CHAPTER SIX

AGRICULTURAL POTENTIALITY

The assessment of the agricultural potentiality of the Brahmaputra valley is desirable in order to effect the launching of appropriate plans and their implementation for the improvement of agriculture in the region. With a view to explore the potentiality, it would be pertinent to discuss the potential of the physical and infrastructural facilities which has to be organised to set off towards a dynamic stage of agricultural development. It will also be appropriate to understand the priority given to agriculture and related aspects during the five year plans vis-a-vis the targets and achievements. The development of the agricultural resource base of the valley is an essential prerequisite to foster industrial development, to meet the food and non-food requirements of a numerically increasing population, and above all, to overcome some of the chronic problems incurred by seasonal, or total unemployment of the employable work force. Admittedly, the failure to achieve rapid agricultural growth on modern and scientific lines is partly due to some serious physical constraints, and due to inadequate development of the basic infrastructures which are so essential for a "take-off" stage in agriculture, industries and other sectors of the economy.
Brahmaputra Valley
Concentration of Culturable Waste Land
1976-77

INDEX TO DISTRICTS
1. Goalpara
2. Kamrup
3. Nagaon
4. Akhimup
5. Nagaon
6. Sibsagar
7. Dibrugarh

INDEX LOCATION QUOTIENT
> 2.00
1.00-2.00
< 1.00
Land potential

Reference has been made to the land resources of the valley in Chapter 4. Land is a key resource which should be properly managed, if full benefits are to be derived from its potential. With increasing human pressure on land there is an imperative need to bring new lands under cultivation, after reclamation of fallow lands. In 1976-77, the area under culturable waste, current fallow and other fallows shared 1,21,000 hectares, 93,000 hectares and 97,000 hectares of land respectively. Evidently, this means that about 3,11,000 hectares of land were lying unused at one point of time, which is 4.50 per cent of the total geographical area of the valley.

Focussing our attention on the culturable waste land we find that in 1976-77, it covered roughly 2.15 per cent of the total land area. The spatial concentration of such lands in the districts are not uniform. Applying the Location Quotient Index\(^1\) we get the figures presented in Table -1 (next page).

The table shows that the Lakhimpur district has the highest concentration of culturable waste lands followed by Nowgong (Map 49). It is also a paradox that Nowgong district being one of the district with highest density of

\[ \text{Location Quotient Index} = \frac{\text{percentage of culturable waste in a district}}{\text{percentage of culturable waste in Brahmaputra valley}} \]

\[ \text{percentage of culturable waste in the districts total geographical area}} \]

\[ \text{total geographical area of the valley}}. \]
Table -1
Concentration of culturable waste lands, 1976-77.

<table>
<thead>
<tr>
<th>DISTRICTS</th>
<th>Total geographical area (in sq.km)</th>
<th>Culturable waste lands</th>
<th>Location Quotient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area in thousand hectares</td>
<td>Percentage share in each district to valley's total</td>
<td></td>
</tr>
<tr>
<td>Goalpara</td>
<td>1,031</td>
<td>17</td>
<td>1.65</td>
</tr>
<tr>
<td>Kamrup</td>
<td>996</td>
<td>13</td>
<td>1.31</td>
</tr>
<tr>
<td>Darrang</td>
<td>872</td>
<td>15</td>
<td>1.72</td>
</tr>
<tr>
<td>Lakhimpur</td>
<td>565</td>
<td>25</td>
<td>4.42</td>
</tr>
<tr>
<td>Dibrugarh</td>
<td>702</td>
<td>15</td>
<td>2.14</td>
</tr>
<tr>
<td>Sibsagar</td>
<td>900</td>
<td>20</td>
<td>2.22</td>
</tr>
<tr>
<td>Nowgong</td>
<td>570</td>
<td>16</td>
<td>2.81</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>5,638</strong></td>
<td><strong>121</strong></td>
<td><strong>2.15</strong></td>
</tr>
<tr>
<td><strong>Brahmaputra valley</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

agricultural population has a sizeable area of culturable waste. The Kamrup district on the other hand, has the smallest share. This indicates that those districts which have large share of culturable waste lands possess sufficient potential for horizontal expansion of agricultural lands. It is pertinent to note that pending development of adequate all-season irrigation facilities, the horizontal expansion of cultivable lands is an urgent necessity, so as to grow crops during the monsoon season, and additionally to support the growing population with food and employment.
The existing potential of the culturable waste lands can be gainfully utilised, after reclamation by the farming cooperatives, or the Government agencies like the State Agriculture, Cooperative or Revenue Departments. The reclaimed lands should be distributed to the landless labourers, small and marginal farmers. This will have a beneficial effect in raising agricultural production, and providing employment to the rural people, who are either seasonally or chronically unemployed due to the small size of their holdings, or because they do not own any lands at all.

