VII
DISTRIBUTION OF OUTPUT

Knowledge about changes in the distribution of output among factors of production and between the regions consequent to irrigation and concomitant technological change facilitate, among other things, understanding of the bias in respect of factor use. Such a knowledge is an imperative to identify the constraints for future growth. For example, if the irrigation induced technology demands the use of a scarce resource and saves the factor which is abundant in supply, the scarce factor favoured by the new technology will act as a severe constraint in the growth process.

7.1 DETERMINANTS OF FACTOR SHARES

According to the neo-classical theory, the relative (factor) shares are resultant of configuration of technical change (neutral and non-neutral), elasticity of substitution (\( \sigma^- \)) and factor prices/supply.\(^1\) The upper and lower limits within which relative shares move are a function of i) factor saving innovation, ii) concomitant change in \( \sigma^- \) and its initial value and iii) movement of relative factor input ratio.\(^2\)

---

The changes in supply conditions of factors will affect the relative prices and given the substitution possibilities between factors of production, these price variations may influence the relative shares. So, estimation of the magnitude of elasticity of substitution (\(\sigma\)) helps in predicting the relative share movements when supply of input varies.

If \(\sigma = 1\), then changes in factor proportions (or supply of factor inputs) result in exactly equal changes in factor prices and consequently factor shares remain unaltered.

If \(\sigma < 1\), then the relative share of the factor, whose supply is growing faster, will decrease.

If \(\sigma > 1\), then the relative share of the factor, whose supply is growing faster, will increase.

The effects of technical change on factor shares can be examined on the basis of the nature of technical change — neutral or non-neutral — and the elasticity of substitution. Assuming, a priori, the magnitude of elasticity of substitution (\(\sigma \leq \frac{1}{2}\)), and also the nature of technical change, the implications on the relative shares can be discussed. When the technical change is neutral, the relative shares remain constant, if \(\sigma = 1\).

---

*A more increase in the price of an input does not ensure increase in the relative price.


4. For various definitions of neutral technical change, see Hann and Mathews, "opcit", 1964.
The disembodied technical change is neutral since it does not affect the ratio of marginal productivities of factor inputs. In case of non-neutral technical change, the factor shares vary. For example, in capital-using technical change, the marginal productivity of capital increases and also its relative share.

7.2 TECHNOLOGY, IRRIGATION AND FACTOR SHARES

Since new technology is conditioned by the availability of irrigation, the impact of irrigation induced new technology on the absolute and relative shares of land, labour and capital is discussed here.\(^5\)

**Land:** Irrigation enhances the effective supply of land and if the elasticity of substitution between land and other inputs is less than unity, its relative share is likely to decrease. Since, irrigation enriches the quality of soil, its rental value may increase and the absolute share may go up. Further, if irrigation induced technological changes improve the substitution possibilities between land and fertilisers or new seed inputs, then land may not be a limiting factor in the growth process. In such an event, the relative share of land may decline.\(^6\)

**Labour:** Irrigation Per se may increase the absolute share of labour by either enhancing wage rate or increasing the demand for labour or both.

---


6. For the effects of other technological innovations such as mechanical innovations on the relative share of land, see Hanumantha Rao, CH., "opcit", 1975.
However, the supply of labour may increase due to the existence of surplus labour within the region and also due to in-migration which may arrest the wage rate. Similarly, if mechanisation on a large scale is resorted to, by farm community, then the absolute level of wage income may fall. Under these conditions, the irrigation induced technology reduces the labour coefficient per unit of output and the relative share of labour is likely to shrink. Also, the decline in relative share of labour can be expected to be more rapid than that of land.

**Capital:** Since, the new agricultural technology is embodied in capital inputs, capital is likely to gain both in absolute as well as relative terms. The share of capital may not increase monotonically, since capital intensification may result in diminishing returns to capital. Further, if capital is unevenly disturbed, then it may not only result in reduction of output but may act as a drag on the growth of the sector.

Another important dimension of capital viz., human capital, as a factor of production has been receiving attention in the growth accounting models. Inclusion of this factor could explain the growth process where physical capital failed to capture the total variations in output. For

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* Irrigation also attracts seasonally migrant agricultural labour which may also cause reduction in the tempo of wage rise.

