CHAPTER XIII

OTHER AGRICULTURAL PROBLEMS AND THEIR SOLUTIONS

In the preceding chapters we examined in details certain fundamental problems of agriculture as associated with the control of floods and famines and with the improvement of irrigational facilities. Some other problems still remain to be examined for their timely and effective solutions without which much of the agricultural situation in Bundelkhand would remain static. These are the problems connected with erosion, exhaustion and conservation of soils, eradication of weeds, checking sub-division and fragmentation of holdings, effecting improvement of seeds and of agricultural marketing and reducing rural indebtedness etc.

Problems of Soils in Bundelkhand

The most important factor responsible for many-sided problems of our soils is in terms of our ignorance of the basic fact that we regard soil as some static reserve of plant food. Instead, we should consider it as a sensitive, vital and dynamic whole, having characteristics, functions and possibilities in relation to crop production, which are certain to be changed by man's interference and which, too
often, are thereby altered for the worse.\(^{(1)}\)

Erosion of soils is a natural phenomenon. It has been going on since the beginning of earth's history. It is this phenomena of erosion and subsequent deposition, that has given us extensive alluvial plains of high fertility. In the past both erosion and deposition were usually slow but constant processes. The difference between natural erosion and one initiated by man, lies in the fact that while in Nature there is always some order or balance, it is sometimes totally absent in human activities which are essentially selective.

Soil erosion is of two types viz. gully erosion and sheet erosion. In Bundelkhand the former is most extensive. Rivers with their numerous tributaries and sub-tributaries are principal agents responsible for extensive gullyng. They have carved out, in India, about three million hectares of ravine-lands, which are constantly expanding at a rate of about 300 acres a year in Madhya Pradesh alone. Much of this area lies in Bundelkhand. Ravine-lands here, form compact mass of areas along such streams as Pahuj, Betwa, Yamuna, Dhasan and Ken, specially in their lower vallies. Before we discuss the lines of action to be followed in the region, it would be desirable to review the work of soil erosion and conservation in U.S.S.R. and Japan.

\(^{(1)}\) Jones & Bryan: North America (Mathuen, N.Y.) 1950, p.168
413.

**Soil Conservation Work in U.S.S.R. and Japan**

In U.S.S.R. the policy of 'Collectivisation' has given much impetus to the study and methods of checking soil-erosion. Special mention may be made of the valuable contribution made by Novosil Station to the study of 'spent lands' which are badly eroded lands adjoining water courses. They are full of gullies and hollows. The significance of these spent lands (similar to ravines) lies not so much in their uselessness as their destructiveness. They act as foci from which erosion spreads, both in length and breadth on an alarming scale. Slope permits them to receive full and destructive force of the run-off from higher parts. Gullies multiply in all dimensions and these in turn, speed up erosion. The government of U.S.S.R., therefore, rightly associates the problem of such spent-lands with the problem of drainage and run-off. The measures so far taken suggest at the minimisation of the rate of run-off by levelling the land, prohibition of over-grazing and deforestation; gullies are also being dammed at suitable places.

Japan, with highly erodible soils and topography affords another example in combating soil erosion in the face of torrential rainfall. Here the real problem is not so much to check soil-erosion from the steep slopes, for their own sake, but to save rice lands in the valley from excessive
deposition of debris from above. Every bit of slope has, therefore, been carefully terraced at an interval of five feet. Hill sides of these terraces have been planted with grasses to keep them fixed and to check debris more effectively.

**General Principles of Erosion Control**

These two examples will suffice to suggest that there are in general, two principles on which the work of erosion control must be based. These are (1) Plantation of suitable natural vegetation on the eroding surface and (2) Establishment of base level of erosion i.e. check-dams etc. In Bundelkhand both these are essential and they have been endorsed by the Wing of the Board of Agricultural and Animal Husbandry in India (1935) and the Usar Land Reclamation Committee for Uttar Pradesh (1938-39).