The under-utilization of the net area sown also merits attention of the agricultural planners. It is known that large areas in the valley are dependent on monsoon rains for their agricultural production. The low cropping intensity (123.21 per cent in 1976-77) in the valley also reflects that land is lying uncultivated in the non-monsoon season, except in areas which have some irrigation facilities. It is also to be noted that the areas having irrigation facilities are dominated by immigrants from Bangladesh - who are by and large confined to the 'chor' areas of the Brahmaputra and its banks. The Bangladeshis grow a variety of crops (chillies, vegetables, oilseeds and summer rice) during the rabi season. Also, the Nepali immigrant graziers grow maize, potatoes, and vegetables in the winter season. The indigenous farmers, except a few farmers who own large holdings (say, above 2 hectares),
do not grow any rabi crops (Refer Chapter 7 also). Those local farmers who grow rabi crops devote only a small part of their land for the same. The crops generally grown by them are vegetables, oilseeds, pulses and tapioca. Obviously then, it is mainly the immigrant population who have been able to realise the gross potentialities of the available land resources. The local farmers have only realised the net potentiality so far. This is a distressing situation, for the months between October-May is devoid of heavy rainfall and there is no threat of floods damaging the crops or eroding the land.

In intensifying our efforts to raise agricultural production and productivity, a proper focus is necessary on the importance of fertilisers in the cropping sequence. While irrigation is essential, the important role played by fertilisers cannot be dispelled. In fact, if our farmers are to be motivated to adopt the high yielding varieties, then a package of practices in the form of fertilisers, pesticides, insecticides, irrigation facilities, improved implements and technology and monetary inputs would become necessary. As things stand to-day, the fertiliser consumption in the valley is only a fraction of the all-India total. For example, in 1978-79, out of India’s total consumption of 5,113 thousand tonnes, the consumption in the valley was only 6,574 tonnes.  

Further, the consumption of fertilisers per unit of gross cropped area was 30.9 Kg/Ha at the all-India level, compared to a meagre 2.3 Kg/Ha in the valley. The valley's position compares unfavourably with the agriculturally advanced States of the country. For, in 1978-79, the consumption of fertilisers was 183 Kg/Ha in Pondicherry, 106.8 Kg/Ha in Punjab, 69.3 Kg/Ha in Tamil Nadu, 43.3 Kg/Ha in Uttar Pradesh and 30.6 Kg/Ha in West Bengal.

Several factors stand in the way of proper and adequate fertiliser utilisation. "Among them are soil, seed variety, season, time of planting, water management, pest control, cropping sequence, fertiliser sources and time and method of fertiliser applications". In order to get maximum benefit out of fertiliser application, it is of prime necessity to raise the fertiliser consumption from the present low level to higher standards. Admittedly, whatever fertiliser is given to the plants is likely to be leached or washed off during the heavy showers of the monsoon season. To compensate the loss and to secure better results, the farmers' should be supplied with adequate quantity of chemical fertilisers at nominal rates at the right time. At present, green manuring is done and the use of cow-dung is important. Admittedly the

5. ibid.
BRAHMAPUTRA VALLEY
FERTILISER CONSUMPTION AND GROSS CROPPED AREA

INDEX TO DISTRICTS
1. GOALPARA
2. KAMRUP
3. DARRANG
4. NOWGONG
5. SIBSAGAR
6. LAKHIMPUR
7. DIBRUGARH

INDEX

GROSS CROPPED AREA IN 1000 HECTARES
0
100
200
300
400
500
600
700
800

FERTILISER CONSUMPTION IN 1000 KILOGRAMS
0
500
1000
1500

districts of the valley, exhibit wide spatial variations in the fertiliser consumption pattern per unit of gross cropped area (Map 50). This is shown in Table -2 below:

Table - 2

Gross cropped area and fertiliser consumption

<table>
<thead>
<tr>
<th>DISTRICTS</th>
<th>Gross Cropped Area* (in Hectares)</th>
<th>Fertiliser Consumption** (in K)</th>
<th>In K/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goalpara</td>
<td>5,12,000</td>
<td>6,27,491</td>
<td>1.23</td>
</tr>
<tr>
<td>Kamrup</td>
<td>6,64,000</td>
<td>14,32,860</td>
<td>2.16</td>
</tr>
<tr>
<td>Darrang</td>
<td>4,54,000</td>
<td>11,06,146</td>
<td>2.44</td>
</tr>
<tr>
<td>Nowgong</td>
<td>3,87,000</td>
<td>6,49,036</td>
<td>1.58</td>
</tr>
<tr>
<td>Sibsagar</td>
<td>4,14,000</td>
<td>12,92,203</td>
<td>3.12</td>
</tr>
<tr>
<td>Lakhimpur</td>
<td>1,73,000</td>
<td>2,91,962</td>
<td>1.67</td>
</tr>
<tr>
<td>Dibrugarh</td>
<td>2,41,000</td>
<td>11,71,451</td>
<td>4.86</td>
</tr>
<tr>
<td>Brahmaputra valley</td>
<td>28,45,000</td>
<td>65,71,149</td>
<td>2.31</td>
</tr>
</tbody>
</table>


* Gross cropped area in 1976-77
** Fertiliser consumption in 1978-79.

The table shows that Dibrugarh district has the highest consumption of fertiliser among the districts of the valley, about 4.86 K/ha, and Goalpara the least, about 1.23 K/ha.
In general, only Darrang, Sibsagar and Dibrugarh districts have fertiliser consumption above the valley's average, while in the remaining four districts it is below the valley's average. Dibrugarh and Sibsagar districts by virtue of their proximity to the Namrup fertiliser factory has easy availability of fertilisers. In Darrang district, the fertiliser consumption has kept pace with the developed irrigation facilities. Admittedly, a large quantity of fertilisers is consumed by the tea gardens in Dibrugarh, Sibsagar and Darrang districts. Nevertheless, the fertiliser consumption in the valley is low due to non-availability of adequate quantity of fertilisers from within the State or from outside sources, as also, due to poor transportation, storage and ineffective public distribution facilities. Also, most farmers in the valley being small and poor, cannot afford the costly chemical fertilisers.

