CHAPTER VI

GREEN REVOLUTION AND AL.
The introduction of HYV seeds coupled with other improved techniques, which is said to have heralded transformation of agriculture in most of the countries and to have succeeded in bringing a spectacular increase in food production in a decade or so in countries where famine appeared imminent only a few years ago, is undoubtedly a recent happy development. The contribution of technical change to agricultural productivity in developing countries has been widely recognised and increasingly documented. Food production indices moved as follows between 1966 to 1977 in various regions of the developing world:

<table>
<thead>
<tr>
<th>TABLE 6.01</th>
<th>Food Production Indices in Different Regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region</td>
<td>1966</td>
</tr>
<tr>
<td>Africa</td>
<td>86</td>
</tr>
<tr>
<td>South America</td>
<td>87</td>
</tr>
<tr>
<td>Asia</td>
<td>88</td>
</tr>
<tr>
<td>Developing market economies</td>
<td>85</td>
</tr>
<tr>
<td>All Developing Countries</td>
<td>87</td>
</tr>
</tbody>
</table>


Indian agriculture which was caught in a vicious circle of low productivity and low investment has shown some resilience since mid-sixties when India imported new breeds from Mexico and Philippines. In the beginning, HYV seeds and other inputs were used on selected farms and the results achieved were quite encouraging. Inspired with the initial successes, India embarked on using the new technology on a massive scale and as a result, the production of foodgrains increased from 55 million tonnes in 1949-50 to 89 million tonnes in 1964-65 and to 126 million tonnes in 1977-78 i.e., an increase of about 139 per cent during 28 years period. The index of agricultural production (1967-68 to 1969-70 = 100) which was merely 62.2 in 1949-50 reached to 96.9 in 1964-65 and to 132.7 in 1977-78.\(^1\) Prior to its adoption, India was heavily dependent on food imports from the United States, for which it had to pay a heavy political price.\(^2\) But the use of new technology opened new vistas in crop production and especially with the achievement of a decisive break-through in food production, the country has emerged from the 'scarcity-trap' and has presently created huge buffer stocks of foodgrains.

The Green Revolution is the name given to the technology associated with HYVs and can be defined in terms of a package of agricultural inputs and new agricultural practices. The core of

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this package is the 'miracle seed.' New seeds without water and fertilizer would be unable to realise their full potential, without insecticides and weedicides their output would be highly variable and without resort to mechanisation their potential for multiple cropping would remain underutilised. Thus the 'package approach' is a major feature of the new agricultural strategy associated with HYVs.\(^1\)

Generally, technological innovations in agriculture can be divided into two broad categories viz. biological and mechanical. Biological innovations refer mainly to inputs that increase the productivity of a given land base. HYV seeds, fertiliser and irrigation are the main inputs coming in this category. The green revolution is frequently described as a seed-fertiliser technology.\(^2\) The mechanical innovations refer mainly to improved agricultural implements which have a physiological effect in increasing timeliness of field operations. Since biological innovations are more effective only with the support of mechanical innovations, the green revolution is better characterised as a biological-mechanical innovation.

The agrarian structure of production relations existing in rural India makes the use of new farm technology more favourable

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and beneficial to those farmers who own and operate large size holdings or farms than to the farmers owning and operating a small or marginal size-holding because of the following:

(a) they have greater control over the supply of scarce agricultural resources;
(b) they have greater access to credit with their greater credit worthiness; and
(c) they possess greater technical dynamism.

The case for holding the view that the green revolution has largely benefited the rich farmers, has been well documented by Frankel. Concentrating his analysis on the five TARD districts—Ludhiana, West Godavari, Thanjavur, Palghat and Burdwan, Frankel found that in each district, while there was evidence that small farmers had made some limited gains, the gains made by large farmers, especially those owning land say 10 to 20 acres or over, were very much larger. Similarly in a study Bhalla has concluded that income disparities between the poorest non-progressive and the richest progressive cultivators have widened as a result of green revolution. This fact has been further supported by Ladjejinsky in his studies.

