

Size-Productivity Revisited

Manabendu Chattopadhyay

Ashok Rudra

In this article, the authors propose to come back to the much-debated alleged inverse relation between farm size and productivity.

Our discussion will be presented in four parts. In Part I, we shall try to take a view about the statistical validity of the alleged relationship, taking into account the latest statistical works of others. In Part II, we shall discuss it from fresh results, involving grouped data which are presented in this article. In Part III, we shall take yet another look at the 'cheap labour based explanation' advanced by A. K. Sen, with the help of fresh statistical exercises. In Part IV, we shall present our understanding of the alleged relationship where it holds and its policy implications.

I

IN the early stage of the discussion, most writers writing about this subject took the validity of the inverse relation for granted, without undertaking any investigations into the statistical validity of the same. (Rudra is among the few who challenge the universal validity of the alleged relationship.) As his views have been much misrepresented and misunderstood we may emphasize that it was never the view expressed by the author that the inverse relationship was not to be observed in any circumstances in Indian agriculture. (Our view was that such a relationship could not be regarded as a universally valid law operating in Indian agriculture. That (here) were indications in the Farm Management data, themselves, that in certain areas yield per acre instead of declining with increasing size might actually be increasing. Also, that in certain cases, where an inverse relationship could be recognised to hold, it might do so among the smallest size classes of farmers but not among others. It is also our view that, in many areas, one could not possibly observe any systematic pattern of dependence between yield per acre and farm size. "There is no justification for steam-rolling such regional differences in one's hurry to make generalisations about the Indian economy as a whole" — this statement, by Rudra, in his article (Rudra, 1988b)) states correctly his stand which is certainly not one of rejecting the validity of the inverse relationship in all circumstances. His cautious and conditional views were posed against the sweeping generalisations that were made by several authors in the earlier stage of the debate. Some examples are provided below.

Thus, Khuro (1968) writes: "Of particular interest are some generalisa-

tions about the relations between farm size and farm efficiency which are based upon a remarkable omnipresence of some phenomena almost everywhere among the areas studied...". Later he mentions as one of the generalisations: "As farm size (average) expands, gross output per acre declines". Similarly, A. K. Sen (1962) related three results "found to be broadly valid in Indian agriculture", one of which was, "by and large, productivity per acre decreases with the size of holding". D. P. M. M. (1983) in his turn wrote, "The data presented by the Farm Management Survey in India have added another example to a phenomenon observed in many parts of the underdeveloped world, viz. that in peasant agriculture, as the size of farms decreases the output per acre increases". Saini (1971) wrote, "Thus, by and large, the inverse relationship between farm size and productivity is a confirmed phenomenon in Indian agriculture and its statistical validity is adequately established by an analysis of the disaggregated data" (italics added). Hanumantha Rao (1966) made such generalisation not only for yield per acre but also about some of the factors associated with it. Thus, "in all the districts studied, the percentage of cultivated to uncultivated area as well as the percentage of cultivated area cropped more than once decreased sharply with increase in the size of holding. This is because, among the factors, the percentage of holding irrigated invariably declines with increase in the size of holding" (italics added). Sen (1964), who was cautious enough precisely in the earlier stage to write that "The statistical basis of the observations around which all this controversy is centred is not really something that has been proved beyond the legitimate doubts of exacting statisticians", seems to lose that cau-

tion when he tries to summarise the position as late as in 1975 (Sen, 1975) in the following words, "Perhaps the only clear finding is that the size-productivity inverse relationship based on size-class average data is vindicated also by disaggregated inter-farm data from different villages in the same region considered together. But the picture is less clear for data within a village".

It is indeed surprising that Sen holds that disaggregated inter-farm data from different villages in the same region vindicate conclusions based on size-class average data. To take a view on this matter it is necessary for us to briefly recapitulate the statistical work that has been done with aggregated and disaggregated data and the conclusions drawn from them by the concerned research workers.

(1) The Farm Management reports themselves present grouped data which are not subjected to any statistical tests, and the conclusions drawn by the authorities presenting the results were quite cautious: it was the economic theorists who were prone to make generalisation. Thus the following kind of statements occur in the study "Farm Management in India" (DES, 1966): "In some of the regions like Punjab, U.P., Maharashtra, Madras, Andhra Pradesh, and Orissa, output per hectare decreases with increase in farm size and "...yields per hectare and, therefore, gross income per hectare of paddy generally decrease as farm size increases in all the regions (except West Bengal and Andhra Pradesh where no definite trend is discernible)".

(2) Khuro did carry out 'the same tests on straight line fit to grouped data and did permit himself the generalisation cited earlier.

(3) The latest result released of tests carried out on grouped data are those by Krishna Bharadwaj (1974).

1974b) who fitted logarithmic straight lines to such data pertaining to the earlier round of Farm Management Surveys. But her conclusions by no means lend to support to any generalisations. Her cautious conclusions are: (a) "Thus the inverse relation while not supported invariably, is not rejected either". (b) "Taking the per acre yields (in physical units) of individual crops we carried out regression exercises to test the inverse relation between yield per acre and size of holding. We found that in the majority of cases there is no significant or systematic relation between the two".

(c) We ourselves undertook analysis of the grouped data on two occasions. The first set of results had been presented by Rudra in 1968(b). The second set of results have been freshly carried out by us with respect to grouped data pertaining to much later periods and presented in Table 2 in Part II of this paper. Our reservations about the universal validity of the alleged inverse relationship, based on our earlier results, are strengthened by the fresh results presented in this paper. To the best of our knowledge, nobody has till now challenged our tests based on the use of rank correlation coefficient. In this connection it may be noted that, in our work with grouped data in our paper of 1968(b), we have not used gross cropped area as the divisor for obtaining output per acre which we did in our paper of 1968(a). This we feel necessary to emphasise as other research workers have often found fault with our work for allegedly using this concept of acreage [e.g. Bhasadwaj (1974a), Sen (1975)].

We may now turn to the exercises that have been carried out with disaggregated data.

(1) The first exercise is, of course, that by A P Rao who fitted a logarithmic linear function to farm-level data all belonging to the same village. His conclusion was: "contrary to the findings of the Farm Management Studies, according to the present study productivity remained constant over all holding sizes in all the villages, which indicates that holding size has no effect on productivity". It may be noted here that Rao did not make use of the concept of gross cropped area for calculating yield per acre so that there is no reason to underestimate the importance of his results.