It is widely shared belief that natural manures like cow-dung, humus and human excreta give better results than chemical fertilisers. In reality, both natural and artificial fertilizing agents are equally beneficial, and their utility in increasing soil fertility should not be discriminated. Of course, it is true that different soils, and for that matter, different crops, respond differently to different kinds of fertilisers. Essentially, the main types of fertilisers which are used are those which supply nitrogen, lime and phosphates. Ammonium sulphate which supplies adequate
quantity of nitrogen to the soil is widely used for growing cereals, sugarcane, cotton and tea. Lime is used as a fertilising agent for the soil, particularly in heavy rainfall areas, where it is washed away due to its soluble nature, and needs to be replenished annually by artificial means. The other elements which are required in small amounts like boron, iron, magnesium, sulphur, zinc etc are usually present in the soil in traces.

However, in order to utilise the inherent fertility of the soils, the growth of weeds along with the standing crops, or, when the land is lying fallow (during the winter season), should not be allowed. For, the weeds tend to eat up valuable plant food and thereby impoverish the soil.

Water potential

The Brahmaputra valley receives sufficient quantity of rainfall (nearly 175 cm annually). Over 80 per cent of the rainfall occurs during the monsoon season from June to September. The distribution of rainfall, is however, not uniform over space and time. For whereas, the upper valley receives over 200 cm of rainfall annually, the Nowgong district lying in the rainshadow of the Jaintia Hills (Meghalaya) gets only about 110 cm. The monsoon rainfall is unpredictable from the point of its arrival and duration of its stay. In normal years, the amount of rainfall received by the valley is sufficient for growing different kharif crops, but, in the
rabi season when soil moisture deficit is high, artificial supply of water has to be resorted to for successful crop production.

At this stage it would be worthwhile to point out some of the achievements under the major and medium irrigation in the valley. The figures are presented in Table-3 below:

Table -3

Total potential, developed and utilized under the major and medium irrigation schemes in Brahmaputra Valley.

(Area in '000 Hectares)

<table>
<thead>
<tr>
<th>Name of irrigation scheme</th>
<th>District covered</th>
<th>Type</th>
<th>Gross Irrigation Potential</th>
<th>Total</th>
<th>Kharif</th>
<th>Rabi</th>
<th>Perennial</th>
<th>Developed</th>
<th>Utilized</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Jamuna (completed)</td>
<td>Nowgong</td>
<td>Run-off of the river flow (weir)</td>
<td>25.29</td>
<td>7.63</td>
<td>32.92</td>
<td>32.92</td>
<td>19.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Kumta-bore (near completion)</td>
<td>Nowgong</td>
<td>Lift from surface water</td>
<td>9.06</td>
<td>8.50</td>
<td>17.56</td>
<td>12.00</td>
<td>2.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Sukla (completed)</td>
<td>Kamrup</td>
<td>Run-off of the river flow</td>
<td>17.20</td>
<td>15.51</td>
<td>32.71</td>
<td>32.71</td>
<td>8.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Taglai-gaon/Rajabari (completed)</td>
<td>Goalpara</td>
<td>Lift from surface water</td>
<td>2.50</td>
<td>0.75</td>
<td>3.25</td>
<td>3.25</td>
<td>0.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Longa (completed)</td>
<td>Goalpara</td>
<td>Run-off of the river flow</td>
<td>5.00</td>
<td>4.56</td>
<td>9.56</td>
<td>7.26</td>
<td>2.50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The table indicates that so far very little has been achieved under the medium and minor irrigation schemes. The above irrigation projects referred to in table-3, covers Nowgong, Kamrup and Goalpara districts. As a result of the completion of the projects, the developed potential is little over 88,000 hectares, but, the utilized potential is only 24,100 hectares. This is an unwarranted situation, but at the same time inevitable; because, the farmers are not in a position to bear the expenses incurred by taking advantage of the available irrigation facilities. Another explanation for the poor utilisation of the developed potential is attributed to the fact that "the water courses and the field channels which were to be constructed by the beneficiaries themselves from Government outlets have not come up."  

Leaving aside the major and medium irrigation schemes, we find that even the minor ones have not received proper attention. This is evident from the poor utilisation of the tremendous potential of ground water resources. It is

estimated by the Central Ground Water Board (C.G.W.B.) that
the ground water potential of the Brahmaputra valley is
immense. The ground water potential is shown in Table-4 below:

Table -4
Ground water potential and feasibility of ground
water structures.

