ROYAL COMMISSION

ON

AGRICULTURE IN INDIA

INTRODUCTION

TO

VOLUME VII

EVIDENCE

TAKEN IN THE

UNITED PROVINCES

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UNITED PROVINCES

Scale 1" = 32 Miles

1928

REFERENCES.

- Boundary, Province, State
- do. District
- Road Metalled
- do. Unmetalled
- Standard Gauge Double Line
- do. do. Single Line
- Metre Gauge
- Other Gauge
- Central Experimental Farm
- Ordinary Experimental Farm
- Seed Farm
- Demonstration Farm
- Cattle Farm

TIBET

NEPAL

SIRMOR

UMBALLA

KARNAL

DELHI

GURGAON

BHARATPUR

DHOLPUR

GARHWAL

TEHRI

ALMORA

CHAMPARAN

SARAN

SHAHABAD

PALAMAU

SIRGUJA

SINDHIA

BUNDELKHAND

STATES

REWAH

DEHRADUN

SAHARANPUR

MUZAFFARNAGAR

BIJNOR

MEERUT

MORADABAD

RAMPUR

BULANDSHAHR

ALIGARH

BUDAUN

SHAHJAHANPUR

PILIBHIT

BAREILLY

KHERI

SITAPUR

HARDOI

FARRUKHABAD

ETAH

MAINPURI

AGRA

MUTTRA

ETAWAH

JALAUN

JHANSI

HAMIRPUR

BANDA

CAWNPORE

UNAO

LUCKNOW

BARABANKI

RAE BARELI

FATEHPUR

BAHRAICH

GONDA

FYZABAD

SULTANPUR

PARTABGARH

ALLAHABAD

BASTI

GORAKHPUR

AZAMGARH

JAUNPUR

BALLIA

GHAZIPUR

BENARES

BENARES STATE

MIRZAPUR

Nagina

Kalai

Madhurikund

Jachonda

Bichpuri

Kalyanpur

Naugawan

Manjhra

Nawabganj

Atarra

Ganges River

Jumna River

Gogra River

Rapti River

Gumti River

Sarda River

Offset

Gov' Photozinco Office, Poona 1928.

THE UNITED PROVINCES

1. GENERAL FEATURES.

The United Provinces cover, in all, an area of 72·6 million acres and in 1921 had a population of 46·5 million persons. Deducting 4·3 million acres from the area and 1·1 million persons from the figure for population on account of the three States of Rampur, Tehri-Garhwal and Benares, the area of the territory under direct British administration is 68·3 million acres, with a population, according to the census of 1921, of 45·4 million persons. Lands either absolutely barren or otherwise not available for cultivation take up 10 million acres and forests another 9 millions. The area at present cultivated is about 35 million acres; and three million acres are under current fallows. The total quantity of land available for extending cultivation in the future is thus about ten million acres. The possibility of any considerable expansion is, however, limited. In the Indo-Gangetic plain, there is very little land that is not already under the plough. In Bundelkhand, the soil is thin and poor, the level of sub-soil water low and rainfall very precarious. In the country lying at the foot of the Himalayas and extending from Saharanpur in the west to Gorakhpur in the east, the areas of uncultivated land at present under jungle grass or forests are unhealthy on account of malaria and in the absence of heavy expenditure on sanitation, successful agriculture cannot be carried on. The reclamation of land, lying in patches here and there all over the plains and impregnated with salts to such an extent that crops cannot grow on it, is again chiefly a matter of expenditure. The outlook for a considerable increase of the area cultivated at present is thus not very encouraging.

Of a total population of over 45 million persons, 34·8 millions directly depend upon agriculture for their livelihood, 29 millions as tenants, or as cultivating proprietors depending mainly on their cultivation, four millions as agricultural labourers, one million as landlords, agents, clerks, etc., and three-fourths of a million as stock breeders and herdsmen. There are no large scale enterprises on the western factory system, using modern machinery and producing for distant markets in the province, apart from a few concerns mostly concentrated in Cawnpore and Agra. The province is thus predominantly agricultural,—in appearance, in outlook, and in distribution of population according to occupations and localities. A railway journey through any part of it reveals a vast expanse of unenclosed cultivation, field upon field, with innumerable mud villages and hamlets. When people come together, conversation centres round crops, prices of foodstuffs, rain and the weather. As regards distribution of the population, the census figures show strikingly its agricultural character. Of every thousand persons enumerated, 894 were rural and 106 urban. Classified according to occupations, 768 out of every thousand depend directly upon agriculture for their livelihood. If the crops are good, there is more to be transported, more to be bought and sold and more available for the services rendered by the village artisans, the priests and men of law.

For such a population the chief physical factors that determine its prosperity are the nature of the soil and the agricultural water supply available. Soils will be discussed later. In this general sketch of the chief features of the province, the question of water, which is the life of agriculture in a hot country, must be briefly touched upon. Rainfall obviously is of the greatest importance in a consideration of the water supply. The province depends almost entirely upon the monsoon for the growing of the *kharif* crops. Sugarcane is on the ground in the hot dry weather from April to June and for it irrigation is therefore essential. In a normal year, the *rabi* is for the most part sown without irrigation by conserving the moisture in the soil through careful tillage, but, in years of deficient rainfall, the more valuable *rabi* crops are sown after irrigation and several waterings are necessary to bring those crops to maturity in the greater part of the provinces.