TABLE 1: RANK CORRELATION COEFFICIENT BETWEEN FARM SIZE AND TWO INDICATORS OF FARM ECONOMICS

Crop(s)	State and Agricultural Year	(for individual crops)		
		Yield Per Hectare (Q1) (3)	Labour Days Per Hectare (4)	
(1)	(2)			
Paddy	Uttar Pradesh (Muzaffarnagar)	1966-67	-0.10	-0.10
		1967-68	-0.20	+0.30
		1968-69	-0.60	-0.30
	Punjab (Ferozpur)	1967-68	+0.00	-0.20
		1968-69	+0.30	+0.10
		1969-70	+0.60	-0.80**
	Orissa (Cuttack)	1967-68	-0.90*	-0.90*
		1968-69	-1.00*	-1.00*
		1969-70	-0.80**	-0.70
	Madhya Pradesh (Raipur)	1962-63	-0.90*	
		1963-64	+0.30	+0.10
		1964-65	-0.10	
Andhra Pradesh (Cuddapah)	1967-68	+0.50	-0.90*	
	1968-69	-0.80	NA	
	1969-70	-0.80**	-0.70	
Kerala (Alleppey and Quilon)	1962-63	-0.07	NA	
	1963-64	+0.89*	NA	
	1964-65	+0.00	NA	
West Bengal (Hooghly)	1970-71	+0.28	NA	
	1971-72	+0.67*	NA	
	1972-73	-0.76**	NA	
Gujarat (Surat and Bulsar)	1966-67	-0.50	NA	
Paddy (improved)	West Bengal (Hooghly)	1970-71	+0.43	NA
		1971-72	+0.38	NA
		1972-73	-0.57	NA
	Punjab (Ferozpur)	1969-70	-0.40	NA
Paddy (different varieties):	Assam (Nowgong)	1968-69	+0.00	-0.30
		1969-70	-0.80**	NA
	Bao	1968-69	-0.90*	-1.00*
		1969-70	-0.90*	NA
	Abu	1968-69	-0.50	-0.80**
		1969-70	-0.30	NA
	Kuruvi	1967-68	-0.60	NA
		1968-69	+0.60	NA
		1969-70	-0.70	NA
	Samba CC-23	1967-68	-0.10	NA
		1968-69	+0.00	NA
		1969-70	-0.10	NA
Thaladi CC-23	1967-68	+0.00	NA	
	1968-69	+0.40	NA	
	1969-70	+0.90*	NA	
Virippu	1962-65	NA	-0.30	
	1962-65	NA	-0.10	
	1962-65	NA	-0.60	
Wheat (dual): irrigated	Uttar Pradesh (Muzaffarnagar)	1966-67	-0.50	-1.00*
		1967-68	+0.10	-0.60
		1968-69	-0.70	-0.60
	Unirrigated	1966-67	NA	-0.90*
		1967-68	+0.20	-1.00*

(Continued overleaf)

TABLE 1: CONTINUED

Crop(s)	State and Agricultural Year	Yield Per Hectare (Q/1)	Labour Days per Hectare
(1)	(2)	(3)	(4)
	West Bengal (Hooghly)	1968-69	+0.90 ¹ -0.30
		1969-70	-0.10 -0.10
		1970-71	-0.14 NA
		1971-72	-0.24 NA
		1972-73	+0.05 NA
Wheat (Mexican)	Uttar Pradesh (Muzaifarnagar)	1966-67	-1.00* -1.00*
		1967-68	-0.10 -0.30
		1968-69	-0.70 -0.50
	Punjab (Ferozepur)	1967-68	+0.30 -0.90*
		1968-69	+1.00 ² -0.90*
		1969-70	+0.90 ² -0.90*
Sugarcane: planted	Uttar Pradesh (Muzaifarnagar)	1966-67	-0.10 +0.00
		1967-68	-0.90* -1.00*
		1968-69	+0.90 ² -0.70
	ratoon —do—	1966-67	+0.50 -0.50
		1967-68	-0.70 -1.00*
		1968-69	-0.10 -0.50
Jute	West Bengal (Hooghly)	1970-71	+0.07 NA
		1971-72	-0.07 NA
		1972-73	-0.10 NA
	Assam (Nowgong)	1968-69	-0.80** -0.80**
		1969-70	-0.70 NA
Cotton (desi)	Punjab (Ferozepur)	1967-68	+0.60 -0.10
		1968-69	+0.00 +0.50
		1969-70	-0.20 -0.50
	Gujarat (Surat and Buzsar)	1966-67	-0.70 NA
Cotton (American)	Punjab (Ferozepur)	1967-68	+0.40 -0.70
		1968-69	+0.10 -0.60
		1969-70	+0.80 ² -0.80**
Maize	Uttar Pradesh (Muzaifarnagar)	1966-67	+0.00 -0.90*
		1967-68	+0.70 -1.00*
		1968-69	-0.50 -0.90*
Maize (desi)	Punjab (Ferozepur)	1967-68	-0.40 -0.90*
		1968-69	+0.30 -0.50
		1969-70	-0.80** -0.70
Gram	Uttar Pradesh (Muzaifarnagar)	1966-67	+0.70 -0.30
		1967-68	+0.70 -0.90*
		1968-69	-0.60 -0.20
	Orissa (Cuttack)	1968-69	+0.50 -0.30
		1969-70	+0.30 +0.30

(Continued on next page)

(4) Rao's conclusions were confirmed by Rudra (1968b), who also used disaggregated data referring to farms within the same village. The author tested a larger number of observations and used statistical methods which he still thinks are superior to the regression method used by all the others. However, considering that he made use of gross cropped area for calculating output per acre — a procedure that has been the object of much criticism from other research workers — we do not propose to take into account the results of this exercise in our present arguments.

(3) C H H Rao, Saini, and Usha Rani undertook analysis of farm-level observations taken from Farm Management Survey reports. It may be noted that these observations were not confined to single villages but were drawn from a number of villages in each case. While C H H Rao and Saini permitted themselves the conclusions that have been quoted earlier in para 3, Usha Rani was more cautious and her conclusions are conditional as exemplified by the following statements.

(a) "Hence one can even conclude that yield per acre remains constant over different size groups of farms".

(b) "Hence no firm generation can be made about the variation of intensity of cropping over different size groups".

(c) "Hence it can be said that there are no significant variations in the inputs per acre over different size groups of farms".

It may be mentioned, here, that Usha Rani selected only IADP districts with a view to finding out if there were any differences in this matter in the more technologically advanced areas.

(4) The most voluminous work that has been undertaken on this problem is that by Bhattacharya and Saini (1972). In order to eliminate the effects given rise to by inter-village variations, they took Farm Management data but considered the data for different villages separately and attacked them in all possible manner. Some students of the subject have persuaded themselves that Bhattacharya and Saini have definitively established the validity of inverse relation obtained between farm size and productivity. Far from it, Bhattacharya and Saini considered only two districts — viz. Muzaifarnagar and Ferozepur — and what they have to say is best said in their own words as follows:

"The negative correlation between farm size and productivity is, therefore, clear for this region (Muzaffargarh) in the sense that such correlation is observed within most of the sample villages and could not have arisen due to the aggregation over villages" (parenthesis added).

"But, on the whole, the size-productivity correlation is not at all clear for this region ('Ferozepur') (parenthesis added).

This presumably forms the basis of Sen's contention about the picture being not clear within a village. Krishna Bharadwaj, however, writes erroneously that "Saini and Bhattacharya (1972) using data on individual holdings reported statistically significant inverse relation in the majority of cases they studied".

