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INTRODUCTION

The Reserve Bank of India has been publishing a monthly Bulletin regularly which carries statistical data, studies of descriptive and analytical nature and also other relevant material of informative value. The Bulletin, in effect, has become the main channel for carrying factual as well as technical studies on economic problems undertaken by the Bank staff. A stage has, however, been reached when it is felt that it would not be possible to accommodate the increasing number of technical studies which are being made or are likely to be made by the staff, within the present scope of the Bulletin. Thus, it has been decided to issue a separate periodical to provide an outlet for such studies. 'Occasional Papers', it is expected, will help to provoke discussion and thinking among the professional economists by making available technical analyses and studies relating to various economic problems. We hope that in course of time the 'Occasional Papers' will serve as a catalytic agent and, through proper feed-back, will help to promote a meaningful understanding of economic problems among our staff and professionals outside the Bank. To begin with, it has been decided to issue 'Occasional Papers' twice a year, i.e., in June and December.

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Deputy Governor

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INEQUALITIES IN ASSET DISTRIBUTION OF RURAL HOUSEHOLDS[1]

V. V. DIVATIA†

Introduction

In this paper we seek to quantify and analyse the prevailing inequalities in the distribution of rural household assets in India and also examine the distributions of total value of assets according to broad categories of assets. The summary results of the first schedule (Schedule 18.1) of the All India Debt and Investment Survey, 1971-72 (AIDIS) provide the necessary data for this analysis. The requisite tables are now published as estimates based on pooled data of three independent samples. Section 1 gives some idea about the data base ; section 2 discusses the results of the inequality measures ; section 3 discusses the distribution of assets, with particular reference to their nature at the lower and the upper extremes, and attempts to examine if any relationships subsist among the average level of per household total assets, the degree of inequality and the pull of the distributions at the lower and the upper extremes. Section 4 dwells on the share of different broad categories of assets and the extent of households reporting these assets. Section 5 is the concluding one. The analysis in these various sections is attempted to the extent possible and considered necessary, at All India and State levels, and also by various occupational classes. It is possible to break up the data still further at regional levels (i.e. below State-level), but this has to be left to another paper. Since the mathematics of the measures of inequality as well as the concept of inequality are not discussed in any of the sections, an Annexure is included to cover these aspects.

1. Data

The Reserve Bank of India (RBI) has been conducting decennial sample surveys in rural areas covering the various aspects

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1. The article is a revised version of the paper presented at the 14th General Conference, Aulanko, Finland, (August 18-23, 1975) of the International Association for Research in Income and Wealth. Preliminary results were also presented at the Pachmarhi Seminar held in January 1975 by the Indian Association for Research Workers in National Income and Wealth.

of the farm economy, the assets and liabilities of rural people covering in particular the various aspects of their debts, assets and investments. Two surveys, one in 1951-52 and another in 1961-62 were conducted before the 1971-72 survey was taken up. The current survey (1971-72) was conducted jointly by the RBI, the National Sample Survey, Organisation (NSSO) and the State Statistical Bureaux (SSBs). It has been termed as the All-India Debt and Investment Survey, 1971-72 (AIDIS), and for the first time the coverage was also extended to the urban areas. There were three independent samples viz., Central, State and the RBI—and each sample had about 3,900 to 4,500 villages in the rural areas, the aggregate being 12,452 villages. It was expected that on an average 12 households in each sample village would be selected. However, due to various reasons, which need not be gone into here, the number of households in each selected village has been on the average slightly over 8.[2]

The assets are as on 30th June 1971 and are in gross terms. That is, the values of physical as well as financial assets, including lending to others, are recorded for each household in the sample and while household indebtedness is also recorded, it is not netted out. Inventories are excluded from asset figures. Estimates of gross assets are based on this data. The valuation is done at the current market price of assets on as-is-where-is basis. While these instructions were issued to the field staff, accuracy of valuation would obviously depend on how effectively the instructions are carried out. One guideline was to inquire how much the respondent would get if he were to sell the assets on the reference day (30th June 1971). For some assets like small huts, etc. it might have been indeed somewhat difficult to ascertain the value of the property, these being almost non-marketable goods. Some assets may not have been declared, particularly by the richer or the not-so-poor classes and to this extent, inequalities might be understated. However, in the rural areas, the preponderent asset is really land and the owner-cultivator class is really the predominant one. Hence, if land is properly evaluated, there should not be much of an under-estimation in the aggregate. All economic surveys have this type of limitation. Training of the field staff, continuity of field staff for developing expertise in the job, and intensive supervision appear to be the only remedies.

2. For details of schedules, sampling design, coverage, scope and estimational methods, reference is invited to introductory and technical notes appearing in Vol. I and Vol. II of the published results.

The data have been tabulated at regional level and then aggregated to state and All India level. The tabulations also give data separately for the four occupational classes, viz., cultivators, agricultural labourers, artisans and other non-cultivators. For each of these various classes, estimated number of households and estimated amounts of assets are worked out in the form of frequency tables having 11 per household asset size-groups. These size-groups are[3]

1. Less than Rs. 500
2. Rs. 500 — 1000
3. Rs. 1000 — 2500
4. Rs. 2500 — 5000
5. Rs. 5000 — 10000
6. Rs. 10000 — 15000
7. Rs. 15000 — 20000
8. Rs. 20000 — 30000
9. Rs. 30000 — 50000
10. Rs. 50000 — 100000
11. Rs. 100000 and above

A number of other tables have been generated, but, for the purposes of this paper, these tables are basic.

The four formulae we use to express inequalities are : (1) Theil's formula called T index here, (2) Gini's Coefficient or the Concentration Ratio—called CR, (3) Kuznet's index—termed Kindex and (4) the variance of logarithms of per household average value of assets—denoted as V index. Much of the detailed discussion is based only on T index (Refer to Annexure).

Separate tables have been generated according to following five household size-groups : single person, 2 persons, 3-4 persons, 5-7 persons and 8 or more persons per household.[4]

2. Extent of Inequality

All Households

First, we examine the All India and State-wise inequalities of assets for all households. The term 'All India' for the purpose of this paper means aggregation of the figures for the 20 States and 3 Union Territories. Value of all the four indices are shown in Table 5

3. For all classes other than the cultivator class, the published data in Vols. I and II are terminated with the highest class of Rs. 10,000 and above.
4. Vols. I and II do not have tables according to size of households.
5. Tables referred to in the text are presented at the end of the article.

separately for the 20 states and Delhi. Of these, Delhi could as well be omitted since it is very small and also highly urban. There are also very small states like Manipur, Meghalaya and Tripura—all in the Eastern region of the country, which need not be discussed in great detail in studying inter-state variations. Sampling errors in their case are likely to be high.

For All India, the T value is about 0.84; the CR value, 0.66; K index, 0.99 and the V value, 2.40. While these figures represent inequality within the country, T and K indices for 'between-states' inequality are also given separately. The figures of 'between-states' inequality based on per household assets for each state are much less—only 0.05 for T index and 0.26 for K index—compared to the dominant component of the All India asset distributional inequality.

When the states are arranged according to descending order of inequality for each measure, the pattern is as given in Table 2. The rankings differ with each measure, largely because each formula treats the data somewhat differently. For instance, T index has larger weightage for asset groups with higher assets-shares ; and hence, for the type of distribution we are dealing with, higher asset brackets are likely to get higher weightage. Gini's coefficient is also likely to be affected by upper bracket values. The V values on the other hand are likely to be more affected by the staggering of the lower brackets relative to the upper brackets. Ranking of states on the basis of each measure will, therefore, differ. However, the rankings do seem to segregate states with higher inequalities from those of lower inequalities. Tables 1 and 2 show that there are five common States which have values of all except V measure above average All India values. These are : Andhra Pradesh, Bihar, Kerala, Punjab and Tamil Nadu. In the case of V values there are 9 such states of which 3 are common to all the four measures. The three common states are : Andhra Pradesh, Punjab and Tamil Nadu. Their internal rankings of states are somewhat different on the basis of each individual measure. Individual ranks are pooled and a common ranking is given to the states on the basis of combined total scores. First three, all of which have higher than average inequality and have ranks 1 to 4 for each of the four measures are classed as states with very high inequality and the second set of 5 states which occur next in order of rankings are classed as high inequality states. Two of these are among the 5 which are common for the three measures T, K and CR

with values above the All India average. Looking to the range of inequality, one can then discern 4 states common in the next set of ranking. Although inequalities are below average for these four states on the basis of T, K and CR values, they are close enough for these states for these respective measures. Then there is a group of 5 similar states, followed by the remaining 4 states. Accordingly, we make five categories in the descending order of degree of inequality. These are as follows :

Category of Inequality	Name of the States (and their rank)
I (Very High)	1. Tamil Nadu 2. Andhra Pradesh 3. Punjab
II (High)	4. Delhi 5. Bihar 6. Karnataka 7. West Bengal 8. Kerala
III (Intermediate)	9. Maharashtra 10. Gujarat 11. Haryana 12. Orissa
IV (Less)	13. Uttar Pradesh 14. Madhya Pradesh 15. Tripura 16. Rajasthan 17. Assam
V (Low)	18. Meghalaya 19. Himachal Pradesh 20. Manipur 21. Jammu & Kashmir

In a way, the groupings are subjective and could be varied somewhat. However, the first and the last groupings of very high and low inequalities seem to form distinct groups which need not undergo any change in any alternative scheme of groupings of the states.

It is interesting to note that two of the four southern states come in the first category indicating very high inequality. Even the other two southern states, Karnataka and Kerala, have high inequality and are placed in the second category. Punjab in the north with the reputation of 'green revolution' is in the first category, although its adjacent state, Haryana, has intermediate degree of inequality. All the hilly states come under the last

category depicting lowest inequality, and Assam with similar features comes in category four.

'All households' group is a heterogeneous one. Several occupations and different household sizes make up the group. In order that the character of the inequality is better understood, it is necessary to carry forward the analysis separately for more homogeneous occupational and household-size groups. We first consider the occupational groupings. The AIDIS has two main groups : cultivators and non-cultivators, and the latter group is divided into three sub-groups, agricultural labourers, artisans and others. According to AIDIS the cultivators account for over 72 per cent of the households ; agricultural labourers about 15 per cent ; artisans less than 3 per cent and others less than 11 per cent (see statement 3). - Statewise, there are no doubt marked variations. Leaving out Delhi, Punjab has the least percentage of cultivators (42.91 %). Smaller eastern states, and hilly tracts of Himachal Pradesh and Jammu & Kashmir in the north show large percentages of cultivator households, figures being nearly 90 per cent or even more. Kerala in the south is the only other state which comes near the figure of 90 per cent. States of Andhra Pradesh, Punjab and Tamil Nadu have over 20 per cent of the total number of households classed as agricultural labourers. Interestingly enough, these states also show very high degree of inequality for 'All households'. Gujarat, Haryana, Karnataka, Maharashtra and West Bengal have higher proportions of agricultural labourers than that for All India though not exceeding 20 per cent. These states are also among the first 10 states (excluding Delhi) in descending order of inequality and belong to the groups of high or intermediate degree of inequalities. It would appear that states which have higher proportions of agricultural labourers have also high inequality. Kerala with high degree of inequality and low proportion of agricultural labour households seems to be the only exception. Delhi also is an exception but its rural character is only marginal. States with lower percentages of agricultural labour households, on the other hand, show less or low inequality.

Occupational

Table 3 shows that T inequality value within each occupational class gets reduced considerably except in the case of the 'others' class. Within the cultivator group, the T value is 0.66 which is 22 per cent lower than the overall T inequality measure (0.84). These values for agricultural labourers and artisans are

also lower at 0.75 and 0.67 but for 'others' the value is 1.18 which is much higher than the overall T inequality value. Among these occupational classes, the most predominant class of cultivator households also shows the lowest value. There is thus some distinct advantage in treating occupation classes separately. These reductions are marked in all the states in the case of cultivator class. It is also the largest single class that matters most in rural areas. Interestingly, the reductions are more marked in those states where the proportions of agricultural labour households are relatively high. For instance the ratio of T value for all-households to T value for cultivators is as high as 2.16 in the case of Punjab. Tamil Nadu, Karnataka, Gujarat, Maharashtra and Andhra Pradesh also have relatively high value of this ratio. The other measures also lead to the same conclusions. These results are to be expected since the average asset value per household for the agricultural labourer group is much lower as compared to the overall average and a very large proportion of the households belonging to that group is concentrated at the lower end of the distribution, where their predominance is much more marked. It is also of interest to note that in the case of all occupational classes except 'others' the V value gets reduced and is lowest for agricultural labourer class (1.03). This is mainly because of the bunching of a large proportion of this class of households on the lower asset size-groups. The fact that inequality for artisans is also much lower than for all occupations taken together is of course no consolation; for, in their case also, the concentration is near very low asset size-groups. The average value of assets per artisan household is only Rs. 2,381. Only Punjab and Haryana have values higher than Rs. 5,000 for artisan households. Thus, it seems that classifying the households by occupation does lead to more homogeneity on the whole. Each class by itself appears to be less heterogeneous than the overall household population. The 'others' class appears to be an exception since inequality measures for this class are higher than for all classes together. This is largely because of the varied occupations coming under this category right from small services to money-lenders and rich traders in rural areas.

A word regarding 'between-ocupation' inequalities (Table 4). The T values show that the between-occupation inequality is only 0.16 compared to 0.84 value for total inequality. The very large proportion of cultivator households (72.3 per cent) in the population and their even higher share of assets (93.65

per cent) in the total assets both go to give a large weightage to the ratio of these two proportions for the cultivators in the calculation of T inequality. The small between-occupation inequality should not be interpreted as having no significant differences in the per household assets of these classes. The average asset value per household in each occupational class has to be seen to visualise the disparities among occupational classes. These values which are presented in Statement 3 by states, reveal the high degree of disparity in the average value of per household assets of cultivator and non-cultivator classes succinctly. As against the average of Rs. 11,311 for all classes, cultivators have an average of Rs. 14,627 and the next largest class, viz., agricultural labour has an average of only Rs. 1,142. The class of 'others' comes as a second poor with an average of Rs. 4,695. These differences in the average asset value per household among occupations become more glaring in the case of states where the representation of the agricultural labour class is somewhat greater than for other states and for All India. Usually, the cultivator's average is at least ten times higher than that for the agricultural labour. The between-occupation inequalities are likely to get accentuated particularly in a state like Punjab where the differences in average asset per household for cultivators is far too large as compared with the corresponding figure for agricultural labourers and where the weightage of the agricultural labour class is relatively higher in the T formula. In such cases a much larger proportion of cultivators than in the case of All India or other states with lower proportions of agricultural labour class is found in the higher asset size-groups claiming a large proportion of the total assets and a sizeable proportion of households claiming a very small share of assets, in the lower size-groups. Such states having large 'All household' inequality values also have respectively higher values of between-occupation K and T values as compared to corresponding values in other States. Although the T and K values for 'between-occupations' are small at All India level, the differentials among the States throw light on the different patterns of asset distributions among these classes. Generally speaking, states with larger percentage of agricultural labourers have relatively higher 'between-occupation' T and K values and vice-versa. This is because, the weightage for the cultivator class gets reduced and that for the agricultural labour class becomes more substantial than for states with preponderant cultivator class.

Effect of Household size

We may now study the effect of household size on the inequalities. One could argue that household size being different from household to household, the inequalities might further reduce if these are studied separately for each household size-group. This would be particularly so if total assets of households are related positively with the household size. We have five household size-groups mentioned earlier for each of which asset frequency distributions are generated. The total T inequality based on 55 cell values (11 asset groups x 5 household size-groups) gives a T value of 0.84 for 'all-households'. The between-household size-groups inequality is only 0.10, even less than that for between-occupations (viz., 0.16). For the various household size-groups, the one with the largest size (8 or more persons) shows the lowest inequality values for all the four measures, and the smallest size-group of single person shows the largest inequality values. This seems to be the general pattern for all the states also (Table 5). The reductions in inequalities are more marked for each occupation than for household size-group.

One could carry the argument further and break up the data in terms of per capita rather than per household assets values. We do not have records of assets for each individual but only for each household. It is, therefore, not possible to have per capita estimates on that basis. We could, however, reduce each household's assets to per capita asset, knowing the number of persons in each sample household and build up in that fashion the distribution of households and their share in the total assets by their per capita asset groups. The per capita asset for each such group can also be computed. In the T, CR and K values we need the share of aggregate assets in each cell to the totals—either to grand total or to marginal totals—and similarly the share of persons in total number of persons in each cell instead of share of households to total number of households. Both these sets of figures are now available. For each of the four occupatoinal categories also, similar sets of figures are available.

From Table 3 we observe on comparing corresponding sets of per household and per capita figures of inequality that when per capita figures are considered, inequalities get reduced. The inequality of 0.84 (T value) on per household basis for all households gets reduced to 0.72 on per person basis—a reduction of over 14 per cent.

Within the cultivator class, the 'total' inequality value on per-capita basis is 0.58 as against 0.66 on the per-household basis. For 'all occupations', within-category inequality gets reduced from 0.74 to 0.71. It does seem, therefore, that when households are adjusted for their varying sizes, i.e. when value of assets are considered in relation to number of persons rather than number of households for each cell, the inequality is somewhat evened out (from 0.84 to 0.72). The reduction in 'total' inequality because of switching over from per household to per capita basis occurs for all occupational classes except 'others'. A further reduction, though not of the same magnitude occurs when household-size groups are separated out and within household size-group category inequality on per capita basis is considered. It is, therefore, important that inequalities are not considered in the aggregate but occupation-wise and on per capita basis. Even within the major occupational cultivator class, larger households have larger assets so that on per capita household basis, the inequalities get further reduced. Somehow, going over from per household to per capita basis adversely affects the 'total' as well as between household-size inequalities in the case of 'others' classes.

In the case of between-household size groups inequality, considerable reduction is seen for "all occupations" (from 0.101 to 0.014) when we shift from per household to per capita asset basis. There is some substantial reduction in the case of cultivator, agricultural labour and artisan categories also. Only for 'others' category some increase is noticed. This is possible if the ratios y_i/x_i's change adversely, where x_i becomes the percentage of persons in the ith cell to the total number of persons, instead of percentage of number of households in ith cell to total number of households, and y^i is the percentage share of the total assets of the ith cell. In that case, the expected value.

$\sum_{i=1}^{n} y_i \log y_i/x_i$ is larger on the person basis rather than on the household basis.

It may be added that reductions in inequalities of the above type are also observed when other measures of inequality are used. For individual states also this appears to be the general pattern.

Some comparisons of inequalities are possible with the results of a similar survey conducted with reference year 1961-62. The assets recorded then were as on 30th June 1962. The results are available at All India and state level, and only CR values were computed for the 1961-62 data. These values indicate that the CR was 0.65 for all households in rural areas in that year which is hardly any different from the value for the year 1971-72 (Table 8). statewise, comparisons are possible only in the case of 15 states. Comparisons of CR values show that more or less the same inequalities prevailed in 1971-72 as in 1961-62. Kerala shows some marked fall from 0.73 in 1962 to 0.66 in 1971. On the other hand Orissa and Rajasthan show some increase in the CR values, the former going up from 0.58 to 0.60 and the latter from 0.53 to 0.56.

Comparison with 1961-62 data

In the case of cultivators, the statewise values of CR show a few changes. The states which show some increase in 1971-72 over 1961-62 in this inequality coefficient are Rajasthan (from 0.50 to 0.53), Orissa (from 0.50 to 0.54). Following states show a fall in the CR value of cultivators: Andhra Pradesh (from 0.67 to 0.61), Kerala (from 0.68 to 0.66), Jammu & Kashmir (from 0.47 to 0.42), Tamil Nadu (from 0.64 to 0.59) and Karnataka (from 0.62 to 0.57). Elsewhere declines are small. Punjab seems to have recorded a fall but the extent cannot be known since in 1961-62 both Punjab and Haryana were one single state. But the value in the case of combined state was 0.53 in 1961-62 as against 1971-72 CR values of 0.49 for Haryana and 0.48 for Punjab. Combined value would also, therefore, be lower for 1971-72. On the whole, for All India no marked reduction in inequality seems to have occurred, during the ten-year period ending 1971-72.

3. Distribution of rural household assets

Bearing in mind the limitations of composite indicators of inequalities, it seems necessary to study the distribution of assets as such in order to gain knowledge about the shape of the distribution curve. Regionally, such distributions can be studied for each state and the comparable and contrasting features of distribution curves for states could be brought out. The features which make for high inequality or low (or less) inequalities (Table 1) can be examined. Attempts can also be made to see if any association exists between the level of average value of per-

Distribution on All-household basis

household assets, the degree of inequalities and particular patterns of distribution. In this section we propose to discuss these various aspects of the distributional patterns. Statements 1 to 3 incorporate state-wise and All India details on the distributional and level aspects of rural households assets.

Total estimated value of assets in the rural areas of India as on 30th June 1971 comes to Rs. 871 billion, and yields an average per-household of Rs. 11,311. Among the states, there is considerable variation, the state of Punjab having an average household asset value of Rs. 31,833 at one end and Meghalaya, a small north-eastern state having only slightly over Rs. 6,000 at the other. Larger states like Tamil Nadu and Orissa also have low average-values, the figures being Rs. 6,827 and Rs. 6,023 respectively. The states are grouped into four classes according to their averages.

I. States having more than Rs. 20,000 average per household asset value,

II. States having more than All India average (i.e. Rs. 11,311) but not more than Rs. 20,000,

III. States having more than Rs. 10,000 average but not more than All India average,

IV. States having average value not more than Rs. 10,000

These groups and the five groups with varying degrees of inequalities already described earlier are matched to form the following two-way classification.

Per-household average asset category	Inequality Category				
	I (Very High)	II (High)	III (Intermediate)	IV (Less)	V (Low)
I Very High	Punjab	Delhi	Haryana		Himachal Pradesh
II High		Bihar Kerala	Gujarat Maharashtra	Uttar Pradesh Rajasthan	Jammu & Kashmir
III Less		Karnataka		Madhya Pradesh	
IV Low	Tamil Nadu Andhra Pradesh	West Bengal	Orissa	Tripura Assam	Meghalaya Manipur

This Table fails to show any association between level of asset value and degree of inequality. Very high and high inequalities are to be found in states with highest as well as lowest average asset values. Less or low inequality is to be found among states of all the four groups of per household asset classification. But it does point up states with low average asset value with high inequality (Andhra Pradesh and Tamil Nadu) as also Haryana and Himachal Pradesh which belong to highest average asset-value group showing intermediate or low inequality. Whether one would prefer a pattern depicting high degree of inequality but at the same time possessing highest average asset value as in the case of Punjab to a pattern obtaining in, say, Maharashtra, Gujarat or U.P. showing somewhat lower (but yet high as compared to All India level) average asset value but intermediate and less degree of inequality is a matter for subjective decision ; but, it would appear that one would like to reject outright a pattern showing high degree of inequality and lowest levels of per household average value as in the case of Tamil Nadu and Andhra Pradesh and to some extent that of West Bengal. It is also clear that in the case of eastern states of Assam, Tripura, Manipur and Meghalaya less or lower degree of inequality means only a less uneven distribution of low levels of assets—a less uneven distribution of poverty, perhaps.

The distribution at All India level shows that over 11 per cent of all rural households having assets worth less than Rs. 500 per household share only about 0.23 per cent of total assets, and a little less than 20 per cent of the households, each having less than Rs. 1,000 of assets, share only about 0.76 per cent of the total value of assets. At the other end, less than 1 per cent of households, each having an asset value of Rs. 1,00,000 and above, account for almost 14 per cent of the total value of assets and a little less than 4 per cent in the two highest asset value brackets, each household with an asset of Rs. 50,000 or more, account for over 30 per cent of the total value of the assets. The median value of the household asset is only about Rs. 4,800 as against the average of Rs. 11,311. Thus, 50 per cent of rural households have less than Rs. 4,800 worth of assets. Their share of the asset value is only 7.8 per cent. First quartile is Rs. 1,519, and the third quartile is about Rs. 12,770. The share of rural household below first quartile (or, in other words, of the lowest 25 per cent rural households) is only 1.3 as against 74.8 per cent for the top 25 per cent. Almost three-fourths of the total assets are thus

held by top 25 per cent of the households. These statistics bring out the highly unequal distribution of assets succinctly.

Inter-state comparisons of distributions reveal glaring differences in the patterns of distributions. However, since the distributions are described in terms of fixed asset-value classes, right conclusion can be drawn only when they are reduced to a standard form. For instance, Punjab shows that almost three-fourths of the total assets value of the rural households of that state belongs to the households of the highest brackets, whereas in Uttar Pradesh, the share of the households in the corresponding brackets is less than thirty per cent of the total value. To study the distributions across the states, first decile, first quartile (Q1), median (M), third quartile (Q3) and top decile values have been calculated for each state, along with the shares in the total assets of households belonging to the lowest 10 per cent, lowest 25 per cent (i.e. those having asset value below Q1), lowest 50 per cent, top 25 per cent (i.e. those having asset value above Q3), and top 10 per cent (Statement 1). These figures are rearranged according to the pattern of the two-way classification on page 12 and reproduced for states falling in corresponding cells (Table 6). For instance, this classification shows Punjab in the first cell of very high inequality and very high per household asset level. Correspondingly, Table 6 shows that the lowest 10 per cent of households in Punjab claim a share of 0.4 per cent (first row and first column) Similarly, we have states of Gujarat and Maharashtra falling in the cell of high asset value (asset group II) and intermediate inequality (inequality group III). The Top 25 per cent of households in each of these states have a share of 72.7 and 74.0 percentage on the total assets in their respective states. It seems that for a given category of state level average asset value per household, the share of the lowest groups (i.e. lowest 10 per cent and 25 per cent) increases as inequality degree decreases (i.e. along the row) and for the top 25 per cent and top 10 per cent, the share decreases as inequality decreases. Some weak tendency for the share of low asset groups (lowest 10 per cent and lowest 25 per cent) to decline with the state average asset value per household in any given inequality category (i.e. along the column) seems to exist. There is no such tendency with regard to the top 10 per cent or top 25 per cent of households. The lower inequalities are a resultant of somewhat better share of the households at the lower ends and a somewhat reduced share for the top brackets. It is the other way round for states with high inequalities.