<table>
<thead>
<tr>
<th>DISTRICTS</th>
<th>Ground water potential (in million cubic metres)</th>
<th>Tentative number of ground water structures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Dug wells</td>
</tr>
<tr>
<td>Goalpara</td>
<td>1,970</td>
<td>31,900</td>
</tr>
<tr>
<td>Kamrup</td>
<td>1,606</td>
<td>48,200</td>
</tr>
<tr>
<td>Darrang</td>
<td>1,548</td>
<td>30,560</td>
</tr>
<tr>
<td>Nowgong</td>
<td>895</td>
<td>31,400</td>
</tr>
<tr>
<td>Sibsagar</td>
<td>1,626</td>
<td>38,400</td>
</tr>
<tr>
<td>Lakhimpur</td>
<td>630</td>
<td>15,400</td>
</tr>
<tr>
<td>Dibrugarh</td>
<td>1,205</td>
<td>22,000</td>
</tr>
<tr>
<td>Total :</td>
<td>9,480</td>
<td>2,77,860</td>
</tr>
<tr>
<td>Brahmaputra Valley</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source : - Report of the Central Task Force,

Considering the tremendous ground water potential,
the amount that has so far been utilised is meagre. This is
probably a true indication that the utilisation of the ground
water resources has hardly begun.
Taking into account the physical controls of location, physiography, climate, soils and the perennial problems of flood and earthquakes in the valley, the construction of costly dams, reservoirs and diversion canals would not be technically and financially feasible. Even the cost of erecting such large/medium irrigation schemes is beyond the financial ability of the local farmers; and considering the huge load of sediments brought down by the Brahmaputra and its tributaries, there is little scope for canal irrigation in the valley. This is because the irrigation channels will be silted up, and the valley does not offer sufficient gradient for the channels to flush out the detritus on its own. Again, the fluctuating volume of water in the rivers is likely to hinder the smooth functioning of the drainage channels. Moreover, except casual drought, water in kharif season (from rainfalls) is adequate in the valley for raising crops. But, for rabi cultivation artificial water supply is very essential when most of the rivers dwindle.

In the light of the above handicaps, it would be wise to go for a massive programme of ground water development; for the ground water offers the advantage of utilising the same only at specified times when water is essential for crop growth. This means that the supply of water to the crops can be regulated by the farmers, and no undesirable flooding of fields is necessary. In addition,
the problems of waterlogging and siltation can be
conveniently checked, if not totally eliminated. Moreover,
no costly headworks are necessary in the installation of
ground water structures. The wells can be bored by the
farmers individually or through collective efforts, as it
involves a relatively small capital expenditure (anything
between Rs. 4,000/- to Rs. 5,000/- per well). If the farmers
do not have their own capital to sink wells and energise
pumpsets, the money can be obtained from the financial
institutions. It may also be noted that the Assam Minor
Irrigation Development Corporation which was set up in 1980,
is engaged in the task of supplementing the farmers efforts
in tapping the available ground water potential.

At this stage it would be appropriate to have a
close scrutiny of the remarks made by the Central Task Force? which visited Assam in March, 1980. Those remarks have a
worthy and fitful bearing on the agricultural production in
the Brahmaputra valley. Evidently then, the valley should

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7. The Task Force led by Shri P. R. Dubhashi, Additional
Secretary in the Ministry of Agriculture reported thus;
"Ground water today has come to stay as the major
source of sustained irrigation and the potential created
through ground water is entirely available both for kharif
and rabi crops. In fact the "Green Revolution" in the
alluvial tracts of northwestern India and the deltaic
region of South India has come not by mere accident but
by the utilisation of the ground water resources. It would
not be an exaggeration to state the "Green Revolution"
is intimately linked with "Ground Water Revolution".
Obviously ground water utilisation has to be launched in
a very big way as a step towards increased agricultural
production". (Refer p.VII-17 of the Central Task Force
Report).
go for a massive programme of ground water development, by developing and utilising all available potentials. In order to qualify for utilising the developed ground water potential, there should be a strong sense of cooperation among the farmers' and, the land tenure system is to be restructured to give full authority to the owners and tenants to obtain liberal loans from the banks and other financial institutions including cooperatives.

It hardly seems necessary to point out that irrigation development and land development-cum-management are two sides of the same coin. Considering all aspects, it is essential for the State agriculture and irrigation departments, as also, the Central Ground Water Board to work in close unison in investigating, evaluating and monitoring the development and utilisation of the surface and ground water resources. Again, it must be admitted that the possibility of utilising surface water resources would be inefficient, for the major and medium irrigation projects have long gestation periods; but, the installation of ground water structures has the capacity to give sustained and beneficial returns within a reasonably short period of time.

However any scheme to utilise the ground water potential would require prior development of electricity – to energise pump sets for drawing water from wells, and supplying the same to the fields. It would thus be necessary to go for a comprehensive programme of Rural Electrification, to extend
electricity to different villages, distributed unevenly over a relatively homogeneous space. However, in the flood-prone areas where electricity cannot be provided by overhead transmission lines, it would be desirable to provide diesel operated pump sets to the villagers.

Irrigation development - both ground water and surface water, should be accorded a proper place in the scheme of agricultural planning and management. This is essential not only to maintain steady agricultural production, but also to raise yields per hectare and per unit of water utilised. This will give big boost to the agricultural base and the economy of the valley. It is also true that, through the development of irrigation facilities, the farmers will gain incentive to alter the cropping pattern from the present monocropping to raising of two or more crops throughout the year. Such an innovation in agriculture will induce the farmers to produce surplus food and cash crops over and above their subsistence needs. The surplus agricultural commodities can be sold in the market to feed the urban population. Above all, it should be remembered that mere development of irrigation facilities would be meaningless, unless the farmers learn to adopt suitable technologies, whereby they can reduce the exposure of crops to flood waters in the monsoon season.