Yet another testing, carried out with data not belonging to Farm Management Surveys, is that of Nirmal Chandra (1974). He carried out tests for the hypothesis that value of output per acre and labour input per acre depend on farm size, mode of labour employment, and tenancy. He carried out two different exercises. One was a three-way analysis of variance, where the three factors were (1) different farm sizes; (2) farms having more than half share of family labour in total human labour and less than half of family labour in total human labour; and (3) farms having more than half the land leased in and less than half the land leased in. He also carried out regression analysis with these three factors treated as variables. His results from these two lines of analysis are not quite consistent with each other, not very clear. On the basis of his analysis of variance, he writes: "The results are really striking; none of the main factors is significant at all and there is no exception to this proposition". This, however, is not borne out by his regression analysis for he indicates quite a few of his regression co-efficients to be turning out as significant.

Most of the results that we have discussed above were based on tests of significance for the regression co-efficients of simple linear regression fit in two variables. Thus A. P. Rao (1967), Saini (1971), Usha Rani (1971), C. H. H. Rao (1968), and Bhattacharya and Saini (1972), all assume the following form:

$\log Y = \log A + B \log X$ ✓
where Y is value of output and X is farm size. Whereas Bharadwaj (1974),

TABLE 1: CONTINUED

Crop(s)	State and Agricultural Year	Yield Per Hectare (3)	Labour Days Per Hectare (4)	
(1)	(2)	(3)	(4)	
Potato	West Bengal (Hooghly)	1970-71	+0.48	NA
		1971-72	+0.83 ¹	NA
		1972-73	-0.33	NA
	Orissa (Cuttack)	1968-69	-0.90*	NA
		1969-70	-0.90*	NA
Jowar (unirrigated)	Andhra Pradesh (Cuddapah)	1967-68	+1.00 ¹	+0.90 ¹
		1968-69	+0.90 ¹	NA
		1969-70	NA	-0.80**
Bajra (irrigated)	Andhra Pradesh (Cuddapah)	1967-68	-0.90*	-0.90
		1968-69	-0.40	NA
		1969-70	+0.10	-0.60

Note: In obtaining yield per hectare, we have used net cultivated area as divisor.

* 1 per cent significant in the negative tail area;

• 5 per cent significant in the negative tail area;

¹ 1 per cent significant in the positive tail area;

• 5 per cent significant in the positive tail area;

NA Not Available.

1974b) uses the same form but interprets Y as value of output per acre. Khurru (1968) alone dispenses with logarithms and uses the simple form:

$$Y = A + B X$$

where Y and X are as before. None of these research workers, however, gave any justification whatsoever for the forms assumed by them. They seem to be unaware that the conclusions drawn by them on the basis of the 't-tests' carried out by them for the significant difference of the regression co-efficient from zero is dependent on the assumption that the regression relations assumed by them are valid. The rank correlation tests made use of by us involve no assumptions whatsoever about the mathematical relation between Y and X.

A detailed discussion of this point was presented in Rudra's article (1968b). Nobody has refuted them, but nobody excepting Bhattacharya and Saini have been prevented from continuing to make use of arbitrary functional forms.

✓ A second statistical point we would like to make here is about the preponderance of negative signs in the regression co-efficients or rank correla-

tion co-efficients. Bhattacharya and Saini write about this phenomena in the results of Rudra (1968b): "However, too many of his rank correlation co-efficients were negative and any overall test would give a significant verdict".

Bhattacharya and Saini (1972) are certainly in the right and they are entirely justified in carrying out pooling of tests. However, this ought not to be construed as an argument against Rudra, as one might get the impression from the way it is cited in (Sen 1975). For, Rudra himself pointed out the role that pooling of tests can be made to play in the following words:

"While the test results are significant only in a few cases which rule out any generalisations, it is seen that with all the variables excepting net profit per hectare, there is a preponderance of the negative sign attached to the rank correlation co-efficient. It may be asked quite legitimately: 'among the non-significant co-efficients, why is there an uneven distribution of positive and negative signs? Can the preponderance of the negative signs be without some significance in their totality?'"

It is, however, necessary to have a proper appreciation of what a pooled test implies. If there are n different independent tests with null hypotheses

"It is evident from the findings of the Farm Management Studies that inputs and output per acre decline consistently with size for holdings above 10 acres" (Rao, 1966).

[We may now consider the effect of aggregation over, or pooling of data pertaining to, different villages. It is quite clear that such pooling or aggregation can falsify the nature of dependence of productivity on farm size in both directions. Thus, if within a single village, productivity of land is invariable with respect to farm size but if the productivity of land is different in different villages and if the villages with higher productivity of land have small average farm sizes, then putting together data from different villages would reveal a spurious inverse relationship. If, on the other hand, average productivity of land is the same in every village and if within each village the inverse relationship holds, then if the different villages have got different average ranges of farm sizes, the intra-village inverse relationship would get obliterated in the process of pooling of inter-village data. Thus, use of such data may be expected to give highly misleading results. We have seen, before, that the few exercises that have analysed data separately for different villages [e.g. the works of A P Rao (1967), and Bhattacharya and Saini (1972)] lead little support to the inverse relationship hypothesis. In this connection, one may wonder why then we have ourselves dealt with grouped data in Tables 1 and 2 in Part II. Our answer is that our purpose in presenting these results is the same as that of Rudra (1968a, 1968b) — merely to show that the *prima facie* arguments that were made in the Farm Management reports and by the earlier batch of research workers on the basis of grouped data cannot be validly drawn from those data. We now turn to a discussion of these results.]

II

(Presented in Tables 1 and 2 are the results of application of rank-correlation tests to hypotheses regarding the declining tendency with regard to size of output per hectare of all crops, a few selected individual crops, as well as certain other factors which have been suggested as explaining the behaviour of output per hectare. The tests have been carried out on exactly the same line as those carried out by Rudra in

TABLE 3: PROPORTION OF H-FARMS AND F-FARMS OVER SIZE CLASSES FOR PUNJAB: 1967-68 TO 1969-70

Size Classes (hectares) (1)	H-Farms (2)	F-Farms (3)	F-H Farms (4)
0-6	0.0000	0.2673	0.7327
6-9	0.0217	0.0682	0.9091
9-14	0.1273	0.0455	0.8727
14-24	0.1504	0.0754	0.8142
24 and above	0.3947	0.0000	0.6053
All	0.1067	0.0933	0.8500

TABLE 4: PROPORTION OF H-FARMS AND F-FARMS OVER SIZE CLASSES FOR ASSAM: 1968-69 TO 1970-71

Size Classes (hectares) (1)	H-Farms (2)	F-Farms (3)	F-H Farms (4)
0.01-1.25	0.0000	0.3294	0.4706
1.26-2.50	0.0000	0.0752	0.5248
2.51-5.00	0.0372	0.2977	0.6651
5.01-7.50	0.0233	0.3023	0.6744
7.51 and above	0.1176	0.2941	0.5883
All	0.0244	0.3711	0.6045

TABLE 5: PROPORTION OF H-FARMS AND F-FARMS OVER SIZE CLASSES FOR WEST BENGAL: 1971-72 AND 1972-73

Size Classes (hectares) (1)	H-Farms (2)	F-Farms (3)	F-H Farms (4)
0.01-0.50	0.1982	0.1982	0.6036
0.51-1.00	0.2353	0.2706	0.5441
1.01-1.50	0.1111	0.1844	0.6945
1.51-2.00	0.2727	0.0909	0.6364
2.01-3.00	0.1905	0.1905	0.6190
3.01-4.00	0.4286	0.0000	0.5714
4.01-6.00	0.0000	0.0000	1.0000
6.01 and above	0.3333	0.0000	0.6667
All	0.2133	0.1800	0.6067

his 1968 (b) paper.