7. See Hayami, Yujio, "Understanding village community and the Direction of agrarian change in Asia", Institute of Economic Growth, Occasional Papers New Series No.1, New Delhi, 1981.

example, human capital as a variable (measured by consumption expenditure and health services), is considered as a separate variable in auditing the Japan's growth process. The observed growth of 'residual' unexplained by the expansion of factor inputs in US economy is largely attributed to improvements in quality of labour. In practice, the human capital component is being ignored owing to difficulties in the measurement. The growth of skilled workers can be treated as an index of human capital and the difference between payments made to skilled and non-skilled persons can be taken as a proxy for this factor.

7.3 METHODOLOGY FOR ESTIMATION OF FACTOR SHARES IN AGRICULTURE

Generally, the analysis of factor share movements, is attempted either from the supply side or from the demand side of the factor markets. Since the focus of the study is on net effect of technological change on factor shares, the demand aspect is only considered here. The methods widely used in estimating the shares are (i) Accounting method and (ii) production function approach. In the former method, the actual expenditure incurred for the use of the factor or its service is considered while in the latter, the factor shares are obtained by estimating the parameters of a chosen production function.

A number of studies have been conducted in Indian agriculture evaluating the effects of technical change on functional income distribution.11 Some of the studies investigated the bias of the new agricultural technology in respect of selected crops and regions on the basis of data for two periods of time, while others examined the issue using cross-section data. In regard to methodology, the accounting method was mainly adopted for finding out (relative) shares in value of output/value added. The Cobb-Douglas production function with dummy variable to test the bias of


* In majority of the studies, the data base is "comprehensive scheme for the cost of cultivation of principal crops" and "Farm Management Studies", sponsored by Directorato of economics and Statistics, Ministry of Agriculture.
the technology was attempted by some. These studies have observed that on the whole the new technology has capital using bias and land-saving bias. It was conclusively proved that share of labour declined with technological advancement. These trends were more conspicuous in regions with better performance of agriculture.

Accounting Method: The implicit assumptions behind the use of this method are: 1) the factor and product markets are competitive; 2) constant returns to scale are prevailing.

In this method, the gross value of agricultural output is distributed among the quantifiable inputs such as land, labour and capital and the non-quantifiable factors. The contribution of non-quantifiable factors is estimated as the 'residual'. In other words, the total cost incurred on land, labour and capital is subtracted from total value of output and the residual (positive or negative) is attributed to non-quantifiable factors. But this residual includes the contribution of exogeneous variables like weather also. In the event of bad weather, the total cost of production may exceed the output value, resulting in a negative share for the residual. A 3-year or 5-year average may nullify the (adverse) effect of weather and may yield stable estimates of factor shares. Thus, according to this


Some studies have estimated production functions for local varieties and high yielding varieties separately and also for the pooled data. Then chow-test was carried out to test the hypothesis of structural break-in production relations. See Elsallah, S., "opcit", 1933.

method, the share of a factor is given by the ratio of actual expenditure on the factor to the total value of output.¹⁴

Factor shares in output ($S_i$): The relative share of a factor in the total value of output $(P_Q Q)$ is given by

$$S_i = \frac{\sum P_i X_i}{\sum P_i X_i} = \frac{P_i X_i}{P_Q Q} = \frac{\left(\frac{P_i}{P_Q}\right)}{Q}$$

$$P_Q Q = \sum P_i X_i + \text{Residual}$$

and $\sum_{i} S_i = 1$

where, $S_i = \text{Share of the } i\text{ th factor}$

$X_i = \text{Quantity of } i\text{ th factor}$

$P_i = \text{Price of } i\text{ th factor}$

$P_Q = \text{Price of output}$

$Q = \text{Quantity of output}$

This criterion helps in assessing whether any factor has gained in relation to others, due to technological advancement.

Value-added may also be used, instead of total output in estimating the factor shares. If share of current inputs in gross output is constant then value added approach is more appropriate. The value added is obtained by subtracting the value of current inputs from the gross value of output.

¹⁴ Some studies have included interest charges also to work out factor earnings. See: Hopper David, "Allocation efficiency in traditional agriculture", Journal of Farm Economics, 1965.
Value added \((V)\) is given by
\[ V = P_Q \cdot Q - \sum_j P_j X_j \]
where \(X_j\) refers current inputs and \(P_j\) the price.