Comparison with 1961-62 results

Comparing the results with those for the 1961-62 survey, it is seen that the basic pattern remains the same. The shares in the assets at the two specified points of time are as follows :

Household Category	Per cent share in assets value	
	1961-62	1971-72
Lowest—10 per cent	0.1	0.1
Lowest—30 per cent	2.5	2.0
Top—30 per cent	79.0	81.9
Top—10 per cent	51.4	51.0

Thus, at the extreme ends, there is hardly any change. But the share for intervening groups of 20 per cent households just above the lowest 10 per cent seems to have declined and the share of the 20 per cent households just below the top 10 per cent seems to have somewhat increased indicating a tendency for increasing inequality. However, these figures need not be taken as a positive indication of increased inequality since differences are slight. The important point is that there is no positive indication of any reduction in inequality during the ten-year period 1961-62 to 1971-72.

4. Inequalities and asset levels for cultivator households

Cultivators form the main plank of rural life. Over 72 per cent of the rural households belong to this class and they account for 93 per cent of the value of assets. Also land held by them account for the bulk of rural assets and in any scheme of reduction in basic inequalities, distribution of land is a prime factor for the rural areas. It is, therefore, necessary to study the distribution of assets in the case of this occupational class separately. The type of analysis carried out for all households is, therefore, also undertaken for the cultivator class.

Category of Inequality	Name of the States (and their rank)
I (Very High)	1. Kerala 2. Bihar 3. Andhra Pradesh 4. Tamil Nadu
II (High)	5. Karnataka 6. West Bengal 7. Tripura 8. Maharashtra
III (Intermediate)	9. Orissa 10. Uttar Pradesh 11. Madhya Pradesh 12. Rajasthan 13. Gujarat 14. Assam
IV (Less)	15. Punjab 16. Haryana 17. Delhi
V (Low)	18. Meghalaya 19. Himachal Pradesh 20. Manipur 21. Jammu & Kashmir

The above table gives the ranking of states according to the inequalities for cultivator households and can be compared with the ranking based on all households described earlier. Tables 1 and 7 giving values of these inequalities for all-households and for cultivators respectively show that cultivator inequality is less than All household inequality for all states. The degree of reduction varies with individual states. A major reduction in inequality occurs in the case of Punjab. For the cultivator households, the T value is only 0.40 as against 0.87 for all-households. For the former, its rank is 15th as against 3rd rank for all households. Haryana also shows some considerable reduction in the inequality when only cultivator class is considered. Both these states have a large proportion of agricultural labour households (Statement 3) and when these households with their low average level assets and bunching at the lower end of the distribution of assets are segregated, the cultivator class shows much reduced values of inequality. Tamil Nadu and Andhra Pradesh which have first and second ranks in the all household inequality move down to 4th and 3rd places in the

ranking of states for cultivator households. Gujarat also moves down in the ranking. The reductions in the T values are, however, not as glaring as in the case of Punjab and Haryana. Contrary to this, Kerala and Bihar go up the scale of inequality ranking, although no doubt in their case there is some improvement in the T values. Kerala occupies first and Bihar second positions for cultivator inequalities whereas they had a ranking of 8 and 5, respectively, for all household inequalities. In the relative scale of ranking their position, therefore, worsens. Other States in whose case the ranking of cultivator-inequality moves up as compared to the ranking for all-households are Karnataka, West Bengal, Orissa, Uttar Pradesh, Madhya Pradesh, Tripura, Rajasthan and Assam. The hilly states of Meghalaya, Himachal Pradesh, Manipur and Jammu & Kashmir do not change their ranks.

With the reduction in inequality where only the cultivator class is considered, and the generally higher average value of assets for cultivator households as compared to the corresponding value for all-households one finds that the share in the total assets value increases at the lower end and gets reduced at the upper end of the distribution of assets. Thus, at All India level the lowest 10 per cent cultivators have 0.8 per cent of total asset value and lowest 25 per cent of them have 3.4 per cent of asset value as compared to the corresponding shares of 0.1 and 1.5 per cent in the case of all households. Similarly, for the top 10 per cent and 25 per cent, the shares of cultivator households in their total assets are 45.4 and 68.8 per cent as against corresponding figures of 51.0 and 74.3 per cent in the case of all-households. Comparing these figures, it is clear that reduction at the top level is not so much as the gains in the shares at the lower levels. Even so, the shares are miserably low for the cultivators in the lowest decile or quartile.

For Punjab which shows highest reduction in inequality, the share of top 10 per cent cultivators in the total value of assets of all cultivators shows a large reduction when compared with the share of top 10 per cent of all-households in the total value of assets of all-households, the figures being 38 against 51 per cent. At the other end, states like Bihar, Kerala and Rajasthan which are on a relatively higher scale of inequality for cultivator class (although absolute values of CR values are no doubt lower than those for all households for their respective states) reduction in the shares of assets at the top 10 per cent level is much

less ; from 52.2 per cent of all-households to 48.0 per cent for cultivators for Bihar, from 52.0 per cent to 50.0 per cent for Kerala and from 42.5 per cent to 41.0 per cent for Rajasthan. At the lower end of the distribution, there are some gains in the share of assets.

5. Composition of Assets

Land, vacant house site, building, livestock, implements and machinery, durable household assets, financial assets (shares and deposits), dues receivable in cash and in kind—these are the broad categories under which households have registered their assets. Detailed breakdowns are also available within each of these broad categories but these tabulations have yet to appear. The distribution of asset value under these broad categories can only be discussed (Table 9). For all households and at All India level, about two-thirds of the asset value is accounted for by land and another 18 per cent is accounted for by buildings. Livestock is third in importance, with about 6.5 per cent as its share, followed by durable households assets with less than 5 per cent as its share. Implements and machinery take up only 2.7 per cent. Over 90 per cent of households report buildings and durable household assets, and 70 per cent and 75 per cent report land and livestock respectively. Financial assets are held by only a small percentage and their value also claims slightly over one per cent of the total asset value. Financial instruments have not yet gained popularity as a way to invest the saving of the households. If the interest lies in estimating reproducible tangible wealth (RTW) we have to deduct land, vacant sites, durable household assets, financial assets and dues receivable. When this adjustment is made, RTW (except inventories) comes to Rs. 24,029 crores as against Rs. 87,132 crores (*i.e.* Rs. 871.32 billions). Both these estimates, however, exclude inventories.

Among the states, there are no doubt variations. Agriculturally rich States like Punjab and Haryana show a larger proportion of asset values under land, as compared to corresponding proportion for All India. Some other states *viz.*, Bihar and Tripura in the Eastern region, Maharashtra in the Western region and Andhra Pradesh in the South, also have similar larger proportions. There does not seem to be any close relationship of these high proportions with either high degree of inequality or high per household asset values. Where proportions under land value are low (*i.e.* lower than All India figure), higher shares

of assets are seen under buildings, livestock, implements or durable assets. Apart from West Bengal and Delhi higher shares under buildings are particularly seen in the hilly states like Himachal Pradesh, Jammu & Kashmir, Manipur and Meghalaya and to some extent in Assam and this may be due to relatively high cost of construction in hilly terrain. One-fifth to one-fourth and even higher shares of total assets are found under buildings in these states. Livestocks are more important in States like Rajasthan, Madhya Pradesh and Jammu & Kashmir. Population densities are low in these states and presumably the availability of vast areas make for this situation. About 10 to 13 per cent of asset values are accounted for by livestock in these areas. Assam and Meghalaya also show 8 to 9 per cent of assets under livestock. Although states like Punjab, Uttar Pradesh, Haryana and Delhi in the north show lower than All India percentages under livestock, yet, their per household averages are substantially higher than All India average.

Higher than All India percentages of asset-value under implements and machinery are found in Punjab, Haryana, and Delhi in the North; all the three western states of Gujarat, Maharashtra and Rajasthan; Tamil Nadu and Andhra Pradesh in the South and only Meghalaya in the Eastern region.

Cultivators depict more or less the same pattern. It is to be expected that in their case proportions for land asset would be much higher than for 'all households' in each respective state. Similarly, proportionate shares under livestock and implements are also higher, generally speaking, for cultivators than for all-households in several states. Building as an asset has relatively a lower share for cultivators. This, of course, does not mean that the average level per cultivator household is lower than average level for all households. In the case of non-cultivator classes, it is the building asset that is predominant. At All India level, buildings account for over half the total assets for agricultural labourers as well as artisans. Durable household assets seem to be next in importance. For the 'other-non-cultivators' land is the predominant component of asset composition but the proportion of total value is much less than for the cultivator class, being less than 40 per cent of the total value of assets for this class. Correspondingly b ch higher share for other non-cu or class.

6. Concluding Remarks

That there is inequality in the distribution of assets is amply seen in the data collected through the AIDIS. When inequalities are decomposed into between States and within States, the basic pattern of the distribution of household assets in rural areas shows hardly any change. Between State inequality does not come out as the dominant component. Even when between-occupational classes and between-household size groups inequalities are segregated, the analysis shows a persistent unequal pattern *within* occupational classes. The cultivator class which is the dominant part of the population, exhibits considerable inequality within its fold though it is less than that for all households. Reductions in inequality are also seen in the case of agricultural labourers and artisans class. Even if one accepts that segregation of the effects of factors like states or regions or occupations goes to reduce inequality, the question can still be asked as to why one should try to explain away the existence of overall inequality in terms of component inequalities such as between-regions, between-occupations, within each different occupation, etc. These are, in fact, the very manifestations of an unequal society. The utility of studying component inequalities is to see their individual weight in the overall inequality and cannot be preferred as an explanation or justification of existing overall inequalities. The fact that over the period 1961-62 to 1971-72, the CR value and the shares of the lowest 10 or 25 per cent households in the total assets both for all-classes and cultivator classes at All India as well as state level—have remained more or less the same seems to indicate that if any efforts were made to reduce inequality, say, through land reforms, etc. in some parts of the country during this decade there has not been any visible impact by and large in terms of reduction of overall rural inequality of wealth. It may be that simultaneously with such reformatory efforts, other factors had their impact offsetting the benefits flowing from these reforms. That appears to be the situation with regard to inequality in rural areas.

The concept of inequality and the problems involved in measuring the extent of inequality are difficult if one has to take a purely academic approach to the subject. One has to, it seems, introduce a subjective element in defining the concept and evolving measures of inequality. It would seem necessary that in interpreting and understanding the computed inequality measures, the various limitations are kept in view. For instance,

the fact that CR values are close for any two Lorenz curves may not mean that distributional patterns would be of the same type and that the two Lorenz curves would be more or less coincident all along their run. Nor should much store be laid on some differences in CR figures unless there is further evidence that one Lorenz curve is fully contained in the other. The analysis presented here also shows that different measures of inequality are likely to give somewhat different results, particularly in ranking the states on the scale of inequality in showing the relative levels of inequalities for different components or groups, and in analysing the extent of reduction of inequalities due to spatial, occupational or other breakdowns. By and large, however, based on these different measures, the directions of tendencies indicated by these measures are the same and it would appear possible to at least classify states into different groups according to levels of inequalities.

The main characteristics of the inequality in asset distribution emerging from the study can be summarised as follows :

(1) There does not seem to be any evidence of a relationship between the degree of inequality and average level of asset value per household. (2) With the increase in inequality, the share of assets in the lower extreme decreases and the share at the upper end increases. (3) For any given inequality level, the share in the total assets at the upper end (say, top 10 or 25 per cent) does not seem to change in any systematic manner as the average asset value per household (for different states) changes, in the cross-section analysis. (4) For the cultivator class the distribution seems somewhat less unequal than for 'all households'. The reduction is much more marked in states which have sizeable proportion of agricultural labour. (5) In general one finds a reduction in inequality when the households are classified according to occupations. That is, inequality for each occupational class is lower than overall inequality for all-households. A further reduction occurs when inequalities are analysed separately for different household-size groups and asset values are considered on a per person basis rather than on a per household basis. The solitary exception appears to be 'other non-cultivators' class of households. (6) There is considerable disparity in the level of per household values among occupational classes and that for the cultivator class is far above the next highest value. (7) In the case of non-cultivator classes bulk of the households are in the lower extremes. (8) Land is no doubt

the preponderent component of asset with cultivators and to some extent with 'other non-cultivator' classes whereas buildings constitute the main component for others like agricultural labourers and artisans. (9) By and large even for cultivators implements and machinery constitute a very small part of the total assets. This situation obtains even in agriculturally rich states like Punjab and Haryana, or for cultivators in the higher brackets of asset values. (10) Financial instruments are held by a very small proportion of the rural households and the share of financial assets in the total assets is also meagre. (11) Over the decade of 1961-62 to 1971-72, there has not been any material reduction in the degree of inequality.

It may be pertinent to observe that inequality measures, averages or distributional patterns are studied at state level only. For deeper analysis, it would be necessary to bring in the regional level data, within a state, and relate them to the economic characteristics of the regions. Whether crop pattern or types of main crops grown, or the extent or irrigation provided, etc. have any relation to degree of inequality, level of asset average, or any special characteristics of the Lorenz curve at the upper or the lower extremes needs to be examined. Similarly, it would be worth examining whether by bringing together similar types of regions (say tribal areas, backward areas, plantation areas, hilly areas, etc.) any special patterns of inequality, average levels of asset values, and composition of assets emerge for each such combination. Attempts are being made to study the regional data on these lines.

TABLE—1

(All Households)

Sr. No.	State	All Households			
		T	CR	K	V
1.	Andhra Pradesh	1·0170	0·7030	1·0761	2·5821
2.	Assam	0·5676	0·5560	0·8145	1·7851
3.	Bihar	0·8876	0·6715	1·0267	2·3138
4.	Gujarat	0·7634	0·6342	0·9543	2·4486
5.	Haryana	0·7149	0·6291	0·9683	2·4585
6.	Himachal Pradesh ..	0·4647	0·4967	0·7268	1·1268
7.	Jammu & Kashmir ..	0·3554	0·4390	0·6407	0·7860
8.	Karnataka	0·8625	0·6547	0·9883	2·5735
9.	Kerala	0·8656	0·6608	1·0108	2·3116
10.	Madhya Pradesh	0·6517	0·5890	0·8808	1·9698
11.	Maharashtra	0·7968	0·6488	0·9857	2·5388
12.	Manipur	0·4274	0·4873	0·6986	1·0549
13.	Meghalaya	0·4810	0·5027	0·7392	1·1827
14.	Orissa	0·7071	0·5976	0·8860	1·8784
15.	Punjab	0·8713	0·6831	1·1019	2·6673
16.	Rajasthan	0·5937	0·5588	0·8263	1·3930
17.	Tamil Nadu	1·0292	0·7113	1·0891	2·7141
18.	Tripura	0·6103	0·5784	0·8536	2·0277
19.	Uttar Pradesh	0·6577	0·5922	0·8895	1·7655
20.	West Bengal	0·8402	0·6600	0·9892	2·5215
21.	Delhi	0·8075	0·6623	1·0457	3·1265
	All India	**0·8416**	**0·6551**	**0·9936**	**2·3990**
	Between States	0.0477	—	0.2554	—

TABLE—2

(All Households)

Sr. No.	States	Rank (in descending order) according to various measures				Common Ranking
		T	CR	K	V	
1.	Andhra Pradesh	2	2	3	4	2
2.	Assam	17	17	17	15	17
3.	Bihar	3	4	5	10	5
4.	Gujarat	10	10	11	9	10
5.	Haryana	11	11	10	8	11
6.	Himachal Pradesh ..	19	19	19	19	19
7.	Jammu & Kashmir ..	21	21	21	21	21
8.	Karnataka	6	8	8	5	6
9.	Kerala	5	6	6	11	8
10.	Madhya Pradesh	14	14	14	13	14
11.	Maharashtra	9	9	9	6	9
12.	Manipur	20	20	20	20	20
13.	Meghalaya	18	18	18	18	18
14.	Orissa	12	12	13	14	12
15.	Punjab	4	3	1	3	3
16.	Rajasthan	16	16	16	17	16
17.	Tamil Nadu ..	1	1	2	2	1
18.	Tripura	15	15	15	12	15
19.	Uttar Pradesh	13	13	12	16	13
20.	West Bengal	7	7	7	7	7
21.	Delhi	8	5	4	1	4

TABLE—3

Category	T—Inequality					
	Per household basis			Per capita basis		
	Total	Between household size-groups	Within the category	Total	Between household size-groups	Within the category
All occupations ..	0.842	0.101	0.741	0.721	0.014	0.707
Cultivators	0.663	0.065	0.598	0.581	0.020	0.561
Non-Cultivators						
Agricultural labourers	0.745	0.037	0.708	0.739	0.043	0.696
Artisans	0.666	0.072	0.594	0.582	0.021	0.561
Others	1.179	0.042	1.137	1.203	0.081	1.122

TABLE—4

Sr. No.	State	(T) Total Inequality	(B) Between Occupations	Within Occupation T-Inequality			
				Cultivators	Agr. Labour	Artisans	Others
1.	Andhra Pradesh	1·0181	0·2487	0·7376	0·8779	0·4428	1·2777
2.	Assam	0·5678	0·0891	0·4648	0·5361	0·8963	0·7984
3.	Bihar	0·8879	0·1402	0·7461	0·4345	0·6182	1·0691
4.	Gujarat	0·7637	0·2211	0·5122	0·5578	0·4162	1·1596
5.	Haryana	0·7151	0·2785	0·4074	0·4215	0·3483	1·0143
6.	Himachal Pradesh	0·4649	0·0354	0·4255	0·3962	0·1939	0·7145
7.	Jamnu & Kashmir	0·3555	0·0208	0·3319	0·4610	0·2441	0·4982
8.	Karnataka ..	0·8609	0·1932	0·6497	0·9151	0·6536	1·0091
9.	Kerala	0·8657	0·0650	0·7925	0·9937	0·8577	1·4500
10.	Madhya Pradesh	0·6518	0·1040	0·5329	0·5577	0·5510	1·1596
11.	Maharashtra ..	0·7969	0·2312	0·5524	0·8014	0·4415	0·9340
12.	Manipur	0·4274	0·0147	0·4051	0·6685	0·0880	0·6234
13.	Meghalaya ..	0·4812	0·0424	0·4318	0·4672	0·5245	0·7842
14.	Orissa	0·7072	0·1231	0·5777	0·4755	0·5381	0·7994
15.	Punjab	0·8718	0·4020	0·4031	0·3364	0·4956	0·9894
16.	Rajasthan ..	0·5940	0·0411	0·5330	0·7904	0·6669	0·9629
17.	Tamil Nadu ..	1·0295	0·2952	0·6650	0·8381	0·5547	1·4737
18.	Tripura	0·6105	0·0467	0·5499	1·3441	—	1·0101
19.	Uttar Pradesh ..	0·6579	0·1074	0·5330	0·4275	0·5261	0·9401
20.	West Bengal ..	0·8406	0·1854	0·5932	0·6021	1·3250	1·2614
21.	Delhi	0·8081	0·3795	0·3756	0·7060	0·4924	0·7235
	All India	**0·8416**	**0·1603**	**0·6573**	**0·7356**	**0·6673**	**1·1771**
	Between States T			0·0622	0·0112	0·1176	0·1095
	-do- K			0·2361	0·3588	0·3934	0·3165

TABLE—5

Sr. No.	State	(T)* Inequality	(B) Between Household Size groups	Within Household Size groups T—Inequality 1	2	3-4	5-7	8 & above
1.	Andhra Pradesh	1·0223	0·1017	1·7462	1·4757	0·9883	0·8626	0·7759
2.	Assam	0·5683	0·0933	0·7803	0·5925	0·5908	0·4805	0·4171
3.	Bihar	0·8882	0·1150	1·0219	0·9404	0·9312	0·8001	0·6557
4.	Gujarat ..	0·7640	0·0812	1·2309	0·7485	0·7556	0·7040	0·6073
5.	Haryana	0·7163	0·0757	1·2101	0·9592	0·8582	0·6928	0·5233
6.	Himachal Pradesh	0·4659	0·0486	0·8179	0·3705	0·4983	0·3881	0·3804
7.	Jammu & Kashmir	0·3559	0·0548	0·2245	0·2591	0·2757	0·3132	0·3056
8.	Karnataka ..	0·8853	0·0956	1·4345	2·1379	0·8645	0·7037	0·5884
9.	Kerala	0·8663	0·0369	1·1901	0·9944	1·0149	0·8291	0·7017
10.	Madhya Pradesh	0·6518	0·0875	1·0032	0·7143	0·6116	0·5750	0·4837
11.	Maharashtra ..	0·7974	0·1077	1·0489	0·8735	0·8385	0·6803	0·5821
12.	Manipur ..	0·4279	0·0426	0·5901	0·3281	0·3744	0·4035	0·3686
13.	Meghalaya ..	0·4820	0·0793	0·7920	0·4131	0·3542	0·4492	0·3114
14.	Orissa	0·7075	0·0906	1·1450	0·8236	0·6165	0·6036	0·5599
15.	Punjab	0·8734	0·0532	1·6650	0·9706	0·9030	0·8828	0·6569
16.	Rajasthan ..	0·5944	0·0589	0·9072	0·7511	0·6022	0·5185	0·4777
17.	Tamil Nadu ..	1·0299	0·0988	1·6623	1·1588	0·9771	0·8912	0·7887
18.	Tripura ..	0·6104	0·1199	0·5453	0·9053	0·5852	0·5104	0·3939
19.	Uttar Pradesh ..	0·6580	0·1024	0·9394	0·6523	0·5734	0·5541	0·5113
20	West Bengal ..	0·8408	0·0917	1·0897	0·9710	0·8859	0·8217	0·5691
21.	Delhi	0·8104	0·1210	1·7990	1·1347	1·0184	0·6754	0·5853
	All India ..	**0·8418**	**0·1007**	**1·2615**	**1·0145**	**0·8355**	**0·7428**	**0·6279**
	Between States T			0·1272	0·1175	0·0634	0·0093	0·0480
	-do- .. K			0·4157	0·3289	0·2388	0·2862	0·2556

*The T—values in Tables 1, 4 & 5 differ due to the grouping of data into 11, 44 & 55 classes respectively.

TABLE—6

Share of specified percentage of households in different States

Average Assets Category		Inequality Categories				
		I	II	III	IV	V
		(a) Lowest 10% households				
I	..	0·4	0·1	0·5	—	0.9
II	..	—	0·3 neg.	0·3 0·1	0·6 0·6	1·4
III	..	—	neg.	—	0·3	—
IV	..	neg. 0·4	neg.	0·3	0·2 0·4	0·6 1·1
		(b) Lowest 25% households				
I	..	1·2	1·1	1·5	—	5·3
II	..	—	1·6 1·9	1·6 1·4	2·4 3·8	6·9
III	..	—	1·1	—	2·2	—
IV	..	0·8 1·0	1·2	2·2	2·0 2·8	5·0 4·8
		(c) Top 25% households				
I	..	78·9	77·1	71·9	—	60·3
II	..	—	76·2 75·3	72·7 74·0	68·9 66·3	55·8
III	..	—	74·0	—	67·9	—
IV	..	79·1 78·2	74·4	67·6	66·3 65·6	60·4 59·9
		(d) Top 10% households				
I	..	51·0	47·5	45·4	—	37·5
II	..	—	52·2 52·0	48·0 47·6	44·7 42·5	34·0
III	..	—	50·0	—	43·5	—
IV	..	57·1 56·6	50·4	45·5	41·3 40·5	39·3 36·3

TABLE—7

(Cultivator Households)

Sr. No.	State	T	CR	K	V
1.	Andhra Pradesh ..	0·7376	0·6090	0·9184	1·5178
2.	Assam ..	0·4648	0·5042	0·7508	1·2181
3.	Bihar ..	0·7461	0·6216	0·9474	1·6841
4.	Gujarat ..	0·5122	0·5269	0·7906	1·0823
5.	Haryana ..	0·4074	0·4849	0·7226	1·1439
6.	Himachal Pradesh ..	0·4255	0·4747	0·6894	0·7884
7.	Jammu & Kashmir ..	0·3319	0·4235	0·6183	0·6488
8.	Karnataka ..	0·6497	0·5715	0·8548	1·3010
9.	Kerala ..	0·7925	0·6352	0·9672	1·7436
10.	Madhya Pradesh ..	0·5329	0·5339	0·7842	1·2947
11.	Maharashtra ..	0·5524	0·5481	0·8270	1·2364
12.	Manipur ..	0·4051	0·4745	0·6888	0·9016
13.	Meghalaya ..	0·4318	0·4753	0·6911	0·8262
14.	Orissa ..	0·5777	0·5392	0·7787	1·2209
15.	Punjab ..	0·4031	0·4818	0·7262	1·2854
16.	Rajasthan ..	0·5330	0·5293	0·7883	1·0447
17.	Tamil Nadu ..	0·6650	0·5880	0·8835	1·5521
18.	Tripura ..	0·5499	0·5507	0·7924	1·6763
19.	Uttar Pradesh ..	0·5330	0·5356	0·8007	1·1444
20.	West Bengal ..	0·5932	0·5611	0·8474	1·3593
21.	Delhi ..	0·3756	0·4659	0·7120	1·3007
	All India ..	**0·6573**	**0·5847**	**0·8821**	**1·4507**

TABLE—8

State-wise Concentration Ratios

Sr. No.	States	1961–62		1971–72	
		Cultivators	All households	Cultivators	All households
1.	Andhra Pradesh ..	0·6676	0·7284	0·6090	0·7030
2.	Assam ..	0·4957	0·5514	0·5042	0·5560
3.	Bihar ..	0·6547	0·6938	0·6216	0·6715
4.	Gujarat ..	0·5295	0·6178	0·5269	0·6342
5.	Haryana ..	—	—	0·4849	0·6291
6.	Himachal Pradesh ..	—	—	0·4747	0·4967
7.	Jammu and Kashmir ..	0·4659	0·4810	0·4235	0·4390
8.	Karnataka ..	0·6234	0·6675	0·5715	0·6547
9.	Kerala ..	0·6769	0·7272	0·6552	0·6608
10.	Madhya Pradesh ..	0·5349	0·5966	0·5339	0·5890
11.	Maharashtra ..	0·5635	0·6576	0·5481	0·6488
12.	Manipur ..	—	—	0·4745	0·4873
13.	Meghalaya ..	—	—	0·4753	0·5027
14.	Orissa ..	0·5042	0·5768	0·5392	0·5976
15.	Punjab ..	0·5274*	0·6332*	0·4818	0·6831
16.	Rajasthan ..	0·4975	0·5320	0·5293	0·5588
17.	Tamil Nadu ..	0·6364	0·7188	0·5880	0·7113
18.	Tripura ..	—	—	0·5507	0·5784
19.	Uttar Pradesh ..	0·5601	0·6040	0·5356	0·5922
20.	West Bengal ..	0·5806	0·6558	0·5611	0·6600
21.	Delhi ..	—	—	0·4659	0·6623
	All India ..	**0·5976**	**0·6524**	**0·5847**	**0·6551**

* Figures for Punjab are before re-organisation.