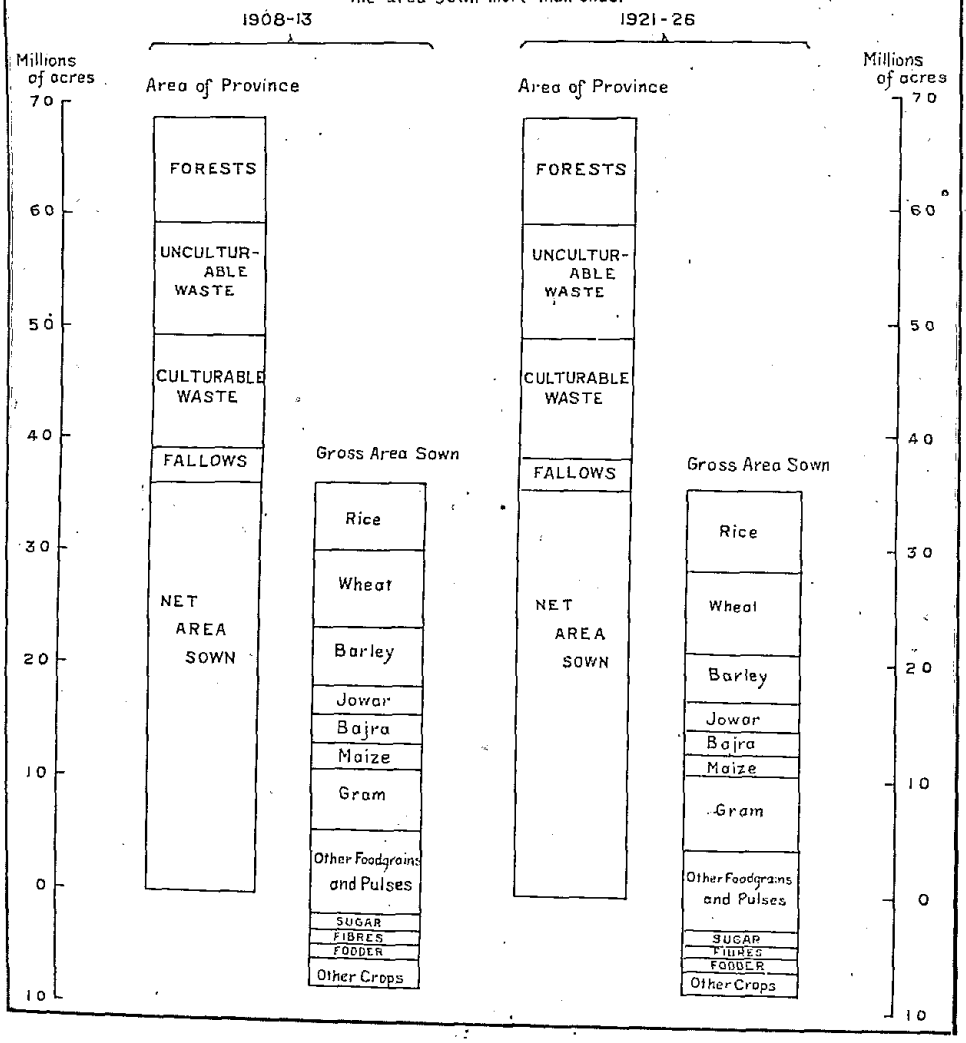
The replenishment of the supply of sub-soil water depends entirely on the monsoon except in small areas adjacent to the irrigation canals and the main source of *rabi* irrigation is this subsoil supply which is tapped by means of wells of different designs. The incidence of rainfall varies. The largest amount is received in the north, the mountainous region of the Himalayas, where most of it runs to waste either in the rivers or reappears in the tracts bordering on the foot hills of the Himalayas, to produce malaria and rank jungle vegetation. In the Indo-Gangetic plain, the incidence of rainfall increases from west to east. This variation from west to east is a marked feature of the provincial climate. In this connection it is interesting to note that density of population also increases from west to east, showing the correlation of rainfall and density of population. A few figures may be given in illustration. The normal rainfall of Muttra is 23·42 inches and the mean density of the rural population 350; Agra receives 25 inches and its density is 372. Cawnpore, with a rainfall of 31·99 inches, has a density of 392. Fatehpur with 35·06 inches has a density of 397·3. Allahabad with 37·28 inches has a density of 428. Barabanki shows a rainfall of 39 inches and a density of 585·5 and Gorakhpur a normal of 48·30 inches of rain and a density of 690 persons to the square mile. The bulk of the rainfall is concentrated in the monsoon season, from the end of June to the end of September, and only a few light showers, not more than one or two inches, are received in the cold weather. As regards means of irrigation, canals and wells play a very important part in the agricultural economy of the province. The area served by wells in 1924-25 was over 4·3 million acres and in 1926-27, 5·38 million acres. The area irrigated by canals was nearly 2 million acres in 1924-25 and 2·46 million acres in 1926-27. In the Indo-Gangetic plain, wells are not difficult to make, as the water table is not deep down and wells consequently play a very important part in irrigational facilities. Bundelkhand, on the other hand, is a tract of precarious rainfall and a precarious underground supply of water, with a severe climate and an unresponsive soil. Its agriculture is consequently also precarious and the tract as a whole is not a flourishing part of the country.