We shall start by taking a look at the results presented in Table 1 regarding yield per hectare and labour input per hectare for individual crops. It is seen that one cannot discover any tendency of yield per hectare decreasing with farm size on the basis of these data. The rank correlation co-efficients are mostly non-significant and they are also not preponderantly of any one sign. For most of the crops, there are about as many negative signs as positive ones. The rank correlations that are significant are also obtained quite positive. Thus, for paddy, out of 41 rank correlation co-efficients, as many as 71 are positive of which 3 are significantly so. Of the negative rank correlation co-efficients a larger number, viz. 9 are significant. For wheat, 8 co-efficients are negative with only one significant, as against 7 positive co-efficients of which 3 are significant. For cotton, there are 5 positive co-efficients, as against 2 negative ones. Only one positive coefficient is signifi-

cant, whereas there is no significant negative co-efficient. The same pattern may be discerned for the different individual crops, and we need not any further paraphrase the Table. We have no hesitation in drawing the conclusion that, output per hectare decreasing with farm size, certainly does not hold true for individual crops. There may be cases where a decreasing tendency holds; there may be other cases where an increasing tendency holds; and in the rest there is no discernible systematic pattern. In any case, there is no scope for propounding a general law.?)

✓ It is, however, interesting to note from the same Table that, when it comes to labour input per hectare, there are strong indications that even for individual crops smaller farms by and large apply labour with a greater intensity. There is a preponderance of negative signs among the rank correlation co-efficients, and quite a good proportion of them are statistically significant. Taking these two results

TABLE 6

State (Region)	Years	Hypothesis H ₁ :	Hypothesis H ₂ :	Hypothesis H ₃ :
		Labour Intensity Higher for F-Farms	Output Per Hectare Higher for F-Farms	Proportion of H-Farms Higher for Larger Farm Size Groups
(1)	(2)	(3)	(4)	(5)
Punjab (Ferozpur)	1967-68 to 1969-70	Rejected (no distinct pattern)	Rejected (O/A higher for H-farms)	Confirmed
Assam (Nowgong)	1968-69 to 1970-71	Undecided (no distinct pattern)	Undecided (no distinct pattern)	Confirmed
West Bengal (Hooghly)	1971-72 and 1972-73	Confirmed for large farm sizes, rejected for small farm sizes	Confirmed for large farm sizes, rejected for small farm sizes	Confirmed

Note: (1) O/A : Value of output per net area ; L/A : Input of labour per net area.

- (2) Comparison of O/A and L/A as between F-farms and H-farms has been carried out graphically; we have noted 'confirmed' when the graph for H-farms lies below that for F-farms for almost all values of A; and 'rejected' when it does not do so. The second case can be of two kinds: either the curves for H-farms lie above that of those for F-farms, or they do not reveal any clear pattern.

together, we have to draw the following conclusions. Smaller farms in almost all areas seem to devote a greater amount of labour per hectare of land not only for cultivating more crops on the same land but even for looking after a single crop. However, this greater amount of labour does not result in higher production. Presumably, the larger farms while devoting less labour apply capital and other non-labour inputs at a higher rate so as to obtain the same amount of production or more than the smaller farms.

We now turn to results pertaining to all crops presented in Table 2.

(a) The output per hectare for all crops is negatively associated with size in all states considered — other than Gujarat, Punjab and West Bengal. We would like to emphasize that it would be quite wrong to think that any decreasing tendency operates also in Gujarat (Guj), West Bengal (WB) and Punjab (Pn) on the basis of any pooling of tests. (We have already discussed the proper significance of pooling of test results in Part I of this article.) It may be noted here that this indicates an important change in the agriculture of West Bengal and Punjab, between the mid-fifties and the late sixties and early seventies; for, as was noted in our earlier paper (Rudra 1968b), the association between output per acre for all crops and size of farm was significantly negative in these two states in the mid-fifties.

(b) However, among the states indicating negative association only in Tamil Nadu, Uttar Pradesh, Madhya

Pradesh, Orissa and Assam, can one talk of the tendency (for output per hectare to diminish with farm size) to operate all over the size range. In Andhra Pradesh, it seems to operate only among the smallest sizes; in Kerala, the tendency operates only beyond 20 hectares; in Madhya Pradesh indications are that the tendency becomes reverse from 5 hectares onwards.

(c) Labour input per hectare is seen to be negatively associated with farm size in all the states and, with the exception of Madhya Pradesh and Assam, seems to operate over the entire size range. In these two latter cases, the tendency becomes dampened for large size groups.

(d) Intensity of cropping is negatively associated with size in all the states for which information is available. An important case, for which information is not available on this point, is Kerala for which we have reason to believe this tendency does not hold in view of our findings on irrigation discussed in the next para. The situation in respect of intensity of cropping has not changed between the mid-fifties and the late sixties and early seventies.

(e) Incidence of irrigation is negatively associated with size in many a state, but there are important exceptions. The most important exception is Kerala: the association was significantly positive in the mid-fifties, and it has remained so in the early sixties. The proportion of land irrigated is negatively associated also in Maharashtra, Rajasthan and Gujarat. In Uttar

Pradesh, the negative association was highly significant in the mid-fifties, but the association became moderately positive in the mid-sixties. We would like to emphasize again that no kind of pooling of tests would validate a negative association between incidence of irrigation and size, in such cases as we have mentioned above, where it is found not to hold when taking individually.³

(f) Total input per hectare is negatively associated with farm size in all the states. This was so in the mid-fifties, and it has not changed after the so-called green revolution. It should be borne in mind that total input here is the value of all materials and labour inputs arrived at by carrying out various imputations by questionable methods. Some other workers have considered bullock labour separately.⁴ We have on our part considered the total value of material inputs,⁵ and it may be seen that the intensity of application declines with size in many a case, but not everywhere or always. A notable exception is Punjab where the application of material inputs per hectare in the post green revolution period goes up with farm size.