Labour potential

Human labour is a vital factor in every stage of agricultural operations. The success of crop production
depends largely on the availability of sufficient workers
to carry on the farming operations, from the time of ploughing
the land to the harvesting stage on time.

However, the potentials of the labour force
engaged in agriculture in the Brahmaputra valley, have not
been fully utilised. The problem of disguised, and seasonal
unemployment still looms large in the rural areas. It is a
fact that farm labourers hold on to the land for earning
their livelihood, not because they are wanted, but due to the
absence of suitable non-farm jobs.

In a survey of 70 randomly selected farm households
it was found that almost all farm groups engage hired workers.
In the small farm group (below 2 hectares) it was found that
of a total of 26 farms, only 5 were employing hired workers.
In the next group (that is, 2-3 hectares), 12 farms out of
25 were employing hired workers. In the size group, 3-4 hectares,
there were 7 farms, and of them 5 were having hired workers.
In the last group (that is, above 4 hectares), 7 farms out of
a total of 12 were employing hired labour. This shows that due
to shortage of family labour, extra hands have to be hired to
carry on the farming operations. The scarcity of labour is felt
more during the peak periods of planting and harvesting.

It is also to be mentioned that the agricultural
labour force in the valley is inefficient, due to a variety
of reasons. Firstly, most farm operations are done by applying
bullock and manual labour. In the valley, most farmers own at best 2 or 3 bullocks, and only the large farmers own little more than that number. Some households in the rural areas do not own any bullocks of their own, and have to depend on others. Obviously, those farmers who do not have bullocks are unable to maintain timeliness in their agricultural operations, in general. Also, it should be noted that a pair of bullocks can at best be employed to work for 6 to 8 hours a day. They cannot be overworked, as their efficiency would reduce, and the output will under-weigh the amount of time and drudgery devoted in the fields by those draught animals, as also, by human beings.

Secondly, it is felt that the farmers are not able to work efficiently in their fields due to the hot and humid climate (of the monsoon months) which saps their vitality. This reduces their productive capacity because more man-hours have to be devoted to get a unit of work done—say, ploughing the field. Farm works also suffer during the periods of heavy monsoonal rainfall, as also, when storms occur.

Thirdly, due to generally poor irrigation facilities in the valley, the farmers have to wait for the monsoon rains to start their farming operations. The long wait sometimes results in unemployment of the employable work force. Similar situation prevails in the winter season. To overcome these problems and to provide employment and income to the farm labourers and cultivators, the development of irrigation
System to cover large areas needs serious attention. It is important to note that if irrigation facilities are developed, the farmers do not have to sit idle. This is because with the availability of assured and controlled water supply, the farmers will be able to intensify cropping, adopt high-yielding varieties of crops and go in for multiple cropping in a big way. All these demands intensive application of labour inputs to grow different crops within a short period of time. This will provide full time employment to the farmers in their fields at all seasons.

While theoretically, the above point seems sound within reasonable limits, yet, it must also be noted that such niceties cannot be dreamt of by the indigenous cultivators, so long as cheap farm labour continues to be available. These cheap labourers are no other than the swarms of Bangladeshis, who have made deep inroads into the agricultural economy of the valley, and the State as such. The unending flow of Mymensinghis and their voluntary offer to work at low wages in the lands of the large farmers (above 3 hectares) has retarded farm mechanisation in the valley. For, by offering to work at low wages, the exotic labourer lowers the cost of labour inputs on land, and thereby help the large farmers to earn big profits. On the other hand, the indigenous agricultural labourers do not get on-farm jobs and prefer to migrate to the towns in search of non-farm employment. Of course, today it is an admitted fact,
that the indigenous cultivators are not as hard-working and efficient as the Bangladeshis. The latter have been able to contribute much in the agricultural development of the areas, wherever they (the Bangladeshis) have settled. They have cleared jungles, marshy lands and forested areas in the 'chor' lands and have taken full benefits from the land.

The farmers of the valley are economically poor and technically ill-equipped to face the fluctuating conditions of market and natural calamities. The small-size of holdings in the valley are uneconomical for growing rice - the main staple crop of the valley's population. Moreover, the tiny holdings cannot provide adequate employment and income to the farmers owning such holdings. Admittedly, the 1971 World Agricultural Census Report on Assam reveals that there are 11 lakh operational holdings in Assam - each holding measuring less than one hectare. This clearly indicates that the farmers with such holdings are under-fed and under-employed. They are pure subsistence farmers, who are not able to invest anything on their land. To overcome the problem of unemployed labour force in the small and marginal holdings, the farmers have to substitute rice cultivation, for some other crops which requires more intensive application of labour like jute, sugarcane, pulses etc. Those crops will give higher yield per unit of land and higher income to the

8. Goswami, M. N. 'The Case for a special development programme for Assam', Souvenir (Silver Jubilee of the Assam Economic and Statistical Service Association), 1982, Guwahati, p.3.
farmers. This will result in the growth of income and employment. A part of the income can be invested again on the land, to obtain still better returns.