UNITED PROVINCES

CLASSIFICATION OF TOTAL AREA AND AREA UNDER VARIOUS CROPS

(5 Year Averages)

Note. The difference between the Gross Area Sown & the Net Area Sown represents the area sown more than once.



To face page 5

Large estates are a feature of parts of the province. The landlords of Oudh, known as talukdars, own more than half of Oudh. In Agra, they are known as zamindars. The large landowners do little farming on their own account. Apart from these large landowners, who are relatively few in number, the province is, in the main, a province of small proprietors. The land revenue is temporarily settled all over the province except in the Benares division, part of the Azamgarh district, and a few estates in Oudh, which are permanently settled. The holdings are small and scattered ; they are on the average larger in the west than in the east but there has been no detailed analysis of the size of holdings in the different areas. Illiteracy among the rural population is general. There is no cohesion or organisation either among cultivators or agricultural labourers. The failure of the co-operative movement in the United Provinces is to a large extent due to this factor of illiteracy. The peasants have not supported that movement, largely because their ignorance has prevented them from appreciating its advantages. There is now considerable security of tenure. Occupancy tenants in Agra with heritable rights hold 50 per cent of the total holdings area and statutory or life tenants hold 21 per cent ; non-occupancy tenants-at-will hold only 2 per cent. In Oudh statutory tenants hold 64 per cent of the total holdings area. The tenants pay their rents in cash. Only a very small portion of the cultivated area, 3·9 per cent in Agra and 10 per cent in Oudh, was under grain rents in 1924-25.

The normal acreage of the principal crops is as follows : rice, 7·3 million acres, chiefly in the eastern and sub-montane districts ; wheat, 6·9 million acres, chiefly in the western districts and Rohilkhand ; barley, 4·9 million acres ; gram, 5·7 million acres ; *juar*, 2·5 million acres ; maize and *bajra*, 2 million acres each ; sugarcane, 1·2 million acres, with the Fyzabad, Gorakhpur and Rohilkhand divisions as the chief tracts. More than half the total area under sugarcane in India lies in the United Provinces. Cotton with 1·1 million acres is grown chiefly in the dry western tracts. The gross area sown in the United Provinces amounted to 43·5 millions and the area sown more than once to 8·5 million acres, showing the net area cultivated to be 35 million acres.

A quinquennial census of cattle has been taken since 1899. According to the figures for 1925, there were 10·1 million bullocks, 6·1 million cows, and 6·1 million young stock. The numbers of she-buffaloes and young stock were 4 and 3·5 millions respectively. Both sheep and goats were numerous, their respective numbers being 2·1 and 7·4 millions. There were 212 thousand horses ; 197 thousand mares ; 279 thousand donkeys and 24 thousand camels. The total number of ploughs was about 5 millions and of carts one hundred thousand. Practically all the heavy work of the country, ploughing, raising water from wells, threshing grain and carrying produce is done by bullocks. The cattle of the province are mixed. Pure breeds are few. There are two great breeding grounds in the provinces, Bundelkhand in the south and

the sub-montane districts in the north. The principal cattle fairs held are those of Batesar, Kakora, Makanpur and Dadri. Batesar is one of the main sources from which the province obtains superior cattle. Kakora serves to distribute the cattle bred along the Ganges ; Makanpur supplies the south of Oudh and the Allahabad division, while Dadri caters for the Benares division and Azamgarh.

2. NATURAL DIVISIONS.

The United Provinces fall into four well-defined agricultural tracts, *viz.*, the Himalayan or montane tract ; the sub-montane tract ; the Indo-Gangetic plain ; and the trans-Jumna tract, known as Bundelkhand, combined with Mirzapur. The characteristics of each tract are briefly treated below.

The montane tract.—This tract comprises 14 per cent of the provincial area and 3·30 per cent of the population and includes practically the whole of the Almora and Garhwal districts, the hill *pattis** of Naini Tal and the Chakrata tehsil of Dehra Dun district. It is mountainous and largely under forests and from the point of view of agriculture, is not of any great importance. Cultivation is confined to the lower hill tops, the terraced slopes and the alluvial land where the valleys widen out. The cropped area is small. Altitude and temperature are the factors which determine the type of agriculture practised. The chief crops are wheat, rice and *mandua* (*Eleusine coracana*). Ordinarily, each village endeavours to feed itself from its grain crops and to produce something for sale ; its market crop must as a rule be of small bulk in order to bear the cost of carriage and is usually a spice such as red pepper. In accessible places, potatoes are largely grown and there would seem to be considerable scope for producing fruit and vegetables for the markets of the plains. The first essential in any attempt to increase the slender resources of these sturdy hillmen is improvement of communications, chiefly roads. Only then can there be a brisk exchange of goods between the mountains and the plains at little cost. The hill cattle, though well adapted to the kind of work required of them, could also be made to yield much more profit to their owners, if their milking capacity were increased. There is no dearth of fodder and grazing facilities and since there are definite limitations to increasing the cultivated area, it would appear natural to depend more on cattle than on crops for an increase of income. The people are hardy and capable of great physical exertion. They make good use of their spare time by working as carriers of persons and loads. Lately they have taken to military service and in endurance and courage the Garhwalis have shown themselves to be excellent soldiers.