The relative share of factor \(i\) in value added \((V_i)\) is
\[ V_i = \frac{P_i X_i}{P_Q \cdot Q - \sum_j P_j X_j} \]
\[ \sum_i V_i = 1 \]

The relative share in output \((S_i)\) or in value added \((V_i)\) for each factor can be computed and compared to know the distribution of gains under the two different agricultural situations.

Since the classification of participants is not unique, the present study considers five factors namely, land, labour (human and bullock), working capital (seed, bio-chemical inputs, etc.), fixed capital (agricultural implements and machinery and the residual in the empirical analysis.

The factor income (expenditure) is calculated using the market price of the factor or its service charge. In certain cases, the cost is imputed when reliable (market) price is not available. However, the assumptions involved in the imputation process may affect the results.

**Land**: In case of owned land, the rental value of the land is imputed as the factor price. If land is leased-in, then the actual rent paid is taken as the price for this factor. If land is leased-out, the rent received is considered.
Labour (Human): It is a composite factor comprising of three types viz., family labour, hired labour and services of annual farm servants. The value of family labour is imputed using the average wage rate of hired labour or farm servant. The kind and cash payments to farm servants are divided by the number of working days in a year to arrive at the wage rate per day. In respect of hired labour, the total wage bill for different farm operations is divided by the number of days worked by the hired labour to get wage rate.

Labour (Bullock): The animal power input also consists of two components viz., owned and hired. The market hiring rate in the latter case and maintenance cost of bullock pair in the former case is considered. The value of animal power in some cases are also computed by adopting the prevailing (contract) charges per acre for different operations.

Capital (Fixed): 'Fixed Capital' refers to the farm tools and machinery used (owned or hired) for cultivation and include ploughs (wooden and iron), harvest combines, tractors, sprayers, weeder and scalers. Charges for items like sickle are usually paid along with the labour services and constitute small amount in the total expenditure. If, tractor services and other farm machinery are hired, the respective rents paid are taken as prices. In the case of ownership, after adjusting for depreciation and interest charges, the net current values of these items is taken into account in the computation of cost of capital.

Working Capital: This includes costs of seeds, fertilisers, pesticides, manure and irrigation and interest on working capital.
Irrigation as an input in the production of agriculture, was considered in few studies only. The major problem in treating irrigation separately as a factor of production is pricing of water. In case of ground water schemes, the operational cost of lifting and depreciation charges on the equipment can be treated as the cost of water. But in surface irrigation schemes such as canals, the water cess imposed by government is lower than the true price. In such cases, accounting method is likely to underestimate the contribution of irrigation to output.

Limitations: In the accounting method, inputs are allocated anticipating certain level of output and are related to output realised. Since production process involves certain time-lag, the ex-ante and ex-post conditions may differ e.g., agricultural output is subjected to the influence of exogenous factors like weather. This method yields biased results if factor prices and factor productivities differ much.

Production Function Approach: This approach is based on the analysis at a disaggregated level while accounting method is done at an aggregate level. The implicit assumption in the production function analysis is that factor prices are proportional to marginal productivities. In this method, the estimates of marginal productivities are multiplied with the

respective quantities of the inputs used to arrive at the factor earnings and their shares. Thus, the supremacy of this method is that factor contribution is taken into account in the estimation of factor shares.

In this approach, the main task is to select the form of the function characterising the production system. More precisely, knowledge about the elasticity of substitution (\( \sigma \)) between factor inputs — its magnitude and changes in the direction —, is necessary to explain the behaviour of relative shares of factors.\(^\text{15}\) If the Cobb-Douglas production function is opted, the regression coefficients (elasticities) are same as the factor shares. In case, the returns to scale are either increasing or decreasing, i.e. output is not exhausted by the factor inputs, the excess or shortage over unity can be attributed to the 'residual'.

Other practical problems associated with this approach are: specification of variables, measurement, methods (econometric) of estimation etc. Occurrence of negative coefficients for the factors which may be significant statistically in some cases, restrict the use of production function technique to determine the factor shares in agriculture.\(^*\)

7.4 ESTIMATION OF FACTOR SHARES IN RICE

Since advent of irrigation and technology benefitted mainly rice, the factor shares before and after release of water and also in traditional and

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15. The relationship between elasticity of substitution (\( \sigma \)) and changes in relative factor shares are studied by many researchers, e.g. See Hicks, J.R., "Theory of Wages", MacMillan, London, 1965.