III

It is not our purpose in this paper to discuss and evaluate the very many explanations that have been forwarded by different research workers for the alleged inverse relationship. But we have some fresh results to present, with the help of which one may test the validity of the one explanation that has been the occasion of a great deal of theoretical

TABLE 7

State (Region)	Years	Hypothesis H ₁ :	Hypothesis H ₂ :	Hypothesis H ₃ :
		Higher the Proportion of Family Labour to Hired Labour, Higher the Intensity of Application of Human Labour as a Whole (L/A increases with L/L)	Higher the Proportion of Family Labour to Hired Labour, Higher the Productivity of Land (O/A increases with L/L)	Higher the Proportion of Family Labour to Hired Labour, Lower the Productivity of Labour (O/L decreases with L/L)
(1)	(2)	(3)	(4)	(5)
Punjab (Ferozepur)	1967-68 to 1969-70	Confirmed	Rejected (O/A goes down slightly with L/L)	Confirmed
Assam (Nowgong)	1968-69 to 1970-71	Confirmed	Confirmed (O/A goes up slightly with L/L)	Rejected
West Bengal (Hooghly)	1971-72 and 1972-73	Rejected	Rejected (no distinct pattern)	Confirmed

discussions — $\alpha \geq \beta$ the Cheap Labour based Explanation¹ advanced by A K Sen (1962, 1964). The results presented in this paper may be treated as a follow-up of the results that were presented by one of the authors in an earlier paper (Rudra, 1973). The explanation is a composite one, involving not one but a number of hypotheses. Thus we suppose the explanation can be broken up into the following component parts:

Hypothesis H₁: Farms employing exclusively family labour use labour more intensively than farms based exclusively on hired labour.

Hypothesis H₂: Higher input per acre of human labour in the farms based exclusively on family labour results in higher output per acre on such farms.

Hypothesis H₃: Larger the farm size, higher the proportion of farms based exclusively on hired labour.

It is quite clear that, if farms were either exclusively based on family labour (farms of type F) or exclusively based on hired labour (farms of type H) and if the three hypotheses formulated above hold true, then indeed output per acre would decrease with farm size increasing. So, one way of testing the validity of the cheap labour hypothesis would be to test separately for the three hypotheses. In this connection, two important points of theory require to be stated even at the cost of repeating some earlier writers.

(1) Hypothesis H₁ has been so formulated as to imply the marginal productivity of labour in farms of type F to be the same for a given volume of input of labour as that in a farm of type H. Thus, as is by now very familiar, the argument is presented in terms of a

marginal productivity curve which is assumed to be the same, both for H farms and F farms. Assuming that H farms employ labour up to the point of intersection of the line representing wage rate with the marginal productivity curve, and that F farms employ labour beyond that point, it is concluded that

- Farms employ labour more intensively than H farms;
- thereby they produce more of output per acre and;
- this is done at the cost of a lower average labour productivity.

However, there is no justification for assuming the same marginal productivity curve for F farms and H farms.² If any one of these two types of farms use more of capital or other non-labour inputs or enjoy any other benefits, one of the curves would be above the other. In case the curve for H farms is above that of F farms, the latter may not give rise to higher output per acre even while employing more labour per acre. On the other hand, if the curve for F farms is higher than that for H farms, by virtue of better management, better soil quality, etc., as have been suggested by many participants in the discussion, higher output per acre in F farms would result even if there be no higher use of labour in F farms.

(2) The second point is: it is not true that farms are exclusively either of the type F or of the type H. As a matter of fact, most farms in India — even very small ones — employ a combination of family labour and hired labour (we shall call this F-H farms). Some of the critics of the cheap labour based explanation (e.g. Dipak Mazumdar, 1965; C H H Rao, 1966; Bhagwati and Chakravarty, 1971) have pointed

this out and argued that the opportunity cost of family labour must be the same as hired labour in farms which employ such a combination. Sen, replying to Dipak Mazumdar's argument wrote: "This argument overlooks the fact that the data presented by the Farm Management Surveys are size-classes averages and do not state the position of any individual holding; just because in the average data it is found that, in each class, a certain amount of hired labour is used, it does not follow that all or even the bulk of the farms in the smaller size-groups use hired labour at the margin" (Sen 1964).

It would appear from Sen's reply that he proposes to rely on the fact of smaller farms having a higher proportion of farms of type F. Even if farms that employ a mixture of family labour and hired labour — i.e. F-H farms — were to price the mixed human labour employed by them in the same way as farms of type H, Sen's argument would hold all the same, as long as the proportion of F farms would decline with farm size increasing. However, the proportion of the farms of the type F is negligible in the higher size groups and not very high even in the smallest size groups — so that their labour utilisation pattern cannot provide a firm basis for an explanation for the alleged inverse relation between size and productivity over the entire range of size classes. (Tables 3, 4 and 5.)

We however, do not think that even for mixed farms employing family labour as well as hired labour, the market wage rate can be treated as the opportunity cost of family labour. For, family labour and hired labour under Indian conditions are not substitutes.

Human labour as a whole cannot be treated as a homogeneous commodity for which a single marginal productivity curve can be drawn. On the other hand, it is difficult to think in terms of drawing for the same farm two or more separate marginal productivity curves for hired labour and family labour of different kinds, because of the operation specific nature of the different kinds of human labour and the fixed complementary relations that hold between them.⁸

However, it appears to us that, if forms of type F-H would value family labour at a lower price than hired labour, then the 'cheap labour' based explanation would require to be restated for such farms in terms of the following component hypotheses.

Hypothesis H₁: Higher the farm size (of type F-H), higher the proportion of hired labour to family labour.

Hypothesis H₂: Higher the proportion of family labour to hired labour, higher the intensity of application of human labour as a whole.

Hypothesis H₃: Higher the input of human labour (whatever its composition in terms of hired labour and family labour), higher the output per acre.

Hypothesis H₄: Higher the proportion of family labour to hired labour, higher the productivity of land.

The corollaries to the above hypotheses — given rise to by the assumption of declining marginal productivity of labour implicit all through in this line of discussion — would be as follows:

Hypothesis H₁: Higher the proportion of family labour to hired labour, lower the productivity of labour.

Hypothesis H₂: Higher the farm size, higher the productivity of labour.

We shall now present some results of subjecting the above hypotheses to some statistical examinations, carried out with the help of farm level observations, which refer to certain selected areas and certain selected time points. As such, our results do not claim any definitive refutation or confirmation of the hypotheses for the country as a whole. (It has to be borne in mind, however, that practically no evidence has been put forward by anybody in support of the more crucial component parts of the 'cheap labour based explanation'.) The data that we have used for this purpose are the disaggregated farm level observations, collected by the Farm Management Surveys of Punjab, Assam, and West Bengal. Hypothesis H₁ is based

TABLE 8

State (Region)	Years	Hypothesis H ₁ : Higher the Farm Size, Higher the Productivity of Labour
(1)	(2)	(3)
Tamil Nadu (Thanjavur)	1967-68 to 1969-70	Rejected
Andhra Pradesh (Cuddapah)	1967-68 to 1969-70	Confirmed
Kerala (Alleppey and Quilon)	1962-63 to 1964-65	Confirmed
Uttar Pradesh (Muzaffarnagar)	1966-67 to 1968-69	Confirmed
Punjab (Ferozpur)	1967-68 to 1969-70	Confirmed
Madhya Pradesh (Raipur)	1962-63 to 1964-65	Rejected
Orissa (Cuttack)	1967-68 to 1969-70	Confirmed
West Bengal (Hooghly)	1970-71 to 1972-73	Confirmed
Assam (Nowgong)	1968-69 to 1969-70	Rejected*
Gujarat (Surat and Bulsar)	1966-67	Confirmed

Note: *Labour productivity strongly decreases with farm size.

on aggregated data, collected from the different reports of Farm Management Surveys.