The sub-montane tract.—The soils of this tract and those of the Indo-Gangetic plain are alike as they have a common origin. In the northern portions of the districts, there is an excess of rainfall and moisture ; in the southern portions, the conditions approximate to those prevailing in the

* Subdivisions.

Gangetic plain. As the administrative districts cannot be split up and portions assigned to the sub-montane tract and portions to the Indo-Gangetic plain, they are included, for purposes of convenience, in their entirety in the sub-montane tract. Bearing this in mind, we may indicate broadly the boundaries of the area. It is bounded on the north-east by the foot hills of the Himalayas and the Nepal Tarai. On the south-western side, as stated above, the boundary line is ill-defined but a line drawn parallel to the foot hills of the Himalayas and the Nepal Tarai frontier and roughly forty miles distant from them would indicate the south-western limit. The tract stretches from Saharanpur to Gorakhpur and includes 21·50 per cent of the area and 25·90 per cent of the population of the province. It consists of the following administrative areas : Saharanpur, Bijnor, Bareilly, Pilibhit, part of Dehra Dun and Naini Tal, Kheri, Bahraich, Gonda, Basti and Gorakhpur. The tract has a million acres under forest. Irrigation for the *rabi* crop is unnecessary in certain parts on account of the moisture. The abundance of water, however, breeds malaria and cultivation suffers in consequence from shortage of labour. The Bhabar* and Tarai* in particular are not prosperous. The Bhabar, a strip of country about twenty miles in width and gradually narrowing towards the east, consists of a stony slope covered by a thin layer of soil and has been brought under cultivation to relieve the pressure on the hill *pattis*. Beyond the Bhabar lies the Tarai. Both these tracts are fever-ridden. Hill-men come down into the Bhabar to sow after the rains and, after harvesting the crops, they retire to the hills to escape the ravages of malaria. Cultivation of the Tarai is done by cultivators who come in from the adjoining districts in the plains. In other parts of the tract, conditions are much better, the cultivated area is steadily increasing and the population is fairly dense and prosperous, the density varying from 400 in the west to 720 persons per square mile in Gorakhpur. The soils commonly met with are *bhur* or sand, *domat* or loam and *matiyar* or clay.

One of the features of this area is the abundance of grazing facilities throughout the year. The cattle raised in this tract are small, hardy and very active and are in great demand among cultivators especially in the rice growing areas. Where roads are bad, they are largely used for light bullock carts. Some large herds are kept by professional breeders. During the rains when conditions are unfavourable both for men and cattle, the animals are moved westward. The most valuable crops are rice and sugarcane. Holdings are small, especially in the east. Malaria is the problem of the more moist parts of this tract. The people speak various dialects of Western and Eastern Hindi and Central Pahari. Hindustani is, however, understood everywhere.

The Indo-Gangetic plain.—This tract, popularly known as Hindustan and from remote antiquity celebrated in religious lore and history for its fertility, its sacred streams and flourishing cities, imparting the stamp of its civilisation, institutions, and religious beliefs to the rest of India and drawing upon itself the cupidity of invaders, foreign as well as

* The words mean respectively 'porous' and 'moist'.

native, is even at the present day one of the most fertile regions to be found anywhere in India. Taken as a whole, it represents provincial agriculture at its highest and is the most densely populated portion of the tracts under consideration, the density of some of the eastern districts being unparalleled in any rural tracts outside China. Its area and population are 50·70 and 64·60 per cent of the total provincial area and population respectively. Geographically it includes portions of Rohilkhand; most of Oudh, south of the Gogra; the Benares division, north of the Ganges; the districts of Muttra and Agra and the whole of the Ganges-Jumna *doab**. The latter has three sections, upper, middle and lower. The upper section, extending from Saharanpur to Aligarh, and including within itself 22·50 per cent and 26·80 per cent of the total provincial area and population, is the most fertile; the middle section stretches from Aligarh to Cawnpore, and accounts for 21·20 per cent of area and 26·30 per cent of the population of the province. Its soil is not so fertile as that of the upper section but it is comparatively well-cultivated, prosperous and populous. The lower section, from Cawnpore to Allahabad, situated at the junction of the Ganges and the Jumna is the least fertile portion of the *doab*. Its area and population are 7 per cent and 11·50 per cent of the provincial totals.

The soils of the Indo-Gangetic plain are alluvial. There are considerable areas cut up by ravines and rivers. By far the greatest part of the plain comes under one of three classes: *bhur* or sandy soil, *matiyar* or clay and *domat* or loam. The lowlying moist areas near the rivers are commonly known as *khadir* or *diara*. The range of density is from 500 persons to the square mile in the west to 900 persons in the east and rainfall increases from west to east. Except for twenty thousand acres of afforested area, there are no forests. Irrigation is necessary for the *rabi* and sometimes for the *kharif* also. The tract is well served by canals; wells, however, irrigate a much larger area and play a very important part in its agricultural economy. The standard of cultivation is highest in the western and northern districts. Holdings there are also larger. The sturdy Jats of the west working with their women, can make the most intractable soil yield abundant harvests. The Kurmis and Kachis, the Ahirs, Gujars, Pasis and Lodhas are also excellent cultivators. The people have an innate kindliness of heart, are gentle and law-abiding. Throughout their history they have experienced vicissitudes of fortune but nothing has broken their spirit. Like their *dhub* grass they have clung to the soil and have always re-arisen after every calamity, inflicted on them by nature or man.