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This situation is largely due to the fact that the rich farmers have easy access to credit and other inputs. For example Lele and MELLOR note: "As compared to the smaller cultivators, the larger farmers can better afford the risks of innovation and they wield more political power over the development agencies which provide access to credit and crucial supplies such as fertilisers, seeds and pesticides." Consequently, the income on large farms is much higher than the income on small farms. This fact has been revealed by the various studies.

Before the onset of green revolution, small farmers were capable of reducing this inequality by raising the cropping intensity and per acre yield of their farms. There are adequate evidence to show that under traditional agricultural technology small farms showed higher rates of yield per acre than large farms. But since the new technology is associated with increasing returns to scale, it has tilted the balance in favour of large farmers and has increased income inequalities and poverty galore.


Although, data have not been collected on this aspect in our enquiry, yet on the basis of the above facts a priori it can be said that the use of new technology, instead of narrowing the gap between the income of large and small farmers, has widened it all the more. This situation has emerged largely due to the fact that "the Green Revolution is biased against the small producer unless land ownership is equally distributed in small parcels and all peasants have nearly equal access to fertiliser, water technical knowledge and credit."¹ Unless these constraints are removed, the disparity between large and small farmers in sharing the benefits of the green revolution will continue to increase and the small farmers will not be able to get their due share of the gains.

Impact of Green Revolution on Employment of AL

It is generally believed that recent technological breakthrough has demonstrated its yield and income raising potential but its secondary effects on the employment and income of the weaker sections of rural population have not been very clear. It is often argued that biochemical innovations are generally labour absorbing, land saving and neutral to scale of operation whereas mechanical innovations are generally labour displacing and biased to the scale.

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Various studies have been undertaken to find out the absolute as well as the relative impact of HYVs, tractorisation, tubewell irrigation and harvest combines on employment when these techniques are regarded as independent and when the complementary relationship between them is taken into account. So far as the use of HYVs is concerned, it causes a substantial increase in employment, but the effects of farm mechanisation on employment are not very clear. A study undertaken by Biplab Das Gupta shows that "while the mechanisation of ploughing operation has displaced human labour, this has been more than offset by additional employment created through a greater labour need for application of fertiliser, weeding and harvesting, and other activities and due to increase in the area under double crops. However, with a wider application of tractors and particularly of harvesters, there is a serious risk of sudden decline in the number of labour days needed per unit of land."\(^1\)

Another study by Raj shows that some better cultivation practices such as more careful planting, better weeding, etc. tend to increase the demand for labour.\(^2\) But the substitution of pump irrigation for surface irrigation to obtain better control may reduce the demand for labour. In this sense, the new technology may be labour-saving. However, since the use of pump irrigation makes possible the introduction of multiple cropping, it is liable

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1. Biplab Das Gupta, 'India's Green Revolution', op.cit., p. 251
to increase the demand for labour over the year as a whole. In addition to this, technological change in the agricultural sector must have created additional employment through the increased demand for inputs, especially those produced in the non-farm sector, as well as through an increased demand for rural and urban goods of consumption consequent on the increase in farm incomes. Furthermore, additional employment must have been generated for the marketing and distribution of increased agricultural output. Thus there is a priori reason to believe that without the introduction of mechanisation, the green revolution tends to generate more employment.

For the purpose of this study, information was sought from AL of selected households as regards the effect of green revolution on employment, wages and income. In about 90 per cent cases, the effect was positive; 5 per cent cases, negative; and in about 5 per cent cases AL had no definite idea about the impact of new technology on the number of days of their employment. Since new technology has not been adopted in the district on a wider scale as has been done in the Punjab, Haryana and Western U.P., it has not shown adverse effect on employment so far.

There are numerous empirical evidences which fully support the above finding. The net effect of new technology in the Punjab State which is the heart-land of green revolution, has been an

increase in total employment. According to Randhava, "if at all farm mechanisation replaced some unskilled labour per cropped ha, it was more than compensated for by increased intensity of cropping and labour intensive operations such as interculture, irrigation, manuring, fertilising and harvesting."¹ Similar results have been shown by various other studies.² My finding is also quite in conformity with the data given in Table 6.02.