Turning on the employment effects of farm mechanisation we find that in the recent past iron plough, bullock drawn disc harrow, bullock drawn 4 row seed drill, dry land weeder, wet land weeder, wheeled hoe and hand hoe have been used by the small and marginal farmers. Tractors are used mainly in the tea gardens and power tillers are used only for small rice fields. "Sprayers, dusters, seed drills, wheeled hoe, prong cultivators (a type of improved plough) and the paddy threshers were also introduced but their adoption by the farmers is insignificant". It is to be noted that though these implements have increased labour productivity by reducing the time required for farm operations, yet, the productivity of crops has not shown any appreciable increase. And, because those implements are not easily available, their use on a wider scale by the farmers of the valley is restricted, and this makes it difficult to measure the efficiency of the implements.

Nevertheless, it must be emphasized that this 'intermediate technology' should be adopted by the farmers'


10. op. cit., p.60.
of the valley, specially those who cannot afford the
capital-intensive modern technology in agriculture. The
'intermediate technology' has the advantage of not
displacing human labour from agricultural operations. This
means, that the available labour force can be gainfully
employed in farming operations and the mode of production,
in the small farms, is likely to be more efficient.

Farm mechanisation, in the large holdings has been
extremely low. It is an accepted fact that mechanisation of
farm operations in large holdings, is not very likely even
in the near future, as long as cheap immigrant labourers
are available to work in them, at low wages.

If mechanisation of farm operations takes place
rapidly - both in the small and large farms, then there would
be a successive and gradual replacement of bullocks from the
routine farm operations. This of course, will not curtail the
demand for labour per hectare or per farm. 11 Obviously then,
the replacement of draught animals means that less area should

11. The impact of tractor mechanisation on employment of
bullock and human labour is evident from the table
presented below:

<table>
<thead>
<tr>
<th>Muzaffaragar (Uttar Pradesh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
</tr>
<tr>
<td>(i) Average number of</td>
</tr>
<tr>
<td>bullocks per farm</td>
</tr>
<tr>
<td>(ii) Average hired permanent</td>
</tr>
<tr>
<td>farm servants</td>
</tr>
<tr>
<td>(iii) Employment of casual</td>
</tr>
<tr>
<td>labour per hectare</td>
</tr>
<tr>
<td>(man days)</td>
</tr>
</tbody>
</table>

Source: - "Mechanisation of Farming in India", Paper prepared
by Roshan Singh and B.B. Singh for the Seminar on
Farm Mechanisation, Vallabh Vidyanagar, July 24-26, 1970.
be devoted to fodder crops and pastures. This means that this additional area can be brought under cultivation of food and cash crops. This will result in a gross increase of production per unit of land, labour and time.

Perhaps, one feels that it is the ingenuity and perception of the by and large poor rural masses of the valley, that agriculture is their sole occupation. This is relevant, particularly, if examined in the background of the several risks and uncertainties of weather, climate, floods, droughts, storms, pests, diseases and the infrastructural drawbacks (poor roads, power and markets) that so seriously affect agricultural activities and production levels. Surely risk taking is a hazardous task, but, the farmers of the valley have been able to overcome those hazards and psychological fears through several years of experience. This itself provides a potential base, in addition to the vast natural resources, for future agricultural innovations in the valley.

Agriculture during the Five Year Plans

A quick assessment of agricultural performance in Assam as a whole, during the successive five year plans and the annual plan periods are referred to below: 11

During the First Five Year plan (1951-52 to 1955-56) emphasis was made on the adoption of improved seeds,

11. Quick Evaluation Study of the Impact of Agricultural Schemes taken up under the plans on production and adoption of improved methods of cultivation in the State, Evaluation Report No.73, Planning and Development Department, Govt. of Assam, Guwahati, 1979, pp.1-12.
development of irrigation facilities and adoption of sound agricultural practices. As a result rice production was 15.41 lakh tonnes in 1955-56. The production of other crops also increased and the State emerged as an exporter of foodgrains to the neighbouring States.

In the Second Plan (1955-56 to 1960-61), stress was laid on development of minor irrigation and use of manures and fertilisers. Rice production increased to 16.33 lakh tons in 1960-61. The increased production was due to new areas being brought under cultivation and not due to increase of yield per hectare.

In the Third Plan (1961-62 to 1965-66) agricultural production was sought to be stepped up, but due to adverse weather conditions, the yield of major crops viz. paddy, jute, sugarcane and oilseeds actually declined. Rice production went up by 4.9 per cent over the 1960-61 levels. To step up agricultural production, the Intensive Agricultural Development Programme (I.A.D.P.) was taken up in Goalpara, Darrang, Nowgong and Sibsagar districts.

Between 1966-67 and 1968-69, the ad-hoc Annual Plans were in operation. A number of blocks were selected for intensive development of rice and jute. Few high-yielding varieties of seeds such as Tisung, Manohar Sali, I.R.-8 and Mexican variety of wheat were introduced. A lift irrigation scheme was developed at Mayong in Nowgong district.
The major thrust of the Fourth Plan (1969-70 to 1973-74) was to step up foodgrain production, and also of plantation and horticultural crops. Wheat cultivation was started in a big way in 1972-73, in the flood-affected areas. Consequently, the area under wheat increased from 6.5 thousand hectares to 48,000 hectares in 1973-74. Agricultural production increased due to the increase of gross cultivated area, but the increase of production was marginal due to bad weather conditions and rising prices of most inputs.