The trans-Jumna tract and the district of Mirzapur.—The four districts of Jhansi, Jalaun, Hamirpur and Banda, collectively known as British Bundelkhand, the district of Mirzapur and the part of the Allahabad district south of the Jumna account for 13·80 per cent of area and 6·20 per cent of the population of the province. The southern portion of Mirzapur is a wilderness of hill and valley and the northern a bare table land containing also a small strip of the great plain. The population

* Literally "two rivers." The term is used for "land lying between two rivers."

is scanty, the soil poor and the district at the mercy of the rainfall. In British Bundelkhand, there are two distinct belts of soil to be seen, the red formed from the weathering of the rock lying a few inches below and the black, which appears to be water-borne, its origin being not the Himalayas but the hills of Central India. The red soil is thin and poor and cannot hold water. The *rabi* crop is only sown in small areas usually below the embankment of a tank and is irrigated either from the tank or from wells. Elsewhere inferior millet is the utmost that this soil can bear and even that not continuously. It has to remain fallow after every two or three years to recuperate. The black soil has four types: *mar*, very dark and friable; *kabar*, a little less dark than *mar* and a good deal stiffer; *parwa*, a light yellowish loam, and *rakar*, consisting of bare, denuded slopes easily passing into ravine-land and growing only the most inferior crops. Only *parwa* resembles the soils of the Gangetic plain in its behaviour towards water, where it is available. The better types of *mar* are fertile soils and easy to work though not responsive to irrigation. Inferior *mar* and *kabar* are difficult soils to work. A slight excess or deficiency dislocates completely their preparation. Since they are retentive of moisture, a few inches of rain beyond the normal turns them into a sticky mass, rendering impossible the preparation of a seed bed for the *rabi*, and a few inches less reduces ploughing into an operation of drawing mathematical straight lines. So much for the *rabi* crop. As regards the *kharif* crop, again a slight excess or deficiency may result in its rotting or shrivelling up. The normal amount is rarely received and it is the abnormal that strikes at the fortunes of the people. Wells are few, except in limited areas near storage tanks, where there are groups of wells worked by Persian wheels. The depth to water is, in general, great, the sub-soil rocky for the most part and the construction of wells is, therefore, a difficult and costly operation. The only canal irrigation is from storage reservoirs formed by damming the Betwa, Dhasan and Ken rivers. Elsewhere, irrigation depends upon storing rainfall in tanks which also raise the water level in their neighbourhood sufficiently to facilitate the construction of wells.

The people have to struggle constantly against adversity with scanty resources. Holdings are large, and tenants are not in the grip of the landowners. If the conditions appear unreasonable to them, they throw up their holdings and find others at no great distance.

There is a sufficiency of grazing grounds but the cattle are not specially noted for their excellence.

The crops grown in the red soil are usually the inferior millets and pulses. The darker soils give good crops of the better millets in favourable years. Of the *rabi* crops, gram is the main crop and little wheat is grown. Little sugarcane and cotton is now grown and artificial dyes have abolished the cultivation of *al* (*Morinda citrifolia*), a lucrative crop formerly grown for dyeing purposes.

The tract has suffered heavily in the past. The resources of the people have been strengthened considerably during the last thirty years by the

provision of irrigational facilities and loans, and the adoption of a considered policy of land revenue remissions and of a land revenue assessment varying with the area cultivated. Much, however, remains to be done if Bundelkhand is to attain to a real measure of economic security.

3. PROVINCIAL INCOME AND EXPENDITURE.

It is not intended to discuss in detail the figures of provincial income and expenditure. One or two features of general interest, however, deserve to be noticed. The United Provinces have not, like the Punjab and Sind, been amply endowed by nature with unoccupied areas of good cultivable land at the disposal of Government. There is not much Crown waste available for development. Few buyers would look at the little that there is. The provincial purse cannot therefore be filled, from time to time, by the sale of such land. Further, there can be no additions to the annual provincial income, by way of land revenue, from the development of such lands. The lands of the United Provinces are more or less taken up. The annual income of the people may be reduced by the destructive interference of nature. Collective effort, however, is being directed towards reducing such losses to a minimum by strengthening the resources of the people in their fight against nature. Apart from such occasional interferences, there is reason to suppose that the national dividend is increasing. Not, however, that portion of it which is allotted to the community organised as a State. Taking first the most important source of provincial revenue, the term for which the land is settled has been extended from thirty to forty years ; the percentage of the share taken by the State, as pointed out in another section, has been reduced. The water rates are rigid. The revenue from excise may fall. Stamps must bear some relation to the cost and value of the services rendered. It would thus appear that, in the existing arrangements, inelasticity is the word written across that side of the statement which deals with provincial income.