<table>
<thead>
<tr>
<th>TABLE 6.02 : Impact of Complementary Inputs, Ferozepur 1968-69 (estimated at tractor farm size and mean irrigation levels)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non Tractor Farms (53 Acres)</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>1. Cropping intensity</td>
</tr>
<tr>
<td>2. Output per acre held (Rs.)</td>
</tr>
<tr>
<td>3. Human Labour hours per acre held</td>
</tr>
<tr>
<td>4. Bullock cost per acre held (Rs.)</td>
</tr>
</tbody>
</table>

Source: Ch. H. Rao, Technological Change and Distribution of Grains, Macmillan, New Delhi, 1975, p. 115.

But the new technology has other aspects as well. Its employment generating potentialities are not unlimited. There is a strong tendency of the new technology to be accompanied with mechanisation on a large scale which ultimately tends to reduce the demand for labour in agriculture. 1 Since tractor displaces human and animal labour for ploughing, threshing and transportation, it will have an adverse effect on employment of AL. But it is only at advanced stages of technological advancement when all farms get mechanised that substantial reduction in employment of human labour takes place. 2 In a study Rao has estimated that tractorisation would displace between 20 to 30 per cent of total human labour days per cropped acre on account of tillage and transportation. 3

Generally, harvest combines displace human labour employed for harvesting, threshing and winnowing. Further, while pumps and tubewells create demand for casual labour and displace permanent labour, tractors displace casual labour and create demand for permanent labour. 4 Although, "the casual labour input per acre showed a


decreasing trend on mechanised farms, the actual labour utilisation per acre increased with the increase in the level of mechanisation.¹ This happened due to extensive use of other inputs along with mechanised farming. Thus the impact of tractorisation on farm employment depends upon the extent to which its labour substituting effect is compensated by its land augmenting effect.

Since biochemical devices are generally labour absorbing, they should be welcomed. But mechanical devices are usually labour saving and should be used on a selective basis. Studies² undertaken in East African countries and Latin America clearly show that mechanisation of agriculture was both uneconomic and labour displacing. However, Shaw³ citing data from several countries (India, Philippine, Pakistan and Taiwan) regarding employment-man-days per ha and per ton on farms using HYVs and Local Varieties, concludes that the introduction of new cereal varieties by itself increases the demand for labour. Similarly in another study Randolph and others⁴ have expressed their doubts about the possible adverse


effects of the green revolution. It cannot, however, be denied that in the long term mechanisation of agriculture will inevitably lead to displacement of AL on large scale as warned by Raj Krishna: "in the context of the emphasis on increasing the farm sector's absorption of manpower, there was no case for continued farm mechanisation. And among different forms of farm mechanisation use of combine harvesters is among the most objectionable. There is thus no case for their use on social cost-benefit grounds." Considering the large volume of the unemployed and the underemployed in India, his fears cannot be dismissed as totally unfounded.

Impact of Green Revolution on Agricultural Wages:

There is general consensus that with the adoption of new technology in agriculture money-wages of AL have gone up considerably. But the effect of green revolution on the real wages of AL is not very clear and definite. To quote Biplab Das Gupta, "while the money wages have undoubtedly increased, there is conflict between studies undertaken in different areas which used different cost of living deflators regarding the movement of real wages as a result of the green revolution." The average money-wage earnings of casual AL in the district have gone up from Rs. 2.33 in 1966-67 to Rs. 5.34 in 1979-80 as given in Table 5.04. When wage income in 1979-80 is deflated according to CPI for AL in U.P., it shows very nominal increase in the real earnings of AL. The indices of money

wages and real wages of casual male AL for the period 1967-68 to 1970-80 are given in Table 6.03.