TABLE—9

Composition of Assets (All Households)

Sr. No.	States	Land	Vacant house	Building	Live-stock	Implements and machinery	Durable household assets
		1	2	3	4	5	6
1.	Andhra Pradesh ..	67·63	0·27	16·23	6·69	2·99	4·78
2.	Assam ..	60·05	0·95	20·82	8·03	1·84	5·47
3.	Bihar ..	74·29	0·60	15·36	4·30	1·25	3·01
4.	Gujarat ..	57·32	0·19	19·10	8·82	5·61	6·07
5.	Haryana ..	71·47	0·81	14·25	6·38	3·35	3·19
6.	Himachal Pradesh ..	52·27	0·27	31·91	7·61	0·90	6·06
7.	Jammu & Kashmir ..	55·34	0·10	26·22	11·08	1·07	5·20
8.	Karnataka ..	65·76	0·30	18·29	6·87	2·74	4·40
9.	Kerala ..	63·21	0·03	25·22	1·21	1·86	5·22
10.	Madhya Pradesh ..	64·99	0·07	16·04	10·19	2·29	5·70
11.	Maharashtra ..	71·13	0·25	14·62	5·99	3·29	3·10
12.	Manipur ..	56·55	1·57	25·33	6·88	2·69	6·11
13.	Meghalaya ..	55·53	0·07	24·59	9·03	2·84	7·08
14.	Orissa ..	66·28	1·06	18·87	5.68	1·39	4·89
15.	Punjab ..	72·33	0·94	13·54	5.16	3·67	2·87
16.	Rajasthan ..	55·80	0·30	17·94	12·84	3·16	7·87
17.	Tamil Nadu ..	64·70	0·33	17·25	4·24	4·31	6·72
18.	Tripura ..	76·88	0·42	10·54	5·03	1·01	4·32
19.	Uttar Pradesh ..	66·35	0·31	18·95	6·44	2·65	4·49
20.	West Bengal ..	60·25	0·95	24·32	4·80	1·86	4·74
21.	Delhi ..	59·42	0·35	23·37	5·89	4·64	3·58
	All India ..	66·26	0·44	17·94	6·48	2·74	4·61

TABLE—9—(*Concld.*)

Sr. No.	States	Financial assets		Dues receivable		Total assets
		Shares	Deposits	Cash	Kind	
		7	8	9	10	11
1.	Andhra Pradesh ..	0·11	0·48	0·79	0·02	100·00
2.	Assam ..	0·05	2·38	0·36	0·05	100·00
3.	Bihar ..	0·04	0·84	0·30	0·02	100·00
4.	Gujarat ..	0·54	1·34	1·00	—	100·00
5.	Haryana ..	0·09	0·24	0·22	—	100·00
6.	Himachal Pradesh ..	0·13	0·57	0·28	—	100·00
7.	Jammu & Kashmir ..	0·06	0·59	0·27	0·07	100·00
8.	Karnataka ..	0·26	0·98	0·34	0·07	100·00
9.	Kerala ..	0·22	2·60	0·45	—	100·00
10.	Madhya Pradesh ..	0·08	0·43	0·18	0·04	100·00
11.	Maharashtra ..	0·66	0·71	0·23	0·01	100·00
12.	Manipur ..	0·04	0·57	0·13	0·12	100·00
13.	Meghalaya ..	0·01	0·55	0·20	0·10	100·00
14.	Orissa ..	0·08	0·67	0·16	0·12	100·00
15.	Punjab ..	0·14	0·93	1·37	0·04	100·00
16.	Rajasthan ..	0·12	0·60	1·33	0·03	100·00
17.	Tamil Nadu ..	0·27	1·08	1·09	0·01	100·00
18.	Tripura ..	0·10	0·90	0·72	0·08	100·00
19.	Uttar Pradesh ..	0·06	0·52	0·20	0·01	100·00
20.	West Bengal ..	0·11	2·74	0·20	0·02	100·00
21.	Delhi ..	0·12	2·61	—	—	100·00
	All India ..	**0·18**	**0·91**	**0·42**	**0·02**	**100·00**

ANNEXURE

Measures and concept of Inequality

The most striking feature of almost all economic distributions is the high degree of inequality that these distributions exhibit in India. Whether it is consumption, income or wealth, or whether it is distribution of land owned or land operated by cultivators, the basic pattern reveals unequal distribution. It is perhaps this particular aspect of economic distributions that interests the economist and the statistician to study these distributions. While we speak of inequality as if it is a simple idea, it has its complexities. It may be best to reproduce here some observations made by Amartya Sen (1) in his book entitled "On Economic Inequality."

"The idea of inequality is both very simple and very complex. At one level, it is the simplest of all ideas and has moved people with an immediate appeal hardly matched by any other concept. At another level, however, it is an exceedingly complex notion which makes statements on inequality highly problematic and it has been, therefore, the subject of much research by philosophers, statisticians, political theorists, sociologists and economists."

"The relation between inequality and rebellion is indeed a close one, and it runs both ways. That a perceived sense of inequality is a common ingredient of rebellion in societies is clear enough, but it is important to recognize that the perception of inequality and indeed the content of that elusive concept, depend substantially on possibilities of actual rebellion. .... The concept of equity and justice have changed remarkably over history and as the intolerence of stratification and differentiation has grown, the very concept of inequality has gone through radical transformation." "Ultimately the relevance of our ideas on this subject must be judged by their ability to relate to the economic and political preoccupations of our times."

Sen (1) also points out that, "We do not seem to get very much help in studying inequality from the main school of welfare economics—old and new. The literature on Pareto optimality (including the famous 'basic theorem' of 'new welfare economics') avoids distributional judgements altogether. The

standard approach of 'social welfare functions' because of its concentration on individual orderings only (without any use of interpersonal comparisons of levels and intensities) fails to provide a framework for distributional discussions .....Finally, utilitarianism, the dominant faith of 'old' welfare economics, is much too hooked on the welfare sum to be concerned with problems of distribution and it is, in fact, capable of producing strongly anti-egalitarian results."

"Can it be asserted that our judgement of the extent of inequality will not vary according to whether the people involved are generally poor or generally rich ? Some have taken the view that our concern with inequality increases as a society gets prosperous since the society can 'afford' to be inequality-conscious. Others have asserted that the poorer the economy, the more 'disastrous' the consequences of inequality, so that inequality measures should be sharper for low average income."

"There are reasons to believe that our idea of inequality as a ranking relation may indeed be inherently incomplete. If so, to find a measure of inequality that involves a complete ordering may produce artificial problems, because a measure can hardly be more precise than the concept it represents." "..... the implicit notion of inequality that we carry in our mind is, in fact, much less precise and may correspond to an incomplete quasi-ordering .... The notion of inequality has many aspects and a coincidence of them may permit a clear ranking, but when these different aspects conflict, an incomplete ranking may emerge."

It is thus clear that, when we think of inequality, the concept is not clear enough, and perhaps due to several aspects of the problem, as observed earlier, it is not possible to completely or uniquely define the word inequality. In the context of the prevaling inequality, however, the definition must be such as to cover at least such aspects which when quantified through measurement can throw light on how big and extensive is this problem of inequality in terms of these aspects.

Any measure of inequality should have the property of quantifying the degree of inequality and, what is also important, registering the direction, if not the exact degree, of change occuring over time or space accurately when certain measures are taken to abolish altogether or reduce the degree of inequality. Any transfer from a poorer to a richer person, other things remaining

the same, always increases inequality and any measure of inequality must have this minimal property to indicate an increase in inequality. Sen terms this requirement as Pigou-Dalton condition.

The least that can be expected of a measure of inequality is that it should show up sharp contrasts, even though it may not be able to order finely distinguished distributions. In this context, we may observe that the unequal economic distributions we generally come across are always skewed to the right. When the total size of this economic variable for each size-group (of equal length) is evaluated, one finds that a large proportion of small holders (i.e. in the lower size-groups) share a small or very small slice of the entire cake and the big holders (i.e. in the larger size-groups) constituting a small fraction of the population enjoy a sizeable share of the total amount. Whether a measure of skewness or variation singly or jointly would suffice and meet the above mentioned two requirements when dealing particularly with such distributions is a point to be considered while setting up suitable measures of inequality. It may, however, be said that even in the case of normal distribution (skewness being zero) some sort of inequality in terms of variation around the mean will be present, and in the lower size-groups, same frequency as in the symmetric part of the upper size-groups would still mean a lower share of the total amount (of the economic variable), as compared to its counter part in the upper size-groups.

Sen considers a number of measures, these being (1) range, (2) relative mean deviation, (3) variance and coefficient of variation, (4) standard deviation of logarithms, (5) Gini's Coefficient (or the concentration ratio based on Lorenz curve) and the relative mean difference, (6) Theil's entropy measure, (7) Dalton's measure, (8) Atkinson's measure and (9) an alternative measure (alternative to (8)).

According to him these and similar measures fall into two broad groups : (*a*) "Measures that try to catch the extent of inequality in some objective sense, usually employing some statistical measure of *relative variation.*" Measures (1) to (5) can be considered to belong to this group. (*b*) Measures which are of a *normative* character, where "the problem of measurement of inequality ceases to be an objective notion and the problem of measurement is enmeshed with that of ethical evaluation." While these two broad categories can be recognized, usable

measures of inequality should combine factual or objective features with normative ones. The use of normative measures such as (6) to (8) above requires that some sort of a social welfare function be defined and the idea of inequality becomes totally dependent on the form of the welfare function.

Obviously, range depending as it does on the two extreme values only, irrespective of the distribution of the intermediate values, is an inefficient measure. The relative mean deviation has the difficulty that it is not sensitive to transfers from the poor to the rich persons as long as both are below the mean value. The variance suffers from the defect that its value depends on the mean income level and it is possible that one distribution having larger mean than another distribution may show greater variation although it may have smaller *relative* variation than the other. Since we are really interested in measures which point up relative degrees of inequality, it is the coefficient of variation that is more useful. With regard to variance (or standard deviation) of the logarithms, one advantage is that it eliminates the arbitrariness of units, unlike in the case of variance of absolute values. An other advantage is that logarithms would stagger the values at the lower end and more than it would at the upper end of the distribution, when equal intervals or differences are involved. The measure, therefore, highlights differences at the lower end. However, by the same token, it is not quite sensitive at the upper end and thus tends to "soften the blow in reflecting inequality." This measure is used quite frequently and in our study, we propose to calculate the variances of logarithms, as one measure of inequality. When the economic variable under study generates approximately log-normal distributions, this measure is particularly useful.

Gini's coefficient is very widely used in describing inequalties. Since Lorenz concentration ratio and Gini's coefficient yield the same value and since Lorenz curve is easy to comprehend, both these measures are used widely. Gini's coefficient is variously defined. Theil ([2]) defines it as $\frac{1}{2}$ the weighted average of all absolute differences between the 'deflated' per capita incomes, the weights being the products of the corresponding population shares.

Thus, if x_i is the population share of the ith group in a frequency distribution

y_i is the income share of the ith group

$i = 1, 2, \ldots, g.$

$$\text{Then, } G = \tfrac{1}{2} \sum_{i}^{g} \sum_{j}^{g} \left| x_i y_j - x_j y_i \right| \quad i, j = 1, 2, \ldots, g$$

G, Gini's coefficient, being defined as the absolute difference between all possible pairs of $x_i y_j$—i.e. products of two types of shares, x_i, y

G can then be written as

$$\tfrac{1}{2} \sum_{i} \sum_{j} x_i x_j \left| \frac{y_i}{x_i} - \frac{y_j}{x_j} \right|$$

which is the above definition given by Theil. The term 'deflated' per capita income is used, because $\frac{y_i}{x_i}$ is the ratio of two ratios, viz.,

$\frac{\text{per capita income of ith group}}{\text{per capita income of 'all groups.'}}$ The denominator is a common deflator for all individual groups We observe that $G = 0$ if $y_i/x_i = y_j/x_j$ for all i, js. In this case the Lorenz Curve is the diagonal line. If, however, all income is concentrated in one group, then $y_i = 1$ for some i and $y_j = 0$ for all other $j \neq i$. In such case $G = 1 - x_i$. As the grouping becomes smaller, $x \leftarrow 0$ and $G \rightarrow 1$. Thus inequality becomes more pronounced as the population share of the group becomes smaller and smaller and income gets concentrated in one such group.

Sen shows that Gini's Coefficient is exactly $\frac{1}{2}$ of the relative mean difference, defined as the arithmetic mean of the absolute values of differences between all pairs of income shares.

$$G = \frac{1}{2n^2 m} \sum_{i=1}^{n} \sum_{j=1}^{n} \left| y_i - y_j \right|$$

where y_i is the income share of the ith person and m is the mean income.

This expression can be shown as

$$G = 1 + \frac{1}{n} - \left(\frac{2}{n^2 m}\right) \left[y_1 + 2y_2 + \ldots + ny_n\right]$$

Here $y_1 \geqslant y_2 \geqslant y_3 \geqslant \ldots\ldots \geqslant y_n$

In view of the simplicity of working out Lorenz ratio or the concentration ratio, we propose to use this measure.

It is, however, important to note that while comparing the values of concentration ratios care is necessary. This is because, if we are comparing inequalities in two states, then with the same value of the ratio for the two states, say 0.49, it is not possible to say definitely whether the two states have the same pattern of inequality, i.e. the same shape of the Lorenz curve. If this is the situation, the question will be, which of the two states can be considered to have greater inequality than the other ? A subjective judgement has to be made in this case and one reasonable way would be to call that state more unequal which shows lower share of income (or assets, etc.) for a given proportion of lower rung of the population. Such judgements may be called for not only when the Lorenz curves of two states cross each other and area between the diagonal and the curves is the same but also when the value of the concentration ratios differ somewhat. Only when a curve p contains fully curve q can we say that p represents more unequal situation than curve q ? The same limitation holds when one compares the same state or region over two points of time.

What has been stated is true in relative terms only. Two Lorenz curves of the same shape (i.e. coincident) represent the same relative inequalities. But, if two states with coincident Lorenz curves have different per capita real income (or if the same state at two different points of time has different per capita real income) it is evident that for the state with higher per capita income, per capita incomes of similar percentile segments will be higher than that for the corresponding segments of the second state and it may be that in some cases a lower group of the better off state may have a higher per capita income than that of a higher group of the other state. Where the Lorenz curves cut across each other and per capita incomes differ, things become more difficult to interpret as regards absolute values. Irving Kravis[3] has shown that the real per capita income of a given percentile segment of the income distribution—for example, the lowest 20 per cent—will be greater or smaller depending upon whether the product

$$\frac{S_1}{S_0} \times \frac{\bar{Y}_1}{\bar{Y}_0} \text{ is } > 1 \text{ or } < 1 \text{ where S is the share}$$

of total income received by the population in the group, $\bar{Y}$ is the per capita income of the nation at constant prices. Suffixes of 0 & 1 denote time periods.

Before coming to Theil's formula for evaluating inequality, we may dispose of the measures at (7) to (9). These measures belong to the normative group and need specification of some welfare function to operate upon. With this restriction on hand, we do not propose to use these measures.

Now Theil's inequality. His formula is derived from the information theory. If y is the probability of an event happening, the information content h (y) of noticing that that event has in fact happened must be a decreasing function of y. The smaller the probability, the greater the information content of the message that the event has in fact happened, and vice versa. He chooses the function to be a logarithmic function of 1/y. Thus

$$h(y) = \log \frac{1}{y}.$$

If there are N possible events with probabilities $y_1, y_2 \ldots$, y_N and $\sum_{i=1}^{N} y_i = 1$, $y_i \geqslant 0$, then the expected information content (or as in physics, the entropy) will be

$$H(y) = \sum_{i=1}^{N} y_i \, h(y_i)$$

$$= \sum_{i=1}^{N} y_i \log \frac{1}{y_i}$$

Now H(y) is a minimum at 0 value. This occurs when all y_i's except one are zeros and that y_i is then 1. This means, one particular event is certain and no other event among the possible set is likely to happen. Then the information content that that particular event has in fact happened is, no doubt, zero, log 1 being zero. H(y) is maximum at log N. This happens when each event has equal and therefore $\frac{1}{N}$ as the probability. In such a case, there is complete uncertainty and hence information content is maximum.

When $y_i = \frac{1}{N}$

$$H(y) = \sum_{i=1}^{N} \frac{1}{N} \log \frac{1}{1/N} = \frac{1}{N} \sum_{i=1}^{N} \log N = \log N$$

The case of equal probability can be identified with that of equal incomes in the case of income distribution, and that of greatest inequality with the probability of only one event happening. In order to measure inequality, therefore, Theil introduces

$$(1) \quad I(y) = \log N - \sum_{i=1}^{N} y_i \log \frac{1}{y_i}$$

as the measure of inequality which has log N value representing greatest inequality, and 0 representing complete equality. y_i represents income share of the ith person.

$$(2) \quad I(y) = \log N + \sum_{i=1}^{N} y_i \log y_i$$

$$= \sum_{i=1}^{N} y_i \log N y_i$$

Among the properties of this function, the following deserve to be noted.

(1) In the case of transfer of income from the poor to the rich, the inequality I(y) increases, and a transfer in the other direction reduces I(y). It thus satisfies Pigou-Dalton condition.

(2) When data are grouped as in the case of the frequency distribution, or in aggregates for states or regions, or say, occupation-wise, etc., it is possible to apply this measure and get a decomposition of the total inequality according to between sets and within-set inequalities.

Thus,

$$I(y) = \sum_{i=1}^{N} y_i \log N y_i$$

$$= \sum_{g=1}^{G} Yg \log \frac{Yg}{Ng/N} + \sum_{g=1}^{G} Yg \left[\sum_{i \in Sg} \frac{Yi/}{Yg} \log \frac{Yi/Yg}{1/Ng} \right]$$

where N is distributed in G groups $S_1, S_2, \ldots, Sg$ with population $N_1, N_2, \ldots, Ng$, and

$$Yg = \frac{\text{Income of Sg}}{\text{Total income}} = \frac{\text{Ng x per capita income of Sg}}{\text{N x per capita income—overall}}$$

Thus, (2) decomposes into two terms which are additive.

The first term on the right is the between set inequality ; the second term is the weighted average of the within-set inequalities. In distribution, within-set information on individual y_i's is not available in any class-interval (set) and assumption has to be made that all y_i's in any given set are equal to the mean value of the set. This reduces the second term to zero. And total inequality is then the between-set inequality. In case the set consists of States within a country, then

$\sum_{g=1}^{G} Yg \log \frac{Yg}{Ng/N}$ gives the between-set inequality for G States. This reduces to the ordinary form as follows.

We may write Yg as Y_i, i = 1, 2, .., n States instead of sets and N_g/N as x_i, (x_i is the share of population of ith State to the total)

Then the above expression is $\sum_{i=1}^{n} yi \log \frac{yi}{xi}$ as before

where

y_i	per capita income of the State
x	per capita income—overall

Further disaggregation of this into regions within a State is also possible. Thus, the process can be carried forward to smaller regions or classifications within regions. Alternatively, if for each State, there are groups like cultivators, agricultural labourers, etc.—occupationwise, further analysis can be carried out for inequalities between these groups and within groups. Similarly States can be aggregated to zones, if so required. This flexibility of aggregation and decomposition appears to be an interesting advantage in using Theil's formula. We have used this formula

and applied it to various combinations at All-India, state, occupation and household levels.

(3) Theil has shown that when y_i's belong to lognormal distribution, then the inequality measure is exactly equal to $\frac{1}{2}\sigma^2$. When it follows Pareto's law, then, the measure of inequality is

$$\left| \frac{1}{\alpha - 1} \right| - \log \left| \frac{\alpha}{\alpha - 1} \right| \text{ where } \alpha$$

is Pareto constant in the Pareto distribution.

James L. McCabe in his article on Distribution of Labour Income in Urban Zaire([4]) has used Kuznet's index([5]) to describe inequality. He states as follows : "The Kuznet's index is an additive measure of how much individual group per-capita incomes deviate from the mean per capita incomes of all groups independently of ordering—groups being in practice designated by occupational and geographical, as well as relative income, differences." In mathematical terms, this index is the sum of absolute differences between the percentage of total income in particular groups and the percentage of total members in these groups.