REVENUE AND EXPENDITURE CHARGED TO REVENUE

GOVERNMENT OF THE

(Figures are in

Revenue and Expenditure

Receipt heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
Revenue Receipts						
Principal Heads of Revenue—						
Land Revenue ..	681	680	692	671	690	688
Excise ..	140	141	131	131	133	131
Stamps ..	151	161	175	174	176	169
Forests ..	86	84	74	69	64	58
Other heads ..	38	12	12	13	14	13
Railways:						
Subsidised Companies ..	1	1	2	2	2	1
Irrigation ..	93	86	99	66	85	99
Debt Interest ..	15	22	18	18	13	9
Civil Administration—						
Administration of Justice ..	9	10	12	13	14	14
Jails and Convict settlements ..	5	4	5	5	7	8
Police ..	2	5	3	3	3	3
Education ..	7	9	10	10	10	11
Medical ..	1	1	1	1	1	1
Public Health ..	1	1	2	1	1	2
Agriculture (including Co-operation and Veterinary) ..	5	5	5	5	5	5
Industries ..	..	..	..	2	1	1
Other departments ..	1	1	1	1	1	1
Civil works ..	5	5	5	6	4	4
Miscellaneous ..	14	20	24	47	46	41
Miscellaneous adjustments between Central and Provincial Governments ..	..	..	..	2	1	..
Extraordinary Receipts ..	..	..	..	..	..	31
Total, Revenue Receipts ..	1,264	1,248	1,271	1,240	1,271	1,290

UNITED PROVINCES

lakhs of rupees).

charged to Revenue

Expenditure heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
Expenditure charged to Revenue						
Direct Demands on the Revenue—						
Land Revenue ..	78	78	81	80	82	83
Forests ..	73	62	44	38	38	34
Other heads ..	16	15	16	14	23	21
Irrigation—						
Revenue Account ..	47	50	56	64	72	75
Irrigation—						
Capital Account charged to Revenue ..	5	3	3	2	4	6
Debt services ..	42	33	30	30	33	41
Civil Administration—						
General Administration ..	141	141	134	136	137	142
Administration of Justice ..	67	68	70	72	74	77
Jails and Convict settlements ..	37	39	31	30	35	38
Police ..	184	176	162	164	166	169
Education ..	153	139	160	172	187	189
Medical ..	24	26	25	26	31	35
Public Health ..	20	14	13	17	46	23
Agriculture (including Co-operation and Veterinary) ..	28	26	24	24	27	31
Industries ..	9	9	11	10	11	12
Other departments ..	2	3	4	3	1	1
Civil Works ..	104	79	75	82	71	69
Miscellaneous ..	111	110	108	79	79	85
Provincial Contributions ..	262	240	240	240	184	151
Miscellaneous adjustments between Central and Provincial Governments ..	..	2	..	1	..	.
Total, Expenditure charged to Revenue ..	1,412	1,313	1,287	1,284	1,301	1,285

GOVERNMENT OF THE

(Figures are in

Capital Receipts

Receipt heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
Capital Receipts						
Revenue Surplus ..	..	..	..	..	..	5
Permanent Debt incurred ..	419	1	..	..	..	..
Famine Insurance Fund ..	32	33	39	4	17	74
Loans and Advances ..	64	81	371	67	19	15
Deposits of Sinking Funds for Provincial Loans ..	..	3	..	..	..	..
Advances by Central Governments ..	23	..	104	..	..	..
Advances from Provincial Loans Fund ..	..	..	..	149	200	227
Appropriation for reduction or avoidance of Debt ..	..	..	6	5	4	4
Total, Capital Receipts ..	538	118	520	225	240	275
Opening Balance ..	89	302	141	145	75	53
Total ..	627	420	661	370	315	328

UNITED PROVINCES

lakhs of rupees)

and Expenditure

Expenditure heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
Capital Expenditure						
Revenue Deficit ..	148	65	16	44	30	..
Forest Capital outlay ..	3	1	..	2	3	1
Construction of Irrigation Works ..	46	57	103	118	119	131
Outlay on Agricultural Improvements ..	..	..	..	1	..	2
Other Capital outlay ..	..	..	..	2	—2	..
Famine Insurance Fund ..	..	8	6	46	36	34
Loans and Advances by Provincial Government ..	70	77	346	45	15	25
Sinking Fund Investment Account ..	..	3	6	3	6	4
Advances by Central Government ..	48	25	25	25	25	26
Civil Works not charged to Revenue ..	3	14	6	6	58	50
Other Capital Expenditure ..	7	29	8	3	—28	6
Discount on Loans (U. P Development Loan) ..	..	..	..	..	..	29
Total, Capital Expenditure ..	325	279	516	295	262	308
Closing Balance ..	302	141	145	75	53	20
Total ..	627	420	661	370	315	328

4. REVENUE ADMINISTRATION AND LAND RECORDS.

By revenue administration is meant the administration of land revenue. It is proposed to consider in this section the principles underlying the question of its determination and to give a sketch of the agency employed for its collection. In official parlance in India, determination of the amount is effected periodically by a procedure known as the "Settlement." Before discussing this, it is necessary to give an account of the system of land records, as they supply the data which are of great help in expediting settlement work.

