CHAPTER V

AGRICULTURE RESOURCES
FOOD CROPS

In the region under study as much as nearly 90 per cent of the total net sown area is covered by food crops. This is 3 per cent more than the State average.

In general, the Western highlands of this region go in for mixed farming. During the kharif season, it grows rice, jowar, maize, bajra and kodo-linshi by way of cereals, tuar, moong, urad and teana in the line of pulses and the oil-seeds of groundnut, til and rastil. Wheat and barley become the main cereal crop during the rabi season while the pulses of gram, lentil and dried peas and oil-seeds of lin-seed, rai and sarson are also grown.

The Sonar upland is predominantly a rabi tract. The area under food crops is almost entirely assigned to food grains. Cereals and millets are the most widely grown varieties.

Wheat and jowar, by and large, are the staple food of this region. Yet, in the Northern highlands and in the Southern highlands finer grains like wheat are hardly grown owing to bad quality of soil. The percentage of cultivated land is lower because of sharp angle of the slopes. Coarse grains like kodo-linshi, bajra and maize are widely produced. Rice is extensively grown on the Southern highlands. The staple food in these areas are jowar-linshi, kodo-rice, kodo-maize and maize-jowar.
CEREALS

Wheat, jowar, maize, rice, kodo-kuthi and bajra are among the principal cereals grown in this region. 36 per cent of the total net sown area is engaged in producing them.

Wheat

The main rabi crop, wheat, ranks first among the grains produced in this region. The net sown area under wheat is 37 per cent of the total net sown area. It requires cool, dry weather with moderate rainfall during its growing period. January, the coldest month, has an average temperature of about 17.4°C. However, the winter rain-fall is not always adequate. Irrigation facility too is meagre. Only the moisture-retaining medium black soil of the Western highlands and the alluvial uplands and the valleys of the Sonar, the Dhasan and the Beams in the Southern highlands produce good wheat crops. Sometimes cold and cloudy weather during January spoils a bumper crop and the common rust, locally known as Gera, sets in. The other danger is to the rabi crops in the elevated tracts of the region from the bitter cold winds and frost.

Several local varieties of wheat grown in the Western highlands can be roughly divided into the gahum and the nissi. The former is slightly reddish in colour and includes all the hard wheats (Trit, Sat, Vatgara). The latter is the common soft wheat.
In the Sonar upland varieties of wheat like pissi, kathia and No. 65 are grown. The pissi is, again, of two types; the shikarhai or bearded and mundi or plain. While the former is a common variety, the latter is grown on embanked fields since it needs more moisture. In the unembanked wheat fields, common in the Sonar valley, wheat is sown both singly and in conjunction with grass, the latter known as hirra. Presence of grass, a leguminous plant, keeps up the fertility of the soil through a better assimilation of nitrogen.

In the Southern highlands, the embanked kathia fields of the Barama valley are good for growing only wheat.

The average yield of the years 1975-77 was 731.66 kg per hectare. Better and greater use of fertilisers and irrigation facilities as well as improved seeds will undoubtedly make for better yields. It is on record that improved variety of Sonora 64, given proper nutrients, has produced 5,900 kg per hectare. The fault lies not so much with either land or the tillers but with paucity of modern facilities.

Rice

Rice, the second most important crop, also forms the staple food either by itself or along with wheat, though only 11 per cent of the total net sown area is under rice cultivation.

Moderately high temperature, plenty of rainfall and fertile alluvial soil along with a good deal of intensive
labour are necessary to obtain good rice yields. Consequently it is an exclusively monsoon crop. The needed conditions occur in parts of this region only during the kharif season.

Rice is grown on the lighter pataura soils as well as on the sandy gilhar soils. These are found only in limited areas. Fields considered good for rice cultivation are not suitable for wheat. The Sonar valley and the Western highlands of this region devote a very small proportion of the net sown area to rice. Substantial rice-growing tracts are found in the Southern highlands on the loamy soil along the river courses. Same is the case in the Northern highlands. Rice fields abound only on the tracts along the course of the Dhasan.

The common varieties of rice found in this region are qumatinia, antarved, kamaruch and dilbaka. Of these, antarved is perhaps the most popular, being soft and with a special aroma. The crop is sown by scattering the seeds on the field (broadcast) but transplantation, so necessary for improving the quality of rice, has also started gaining currency. Net sown area under rice is also on increase.

The 1975-77 average yield of rice in this region was 600 kg per hectare.

Jowar:

The third important food crop grown in this region is jowar. Along with wheat, rice and kodo, it is also used
as a staple food in some parts. 6 per cent of the total net sown area of this region is under jowar cultivation.

Jowar demands only moderate rainfall and needs clayey soil more than other millets do. Being a staple food all the year round, it also provides a substantial part of fodder.

Bulk of jowar sowing is confined to the northern edge of the Sonar valley and in the Northern highlands, though a small amount is grown elsewhere also.

The average yield during 1975-77 of jowar in this region was 911.5 kg per hectare.

Maize:

Though the net sown area producing maize is very meagre, it is the fourth among the staple foods in this region. Maize prefers fertile soils, especially loam. The sowing is carried out as soon as the rains start while the reaping is done soon after the rains stop. It needs plenty of water supply throughout its growing period.

In the Western highlands, maize is grown in the upper waters of the four rivers, Dhasan, Beas, Barmer and Sonar and along the small rills. It is not grown in the Sonar valley. Bulk of it, however, is grown in the Northern highlands, especially along the course of the Dhasan and on the flat topped Barana hills. In the Southern highlands it is grown along the course of the Beasma, the Barmer and the Padri near the eastern part of the Danoh range.

The average yield of maize in this region recorded
during 1975-77 was 1220 kg per hectare which was slightly below the state average of 1236.

Millet:

Approximately 5 per cent of the total net sown area is earmarked in this region to growing coarse grains like bajra, sanva, kodo-kutki, etc. Grown in areas with low and seasonal rainfall, millets are sown all over the region wherever the soil is rocky and/or sandy and therefore sandy infertile.

Most of the millet-producing tracts are found in the Northern highlands and the Southern highlands and in the Southern parts of the Western highlands which is comparatively high and rocky.

Method of Cultivation:

All kinds of crops cannot be combined at will. Experience has shown that it is advisable to sow wheat singly or mixed with gram or linseed. Similarly, a major crop of gram can take along wheat, linseed and barley. Rice and maize are, as a rule, sown singly. Jowar is grown either singly or mixed with pulses like tuar, green gram and black gram.

Distribution of Crops:

Four types of areas can be identified or the Map in respect of the regional distribution of cereals:

1. Very high percentage, i.e., 85 per cent and above;
2. High percentage, i.e., between 70 and 85 per cent;
3. Moderate percentage, i.e., between 40 and 70 per...
4. Moderately low percentage, i.e., under 40 per cent.

Areas of Very High Percentage:

Cereals are grown on over 85 per cent of the net sown area in some 11 per cent of the patwari circles in this region. These are found either on the hilly terrain of the Northern highlands or in the valleys of the Southern highlands, notably those of the Beasma, the Padri and the Sun. The reason why so much arable land in the hilly region is devoted to cereals is the subsistence agriculture. Finer grains like wheat and rice are not and indeed cannot be grown here. Only millets thrive on the infertile rocky soils. Since most of the Southern highlands is forested, agriculture is possible only in the valleys. Almost the entire eastern part of the Southern highlands, particularly along the course of the Guraiya nala, are under cereal cultivation.

Areas of High Percentage:

Twelve per cent of the patwari circles belong to the second category. These are situated mostly in the valleys, Sonar and Kopra valleys of the Northern highlands and the Beasma valley of the Southern highlands. These have slightly better soil conditions and irrigation facilities, enabling the production of other food crops besides cereals.