**TABLE 6.03 :** Indices of Cash Wages and Real Wages of Casual Male AL with 1966-67=100 as the base year.

<table>
<thead>
<tr>
<th>Year</th>
<th>CPI for AL in U.P. (General Index) Chained to 1966-67=100</th>
<th>Index Numbers of Money Wages</th>
<th>Indices of Real Wages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967-68</td>
<td>112</td>
<td>118</td>
<td>106</td>
</tr>
<tr>
<td>1968-69</td>
<td>85</td>
<td>136</td>
<td>161</td>
</tr>
<tr>
<td>1969-70</td>
<td>93</td>
<td>139</td>
<td>143</td>
</tr>
<tr>
<td>1970-71</td>
<td>87</td>
<td>147</td>
<td>170</td>
</tr>
<tr>
<td>1971-72</td>
<td>91</td>
<td>148</td>
<td>164</td>
</tr>
<tr>
<td>1972-73</td>
<td>114</td>
<td>155</td>
<td>140</td>
</tr>
<tr>
<td>1973-74</td>
<td>144</td>
<td>170</td>
<td>119</td>
</tr>
<tr>
<td>1974-75</td>
<td>179</td>
<td>201</td>
<td>113</td>
</tr>
<tr>
<td>1975-76</td>
<td>136</td>
<td>220</td>
<td>162</td>
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<tr>
<td>1976-77</td>
<td>132</td>
<td>227</td>
<td>173</td>
</tr>
<tr>
<td>1977-78</td>
<td>159</td>
<td>230</td>
<td>145</td>
</tr>
<tr>
<td>1978-79</td>
<td>155</td>
<td>236</td>
<td>153</td>
</tr>
<tr>
<td>1979-80</td>
<td>178</td>
<td>251</td>
<td>142</td>
</tr>
</tbody>
</table>

Source: Index Numbers have been compiled from Table 5.04.

Thus while the money wage indices and CPI (chained to 1966-67=100) showed an increase of 151 per cent and 78 per cent respectively during the period 1966-67 to 1970-80, the real wage indices went up by 42 per cent only. Although, the wage earnings
of casual male AL have increased in terms of monetary income as well as in terms of real income, yet the increase in the latter has not been very significant because a major proportion of increase in money wages was appropriated by a sharp increase in CPI for AL.

Since the new technology in agriculture was used for the first time in the year 1966-67, the above period is often characterised as the post-green revolution era. Thus on the basis of above data, it can be inferred that the effect of green revolution on both money-wages and real wages has been positive but increase in the real wages has been tardy and nominal. This finding is supported by the results of various other studies. In his field trips in Bihar and Punjab, Ladejinsky\(^1\) found that wage levels were still low. Whereas money wages had risen in recent years, especially during the harvest seasons, real wages showed little improvement. A study by Gough\(^2\) showed a small increase in real wages. In a recent study Jose\(^3\) using NSS data concluded that the wage rates of male AL increased significantly in most of the states between 1964-65 and 1970-71. My finding is also quite in

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conformity with the results shown by various other studies.¹

However, there are numerous studies which reveal that the real wages of AL have declined as a result of green revolution. Pranab Bardhan has drawn the conclusion that the so called green revolution may not have helped in raising agricultural wage rate in real terms in North West India; in fact there seems to be some indications of a fall in real wage rates in many areas in this region.² It is observed that the attempts by the large farmers to switch over from payment of wages in kind to cash payments to take the benefit of rising food prices, have tended to keep the real wages down. To quote Krishnaji, "stagnant agricultural wages characterise the whole country."³ There are a host of other studies⁴ which have shown similar results.


The results drawn by various researchers differ largely due to different types of data used for analysis. The data are mostly provided by the Agricultural Wages in India (AWI) and NSS round reports. The consistent tendency of the AWI data to over-state agricultural wages is sought to be explained by V.M. Rao in terms of certain pervasive features of the AWI scheme—such as the relatively smaller coverage of the samples and the typicality of the villages and respondents chosen. Therefore, for comparing the results of two different studies and drawing conclusion from them, we must take into account the reliability and the limitations of data used by them.

From the above discussion it can be concluded that in the wake of green revolution era, both money wages and real wages have increased. While money wages have gone up considerably, increase in terms of real earnings has been very feeble and insignificant. In fact, a substantial proportion of increase in money wages is neutralised by a sharp rise in the CPI of AL and consequently their real wages are kept at low levels. Obviously, AL lag far behind the large farmers in sharing the benefits of new technology. Thus the so called green revolution could not help to mitigate the poverty of AL.

**Impact of Green Revolution on Income of AL**

The impact of green revolution on production has been most commendable but its welfare effects are somewhat dubious. It is generally believed that so far the large farmers have been the major beneficiaries of the green revolution while the small and marginal

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farmers and landless labourers could not get full benefits of it. The income of AL is determined largely by the days of employment and wage rates. We have already seen that as a result of the new technology the days of employment and real wages of AL have gone up and therefore a priori reasoning the income of AL might have also increased. A number of studies undertaken in the Punjab State clearly show that the real income of AL has increased in the post green revolution period. But increase in their income has not been commensurate with the increase in the income of big farmers.