"The Kuznets index is more sensitive to concentration at the extreme ends of the distribution than is the Gini's Coefficient." We have also used this particular index of inequality. The formula for this is as follows :

$$K = \sum_{i=1}^{g} | Y_i - X_i |$$

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STATEMENT—1

All Households (as on June 30, 1971)

Sr. No.	State	Percentage of estimated households to total	Percentage share of assets	Average value of assets (Rs.)		Percentage share of assets value of					Concentration Ratio (CR)	Asset Value (Rs.) per		
				Per household	Per person	Lowest 10% households	Lowest 25% households	Lowest 50% households	Top 25% households	Top 10% households		First Quartile Q_1	Median M	Third Quartile Q_3
1		2	3	4	5	6	7	8	9	10	11	12	13	14
1.	Andhra Pradesh	8·68	6·20	8080	1666	0·4	1·0	5·9	78·2	56·6	0·7030	735	2798	8529
2.	Assam ..	2·51	1·74	7833	1312	0·4	2·8	12·7	65·6	40·5	0·5560	1796	4606	10095
3.	Bihar ..	11·20	12·71	12828	2247	0·3	1·6	7·1	76·2	52·2	0·6715	1584	4851	13908
4.	Gujarat ..	4·90	5·58	12874	2251	0·3	1·6	8·8	72·7	48·0	0·6342	1846	6110	14987
5.	Haryana ..	1·37	3·30	27139	4234	0·5	1·5	7·4	71·9	45·4	0·6291	3277	11792	35712
6.	Himachal Pradesh	0·60	1·20	22673	3902	0·9	5·3	16·9	60·3	37·5	0·4967	7499	15112	27730
7.	Jammu & Kashmir	0·72	0·98	15260	2586	1·4	6·9	21·0	55·8	34 0	0·4390	6332	11399	18552
8.	Karnataka ..	5·42	4·81	10032	1758	0·0	1·1	7·5	74·0	50·0	0·6547	1270	4402	11414
9.	Kerala ..	3·38	3·47	11615	1965	0·0	1·9	8·0	75·3	52·0	0·6608	1733	4641	12778
10.	Madhya Pradesh ..	7·68	7·14	10520	1923	0·3	2·2	11·5	67·9	43·5	0·5896	1994	5963	13000
11.	Maharashtra ..	7·78	8·04	11682	2171	0·1	1·4	7·4	74·0	47·6	0·6488	1392	5111	13870
12.	Manipur ..	0·19	0·12	7296	1254	1·1	4·8	16·7	59·9	36·3	0·4873	2264	4791	9559
13.	Meghalaya ..	0·23	0·12	6018	1238	0·6	5·0	17·7	60·4	39·3	0·5027	1906	3912	7999
14.	Orissa ..	4·77	2·54	6023	1181	0·3	2·2	11·5	67·6	45·5	0·5976	1149	3293	7663
15.	Punjab ..	2·01	5·67	31833	5423	0·4	1·2	4·9	78·9	51·0	0·6831	2747	8096	41181
16.	Rajasthan ..	4·06	4·58	12754	2222	0·6	3·8	14·3	66·3	42·5	0·5588	3349	7449	14857
17.	Tamil Nadu ..	8·35	5·04	6827	1504	0·0	0·8	5·0	79·1	57·1	0·7113	489	2112	7649
18.	Tripura ..	0·22	0·12	6475	1169	0·2	2·0	11·3	66·3	41·3	0·5784	1190	3814	8868
19.	Uttar Pradesh ..	17·80	21·29	13531	2469	0·6	2·4	11·8	68·9	44·7	0·5922	2634	7373	16306
20.	West Bengal ..	7·89	5·12	7331	1321	0·0	1·2	7·0	74·4	50·4	0·6600	793	3005	8908
21.	Delhi ..	0·07	0·14	22689	3562	0·1	1·1	6·5	77·1	47·5	0·6623	2280	8505	26768
	All India ..	**100·00**	**100·00**	**11311**	**2079**	**0·0**	**1·3**	**7·9**	**74·8**	**50·7**	**0·6551**	**1519**	**4800**	**12770**

Estimate value of Assets (in lakhs) = Rs. 8713161
Estimate number of Households (in 000's) = 77035

STATEMENT—2

Cultivators (as on June 30, 1971)

Sr. No.	State	Percentage of estimated households to total	Percentage share of assets	Average value of assets (Rs.)		Percentage share of assets value of					Concentration Ratio (CR)	Asset Value (Rs.) per household for		
				Per household	Per person	Lowest 10% households	Lowest 25% households	Lowest 50% households	Top 25% households	Top 10% households		First Quartile Q_1	Median M	Third Quartile Q_3
1		2	3	4	5	6	7	8	9	10	11	12	13	14
1.	Andhra Pradesh	7·38	6·05	11976	2253	0·5	2·9	11·7	70·8	49·0	0·6090	2562	5933	12912
2.	Assam ..	2·83	1·77	9157	1448	0·8	4·5	16·5	60·8	37·0	0·5042	2808	6032	11909
3.	Bihar ..	12·45	13·22	15539	2599	0·5	3·0	10·7	72·0	48·0	0·6216	3130	7394	17333
4.	Gujarat ..	4·33	5·48	18502	2989	1·0	4·5	15·4	63·6	39·2	0·5269	5430	11238	22488
5.	Haryana ..	1·14	3·26	41822	5991	1·0	4·7	16·8	60·0	35·1	0·4849	13300	27320	54847
6.	Himachal Pradesh	0·76	1·26	24108	3999	1·4	6·1	18·6	59·2	36·8	0·4747	8510	16350	28923
7.	Jammu & Kashmir	0·94	1·02	15938	2658	0·9	7·8	22·3	54·9	33·2	0·4235	6963	11977	19063
8.	Karnataka ..	5·14	4·81	13677	2206	0·5	3·5	12·8	67·8	45·6	0·5715	3441	7619	15018
9.	Kerala ..	4·19	3·65	12755	2107	0·6	2·5	9·5	73·3	50·0	0·6352	2205	5556	14155
10.	Madhya Pradesh	8·69	7·35	12362	2140	0·9	4·1	15·7	64·2	40·9	0·5339	3502	7783	14714
11.	Maharashtra ..	7·34	8·18	16232	2805	1·0	4·0	14·2	65·8	42·0	0·5481	4315	9187	19397
12.	Manipur ..	0·24	0·12	7616	1276	1·0	5·0	17·2	59·4	35·0	0·4745	2464	5036	9785
13.	Meghalaya ..	0·29	0·13	6504	1294	1·6	5·9	19·3	59·0	38·0	0·4753	2264	4253	8469
14.	Orissa ..	5·08	2·56	7832	1352	0·5	4·2	15·2	63·7	42·7	0·5392	2096	4415	8976
15.	Punjab ..	1·19	5·12	62785	9470	0·8	3·7	15·9	59·1	38·0	0·4818	18108	42829	86430
16.	Rajasthan ..	4·87	4·65	13948	2343	1·0	4·8	16·1	63·9	41·0	0·5293	4153	8435	16369
17.	Tamil Nadu ..	6·39	4·76	10907	2173	0·5	2·9	12·1	68·4	45·6	0·5880	2328	5849	12922
18.	Tripura ..	0·27	0·13	7049	1224	0·4	3·0	12·9	64·6	39·2	0·5507	1629	4398	9394
19.	Uttar Pradesh ..	19·11	21·36	16350	2810	0·9	4·2	14·8	64·6	40·7	0·5356	4622	9593	19435
20.	West Bengal ..	7·17	4·89	9965	1653	0·7	3·3	13·3	66·2	43·0	0·5611	2342	5682	12276
21.	Delhi ..	0·04	0·13	45619	5930	1·0	4·5	15·9	55·1	32·5	0·4659	13474	2984	71739
	All India ..	**100·00**	**100·00**	**14627**	**2508**	**0·6**	**2·9**	**12·0**	**68·4**	**45·3**	**0·5847**	**3395**	**7884**	**16638**

Estimated number of households (in 000's) = 55770

Estimated value of assets (in lakhs) = Rs. 8157510

STATEMENT—3
All Households

Sr. No.	State	Percentage of Households by Occupations						Percentage share of assets value by Occupation					
		Total	Cultivators	Non-cultivators	Of which			Total	Cultivators	Non-cultivators	Of which		
					Agricultural Labourers	Artisans	Others				Agricultural Labourers	Artisans	Others
		1	2	3	4	5	6	7	8	9	10	11	12
1.	Andhra Pradesh	100·00	61·60	38·40	23·12	3·26	12·02	100·00	91·29	8·71	2·67	0·55	5·48
2.	Assam	100·00	81·61	18·43	6·20	0·83	11·36	100·00	95·37	4·63	0·71	0·24	3·68
3.	Bihar	100·00	80·44	19·56	13·34	1·02	5·20	100·00	97·45	2·56	0·96	0·13	1·46
4.	Gujarat	100·00	63·96	36·04	18·28	3·66	14·10	100·00	91·92	8·08	2·27	1·11	4·70
5.	Haryana ..	100·00	60·02	39·98	14·74	4·54	20·70	100·00	92·51	7·49	1·66	0·95	4·88
6.	Himachal Pradesh	100·00	92·39	7·61	0·65	0·87	6·09	100·00	98·31	1·70	0·06	0·15	1·48
7.	Jammu & Kashmir	100·00	93·91	6·09	0·72	0·54	4·84	100·00	98·06	1·94	0·13	0·16	1·66
8.	Karnataka ..	100·00	68·73	31·27	19·31	2·88	9·08	100·00	93·70	6·30	2·70	0·56	3·04
9.	Kerala	100·00	89·71	10·29	3·84	0·58	5·88	100·00	98·52	1·48	0·26	0·07	1·16
10.	Madhya Pradesh	100·00	81·99	18·01	10·31	1·40	6·29	100·00	96·36	3·64	1·07	0·23	2·35
11.	Maharashtra ..	100·00	68·62	31·38	19·80	2·87	8·71	100·00	95·35	4·65	1·82	0·41	2·42
12.	Manipur ..	100·00	92·36	7·64	..	..	6·94	100·00	96·47	3·53	0·86	0·29	3·44
13.	Meghalaya ..	100·00	90·40	9·60	2·82	..	6·78	100·00	97·56	2·44	0·47	0·05	1·97
14.	Orissa	100·00	77·18	22·82	12·15	1·66	9·01	100·00	94·59	5·41	1·47	0·32	3·63
15.	Punjab	100·00	42·91	57·09	25·77	5·15	26·16	100·00	84·66	15·34	2·81	0·98	11·54
16.	Rajasthan ..	100·00	86·81	13·19	3·29	1·47	8·43	100·00	94·92	5·07	0·49	0·39	4·19
17.	Tamil Nadu ..	100·00	55·39	44·63	26·66	3·78	14·18	100·00	88·49	11·51	2·71	0·72	8·08
18.	Tripura	100·00	89·29	10·71	2·38	..	7·74	100·00	97·15	2·85	0·28	0·01	2·48
19.	Uttar Pradesh ..	100·00	77·75	22·25	8·12	2·93	11·20	100·00	93·95	6·05	0·91	0·59	4·54
20.	West Bengal ..	100·00	65·80	34·22	17·40	1·94	14·88	100·00	89·42	10·58	1·37	0·62	8·58
21.	Delhi	100·00	41·07	58·93	10·71	14·2	34·939	100·00	83·23	16·77	2·24	2·16	12·38
	All India	**100·00**	**72·40**	**27·60**	**14·60**	**2·42**	**10·58**	**100·00**	**93·62**	**6·38**	**1·47**	**0·25**	**4·39**

Note : The percentage of cultivators and non-cultivators may not add up to 100 because of rounding up. Similarly, totals for agricultural labourers, artisans and others may not add up to the figure for non-cultivators.

Negligible.

STATEMENT—3—(*Concld.*)

Sr. No.	State	Average value of assets per household by occupation (Rs.)					
		Total	Cultivators	Non-Cultivators	Of which		
					Agricultural Labourers	Artisans	Others
		13	14	15	16	17	18
1.	Andhra Pradesh	8080	11976	1832	935	1362	3684
2.	Assam	7833	9157	1969	887	2293	2536
3.	Bihar	12828	15539	1680	927	1661	3612
4.	Gujarat	12874	18502	2886	1602	3900	4287
5.	Haryana	27139	41825	5088	3050	5757	6397
6.	Himachal Pradesh	22673	24107	5101	2223	4031	5555
7.	Jammu & Kashmir	15260	15938	4844	2575	4220	5285
8.	Karnataka	10032	13677	2021	1400	1959	3363
9.	Kerala	11615	12755	1671	783	1277	2291
10.	Madhya Pradesh	10520	12362	2129	1092	1695	3928
11.	Maharashtra	11682	16232	1732	1074	1664	3250
12.	Manipur	7296	7616	3422	2291	1022	3537
13.	Meghalaya	6018	6504	1528	1017	1555	1738
14.	Orissa	6023	7382	1428	727	1153	2424
15.	Punjab	31833	62789	8556	3474	6096	14045
16.	Rajasthan	12754	13947	4905	1886	3404	6347
17.	Tamil Nadu	6827	10907	1762	695	1309	3888
18.	Tripura	6475	7049	1700	767	338	2034
19.	Uttar Pradesh	13531	16350	3679	1521	2726	5493
20.	West Bengal	7331	9965	2267	578	2361	4229
21.	Delhi	22689	45619	6506	4933	3609	8055
	All India	**11311**	**14627**	**2613**	**1142**	**2381**	**4695**

TRENDS IN MONETISATION IN THE INDIAN ECONOMY (1961-62 TO 1974-75)

DR. S. S. MADALGI*

This article attempts to study the trends in monetisation in the Indian Economy since 1961-62. It is divided into five Sections. In Section I general observations are made on the relationship between monetisation and the stage of economic development. Problems in estimating monetisation and limitations in using the existing data on marketable surplus are indicated in Section II. An alternative method of estimating marketable surplus is discussed in Section III while the trends in monetisation are analysed in Section IV. The article ends with a concluding section giving likely future trends in monetisation.

1. Monetisation and Stage of Economic Development

2. The extent of monetisation of an economy implicitly indicates the stage of its development. In an economy where consumption needs of economic units are simple and the modes of satisfying them are also simple, there is less scope for emergence of 'surplus' and, therefore, for 'exchange' with other economic units. In such economies, both the technique of production and the pattern of consumption are simple and there is not much of inter-dependence between economic units. These are subsistence economies *par excellence* which India was two centuries ago, with her self-sufficient village units.[1] In such economies, whatever little inter-dependence of economic units is there, partakes the nature of barter transactions. At the other end of the scale are the economies where consumption pattern is so diversified on account of high incomes that very little of total consumer expenditure is spent on basic needs such as foodgrains ; even this little expenditure is on products which are processed and not on products as grown on the farm. This kind of diversification of consumption is made possible by high living standards and a highly diversified occupational structure. Addition of time, space and form utilities to every product as it moves from the producer to the consumer is a characteristic

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1. See : Romesh Dutt—Economic History of India, Volume I and II, Government of India, New Delhi, 1960. Also see D. R. Gadgil—Industrial Evolution in India, Oxford University Press, 1942.

feature of these economies. Obviously, 'exchange' becomes the primary motive of production and thus these economies are highly monetised.

Non-Monetised Sector—Basic Factors

3. At present, the Indian economy takes a mid-position between the two extreme cases noted above. While the entire non-agricultural sector is monetised, there are certain features in the agricultural sector which make for non-monetisation of a part of its output. Some of these features are of a long term nature and basically emanate from the occupational structure. In the rural area as much as two-thirds of the population depends on agriculture for its livelihood. As majority of this population is extremely poor, foodgrains account for between one-half to two-thirds of total consumption expenditure. Consequently, in the crop-mix that cultivators adopt for production purposes, preference is given to foodgrains to meet the consumption requirements. On account of this, a significant proportion of produce is retained for consumption ; to that extent, it is non-monetised. The practice of payment of wages in kind to agricultural labour and rent to landlord for leased land (crop-sharing tenancy) again emanates from the preponderence of foodgrains in the consumption pattern. In a way, both the practice of providing for family consumption out of one's own production and of payment of wages and rent in kind can be clubbed under the rubric 'non-monetised input system.' In the production system where entrepreneur supplies the bulk of required labour force out of his own family labour, inputs tend to be non-monetised and to that extent output also.

4. Thus we notice that the basic factors which make for non-monetisation in the Indian economy are, first, the occupational structure mainly geared to agriculture and second, the extremely low living standards with major part of income spent on foodgrains consumption.

Subsistence Sector—Conceptual Framework

5. In the current literature on the subject, this phenomenon of non-monetised sector is referred to as the subsistence sector. The FAO study[2] classifies the transition from subsistence to market agriculture into four stages as follows : "There might be, in the first place, areas where production is used entirely for

2. FAO : Monthly Bulletin of Agricultural Economics and Statistics, February 1961 ; quoted in 'Subsistence Sector in Indian Agriculture' by V. M. Jakhade and N. A. Mujumdar, R.B.I. Bulletin, September 1963.

subsistence ; such areas, by definition, are completely self-contained and hence cut off from the rest of the economy. Secondly, in some areas, some barter transactions or even sales might be taking place ; but the emergence of a small surplus above the subsistence requirements may be largely unintentional, perhaps the result of an occasional particularly favourable agricultural season. A third stage in the transition is where the regular production of a marketable surplus is aimed at deliberately, but the main emphasis is still on subsistence production. In the final stage, production for the market predominates over subsistence." In the context of this classification, it may be worthwhile to know (1) in which stage the non-monetised sector of India could be fitted in and (2) to what does this non-monetised sector refer to : to the farmers, to the region or to the non-monetised output itself ?

6. The first two stages clearly apply to a primitive economy where barter transactions prevail. As stated above, such economies are subsistence economies *par excellence* which India was about two centuries ago. But the use of money in the Indian economy is by now over 200 years old ; during this long period money has percolated to the remotest of villages. Though a substantial part of production even now is used by the farmers for family consumption, it cannot be deduced from this that they lack market-orientation. The study by Dharm Narain[3] has brought out that the market orientation, as reflected in the marketed surplus, is noticed in respect of all the size groups of farmers—small, medium and big. It would be seen from Dharm Narain's data reproduced in Table 1 that the small farmers with a size of holding below 5 acres accounted for about one-fourth of the total marketed surplus even though their share in the area was only about one-fifth.[4] It may be argued that these surpluses might be occasioned by an exceptionally good crop or that these might represent sales to achieve a target of cash for meeting other monetary obligations. But then how does one explain the widespread practice of 'retentions' even among big farmers with size of holdings above 50 acres (Table 2)? It would be illogical to call the latter farmers as something less than the 'market-oriented' farmers or worse still the 'subsistence' farmers. Hence it is argued in this study that it is

3. Dharm Narain : Distribution of the Marketed surplus of Agricultural Produce by size level of holding in India 1950-51 ; Occasional Paper No. 2, Institute of Economic Growth, Delhi, 1961.

4. National Sample Survey Report No. 144, 17th Round, 1961-62.

TABLE 1 : DISTRIBUTION OF MARKETED SURPLUS

Size of Holding (Acres)	Marketed Surplus (Rs. Crores)	(2) as % of value of output	(2) as % of Total Marketed Surplus
1.	2.	3.	4.
0-5	564·0	33·6	26·0
5–10	444·8	27·4	20·5
10–15	170·1	23·1	7·9
15–20	172·8	30·1	8·0
20–25	111·0	32·2	5·1
25–30	116·8	39·7	5·4
30–40	139·6	39·8	6·4
40–50	107·8	46·4	5·0
50 and above	339·9	51·4	15·7
Total	**2166·8**	**33·4**	

Source : "Distribution of the Marketed Surplus of Agricultural Produce by Size-Level of Holding in India 1950-51" by Dharm Narain, June 1961, Institute of Economic Growth, Delhi-6, p.35.

TABLE 2 : DISTRIBUTION OF MARKETED SURPLUS BY HOLDING SIZE-GROUPS

Size of holding (Acres)	Total gross value of output (Rs. Crores)	Total value of retentions (Rs. Crores)	Total value of marketed surplus (Rs. Crores)	Marketed surplus as percentage of gross value of output	Marketed surplus of each holding size-group as percentage of total marketed surplus
0–5	1291·2	1024·5	266·7	20·7	24·9
5-10	1250·8	1075·0	175·8	14·1	16·4
10-15	565·8	511·1	54·7	9·7	5·1
15-20	441·3	361·2	80·1	18·2	7·5
20-25	265·3	211·3	54·0	20·4	5·0
25-30	226·1	160·7	65·4	28·9	6·1
30-40	269·5	189·0	80·5	29·9	7·5
40-50	178·5	110·7	67·8	38·0	6·3
50 and above	508·8	280·8	228·0	44·8	21·2
Total	**4997·3**	**3924·3**	**1073·0**	**21·5**	

Source : "Distribution of the Marketed Surplus of Agricultural Produce by Size-Level of Holding in India 1950-51" by Dharm Narain, June 1961, Institute of Economic Growth, Delhi-6, p.43.

only in the rare case of a farmer growing a single foodgrains crop on a tiny piece of land and that too on a shifting basis that one can identify a real subsistence farmer in India. And such farmers are very few in India today. In a study[5] by Jakhade and Mujumdar an attempt was made to identify the subsistence sector at the *micro* level. But the authors could lay their hands only on tribal areas as a clear evidence of subsistence economy *i.e.*, subsistence economy with a barter system. The reasons for this comparative absence of identifiable pockets of subsistence, region-wise or farmer-wise, may be briefly stated. To be a subsistence farmer in the strict sense of the term, he must be completely outside the orbit of money economy. In contrast, the general pattern in the case of almost all farmers is that they have money incomes from farm production as well as from other sources ; they grow and sell food crops as well as non-food crops ; in a nutshell they are very much within the orbit of money economy. *But it so happens that their pattern of consumption is historically so finely tuned to the crop production possibilities, with a given soil-climate complex, that they consume a part of their own output.* And just because they do so should not lead us to mistake them for subsistence farmers, or their operations as of a subsistence nature. This could be more clearly brought out by assuming an imaginary Tughlaquian Rule under which all farmers are asked to sell after the harvest their entire produce for money together with an unrestricted freedom to buy back whatever quantity they need, with an assurance of no gain or loss to them in the process. The balance sheet of operations at the end of the year would show that the farmers bought back precisely the same quantity which they would otherwise have retained for consumption/disposals. Of course, the economist advising the ruler would tell him to his great satisfaction that the economy of his kingdom was cent per cent monetised like that of the U.S.A. What he will not tell the ruler is that everyone's economic status remained the same as it was before this fiat.

7. This analysis brings out that the subsistence sector in the Indian agriculture falls in the third category of the FAO classification and that the sense in which this concept could be applied to Indian agriculture is a limited one. It is argued here that any meaningful measure of subsistence sector in Indian agriculture should refer only to the *non-monetised output* of the farmers

5. opp. cit.

and not to *farmers* or to regions. And the non-monetised output is that part of the produce of the farmer which is consumed/ disposed of by him in kind.

8. With this conceptual clarification of the subsistence sector in India, a question naturally arises : should transition to the fourth stage (of the FAO classification) be the ultimate goal of every developing country ? It may be noted here that by suggesting the fourth stage of complete 'market agriculture' as a further stage in the agricultural development, FAO study attempts to establish parallelism between industry and agriculture. This classification fits well to the system of capitalist agriculture where human element has but a small role to play, and substitution between capital and labour becomes a matter of relative costs with a view to maximising profits. This is practically the case in almost all industrially advanced countries barring Japan. In these countries population pressure on land was not very acute and the Industrial Revolution could attract enough labour force from land to make the remaining farmers look at farming like any other commercial enterprise. But in a country like India with her vast agricultural population of over 400 million out of 560 million of total population, absorption of enough labour force in other sectors so as to make the agriculture a commercial enterprise in the same sense as it is in U.S.A. or U.K. or on the Continent, is not within the sight at least for the next 50 years. Even to maintain the existing man-land ratio in farming, something like 8 million new entrants in the agricultural sector will have to be absorbed annually by the non-agricultural sector. To say the least, this is an impossible task considering the fact that about a century-old experience at manufacturing activity and efforts of a quarter-century in planned economic development, have brought about employment of only 17.5 million in the organised sector. One can therefore say that for many years to come the bulk of the labour force will have to remain in agriculture. Even assuming a rate of growth of 5-6 per cent in farm productivity, the subsistence sector as defined above *i.e.*, non-monetised output, will persist, though on a decreasing scale as a proportion of national product. In any case, it will not disappear altogether, because baker's bread is unlikely to replace our traditional *chapatis/parothas* made tastier by the culinary skill of the village housewife. An acute labour shortage which makes a baker's bread more economical (though not tastier) than the home-made one in the West, is unlikely to face India for at least a couple of generations. Besides, it is debatable whether it is wise to lay down the process of economic

development in a manner which points to Western life style as the only course to human welfare and contented life.[6]

9. Precisely for these reasons, in a densely populated developing country like India, capitalist type of farming is rejected on both economic and social grounds. Instead, 'Family Farm' system has been accepted as the ultimate goal for agriculture. Hence, it could be argued that the primary motive of cultivation—consumption or sale—should not be the crucial basis for determining the final stage of agricultural development. The third stage of FAO could as well be the final stage for these densely populated countries.

II. Limitations in Using Published Data on Marketable Surplus of Foodgrains

10. From the foregoing it follows that measurement of monetisation of the Indian economy involves estimation of those items of national income which are not exchanged for money. Among such items, foodgrains retained for family consumption and for payment in kind constitute the most important components; some portion of the other produce like fruits and vegetables, milk, oilseeds, eggs and poultry raised on the farm is also likely to be retained for family consumption. Excepting these there appear to be no other items which are not encompassed by the money economy in India.

Data on Marketable Surplus

11. In short, then, measurement of monetisation of the Indian economy involves estimation of the value of that portion of the produce of agriculture and allied activities which is not exchanged for money. This produce can be divided into three broad groups viz., (1) foodgrains, (2) non-foodgrains and (3) horticultural and animal husbandry products like fruits & vegetables, milk, meat and meat products, eggs and poultry etc. Among these, foodgrains is by far the most important as a medium of satisfying hunger. Other products, however much desirable from dietary standpoint, figure at a lower level in importance in the existing context of low levels of living. These may be grown on the farm and in the kitchen gardens but the primary motive in raising them is 'sale' in order to supplement

6. Perhaps it is not too late to revive some of the Gandhian ideals in our economic and social spheres. This appears to be the only way to reverse the emerging un-Indian life style of the rich and the new rich in urban India. Besides distorting development, it creates social tensions.

the meagre income, and not 'consumption'. This would suggest that the sale component is likely to be higher in these products than in foodgrains. It is the 'sale' component which indicates the extent of monetisation of this sector.

12. It might appear that the 'sale' component can be directly obtained from the data on marketable surplus which are published by the Government of India in various marketing reports on agricultural commodities. These data for major foodgrains are shown in Table 3. Similar data for non-foodgrains can be had in respect of important crops like cotton, groundnut, jute, tobacco, etc. However, one major pitfall in estimating monetisation on the basis of these data is that these estimates of marketable surplus are based on marketing surveys conducted prior to Independence and as such are out of date. Even the revised estimates in respect of some crops are more than a decade old. Further, major changes in the cropping pattern and largescale adoption of commercialised agriculture in some areas, might have altered the proportions of their marketable surplus quite significantly. In view of even some food crops having come to occupy the position of 'cash crops' in the real sense of the term because of their high prices, disposals in the form of payment in kind to hired labour and quantity retained for personal consumption might have undergone substantial changes in the direction of more economical use in such disposals. Similarly, various land reform measures might also have discouraged at least in a large number of cases, though not in all, payment of rent to the landlord in kind.

TABLE 3 : ESTIMATED MARKETABLE SURPLUS OF AGRICULTURAL COMMODITIES

Foodgrains	Estimated Marketable surplus as % of production	Period to which the estimate refers
Rice	40·5	Pre-war estimate
	31·5	1954-55
	31·4	1956-57
Wheat..	45·0	About 1945
	35·0	1954-55
	32·7	1955-56
Jowar	23·8	About 1952
Bajra	26·5	About 1952

Source : Indian Agriculture in Brief (2nd and 7th edition).

13. In view of these limitations of the published data on marketable surplus, these cannot be used to estimate monetisation in the Indian economy. An alternative approach would be

to estimate the marketable surplus through indirect method. This is attempted in the following section.

III. An Alternative Estimational Procedure of Marketable Surplus of Foodgrains

14. The problem of estimation of marketable surplus is more important and also difficult in respect of foodgrains than in respect of other crops for the reason, stated earlier, namely, the preponderance of foodgrains in the family basket of consumer goods. We shall attempt to make some estimates first in respect of this group.

15. Marketable surplus is a surplus available for sale out of a given level of gross production. The difference between production and marketable surplus is accounted for by 'retentions' for the following three purposes: (1) consumption by cultivators and their dependents, (2) payment in kind to hired services and rent and (3) retentions for seed, feed, etc. Of these three items, the first one accounts for the bulk of farmer's retentions; this is followed by retentions for the second purpose. These two retentions have to be estimated in the absence of readily available data. In regard to the third, it is conventional to take 12.5 per cent of gross produce as the requirement for this purpose. Thus our task will be to estimate, first, the consumption requirements and then the payment in kind.