Areas of Moderate Percentage:

The largest number of patwari circles — 61 percent of the total — come under the third category of moderate
cereal cultivation (between 40 and 70 per cent). Bulk of it is found on the medium black soil of the Western highlands. The conditions are propitious for both rabi and kharif, but rabi crops are given priority. Moreover, in the Sonar upland of the Western highlands other food crops like pulses and oilseeds are also grown, cutting down the land under cereals. During the rabi season, wheat is the main crop though the good quality of soil permits mixed cropping also. The valleys of Dhasan, Savas and Kopra and the Sonar upland fall in this category. The last named has alluvial soil and is particularly good for wheat cultivation. Some patches of this category are found in the Northern highlands, along the course of the Dhasan, and Southern highlands, too.

Areas of Low Percentage:

The remaining 16 per cent patwari circles belong to the category of less than 40 per cent. These are found only in the Western highlands and in the Sonar upland. In the Western highlands these circles are stretched along the hilly forested tracts from south-west to north-east. In these tracts fodder cultivation is dominant and a sizable percentage is fallow. In the Sonar upland only few patches of this type are found which may be due to either large proportion of fallow land or to the rocky areas between the alluvial valley of the Sonar.

PULSES:

Pulses are grown on 23 per cent of the net sown area lying in the region under study. While gram and lentil
are the main rabi crops, tuar, moong, urad and teora are the chief pulse-crops during the kharif season. Gram, lentil, tuar and teora form the bulk of the pulse-cultivation.

Gram :

Among the pulses, gram is the most important crop grown in this region. It covers 12 per cent of the total net sown area.

Gram thrives in the same geographical conditions in which wheat does well except for the fact that gram's soil requirements are less exacting. Consequently, in addition to where gram is grown singly, it is grown along with wheat also. It is grown on lighter soil and it is mixed with wheat wherever soil is unable to support wheat singly.

The highest gram production is recorded in the Sonar upland in this region. Some small patches are found in the Western highlands. The Dhasan and Basas uplands also produce gram in good quantity. Percentage of gram is, however, very small in the net sown area of the Northern highlands and the Southern highlands.

The average yield of gram in this region is 505.5 kg per hectare.

Lentil :

Nine per cent of the total net sown area is covered by the crops of this pulse. Essentially a rabi crop, it is widely grown in the wheat tract. Both trappian and alluvial soils are good for lentil. It demands more or less the same
type of ecological conditions which wheat and gram do.

The uplands and the river valleys produce the bulk of this crop. The Sonar, the Bemas and the Dhasan uplands grow most of it. The Northern highlands and the Southern highlands, which grow cereals in the largest proportion, produce very little pulses.

The average yield of lentil in the year 1966-67 was 383 kg per hectare.

Red Gram :

Red gram (Arhar or tuar) is the third ranking pulse-crop, occupying 2 per cent of the net sown area.

Being a kharif crop, red gram is sown during the rainy season and harvested in February-March. It is grown either in the field or on the boundaries of the fields of other crops. Although it can be grown on a variety of soils, it seems to prefer black soil. It is grown mostly in the uplands of the Dhasan, the Bemas and the Sonar. The Western highlands, Barana hills in the Northern highlands and some patches in the Barma river valley in the Southern highlands also produce some red gram. It is insignificant in the rest of the region.

Average yield of red gram is 656 kg. per hectare.

Dried peas, khesari or teora, black gram and Other Pulses : Green gram are sown on the remaining 2 per cent of the total net sown area.

Dried peas, khesari are rabi crops. They demand the same conditions as wheat and gram. Areas growing these latter
crops also produce these pulses. It is grown in the Western highlands and in the Sonar valley.

Black gram (Urad dal) and green gram (moong dal) are kharif pulses. These are also grown in the Western highlands and in the Sonar upland. Few patches of this crop are found in the Northern highlands and the Southern highlands. Rocky character of the region is not a help in growing these pulses.

The average yield of dried peas, black gram and green gram is, respectively, 492, 201 and 473 kg. per hectare.

Method of Cultivation of Pulses:

Pulses are grown either singly or along with other pulses, cereals and oil-seeds. Thus, gram is grown either singly or with wheat, linseed and barley. Up to three different crops can be and frequently are grown in the same field. However, some rules as to the proportion of different items have to be followed when growing these simultaneously in the same field. Dried peas and lentils are always sown singly.

Red gram in a mixed field is grown along with jowar, black gram, green gram, hodo and til. It can be combined with two or three other crops in the same field. The crop is sown in rows two metres apart.

Black gram can be sown singly or along with green gram and red gram and the same applies to the green gram.

Distribution:

Total percentage of pulses in the net sown area can
be categorised into:

(1) Areas of high percentage, i.e., above 30 per cent.
(2) Areas of medium percentage, i.e., 20 to 30 per cent, and
(3) Areas of low percentage, i.e., below 20 per cent.

Areas of High Percentage:

Some 32 per cent of the total number of patwari circles in this region devote over 30 per cent of net sown area to pulses. These are found in the upland of the Sonar especially along the right bank of the river and where the Bemus joins it. Another big patch belonging to this category is found at the confluence of the Sonar and the Bemus. Some patches are found along the Bemus before it enters the Southern highlands. Scattered patches are noticeable in the Dhasan and the Bemus uplands. Entire Kopra valley falls in this category.

Areas of Medium Percentage:

31 per cent patwari circles belong to the second category of medium pulse-cultivation. This category is found in patches all over the Western highlands, in the Dhasan upland and in the Bemus upland, along the lower waters of the Sonar, along the Kopra valley and on the Sonar upland. In the Southern highlands a few patches are found along the Bemus valley, along the confluence of the Bemus and the Bemus and in the Singrampur valley.

Areas of Low Percentage:

The remaining 37 per cent of the patwari circles come
under the low percentage category. The Northern highlands belong totally to this category. The Western highlands have some patches while the Bina valley in the extreme west belongs to this category. Few patches are found in the Sonar upland, especially towards the northern edge of the valley. In the Southern highlands these circles are found on both the sides of the Damoh range, along the Padri river and the easternmost part, including the Sun valley. The upper waters of the Beara, some patches along the course of this river and some along the Gumaiya nala fall in this category.

Other Food Crops:

All other food crops cover less than one per cent of the total net sown area. Vegetables, fruits, sugar cane, condiments and spices are among these other food crops. Vegetables are grown mostly in the vicinity of townships since these are perishable and must be sold off in time in the city markets. The only exception is potato which can be kept for long periods in cold storages. Interest in this crop is on the increase in the interior villages owing to this modern facility. Orchards are also found near cities for the same reason. Sugarcane, condiments and spices are grown in the villages but on a very limited tract. Sugarcane is not among important crops in this region and covers only marginal acreage.

OIL-SEEDS:

It is arguable if oil-seeds should be included among food crops or not. However, in view of the place of cooking
medium in the Indian kitchen and also remembering the nutritional value of fats and oils, one has to pay attention to the oil seeds in any study of food crops.

Several types of oil seeds are grown in this region, the chief being lin-seed, ground-nut, gingelly-seed, niger-seed and mustard-seed.

Lin-Seed:

This is a non-edible oil-seed and is really a commercial crop. However, since as much as 6.41 per cent of net sown area is devoted to this crop, this item cannot be left out. It certainly has a bearing on the local agriculture.

Lin-seed is a rabi crop and is sown along with other rabi crops like wheat and gram. It needs the same type of ecology.

Bulk of this crop is grown in the uplands of Sonar and Dhasan and in the upper waters of the Beas. It is also grown along the course of the Sonar and Kopra. Actually the entire wheat tract of the Western highlands produces this crop in some measure. Less than 3 per cent of net sown area is assigned to this crop in the Northern highlands and the Southern highlands. As noted earlier, it is significant only in the wheat-producing area.

Yield rate of this commodity is not high, unlike other oil-seeds. The average yield during 1975-77 was only 275.5 kg. per hectare in this region.
Ground-nut:

Next comes ground-nut which is a kharif crop and covers some 3 per cent of the net sown area. Ground-nut in this region is not merely an oil-seed. It is also consumed roasted and in certain food items.