So far as Jalaun district is concerned about 90 per cent AL:hs reported favourable impact of the green revolution on their income, another 5 per cent AL:hs showed negative effect; and the rest 5 per cent households had no definite idea about the impact. To test the validity of the above results, a supplementary question was asked to AL: Do you find yourself economically better at present than in mid-sixties? This exercise also yielded the similar results. By observation also we find that now the dress, diet and housing conditions of AL are somewhat better than those in the early sixties. Thus green revolution has contributed favourably to the real income of AL:hs in the district.

However, it cannot be denied that the use of new technology in agriculture has contributed to enlarging income-inequalities between the large farmers and landowners on the one hand and the landless labourers and tenants on the other hand. It was not until the 'First Decade of Development' had ended, that analysis indicated that the green revolution may actually have a counter productive
aspect. Those who may not benefit fully from the fruits of the green revolution may be small farmers, share-croppers, renteers, shopkeepers, artisans, agricultural labourers and industrial workers. However, Frankel has pointed out that the condition of landless labourers has also improved but at a proportionately smaller rate than that of large landowners and these gains are threatened by the rapid drive towards more complete mechanisation.

The above facts amply demonstrate that the adoption of new technology seems to fall predominantly under the control of those who own large holdings and capital. It is, therefore, visualised that in the present agrarian set up, the green revolution will go on increasing the existing income-inequalities between different sections of farming community. And if this process is not checked well in time, it is likely to cause polarisation in farming community. Tenants, share-croppers and small and marginal farmers are rapidly swelling the ranks and strength of AL as they have been denied their due shares in the gains of the green revolution so far. Thus the use of new technology very often leads to dualism in agriculture.

"The current emphasis is on productivity, to the exclusion of social

1. Clifford R. Wharton Jr., 'The Green Revolution: Cornucopia or Pandora's Box?' Foreign Affairs, April, 1969, pp. 464-78.


3. F.R. Frankel, India's Green Revolution, op. cit.
imperatives: the first will bring India to self-sufficiency, the second is beginning to yield great vexations."¹ This situation is largely due to lack of effective implementation of land reforms.

Land Reform and AL ²

Land reform measures are considered to be vital instruments for removing elements of exploitation and social injustices within the agrarian structure. The abolition of unproductive intermediaries, regulation of tenancy and redistribution of surplus land are some of the important land reform measures initiated in India since independence. These measures affect labour utilisation, job potentials productivity and distribution of gains in agriculture. Although various legislations have been enacted by almost all the states in India for improving tenancy conditions and for redistributing the surplus land of ceiling among the landless and the poor, their implementation have been tardy and unsatisfactory so far largely due to "resistance of the powerful landowning interests."²

For example, in Jalaun district, insecurity of tenure and high rates of rents are the two major problems of tenancy arrangements. The grant of land on oral lease and crop-sharing arrangements are widely in use in the district and land rents tend to be nearly one-half of the farm produce. The legal protection granted to tenants remained ineffective due to resumption of tenanted land for self cultivation or ejections through the device of voluntary

surrenders. In fact so long as share-cropping tenancies remain undetected or unrecognised, the tenants whose legal status is only that of a servant, remain seriously exposed to evictions and the provisions of land reform relating to security of tenure remain a dead-letter. Thus tenancy reforms could not score the marks of success as they were expected to do.

Land being an asset in almost absolute shortage should be rationed through ceiling and the surplus distributed to certain preferred categories such as landless labourers, marginal farmers and displaced tenants. Apart from social and equity considerations, ceiling on holdings is desirable for raising agricultural productivity and also for expanding job opportunities in agriculture. 'There is a tendency in most places for productivity to decline after the farm size exceeds 15 to 20 acres' Similarly, the small holdings having access to credit and other inputs, usually provide more employment per ha than the large holdings as discussed in Chap. IV.