* Due to non-availability of data, this method is not employed in this study.
Improved seed cultivation are calculated in this section and compared. These results, indicate whether new seed technology in rice has any factor bias and also the source of irrigation.

In the current study, the factor-bias of the new technology is estimated using extended version of Hicksian classification of technical bias by Binswanger. The data base for the analysis is the information provided in the studies of Nagabhushanam and Sarveswara Rao (1966) and Suryanarayana (1930). These data facilitate comparison of factor shares in traditional agriculture and agriculture with improved technology. The relative shares of factors in the output (value) of rice are given in Table 7.1.

From the table 7.1 it can be seen that in the year 1959-60 the share of human labour in output is maximum followed by land and bullock labour. The role of traditional capital is limited in this backward and traditional economy. The share of land over time declined from 30 to 25 per cent, irrespective of seed variety and source of irrigation. This phenomenon is due to the accounting procedure adopted in the study by Suryanarayana. The rental value of owned land is taken as reported subject to ceiling of 25 per cent of the gross produce. The trend in relative share of human labour over time is not clear. Its share improved in certain cases and declined in the rest of the cases. On the whole, its

<table>
<thead>
<tr>
<th>FACTOR</th>
<th>1959-60¹ (Local)</th>
<th>COMMAND AREA (1973-78)²</th>
<th>ECON-COMMAND AREA (1973-78)²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>KHAREF</td>
<td>RABI</td>
<td>KHAREF</td>
</tr>
<tr>
<td></td>
<td>LOCAL HYV</td>
<td>LOCAL HYV</td>
<td>LOCAL HYV</td>
</tr>
<tr>
<td>I Land</td>
<td>30.7</td>
<td>25.30 23.26</td>
<td>25.25 25.21</td>
</tr>
<tr>
<td>II Labour</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Human</td>
<td>33.3</td>
<td>42.29 27.26</td>
<td>35.29 29.56</td>
</tr>
<tr>
<td>III Capital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Working</td>
<td>17.9</td>
<td>63.69 42.12</td>
<td>69.11 25.33</td>
</tr>
<tr>
<td>b) Fixed</td>
<td>1.9</td>
<td>15.21 9.46</td>
<td>10.53 3.89</td>
</tr>
<tr>
<td>IV Irrigation</td>
<td></td>
<td>6.70 7.39</td>
<td>14.31 9.16</td>
</tr>
<tr>
<td>V Residual</td>
<td>-7.7</td>
<td>-53.6 -13.39</td>
<td>-32.72 -1.57</td>
</tr>
</tbody>
</table>

Value of Output (Rs. Per acre) 333.60 663.60 504.21 1200.69 663.16 1215.58

1: Source: Nagabhushanam, K and B. Sarveswara Rao, "opcit", 1964
share declined with shifts from a) local to improved technology, b) kharif to rabi and c) non-command area (well & tank irrigation) to command area (canal irrigation). Almost similar trends are noticed in case of bullock labour except that its share improved in command area compared to non-command area. Thus, technological advancement reduced the share of human and bullock labour, and source of irrigation affected these shares differently. Share of irrigation in output increased over time; it is higher in rabi season and in non-command area. However, the rainfall from south-west monsoon supplements the irrigation in kharif season whereas in the case of rabi, it is almost inadequate making irrigation component as pivotal in rabi rice cultivation in non-command area. The water cost applicable to command area is less than that of the cost of lifting irrigation in non-command area.

As far as working capital is concerned its share increased substantially over the two time periods. And no clear pattern is observed in respect of changes in its share with source of irrigation, seasons and seed variety during 1975-78. The fixed capital’s share is substantially higher in 1975-78 than that in 1959-60. It is relatively low in rabi season, in HYV seed cultivation in command area, since the use of machinery will be more during second crop for lifting of water in non-command area and command area is mainly served by canal irrigation, which do not require the machines for irrigation purpose. This is also due to the fact that HYV technology also ensures short-crop duration. From the

* The results of Chakradhar Rao’s study are not used since the non-command area (uplands) in his study include the uplands of Huzurnagar, while entire Huzurnagar taluka is one of the talukas in the command area in our study.
above, it can be summarized that the traditional factors lost their dominance and the modern inputs/capital made a headway in the transformation of agriculture (paddy).

The factor bias of the new seed technology is estimated and the results are given in Table 7.2. It is evident from the table that the new technology has land and labour (human and bullock) saving and capital using bias. For the traditional varieties, the share of human labour increased between the periods.