Ground-nut grows well on light, loamy soils and needs but moderate rainfall of between 60 and 75 cm. However, it can tolerate up to 115 cm. too.

The Northern highlands do not produce any ground-nut. In the Southern highlands ground-nut cultivation is restricted only to the Bearn valley. The Western highlands, however, produce a great deal of it. The uplands of Sonar, Dhasan and Beams are particularly good for it. In the Sonar upland ground-nut is seen on either side of the river and near the confluence point with the Beams on the right bank. It is grown significantly along the Kopra valley and the upper waters of the Sonar.

Among oil-seeds ground-nut has the highest yield rate. It was 617 kg. per hectare in 1975-77 in this region.

Other Oil-Seeds:

Gingelly-seed and niger-seed are the other kharif oil-seeds while mustard-seed is a rabi oil-seed. Between them, they account for 1.39 per cent of the net sown area.

The kharif oil-seeds, gingelly and niger, are grown mixed with other food crops. Mustard is grown on a rather limited scale. These oil seeds are grown on more than 1 per
cent of net sown area in a few patwari circles in the Western highlands and Sonar upland. In the Northern highlands and Southern highlands this is not done on a significant scale. Gingelly-seed is grown all over the region except the Northern highlands, the Dhasan upland, around Bina river, in the Upper waters of Bearer and in the Kopra valley. In the Southern highlands it is widely grown. Niger-seed is grown mixed with a local coarse grain, Kangani. It is sown in the Northern highlands except the Barana hill area. The Bearer upland and the Southern highlands are particularly good for this crop.

The average yield per hectare of mustard, gingelly- and niger-seed in this region was, respectively, 503, 131 and 161 kg. in 1975–77.

Distribution:

Net sown area under oil-seed cultivation varies from less than 5 per cent to over 15 per cent. Consequently, patwari circles can be divided from this point of view into four categories:

1. Areas of very high percentage, i.e., above 15 per cent;
2. Areas of high percentage, i.e., between 10 and 15 per cent;
3. Areas of moderate percentage, i.e., between 5 and 10 per cent; and
4. Areas of low percentage, i.e., less than 5 per cent.

Areas of Very High Percentage:

21 per cent patwari circles devote over 15 per cent
of their net sown area to the production of oil-seeds. The Sonar upland does particularly well in this respect. Few patches are found in the Northern highlands. In the Western highlands, this category is found in the valleys of Dhasan, Beas and Sonar and near the forest-covered hill tracts in the Southern parts. It covers the major portion between the Sonar and the Kopra valleys. Southern highlands do not have any patwari circle of this type.

Areas of High Percentage:

20 per cent of patwari circles belong to the second category. Few patches of this type are found in the Northern highlands. In the Western highlands this category does not show any definite pattern. Only small patches are scattered here and there. The upper waters of Kopra and Baner have some larger patches. The same patchy pattern continues in the Sonar upland also. Only the left bank of the Beas, in the Sonar upland, has a continuous stretch of this category. In the Southern highlands only the Sigrampur valley, the Beas valley and areas along the Baner river have some patches.

Areas of Moderate Percentage:

Some 29 per cent of the patwari circles grow oil-seeds on 5 to 10 per cent of their net sown area. These are located in the Northern highlands and all over the Western highlands. Almost all of the Dhasan upland comes under this category. Some patches are found in the Beas upland, some along the course of the Kopra valley and some in the hilly tracts of the Southern highlands. Patches are also found near the point
where the Guraiya nala meets the Beama river as also on their upper waters and along some small rilles.

Areas of Low Percentage:

The remaining 30 per cent patwari circles grow very little oil-seeds: less than 5 per cent of their net sown area. These are found mainly in the Northern highlands and the Southern highlands. In the Southern highlands, almost the whole of Beama, Guraiya, Sun and Padri valleys and the Damoh range are sprinkled with these patches. Three or four small patches are found in the Sonar valley. In the Western highlands some patches are found near the hilly forested areas and also near cities.

Other Crops:

Fibres are not produced on any significant scale in this region. Of the three fibres grown in Madhya Pradesh, Cotton and Mesta are totally absent in this region. Only sunshemp is grown in a very limited way on the Western highlands. Its production in 1974-75, 75-76 and 76-77 was, respectively, 54,000, 90,000 and 90,000 kgs.

Potatoes may be regarded as a significant commercial crop grown on the Sagar-Damoh plateau. While sugar-cane and sweet-potatoes are also grown in a limited way, tobacco is not grown here. Production of commercial crops, in thousand tonnes, has been recorded as follows:

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<th>Table V.1</th>
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<tr>
<td>Other Food crops grown in Sagar-Damoh Plateau</td>
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<tr>
<td>1974-75</td>
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<tr>
<td>Sugarcane</td>
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<tr>
<td>Potato</td>
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<td>Sweetpotato</td>
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</tbody>
</table>

(Source: Agricultural Statistics, compiled and published by Director of Agriculture, Bhopal).
FODDER CROPS

As already noted, fodder crops are also grown in the region under study. It can be categorised into three parts from this point of view: (Map 37)

1. Areas of high percentage (16 per cent and above)
2. Areas of moderate percentage (between 5 and 15 per cent);
3. Areas of low percentage (less than 4 per cent).

Areas of High Percentage:

22 per cent patwari circles belong to the first category. These are located mostly in the Northern highlands, particularly the Banda tahsil. Some patches are found along the Bina river and in the Dhasan upland. The Bemas upland has large patches of this type. This category is limited to the line parallel to the hill ranges in the Western highlands, lying south-east to north-east. The remaining patwari circles are in the eastern fringe of the Western highlands, the Sonar valley and the upper waters of the Mopra. Parts of the Northern highlands lying in the Mota tahsil (Lower Vindhyans) and the whole of the Southern highlands are without this category.

Areas of Moderate Percentage:

Bulk of the patwari circles — 36 per cent of the total — come under the category of moderate acreage under fodder crops. In the Northern highlands it is found along the Bina river and on the Barana hills. There are large patches of this type in the uplands of Dhasan and Bemas.
A large number of such circles are located in the Western highlands and along the Kopra river. Some patches in the northern fringes of the Sonar upland have fodder crop area of between 9 and 15 per cent while the rest of it has from 5 to 8 per cent. The southern highlands have only some small patches here and there.

Areas of Low Percentage:

The remaining 22 per cent patwari circles grow very little fodder. These are in large number in the Sonar upland and in the valley and upper waters of the Barmas. In the Northern highlands, few patches can be seen in the Barmas upland, upper waters of the Bannar nala and the Kopra valley. In the Southern highlands there are some patches which assign even less than one per cent to fodder crops.

A study of the growth figures reveals certain disturbing trends. In 1956-57, Sagar district used to grow fodder on 55599 hectares. The area shrank to 47038 in 1976-77—a decline of 16 per cent over a twenty-year period. Damoh district, however, registered an increase of 169 per cent over the same period (from 14765 hectares to 39739). Yet, as is evident, the total area under fodder crops in Damoh is less than in Sagar even after this increase. The decline in area under fodder crops may be related to rise in population as well as fragmentation of holdings. Only a well-to-do farmer can afford to leave some part of his holdings for fodder crops. As the size of holdings goes down, area under not highly
remunerative crops also goes down. As far as the Southern highlands (mostly Banoh district) are concerned, the high percentage of pasturalelands and forests perhaps makes growing of fodder redundant.

CROP INTENSITY:

'Crop intensity' connotes the number of crops which can be and are grown on the same piece of land during one agricultural year. Multiple-cropping, however, is possible only where irrigation facilities are available in a fair measure. The region under study is largely dependent on the monsoons for its water supply and irrigation facilities are meagre or even non-existent in certain areas. Not surprisingly, the index for cropping intensity¹ is rather low, only 106, for the plateau as a whole. Moreover, crop intensity of any region depends also on total annual rainfall, the soil's capacity for moisture retention and the nature of crops grown.