According to the Crops and Soils Wing of the Board of Agriculture and Animal Husbandry in India, held at Lucknow in 1935, commercial timber plantation in ravines is not possible owing to the presence of impermeable strata of kankarpans and unfavourable climatic conditions, but erosion and rate of run-off can be greatly reduced by control and regulation of grazing by domestic animals. This would not only ensure the improvement of quality and quantity of fodder grasses but also check soil erosion most effectively.
Experiments in Yamuna-Chambal Ravines

Experiments carried out in Yamuna-Chambal ravines in Agra district suggest that closure to grazing enormously improves the quality and quantity of grasses, shrubs, and trees. These in turn put a natural and effective check on soil erosion. Overgrazing on the other hand deteriorates both quality and quantity of fodders and enhances the rate of erosion. Therefore, grass cutting twice or thrice a year should be preferred to direct grazing. Based on these observations Usar Reclamation Committee of Uttar Pradesh recommended two acres of grazing area per cow. Goat, which is very destructive, has been strictly prohibited from the ravines. (1) These recommendations may be applied with maximum profit in the region under study. Experiments on run-off carried out by Irrigation Department in Bundelkhand region also establish that when area is covered with natural cover run-off is only 25% but when without it, it may be as high as 75% of the total volume of rain water. (2) Thus the problem of ravines by extensive soil erosion and improvement of fodder situation may be tackled simultaneously simply by protecting natural cover where it has been already established and encouraging its growth where it has been partially or totally destroyed.


(2) Ibid, p.
Bundling

Further measures to improve the cultivated land bordering the ravines may be taken up by large-scale bunding for which Provincial governments have established Soil Conservation Departments in each district of the region. These departments are now busy in selecting villages, surveying and bunding them. Following table gives the area so far improved by bunding in Chhatarpur, Panna, Hamirpur and Jalaun, Banda districts:-(1)

<table>
<thead>
<tr>
<th>District</th>
<th>Total area in acres</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chhatarpur</td>
<td>32,331</td>
<td>1961-1966</td>
</tr>
<tr>
<td>Panna</td>
<td>21,260</td>
<td>1961-1966</td>
</tr>
<tr>
<td>Hamirpur</td>
<td>2,000</td>
<td>1963-1964</td>
</tr>
<tr>
<td>Jalaun</td>
<td>55,583</td>
<td>1963-1966</td>
</tr>
<tr>
<td>Banda</td>
<td>2,731</td>
<td>1963-1964</td>
</tr>
</tbody>
</table>

It may, therefore, be seen that much work has still to be done. According to the Soil Conservator of Orai (Jalaun)

(1) Courtesy: Soil Conservators of Chhatarpur, Panna, Hamirpur, Jalaun and Banda.
about 6 lakh acres of land in district Jalaun needs bunding. Likewise extensive areas in other districts may be improved by bunding and other methods of soil conservation. This would need substantial grants of money which are generally not coming forth in view of the economic crisis through which our country is passing at present. The farmers, therefore, must come forward to learn the techniques of soil conservation and apply them in their fields. If soil erosion is arrested in the field itself, the problem of soil erosion at the regional level, which assumes serious proportions later, would be subjected to drastic demunition. The countrymen must realise that no government can undertake the entire responsibility of saving every inch of fertile land from erosion which is so extensive in our country. At best it can and must provide technical assistance in the matter, but the initiative must come from the farmers themselves.

Further, even when measures to protect an area from soil erosion have once been taken, the problem does not end there. "Erosion control takes on the nature of a great game of chess. The forest engineer, after studying and mapping his eroding valley, locates and builds one or more check-dams. This is his move. He then waits to see what the responses of the natural forces are. -- The response of the natural forces determine engineer's next move which may be another dam
or two or an increase of the height of the former dam or the construction of side-retaining walls. After another pause next move is made and so on until erosion is checkmated. The game takes on a lively interest. The operation of natural forces of sedimentation, plant succession and revegetation must be guided and used to the best advantage to keep the cost of his expensive work down to minimum and to practical operations. (1) In other words, strict and constant vigilance is needed to contain and foil the game of destructive forces responsible for soil erosion. This must be borne in mind by the farmers in order to act in time.

**Problem of Soil Depletion**

To a very great extent the problem of soil depletion is tied up with the question of soil erosion. When top soils are eroded and washed away, layers of exhausted soils, which are deficient in plant-foods, are left behind. That fertility can always be restored by applying some huge quantity of artificial fertilisers, has now been shattered by the recognition of the fact that fertility is not merely a matter of plant food-supply but is also connected with the soil stability. An exhausted soil is unstable and Nature has no further use of it than to remove it bodily. It, therefore,

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(1) Report of the Usar Land Reclamation Committee, U.P. Dep. cit. p. 84
means that if soil erosion could be checked, fertility can be preserved to a great extent except when adequate quantity of artificial fertilisers is not used or defective crop-rotation or no rotation is adopted.