The elaborate system of land records rests on a humble official known as the *patwari*, or the village accountant. He resides in a village, draws a small salary and prepares, and has the charge of, the records of a village or group of villages, the number varying with the area cultivated. His important papers are, (i) the map of the village lands, (ii) the *khasera* or field book, (iii) the *khatauni* or the register of cultivating rights, (iv) the *jamabandi* or record of rents demanded by the landlord and payments of rent received by him from the tenant. He measures the village lands with the help of a chain, a right angle and a compass and reproduces his measurements on a map showing the boundaries of the village and the fields with their numbers. All alterations in boundaries which are necessitated by a division or sale of land are continuously noted by him and incorporated in the map. The map gives a bird's eye view of the fields. Detailed information about the area of each field, the name of the cultivator, the rent, the method of irrigation, the number of wells, the irrigated and unirrigated area under each crop are given in his *khasera* or field book. This is the source from which he prepares his other statistical registers, *e.g.*, the *khatauni* or register of cultivating rights, and the *jamabandi* or rent roll. Besides these permanent records, the *patwari* has to prepare seasonal crop statements known as the *kharif*, the *rabi*, the *zaid* or extra crop, and the area statements. The object of these statements is to acquaint the higher authorities with any changes that may be taking place in the total cultivated area, the area sown, the kind of crops grown and their condition, the proportions of the irrigated and unirrigated area under each crop in each season, the number of wells, the nature of the season—all details, as a matter of fact, which throw light on the state of cultivation. At the tehsil headquarters, the statistical information supplied by the *patwari* is compiled, abstracted and abbreviated into registers arranged according to villages, groups of villages, known as parganas, and then for the tehsil as a whole. These registers are written up year by year and constitute a permanent record of great statistical value.

The seasonal statements forwarded from the different tehsils to the district headquarters are consolidated into a statement for the whole district and then sent to the Director of Land Records. The staff of the Director compares these statements with those for the previous years, asks for explanation of any marked changes and splits up areas under a mixture of crops according to conventional formulæ accepted

by the department. The information is then taken down in permanent registers and also published every year in reports known as the " Season and Crop " reports.

It will be seen from the above account that the whole pile of records, both seasonal statements, and those of a more permanent character showing rights of ownership and cultivation of the lands of a village rests on the *patwari*. His work is examined and checked, not only by his immediate superior, the *kanungo*, but also by officers of the revenue establishment in charge of the tehsil. The naib tahsildar and the tahsildar send for the *patwari* constantly and also go out into their administrative charges to verify the information on the spot. Their work in turn is checked by the subdivisional officer who is a member of the Indian Civil Service or of the Provincial Civil Service. He is stationed at the headquarters town of the district, but has to move out every now and then for carrying out his duties of inspection and supervision. The Collector receives reports from and checks the work of his lieutenants, the subdivisional officers. He also goes out into the district to the fountain of information, viz., the *patwari*. There is nothing which the latter does not know, nothing for which he has not an explanation. He is the ultimate source of all official information relating to land and the entries made by him are valuable evidence, and often the only real evidence, in case of disputed rights. This humble individual, with his bundle of papers, is the very spirit of obedience and of detail and very often entries made by him come up in a law suit before the Privy Council.

The determination of the amount payable by owners as land revenue is carried out by an officer known as the " Settlement Officer " who is detailed for this duty in each district coming under settlement and who may be a member of the Indian Civil Service or of the Provincial Service of deputy collectors. In any one year there may be a number of districts falling due for settlement. Settlement is usually preceded by a revision of records, for which work the settlement officer is also gazetted as record officer. The revision of the records and the overhauling of the village map is the first preliminary operation. This work is done under the supervision of a deputy collector. In settlement operations proper, the settlement officer joins the district when this work has been completed for part of the area and he then inspects the villages for the purpose of classifying soils and villages. The soil classification is not an affair of test tubes, retorts and the microscope, but a division into broad grades recognised by the people. Natural composition, facilities for irrigation, nearness to the village or to a town are all factors which are taken into consideration in fixing the classification. The settlement officer then proceeds to plan out his rental or assessment circles formed of villages possessing a general similarity of soil or physical character or rent paying capacity. The next stage is the most difficult part of his work, *viz.*, the determination of the standard rates of rent for each category of soil. These rates are based on the actual rentals of each circle, but, in working them out,

he omits from the calculations those rentals which he finds to be either excessive and unstable having regard to the general standard of the village, not genuine owing to the exclusion of premia or other reasons, or inadequate as being materially below what the landlord could at once claim under the Land Revenue or Tenancy Acts. In Oudh, the standard rates are based on the " genuine, adequate and stable rents which are paid by substantial tenants of average skill and industry, who depend for their livelihood on the produce of their holdings." In the province of Agra, on account of the existence of occupancy and statutory tenants and of the passing, in 1926, of a new Tenancy Act, the position is a little complicated. In general two sets of circle rates have to be calculated, one set for occupancy tenants and the other for statutory tenants, the rate for the former being as a rule considerably below that for the latter.

The difference is due to the fact that occupancy rents have been controlled for many years and are now much below economic rents, while statutory rents have only been brought under control by the new Tenancy Act and are, therefore, still competition rents.