In all, only 5.68 per cent of the net sown area is serviced by irrigation and is consequently multi-cropped. High cropping index has been correlated with area of high irrigation facility on Map. Double-cropped area has also been related with irrigation.

The lowest level of crop intensity — less than 105 on the index — is found all over the Western highlands and in the Sonar upland. In the Northern highlands it is found on the Barana hill. Not a single all-weather or perennial river flows through these regions. Seasonal rivers like the

<table>
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<tr>
<th>1. Index of Crop Intensity: Total cropped area × 100</th>
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<td>Net sown area</td>
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Sonar, the Bhasan and the Bawas breach their embankments during the rainy season on the one hand while on the other they more or less dry up during the summers and part of winters. The soil’s capacity for moisture retention consequently remains the only help to double cropping. The medium black soil of the Western highlands is better able to retain moisture than the alluvial upland of the Sonar.

The highest index of cropping intensity — above 110 — is found in the Northern highlands around the Bila river because a dam on the Bila river helps provide irrigation for growing a second crop. It is also found in the Southern highlands whose hilly terrain provides scope for the creation of reservoirs and tanks. Though the area is rocky and sandy, irrigation by these natural and man-made sources help in the growing of a second crop. Heavy rainfall during the monsoon period encourages good kharif crops. After paddy, wheat, birra and mostly coarse grain of the rabi season are grown, though qualitatively speaking the rabi crop is hardly significant.

The intensity of cropping can certainly be increased if irrigation facilities, high-yielding varieties of seeds and fertilisers could be provided in this region on an adequate scale. Whereas the Western highlands and the Sonar upland are in need of water and good quality seeds, the Southern highlands require fertilisers as well as good quality seeds.

Mixed Cropping:

Mixed cropping can be regarded as an indicator of the pressure of population in subsistence agriculture. The
region under investigation is no exception. In addition to double-cropping, mixed cropping is also prevalent. During the kharif season crops are generally sown mixed, with the sole exception of paddy which does not permit any other crop in the same field. Up to four crops are grown simultaneously in this region.

Double Cropping:

Areas where double cropping is successful indicate high cropping intensity. In the Northern highlands and the Southern highlands, where paddy is an important crop, wheat, barley and peas are grown during the rabi season. In the fields where maize is grown during kharif, mustard is grown during rabi. However, double cropping, regrettably, solely depends on plentiful rainfall in this region. Consequently, double-cropped area tends to go down whenever the rains are even a little niggardly.

Crop Rotation:

Kodo by far is the only crop which is never repeated and the land is left fallow after three or four crops to recoup. This also affects mixed cropping.

Cropping Pattern Zones of Cereals:

Techniques have been developed and refined to delineate crop and agricultural regions by, among others, J.C. Weaver, P. Scott and N.P. Ayyar.\(^1\) Perhaps crop combination is better.

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reflected by such delineations. These techniques are of
undoubted worth and help one develop a clear picture of a
given region. However, in the present study these techniques
proved to be of limited usefulness owing to the following
reasons. The study is essentially micro-level, while the
region has an unconscionably high degree of diversity. Mor-
over, various agro-climatic factors determine the cropping
pattern and the nature of crop, resulting in a total lack of
a clear and definite picture. The cropping map is likely to
look like a jigsaw puzzle or a crazy mosaic. Worst of all,
there are no rational or easily understandable explanations
for the situation. All these factors obliged the present
investigator to give up attempts to look for patterns in the
food and non-food crops in this region. Instead, one has
contented oneself with showing staple food zones, limiting
oneself to the first two ranks to be designated primary and
secondary. Secondly, percentages have been worked out from
the gross cropped area. Numerically, the position can be
expressed in the following manner: \( \frac{W J}{60:10} \) in which \( W \) stands
for wheat, \( J \) for jowar while the denominators 60 and 10 ref-
lent the percentage of area under these crops to the gross
cropped area.

The region under investigation has as many as ten
such combinations. The following four account for 97 per cent
of the entire area: 

1. Wheat-Jowar (53 per cent of the total patwari
circle);
SAGAR-DAMOH PLATEAU
STAPLE-FOOD COMBINATIONS
1975-77

INDEX
WHEAT-JOWAR
WHEAT-RICE
RICE-WHEAT
WHEAT-KODO\n\nJOWAR-WHEAT
RICE-KODO\n\nKODO\-WHEAT
KODO\-RICE
JOWAR-KODO\n\nN.A. = DATA NOT AVAILABLE

URBAN AREA
FOREST AREA

SOURCE: TAHSL LAND RECORDS
2. Wheat-Rice (25 per cent of the patwari circles);
3. Rice-Wheat (15 per cent of the patwari circles)
4. Wheat-Kodolutchi (4 per cent of the patwari circles).

The remaining six combinations which account for 30 per cent area are:

5. Jowar-Wheat;
6. Rice-Kodolutchi;
7. Kodo-Wheat;
8. Kodo-Rice;
9. Jowar-Kodo;

Wheat-Jowar:

This combination is popular on the Western highlands, the Dhasan upland, the Bexas upland and is widely spread over the Sonar upland. Wheat is the principal staple cereal grown for human consumption in the fertile riverine alluvial and medium black soil of the Western highlands, with rainfall between 50 cm and 150 cm. Jowar is the other staple foodgrain produced in the black soil region and also in the nagur region where rainfall is between 50 and 100 cm. Jowar's popularity is due in part to the fact that it is a drought-resisting and even escaping variety.

Wheat-Rice:

This combination characterises the Northern highlands and the Western highlands, the Bina valley, some patches of the Dhasan upland, lower waters of the Bexas and the Kopra
valley. In the Southern highlands, some patches of this category are found in the Barana valley and the Singrampur valley. The northern fringe of the Southern highlands presents east to west a ribbon-like pattern of this combination. It also appears to encircle the wheat-jowar zone except in the north-eastern part. It is found wherever rocky terrain dominates.

Rice-Wheat:

This combination is found only on the Southern highlands. Not that conditions are particularly propitious for rice-cultivation here; only inferior quality rice can be grown on a sandy and inferior soil.

Wheat-Kodo:

This is also found in a limited area, mostly in the Barana hills of the Northern highlands and some patches of the Western highlands.

Of the remaining six combinations, Jowar-Wheat, Rice-Kodo and Kodo-Wheat are popular in a small number of patwari circles scattered over a wide region while Kodo-Rice, Jowar-Kodo and Kodo-Jowar characterise a single circle each. It would be pointless to go into greater details.

Crop Diversification:

The index of crop diversification reflects the crop specialisations and preferences obtaining in various regions.
The formula evolved by Bhatia has been used here to arrive at this index.

Bhatia feels that in India crop diversification mostly relates to the distribution of rainfall. Other geographical factors such as soil-condition and terrain are also important and, last but not least, modern techniques help farmers make a choice among crops.

As Map 40 shows, the region can be divided into three parts.

1. Areas of low diversification;
2. Areas of moderate diversification;
and 3. Areas of high diversification.

Areas of Low Diversification:

Index of above 50 per cent crop diversification marks out the first category. It is found in small patches over the Western highlands, in the Dhasan upland and in the Beas upland. These patches in most cases adjoin forest-covered hilly areas. In the Southern highlands this category is found in the Mangalrage near the Padri nala, in some patches in the upper waters of the Barea, in the Sun valley and in areas near the Guraiya nala. Only 8 per cent of the total patsari circles come under this category.