16. The 15th and 16th rounds of the National Sample Survey (NSS) on Consumer Expenditure give the estimates of foodgrains consumption for rural area and for urban area. Using these data, a recent study[7] has estimated that foodgrains consumption of the rural sector was 58.5 million tonnes in 1959-60. The NSS data give the quantity of foodgrains consumed by the rural and the urban population on per capita per day basis. By blowing these figures for the total rural population on annual basis, the total rural consumption in 1959-60 was derived after some adjustments ; a similar procedure was followed to derive the urban consumption. The present study takes this estimate as a starting point.

17. From the aggregate foodgrains consumption of the rural population in 1959-60 we have to derive the consumption of various functional groups in the rural sector. The rural popu-

7. S. S. Madalgi—Population and Food Supply in India, Lalvani Publishing House, Bombay, 1970, pp. 10-16. Also see by the same author "Foodgrains Demand Projections, 1964-65 to 1975-76.", R.B.I. Bulletin, Jan. 1967.

lation consists of three broad groups, namely, cultivators, agricultural labourers and non-agriculturists. Some data are available in regard to foodgrains consumption levels of agricultural labour population in the rural area. By deducting total foodgrains consumption of this class from the total rural consumption referred to above, we get consumption of foodgrains by cultivators and non-agriculturist population together.

Consumption of Agricultural Labourers

18. The Second Agricultural Labour Enquiry Report[8] gives information about the strength of agricultural labour class as also about the quantity of foodgrains consumed by this class on per capita per day basis. By blowing these data for the total agricultural labour population on an annual basis, we derive total foodgrains consumption of this class as follows: The total number of agricultural labour households in 1956-57 was 16.3 million and the average size of the household was 4.4. Thus, the total agricultural labour population in 1956-57 was 71-72 million. The per capita per day consumption of foodgrains was estimated at 0.54 seers or 505 gms. (1 seer = 935 gms.). At this rate, the consumption for the total agricultural labour population amounted to 13.0 million tonnes in 1956-57. Consumption for the subsequent years could be derived on the basis of 2.0 per cent per annum rate of increase in the agricultural labour population i.e., the same as for the rural population. On this basis, their foodgrains consumption would amount to 13.8 million tonnes in 1959-60.[9] Deducting this from the total rural consumption at 58.5 million tonnes in that year, we get 44.7 million tonnes as the consumption of cultivators and non-agricultural population. To the estimation of the share of each of these two classes, we may now turn.

Estimates of Cultivating Population

19. We may first assess the relative strength of these two classes in the rural sector. As the 1961 census does not give livelihood categories of the population, we use 1951 census data as given in Table 4. A couple of points in respect of these data may be noted. The term cultivating labourers used by the 1951

8. The Second Agricultural Labour Enquiry Report 1956-57, Government of India.

9. Because of overcrowding in the agricultural labour market and the consequent severe unemployment and under-employment in this group, it is assumed that the per capita real incomes in this group and hence per capita consumption levels might have remained unchanged during the period under study.

census relates to landless labour with the result that some of the agricultural labourers who derived only a nominal income from cultivation of land are also included in the categories 1(a) and 1(b) i.e., 'cultivators of wholly or mainly owned/unowned land' (Table 4). This is confirmed by the data on agricultural labour as given by the Report on Second Agricultral Labour Enquiry 1956-57. According to the estimates of this Enquiry, in 1950-51 the strength of Agricultural labour households with land and those without land was 8.9 million and 9.0 million respectively (p.47 & 53). As the average size of the agricultural labour household was 4.3 in 1950-51 (p. 186) the total strength of the two groups was 38.3 million and 38.7 million persons respectively. Thus, the latter figure is very close to the 1951 census figure of cultivating labourers (42.9 million), if allowance is made for the lag of about one year between the agricultural labour Enquiry data and the Census data. It would appear, therefore, that the 1951 census data on the population of cultivating class (owners or tenants) will have to be scaled down by 38.3 million i.e., population of agricultural labourers with land.

TABLE 4 : LIVELIHOOD CATEGORIES OF POPULATION (1951)

(In millions)

	Rural	%	Urban	%
I. Agricultural Class	**240·4**	**81·5**	**8·6**	**13·9**
(*a*) Cultivators of wholly or mainly owned land	162·9	55·3	4·4	7·1
(*b*) Cultivators of wholly or mainly unowned land	30·2	10·2	1·4	2·3
(*c*) Cultivating labourers	42·9	14·5	1·8	2·9
(*d*) Non-Cultivating owners of land and agricultural rent receivers ..	4·4	1·5	1·0	1·6
II. Non-Agricultural Class	**54·4**	**18·5**	**53·2**	**86·1**
Total	**294·8**	**100·0**	**61·8**	**100·0**

Source : Census of India, 1951, Vol. I, Part II, Economic Tables.

20. As for the other classes, it may be noticed from Table 4 that the agricultural rentier class constituted 1.5 per cent of the total population. Because of major institutional changes in the shape of land reforms legislation, which swept the country

after 1951 population census, there is reason to believe that the relative strength of the rentier class was shaken considerably. It can be inferred that the land reforms legislation would affect the strength of this class in two ways ; by resuming land for personal cultivation some agricultural rentiers might have technically qualified themselves for the cultivator's class ; while some others who could not do so, either because of difficulties in evicting the tenant or because of difficulties in taking up personal cultivation in view of urban employment etc., might have perforce devoted themselves entirely to non-agricultural activities. It is difficult to precisely estimate the relative strength of these two forces. It may be assumed that one-half of this class got merged in the 'cultivator' class and the other half in the 'non-agricultural' class. In view of various considerations mentioned above, we adjust the relative strength of various livelihood categories as shown in Table 5. It may be noticed from the table that in 1951, the total strength of cultivator population was 157.0 million and of non-agricultural population 56.6 million. In other words, the former constituted 73.5 per cent of the total of these two groups.

TABLE 5 : ESTIMATES OF CULTIVATING POPULATION (1951)

(Million Persons)

		Rural	Urban
1.	(A) Cultivators of owned/unowned land and their dependents ((a)+(b) of Table 4) ..	193·1	5·8
	(*i*) *Add* ½ of Agricultural rentiers ((d) of Table 4)	+ 2·2	0·5
	(*ii*) *Deduct* Agricultural labourers with land and their dependents	—38·3	—
1.	**(B) Total Number (Adjusted) of Cultivators and their dependents .. ..**	**157·0**	**6·3**
2.	(A) Agricultural labourers and their dependents ((c) of Table 4)	42·9	1·8
	(*i*) *Add* Agricultural labourers with land and their dependents (1A (*ii*) above)	+38·3	—
2.	**(B) Total Number (Adjusted) of Agricultural labourers and their dependents .. ..**	**81·2**	**1·8**
3.	(A) Non-Agricultural Class and their dependents	54·4	53·2
	(*i*) *Add* ½ of Agricultural rentiers ((d) of Table 4)	+ 2·2	0·5
3.	**(B) Total Number (Adjusted) of Non-Agricultural Class .. ..**	**56·6**	**53·7**
	Total Population (1B+2B+3B)	**294·8**	**61·8**

21. In regard to foodgrains consumption it was indicated earlier that these two classes consumed about 44.7 million tonnes in 1959-60. In the absence of any information about consumption levels of each of these two classes it is assumed that the share of each of these two classes in their total foodgrains consumption will be in the same proportion as their respective share in the total of their population. This is quite a reasonable assumption in view of the fact that comparable to affluent large land holding families in the cultivators class, we notice a corresponding affluence in families of moneylenders, shopkeepers and such others in the non-agricultural class. At the other end of the scale, we notice poverty among marginal and sub-marginal farmers in the cultivators class and among village artisans in the non-agricultural class. There may be small differences in the consumption levels of these two classes, but considering the generality of poverty of the population in the rural area, these differences will not render our assumption unrealistic. Thus the estimated consumption of cultivators and their dependents would amount to about 32.8 million tonnes in 1959-60 as shown below :

Consumption of Cultivators and their Dependents

		Million tonnes	
1.	Total rural consumption in 1959-60 ..	58.5	
2.	Deduct consumption of agricultural labour population	13.8	
3.	Consumption of cultivators and non-agriculturist population	44.7	(100.0%)
4.	Consumption of cultivating population ..	32.8	(73.5%)
5.	Consumption of non-agriculturist population	11.9	(26.5%)

22. Now, we have to take into account foodgrains consumption of urban cultivators. Data in Table 5 show that cultivating population living in the urban area was about 6 million. As this class constitutes a very small proportion of the total urban population, it may not be valid to apply to them the NSS levels of foodgrains consumption in the urban area. At the same time, we cannot assume that all the foodgrains

Consumption of Urban Cultivators

which these urban cultivators require will be grown on their own fields. Due to proximity to the market and to financial institutions like banks, these urban cultivators are apt to be more progressive and commercial-minded in their cultivation operations. One may expect them, therefore, to devote their land for more profitable uses like commercial crops, fruits and vegetables etc. Thus they are likely to rely for their foodgrains requirements to a greater extent on the market purchases than on their own production. Hence, we assume that only about one-third of their requirements of foodgrains is self-grown and the remaining two-thirds is consumed out of the general pool of marketable surplus. As these urban cultivators account for only 3.9 per cent of the total number of cultivators in the country and as only one-third of their consumption of foodgrains is assumed to be self-grown, we need to inflate our estimate of rural cultivator's consumption by about 1 per cent to arrive at the total foodgrains consumption of all cultivators. In other words, the foodgrains thus estimated to have been consumed by all cultivators would amount to 33.1 million tonnes in 1959-60.

23. After determining the foodgrains consumption level of the cultivating population in the year 1959-60, it is easier now to derive consumption estimates for the subsequent years.

Trends in Foodgrains Consumption of Cultivators

24. While estimating foodgrains consumption of cultivators in the subsequent years, it should be noted that the consumption will increase on account of two factors, namely, the increase in population and the increase in income. It is assumed in this study that the increase in population will lead to proportional increase in consumption mainly because of the generally prevailing practice of farmers to provide fully for family consumption before deciding on the quantity to be sold. As for the increase in income, it is assumed that the observed expenditure elasticity[10] of 0.6 in respect of rural families will hold good for cultivators also. Both these assumptions are predicated on the ground that the small, marginal and sub-marginal farmers (with 5 acres or less) in all areas and medium farmers (with 5 to 10 acres) in dry areas together account for about two-thirds of the cultivators and they constitute by far the largest group among the under-nourished population. As a result providing for consumption requirement of additional

10. Vide : Pushpam Paul and Ashok Rudra: Demand Elasticity for foodgrains, Economic Weekly, November 28, 1964.

mouths as also to raise their low levels of consumption become the first charge on their foodgrains production. The income-elasticity of demand in respect of them may be higher than 0.6 assumed above. But in the case of cultivators with a larger cultivating area, income-effect perhaps may not be noticed in the form of quantitative increase ; it would rather be in the form of qualitative improvement. The overall increase in demand due to the income effect for the cultivator class as a whole is therefore assumed to be 0.6. Thus the total increase in foodgrains consumption of cultivators consists of the rate of annual increase in cultivator-population and 60 per cent of the annual increase/decrease in per capita income.

25. Data on rates of growth in the population of various functional groups in the rural sector are not available. However, as the cultivator class accounts for 53 per cent of the total rural population, it is assumed that the rate of growth in rural population would be valid for cultivating population also. Between 1961 and 1971 the rural population has increased at the annual compound rate of 2.0 per cent. We have applied this rate to the foodgrains consumption level in 1959-60 to derive estimates for the other years. As for the increase in income, the CSO estimates on national per capita income are assumed to hold good for the cultivators in view of lack of any other data in this regard. Rate of growth of urban cultivating population is assumed to be the same as that of rural cultivators.

Payments in Kind

26. Now, we may turn to the other two components mentioned at the beginning of this note. First, we take the item 'Payments in Kind.' It may be mentioned that the bulk of such payments are in the form of wages to hired labour and rent to landlord. According to the All India Rural Credit Survey[11] (1951-52) about 15 per cent of the total produce was disposed of in kind for various payments. The nature of these disposals and their relative significance are shown in Table 6. These data show that rent and wages in kind are the most important items of payments in kind. In respect of rent, there were both disposals and receipts in kind. This shows inter-group payments in kind. The net payment in kind on account of rent was only Rs. 70 crores or 3.8 per cent of the total gross produce. Since 1951, this proportion might have declined on account of land reforms

11. Reserve Bank of India : All India Rural Credit Survey: The General Report, Vol. II, 1954, p. 15.

legislation. Such payments might have almost dried up in the case of land owners having jobs in urban areas and who could not resume land for personal cultivation. It is difficult to make precise estimates of impact of this factor on the magnitude of payment of rent in kind. It is assumed in this study that the proportion of rent paid in kind to the total gross produce has declined to about 2.5 per cent. As regards payment of wages to agricultural labour, we have two sources of data, namely, the Rural Credit Survey[12] data for 1951-52 and the Second Labour Enquiry Committee's data[13] for 1950-51 and 1956-57. Wage bill estimated on the basis of the Rural Credit Survey data amounts to Rs. 469 crores in cash and Rs. 41 crores in kind, a total of Rs. 510 crores in 1951-52. This is very close to the estimate of the Second Agricultural Labour Enquiry Committee at Rs. 500 crores in 1950-51 and Rs. 520 crores in 1956-57. Therefore, Rural Credit Survey data on wages paid in kind appear to be reliable.

TABLE 6 : DISPOSAL IN KIND (1951-52)

(In Crores of Rupees)

Item	Disposals in kind	Receipts in kind	Net disposals in kind	As % of item 6
1. Payment to artisans	42	—	42	2·3
2. Rent for leased land ..	117	47	70	3·8
3. Wages in kind	59	18	41	2·2
4. Other payments	14	—	14	0·8
5. Miscellaneous	22	—	22	1·1
Total	**254**	**65**	**189**	**10·2**
6. Total value of Gross Produce	1853			

Note: Aggregates on these items have been worked out from the average amount per family, given in the All-India Rural Credit Survey, Vol. I, Part I (Rural families), pp. 854-55.

27. In regard to 'other payments' in kind, we assume that the earlier proportions will hold good even today.

28. Thus, it may be assumed on the basis of Rural Credit Survey data that on an average about 9 per cent of the produce is

12. Reserve Bank of India : All India Rural Credit Survey : The Survey Report, Vol. I, Part I, pp. 854-55.
13. op. cit. p. 126

disposed of in kind by the cultivators. This is confirmed by the Rural Credit Follow-up Surveys (1957-58 to 1959-60) which show that such disposals amounted to 10.8 per cent of the gross produce. However, since receipts in kind are not considered by the Follow-up Rural Credit Survey data, the R.C.S. estimates appear quite reasonable.

Retentions for Seed, Feed, etc.

29. The above discussion takes us to the last items, namely, quantity retained for seed, feed, wastage, etc. A conventional allowance made for this purpose is 12.5 per cent of gross production. In this connection, it may be noted that seed inputs in agriculture account for about 6 to 7 per cent of gross produce. In view of this, we adopt the norm of 12.5 per cent for this item.

30. We may now bring together estimates of different items which determine marketable surplus. First, we deduct from the gross foodgrains production, retention on account of seed, feed, wastage, etc. at the rate of 12.5 per cent of gross production, which gives us production available for consumption. From this we deduct (1) 9 per cent of gross production for net disposals in kind and (2) the estimated consumption of cultivators and their dependents, to arrive at the marketable surplus of foodgrains. Trends in the marketable surplus of foodgrains are shown in Table 7.

31. Since monetisation involves the estimation of value of barter transactions, we have now to estimate the value of marketable surplus of foodgrains.

Estimates of Value of Foodgrains and of Marketable Surplus

32. In order to estimate the *value* of marketable surplus of foodgrains, we have to estimate the value of foodgrains output for the period under study and then apply to it the proportions of marketable surplus derived by us (Table 7). The value of foodgrains output is a function of price and quantity ; therefore, by applying annual percentage variations in prices and production to the base year value of output, we can derive values of output for other years. In regard to the base year value of output there are two sources : (1) the C.S.O. publication[14] which gives data on value of each of the major foodgrains for the year 1960-61. (2) The other source is

14. Central Statistical Organisation : 'Brochure on Revised Series of National Product for 1960-61 to 1964-65', August 1967.

TABLE 7 : PRODUCTION, CONSUMPTION AND MARKETABLE SURPLUS OF FOODGRAINS

(Quantity in million tonnes & value in Rs. crores)

Year	Production		Value of Gross production	Retentions/Disposals in kind			Value	Value of net production	Marketable Surplus**	
	Gross	Net*		Family consumption	Payment in kind (9% of Col. 1)	Total			Quantity Col. 2 minus Col. 6	Value
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1961-62	82·7	72·4	3771	34·3	7·4	41·7	1901	3301	30·7 (37·1)	1400 (37·1)
1962-63	80·2	70·2	3792	34·9	7·2	42·1	1990	3319	28·1 (35·0)	1329 (35·0)
1963-64	80·6	70·5	4233	36·3	7·3	43·6	2290	3703	26·9 (33·4)	1413 (33·4)
1964-65	89·4	78·2	5820	38·1	8·0	46·1	3001	5091	32·1 (35·9)	2090 (35·9)
1965-66	72·3	63·3	5012	37·1	6·5	43·6	3022	4388	19·7 (27·2)	1366 (27·2)
1966-67	74·2	64·9	5996	37·7	6·7	44·4	3888	5245	20·5 (27·6)	1657 (27·6)
1967-68	95·1	83·2	9310	40·0	8·6	48·6	4758	8145	34·6 (36·4)	3387 (36·4)

TABLE 7—(*Contd.*)

(Quantity in million tonnes & value in Rs. crores)

Year	Production		Value of Gross production	Retentions/Disposals in kind			Value	Value of net production	Marketable Surplus**	
	Gross	Net*		Family consumption	Payment in kind (9% of Col. 1)	Total			Quantity Col. 2 minus Col. 6	Value
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1968-69	94·0	82·2	8495	40·9	8·5	49·4	4464	7428	32·8 (34·9)	2964 (34·9)
1969-70	99·5	87·1	9302	42·2	9·0	51·2	4787	8143	35·9 (36·1)	3356 (36·1)
1970-71	108·4	94·9	9891	43·5	9·8	53·3	4864	8660	41·6 (38·4)	3796 (38·4)
1971-72	105·2	92·0	9988	44·2	9·5	53·7	5098	8734	38·3 (36·4)	3636 (36·4)
1972-73	97·0	84·9	10481	44·1@	8·7	52·8	5702	9171	32·1 (33·1)	3469 (33·1)
1973-74	104·7	91·6	13651	45·7@	9·4	55·1	7180	11945	36·5 (34·9)	4764 (34·9)
1974-75	101·1	88·4	18173	46·1@	9·1	55·2	9922	15901	33·2 (32·9)	5979 (32·9)

@ Worked out on the basis of growth rate in per capita net national product at constant prices at —3·6%, + 2·9% and —1·7% during 1972-73, 1973-74 and 1974-75, respectively.

* Net production is derived by making a conventional allowance of 12·5% of gross production for seed, feed and wastage.

** Figures in brackets are percentages to gross production and its value.

'Material and Financial Balances' of the Perspective Planning Division (PPD) of the Planning Commission.[15] The P. P. D's estimates for 1960-61 are derived on the basis of unit prices of rice, wheat, coarse grains and pulses per tonne and production in the respective year. The C.S.O.'s estimate, on the other hand, relate to more crops *viz.*, rice, wheat, bajra, barley, maize, ragi and pulses. Since acreage and production data for each of the CSO group of commodities are not available for the recent years, we have the estimates on such basis only upto 1969-70. The estimates on the basis of PPD grouping *i.e.*, rice, wheat, coarse grains and pulses, are derived for the whole period under study *i.e.*, 1961-62 to 1974-75. The estimates on these two basis enable us to check the accuracy of the estimates of value of foodgrains production on one basis rather than on the other. The methodology used for these estimates is as follows :

33. First, the percentage variations in production in each year over the base year 1960-61 were derived for each major crop (CSO grouping) on the basis of official indices of production (1949-50=100). The crops for which both the price and production indices are available are : rice, wheat, jowar, bajra, maize, barley and ragi. Price indices are not available for 'other cereals'; hence we have used the price indices of ragi for these crops. In regard to pulses, although both the indices are available for gram, in the absence of these data for 'other pulses,' we have derived the estimates for 'pulses' as a group. Thus, the first step in our methodology was to derive the value of output of crops mentioned above in each year by applying the percentage variations in production to the C.S.O.'s values of output in 1960-61. This gives us the value of output of major crops in each year as revealed by only production changes.

34. Second step in our methodology was to derive values of output on account of changes in prices. The percentage increase/decrease in wholesale prices in a year over the base year 1960-61 was derived. For this, we used the revised series of wholesale price indices (1961-62=100) for the period 1961-62 to 1974-75. Price variations in 1961-62 over 1960-61 were derived on the basis of old series (1952-53=100). Thus, the value of output in 1961-62 was derived by applying the percentage variations in prices of major crops in 1961-62 over 1960-61 by using the old series of wholesale prices with 1952-53 as the base year. The

15. The Planning Commission : Draft Fourth Plan, Material and Financial Balances, 1964–65, 1970–71 and 1975–76, September 1966.

TABLE 8 : VALUE OF OUTPUT OF FOODGRAINS (ESTIMATED)

(Rs. Crores)

Year	Rice	Jowar	Bajra	Barley	Maize	Ragi	Wheat	Pulses	Other Cereals (Small millets)	Total Food-grains (1 to 9)	Total* Food-grains	Difference as% of national income
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1961–62	1953	256	152	90	142	81	495	430	55	3654	3771	0·83
1962–63	1915	359	155	54	140	75	435	487	44	3664	3792	0·86
1963–64	2389	304	156	63	149	78	426	473	51	4089	4233	0·84
1964–65	2728	511	247	132	226	114	692	859	73	5582	5820	1·18
1965–66	2280	405	242	134	270	101	636	675	79	4822	5012	0·92
1966–67	2799	504	309	156	333	106	830	678	65	5780	5996	0·91
1967–68	4112	634	294	278	541	128	1449	1431	86	8953	9310	1·25
1968–69	4239	580	281	182	346	119	1462	807	87	8103	8495	1·38
1969–70	4310	597	422	164	370	155	1769	1003	84	8874	9302	1·38

* Based on Table 9.

Note : Based on C.S.O. estimates for 1960–61.

estimated value of output of individual crops and the value of foodgrains for the period 1961-62 to 1969-70 are shown in Table 8.

35. Since the price and production indices could not be obtained for each one of these crops for the recent years, as stated above, another series of estimates of value of foodgrains was worked out on the basis of PPD grouping, *i.e.*, rice, wheat, coarse grains and pulses for the period 1961-62 to 1974-75 (Table 9). The unit value of these crops for the base year 1960-61 was obtained from the 'Material and Financial Balances' of the P.P.D. The estimates of the value of foodgrains derived on these two basis are shown in column 10 and 11 respectively in Table 8. Comparison of these two estimates would show that the difference between them is as small as about 1 per cent. Since the contribution of the value of foodgrains to the national income at current prices is only about 27-28 per cent, the difference to the extent of monetisation made by PPD basis of estimation, instead of CSO basis is almost negligible.

TABLE 9 : VALUE OF OUTPUT OF FOODGRAINS
(Estimates)

(In Crores of Rs.)

Years	Rice	Wheat	Coarse Grains	Pulses	Total Foodgrains
1961–62	1977	517	810	467	3771
1962–63	1939	454	864	535	3792
1963–64	2430	446	838	519	4233
1964–65	2773	723	1375	949	5820
1965–66	2318	664	1275	755	5012
1966–67	2844	867	1540	745	5996
1967–68	4180	1514	2041	1575	9310
1968–69	4328	1631	1614	922	8495
1969–70	4403	1848	1940	1111	9302
1970–71	4711	2129	1924	1127	9891
1971–72	4839	2359	1596	1194	9988
1972–73	5047	2373	1738	1323	10481
1973–74	6783	2620	2586	1662	13631
1974–75	8214	4695	3152	2112	18173

Note : Derived from the base year estimates of Planning Commission (PPD) "Material and Financial Balances", September 1966.

36. It was indicated earlier that besides foodgrains there are other commodities which comprise the non-monetised sector. These are edible oilseeds, gur, fruits and vegetables, poultry and animal products. In the absence of any data it is assumed that home retention is about 20 per cent of production in respect of fruits and vegetables and milk and 10 per cent in respect of other products. Considered thus in 1960-61, the base year, the value of retentions for consumption to their total value works out to about 2.6 per cent as shown in Table 10. The same proportion is assumed for the subsequent years.

Estimate of Non-monetisation in Other Crops

TABLE 10 : NON-MONETISED OUTPUT OF NON-FOODGRAINS

(Amount in Rs. Crores)

Item	Value of output in 1960-61	Approximate retentions of producers	Value of retentions	As % of national income
1. Edible Oilseeds*	519	10%	51·9	0·39
2. Gur	260	10%	26·0	0·20
3. Fruits and Vegetables ..	508	20%	101·6	0·76
4. Spices	208	10%	20·8	0·16
5. Milk	607	20%	121·4	0·91
6. Meat and meat products ..	120	10%	12·0	0·09
7. Eggs and poultry meat ..	67	10%	6·7	0·05
Total	**2289**		**340·4**	**2·6**

*Groundnut, rapeseeds and mustard seeds and coconut.