In Bundelkhand most of the soils may be regarded as old and exhausted owing to the high rate of soil erosion and the system of continuous cropping on some of them. In Banda the so-called 'Patha Soils' constitute a group of thin soils covering the plateau-tops and their escarpments. Extensive areas of granite country also come in this category. These are examples of badly exhausted soils. Original fertility (and therefore productive capacity) of northern Trans-Yamuna region has also been largely reduced by continuous cropping. Thanks to the system of diversified cropping pattern which did not permit its total destruction.

Following steps should be taken to put an end to the problem of soil exhaustion:

1. Soil erosion should be checked on the lines as indicated in the preceding section.

2. Adequate quantity of suitable fertilisers should be applied in the fields after their soils are properly analysed (with the help of soil scientists) and their deficiencies determined.
3. A scientific crop-rotation, with full consideration of local conditions, should be evolved and adopted.

4. Deep ploughing should be preferred, so that hard pans in the sub-soil zones be broken and deeper layers of the soils are turned over. This will bring on to the surface such elements of plant food as were lost through leaching.

5. Timely guidance should be taken from local or regional officials of the Agriculture Department on matters of agricultural importance.

Here again, the government should provide to the farmers with sufficient quota of chemical fertilisers and manures and make available to them improved types of agricultural implements. The rest of the work should be done by the farmers themselves.

The Problem of Weeds and Their Solution

Weeds are second only to soil erosion in the natural losses to agriculture. Weed has been defined as 'a plant out of place'. Growing separately, they may be very useful for conserving eroding soils and providing fodder to the cattle, but they are a menace when they grow along with the field crops. They eat away the entire plant foods which the farmers adds into the field for his crops.
Weeds are generally classed into three categories. They are: Annuals, Biennials and Perennials. Of these the most dangerous are perennials which take on an epidemic form and are difficult to eradicate even at high operational cost. In Bundelkhand one such noxious weed is 'kans' (*Saccharum spontaneum*).

**Kans and the Problem of its Eradication**

*Kans* in itself is a very useful kind of grass. It is an excellent fixer of shifting sand and unstable soils. Its leaves provide a very good material for thatching (hence often called thatching grass) and for making mats, screens and brooms. Ropes made from its fibre are very strong and are used even in Persian wheels. In its early stage it forms good fodder for buffaloes. Viewed from the agricultural point, however, it is an epidemic in its worst form.

*Kans* is a perennial grass with a very deep system of roots. Once it is established, it spreads like wild fire and defies all measures of its eradication. It throws huge parcels of cultivated land completely out of cultivation. This grass specially grows on black soils under humid conditions. Black soil areas of Jhansi, Banda, Tikamgarh and Hamirpur are specially infested with it. In periods of droughts, however, it dies out automatically.
The magnitude of the problem of 'kans' can be realised by the fact that the settlement reports of Jhansi, Hamirpur and Jalaun districts alone recorded more than two lakh acres of kans infested land in them. Jhansi had always been considered to be worst effected. At the time of its final settlement in the year 1947, kans occupied roughly 6% of the total cultivable area or 14% of the net area sown in Jhansi in that year. Report of the Congress Agrarian Reforms Committee (1949) gave the acreage of kans in Jhansi district as 250,000 of which 66,000 acres were in Mahroni tahsil alone.

Since the roots of kans are deep (4 to 5 ft.) and tenaceous, it is manifestly clear that its eradication is only possible through deep ploughing which is impossible with the help of the ordinary country plough. Only tractors can do this job.

**Kans eradication scheme in Mahroni tahsil**

In order to deal with the serious situation caused by ever expanding area under kans, the government of Uttar Pradesh in the year 1943 selected 14 villages for launching their eradication scheme. These villages had altogether about 10,000 acres under kans infestation. For operational purposes, seventeen tractors were obtained from the Central Government Tractor Organisation. Subsequently

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(1) Final Settlement Report of Jhansi Distt., 1947, p. 11
8 more villages were included in the scheme. The work started in March 1948 without sufficient survey of the area and the nature of soils there. As a result of this tractors were badly damaged, a few beyond repairs and were sent to Delhi. This held up the work. It was further held up by shortage of fuel. As a result of these difficulties the expenditure per acre, rose high i.e. Rs. 40/-. Out of this cultivators, whose fields were cleared of kans, were asked to pay Rs. 13/- only. Even this amount was not easily paid by the farmers who made inordinate delays in payment. Later on, cooperative societies of multipurpose type were started in these villages for facilities of credit and for looking after better methods of farming, dairying and marketing. The fences of the holdings were broken down to make them economical. Lands were pooled for joint action of the village community but their rights were kept in tact.