1. The formula proposed by Bhatia is as follows:

\[
\text{Index of Crop Diversification} = \frac{\text{Percentage of cultivated area under a crop}}{\text{Number of N Crops}}
\]

where 'n' crops are those which individually occupy 10 per cent or more of the cropped area. Thus, higher the index, lower the diversification. Bhatia, S.S., "An Index of Crop Diversification", Professional Geographer, 1960, 12:2.
Areas of Moderate Diversification:

Areas of moderate crop diversification, that is, between 30 and 50 per cent, are found in the Western highlands, the Southern highlands and the Barbana hills of the Northern highlands. This category can also be witnessed in the river uplands of the Dhasan and the Bawas. In the Southern highlands these patches are found all over the region, mainly in the river valleys. 23 per cent patwari circles are covered by this category.

Areas of High Diversification:

69 per cent patwari circles belong to the category of high crop diversification, that is, between 10 and 30 per cent. In Northern highlands around the Bina river and on the right bank of the Dhasan this category can be found. The Sonar upland is particularly dominated by this category. The alluvial valley of Sonar grows wheat, gram and other pulses and some oilseeds. This category appears to dominate in the Western highlands also. Patches in the Bina river valley, the Dhasan upland, the Bawas upland, the Sonar valley, the Kopra valley with its upper waters and the upper waters of the Bawas and Sonar belong to this category. These areas are also mixed farming zones. Wheat, jowar, gram, pulses and oilseeds are grown widely. In the Southern highlands, this category of crop diversification is found near the Bhandla range where the Bawas river crosses it, in the valley and upper waters of the Bawas and the Guraiya nala and in the Singrampur valley.
On the whole, the region is predominantly moderate and low crop diversification zone. High crop diversification is confined to hilly terrain and sandy soil where only one crop is grown. Moderate crop diversification is found in some hilly tracts too, but these are in river valleys where soil is alluvial and water is available for the rabi crop.

SIZE OF HOLDINGS:

A look at Diagram I partly explains the reason why this region has a predominantly subsistence agriculture. The position in regard to the size, number and area of agricultural holdings here appear to pose the same type of problems which by and large characterise the whole country and especially its backward areas.

In 1970-71 there were 156 thousand holdings covering 562 thousand hectares in Sagar district and 84 thousand holdings covering 321 thousand hectares in Damoh district. Thus, the average size of a holding in Sagar was 3.6 hectares and 3.8 hectares in Damoh. This might lead one to think that the situation was satisfactory and certainly far better than what obtains in thickly populated regions like east U.P. and Bihar. However, this optimism is misplaced.

Of the 156 thousand holdings in Sagar, as many as 43 thousand account for 404 thousand hectares of arable land; 28 per cent land owners in possession of 72 per cent land! The number of those who had less than one hectare to
themselves was, in sharp contrast, 49 thousand, occupying only 19 thousand hectares. Those between 1 and 4 hectares numbered 64 thousand, accounting for 139 thousand hectares. Situation was no different in Damoh. The category of medium and large holdings had 24 thousand units, occupying 236 thousand hectares of arable land. 29 per cent land owners in possession of 73 per cent of land. The marginal farmers numbered 28 thousand and had only 12 thousand hectares of land to themselves. Small and semi-medium holdings were 32 thousand, the area under them being 73 thousand hectares.

Farms of 10 hectares or more occupied 209 thousand hectares in Sagar and 133 thousand hectares in Damoh. This shows the tardiness of the operation of the Land Ceiling law at that time. Indications are that the position has not improved much since then. The unusually large number of medium and large holdings really explains why the number of landless labour in this region is so large. The people grouped by census enumerators under the head 'cultivators' too is unusually large in this region. However, this is no cause for satisfaction since these are the marginal and small farmers. There is reason to think that this section of agriculturists is getting more and more alienated and with further fragmentation of holdings with the passage of time the situation would become worse. These are the source of out-migration from rural areas and of somewhat alarming growth of urban centres. Perhaps it can be said that they are responsible for the general backwardness of agriculture in this region.
They seem to have little stake in the improvement, there being hardly much scope with the size of the holding being what it is. One does not know about other regions but this region is certainly in need of joint farming to make agriculture more remunerative and attractive.

LAND AVAILABILITY:

The Sagar-Damoh plateau is a low-density area. Available per capita land in the net sown area .79 hectare is considerably more than the state average of .44 hectare. Dudley Stamp has opined that "One acre (i.e., .4 hectare) of well cultivated land in the middle latitudes is sufficient to produce an adequate diet for one person". 83 per cent of the total patwari circles in this region have over one acre per capita net sown area. (Map 41)

The region can be divided into four types of areas from the point of view of per capita land availability:

1. The areas where amount of per capita net sown area is less than .40 hectare;
2. The areas where per capita net sown area is between .41 and .60 hectare;
3. The areas where per capita net sown area is between .60 and .80 hectare; and
4. The areas where per capita net sown area is above .80 hectare.

---


SAGAR-DAMOH PLATEAU
PER CAPUT NET SOWN AREA
1975-77

HECTARE
ABOVE 1.0
1.00
0.80
0.60
0.40
BELOW 0.40
URBAN AREA
FOREST AREA

KM: 0 5 10

BASED ON DISTRICT CENSUS HANDBOOKS 1971 & TAHSIL LAND RECORDS
Areas Where Per Capita Net Sown Area is less than .40 hectares:

Only 17 per cent of patwari circles belong to this category. These patwari circles are in the main confined to the Northern highlands and the Southern highlands. Some circles are found in the Bemas upland and the Sonar valley of the Western highlands also. In the Dhasan upland only a few patches are found near the forested and hilly areas. In the Sonar upland, these patches are found on the Bemas, a tributary of the Sonar joining it on the left bank.

Areas Where Per Capita Net Sown Area is Between .40 and .60 hectares:

This category covers some 33 per cent patwari circles. The largest chunk of this type is found in the Western highlands and in the Sonar upland. Patches are found in the Northern highlands and Southern highlands also. Large patches are found in the Bemas upland in the Sonar valley while some patches are found in the Kopra valley and its upper waters as well as in the upper waters of the Bannar nala. The pattern in this area is rather patchy, as it is in the Northern highlands also. In the Sonar upland, these circles are situated on the left bank of the Sonar. In the Southern highlands these are limited to the river valleys, mainly of the Bemas and the Guraiya nala and the Singrampur valley.

Areas Where Per Capita Net Sown Area is Between .60 and .80 Hectare:

Between .60 and .80 hectare net sown area is available
per capita in nearly 31 per cent patwari circles. This category is mainly found in the fertile Western highlands. Patches can be seen between the river valleys of the Bina, the Dhasan, the Beas and the Sonar. In the Northern highlands it is limited to the right bank of the Dhasan. In the Sonar upland, these patches are found on both sides of the river on the slopes.

Areas Where Per Capita Net Sown Area is Above .80 Hectare :

As many as 21 per cent patwari circles record above .80 hectare per capita net sown area. This category is mainly confined to the Dhasan and Sonar uplands.

Conclusions :

(1) There are two distinct features characterising this region. First, there are areas with sparse population but with low per capita land availability; second, populated areas have high percentage of per capita land.

(2) Low per capita land characterises mainly the Northern highlands and Southern highlands and some hilly forested ranges of the Western highlands. This may be due to low percentage of net sown area in these regions, though they have high agricultural density.

(3) High percentage of land per head is mainly found in the river uplands and river valleys. These regions have a very high percentage of net sown area (more than 80
per cent of the total land). Population is relatively not so dense. However, the productivity of this area is not very high.

Agricultural Development Inputs:

IRRIGATION

Water supply is a basic necessity for human life as well as for agriculture. "Man, land and water cannot be separated from each other," observes Robert M. Brown, "as one cannot imagine man separated from water any more than one can imagine him separated from land." In fact, life as such in whatever form, vegetative or animal, depends on water. Only those planets or satellites can be expected to support life which have water.

Ready availability of irrigation facilities always acted as a determining factor in agricultural production. Introduction of chemical fertilisers and high-yielding varieties of seed has further accentuated the importance of water. Only well-irrigated farms can properly utilise fertilisers and high-yielding seeds.