Source : C.S.O. : Brochure on Revised Series of National Product for 1960-61 to 1964-65, August 1967.

IV. Trends in Monetisation

37. After estimating the value of marketable surplus of foodgrains and of other products of agriculture and agro-based sector, all that remains to be done now is to link it with the national income. The resultant is the index of monetisation. It is shown in Table 11. It can be broadly said that at present the national income monetised is about 83-84 per cent. Barring some minor changes in particular years, the extent of monetisation has remained more or less constant between 83-84 per cent during the last 12 years. In this context, the assumption of the Working Group of the Reserve Bank Economists may be referred to. In their study 'Analysis of Money Supply in India,' the Group observed, "Although there is no invariant relationship between changes in money supply and national income, in India the ratio

of money supply to national income may show a rising trend over the years in so far as it reflects the absorption of the barter and subsistence sectors into the monetary exchange sector of the economy, a process termed as monetisation. This is an additional factor in increasing the demand for money over and above the main factors directly related to the growth of national income. The rate of monetisation in the Indian economy may be assumed to be one per cent per annum on the basis of the results of successive rounds of the National Sample Survey and other relevant data."[16] If this assumption of the Working Group were to hold good, then the monetisation at 83-84 per cent in 1961-62 should have gone upto 95-96 per cent by now. That this has not happened is brought out by our study. On the contrary, there appears to be no particular long term rate of growth in monetisation ; monetisation has been constant at about the same 83-84 per cent during the last 12 years.

TABLE 11 : TRENDS IN THE MONETISATION IN THE INDIAN ECONOMY

(In crores of rupees at current prices)

Year	National income at current prices@	Value of retentions/ disposals in kind	Value of retentions/ disposals as % of national income	Value of output of other products retained by cultivators as % of national income	Non-monetised output as % of national income	Percentage of national income monetised
1961-62	13991	1901	13·6	2·6	16·2	83·8
1962-63	14796	1990	13·4	2·6	16·0	84·0
1963-64	16975	2290	13·5	2·6	16·1	83·9
1964-65	20000	3001	15·0	2·6	17·6	82·4
1965-66	20636	3022	14·6	2·6	17·2	82·8
1966-67	23810	3538	14·9	2·6	17·5	82·5
1967-68	28166	4758	16·9	2·6	19·5	80·5
1968-69	28859	4464	15·5	2·6	18·1	81·9
1969-70	31968	4787	15·0	2·6	17·6	82·4
1970-71	34476	4864	14·1	2·6	16·5	83·3
1971-72	36535	5098	14·0	2·6	16·6	83·4
1972-73	39573	5702	14·4	2·6	17·0	83·0
1973-74	49148	7180	14·6	2·6	17·2	82·8
1974-75	60120	9922	16·5	2·6	19·1	80·9

@National Accounts Statistics, 1960–61—1972–73, and quick estimates of National Income 1974–75, Central Statistical Organisation, Ministry of Planning, Government of India.

16. Working Group comprising S.L.N. Simha, V.V. Bhatt, A.G. Chandavarkar and D.R. Khatkhate : Analysis of Money Supply in India, Reserve Bank of India Bulletin, July 1961, p. 1946 para 5.

38. This long-term trend of stability in monetisation at 83-84 per cent or, to look from the other side, the persistence of the size of non-monetised sector at 16-17 per cent of national income, may appear rather puzzling in the context of positive growth rates recorded in the last decade in the agricultural sector. In a growing economy one would expect monetisation to grow. However, this has not happened in India during the last decade, primarily because of the effect of, what we call, a 'subsistence drag' on monetisation. This drag refers to the inherent tendency in the non-monetised sector to increase at a certain rate irrespective of changes in the agricultural output. The growth in the subsistence sector is occasioned by two major factors, namely, increase in the number of mouths to be fed by the cultivator and the desire to raise the per capita consumption levels of the family. It was indicated earlier that these two factors raise the absolute level of consumption demand for and hence the level or 'retentions' of foodgrains by the farmers at the annual compound rate of about 3 per cent. Since the marketable surplus is what is left for sale after the consumption demand (including other disposals in kind) is fully met, the growing subsistence demand reduces the marketable surplus whenever production stagnates or declines.[17] This phenomenon of 'subsistence drag' explains the decline in monetisation during the drought years 1965-66 and 1966-67 and as a lag-effect in 1967-68. The relative constancy in monetisation in other years is explained by the fact that the growth rate of about 3 per cent in foodgrains production during this period was just enough to neutralise the effect of 'subsistence drag' on monetisation. It was indicated in the preceding section that the share of the value of foodgrains in the national income is about 27-28 per cent and of the value of non-monetised output is about 16-17 per cent. As the non-monetised sector is growing at the rate of 3 per cent per annum, the value of 'subsistence drag' on monetisation is 0.5 percentage point per annum. In other words, if the foodgrains production stagnates in any given year, the monetisation would decline by 0.5 percentage point. If the production increases by 3 per cent, the 'subsistence drag' will be neutralised, and if the production increases by 6 per cent, monetisation will increase by 1 percentage point.

17. As the decline in agricultural production brings about a more than proportionate incease in agricultural prices, the decline in production does not compel the farmers to reduce their foodgrains consumption at macro level. This process leads to a decline in marketable surplus more than proportionately.

39. In the light of this arithmetic of monetisation, it would be pertinent to conclude this study with a guess about the likely future trends in monetisation, say during the next 10-15 years.

V. Concluding Remarks

40. The main conclusion of this study is that at present about 83-84 per cent of the national income is monetised. This proportion is almost constant during the last one decade. Occasional decline of one to two percentage points in monetisation was the result of 'subsistence drag' on a declining output in the drought years of 1965-66 and 1966-67.

41. In regard to the long term trend of relative constancy in monetisation in India, it may be noted that basically speaking, monetisation of the economy is not a very dynamic phenomenon in the sense that a couple of decades of industrialisation and development would wipe out, or reduce rapidly to insignificance, the non-monetised sector in the national economy. As stated at the outset of this study, the non-monetised sector reflects economic backwardness or underdevelopment of the economy, backwardness reflected in the occupational structure mainly linked to land and to satisfying basic needs. It is beyond the pale of 'monetisation' and much beyond the higher form *viz.*, 'commercialisation'—wherein profit motive plays a central role—not because there is lack of will to produce more for the market but because there are fundamental constraints in doing so ; population pressure on land and lack of enough opportunities in non-farm occupations or to put it generally, lack of adequate rate of industrial development, prevents the majority of farmers to look upon land as anything more than the only source to subsist on. And if the rate of expansion of non-farm employment opportunities happens to be equal to or less than the rate of population growth, as is true of India at present, the non-monetised sector would persist.

42. Besides, the long-term rate of growth in agriculture, especially the foodgrains sub-sector, has been just about 3 per cent per annum (compound) during the last decade or so. This rate is only marginally higher than 2.0 per cent annual increase (compound) in the rural population. And because of subsistence levels of living of majority of the farmers, this marginal surplus in growth goes to increase their own per capita consumption rather than the marketable surplus. This fact explains the

phenomenon of marketable surplus not crossing the upper limit of say 40 per cent of production during the period under study (Table 7). The need for more foodgrains for feeding the family imposes a limit on 'sale' whenever production increases. It appears that so long as the annual growth in foodgrains production does not exceed the current rate of about 3 per cent, there will be little prospect of the proportion of marketable surplus to cross the limit of 40 per cent, the limit put by the consumption requirements of the peasants due to increase in population and the increase in their per capita income. The intensity of the latter factor has been greatly increased by the unreasonably favourable price parity which they have been getting for the last few years.

43. The upper limit of 40 per cent on the marketable surplus indicated above, in turn, sets limits on monetisation. Assuming for the next 10-15 years the continuation of the past observed annual rate of growth of 5-6 per cent (compound) in secondary and tertiary sectors, and of about 3 per cent in the agricultural sector, the extent of monetisation would continue to remain around 83-84 per cent because not less than 60 per cent of foodgrains production—which would constitute 16-17 per cent of the national income—would continue to be non-monetised. It is unlikely that the growth in secondary and tertiary sectors will be so spectacular as to push the primary sector (agriculture) to the back-most seat in the national economy during the next 10-15 years.

44. Nor are found feasible the growth rates in the agricultural sector which will help achieve 1 percentage point increase in monetisation. The targeted growth rates of 5 to 5.5 per cent in agricultural production under the plans could have enabled monetisation to increase by this magnitude. But the actual achievement was only about half of the targeted rate. It is unlikely that these rates will double during the next 10-15 years.

FERTILISER CONSUMPTION IN INDIAN AGRICULTURE

A. SESHAN*

1. INTRODUCTION

In this article trends in the consumption of chemical fertilisers are analysed. The factors which have accounted for the deceleration in the growth rate of fertiliser use in recent years are identified and prospects examined. Some suggestions are also made for giving a further boost to its use in Indian agriculture.

Since fertiliser use was negligible in the pre-Second Plan period and relative data are scanty, the analysis begins with the position pertaining to 1955-56, the terminal year of the First Plan period. The steep hike in fertiliser prices effected in June 1974 marked a definite turning point in its use—a break with past trends—and for the first time, the total consumption (in 1974-75) fell in absolute terms below the level recorded in the previous year. Thus it is appropriate to study the trends from 1955-56 to 1973-74 to begin with and examine the subsequent developments separately.

2. TRENDS IN FERTILISER USE (1955-56 TO 1973-74)

Fertiliser use is now widely accepted as one of the key elements in the strategy for accelerating the growth of agricultural output, especially in the short run. According to one estimate, the use of one tonne of plant nutrients would be equivalent to adding 10.7 acres of average crop land in terms of additional production.[1] An important reason for the low level of crop yields in the country is the widespread deficiency of soil nitrogen. Any effort at increasing agricultural production should take this factor into account. Both inorganic and organic fertilisers are equally essential for replenishing the lost nutrients of the soil. Thanks to various agricultural production programmes the con-

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1. *Agricultural Development : Problems and Perspectives*, Government of India.

sumption of nitrogenous, phosphatic and potassic fertilisers increased from 1,07 thousand tonnes, 13 thousand tonnes and 10 thousand tonnes, respectively, in 1955-56 (on the eve of the Second Plan period) to 18,29 thousand tonnes, 6,50 thousand tonnes and 3,60 thousand tonnes, respectively, in 1973-74 (on the eve of the Fifth Plan period). This amounts to an annual compound growth rate of 17 per cent, 24 per cent and 22 per cent in respect of consumption of N,P_2O_5 and K_2O, respectively, during the period under reference. The compound growth rate of consumption of nutrients of all the three types (taken together) is 19 per cent. Still the present level of application is very low compared with the position obtaining in other countries. On the average 15 kgs. of all the three types (N,P_2O_5 and K_2O) were applied per hectare of arable land in 1972-73 (the latest year for which comparable data are available) in India as compared with 328 kgs. in Japan, 319 kgs. in Belgium, 285 kgs. in Netherlands, 162 kgs. in France, 99 kgs. in U.K., and 84 kgs. in U.S.A., to give a few examples. Within the Indian Union the inter-State variations in this respect are very marked[1]. The consumption of fertilisers (N,P_2O_5 and K_2O) per hectare of cropped area in 1973-74 ranged from 2 kgs. in Assam to 47 kgs. in Punjab (91 kgs. in Pondicherry) giving an all-India average of 16 kgs.[1]. Uttar Pradesh, Punjab, Haryana, Andhra Pradesh and Tamil Nadu—States which are important from the point of view of marketable surplus of agricultural commodities and the High-Yielding Varieties Programme (HYVP) due to their having relatively better irrigation facilities than the other States—accounted for more than a half of nitrogenous fertilisers consumed in the country in 1973-74 (Table 1). Near about 60 per cent of consumption of fertilisers in a year takes place during the *rabi* season.

Considerable concern has been expressed recently about the deceleration in the growth rate of fertiliser consumption in the country. It may be recalled that in the Draft Fourth Plan a target of consumption of 3.7 million tonnes of N, 1.8 million tonnes of P_2O_5 and 1.1 million tonnes of K_2O was laid down. This target was subsequently revised downwards to 3.2 million tonnes of N, 1.4 million tonnes of P_2O_5 and 0.9 million tonne of K_2O in the final Fourth Plan taking into account the latest available data on fertiliser response and other factors.[2] According

1. *Fertiliser Statistics, 1974-75*, The Fertiliser Association of India.

2. *Fourth Five Year Plan 1969-74*, Planning Commission, Government of

TABLE 1 : CONSUMPTION OF FERTILISERS IN INDIA—1973-74
(February-January)

('000 tonnes)

Zone/State/Union Territory	N		P_2O_5		K_2O		Total	
	1		2		3		4	
CENTRAL	**466.3**	**(25.3)**	**145.2**	**(22.3)**	**64.1**	**(17.6)**	**675.6**	**(23.6)**
Madhya Pradesh	78.7	(4.3)	44.6	(6.9)	8.9	(2.4)	132.2	(4.6)
Rajasthan	56.5	(3.1)	13.5	(2.1)	4.1	(1.1)	74.1	(2.6)
Uttar Pradesh	328.6	(17.8)	86.6	(13.3)	50.1	(13.8)	465.3	(16.3)
Delhi	2.5	(0.1)	0.5	(0.1)	1.0	(0.3)	4.0	(0.1)
EAST	**177.5**	**(9.6)**	**47.9**	**(7.4)**	**47.9**	**(13.2)**	**273.3**	**(9.6)**
Assam	5.5	(0.3)	0.5	(0.1)	2.0	(0.6)	8.0	(0.3)
Bihar	70.1	(3.8)	15.9	(2.4)	10.8	(3.0)	96.8	(3.4)
Orissa	43.8	(2.4)	12.0	(1.8)	7.5	(2.1)	63.3	(2.2)
West Bengal	54.0	(2.9)	18.4	(2.8)	26.9	(7.4)	99.3	(3.5)
Manipur	1.5	(0.1)	0.3	(—)	0.1	(—)	1.9	(0.1)
Tripura	1.1	(0.1)	0.3	(—)	0.3	(0.1)	1.7	(0.1)
Nagaland	0.5	(—)	0.3	(—)	0.3	(—)	0.1	(—)
Meghalaya	1.5	(0.1)	0.5	(0.1)	0.3	(0.1)	2.3	(0.1)
NORTH	**351.8**	**(19.1)**	**94.2**	**(14.5)**	**29.9**	**(8.2)**	**475.9**	**(16.6)**
Haryana	94.0	(5.1)	16.5	(2.5)	4.4	(1.2)	114.9	(4.0)
Himachal Pradesh	4.1	(2.2)	1.6	(0.3)	1.3	(0.4)	7.0	(0.2)
Jammu & Kashmir	10.3	(0.6)	2.9	(0.5)	1.0	(0.3)	14.2	(0.5)
Punjab	242.0	(13.1)	73.0	(11.2)	23.0	(6.3)	338.0	(11.8)
Chandigarh	1.4	(0.1)	0.2	(—)	0.2	(0.1)	1.8	(0.1)
SOUTH	**520.3**	**(28.2)**	**225.5**	**(34.6)**	**162.3**	**(44.7)**	**908.1**	**(31.8)**
Andhra Pradesh	172.6	(9.4)	82.0	(12.6)	29.2	(8.0)	283.8	(9.9)
Karnataka	108.0	(5.9)	48.3	(7.4)	39.5	(10.9)	195.8	(6.8)
Kerala	34.7	(1.9)	22.7	(3.5)	24.5	(6.7)	81.9	(2.9)
Tamil Nadu	202.0	(11.0)	71.0	(10.9)	68.0	(18.7)	341.0	(11.9)
Pondicherry	3.0	(0.2)	1.5	(0.2)	1.1	(0.3)	5.6	(0.2)
WEST	**288.6**	**(15.6)**	**134.1**	**(20.6)**	**55.1**	**(15.2)**	**477.8**	**(16.7)**
Gujarat	138.5	(7.5)	60.2	(9.2)	13.1	(3.6)	211.8	(7.4)
Maharashtra	148.1	(8.0)	72.5	(11.1)	41.1	(11.3)	261.7	(9.2)
Goa	1.5	(0.1)	1.1	(0.2)	0.8	(0.2)	3.4	(0.1)
Dadra and Nagar Haveli	0.5	(—)	0.3	(—)	0.1	(—)	0.9	(—)
FOR PLANTATION CROPS ..	**40.0**	**(2.2)**	**4.0**	**(0.6)**	**4.0**	**(1.1)**	**48.0**	**(1.7)**
ALL-INDIA	**1844.5**	**(100.0)**	**650.9**	**(100.0)**	**363.3**	**(100.0)**	**2858.7**	**(100.0)**

Source: Proceedings of the Zonal Conference held by the Ministry of Agriculture, New Delhi, as quoted in *Fertiliser Statistics, 1973-74* The Fertiliser Association of India,
(Figures within brackets are percentages to totals for all-India.)

to the (final) Fourth Plan (document) while during 1966-67 and 1967-68 (the initial years of the HYVP) there was a sharp upward trend in fertiliser consumption there was some deceleration in 1968-69. This decline in growth rate continued in the subsequent years also as evident from the concern expressed by the Government as well as the fertiliser industry. The Fourth Plan Mid-term Appraisal remarked : "Fertiliser consumpton which is a major source of additional production has not increased as planned. The targets are not likely to be reached. The likely consumption of nitrogenous fertilisers in 1973-74 is now reckoned at 2.60 million tonnes (N) as against the original target of 3.20 million tonnes (N). Against the Plan target of 1.4 million tonnes (P_2O_5) for phosphatic fertilisers, actual achievements are likely to be around 0.8 million tonne (P_2O_5)"[1]. Even these expectations were not realised. The Draft Fifth Five Year Plan (1974-79) has also referred to the shortfall in the achievement of targets of fertiliser consumption.

The fall in growth rate of consumption of N,P_2O_5 and K_2O during the Fourth Plan period, as compared with the periods of Second Plan, Third Plan and "Plan Holiday", is evident from Table 2.

TABLE 2 : ANNUAL GROWTH RATE OF CONSUMPTION OF FERTILISERS IN INDIA (1955-56 TO 1973-74)

Nutrient	Consumption of fertilisers ('000 tonnes)					Compound growth rate (Per cent)			
	1955-56	1960-61	1965-66	1968-69	1973-74	1955-56 to 1960-61	1960-61 to 1965-66	1965-66 to 1968-69	1968-69 to 1973-74
1	2	3	4	5	6	7	8	9	10
N	1,07	2,12	5,47	11,31	18,29	15	21	27	10
P_2O_5	13	53	1,32	3,89	6,50	32	20	43	11
K_2O	10	29	78	1,54	3,60	24	22	25	19
Total	1,30	2,94	7,57	16,74	28,39	18	21	30	11

Source : Fertiliser Statistics, The Fertiliser Association of India, New Delhi for cols 1 to 6).

Though changes in base and terminal years will result in differnt sets of growth rates, time-series data for each year in the period of reference, plotted on a graph, show a clear tendency towards the levelling off of fertiliser consumption.[2]

1. *Fourth Plan Mid-term Appraisal.* Planning Commission, Government of India.
2. The graph is *not* reproduced here.

3. CAUSES OF DECELERATION IN GROWTH RATE

Fertiliser Levy

With a view to mobilising resources from the agricultural sector an excise duty of 10 per cent *ad valorem* on chemical fertilisers was introduced in the 1969-70 budget. This was subsequently enhanced to 15 per cent in the budget for 1972-73. Spokesmen for the fertiliser industry and trade opined then that the levy acted as a deterrent to the fast growth of fertiliser consumption. There is no doubt that when the existing relationship between cost of inputs and price of outputs (referred to as cost-price relationship hereafter) is disturbed it will have its effect on the level of application of inputs on the part of a farmer rationally allocating his resources with an eye on profit maximisation. Thus when the prices of inputs go up without a compensating increase in the price of output the farmer, given the declining marginal productivities of resources and the optimum criterion of marginal revenue being equal to marginal cost, may be expected to cut down his use of inputs and level of production to maximise his profits. The real question is whether the levy was really so large as to make a substantial dent in the profitable level of fertiliser application at the farm level.

Methodology and Limitations

The approach to the problem, which is an exercise in comparative statics, is based on the analysis of fertiliser response functions available from the studies undertaken by I.J. Singh and associates at the U.P. Agricultural University at Pantnagar. Given the prices of outputs and the costs of inputs (fertilisers) the economic optima for fertiliser use for different crops can be determined with the methods of differential calculus.[1] (Later while discussing the impact of the steep rise in prices of fertilisers effected in June 1974 a similar exercise is attempted based on the methodology and limitations dealt with here) It would then be possible to see whether there is any marked change in optimum dosages consequent to changes in cost-price relationship and the relative changes

1. The economic optimum is found out by differentiating the response equation, setting the first derivative equal to cost-price ratio and solving the equation. By using this value in the equation one can determine the additional production due to fertilisation. Then, with the help of data on cost and price, additional net income can also be found out. In this Study it is assumed that there are no budget constraints and that the farmer has enough resources (owned or borrowed) to use fertilisers to the optimum extent.

in output and (net) income at the farm level due to a lower dosage of application of nutrients. Though it is known that the average Indian farmer does not use fertilisers to the optimum or recommended levels due to various reasons, the methodological approach mentioned above should still be useful to assess the possible reactions of farmers to the changing situation. If there is a marked fall in economic optimum one should expect, correspondingly, a decline in the actual use at the farm level.[1]

The selection of crops has been dictated by the ready availability of response equations. The selected crops are high-yielding varieties of wheat and paddy and tall varieties of wheat. Since the high-yielding varieties have been bred with a genetic potential to respond to heavy doses of fertilisation (without lodging) it is also appropriate to study them for determining the impact of the increase in fertiliser price. Though crop-wise data on consumption of fertilisers are not available, there is evidence to show that the bulk of the nutrients used in the country is accounted for by paddy and wheat and a few non-foodgrain crops grown mainly under irrigated conditions.[2] The analysis is limited to nitrogen only as it is the most popular fertiliser in use. Response equations indicating the synergistic effects of balanced fertilisation with N,P_2O_5 and K_2O are not readily available and the impact of the price increases in P_2O_5 and K_2O are not assessed. The results should not be taken to be representative of any State or geographic region but only illustrative of possible outcomes at the level of the farm firm. The limited number of response equations used in the analysis should also be kept in view.

Results

In Table 3A the impact of the excise duty on fertilisers on economic optima in the level of their application in respect of different varieties of wheat and paddy is brought out. After the levy of 15 per cent excise duty, the decrease in optimal dose (per hectare) ranged from 1.14 kgs to 2.77 kgs in the case of the high-yielding and

1. The use of fertilisers depends also on the availability of complementary inputs like credit and irrigation. Thus a fall in fertiliser use may not be entirely due to any distortions in cost-price relationship. Some of these reasons are dealt with later.

2. See "Changing basis of demand for fertiliser" Gunvant M. Desai and John W. Mellor, *Economic and Political Weekly, Review of Agriculture*, September 27, 1969. In the context of the HYVP there is reason to believe that Desai and Mellor's observations still hold good. The HYVP has in fact acted as a demand shifter, shifting the demand curve for fertilisers to the right.

tall varieties mentioned in the Table with the exception of IR8 for which the decline was a little more at 4.39 kgs. per hectare. For Kalyan Sona, a variety widely sought after by the farmers in the Wheat Belt (Punjab, Haryana and Uttar Pradesh), the decrease in optimal dose was 2.32 kgs. per hectare. The decline in production due to the lower optimal level of fertiliser use ranged from 4 kgs. to 8 kgs. per hectare in the case of wheat and from 3 kgs. to 13 kgs. in the case of paddy. (Table 3B). The decline in income related to the lower level of production ranged from Rs. 25 to Rs. 67 per hectare for wheat and from Rs. 15 to Rs. 42 per hectare for paddy. (Table 3B). Considering the fact that farmers, by and large, apply fertilisers in quantities short of the optimal doses the impact of the levy on consumption of fertilisers, production and income should be considered to be even less than what is brought out in the Table. Thus the imposition of the excise duty should have had only a marginal effect, if any, on their use at the farm level, other things being equal. Incidentally, the excise duty on fertiliser is not the first levy on the input. Several State Governments have in the past imposed varying levels of sales tax which do not appear to have curbed fertiliser consumption.