The conclusions with respect to H₁, H₂ and H₃ are presented in a tabular form in Table 8. Similarly the conclusions with regard to H₄, H₁, H₂ and H₃ are presented in Tables 7 and 8. The hypotheses H₁ and H₂ seem to be confirmed for all the cases. In each Table, against each body of data, the different hypotheses have been indicated as confirmed, refuted or undecided (i.e. neither refuted nor confirmed). The inferences have been drawn without taking resort to any statistical tests but by merely resorting to graphical analysis.

It may be noted, here, that for statistical purposes we have treated as F

farms those for which $\frac{L_f}{L}$ is greater

than 0.90 and as H farms those for

which $\frac{L_h}{L}$ is greater than 0.90 where

L_f represents family labour and L_h hired labour working on the family farm ($L_f + L_h = L$)

We may now put together our findings with regard to the different hypotheses for the three different regions as follows:

Punjab: (1) Both hypotheses H₁ and H₂ are rejected. As a matter of fact, purely hired labour based farms put in about the same amount of human labour as purely family labour based farms, whereas output per hectare on purely hired labour based farms is higher than that on purely family labour based farms. This would imply that the purely hired labour based farms use capital and other non-labour inputs at a higher intensity than purely family

labour based farms.

(2) It is, however, seen that labour input per hectare decreases as farm size goes up both for H farms and F farms whereas output per hectare decreases as farm size goes up for F farms only but does not do so for H farms. From these we can draw the following two important conclusions:

- There are factors other than cheapness of family labour which operate in Punjab to give rise to decreasing labour intensity in larger sized farms.
- However, decreasing labour intensity in large sized farms results in decreasing value of output per hectare with farm size only on F farms; there is no such tendency operating for H farms. One interpretation of this may be that the larger H farms use higher amounts of capital and other non-labour inputs than smaller H farms.

(3) Coming now to mixed farms — i.e. those using the combination of family labour and hired labour — it is seen that the total labour input per hectare does indeed go up as proportion of family labour to hired labour goes up (thus confirming H₂); but this does not result in the output per hectare going up at the same time, thus refuting H₃. This is because, the productivity of labour goes down as the proportion of family labour to hired labour goes up (confirming H₁) in such a fashion as to counteract the higher intensity of application of labour with higher proportion of family labour to hired labour.

To conclude, in Punjab, the fact of the proportion of H farms going up with size and the proportion of hired labour to family labour in farms with mixed labour going up with size, results in the contrary of what the 'cheap

labour based explanation would have; i.e., output per hectare increases instead of decreasing as farm size goes up.

Assam: Hypotheses H_1 and H_2 both fail to receive either refutation or confirmation — there being no clear pattern over the different size classes. However, when it comes to a farm using a combination of hired labour and family labour, labour intensity goes up as proportion of family labour to hired labour goes up, but output per unit of labour remains more or less unchanged. This may imply that complementary inputs are increased along with the input of labour in such a fashion as to prevent labour productivity from declining. The net result is output per hectare going up as the proportion of family labour to hired labour goes up. The case of Assam can, therefore, be treated as a case by and large supporting the cheap labour based explanation as far as mixed farms (farms of type F-H) are concerned. The explanation in terms of pure H farms and pure F farms does not, however, apply unambiguously. But it may be noticed that output per hectare decreases with farm size for F farms and the input of labour per hectare shows a similar tendency — though much less marked. The same tendencies are not particularly discernible in H farms. This, however, indicates that in the case of Assam, whether or not cheapness of family labour is a factor giving rise to the inverse relationship between output per hectare and farm size, there are certainly factors giving rise to the phenomena.

West Bengal: In the matter of intensity of labour input as well as productivity of land, there does not seem to be any difference between F farms and H farms, as long as the farm size is small. But, for the larger sized farms, the H farms do seem to apply labour less intensively and obtain lower per hectare output. However, in farms using a combination of hired labour and family labour, neither intensity of labour input nor output per acre vary systematically with the proportion of family labour to hired labour (see Rukus, 1973). Productivity of labour, however, does fall with the proportion of family labour to hired labour going up (see Rudra 1973). This suggests that farms utilising more of hired labour use more of non-labour inputs per acre. Hence, the net result is that, even

though proportion of family labour to hired labour goes down as farm size goes up, it is not accompanied by any decrease in output per acre. In this connection, we may further note that the labour input per hectare as well as the output per hectare decreases with farm size for H farms, though they do not do so for F farms. This once again suggests that there are factors other than cheapness of family labour which give rise to a tendency of decreasing output per hectare with farm size increasing for farms based on hired labour. There must be other compensatory factors, once again other than cheapness of family labour, which prevent this tendency from operating in the case of F farms.

We may now conclude that the 'cheap labour' based explanation may possibly be the one explanation for the alleged inverse relationship where it holds, but certainly not one that is either universally valid or which takes precedence over various explanations that have been advanced by other research workers.

IV

We now present our own view about the relationship of farm size and the intensities with which inputs are applied and output obtained.

(a) In most regions of India, for which data are available, small farmers seem to cultivate their lands more intensively — in the sense that they put in more of labour per hectare, more of non-labour material inputs per hectare, they seem to arrange for irrigation for greater proportion of their land, go in for a multiplicity of crops, and choose among crops those that are more remunerative. These are not universal laws but these features occur in different combinations in different parts of the country.

(b) There are possibly various reasons why small farmers behave in this fashion. The different explanations that have been put forward by different authors are not really rivals. They probably operate, once again, in different combinations in different areas. It seems to us that one ought to distinguish between forces that drive small farmers to such intensive effort and factors that permit them to indulge in such more intensive effort.

(1) Among the factors that permit small farmers to undertake more intensive effort are the cheapness of family labour (where it is true), indivisibilities of capital, superior quality

of land (where it is true), better quality of management that can be applied to a smaller farm, etc.