Sagar-Damoh plateau's economy is essentially agriculture-based. Total dependence on monsoonal rainfall in such an economy is full of hazards. As a rule, the lower the rainfall and greater its variability, the more is the need for irrigation. A variability in excess of 20 per cent implies

great risk in farming. And, as has been pointed out, "Rainfall characteristics unfavourable, both in space and time, to crop husbandry necessitate supplemental irrigation for not only annual crops like sugar cane grown during dry periods, but also for adequate growth and high yields of kharif and rabi crops. Now that the farmers are picking up modern farming techniques and adding chemical fertilisers and other inputs to the fields, the availability of adequate amount of developed water supply to the standing crops at opportune times can not be set aside."

Moreover, it must be remembered that irrigation affects not only the quantity but also the quality of the produce. In knowledgeable and experienced hands, irrigation can be a boon. But it can also be otherwise. While analysing the relationship between water and crop quality, Chang has pointed out, one must differentiate between natural rainfall and controlled irrigation water. While rainfall usually is accompanied by high cloudiness and low radiation the application of irrigation is not complicated by a change of unfavourable weather conditions. The common misconception that

irrigation exerts an adverse effect on crop quality is often
deduced from a comparison of crop quality which is usually
to better in a moderately dry than in a wet year. Chang has
warned that since the quality of a crop is affected by fertili-
er application, radiation intensity, diurnal temperature
range, rainfall during the ripening period and the like, care
should be taken to see that irrigation as a cultural practice
does not create a micro-climate or soil condition unfavourable
for good crop quality. The radiation balance may even increase
slightly after irrigation which would be a welcome change.

Certain other variables also govern the pattern of
irrigation distribution in a given region, and these should
be taken into account. Nature of terrain, availability of
water resources and socio-politico-economic situation are
among these. The present, very localised, picture of irriga-
tion in this region has been analysed keeping in view all
these conditioning factors. It has been found that along with
the nature of terrain and fertility of soils, human factors
(particularly political consciousness), structure of farming
and socio-economic levels have decisive influence on the
present distribution of irrigated area. Absence of a single
perennial river in this region adversely affects the situation.
Added to this is the fact that it is not easy to develop means
of irrigation in a plateau-type terrain. Vast sums would be
required to build a canal system in this region which would
ensure returns through an expansion of cropped area, intensive
farming and substitution of present crops by more remunerative
ones.
Water-wealth Assessment:

The primary source of water is precipitation, much of which is lost through evaporation. A good deal of it runs off and is known as surface water while the small amount that seeps through the ground becomes ground water. The surface water remains available to the farmers in the form of rivers and streams, tanks and reservoirs. The amount of water depends on the degree of rainfall, structure of the terrain and soils and on socio-economic constraints.

The region under study is divisible into three sub-basins: the Ken sub-basin of the Ganga basin, the Betwa sub-basin of the Yamuna basin and the Sindhur-Hiran sub-basin of the Narmada basin. The major tributaries are as follows:

The Ganga basin (Ken sub-basin):
1. The Sonar; 2. The Beas;

The Yamuna Basin (Betwa sub-basin):
1. The Rina; 2. The Jamni;
3. The Haren; 4. The Dhasan.

The Narmada basin:
1. The Sindhur; 2. The Hiran.

Ground Water:

Importance of ground water is growing day by day. Availability of ground water depends on the climatic conditions, soil character, land use and the geology of the area.
Excepting the climatic factors, the other factors are really
dependent on the rock-formations.

Geohydrologically, three combinations occur in this
region.

(1) Vindhyan Sandstone: The Vindhyan sandstones
are compact, hard and devoid of prominent vertical joints.
Ground water in this formation appears to be inadequate.
Only the bedding plains give some water where it has loosened
due to weathering. The average depth of tube-wells in these
areas is between 200 and 250 feet and the discharge is 8500
gph. It is found that generally in sandstone areas tube-
wells do better than dug-wells.

(2) Lametas: The Lametas which are represented
by sandstone in this region are compact and act as water
barriers due to their quartzitic nature.

(3) Deccan Trap: Deccan trap is seen overlain
by alluvial soil, though some exposures are seen in nālas in
the Damoh area. It has been observed that the basalt of
this area is mostly compact. The jointing, though somewhat
developed, is only feeble. The interflow zones are well
developed only at a few places, but these are discontinuous
and of small extents. These can supply only limited quantity
of water for irrigation. The depth of water level varies
with structure, dip of rocks and local slopes of the land.
The average depth of the wells range between 6-8 and 15-20
metres in the trap area. Recharges are more pronounced where it is in the vicinity of 6 to 8 metres.

MEANS OF IRRIGATION:

Canals:

Canal is, by and large, the major source of utilising surface and sub-surface water on pre-determined lines. However, it is a large-scale enterprise and is out of reach of the individuals. Moreover, its water cannot reach every point. This region’s share in the total length of canals in Madhya Pradesh was only 5.6 per cent in 1973-74 which came down to 3.1 per cent in 1976-77. The gross canal irrigated area in this region was 12.9 per cent, 15.4 per cent and 15.1 per cent respectively in the years 1974-75, 1975-76 and 1976-77.

Wells:

If canals were the first ranking source of irrigation in the Sonar upland and the Southern highlands, wells are the major source in the Western highlands. This is due to a difference in rock-structure. However, the percentage of wells in this region in the state aggregate is woefully low: only 1.9 in 1973-74 and 1.8 in 1976-77. The gross well-irrigated area was 8.8 per cent in 1974-75, 9.7 per cent in 1973-76 and 10.6 per cent in 1976-77.

There are several methods of lifting sub-soil water
in use in this region. Diesel and electric pumping sets too
have reached the interior areas.

Tanks, Reservoirs and Tube-wells:

Tank irrigation is as popular as well irrigation in
the Western highlands of Sagar-Damoh plateau. From .4 per
cent in 1974-75 it has gone up to .5 per cent in 1975-76 and
.7 per cent in 1976-77. In the other parts of the State it
was significant in the pre-Plan period but is gradually dec-
lining in the Plan periods. Number of tanks has gone down
in this region also, from 101 in 1974 to 85 in 1977. Predom-
ine of tanks in this region may be ascribed to certain
physical facts, such as undulating terrain with impervious
rock base and high rainfall. Some tanks are in use for
pisciculture also these days.

These were 28 reservoirs in 1974. The number of
tube-wells was 18 in 1976-77, 17 of these in the Sonar upland
alone.

Pattern of Irrigation:

5.68 per cent of the total net sown area belonging
to the Sagar-Damoh plateau is irrigated by various methods.
This is much lower than the State average of 10.7 per cent
(in 1976-77).

The proportion of irrigated area varies markedly in
different parts of this region, ranging between 1 and 73 per
1. Areas of very low percentage of irrigated cropland;
2. Areas of low percentage of irrigated cropland;
3. Areas of moderate irrigated cropland;
4. Areas of high irrigation percentage, and
5. Areas of very high percentage of irrigated cropland.

Areas of Very Low Percentage:

It is a pity that nearly 56 per cent patsari circles belong to the first category of less than 2.36 per cent irrigated area. This really explains the overall low percentage of irrigated area in this region. The Western highlands, the Barana hills of the Northern highlands, all of the Sonar upland and Beama valley excepting a few isolated patches, the upper waters of the Guraiya nala, the Singraspur valley and the eastern-most part of this plateau largely belong to this category.

Areas of Low Percentage:

Category of low irrigated area - between 2.36 and 5.56 per cent - is found in 20 per cent of the total patsari circles. Large patches of this category can be seen on the Western highlands and in the Sonar upland. In the Western highlands, these patches are located in the river valleys of Dhasan, Bevas and Sonar, and in the upper waters of the Beama and the Kopra. In the Sonar upland, some patches of
this category are found at the junction of the Beas and the Sonar and around the urban area of the Hatta town. Few small patches are found along the course of the Beas and the Guraiya nala also.