**Solutions**

This description of the co-operative farms at Paruna and Nanwara in the Mahroni tahsil serves to indicate the problems involved in the eradication of the kans. It is only with the fullest co-operation of farmers (in order to pool all their resources) that the war can be waged successfully against this great epidemic.
There is a general belief among the regional peasantry that natural destruction of kans takes place in a cyclic order. It is reputed to die automatically in a period from 12 to 20 years.\(^1\) To be sure no farmer can keep his land fallow for such a long time. Besides, this may permit kans to spread to more fields which may be permanently abandoned for the cultivation of wheat. Wheat is specially very susceptible to kans. While crops like jowar and gram may be grown to some extent, wheat cannot.

One of the cheapest and the best ways of checking the spread of kans is to erect kuchcha mud walls (3 to 4 ft. high) around the field. These fences act as barriers to the lateral expansion of the roots of this grass. They also check import of seed-bearing blossoms by wind. In the rainy season, if this walled field is temporarily turned into a tank, it will decay the roots and the seeds of this weed (for want of aeration) and destroy them. It may be noted with considerable interest that kans never grows in the tank areas.\(^2\) When dry, the field must be ploughed with unusual care and as many times as possible so that the weed does not get a chance to establish itself.

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\(^1\) District Gazetteer, Vol. XXII, Hamirpur District, p. 11

\(^2\) Report of Indian Irrigation Commission (1901-02), Evidence of Mr. Ferrard on Banda, p. 75
Sub-division and Fragmentation of Holdings:

Reference to the question of sub-division and fragmentation of holdings has already been made in Chapter VI, in which this phenomena was viewed from the angle of growing population of the region. Further reference to this question was made in the summary report of the village surveys. Therein it was shown that roughly 60% of the agricultural holdings in these villages were of less than one acre in size. In the following lines we propose to deal further into their causes and effects in Bundelkhand.

Causes of sub-division and fragmentation

There are three well-known causes of this phenomena and these are universal throughout India. These are: (a) Growing pressure of population, (2) Decline of rural industries and (3) Laws of succession. We have already examined, in the Chapter on Population, the effects of rapidly expanding population on the size of farm as well as on per capita share of agricultural land. These need not be repeated here.

Decline of village industries and lack of opportunities for alternative jobs are also important causes for sub-division of land in Bundelkhand. In the past, the village community largely relied on the local artisans and craftsmen for meeting out their daily needs of life. Cottage industries,
which were mostly found in the villages, flourished, but owing to the detrimental effect of machine-made foreign goods, these gradually declined in the days of British rule. Eventually, the village artisans had to look out for alternative jobs. While majority of them migrated to the nearby towns, others took to farming. Rest of them became either landless labourer or went completely out of employment. Those who inherited agricultural land got it divided among brothers for their livelihood and became solely dependent on it.

Laws of succession, though important, are not to be regarded as the root causes of sub-division of land. These were also in operation in the ancient times, but land was never so badly divided as at present. In the modern period of economic crisis, however, these laws have become an important instrument of division of land.

Hindus, who form majority in Bundelkhand practise a system in which father is the absolute owner of the land property, both ancestral and self-earned and on his death all of his sons get equal share in the property. With the passing of Hindu Code Bill, the daughters have also become owners of their proportionate share like brothers.

Under Muslim law of inheritance, the property is divided among a large number of heirs, including sons, daughters and parents.
It is thus clear that our laws of inheritance permit large number of heirs as against 'only one recognised by the western laws'. This is a fundamental cause of sub-division of holdings in the present times.

The cumulative effects of these forces and factors may be seen on the size of farms as shown in the village maps. Particular notice may be given to the map of village Bijoli (Plate XXIV). This part of the village represents the only area which is suitable for cultivation. It is here that every farmer attempted to own the land. Consequently, it has been parcelled out into tiny fields by subsequent sub-divisions; so small are some of the plots that any further reduction of the size of the map must have obliterated their drawings from it.