(ii) Among the factors that drive a small farmer to more intensive effort the most important one, of course, is his need for survival. There is a certain basic minimum of consumption that a poor peasant family has to have without which it will be simply wiped out. It is only understandable that such a poor peasant family, depending on a small piece of land, submerged in a vast population of surplus labour in the countryside, and thus not having any alternative sources of employment and income, would try to produce the maximum output on his piece of land. He would not only ignore any marginal productivity calculations insofar as family labour is concerned, he would employ hired labour whenever necessary to supplement family labour, and in doing that would pay no heed to marginal productivities. He would also try to apply non-labour and non-monetised inputs with maximum intensity once again by using labour without any calculations. He would try to improve the quality of land by small-scale irrigation and other such means as can be procured with the help of labour. He will tend to leave fallow as little land as possible, and try to cultivate as many crops as possible and choose such crops which slow down his minimum consumption needs would meet his minimum cash needs. In case the poor peasant's land is leased in on share basis, he would not be applying inputs that he can command less intensively guided by any consideration of the Marshallian analysis of sharecropper behaviour. His tendency to intensify his effort would be all the more so because of the fact that he has to meet his minimum needs with only a share of the results of his effort.

(c) However, a poor peasant by his very position is at a disadvantage compared to the bigger farmer insofar as his capacity to apply capital and other monetised inputs is concerned. As such, even after all the efforts he can undertake, output per hectare on his farm may not be larger than on the farms of bigger farmers.

It is our view that the factors driving a poor peasant towards more intensive effort are more important than the factors permitting him to do so. In other words, to the extent the smaller farms in many parts of India yield higher output per hectare than the larger farms, it is somewhat misleading to treat the phenomena as one of relative efficiency rather than of distress and affluence. Also, it is somewhat misleading to treat the phenomenon as one of scale; for, in our view, in many areas, the phenomenon is re-

stricted to the small farm size groups which are subject to distress conditions and not a law that holds for all values of size variable X — from zero to infinity. We, of course, do not claim any originality in emphasising this distress factor. Many authors — e.g. C H H Rao (1966),⁷ Bhagwati and Chakravarty (1971),⁸ Krishna Bharadwaj (1974a)⁹ — have made similar observations.

While some of the discussions participating in the controversy regarding the inverse relationship between farm size and land productivity have treated the question as merely one of academic interest, there are others who have not failed to notice that the question is of fundamental significance from the point of view of economic policy — and hence, of politics. Involved are questions regarding the choice between small family labour based 'peasant farms', large hired labour based 'capitalist farms', and large farms with co-operative type of organisations. In this, we are in the company of Bhagwati and Chakravarty (1971),¹⁰ Krishna Bharadwaj (1974a),¹¹ among others. Policy implications would differ diametrically, depending on whether one tends to treat the inverse relationship when operating as an indication of higher 'efficiency' of smaller farms or regards the phenomenon as reflecting conditions of distress of small farms. From the first point of view, would follow such a policy recommendation as say that of C H H Rao (1966), "... measures to effect the transfer of land from the big to the small and medium farms through sales and through tenancy on a commercial basis are desirable", or as say that of Damodar: "... for India the capitalist form of wage-labour organisation will lead to inefficient aggregate output and the peasant family system implied by individual peasant proprietorship would be superior. Ideally, this argument would lead to an agrarian structure, based on peasant families owning land in the same ratio as the overall family-land ratio" (Bhagwati and Chakravarty, 1971). From the second point of view (i.e. of distress driving small farmers to endeavour in all possible ways to eke out a subsistence from their small land fragments), if it be made the basis of a policy for preserving small farms as they are, the result would be the destitution and expropriation of poor peasants and the promotion of capitalist farming on a large scale in the countryside.

For, as Parsh Chatterpathy (1972)

writes, "... behind the facade of 'efficiency' of the family labour-based agriculture, lies the stark exploitation of the cultivator by merchant capital and usurious capital, and this is manifested in his over-work and chronic underconsumption. If such is the situation under the system of owner-cultivation, it is far worse under the system of tenancy, such as sharecropping, inasmuch as the landlord becomes a sharer, together with the merchant and the moneylender, of the produce made out of the surplus-labour of the tenant cultivator."

It is ironic that a static comparative situation between small farms and big farms, allegedly prevailing in the fifties in certain parts of the country — and even that, not at all established beyond doubt — has been the basis of plenty of friends of the rural poor opting for an agrarian policy that is ultimately destined to cause immiseration of the rural poor. For, even if the static comparison is valid in a certain stage of development of agriculture with low technological inputs, it cannot remain so during a period when there is a mounting drive by richer farmers to go in for more and more technological agriculture in search of higher profits. As Bhagwati and Chakravarty point out, the argument in favour of small peasant farm "... rules out possible indivisibilities, relating to inputs, which may make co-operation desirable. Further, as a policy prescription, it is inadequate as it does not take into consideration the economic problems of the transition from one system to the other ... while such an agrarian structure can be demonstrated to be statistically efficient, its effect on long-run growth may be deleterious if induced savings are adversely affected and there are political limits to the governmental ability to tax (as there certainly is in India, especially with respect to the agricultural sector)" (Bhagwati and Chakravarty, 1971).

It is also ironic that, on the policy level, the alternatives seem to have reduced themselves to two — viz, small-scale peasant farming and large-scale capitalist farming. That there was a third alternative — viz, that of co-operative farming — seems to have completely disappeared from public memory. Under the peculiar conditions in which socialism has been adopted as a programme by equally peculiar political forces, the co-operative movement, which figured as one of the most important planks in the programmes of

socialists in pre-independence years, rapidly proved to be a failure in the post-independence years. All shades of opinion in the country seem to have accepted once for all that co-operativisation is to be decisively rejected as a means of overcoming difficulties arising from the smallness of the overwhelming majority of farms in India. Many erstwhile supporters of the co-operative movement have now turned into supporters of peasant farming, drawing consolation from the thought that large-scale farming is not after all necessary for dynamism in agriculture.

Notes

- 1 Thus, Sen (1975) writes: "Furthermore, Observation III was concerned with output per net acre and not with output per gross acre, whereas Rudra (1968) looked at the latter in his testing." And Bharadwaj (1974b) writes: "Commenting on Rudra (1968), C H H Rao (1968) pointed out that the disagreement could have arisen because of the use of *Rudra* of yield per gross cultivated acre as the dependent variable instead of yield per net cultivated acre." Both of them fail to mention that Rudra in his paper in 1968 (b) used net cropped area, not gross cropped area.
- 2 This agrees with the conclusion of Krishna Bharadwaj (1974a) about individual crops: "that in the majority of cases there is no significant or systematic relation between the two". Our findings relating to total material input per hectare, labour input per hectare, intensity of cropping are also in agreement with the conclusions drawn by Bharadwaj in (1974a, 1974b). In this connection, her findings about cropping pattern are illuminating.
- 3 See results derived by C H H Rao (1966) and Krishna Bharadwaj (1974b) on the contribution of irrigation to higher productivity in smaller farms.
- 4 See discussions by Dipak Mazumdar (1965) and Usha Rani (1971) for consideration of the higher intensity of application of total inputs by smaller farms.
- 5 C H H Rao (1966) also makes the point of same marginal productivity curve not being applicable for the different kinds of farms under consideration. However, Rao argued for the marginal productivity curve for small farms to be higher than that for large farms. It does not seem to us that this may be taken for granted for all situations.
- 6 See Rudra (1970) and Bharadwaj (1974a) for extensive discussion of the point regarding heterogeneous character of labour.
- 7 Thus C H H Rao (1966) writes: "It is also possible that income itself is an important variable motivating the small farmers to work the

land intensively and introducing an element of indifference among big farmers, especially where such farmers are accustomed to the traditional consumption patterns and show greater preference for leisure and non-economic pursuits in the villages.