Despite the various legislations enacted by almost all the states in India, the progress made in this sphere so far is indicative of their poor performance. For example, in Jalaun district an area of 18579 acres of land was estimated to become surplus as on 31st May, 1980 under the revised Ceiling Act of 1972. Land finally declared as surplus was 4012 acres and possession was taken over 3064 acres of land up to 31st May, 1980. An area of about 948 acres

1. A.M. Khuro, Economics of Land Reform and Farm Size in India, op.cit., pp. 22-23.
2. B.M. Bhatia, India's Deepening Economic Crisis, S. Chand & Co., New Delhi, 1974, p. 201.
of land declared as surplus could not be acquired due to stay orders by the courts or non-compliance of formalities. The actual land distributed under the Ceiling Act was 2221 acres as on 31st May, 1980. A better idea about the progress of Ceiling Act in Jalaun district can be had by the data given in Table 6.04.

**TABLE 6.04 : Progress of Land Ceiling in Jalaun District upto 31st May, 1980.**

<table>
<thead>
<tr>
<th>Tehsil</th>
<th>Land Finally Declared as Surplus</th>
<th>Surplus Land Taken Under Charge</th>
<th>Land Allocated to SC</th>
<th>Land Allocated to ST Landless AL</th>
<th>Land Allocated to Other Landless AL</th>
<th>Total Land Allotted &amp; Ownership Conferred</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jalaun</td>
<td>1011.75</td>
<td>455.34</td>
<td>186.10</td>
<td>51.68</td>
<td>237.78</td>
<td></td>
</tr>
<tr>
<td>Orai</td>
<td>905.42</td>
<td>783.58</td>
<td>321.71</td>
<td>82.54</td>
<td>404.25</td>
<td></td>
</tr>
<tr>
<td>Kalpi</td>
<td>1279.72</td>
<td>1264.19</td>
<td>1012.23</td>
<td>97.26</td>
<td>1109.49</td>
<td></td>
</tr>
<tr>
<td>Konch</td>
<td>815.53</td>
<td>560.54</td>
<td>371.06</td>
<td>98.58</td>
<td>469.64</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4012.42</td>
<td>3063.65</td>
<td>1891.10</td>
<td>330.06</td>
<td>2221.16</td>
<td></td>
</tr>
</tbody>
</table>

Source: Data compiled from the Office of District Ceiling Officer, Jalaun District, U.P.

The above Table shows that in the allotment of surplus land SC and ST landless AL have been given priority. They were recipient of 1891 acres of land representing about 85 per cent of the total land distributed. The land distributed was generally of poor quality. Moreover, in the absence of credit and other input facilities, mere allotment of land could not do much to improve their economic condition.
A review of the implementation of land Ceiling Act shows that a large landholder can escape the ceiling provisions by transferring his total land to different persons depending upon him in anyway to be held benami. It is tragic to find that "laws were frequently enacted with deliberate loopholes and tell-tale exemptions designed to induce fictitious transfer of land to close and distant relatives." ¹

Thus land reform measures in practice could not help much to the landless and the poor because benami transactions, rack renting, forced bonded labour, eviction of tenants and treating labourers as inanimate objects still continue in different parts of the country-side due to inadequate enforcement implementation and administrative machinery. 'Perhaps in no other sphere of national policy has the hiatus between promise and performance been so conspicuous as in sphere of land reform policy'. ²

To conclude then, the green revolution ushered in by the use of new technology has helped to increase employment, wages and real income of AL. While the new technology has expanded employment in the short run, in the long run with the adoption of mechanisation on a massive scale, there is a serious risk of negative employment effect from it. As a result of technological innovations money wages and real wages both have increased but increase in the latter has not


been very substantial. Although the new technology has increased the income of all sections of the farming community, a big proportion of gains has been appropriated by the large farmers and consequently it has increased income-inequalities between the different sections of rural population. Thus "the euphoria created by the green revolution has certainly given a boost to the economy of the country, but it remains to be seen if the social tensions which this very revolution has generated can be overcome and the energies of the less fortunate tillers canalised into higher production."¹

As regards land reform measures, various legislations have been enacted by the state governments for providing security of tenure to the tenants and also for distributing surplus land of ceiling to the landless AL and the poor, but their implementation so far has been tardy and unsatisfactory. Therefore, land reform measures should be implemented effectively for ensuring equitable distribution of the benefits of green revolution.