Evils of Fragmentation

Small size of agricultural plot means small out-put, small income, low investing power, no use of machinery and difficulties in irrigation. Anuragi's(1) investigations may be cited here in order to show the relationship between size of holdings and levels of income in Hamirpur district.

His findings have been recorded in the following table.

Table No. LX

<table>
<thead>
<tr>
<th>Size of Holdings in Gohad Block (Hamirpur)</th>
<th>Percentage</th>
<th>Cropping intensity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 2.5 acres</td>
<td>32.87</td>
<td>164</td>
</tr>
<tr>
<td>2.5 to 5.0 acres</td>
<td>28.52</td>
<td>152</td>
</tr>
<tr>
<td>5.0 to 7.5 acres</td>
<td>16.23</td>
<td>132</td>
</tr>
<tr>
<td>7.5 to 10.0 acres</td>
<td>8.52</td>
<td>130</td>
</tr>
<tr>
<td>Above 10.0 acres</td>
<td>13.34</td>
<td>124</td>
</tr>
</tbody>
</table>

Even when we see that cropping intensity increases inversely with the decreasing size of the holdings, their uneconomic size cannot be defended. Not much can be produced (in terms of grains) which would enable the owner a comfortable living. One acre of land averagely produces about 8 mds. of wheat, 5 mds. of gram and 9 mds. of Jowar and 5 mds. of arhar in both kharif and rabi. This means that there is no surplus grain for the farmer's family of even three members. He will have to work himself in the field as he cannot engage outside labourers. In fact, as Anuragi discovered, the holdings less than 5 acres have 89% of the farmer's own family-labour. In holdings of more than...
10 acres this percentage is only 68. If he keeps a few animals he may be required to spend at the rate of Rs. 4.50 per bullock or buffalo. He usually prefers a buffalo because the net return per milch cow is Rs. 150/- and per buffalo Rs. 250 per annum. The farmer, of necessity, supplements his income by keeping more animals than he can maintain properly.

**Solution**

Consolidation of holding and collective farming are the only well known solutions to this evil of sub-division and fragmentation. However, the scheme of consolidation has not yet been introduced in any district of Bundelkhand. The question of cooperative or collective farming, therefore, does not arise at present.

**Problem of Agricultural Indebtedness**

Various estimates have been made on all India basis, from time to time, regarding the extent and magnitude of indebtedness. Provincial estimates have also been made by such persons as Sir Nicholson (Madras), Sir M.L.Daling (Punjab) etc. Central Banking Enquiry Committee estimated, as early as 1930-31, total indebtedness of Indian cultivator as 900 crore rupees. Very little has been done to determine it at district level.

During 1951-52 a comprehensive 'All India Rural Credit Survey', covering more than 600 villages in 75 diatricts.
(Hamirpur was one among them) spread out throughout the country was initiated by Reserve Bank of India under the chairmanship of Shri A. D. Gorwala. Following were its chief findings:

1. The proportion of borrowing families among the rural families was 51.7% (58.6) among cultivators and 39.6% among non-cultivators.

2. The average amount of debt per family was Rs. 293.00 (cultivators Rs. 364.00 and non-cultivators Rs. 129).

3. Money lenders provided about 45% of total credit to the farmers, whereas government only 3.3%.

4. Productive purposes accounted for 44% of the total credit and rest for non-productive purposes.

An All India Rural Credit Follow up Survey by the same agency (1956-57) further revealed that rural indebtedness has increased by Rs. 170.00 per family from 1951-52 to 1956-57.

Causes of Indebtedness

The simplest known cause of large scale indebtedness of our farmers lies in their utter poverty. They need money for various items of agricultural and social activities. His production is so small and its value so meager and uncertain that he must borrow money from outside. His principal
financiers are professional money lenders, the village baniya, cooperative societies and some times commercial banks and the government agencies. Co-operative societies have not yet made much headway in Bundelkhand where village money lenders and baniyas still monopolise this in-human but lucrative trade. They keep these dealings strictly secret, as such the peasant continues to enjoy social prestige despite his total bankruptcy. They pay very high rates of interest (25 to 50%) as against government rates (6 to 9%).