- 8 "On the other hand, the possibility that the smaller farms are in distress could lead to their being more efficient in their use of resources, especially labour and management (the alternative being mination)." Bhagwati and Chakravarty (1971).
- 9 This Krishna Bharadwaj (1974a) writes: "... very small farmers may 'choose' to raise as much gross value of output as possible per acre, even at the cost of having to incur debts to provide circulating capital; they may be found operating land intensively even to a point where the additional input costs exceed the value of additional output". And also: "... a small enough parcel would compel the tenant to put in a high amount of his own labour and other inputs in an effort towards providing subsistence for himself and his family after paying out the landlord's share".
- 10 This relationship has an obvious bearing upon the policy issues pertaining to land ceilings and land grouping under co-operative farming and other forms of agrarian reorganisation. Bhagwati and Chakravarty (1971).
- 11 "An adequate 'explanation' is important not only for policy formulation but also for assessing the future possibilities — whether the productivity differentials are a characteristic that could persist, making the small peasant family farms a historically viable form (and possibly a relatively 'efficient' one) or whether their relative 'advantage' rests on a specific conjuncture subject to change or whether it is more of a static reflection of the economically vulnerable position of the small operators." Krishna Bharadwaj (1974a).

References

- Bharadwaj, Krishna 1974a: 'Notes on Farm Size and Productivity', *Economic and Political Weekly*, Review of Agriculture, March 30.
- 1974b: 'Production Conditions in Indian Agriculture: A Study Based on Farm Management Surveys', Cambridge University Press.
- Bhagwati, J N and Chakravarty, S 1971: 'Contributions to Indian Economic Analysis: A Survey', Lalvani Publishing House.
- Bhattacharya, N and Saini, G R 1972: 'Farm Size and Productivity: A Fresh Look', *Economic and Political Weekly*, June 24.
- Chattopadhyay, Parash 1972: 'Mode of Production in Indian Agriculture', *Economic and Political Weekly*, March 25.
- Chandra, N K 1974: 'Farm Efficiency under Semi-Feudalism: A Critique

- of Marginalist Theories and Some Marxist Formulations', *Economic and Political Weekly*, Special Number, August.
- DES (Directorate of Economics and Statistics) 1960: *Farm Management in India*, Government of India Publication.
- Khuroo, A M 1968: 'Returns to Scale in Indian Agriculture', in: 'Readings in Agricultural Development', A M Khuroo (ed), Allied Publishers.
- Mazumdar, Dipak 1963: 'On the Economics of Relative Efficiency of Small Farmers', *Economic Weekly*, Special Number.
- 1965: 'Size of Farm and Productivity: A Problem of Indian Peasant Agriculture', *Economica*, Volume 32.
- Rao, A P 1967: 'Size of Holding and Productivity', *Economic and Political Weekly*, November 11.
- Rao, C H Hanumantha 1966: 'Alternative Explanations of the Inverse Relationship between Farm Size and Output Per Acre in India', *Indian Economic Review*, Volume 1.
- Runka, Ashok 1968a: 'Farm Size and Yield Per Acre', *Economic and*

- Political Weekly*, Special Number, July.
- 1968b: 'More on Returns to Scale in Indian Agriculture', *Economic and Political Weekly*, Review of Agriculture, October 20.
- 1973: 'Marginalist Explanation for More Intense Labour Input in Smaller Farms: Empirical Verification', *Economic and Political Weekly*, June 2.
- Madan Mohan Mukhopadhyay 1976: 'Hiring of Labour by Poor Farmers', *Economic and Political Weekly*, January 10.
- Saini, C R 1971: 'Holding Size, Productivity, and Some Related Aspects of Indian Agriculture', *Economic and Political Weekly*, June 28.
- Sen, A K 1962: 'An Aspect of Indian Agriculture', *Economic Weekly*, Annual Number, February.
- 1964: 'Size of Holdings and Productivity', *Economic Weekly*, Annual Number, February.
- 1975: 'Employment Technology and Development', Oxford University Press.
- Usha Ram 1971: 'Size of Farm and Productivity', *Economic and Political Weekly*, June 28.

Development Aid

DEVELOPMENT ASSISTANCE COMMITTEE (DAC) Members raised their net disbursements of official development assistance (ODA) in 1975 to \$ 13.6 billion, from \$ 11.3 billion in 1974, an increase of 20 per cent. As a share of DAC Members' GNP, ODA rose to 0.38 per cent, from 0.33 per cent in 1974. This confirms the reversal of the earlier downward trend, but still leaves the total far short of the target of 0.7 per cent of GNP which has been accepted by thirteen DAC members.

All seventeen DAC countries, except Italy, increased their outflow of ODA in dollars, and thirteen raised it as a share of their GNP. Particularly rapid growth was recorded by Australia, Belgium, Canada, Netherlands, New Zealand, Norway, Sweden and Switzerland; all these countries' ODA/GNP ratio rose by at least ten per cent above the 1974 level. Two countries, Netherlands for the first time, and Sweden for the second time, achieved an ODA/GNP ratio above the target of 0.7 per cent, setting new records in each case (Sweden: 0.82 per cent, Netherlands: 0.75 per cent).

As prices rose by about 10 per cent in 1975, the growth of ODA in real terms, i.e. measured in constant prices and exchange rates, was a little less than 10 per cent.

Preliminary figures indicate a certain shift to the purposes for which ODA

resources were provided in 1975. Food aid, supplied directly or through multilateral channels, rose from 15 to 16 per cent of the total, and there was a decline in the share of technical cooperation expenditures from 25 to 23 per cent. The most noteworthy feature, however, was the considerable increase in project, rather than non-project, assistance, as earlier commitments were brought to the disbursement stage. An increase of some 5 per cent, to 23 per cent, in the share of capital project assistance was almost identically offset by a fall in the share of non-project financing from 21 per cent in 1974 to 10 per cent in 1975.

The terms of ODA softened slightly in 1975. According to the preliminary data available, the share of grants in total commitments rose slightly from 65.4 per cent in 1974 to 66.2 per cent in 1975, while loan terms remained on average at their 1974 level.

The total flow of \$ 47.8 billion was an increase of one third on 1974 in dollars, and of some 20 per cent in real terms. It brought the total receipts of developing countries to \$ 23 per person — equivalent to 5 per cent of their GNP and about one quarter of their investment. A decade ago (average 1964/1968) the corresponding figure was \$ 8.50 per person. On this basis, the real value of the annual transfer of resources has risen by some 60 per cent in the past ten years.