In the process of technological development, rice cultivation is becoming capital intensive. If the above trends are true with respect to other crops also, the major implication of these results is that growth process is not ensuring social justice and the decline in the share of labour will reduce the wage income and this widens the distribution inequalities in the income among the social groups. This skewed distribution may hamper the future growth prospects (because of a fall in effective demand for food items), if such conditions prevail in other parts of the country also.

7.5 SHARE OF COMMAND AREA IN NALGONDA DISTRICT

The share of command area in respect of traditional and modern inputs and also in farm output for six triennia is calculated to examine whether command area improved its share with irrigation level leading to regional (intra district) inequalities. The shares are given in Tables 7.3, 7.4 and 7.5.
### TABLE 7.2
ESTIMATED FACTOR BIAS OF NEW TECHNOLOGY

<table>
<thead>
<tr>
<th>FACTOR</th>
<th>COMMAND AREA</th>
<th></th>
<th></th>
<th>NON-COMMAND AREA</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>KHARIF</td>
<td>RABI</td>
<td>KHARIF</td>
<td>RABI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LOCAL</td>
<td>HYV</td>
<td>LOCAL</td>
<td>HYV</td>
</tr>
<tr>
<td>Land</td>
<td>-17.5</td>
<td>-17.5</td>
<td>-17.5</td>
<td>-17.2</td>
<td>-16.1</td>
</tr>
<tr>
<td>Human Labour</td>
<td>19.8</td>
<td>-22.6</td>
<td>-0.03</td>
<td>33.1</td>
<td>-28.7</td>
</tr>
<tr>
<td>Bullock Labour</td>
<td>26.9</td>
<td>-57.5</td>
<td>-42.6</td>
<td>-32.7</td>
<td>-50.1</td>
</tr>
<tr>
<td>Working Capital</td>
<td>140.7</td>
<td>135.3</td>
<td>170.0</td>
<td>109.0</td>
<td>184.3</td>
</tr>
<tr>
<td>Fixed Capital</td>
<td>700.5</td>
<td>396.3</td>
<td>450.7</td>
<td>373.2</td>
<td>1270.0</td>
</tr>
</tbody>
</table>

*(Per cent)*

*Based on 1975-76 and 1959-60 data for rice.*
<table>
<thead>
<tr>
<th>PERIOD</th>
<th>IRRI AREA</th>
<th>SOWN AREA</th>
<th>LABOUR</th>
<th>WOODEN PLOUGH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NET</td>
<td>GROSS</td>
<td>NET</td>
<td>GROSS</td>
</tr>
<tr>
<td>1960-63</td>
<td>21.0</td>
<td>21.0</td>
<td>26.1</td>
<td>25.8</td>
</tr>
<tr>
<td>1965-66</td>
<td>22.0</td>
<td>22.1</td>
<td>27.1</td>
<td>26.0</td>
</tr>
<tr>
<td>1968-71</td>
<td>46.6</td>
<td>48.6</td>
<td>25.7</td>
<td>27.8</td>
</tr>
<tr>
<td>1973-76</td>
<td>58.1</td>
<td>60.0</td>
<td>26.2</td>
<td>31.1</td>
</tr>
<tr>
<td>1976-79</td>
<td>53.8</td>
<td>53.8</td>
<td>25.3</td>
<td>23.8</td>
</tr>
<tr>
<td>1980-83</td>
<td>60.8</td>
<td>59.2</td>
<td>25.3</td>
<td>24.9</td>
</tr>
</tbody>
</table>

Notes: Irrl. Area = Irrigated area
TABLE 7.6
SHARE OF COMMAND AREA IN MODERN INPUTS IN NALGONDA DISTRICT

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>FERTILISERS</th>
<th>OIL ENGINES</th>
<th>PUMPSETS</th>
<th>TRACTORS</th>
<th>IMPLEMENTS &amp; MACHINERY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960-63</td>
<td>NA</td>
<td>5.0</td>
<td>10.9</td>
<td>56.9</td>
<td>23.3</td>
</tr>
<tr>
<td>1965-66</td>
<td>21.3</td>
<td>10.3</td>
<td>8.5</td>
<td>63.0</td>
<td>23.4</td>
</tr>
<tr>
<td>1966-71</td>
<td>46.0</td>
<td>11.2</td>
<td>8.3</td>
<td>70.2</td>
<td>25.7</td>
</tr>
<tr>
<td>1973-76</td>
<td>59.4</td>
<td>9.3</td>
<td>8.7</td>
<td>82.3</td>
<td>30.6</td>
</tr>
<tr>
<td>1976-79</td>
<td>52.6</td>
<td>9.7</td>
<td>8.3</td>
<td>80.7</td>
<td>31.2</td>
</tr>
<tr>
<td>1980-83</td>
<td>59.9</td>
<td>15.3</td>
<td>7.2</td>
<td>70.6</td>
<td>28.2</td>
</tr>
</tbody>
</table>