Unfavourable Cost-Price Relationship

In this context one may examine the contention of some that the low (per hectare) consumption of fertilisers in India as compared with many other countries is due to the unfavourable cost-price relationship obtaining in this country. The available evidence is not conclusive to prove this point. Table 4 shows the relationship of prices of wheat and rice, on the one hand, and of fertilisers (N, P_5O and K_2O), on the other. The cost-price relationship is definitely favourable to farmers in Japan, a country with a high per hectare consumption of nutrients. Thus, as against 2.77 kgs. of wheat and 2.48 kgs. of rice required to buy 1 kg. of N in India, 1.49 kgs. of wheat and 0.67 kg. of rice only are required in Japan. The comparative position is similar in respect of P_2O_5 and K_2O. On the other hand, farmers in Egypt require 4.30 kgs. and 4.95 kgs. of wheat and rice, respectively to buy 1 kg of N. Still the per hectare consumption of N in Egypt (122.7 kgs. in 1972-73) is much higher than in India. In this connection it is worthwhile noting that the terms of trade as between fertiliser and wheat/rice continuously recorded improvements in favour of the Indian farmer from 1963-64 till about 1970-71 (Table 5). Thus as against 3.74 kgs. 3.15 kgs and 1.34 kgs. of wheat required to buy 1 kg. of N, P_2O_5 and K_2O, respectively, in 1963-64, the relative requirements were lower at

TABLE 3A : IMPACT OF EXCISE DUTY ON FERTILISERS ON ECONOMIC OPTIMA IN USE OF NITROGENOUS FERTILISERS (PER HECTARE)

Crop/Variety	Optimum dose of nitrogen (Kgs.)		Decrease in optimum dose (Col.2 – Col.3) (Kgs)	Price (Rs. per kg.)		Response equation
	Before levy of excise duty	At 15 per cent excise duty		Nitrogen (Before levy of excise duty)	Wheat/ Paddy	
1	2	3	4	5	6	7
Wheat						
1. Sonora-63 ..	98.60	97.05	1.55	2.65	0.76	$Y=2108.1 + 37.01\ X - 0.17\ X^2$
2. Sonora-64 ..	126.62	125.16	1.46	2.65	0.76	$Y=2068.2 + 49.07\ X - 0.18\ X^2$
3. Lermo Rojo ..	110.70	109.56	1.14	2.65	0.76	$Y=1923.42 + 54.41\ X - 0.23\ X^2$
4. Kalyan Sona ..	169.82	167.50	2.32	2.75	0.76	$Y=2365.26 + 43.1182\ X - 0.1163\ X^2$
5. Sonalika ..	132.74	130.99	1.75	2.75	0.76	$Y=2433.52 + 44.3708\ X - 0.1535\ X^2$
6. Sharbati Sonora	114.45	112.68	1.77	2.75	0.76	$Y=2509.43 + 38.5711\ X - 0.1527\ X^2$
7. Chhoti Lerma ..	141.68	139.64	2.04	2.75	0.76	$Y=1990.95 + 41.0785\ X - 0.1322\ X^2$
8. C-306	79.08	76.84	2.24	2.65	0.81	$Y=2369.2 + 20.67\ X - 0.11\ X^2$
9. NP-876	73.90	72.66	1.24	2.65	0.81	$Y=1610.25 + 32.83\ X - 0.20\ X^2$
10. NP-887	63.00	61.62	1.38	2.65	0.81	$Y=1670.60 + 25.95\ X - 0.18\ X^2$

TABLE 3A—(*Contd.*)

Crop/Variety	Optimum dose of Nitrogen (Kgs.)		Decrease in optimum dose (Col. 2-Col. 3) (Kgs.)	Price (Rs. per kg.)		Response equation
	Before levy of excise duty	At 15 per cent excise duty		Nitrogen (Before levy of excise duty)	Wheat/Paddy	
1	2	3	4	5	6	7
Paddy						
11. IR-8	151.44	147.05	4.39	1.84	0.68	$Y=5870.124+16.902\ X-0.04687\ X^2$
12. Tainan-3 ..	95.28	93.17	2.11	1.84	0.68	$Y=4321.83+21.305\ X-0.09760\ X^2$
13. China-4	57.55	54.78	2.77	1.84	0.68	$Y=4331.39+11.252\ X-0.07425\ X^2$

(*Note :* The crops mentioned in rows 1 through 7 and 11 through 13 are high-yielding dwarf varieties while the remaining are tall varieties. The response equations have been taken from the following sources).

Rows	*Col.*	*Sources*
1—3 & 8—10	7	"Production Functions and Economic Optima in Fertiliser Use for Some Dwarf and Tall Varieties of Wheat", I.J. Singh and K.C. Sharma, Research Bulletin No. 5, U.P. Agricultural University, College of Agriculture, Pantnagar (U.P.)
4—7	7	"Production Functions for the New Dwarf Wheats", I.J. Singh, K.C. Sharma and J.P. Mishra, in the *Indian Journal of Agricultural Economics*, January—March 1970
11—13	7	"Response of Some High Yielding Paddy Varieties to Nitrogen—An Economic Analysis", I.J. Singh, T.K. Chowdhury and Dinkar Rao in the *Indian Journal of Agricultural Economics*, October—December 1968.

Figures under col. 2 in the Table may be a little different from the corresponding figures in the sources cited above due to variations in the number of significant decimals used in the calculations. Input and output prices under cols.5 and 6 are the same as those in the studies mentioned above. In the case of crops at rows 4 through 7 phosphorus (superphosphate) and potash (muriate of potash) were held constant at 60 kgs. per hectare for each level of nitrogen application in the experiment. The costs of these fertilisers (Rs. 2.44 per kg. for superphosphate and Re. 0.79 per kg for muriate of potash) are not taken into account in the Table.

TABLE 3 B—IMPACT OF EXCISE DUTY ON FERTILISERS ON CROP PRODUCTION AND NET INCOME (PER HECTARE)

Variety	Additional yield at optimum level of nitrogen application (Kgs.)		Decrease in yield (Col. 2 – Col. 3) (Kgs.)	Additional net income due to application of optimal dose of fertiliser (Rs.)		Decrease in additional net income (Col. 5 – Col. 6) (Rs)
	Before levy of excise duty	At 15 per cent excise duty		Before levy of excise duty	At 15 per cent excise duty	
1	2	3	4	5	6	7
Wheat						
1. Sonora-63	1,996	1,991	5	1,256	1,217	39
2. Sonora-64	3,327	3,322	5	2,193	2,143	50
3. Lermo Rojo	3,205	3,200	5	2,142	2,098	44
4. Kalyan Sona	3,965	3,959	6	2,547	2,480	67
5. Sonalika	3,183	3,178	5	2,054	2,002	52
6. Sharbati Sonora	2,413	2,407	6	1,519	1,474	45
7. Chhoti Lerma	3,164	3,158	6	2,015	1,958	57
8. C - 306	947	939	8	557	526	31
9. NP - 876	1,334	1,330	4	884	855	29
10. NP - 887	920	916	4	579	554	25
Paddy						
11. IR - 8	1,485	1,472	13	731	689	42
12. Tainan - 3	1,140	1,137	3	603	576	27
13. China - 4	402	394	8	167	152	15

(Sources for the calculations in this table are the same as those cited for Table 3A)

TABLE 4 : RELATIVE POSITION OF PRICES OF WHEAT, RICE, AND FERTILISERS (N, P_2O_5 AND K_2O) IN DIFFERENT COUNTRIES IN 1972-73

Country	Price per Kg. in U.S. Cents				
	Wheat	Rice	N	P_2O_5	K_2O
1	2	3	4	5	6
Australia ..	8.3[d]	—	22.5	7.2	12.9
Belgium ..	11.6[a]	—	28.4	26.4	9.9
Canada ..	8.3[a]	—	29.1[f]	27.5[g]	11.9[g]
Egypt ..	6.9[a]	6.0[a]	29.7	22.1	10.1
France	9.3[ab]	—	30.0	27.5	11.2
Germany (West)	12.2[a]	—	32.8	31.7	11.1
Italy ..	11.9[a]	16.2[a]	29.7	19.3	12.1
Japan ..	20.6[ab]	45.9[abc]	30.8	36.3	15.2
Netherlands	12.0[a]	—	28.0	27.2	12.3
Pakistan ..	7.5[d]	25.5[eb]	18.1	11.7	6.7
U.K. ..	8.6[a]	—	18.5	—	—
U.S.A. ..	5.8[a]	14.8[a]	29.0	29.0[b]	11.3
India ..	12.8[d]	14.3[e]	35.5	37.5	12.1

Country	Kg. of wheat required to buy one kg. of			Kg. of rice required to buy one kg. of		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
1	7	8	9	10	11	12
Australia ..	2.71	0.87	1.55	—	—	—
Belgium ..	2.45	2.27	0.90	—	—	—
Canada	3.51	3.31	1.43	—	—	—
Egypt	4.30	3.29	1.46	4.95	3.68	1.68
France	3.23	2.96	1.20	—	—	—
Germany (West)	2.69	2.60	0.91	—	—	—
Italy	2.50	1.93	1.02	1.83	1.19	0.75
Japan	1.49	1.76	0.74	0.67	0.79	0.33
Netherlands ..	2.33	2.27	1.02	—	—	—
Pakistan ..	2.41	1.56	0.89	0.71	0.46	0.26
U.K.	2.15	—	—	—	—	—
U.S.A.	5.00	5.10	1.95	1.96	2.00	0.76
India	2.77	2.93	0.95	2.48	2.62	0.85

a—Produce prices, b—1971 prices, c—Husked rice, d—Wholesale prices e—Milled rice, f—1968-69 prices, g—1971-72 prices.

Note : N is supplied through ammonium sulphate, P_2O_5 through superphosphate and K_2O through muriate of potash.

Source : Fertiliser Statistics, 1974-75, The Fertiliser Association of India.

TABLE 5—RELATIVE POSITION OF PRICES OF WHEAT, RICE AND FERTILISERS (N, P_2O_5, K_2O) IN INDIA DURING 1963-73

Year	Kgs. of wheat required to buy 1 kg. of			Kgs. of rice required to buy 1 kg. of		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
1	2	3	4	5	6	7
1963-64	3.74	3.15	1.34	3.80	2.36	1.00
1964-65	3.01	2.53	1.07[a]	3.08	2.60	1.10[a]
1965-66[b]	2.94	2.72	0.84	2.96	2.74	0.85
1966-67[c]	3.25	2.33	0.88	2.57	1.84	0.70
1967-68	3.12	1.90	0.62	3.20	1.95	0.64
1968-69[d]	2.28	1.90	0.62	2.33	1.95	0.64
1969-70[e]	2.19	1.82	0.60	2.07	1.73	0.56
1970-71[f]	2.14	1.80	0.76	1.84	1.55	0.66
1971-72[g]	2.76	2.81	0.94	2.36	2.40	0.80
1972-73[g]	2.77	2.93	0.95	2.48	2.62	0.85

Note: N is supplied through Ammonium Sulphate, P_2O_5 through Superphosphate and K_2O through Muriate of Potash

a Price of P_2O_5 relates to 1963-64.

b Wheat and rice prices are wholesale prices.

c Prices of N, P_2O_5 and K_2O relate to 1965-66. Wholesale price of wheat and producer's price of rice are used.

d Prices relate to 1967. Wheat and paddy prices are wholesale prices.

e 1967 prices are used for N, P_2O_5 and K_2O.

f Wholesale prices are used for rice and wheat.

g Wholesale price of wheat is used. 'Rice' refers to milled rice.

Source : Fertiliser Statistics, The Fertiliser Association of India.

2.14 kgs., 1.80 kgs and 0.76 kg., respectively, in 1970-71. A similar improvement was noticed for rice also. However, a contrary trend was observed subsequently.

Lack of Supplies

A possible cause for the slow down in the growth of consumption of fertilisers could be that the supply and distribution arrangements are not satisfactory with the result that the fertilisers are not available in time and in quantities and at places where they are needed. This was, of course, true in the earlier stages of fertiliser promotion programmes when consumption targets were set up in a mechanical manner according to some formula without taking into account the variations in soil-crop complexes from place to place. Transport bottlenecks and unsatisfactory distribution arrangements led to the phenomenon of surpluses in some places and shortages elsewhere. However, these difficulties appear to have been overcome in the case of at least the HYVP. Both the Kharif 1968 Report and Rabi 1968-69 Report on the Evaluation Study of the High-Yielding Varieties Programme of the Programme Evaluation Organisation (PEO) clearly state that the supply of fertilisers was not a problem. The Kharif 1968 Report says : "The first two years after the introduction of the high-yielding varieties viz., 1966-67 and 1967-68, were years of relative scarcity of different types of chemical fertilisers. Our field enquiry last year had brought out that there were no serious shortages of the chemicals except for phosphatic and potassic types generally and the preferred types of N fertilisers in certain areas. In fact, the problem, as in Kharif 1967, was one of poor off-take of the stocks available in many areas."[1] The Rabi 1968-69 Report has also the same story to narrate. "Supplies of chemical fertilisers of all the three types were not only adequate but were in excess of requirements in all our selected areas except in the two districts of Orissa."[2] One may reasonably assume in the context of the concern of the fertiliser industry regarding the fall in the growth rate of consumption that poor off-take rather than poor supplies was the problem during the subsequent period also.

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1. *Report on Evaluation of the High-Yielding Varieties Programme, Kharif 1968*, Programme Evaluation Organisation, Planning Commission, Government of India.

2. *Evaluation Study of the High-Yielding Varieties Programme Report for Rabi, 1968-69—Wheat, Paddy and Jowar*, Programme, Evaluation Organisation, Planning Commission, Government of India.

Since the HYVP areas are the potential growth centres for high level consumption of fertilisers it is not inappropriate to conclude from the available evidence that lack of supplies was not an inhibiting factor in the consumption growth of fertilisers for a part of the Fourth Plan period. The Fourth Plan document noted that the main factors inhibiting increase in fertiliser use were essentially those on the demand side.[1]

Lack of Credit

Another possible explanation for the lack of growth of fertiliser consumption may be that though the stocks are available farmers do not have the wherewithal to buy the input or increase their purchases in the absence of credit facilities. There is no doubt that fertiliser is a costly input necessitating credit arrangements for its use. Field studies have shown that fertilisers and wage payments to labourers are the two most important items accounting for a large proportion of the current farm expenditure incurred in cash by farmers. However, the PEO's evaluation studies of the HYVP have revealed that barring a few instances, by and large, lack of credit has not been a hindering factor so far as fertiliser consumption is concerned. In fact the Rabi 1968-69 evaluation report categorically states that there was no dearth of co-operative credit though further expansion of co-operative credit was dogged by the usual problems of overdue loan repayments, defunct co-operatives and procedural delays.[2] Other field studies also support this view[3]. It is not out of place to mention here that the short-term credit extended to members by co-operatives increased from Rs. 305 crores in 1965-66 to Rs. 490 crores in 1969-70 and further to Rs. 683 crores in 1973-74. With the nationalisation of commercial banks and the adoption of multi-agency approach to agricultural credit there has also been a spurt in commercial bank advances to farmers. Considering the fact that the bulk of fertiliser consumption is accounted for

1. In the Draft Fifth Five Year Plan it is stated that one of the major reasons for the shortfall in the achievements of targets of chemical fertiliser consumption in the second half of the Fourth Plan period was a significant inadequacy of supplies resulting mainly from shortfall in indigenous fertiliser production and non-availability in the international market. In the earlier part of the Fourth Plan other factors operated to keep down consumption. These include inadequate fertiliser promotion measures, lack of adequate credit facilities in several areas and insufficiency of retail points at convenient distance from the various rural areas (*Draft Fifth Five Year Plan, 1974-79, Vol. II*, Planning Commission, Government of India).

2. *Evaluation Study of the High-Yielding Varieties Programme, Report for Rabi, 1968-69* op. cit.

3. *The Small Farmers (1967-69)—A Field Study*, Reserve Bank of India.

by well-to-do sections of the farming population, lack of credit does not appear to be an explanatory factor for the fall in the growth rate of consumption of fertilisers.

Estimates of Fertiliser Requirements

The question is : how can one explain the deceleration in the growth of consumption of fertilisers observed in the recent period ? To begin with, one may question the assumption that the consumption of fertilisers will grow at the same compound rate in the future as in the past. The pre-Plan levels of consumption of N, P_2O_5 and K_2O were so low as a base that subsequent increases in fertiliser consumption worked out to a high compound growth rate. Such high growth rates cannot be expected to be sustained throughout in the future for the simple reason that the bulk of fertiliser consumption, by and large, is accounted for by certain pockets in various parts of the country with favourable conditions for its use and even as it reaches a near saturation level at the existing level of technology and related factors like irrigation and cost-price relationship the scope for further growth is rather limited.

Estimates of fertiliser requirements in the past were made on the basis of the targeted acreage and the per acre recommended dosages of nutrients to be applied. This was especially true in the case of estimates of fertiliser requirements for the HYVP. In the earlier stages of the programme separate allotments of fertilisers were made for it, the basis again being the product of targeted acreage and recommended dosage per acre, without taking into account the variations in soil characteristics. This position appears to have changed subsequently. According to the PEO, "Kharif 1968 marked the beginning of a scientific rather than a mere administrative approach to the supply and use of this item."[1] Thus the distinction between HYV and non-HYV crops was given up and fertiliser dosages were estimated, hopefully, taking into account the varying needs of soils and varieties of crops. Yet the crucial fact remains that farmers are expected to use fertilisers on the targeted area to the full extent of the recommended doses. Herein lies the cause of inflated estimates of fertiliser consumption for the future. The existing evidence shows that farmers neither cover the entire area under HYV with fertilisers nor do they use the full recommended dosages. Thus

1. *Report on Evaluation of the High-Yielding Varieties Programme, Kharif 1968*, op. cit.

the PEO's report for Kharif 1967 says : "The nitrogenous fertilisers were applied for about 2/5ths of the high-yielding paddy plots and at about half the recommended dose."[1] Subsequent reports and the Draft Fifth Plan reveal a similar situation. What are the reasons for such a situation ?

From the evidence available from various field studies it may be inferred that farmers in the country as a whole are aware of benefits of fertilisers and what is required is greater knowledge of technical details like the need to apply not only N but P_2O_5 and K_2O also, the proportions in which they are to be applied, the need for soil conditioners and so on. However, from available data it is also evident that the percentage of farmers reporting knowledge of fertilisers declines from N to P_2O_5 and from P_2O_5 to K_2O. The levels of consumption (per hectare of cropped area) of these three types of fertilisers in this country (at 11.2 kgs. 4.0 kgs. and 2.2 kgs., respectively, in 1973-74) also decline in this order. The extent of awareness of fertiliser mixtures and complex fertilisers is even less satisfactory among farmers with some exceptions. This is the result of the over-emphasis on nitrogenous fertilisers in the earlier stages of the food production programmes. Even the fertiliser response trials in earlier days were confined to nitrogen. This situation is, of course, being corrected. Thus any future growth in fertiliser consumption will depend, *inter alia*, on the promotion of the concept of balanced fertilisation and the knowledge on the part of farmers of the synergistic effects of such fertilisation on crop production.

Hence a reason for the non-realisation of the targets could be the expectation that as the area under fertilisers increases the level of consumption will also increase *pari passu* to the full extent of recommended dosages. As already pointed out, all the existing evidence shows that farmers rarely apply the full recommended dosages. Fertiliser use is now restricted generally to areas with assured rainfall or irrigation facilities. Though data on fertiliser use, crop-wise and in irrigated and dry areas, are not available, from many recent studies one may conclude that farmers in rain-fed areas adopt fertilisers only to a limited extent. They know that in case the rains fail those who used fertilisers will lose much more than those who did not use them. There is the additional risk of pest attack in the case of some high-yielding

1. *Evaluation Study of the High-Yielding Varieties Programme, Report for Kharif 1967*, op. cit.

varieties. Then there is also the risk of a fall in the price of output which is perhaps not so serious now as before due to the price support operations of Government. One of the attractions of the high-yielding varieties is that even without fertilisation the yield is substantially higher as compared with *desi* varieties. The element of yield risk involved in agricultural production in most parts of the country is such that the average farmer tends to discount the potential benefits by some percentage, based on his past experience. But, what is more important, the crop responses to fertilisers are such that there is no great economic benefit involved in applying the full optimal dose commensurate with the risks involved. The extent of potential reduction in return over the cost of fertiliser because of the non-application of the optimal level depends, of course, on the nature and shape of the fertiliser response curve. As the level of application reaches near the optimum level the additional yields (and incomes) are so small that the farmer will be justified if he feels that risk factors are not adequately 'compensated' by the potential growth in yields.[1] By way of illustration the potential reductions in additional incomes due to the application of only 75 per cent of the optimal doses has been worked out and presented in Table 6.

The reduction in income per hectare which ranges from Rs.10 (China-4 paddy) to Rs. 155 (Kalyan Sona wheat) accounts for only a small percentage of the total additional income attributable to nitrogen application at optimal level. Thus, the farmer is very well justified in applying, say, only three-fourths of the recommended dosage. Minhas and Srinivasan in their analysis of the HYVP argued that agricultural scientists, in their fertiliser recommendations, were not distinguishing between profit maximising and output-maximising optimal levels.[2] Their conclusion that the recommendations for fertiliser consumption were on the high side for the high-yielding varieties obviously led to some revision (downwards) of fertiliser targets. However, for reasons

1. See *A Graphic Method of Interpreting Response to Fertilisers*, Agricultural Handbook No. 93, U.S. Department of Agriculture, January 1956. See also "Changing basis of demand for fertiliser", Gunvant M. Desai and John W. Mellor, *Economic and Political Weekly*, Review of Agriculture, September 27, 1969. They have shown, for the traditional varieties of crops, that the additional incomes attributable to the application of optimal doses of nitrogen are only marginally higher over the incomes realisable through nitrogen application at 50 per cent or 75 per cent of the optimal levels. This conclusion applies to the high-yielding varieties also.

2. "New Agricultural Strategy Analysed", B.S. Minhas and T.N. Srinivasan, *Yojana*, Annual Number 1966.

TABLE 6 : POTENTIAL REDUCTION IN INCOME (PER HECTARE) DUE TO APPLICATION OF NITROGEN AT 75 PER CENT OF OPTIMAL LEVEL

Crop/Variety	Additional net income due to nitrogen at optimal level of application (Rs.)	Additional net income due to nitrogen at 75 per cent of optimal level of application (Rs.)	Reduction in income (Col.2 – Col.3) (Rs.)	Col.4 as per centage of Col.2	Price of nitrogen per kg. (inclusive of 15% excise duty) (Rs.)	Price of wheat/ paddy per kg. (Rs.)
1	2	3	4	5	6	7
Wheat						
1. Sonora-63 ..	1,217	1,141	76	6.2	3.05	0.76
2. Sonora-64 ..	2,143	2,009	134	6.3	3.05	0.76
3. Lermo Rojo ..	2,098	1,967	131	6.2	3.05	0.76
4. Kalyan Sona ..	2,480	2,325	155	6.3	3.16	0.76
5. Sonalika ..	2,002	1,876	126	6.3	3.16	0.76
6. Sharbati Sonora	1,474	1,381	93	6.3	3.16	0.76
7. Chhoti Lerma ..	1,958	1,837	121	6.2	3.16	0.76
8. C-306	526	493	33	6.3	3.05	0.81
9. NP-876 ..	855	802	53	6.2	3.05	0.81
10. NP-887	554	519	35	6.3	3.05	0.81
Paddy						
1. IR-8	689	646	43	6.2	2.12	0.68
2. Tainan-3 ..	576	540	36	6.3	2.12	0.68
3. China-4	152	142	10	6.6	2.12	0.68

stated above, fertiliser targets need not necesarily proceed on the assumption of application of economically optimal levels of soil nutrients at the farm level.

The response of farmers to weather risk is also brought out by the practice observed in certain areas where they use less than the recommended level of nitrogen as basal dose when the weather situation remains unclear and then they apply more than the recommended dose as top dressing as if to make up for the earlier deficit. (There is some evidence available on this in PEO's Evaluation Reports).

Economic Optimum for Tenants

The analysis made so far relates to peasant proprietors using fertilisers to maximise incomes. While the principles behind profit maximisation are the same for tenant farmers also the procedure is a little different to arrive at their economic optima. If a tenant pays the entire cost of inputs and retains only a half share of the product then his optimum level of input is defined by a marginal product equal to twice that of an owner.[1] In other words while an owner cultivator will theoretically use fertilisers up to a point where, *ceteris paribus*, he receives a return of one rupee for every rupee spent, a tenant will stop applying fertilisers when he gets an income of Rs. 2 for every rupee spent because he has to pay Re. 1 (or the equivalent in kind) to the land-owner.

Table 7 indicates the optimal levels for tenant farmers who bear the full expenses of seasonal agricultural operations and pay half the gross output to the land owner as compared with owner cultivators. The difference in those optimal levels is also supported by results of many field studies which show that tenants adopt improved farm practices only to a limited extent. The rationale for tenancy reform lies in the fact that the existing economic tenancy systems are not conducive to the best utilisation of agricultural resources.

In spite of the lower optimal level of fertiliser use for tenants most of the existing studies on fertiliser consumption deal only with the case of owner cultivators. Farm planning and agricultural extension advice in IADP and other areas do not

1. *Agricultural Production Functions*, E.O. Heady and J.L. Dillon, Iowa State University Press.

TABLE 7 : OPTIMAL LEVELS OF FERTILISER APPLICATION PER HECTARE FOR TENANTS INCURRING FULL CURRENT FARM EXPENDITURE AND PAYING RENT OF 50% OF GROSS PRODUCE

Crop/Variety	Optimal level of nitrogen for owner cultivator (Kgs.)	Optimal level of nitrogen for tenant cultivator (Kgs.)	Col.2 – Col.3 (Kgs.)	Price (Rs. per Kg)	
				Nitrogen	Wheat/ Paddy
1	2	3	4	5	6
Wheat					
1. Sonora-63	97.05	85.25	11.80	3.05	0.76
2. Sonora-64	125.16	114.01	11.15	3.05	0.76
3. Lermo Rojo ..	109.56	100.83	8.73	3.05	0.76
4. Kalyan Sona ..	167.50	149.62	17.88	3.16	0.76
5. Sonalika	130.99	117.44	13.55	3.16	0.76
6. Sharbati Sonora ..	112.68	99.07	13.61	3.16	0.76
7. Chhoti Lerma ..	139.64	123.91	15.73	3.16	0.76
8. C-306	76.84	59.72	17.12	3.05	0.81
9. NP-876	72.66	63.25	9.41	3.05	0.81
10. NP-887	61.62	51.16	10.46	3.05	0.81
Paddy					
11. IR-8	147.05	113.79	33.26	2.12	0.68
12. Tainan-3	93.17	77.20	15.97	2.12	0.68
13. China-4	54.78	33.78	21.00	2.12	0.68

normally make any distinction between an owner cultivator and a tenant cultivator in propagating the package of practices. There is naturally a "credibility gap" surrounding extension advice in rural areas so far as tenants are concerned. A lack of distinction between owners and tenants in fertiliser use also leads to over-estimation of fertiliser requirements. There is need to educate the extension personnel on this matter with a view to making their activities more relevant to tenant farmers than at present.