In the Fifth Plan period (1974-75 to 1977-78), the extension of area under irrigation to grow rabi crops, and adoption of multiple cropping practices gained priority. Foodgrain production was sought to be increased at the rate of 10 per cent per annum. Rabi cultivation was undertaken in the flood-affected areas, with the help of irrigation. The cultivation of high-yielding variety ahu paddy, which could be harvested before the onset of the monsoon season formed a part of the cropping strategy. After the flood water receded, cultivation of short duration sali paddy was popularised among the farmers. Basically, the strategy of this plan was on cultivation of high-yielding varieties in place of the traditional varieties, by using a package of practices; and adopting a rabi-oriented cropping pattern in the flood-prone areas.
Agricultural Marketing

The surplus agricultural produce of the farmers is generally sold in the weekly/bi-weekly markets, locally called 'Hats'. The middlemen traders usually collect the goods from the petty farmers from these markets for wholesale trading.

In the valley, very little agricultural produce enters the market centres. Taking the example of paddy, the most important staple food of the people in the Brahmaputra valley, we find that only about 25 per cent of the total annual production is marketed by the farmers. A field study conducted in the Nongong district by the Department of Agricultural Economics of the Assam Agricultural University, Jorhat, reveals that paddy was marketed both by the small and large farmers (see Table-5 below). The large farmers, of course, contributed the greater part of the share.

Table -5

Percentage of marketed surplus of paddy in Nongong district by size groups of farms

<table>
<thead>
<tr>
<th>Farm size (in Hectares)</th>
<th>No. of farms</th>
<th>Total paddy production (in quintals)</th>
<th>Sale of paddy (in quintals)</th>
<th>Percentage marketed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upto 1.00</td>
<td>6</td>
<td>105.85</td>
<td>16.90</td>
<td>15.97</td>
</tr>
<tr>
<td>1.01-1.50</td>
<td>7</td>
<td>138.00</td>
<td>41.90</td>
<td>30.36</td>
</tr>
<tr>
<td>1.51-2.50</td>
<td>14</td>
<td>448.80</td>
<td>84.00</td>
<td>18.89</td>
</tr>
<tr>
<td>2.51-4.00</td>
<td>13</td>
<td>580.10</td>
<td>152.28</td>
<td>26.25</td>
</tr>
<tr>
<td>Above 4.00</td>
<td>10</td>
<td>813.30</td>
<td>220.70</td>
<td>27.14</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>2,082.05</td>
<td>575.78</td>
<td>24.77</td>
</tr>
</tbody>
</table>

Source (Table-5) :- Field Survey by the Department of Agricultural Economics, Assam Agricultural University, Jorhat.

Note: - Estimated from sample drawn from 15 villages of Nowgong district of Assam for 1981-82.

It should be noted that the small farmers sell their crop immediately after harvest when paddy prices are low. This is unavoidable, because the farmers are economically poor, and their immediate cash requirements are high. The large farmers, however, hold back the paddy till the post harvest stage and obtain higher prices later. It is also a fact that most of the marketing of paddy takes place through the hands of middlemen, who corner bulk of the profits at the expense of the poor farmers. This is because, "the Government procurement price of paddy in Assam at the present period is very low being 23,467 and 24,531 tonnes by F.C.I. and S.T.A.T.F.E.D., respectively in 1979 (Statistical Handbook, 1980, Govt. of Assam, p.367). It is only about one-twelfth of the total paddy marketed in Assam". Further, the procurement price is lower than the market price. In July 1982, in areas around Jorhat, it was found that the procurement price of paddy was Rs. 105 to Rs. 115 per quintal, whereas, the prevailing prices was above Rs. 200.00 per quintal.

14. ibid, p.4.
Turning to mustard, an important commercial crop of the valley, we find that a large part of the produce is marketed. Only a small part is left aside for extracting oil in Ghanis, for home consumption. Admittedly, a study carried out in the Majuli development block — an important oil seed producing area of the valley, indicates that nearly 87 per cent of the total mustard production is marketed. The small-size farm group sell out about 80 per cent of their produce, the medium ones 87.5 per cent and the large size nearly 90 per cent. Further, it has been found that there was wide seasonal fluctuation of mustard prices (Rs. 1.16 to Rs. 227.60p per quintal) between May and December. The prices of mustard oil generally falls at the time of harvest of mustard crop. This means that the prices of mustard seeds also falls. Further, due to storage difficulty and the possibility of deterioration of quality, the farmers prefer to sell immediately after harvest. The mustard seeds are procured by the oil mill owners through their commission agents in the villages. The prices paid to the farmers were much less than the prices prevailing in the urban markets.

15. Pathak, S., 1976, Production and Marketing Pattern of Mustard: A Case Study in Majuli Development Block (Sibsagar), Department of Agricultural Economics, Assam Agricultural University, Jorhat, p.42.
17. The S.T.A.T.F.E.D. also procures mustard seeds from the mustard growing areas of the Brahmaputra valley.
In the case of jute also, it is observed that bulk of the production goes out of the valley to feed the jute mills in the Hooghly industrial region. The prices paid to the jute growers depends on the wholesale price of the commodity in jute market of Calcutta. For instance, the price received by the jute grower is Rs. 155 per quintal in Howli, and the wholesale price at Calcutta is Rs. 188 per quintal (Handbook on Market Intelligence, 1979-80, Govt. of Assam, p.26). The wholesale price at Calcutta is inclusive of the whole seller's margin of profit of Rs. 10 per quintal. In recent years, the Jute Corporation of India and the S.T.A.T.F.E.D. procures jute from the jute growers. The latter procures jute directly from the village level cooperative societies.