NA: Not available.
## TABLE 7.3

SHARE OF COMMAND AREA IN AGRICULTURAL OUTPUT
IN NALGONDA DISTRICT
(AT 1960-63 PRICES)

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>CEREALS</th>
<th>PULSES</th>
<th>FOODGRAINS</th>
<th>AG. OUTPUT</th>
<th>NON-FOODGRAINS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960-63</td>
<td>22.2</td>
<td>26.7</td>
<td>22.4</td>
<td>23.2</td>
<td>27.8</td>
</tr>
<tr>
<td>1965-68</td>
<td>23.3</td>
<td>23.6</td>
<td>23.3</td>
<td>24.6</td>
<td>23.0</td>
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<tr>
<td>1968-71</td>
<td>39.3</td>
<td>17.8</td>
<td>33.6</td>
<td>37.7</td>
<td>34.6</td>
</tr>
<tr>
<td>1973-76</td>
<td>54.7</td>
<td>25.0</td>
<td>34.2</td>
<td>51.8</td>
<td>33.6</td>
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<tr>
<td>1976-79</td>
<td>47.8</td>
<td>15.6</td>
<td>47.1</td>
<td>49.8</td>
<td>61.1</td>
</tr>
<tr>
<td>1980-83</td>
<td>44.9</td>
<td>12.9</td>
<td>44.1</td>
<td>49.2</td>
<td>65.5</td>
</tr>
</tbody>
</table>

Ag. Output = Agricultural Output.
During the pre-irrigation period, the shares of land (sown and irrigated area), labour (human and bullock) and implements and machinery are stable. The command area's share in regard to foodgrains and also agricultural output remained constant. The shares of cropped and irrigated area about 23 and 22 per cent respectively and the share of human labour used in agriculture in the command area is 32 per cent. The stock of bullock labour and agricultural implements in the command area constitute 23 per cent of the total stock in the district. The regional share in output is found to be of the order of 23 per cent. Thus, command area's share in inputs is almost proportional to its share in not irrigated area. Similar relationship is noticed between the share in irrigation and in farm output. Taking into account, the shares of human labour and output, the command area is at a disadvantageous position.

In the transition period, there is no remarkable change in the share in not sown area while its share in the gross sown area increased by five percentage points. The shares increased significantly in the case of irrigation input. Command area improved its position in respect of all other inputs with irrigation. For example, the shares in human labour, bullock labour and implements and machinery rose to 42, 30 and 31 per cent respectively. The maximum response is found in case of fertilisers as revealed by the share of the command area (50 per cent). The regional share in output also increased except in case of pulses. The decline in its share in pulses is due to reduction in area under pulses caused by irrigation. The shares in cereals, foodgrains and total output doubled in this period. The comparison of shares in human labour and output indicate that with the advent of irrigation the availability of output
per (human) labour increased in command area.

During the stabilisation period, the share in irrigated area also fluctuated and variations are also observed in the command area's share in traditional and modern inputs. However, the share of the region in case of traditional inputs is almost stabilised. The shares in fertilisers declined and is not stabilised along with irrigation input. The output shares varied between 43 and 50 per cent with regard to cereals, foodgrains and all crops. The share in non-foodgrains exceeded the level of 60 per cent and the yield increases in groundnut might be responsible for this hike in the regional share. The availability of output per labour in command area continues to be higher. For example, 40 per cent of labour force produced 50 per cent of output.

It can be inferred that with increase in share in irrigated area, the share of traditional as well as modern inputs improved but the magnitude of increase is not uniform. Changes in the shares of irrigated area, fertilisers and farm output are highly correlated indicating that agricultural growth in command area is mainly influenced by irrigation. The trends in inputs and outputs support the view that irrigation creates regional imbalances.