Chaturvedi (1) investigated into the nature and extent of agricultural indebtedness in block Kuthond of District Jalaun. His conclusions which were based on the investigation of 10 villages selected on random sampling, are as follows:

1. The average debt per indebted family was Rs. 332.57.

2. Proportion of indebted families in Kulthond block was 48%.

3. Indebtedness per size of land holding was determined as exhibited in the table that follows.

Table No. LXI

Agricultural Indebtedness in Kuthond block, 1963-64

<table>
<thead>
<tr>
<th>Size of holdings</th>
<th>Indebtedness per family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 5 acres</td>
<td>Rs. 271.00</td>
</tr>
<tr>
<td>5 to 10 acres</td>
<td>Rs. 312.00</td>
</tr>
<tr>
<td>10 to 15 acres</td>
<td>Rs. 346.00</td>
</tr>
<tr>
<td>Above 15 acres</td>
<td>Rs. 333.00</td>
</tr>
</tbody>
</table>

In other words the debt per family was found to be inversely proportional to the size of holdings. The reasons for such trend are not far to seek. Money-lenders freely advance loans to owners of large agricultural land as they find their money fully secured. Big cultivators, in their turn, freely borrow money as they feel that they can easily repay it. Non-agriculturists do not enjoy these facilities and, therefore, borrow less and whatever they borrow they try to repay in terms of their wages.

4. Chaturvedi listed six types of interests on the borrower:

(a) Free of interests as is found among the members of the family or relatives.

(b) 5% interest by government on loans in the form of 'taccavi'.

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(c) 9% interest by Co-operative societies.
(d) 12% interest by traders and merchants.
(e) 25% interests by money-lenders.
(f) 37½% interest by professional money lenders.

This is most prevalent.

These investigations, combined with personal surveys and enquiries in the selected villages point out clearly that there is a high incidence of indebtedness in Bundelkhand villages. The situation is really more serious in view of the fact that neither the money-lenders nor the borrowers reveal the their actual amounts to the investigator. They often give lower figures.

Solutions

The best and the lasting solution of reducing indebtedness among the cultivators lies in adopting much agricultural programmes as may increase the productivity of their fields. If yields are improved, the farmers would not ordinarily like to borrow money.

Current high prices of agricultural commodities appear to be very favourable in ameliorating the farmer's financial condition. This cannot, however, eradicate completely the

(1) Village Surveys of Madhoganj (pp. 314-318) and Bijoli (pp. 330.336).
evils of borrowing as some people develop it as a habit. They borrow money even when they have it. Logically, howsoever unsound this may appear, it is very true in practice. Others may borrow money for lending it to other needy farmers at still higher rates of interest. Various measures, including legislation have been taken up by the provincial governments from time to time with a view to protect the interests of the indebted cultivator but none proved effective so far. The problem could be resolved by further expansion of rural credit facilities and extension of the area of their influence. At present there are 115 large sized and 2,472 small sized agricultural societies in Bundelkhand. But there are only 4 Central banks, 1 grain bank and 30 marketing societies. These credit societies and bank float loans to the cultivators. In the year 1964-65 about Rs. 743.68 lakh were advanced in loans. The State Bank of India also envisaged a plan to establish its branches in the villages but the proposal has not yet been materialised and despite efforts to ease credit facilities with existing resources the vicious circle resulting in poverty, debt and high interest rates continues to hold the Bundelkhand cultivator in a tight grip. Efforts are being made in the districts covered by intensive agricultural programmes and Community Development Blocks, for providing

(1) Courtesy: Registrar, Co-operative Societies, U.P., Lucknow

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credit to cultivators on the criteria of repaying capacity or on probable crop production. But care should be taken that money is granted for productive items only. Not only that it should also be seen that the money so given, is rightly invested. The farmers have a deep-rooted habit of borrowing money under the pretext of purchasing agricultural implements or bullocks etc. and spending it in social ceremonies or in payment of older debt of the village baniya. Unless this tendency is curbed no amount of credit facilities will bring about a change for the better in the regional agriculture.

Problem of Improvement and distribution of seeds

One of the factors responsible for low productivity in Bundelkhand is that indigenous varieties of seeds are largely sown here. Even if the seed is of improved variety, it is sown mostly broadcast which is basically defective. The total area under improved varieties in all the districts of U.P. Bundelkhand in 1963-64 was 20,000 acres only i.e. 0.47% of the actually cultivated area of that year. Why should the regional farmer be so unconcerned and antipathetic about it? The answer may be found again in his poverty and meagerness of resources, but non-availability of improved varieties of seeds, their susceptibilities to common pests and diseases, great care needed in their storage, inadequacy of irrigational facilities are some other causes. He, there-

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fore, prefers to meet his requirement of seed from the big cultivators or the village money lender or his erstwhile landlord under 'Sawai' or 'deorha' (1½ or 1½ times) system. They supply mostly indigenous seeds and the interest has to be paid in kind.