Areas of Moderate Percentage :

Medium category of irrigated area ranges between 9.6 and 13.12 per cent. It is found in 14 per cent of patwari circles. These patches are interspersed with the low category in the Western highlands. Some patches are situated around the urban centres like Sagar, Bansa, Gahakota, Rehli and Deori. Others are in the upland of the Beas, in the Sonar valley and in the upper waters of the Banner nala. A few patches are found in the Sonar upland along the Sonar river. In the Southern highlands, these patches can be seen in the Beas and valley, along the Guraiya nala and around Damoh city.

Areas of High Percentage :

High percentage of irrigation characterises only some 5 per cent of patwari circles. It ranges between 13.12 and 30.95 per cent of the total net sown area. In the Western highlands this category is found mostly around the South-eastern part of the Sagar town. Small patches are found near other townships also. In the Southern highlands, patches of this type are found along the Guraiya nala and on the left bank of the Padri river in the north-eastern tip.
Areas of Very High Percentage

In 5 per cent of patwari circles the irrigated area ranges between 30.95 and 73 per cent of net sown area. These are situated on the right bank of the Dhasan and around Bila river in the Northern highlands. In the Southern Highlands these are found on the right bank of the Padri, in the Sun valley, along the course of Guraiya nala and in the upper waters of the Bamera. Three patwari circles of this type are found in the Western highlands near the townships.

Conclusion

As already noted, the region under study has a rather meagre irrigation facility. The State as a whole is far behind some other states in this matter while this region is among the most backward in the State.

It may be noted that the percentage of irrigated area appears to go up in the segments where double-cropping is high, in the hilly terrain of the Northern highlands where a dam on the Bila river provides irrigation channels, in the Southern highlands where the terrain encourages formation of reservoirs and tanks to store rain-water and in the Western highlands where sub-soil water-table appears to be high and well-irrigation is popular. However, owing to the uneven nature of the terrain the irrigation patterns are also uneven. To top it all, there is not a single major river flowing through this region on which any major kind of river project could be built.
Growth of Irrigation:

Irrigation has been in practice for a long time in this as in other regions. However, a planned development of irrigation facility is relatively a new phenomenon, dating only from the commencement of the First Five Year Plan. At the beginning of the First Plan, i.e., in 1950-51, irrigated area in this region was no more than 6718 hectares. Several medium and minor irrigation projects came to be executed in the successive plans, taking the figure to 33523 hectares in 1976-77.

Table V:2

<table>
<thead>
<tr>
<th>Crop</th>
<th>1950-51</th>
<th>1976-77</th>
<th>Per Cent Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>3293 hectares</td>
<td>4700.5 hectares</td>
<td>41.25</td>
</tr>
<tr>
<td>Wheat</td>
<td>2491 &quot;</td>
<td>27201.3 &quot;</td>
<td>1527.5</td>
</tr>
<tr>
<td>Barley</td>
<td>438 &quot;</td>
<td>120 &quot;</td>
<td>-76.0</td>
</tr>
<tr>
<td>Gram</td>
<td>175 &quot;</td>
<td>601 &quot;</td>
<td>651.45</td>
</tr>
<tr>
<td>All pulses</td>
<td>331 &quot;</td>
<td>900 &quot;</td>
<td>578.6</td>
</tr>
</tbody>
</table>

It may be added here that while irrigated area has continuously risen in Sagar district, from 1.2 per cent in 1950-51 to 3.4 in 1976-77, it has gone down from 3.5 per cent in 1950-51 to 3.1 in 1976-77 in Damoh district. Thus, whereas irrigated area rose by 183 per cent in Sagar during this period, it went down by 40 per cent in Damoh district.

Of the various methods of irrigation, growth of canal irrigation has been 294.6 per cent in Sagar and 196.7 per cent in Damoh. Irrigation from wells grew by 132.1 per cent in Sagar and by 196.4 in Damoh. Irrigation from other sources,
however, shows a very marked difference between these two segments. While in Sagar the figure stands at 2144.8 per cent, in Damoh it stands at only 1068.3. In regard to tank irrigation, both districts registered decline, Sagar by 69 per cent and Damoh by 96 per cent.

It is interesting to note that though irrigated area has gone down in Damoh, net sown area has gone up. Thus, Sagar district recorded a rise of 30 per cent in net sown area while Damoh's corresponding figure is 34 per cent.

Double-cropped area expanded in both the districts. However, while Damoh district had an increase of some 320 per cent, Sagar district recorded an increase of only 88 per cent. Perhaps herein lies the reason for the decline of irrigated area in Damoh district. Growth of acreage due to double cropping has been far more steep than in irrigation.

OTHER INPUTS:

It is heartening to note that agriculture is modernising in both the segments at a satisfactory pace. Use of chemical fertilisers (NPK), thus, registered an increase of 687.4 per cent in Sagar and 628.5 in Damoh. Only 174 tons of fertilisers were used in Sagar in 1961-62. The figure rose to 1370 tons in 1975-76. Similarly, in 1961-62 Damoh district could utilise only 132 tons of fertilisers but the figure stood at 955 in 1975-76.
This is not all. Rise in agricultural implements too is note-worthy. Number of electric and oil pumps for irrigation rose by 390.3 per cent in Sagar and by as many as 1260 per cent in Damoh between 1967-68 and 1976-77. During the same period, the number of tractors went up by 395.6 per cent in Sagar and 665.6 per cent in Damoh. The reason why Damoh has higher growth figures lies perhaps in its greater backwardness in earlier years. Thus, it had only 32 tractors in 1967-68 when Sagar had 252. Even after this sizable increase, Damoh had only 245 tractors in 1976-77 when Sagar had 1249.

Finally, one notices that the number of wooden ploughs went down by 3.6 per cent in Sagar while it went up by 11.9 per cent in Damoh; on the other hand, iron ploughs registered an increase of 604.2 per cent in Sagar though they went down by 18.7 per cent in Damoh. Sugarcane crushers remained in the same number in Sagar (127) while they went down by 26 per cent in Damoh. Bullock-carts increased by 17.7 per cent in Sagar and 23.9 per cent in Damoh, a sad commentary on the position of accessibility!

ANIMAL HUSBANDRY:

One cannot overlook the livestock situation while dealing with the problems relating to food and agriculture produce. Significance of cattle in an agrarian society is evident. Cows and buffaloes provide the essential animal
protein and fat in the form of milk-supply. Oxen and male buffaloes not only work as draught animals but also help transport the produce and with the running of the Persian wheels. Last but not least, bulk of manure is produced from the refuse of these beasts. Farming in all its aspects would become unthinkable without the live-stock to help it in various ways. In fact, there is a symbiotic relation between the two. The healthier the cattle the better the agriculture and vice-versa. Panjab and Haryana, agriculturally the two most advanced states in India, also have the best and healthiest cattle.

In the year 1976-77, livestock population of the region under study stood at 2010 thousand. Of this, as much as 76 per cent belonged to the bovine family. Buffaloes, the next numerous category, accounted for 11 per cent. Sheep, goats, pigs and poultry accounted for the remaining 13 per cent. In terms of numbers, the situation was as follows:

<table>
<thead>
<tr>
<th><strong>Livestock Population in 1976-77</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows above 3 years (for milk)</td>
</tr>
<tr>
<td>Cows less than 3 years old</td>
</tr>
<tr>
<td>Oxen and bulls</td>
</tr>
<tr>
<td>Buffaloes above 3 years (for milk)</td>
</tr>
<tr>
<td>Buffaloes less than 3 years old</td>
</tr>
<tr>
<td>Buffaloes working as draught animals</td>
</tr>
<tr>
<td>Sheep</td>
</tr>
<tr>
<td>Goats</td>
</tr>
<tr>
<td>Pigs</td>
</tr>
<tr>
<td>Poultry</td>
</tr>
</tbody>
</table>
Danish district appears to be considerably behind Sagar district in the matter of livestock. Thus, the total number of cattle in Sagar was 698 thousand in 1976-77 while it was 456 thousand in Damoh. Against 236 thousand male cattle, 226 thousand female cattle and 236 thousand young stock in Sagar, Damoh had 155 thousand, 143 thousand and 158 thousand respectively. Situation is the same in regard to buffaloes, other livestock and poultry. While the respective figures for Sagar were 124 thousand, 113 thousand and 41 thousand, Damoh’s figures were 70 thousand, 94 thousand and 28 thousand.