The above description of the marketing system of paddy, mustard and jute gives only a partial view of the agricultural marketing situation in the valley. Bulk of the trade in agricultural commodity takes place outside the orbit of government approved agencies. Admittedly, "the mode of sales of agricultural commodities in rural markets of Assam consist of mostly by negotiation between buyers and sellers combined with open inspection". 18 This system of marketing pays scant attention to the producers' interests,

18. Handbook of Market Intelligence, Assam, 1979-80, Deputy Director of Agriculture (Marketing), Govt. of Assam, Gauhati, p.21.
for the producers do not get remunerative prices for their commodities. Of course, they (that is, the producers) are also handicapped by the absence of basic infrastructures like storage and transport facilities, insufficient prior information on market arrivals of different commodities, and their prevailing prices in the nearby urban market centres.

**Agricultural Base of Industrial Development**

The Brahmaputra valley with rich and diverse agricultural resource base, is capable of providing adequate quantity of food for the people and raw materials for the industries. Leaving aside the three oil-refineries, and the tea industry which give employment to a large number of persons, the industrial landscape of the valley is blank. There are few other industries like fertilizer factory at Namrup, sugar mill at Baruabamongaon (near Dergaon), a paper mill and spun silk mill at Jagiroad, aluminium factory at Bongaigaon, paper mills at Jogighopa and Jagiroad, and match factory at Dhubri, besides a few agro-based, forest-based, engineering and handloom units (in the rural areas). But, those industries have not been able to contribute much to the industrialisation of the valley.

Concurrently, with numerical increase of population, there has been growing pressure of population on land. The number of landless labourers has increased, and
the number of small and marginal farmers too has risen manifold. Side by side, the per capita holding size has been declining.\textsuperscript{19} Evidently, the number of people who can find suitable on-farm employment is restricted to a few only. To check the exodus of surplus labour force to the urban areas, and to provide them with suitable employment and income in the villages, the importance of developing suitable resource-based industries cannot be ignored. It is here that the agro-based industries, and the agri-business sectors have a vital role to play.

It seems reasonable to state that agro-industries like oil, flour, rice, sugar and jute mills have good prospects of development in the valley. The Central Task Force in their report have offered valuable guidelines for setting up agro-industries in the valley. For example, it has suggested the raising of the installed capacity of the cooperative sugar factory at Baruabamungaon from 1,000 tonnes per annum to 2,000 tonnes.\textsuperscript{20} As per the suggestions of the

\begin{table}
\centering
\begin{tabular}{|c|c|c|c|}
\hline
Year & Quantity of cane crushed (lakh tonnes) & Quantity of sugar produced (lakh tonnes) & Recovery per cent \tabularnewline
\hline
1976-77 & 0.83 & 0.07 & 8.00 \tabularnewline
1977-78 & 0.74 & 0.06 & 8.68 \tabularnewline
1978-79 & 1.038 & 0.084 & 8.17 \tabularnewline
\hline
\end{tabular}
\caption{The working of the sugarcane factory between 1976-77 and 1978-79 are given below:}
\end{table}

\textsuperscript{19} The per capita holding size in Assam was 1.47 hectares in 1970-71, and this decreased to 1.37 hectares in 1976-77.
\textsuperscript{20} The working of the sugarcane factory between 1976-77 and 1978-79 are given below:

Task Force, a sugar mill is being set up at Kampur (Nowgong district) in the cooperative sector. Considering the large production of oilseeds in the valley, the S.T.A.T.F.E.D. (Assam State Consumer and Marketing Federation) has proposed to set up 10 mustard oil producing units. Each unit would have 10 to 12 tonnes per day capacity. The proposed units are to be located in Lanka and Dabaka (Nowgong sub-division), Kharupetia (2 numbers) (Majuli sub-division), Abhayapuri (Goalpara sub-division), Majuli (Jorhat sub-division), Golaghat (Golaghat sub-division), Bihpuria (North Lakhimpur sub-division), Tamulpur (Nalbari sub-division) and Gauhati (Gauhati sub-division).

To feed the agro-industries with raw materials, the intensification of agriculture and diversification of agricultural practices is necessary. This will help in absorbing the surplus labour force in agriculture, and thereby raise productivity per labour. The wage level of the labourers will also increase simultaneously. Also indicative is that the generation of higher incomes in the farm sector will induce the development of non-farm sector in the countryside.

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21. A State Government enquiry report revealed that sugarcane production was 2.91 lakh tonnes in an area of 8,100 hectares within a radius of 40 km of the proposed unit.


23. Estimate of Rural Un-employment in Assam, Planning and Development Department (Manpower Wing), Govt. of Assam, Gauhati, June, 1978, p.19.
there would be more demand for various inputs like fertilizers, pesticides, insecticides, power tillers, sprayers and other implements. On the other hand, if agricultural production rises, the surplus can be sold in the markets. The handling of various inputs and outputs will generate considerable agri-business employment opportunities for the valley's population.

It can be asserted here that the "processing of agricultural commodities through captive units set up by growers cooperatives have an important role in providing remunerative prices to growers by manufacturing value added materials, besides generating employment in the rural areas." \(^{24}\)