Necessity for introducing improved varieties of seeds

According to Mr. Burns, the average out-turn of our production can be increased by 50% i.e. 10% by using improved seeds and 40% by adequate manuring. (1) Experiments with paddy, wheat, jowar, oil-seeds and sugarcane carried out at Kanpur, suggest that this is quite easy to achieve in Bundelkhand with the help of 'nucleus' villages, where proper facilities for improved farming exist.

Solutions

The main problem in regard to improved varieties of seed is their non-availability in adequate quantity in the time of need. Like countries of Europe and America, in India there are no private seed stores which specialise in the trade of supplying improved varieties of grains to the cultivators.

(1) Burns: 'Technological possibilities of Agricultural Development in India', quoted by Dr. S.C. Jain in 'Agricultural Policy in India', 1964, Allied Publishers, Bombay, p. 35
Development Blocks are trying to cope up with this problem, but they find it very difficult. In fact no one can expect the Development Block Office to keep supplying all the seed needed in all the villages of the Block. The farmers will have to develop their own resources.

Basically there are three lines open for improvement of seeds by the farmer or the government farms viz. (1) acclimatization; (2) selection and (3) hybridization.

(1) The simplest method is to import new varieties from outside (as Mexican wheat) to replace existing varieties, but the results, so far obtained, are disappointing because varieties quickly deteriorate under the influence of regional climates which are severe.

Selection and hybridization, on the other hand, have shown encouraging results. Selection needs botanical examination of seeds, and the elimination of inefficient forms. In Hybridization process unit species are crossed for the purpose of evolving new varieties which give much better results for longer time. But great care must be taken so that the seed does not mix up with low yielding varieties either in the storage or in the field by cross-pollination with the surrounding fields. It is, therefore, essential that improved varieties should be sown in compact blocks.
Further, in crops like sugarcane and potato, which are produced vegetatively, frequent changes of seed are essential, otherwise, deterioration is very rapid.

With the creation of an improved variety of seed the problem does not end. It must be popularised among the farmers. We have already seen that no department can tackle this problem of seed distribution among huge number of our cultivators. A good step in this direction taken by the Government of Uttar Pradesh is to set up the so-called 'nucleus' villages. Government supplies 'nucleus seed' to the 'nucleus villages' in the block. The seed is always sown in compact blocks of well manured and well irrigated land. Best possible care is taken to guard them against pests and diseases. The seed, so obtained from the harvest, is distributed among the farmers of the surrounding villages with a view that they will develop their own resources in future (at least for three years). Fresh seeds are, however, supplied each year for jowar, bajra and castor because they are easily effected by cross-pollination and, therefore, deteriorate in quality. It is, however, disheartening that there are no nucleus villages in the region. They may be easily started in areas served by canals and this step should be taken as early as possible.
Problem of Agricultural Marketing

Let us now examine briefly the problem of agricultural marketing. In a way this is directly related to geography, in as much as, all agricultural produce moves to the markets through country roads. The nature, type and condition of the network of means of communications, therefore, effect their rate and direction of movement. Problems associated with the actual disposal of these commodities fall in the sphere of either pure Economics or Commerce and have not been touched here.

There is a general inadequacy of means of communication in southern part of Bundelkhand, specially in the plateau region of Panna, Pawai and Ajailgarh and Bijawar tahsils. The character of relief is directly responsible for this phenomena. With the help of map showing the distribution of population, the effect of relief on settlements and communications becomes all the more clear. In these areas, therefore accessibility to road is very limited and commodities must have to be moved through pack animals, specially mules and asses. It is true of both parts of Bundelkhand (U.P. and M.P. The total length of roads in the whole region is about three thousand miles which is shared equally by U.P. and M.P.
Bundelkhand. Out of these 60% are all-weather roads and rest fair-weather roads on which traffic is suspended in the wet
season. Calculations reveal that length of roads per square mile of area in U.P. Bundelkhand is 0.13 mile and in M.P. Bundelkhand 0.17 mile. It is thus clear that there is a great scope for development of motorable roads in the whole region.