However, it is heartening to note that the livestock situation is improving at a faster pace in Damoh than in Sagar. Except for other livestock (sheep, goats and pigs) and poultry, growth in number during the three years preceding 1976-77 was considerably higher in Damoh. Thus, against Sagar’s growth figures of 4.9, 13.1 and 1.0 per cent for male, female and young cattle respectively, Damoh recorded growth rates of 6.1, 20.5 and 16.3 per cent. It appears that there has been a large scale influx of young cattle with a view to accelerate the growth. Similarly, male and female buffaloes increased by 25 and 10.6 per cent respectively in Sagar while the number of young buffaloes declined by 12.2 per cent. In Damoh, on the other hand, male, female and young buffaloes increased by 57.9, 23.3 and .7 per cent. Consequently, while the buffalo population went up by only .3 per cent in Sagar in Damoh it recorded a rise of 13.5 per cent. True,
the fact of Damoh's earlier backwardness is partly responsible for this difference. Yet it must be noted with satisfaction that livestock situation is not being ignored in Damoh. One wished that the number of other livestock and poultry also increased proportionately. The situation is reverse here. Other animals registered an increase of 38.3 per cent and poultry of as many as 220.3 per cent in Sagar. In Damoh the corresponding figures were 34.3 and 90.5 per cent.

Cattle of this region do not seem to belong to any recognised breed. Generally, cows are of medium build, their length being 60-65 inches and weight 300-500 lbs. Their milk produce ranges between 200 ml and 2 litres per animal per day. Situation is better in regard to buffaloes. While the maximum yield on record from a cow is 5 litres, that from a buffalo is 12 litres. Average capacity of producing milk is .56 lt. in case of cows and 1.3 in case of buffaloes.

One reason for low milk yield lies perhaps in the low acreage of pasturage. In 1976-77, 157 thousand hectares were classified as permanent pastures and other grazing land. This gave only .7 hectare of grazing land to each head of livestock. Normal requirement of grazing area, however, is one to three acres per head.

Happily, raising of fodder crops during the Kharif season is on the increase lately. Schemes for fodder development are being taken up on a small scale by the relevant
agencies. Blocks are being reserved for growing nutritious cattle-feed. Wherever irrigation facilities exist, green fodder cultivation is encouraged. Forest grading and certain agricultural bye-products are really the two principal sources of cattle-feed. Forests also provide grazing facilities to the animals. Cattle are sent to the forests before the onset of the rainy season, particularly from the black soil areas. This affords some rest to the village grazing grounds and allows them to recuperate. It also helps in the change of pastures. Sagar being mainly a wheat-producing area, chaff (bhuva) is readily available for use as cattle-feed. Jowar and gram which are largely grown in this area are also given to plough-animals during the farming season. Similarly, jowar stalks (barhi) are left standing in the fields after harvesting and the cattle are encouraged to graze in these fields.

Milk is a principal source of protein supply, indeed the only one for vegetarians as far as animal proteins are concerned. As such it is specially important in this region where most people are vegetarians either by choice or through economic considerations. Milk contains protein of good and readily assimilable quality, unlike vegetable proteins. It has also other nutrients and can be described as a complete food except for vitamin C and iron. With only minor exceptions, the over-all nutritive value of milk from different breeds of cow and buffaloes is considered to be the same. The only major difference between cow’s and buffalo’s milk is greater proportion of fat in the latter and protein in the former.
Per capita availability of milk in this region is very low, much lower than in other countries or even other regions of this country. According to the ICAR, an average diet should contain 80 ml. milk while an improved one ought to have 170 ml. Owing to the small number of milch cattle in this region, the actual in-take of milk and milk-products is not even a fraction of the suggested figure. The diet, especially in the rural areas, is almost exclusively cereal-based. In 1971, per capita daily availability of milk in this region was mere .22 lt., which came down to .19 lt. in 1981. How many could afford even this much is anybody's guess.

Goats are also reared in this region for both milk and mutton while sheep are kept only for the latter. However, their number is negligible. The wool yielded by the sheep is of coarse, hairy type. No recognised breed of sheep and goats is found in this region.

The only full-fledged dairy farm in this region is the one started by the Department of Animal Husbandry at Ratopa, near Sagar city, in October 1946. It supplies dairy products to the residents of Sagar. Recently, Sagar has been brought under the State Milk Federation. The Federation, however, does not own and maintain any cattle. It is a co-operative venture to which the cowherds sell their milk for standardisation and distribution. The Federation plans to set-up a major milk chilling plant at S Sagar. Other towns and the rural areas falling in this region are not served by any dairy. Cattle are maintained
by individual households, mostly somewhat better-off people, and milk is sold by milk-men.

Flesh foods are consumed mostly in the urban centres in the region. These include fish, eggs, mutton and fowl. However, no precise data are available in this regard. By and large, Brahmans, Jains and Vaishyas are strict vegetarians while the lower strata of population eat the meat of pigs. Fishing was confined to small ponds and rivers so far. Now the State Government has taken it up in a big way. Fish and meat have protein of high biological value and vitamins

B. Fish is a good source of calcium also. Government’s efforts in this direction are welcome. The Government is organising and encouraging the sale of eggs also. Eggs are a rich source of all kinds of nutrients except vitamin C. Egg-protein is considered to be among the best. Eggs also have a predominantly urban market.

Low consumption of milk and flesh foods is nothing peculiar to this region. It characterises the whole of Madhya Pradesh as also many other regions in the country. Lack of education and religious considerations have combined to exert a baneful influence on the upkeep and development of livestock. Cattle and fowl fall prey to so many diseases every year. People in general are ignorant of the ways of counteracting such contagious diseases while the number of veterinary hospitals is very inadequate. Religious considerations, on the other hand, forbid a fair section of population from becoming non-vegetarian thus reducing the economic
value of the livestock. Most cows and buffaloes are of poor 
breed and do not give as much milk as is given by cows and 
buffaloes elsewhere. Situation all over the country is not 
happy in this regard. It is reported that while demand for 
milk is increasing at four per cent per annum, production 
of milk is increasing at barely two per cent per annum.

Two factors in particular obstruct the improvement 
of livestock in this region. First, there is an acute 
shortage of cattle-feeds and fodder. Secondly, the admini-
stration has so far not succeeded in persuading people to 
take to dairy farming as a profitable economic activity.
Livestock development has large potential to create back-
ward and forward linkage effect in the rural sector. It will 
have an impact in four areas: (1) Milk and milk-products;
(2) Draught power for agriculture and transport (3) Manures;
and (4) Hides and skins. Hopefully, biogas or gobar-gas may 
also become popular someday with its all-round benefit. Impro-
vement of the breeds of cattle and growth of their numbers 
will have far-reaching effect on the quality of life. It will 
help with not only health and additional income but will also 
be a factor in the ecological balance.

The spread-effects of increasing production in this 
sphere are equally important. The main in-puts in the dairy-
ing industry are feeds and fodder, permanent water source,
efficient management and care and efficient transport facilities.
Development of dairy industry will give rise to the establi-
shment of animal-feed factories, production of fodder crops
and its storage in soils. It may also result in the establishment of milk-food and other milk-product factories, as has happened in Gujarat. Since the dairy-farms will generally be located in rural areas, it will generate fresh employment avenues there thus reducing the burden on agriculture.