Fertiliser Trials, Demonstrations and Extension

It is proper to make a few comments on fertiliser trials and demonstrations here. It is now recognised that the results of fertiliser trials conducted in experiment stations cannot be transferred to real farm situations due to the controlled conditions under which the trials take place and the availability of superior managerial ability which may not be achievable or available on the average farm. The Indian Council of Agricultural Research and its co-operating agencies have been following the sound practice of conducting many fertiliser trials on cultivators' fields, which, besides making the results relevant to the average farmer, also serve the purpose of demonstration. There is need for more and more of such trials on cultivators' fields which can go a long way in lifting up the levels of fertiliser consumption in the country. However, this writer, in his field studies, has come across farmers indicating their unwillingness to participate in laying demonstration plots due to the fear that they may lose heavily in case of crop failure. There is a case for Government to assure a certain minimum income to the participating farmers which should facilitate getting over this hurdle and ensuring their co-operation. This is, of course, nothing but a form of crop insurance.

It is often found from the results of fertiliser trials that the economic optima lie beyond the range of fertiliser doses actually applied in the trials. The pitfalls associated with extrapolations beyond the range of sample observations are well-known. It is worth noting here that what the farmer as a decision maker is interested is in only a segment of the production function, *i.e.*, that part which falls in the "rational zone of production." On any standard diagram demonstrating the law of diminishing returns (in relation to output and fertiliser input) this zone lies in the total product curve between the point where the average product is at a maximum and the point at which the total product is maximised.[1] These points constitute the lower and upper boundaries of the rational zone of production. Refinement is required to be made in this segment of the production function so that statistically reliable response curves can be obtained, if need be, by a larger number of replications of trials falling in this ra-

1. Standard text-books on agricultural production economics and farm management contain this diagram. See, for instance, *Farm Business Management : The Decision-Making Process*, Emery N. Castle, Manning H. Becker and Frederick J. Smith, Macmillan and Co., and *Economics of Agricultural Production and Resource Use*, Earl O. Heady, Prentice Hall Inc.

tional zone. By now enough material has been collected to approximately identify this rational zone in planning future experiments.

If the residual nitrogen is not lost through leaching it can be utilised by the following crop. Though research work on the residual effect of fertilisers has been conducted in this country it is not being effectively communicated to farmers through extension. The residual effect and the effect on quality of the crops are factors which can help the undecided farmer to switch over to fertilisation. In a few experiments on fertiliser response of corn conducted in the United States of America the residual nitrogen produced a yield large enough to pay for the major part of the cost of nitrogen applied.[1] There were indications that on fields of low fertility the increased crude protein ($6.25 \times N$) content of the corn more than paid for the cost of nitrogen applied. The improvement in the quality of corn stover was an additional gain. A correct economic evaluation of the use of fertilisers should take such factors into account on the benefit side. As pointed out earlier, a farmer may find the difference in income between an optimal level and a lower than optimal level of fertiliser small enough to opt for the latter. However, he may think of applying the higher rate of fertiliser dose if he has information on residual effects and the improvement, if any, in the quality of grain and fodder.

On the cost side, most of the studies on economic optima in fertiliser use, undertaken so far, consider only the cost of nitrogen and the cost of its application. A proper cost-benefit calculus should take into account a few more items. Fertiliser use requires additional labour for harvesting the increased output. There are additional intercultural operations involved to get the full advantage of fertilisation. (Weeds, if not cleared, can absorb much of the nutrients supplied to the soil). Prophylactic measures are also called for to get the full benefit of fertilisation. In irrigated areas the increased application of fertiliser necessitates an increase in irrigation requirements and associated costs. There is then the need to reckon the cost of credit obtained for the use of fertilisers. All these additional costs are to be properly accounted for before arriving at the economic optimum level. However, research workers are not in a position to do this due to lack

1. *A Method of Economic Analysis Applied to Nitrogen Fertiliser Rate Experiments on Irrigated Corn*, J.L. Paschal and B.L. French, U.S. Department of Agriculture.

of data on such costs (barring perhaps information on the cost of credit) associated with fertilisation. Research on fertiliser use should throw light on these costs. Further in making the recommendation on fertiliser dosage due notice should be taken of the farmer who has his own supplies of organic manure (cow dung, etc.). A farmer who applies organic manure may not feel it necessary to apply the entire recommended dosage of chemical fertilisers unless he is assured that it is already taken into account in the fertiliser recommendation. In fact, it is desirable if, instead of making one set of fertiliser recommendation (N, P and K), extension officials present the farmer with a few alternative sets of recommendations at varying levels of application of organic manure. This will give wider choice to the farmer with considerable manurial resources of his own, besides making the recommendation realistic.

A related problem in fertiliser extension work is the non-acceptance by farmers in some areas of new varieties. Farmers who have been used to particular fertiliser varieties and have found them to be satisfactory will naturally fight shy of switching over to new varieties. The PEO's Kharif 1967 evaluation report on HYVP says :

> "Another important reason reported from the field for the poor off-take of fertilisers was the supply of non-preferred varieties of N fertilisers. The cultivators still seem to prefer particular types such as Ammonium Sulphate (Thana in Maharashtra and Amritsar in Punjab) to the other types such as urea, CAN, etc., and hence the latter types could not be effectively distributed. Some of the newly issued varieties such as di-Ammonium Phosphate, Basic Slag, etc., are still to find acceptance in many areas. To tackle such a problem it is not so much the supply of a preferred variety that is relevant (which in any case will be difficult to fulfil for all areas) but the effective education of the cultivators regarding the efficacy of other types also to the same crop."

If the farmer is to switch over to a new variety it is not enough if he is told about its efficacy ; he should be convinced about its advantage over the usual varieties as regards nutrient content, price, etc.

4. IMPACT OF PRICE RISE IN JUNE 1974

One of the consequences of the "oil crisis" is the substantial increase in the prices of chemical fertilisers to the Indian farmer. Effective June 1, 1974, Government increased the maximum retail prices of three major nitrogenous fertilisers, viz., Urea, Ammonium Sulphate and Calcium Ammonium Nitrate.[1] Besides, the retail prices of different varieties of imported fertilisers were also marked up. According to press reports appearing subsequently, the hike in prices resulted in a decrease in off-take of the material. To quote one such report, "Customer resistance due to increased prices and tight money policy have led to drastic fall in demand recently in many of the States", "heavy stockpiles of fertilisers in the godowns of both the Government and co-operatives are reported from most of the States" and "a buyers' market has developed in the industry."[2] Earlier (in 1973) there had been an increase in fertiliser price, though of a moderate order. The price increase effected from June 1974 ranged from 56 per cent in the case of Ammonium Sulphate to 91 per cent in the case of Urea (Table 8).

It should, however, be pointed out that meanwhile prices of agricultural commodities, particularly of foodgrains, also had gone up substantially as reflected both in support/procurement prices and in market prices. As stated earlier, for a farmer engaged in decision making regarding the extent of input use what is relevant is not the absolute level of costs of inputs or prices of outputs but rather the cost-price relationship.

An exercise, similar to the one attempted in Section 3, is made here to assess the impact of the June 1974 escalation in prices. The costs of fertilisation and prices of crops used in the exercise are indicated in Table 9. Besides the retail price of fertiliser given in Tabe 8, the cost of nitrogen (Col.2) includes 5 per cent additional local taxes, 5 per cent expenditure on labour hired for applying fertilisers and 10 per cent interest on fertiliser loan.

1. Under the Fertiliser (Control) Order 1957 and the Essential Commodities Act 1955 any sale or offer to sell any fertiliser at a price or rate exceeding maximum price fixed by the Government constitutes an offence.

2. News item entitled "States stop indenting—Drastic fall in fertiliser use" in *Economic Times* of November 18, 1974. Strictly speaking, *ceteris paribus*, the lower off-take should be characterised as a movement to a lower point in the existing demand curve rather than a fall in demand (downward shifting of the curve). A similar news item appeared again in *Economic Times* of March 12, 1975.

TABLE 8 : PRICES OF SELECTED CHEMICAL FERTILISERS DURING 1974-76@

(Rupees per kg.)

Fertiliser	Effective from					
	1-1-1974	1-6-1974	1-1-1975	1-7-1975	1-12-1975	16-3-1976
1	2	3	4	5	6	7
Ammonium Sulphate (20.6% N)	2.91	4.54 (56.0)	4.54	4.54	4.54	4.54 (56.0)
Urea (46% N) ..	2.28	4.35 (90.8)	4.35	4.02	4.02	3.80 (66.7)
Calcium Ammonium Nitrate (26% N) ..	2.48	4.40 (77.4)	4.40	4.08	4.08	4.08 (65.4)
Superphosphate (16% P_2O_5) ..	3.48	5.67 (62.9)	6.25	5.99	5.29	3.95 (13.5)
Muriate of Potash .. (60% K_2O) ..	1.13	2.05 (81.4)	2.05	1.97	1.83	1.52 (34.5)

@The prices are inclusive of excise duty but exclusive of Central Sales Tax and local taxes.

(Figures in brackets are percentage increases over the prices of 1-1-1974)

(*Source ; Fertiliser Marketing News*, April 1976)

TABLE 9 : COST OF NITROGEN APPLICATION AND PRICES OF CROPS

(Rupees per kg.)

Year	Nitrogen @	Paddy	Wheat
1	2	3	4
1973-74	2.75	0.63	0.85
1974-75	5.20	0.74	1.05

@ Through Urea (46 % N)

The prices for 1973-74 (cols. 3 and 4) refer to the minimum support prices announced for the year. Since no support prices were announced for 1974-75 the procurement prices have been used for that year.

Though procurement prices are announced at the time of harvest and support prices are not announced always in time before sowing, one may question the assumption that such prices influence farmers' decision on levels of fertiliser use. However, one can find out the impact of changing cost-price relationship on the *theoretical optimum* as a guide to policy making and also examine the claim that due to increase in fertiliser prices farmers are worse off and further increases in support/procurement prices are justified.

The results of the exercises carried out for the study are given in Table 10. They present the pre and post-June 1, 1974 positions in respect of optimum doses of nitrogen, *additional* yield attributable to optimum level of nitrogen application and the corresponding *additional* net income. The results reveal a mixed picture. In the case of wheat the decrease in optimal level of nitrogen ranges from 3 per cent to 10 per cent. For paddy the relative ranges are from 16 per cent to 39 per cent. The fall in additional production (attributable to a lower dosage of fertiliser) is between 1 per cent and 3 per cent for wheat and 7 per cent and 28 per cent for paddy. As regards additional net income attributable to optimal use of fertilisers, the decrease due to the deterioration in cost-price relationship ranges from 17 per cent to 56 per cent for paddy. The result for wheat is different. In spite of the fall in optimal dosage of nitrogen and additional yield there is an *increase* in additional net income for all varieties ranging from a low of less than 1 per cent for C-306 and a high of 15 per cent for Lermo Rojo. This is due to the nature of the response equation and the substantial increase in price (from Rs. 85 to Rs. 105 per quintal) which the wheat farmer received which more than compensated for the increase in fertiliser price.[1]

1. While a few high-yielding varieties like Kalyan Sona and IR-8 used in the statistical analysis continue to be used by farmers, other varieties have since been phased out and replaced by newer varieties. It may be pointed out here that response equations for newer varieties (developed from All India Co-ordinated Agronomic Experiments Scheme) obtained from the Indian Council of Agricultural Research for official purposes were also used for similar statistical exercises. The results (not reproduced here) confirmed the trends observed here for paddy and wheat. The results for jowar, bajra and maize were similar to those of paddy.

TABLE 10 : IMPACT OF INCREASE IN PRICE OF NITROGENOUS FERTILISER (IN JUNE 1974) ON ECONOMIC OPTIMA IN FERTILISER USE, CROP PRODUCTION AND NET INCOME AT FARM LEVEL

Crop/Variety	Optimum dose of nitrogen (Kgs./hectare)		Decrease in optimum dose of nitrogen (kgs/hectare) (Col.2–Col.3)	Additional yield at optimum level of nitrogen application (Kgs./hectare)	
	Before June 1, 1974	From June 1, 1974		Before June 1, 1974	From June 1, 1974
1	2	3	4	5	6
Wheat					
Sonora-63	99	94	5(5.1)	1,999	1,978
Sonora-64	127	123	5(3.8)	3,330	3,310
Lerma Rojo	111	108	4(3.4)	3,207	3,191
Kalyan Sona	171	164	7(4.3)	3,974	3,943
Sonalika	134	128	6(4.2)	3,189	3,167
Sharbati Sonora	116	110	6(4.9)	2,419	2,396
Chhoti Lerma	143	137	6(4.5)	3,171	3,144
C-306	79	71	8(9.8)	947	915
NP-876	74	70	4(5.8)	1,334	1,317
NP-887	63	58	5(7.6)	921	901
Paddy					
IR-8	134	105	28(21.2)	1,422	1,260
Tainan-3	87	73	14(15.7)	1,114	1,036
China-4	46	28	18(38.7)	362	260

TABLE 10—(*Contd.*)

Crop/Variety	Decrease in yield (Kgs./hectare) (Col. 5 – Col. 6)	Additional net income due to application of optimum dose of nitrogen (Rs./hectare)		Increase (+) or decrease (—) in net income (Rs./hectare) (Col. 9- Col.8)
		Before June 1, 1974	From June 1, 1974	
1	7	8	9	10
Wheat				
Sonora-63	21(1.0)	1,426	1,587	+161(11.3)
Sonora-64	20(0.6)	2,480	2,838	+358(14.4)
Lermo Rojo	15(0.5)	2,420	2,792	+372(15.4)
Kalyan Sona	30(0.8)	2,906	3,287	+381(13.1)
Sonalika	23(0.7)	2,343	2,657	+315(13.4)
Sharbati Sonora	23(1.0)	1,738	1,943	+205(11.8)
Chhoti Lerma	27(0.8)	2,302	2,591	+289(12.6)
C-306	32(3.4)	587	590	+ 2(0.4)
NP-876	18(1.3)	931	1,020	+ 89(9.6)
NP-887	20(2.1)	609	643	+ 34(5.6)
Paddy				
IR-8	162(11.4)	528	385	—143(27.1)
Tainan-3	78(7.0)	463	386	— 77(16.6)
China-4	102(28.2)	101	44	— 56(55.8)

(Figures within brackets under columns 4, 7, and 10 are percentages to columns 2, 5 and 8, respectively.)

Note ; Due to rounding of final figures a slight discrepancy may be noted between col. 4 on the one hand, and the difference of cols. 2 and 3 and so on. The percentages are derived from figures prior to rounding.

The micro-level exercise attempted above does reveal a fall in optimal dosages of nitrogen though with considerable variations for different varieties of crops. That the hike in prices affected fertiliser consumption is also corroborated by macro-level data. The consumption of N, P_2O_5 and K_2O at 17,74 thousand tonnes, 4,78 thousand tonnes and 3,39 thousand tonnes, respectively, during 1974-75 was lower than that recorded for 1973-74 ; the consumption of N and P_2O_5 in 1974-75 was, in fact lower than that of even 1972-73.[1] Thus the price escalation of June 1974, coming on top of the already decelerating trend in growth rate noted earlier, proved a setback to consumption of nutrients with its unfavourable implications for fertiliser industry and trade. Subsequently some reductions in prices were granted as indicated in Table 8 but it should be stated that still the current prices are considerably higher than what they were before June 1974 for N, and there has been no marked changes in agricultural output prices. In fact in the wake of a bumper harvest in 1975-76 market prices of crops fell considerably in many places and price support and procurement operations have had to be mounted on a massive scale.

Policy Implications

Though the exercises attempted in this section are illustrative and cannot be the basis of any aggregate statistical estimates of the impact of recent fertiliser price increases on fertiliser use, agricultural production and net incomes there are obvious policy implications. The fall in optimal dosages will mean further deceleration in the growth rate of consumption of nutrients with adverse implications for the targeted levels of fertiliser production. If, as already observed, fertiliser use is now confined to irrigated areas one may even visualise the possibility of a saturation point having been reached in fertiliser consumption (a point which will be touched upon again later) if the findings of this study are true for a larger number of varieties of food crops and non-food crops. While this may not happen if favourable weather, extension of area under irrigation and fertiliser use by farmers who have not used them hitherto more than offset the unfavourable factors, the decline in net incomes of fertiliser-using small farmers growing crops like paddy due to increased costs of fertilisation has to be borne in mind.[2] It is known that small farmers in large parts of the

1. *Fertiliser Statistics 1974-75*, The Fertiliser Association of India.

2. It may be noted that already the extent of fertiliser use, in terms of percentage of families reporting and percentage of area covered, is lower for small farmers than for large farmers as revealed from many field studies.

country grow food crops with limited marketable surplus. Even where they do not have such surpluses they are constrained to sell a part of their produce for meeting immediate cash obligations (payment of land revenue, repayment of loan, etc.). One may think of fertiliser subsidies for this vulnerable section to get over the problem. However, farmer subsidies pose their own problems in administration as they are either misused or do not always reach the sections of farming population for whom they are intended. The other alternative is to increase the prices of crops for which the cost-price relationship has deteriorated in recent years but then they will have an inflationary potential or will involve consumer subsidies which will be equally undesirable if financed out of created money. A compromise will be to increase support prices for selected crops to an appropriate extent and provide for consumer subsidies financed out of funds raised from agricultural income tax. Such a measure will also have a re-distributive effect on farm incomes. However, while increases in procurement/support prices and consumer subsidies fall within the purview of the Union Government the taxation of agricultural income is a matter for State Governments to act upon. The response of State Governments to the proposals of the Committee on Taxation of Agricultural Wealth and Income, headed by Dr. K.N. Raj, has not been encouraging. The position in regard to consumption of nutrients may improve if it is possible to reduce fertiliser prices further. With the increased capacity utilisation of fertiliser factories in the country noted in recent months due to the removal of many constraints like power shortage, it should perhaps be feasible to reduce the unit costs of fertiliser materials which should go a long way in solving some of the problems discussed in this section.

5. PROSPECTS FOR GROWTH OF FERTILISER CONSUMPTION

There has been a tremendous growth in fertiliser consumption in the country in the last 15 years. This growth has been facilitated by two factors, viz., (*i*) a shift in the cost-price relationship favourable to farmers till about 1970-71 and (*ii*) a shift in the fertiliser response function indicative of technological progress. The data given earlier in Table 5 (granting the limitations inherent in the non-uniformity in prices) show that between 1963-64 and 1970-71 Indian farmers growing wheat and paddy, the two most important crops in the country, had increasingly favourable terms of trade so far as fertiliser use was concerned, providing an addi-

tional justification for the excise levy referred to earlier. This led to the growth of consumption which can be characterised as a movement to a higher point along the same fertiliser response function. Superimposed on this development was the shifting of the fertiliser response function itself consequent to the introduction of the HYVP for five major food crops (wheat, paddy, jowar, bajra and maize).[1] A similar experience has been observed in Japan where, during the period 1883-1937, 70 per cent of the increase in commercial fertiliser use was explained by technical progress in agriculture (which resulted in a continuous shift of the fertiliser demand schedule) and the remaining 30 per cent of the increase was explained by the technical progress in the fertiliser industry (which lowered the price of fertilisers relative to the price of farm products)[2]. However, the cost-price relationship turned favourable to Indian farmers till 1970-71 not because of any reduction in fertiliser prices ; it was rather due to farm output prices (for example, prices of wheat and paddy) rising more than proportionately as compared with fertiliser prices. In view of the preponderant importance of expenditure on food in the total consumption expenditure in the country and the need to stabilise food prices in order to prevent an inflationary situation with wages chasing the prices, it is not proper to expect that food prices will continue to rise ahead of input prices in the future too. Thus any planned growth in fertiliser consumption should depend on further technological progress in agriculture and in fertiliser industry, the former contributing to increased production at a given level of fertiliser use and the latter contributing to a fall in fertiliser prices.

Though it is known that a few States like Punjab and Tamil Nadu have high levels of fertiliser use it is not possible to know from the available information about the crops for which they have been mostly used. However, one may surmise that wheat, paddy

1. In this context see "The Contrasting Response of Rice to Nitrogen : India and the United States", Robert W. Herdt and John W. Mellor, *Journal of Farm Economics*, Vol. 46, No. 1, February 1964, p. 150. Their comparative study showed that the functional relationship between inorganic nitrogen application and rice yield was strikingly different in the United States as compared with India. As a result the optimal level of fertiliser application and the financial returns to use of fertiliser were much lower under Indian conditions than American conditions. Herdt and Mellor made a rather prophetic prognosis that the widening of fertiliser use in India would require research which shifted and extended the response curve up and to the right. It was this type of research which ushered in the HYVP.

2. "Demand for fertiliser in the course of Japanese agricultural development", Yujiro Hayami, *Journal of Farm Economics*, Vol. 46, No. 4, November 1964, p. 766.

and sugarcane are the three crops which would have accounted for the bulk of fertiliser consumption in this country in recent years. Even here the use would have been confined,to a large extent to areas with assured irrigation or rainfall.[1] No doubt research efforts in dry farming techniques have led to methods like foliar application of fertilisers in dry areas but they are yet to be practised on a large scale at the farm level. Areas with assured irrigation or rainfall form only a minor part of the total area under cultivation. The introduction of the HYVP for food crops has given a fillip to the consumption of fertilisers. However, as argued by Desai and Mellor, if there is no break-through in the technology of cultivation of commercial crops (cotton, jute, oilseeds, etc.) on the scale achieved in the case of wheat and if there is no substantial addition to irrigated area and multiple cropping the country may as well be set to reach a point of stagnation in the consumption of fertiliser use.[2] If the targeted area of 5 million hectares to be brought under irrigation under the 20 Point Programme is achieveved it will give a boost to fertiliser consumption.

Considering the fact that the consumption of chemical fertilisers is to a large extent accounted for by big farmers now, the future efforts for accelerating the growth rate of fertiliser consumption should be directed towards aiding the small farmers in taking to these nutrients on a much larger scale than they have done so far. There is considerable potential for increasing agricultural production on small farms in many areas in the country.[3] This potential can be realised if suitable price policies for inputs as well as outputs are evolved along with such supporting facilities as extension for the benefit of small farmers.

1. See Gunvant M. Desai and John W. Mellor, op. cit, where they have argued that the bulk of the growth in fertiliser use in India between the early 1950s and mid-1960s was due to gradual acceptance of fertiliser use by farmers on two major foodgrains and a few non-foodgrain crops grown mainly under irrigated conditions. There is reason to believe that this position has continued to obtain, viewed in the light of concern over the growing regional imbalances in agricultural production and incomes.

2. See Gunvant M. Desai and John W. Mellor, op. cit. They have suggested that "the solution to the problem of sustaining continuous rapid growth in cultivators' demand for fertilisers lies mainly in accelerating the pace of the following three structural changes :
(*i*) continuous improvement in the currently available new varieties of crops,
(*ii*) development of new fertiliser responsive varieties of crops such as jowar, bajra, cotton, groundnut commonly grown under unirrigated conditions, and
(*iii*) expansion in irrigated acreage". "The continuous improvement in the currently available new varieties of crops"needs to be emphasised in the context of the reported decline in yields of some high-yielding varieties in the Punjab. Such a decline will discourage a farmer from applying the recommended dose of fertilisers.

3. *The Small Farmers (1967-69)—A Field Study*, op. cit.

In the light of the analysis made in this article proposals for organising the fertiliser capacity and supplies need to be throughly examined. Fertiliser plants are highly capital intensive and locking up huge investment in such facilities in the absence of assured demand is not a prudent step. It may be pointed out here that the fertiliser consumption targets were never realised to the full extent in any of the Plans indicating that they were always on the higher side (Table 11). This makes it all the more necessary to have a critical appraisal of the targets for the next Plan lest there should be an over-investment in the fertiliser industry. The immediate need is to cut down the import bill. Fertiliser imports during 1974-75 cost the country Rs. 42,52 million.[1] The additional production of fertilisers should be directed to the extent required to stop these imports thus saving considerable foreign exchange for the country. Any further addition to capacity should not be planned on the basis of a mere extrapolation of the past trends but should be thought about only in the context of a definite picture emerging about fertiliser use, consequent to the evolution of high-yielding varieties for commercial crops, extension of irrigation facilities and multiple cropping and a breakthrough in dry farming techniques.

TABLE 11 : TARGETS AND ACHIEVEMENTS IN CONSUMPTION OF FERTILISERS UNDER FIVE YEAR PLANS

('000 tonnes)

	SECOND PLAN			THIRD PLAN			FOURTH PLAN		
	Target	Actual consumption (1960-61)	Col. 3 as percentage of Col.2	Target	Actual consumption (1965-66)	Col. 6 as per centage of Col.5	Target	Actual consumption in 1973-74	Col. 9 as percentage of Col. 8
1	2	3	4	5	6	7	8	9	10
N	3,76	2,12	56.4	10,16	5,47	53.8	32,00	18,29	57.2
P_2O_5	1,22	53	43.4	4,06	1,32	32.5	14,00	6,50	46·4
K_2O	30	29	96.7	2,03	78	38.4	9,00	3,60	40.0
Total	**5,28**	**2,94**	**55.7**	**16,25**	**7,57**	**46.6**	**55,00**	**28,39**	**51.6**

Source : Fertiliser Statistics, The Fertiliser Association of India.

1. *Report on Currency and Finance*, 1974-75, Vol. II, Reserve Bank of India