In Bundelkhand many of these roads were constructed as a measure of famine relief works in order to improve the system of distribution of grain and fodder supplies to the drought affected villages.\(^1\) Droughts, therefore, for the first time impelled the government not only to construct new roads but also to improve the dilapidated condition of existing roads and their feeders. The main line of Central Railway (formerly G.I.P.) with its branches viz. Jhansi-Manikpur and Kanpur-Banda, were also built as relief projects.

In the Table No. LXII

<table>
<thead>
<tr>
<th>District</th>
<th>Total length of roads in 1947</th>
<th>Total length of roads in 1966</th>
<th>Outlay in the 3rd Plan as per Star-Ra.</th>
<th>Total length as per Star-Gid formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banda</td>
<td>115 miles</td>
<td>365 miles</td>
<td>25 lakhs</td>
<td>459 miles</td>
</tr>
<tr>
<td>Hamirpur</td>
<td>113 miles</td>
<td>294 miles</td>
<td>18 lakhs</td>
<td>448 miles</td>
</tr>
<tr>
<td>Jalaun</td>
<td>82 miles</td>
<td>213 miles</td>
<td>16 lakhs</td>
<td>270 miles</td>
</tr>
<tr>
<td>Jhansi</td>
<td>397 miles</td>
<td>526 miles</td>
<td>10 lakhs</td>
<td>548 miles</td>
</tr>
</tbody>
</table>

(1) For example, Chaudaut ghat to Lachhura ghat, Kulpahar to Panwari, Baberu to Nowgong in the famine of 1868-69 and the improvement of roads from Rath to Hamirpur, Kulpahar and Mahoba.
From the table, it may be seen that with the exception of Jhansi, no other district reaches the ideal road mileage as per Star-grid formula. It means that all these districts are still very much short of minimum road accessibility. This may be clear from the comparison of these districts with Kanpur district. In Kanpur district, the actual mileage of existing roads is 333 as against only 260 miles deduced from the star-grid formula. This is why this district could develop so much, both agriculturally and industrially. This means that the inverse ratios in Bundelkhand districts are at least partly responsible for certain degree of backwardness of intra as well as extra regional trade. Immobility of goods and commodities assumes a serious problem, specially in the rainy seasons, when traffic comes to standstill and prices of grains register a marked rise. Thus, for example, the whole sale price indices (harvest) in 1963-64 for Rice and Wheat were Rs. 55/- and Rs. 48/- per quintal as against their respective indices of Rs. 65/- and Rs. 60/- in July in the same year. 

The farmers are, therefore, put to huge losses as they have neither proper storage nor transport facilities in the rainy season. A few big farmers, of course, try to retain a major share of their produce till the arrival of the new crop and, therefore, make some gains.

(1) Courtesy: Chief Engineer, P.W.D. (Building & Roads), Jhansi, U.P.
(2) Season and Crop Report of M.P., 1963-64, p. 20 (base 51-52)
The bullock cart is still the most popular mode of transport in Bundelkhand. The motor truck could not replace it in the countryside, though on State Highways connected with outside regions, movement of commodities is largely controlled by motor vehicles. The popularity of bullock cart lies in its absolute cheapness, nature of country routes and the ease with which it can be repaired by the village carpenter. They are used for travelling as well as loading of many domestic and agricultural things. That is why one finds them everywhere.

Motor trucks are costly for two very distinct reasons: (i) bad condition of country roads and high rate of wear and tear (ii) non-availability of return cargo from the villages, except when pre-arranged. This is a rarity. Enquiries at village Uncho (west of Madhogarh in district Jalaun) revealed that a truck contracted to bring coal dust (for brick burning) costing only Rs. 98/= from Kanpur had to be paid Rs. 210/= as transporting charges up to Madhogarh only. This is, when Madhogarh is fairly a good grain market, commanding western part of Jalaun district. Return cargoes can be picked up not only from here but also from Jalaun, Orai and Kalpi, all of which are situated on way to Kanpur. The tendency of the truck owners is to prefer all-weather State Highways such as Kanpur-Jhansi or Jhansi-Sagar roads to fair-weather kuchcha
or partly pucca roads. Rarely would they ever contract for running their vehicles on approach-roads which are merely cart-tracks, connecting the interior villages. Herein lies the importance of developing country roads. If roads are improved they would at least ensure cheapness of goods and effect their fair distribution in the villages. The farmers may continue to use their carts for transporting their produce to the nearby markets.