Under the rules, standard rates for occupancy tenants must be based on rates which have proved themselves stable and suitable for this class of tenants. They are fixed with special regard to the rates paid by tenants whose period of tenure is twenty years but the rates paid by old occupancy tenants and by tenants of twelve years' standing are also taken into consideration. Circle rates for statutory tenants are determined on the same principles as in Oudh.

The next step is to calculate the gross assets of each *mahal* or area for which a separate land revenue engagement is taken. The area assessed is that which is found by the settlement officer to be the normal cultivated area, having regard to the fluctuations which occur in a series of good or bad seasons. Certain areas are exempt from assessment. These include: (1) land occupied by buildings with their appurtenances which has hitherto not paid revenue; (2) permanent threshing floors; (3) grazing grounds from which no rent or grazing fees are derived; (4) market and village sites which have hitherto not paid revenue; (5) permanent roads and pathways; (6) such other lands as are not ordinarily used for cultivation and yield no income; and (7) old fallow or land which has been out of cultivation for more than three years.

The gross assets of a *mahal* consist of the accepted rental of the cash-rented area, together with a valuation at standard occupancy rates of proprietary cultivation and of the other areas not paying cash rents together with an estimate of the receipts from manorial dues of an agricultural character such as the sale of grass. Assessment on prospective assets is forbidden.

Next, certain abatements and deductions have to be made. As regards cash rentals, the main abatement is an allowance on account of the caste privileges of certain castes in applying the standard rates to lands held by them. This allowance is practically confined to Oudh as in Agra the

low rates for occupancy tenants give a more than equivalent concession. In valuing proprietary cultivation, a deduction is made of from fifteen to twenty-five per cent according to the circumstances of the zamindars. For improvements such as the sinking of wells and making of embankments within thirty years of settlement an allowance is made, either by deducting ten per cent of the estimated cost of the improvement or by valuing the area benefiting from it at the rates which would have been applied if the improvement had not been made. The net assets having thus been determined, the assessment of land revenue is made. The percentage taken by the State in recent settlements has been between forty-five and forty-three of the net assets. At the beginning of the nineteenth century it was ninety, eighty-three in 1822, sixty-six in 1833, fifty in 1855.

A Bill was introduced providing for fixing the general standard of asssessment at forty per cent and for limiting the enhancements in any *mahal* to thirty-three per cent. It failed to pass the Legislative Council but rules to the same effect have been brought into force. The term of settlement has hitherto been thirty years, but will now be forty years.

For revenue purposes the unit is a *mahal*, which means the area for which a separate agreement to pay the land revenue is taken. A *mahal* may be a single village, part of a village or a number of villages. Revenue is collected and paid by a representative of the co-sharers of a *mahal*, called the *lambardar*. In the eastern districts, individual co-sharers pay the land revenue direct.

The Collector and his staff of revenue officials keep the collections close to the amount demanded in normal years. Remissions, or, in the less serious cases, suspensions, are granted for total or partial failure of crops.

Restrictions on the sale and transfer of land exist in the whole of Bundelkhand, and in parts of the districts of Etawah, Allahabad and Mirzapur.

5. THE CULTIVATOR.

The United Provinces with an agricultural population of thirty-five million people (or, counting five persons to a family, comprising seven million households) present many differences in natural conditions. The conditions prevalent in Bundelkhand are different from those in the alluvial plain; the western part of the plain differs from the eastern and the province of Oudh from that of Agra. The mountainous region of the Himalayas has conditions and problems of its own. Apart from these differences due to natural conditions, there are the various interests connected with land of which account must be taken. For example, an analysis of the legal rights of six million people classed as tenants, making with their families thirty million persons reveals a great complexity of interests. Again, striking differences appear if the effort and skill in the cultivation of land are taken into account. This being the position, generalisations about the cultivator of the United Provinces have to be made with great

care and caution. They would have to be so hedged round with qualifications in their application to the circumstances of cultivators of any particular tract, that they would lose their character. Apart from these difficulties, there is the obstacle that the cultivator, typical of a tract or of the province as a whole, lies buried in the bundle of village papers kept by the *patwari*. One does not know how the cultivated area is distributed in holdings of various sizes nor the size of holding which is most numerous and typical. In the absence of such information, no estimate claiming the definiteness of a quantitative measurement of the economic position of the typical cultivator can be made. In the memoranda prepared for this Commission by various officers of the United Provinces Government, figures relating to the size of the average holding in the different districts have been given. The average holding is arrived at by dividing the cultivated area of a district by the number of households of agriculturists. The cultivated area is definitely known. As regards the number of families, they are found by dividing the agricultural population of a district by the divisor 5, which represents the average number of persons in a family. This figure for households is an estimate and depends upon certain assumptions. The average holding as estimated by the Revenue Department in the different districts is given in the Table below :—

	Average size of tenants' holding (in acres)
Sub-montane	
Pilibhit	6·5
Kheri	6·8
Sitapur	6·8
Bahraich	6·6
Gonda	5·3
Basti	4·0
Gorakhpur	4·1
Upper Doab	
Saharanpur	10·4
Bijnor	9·1
Moradabad	6·7
Muzzaffarnagar	11·5
Meerut	8·7
Bulandshahr	7·9
Aligarh	9·8
Muttra	10·3
Agra	7·6
Central Doab	
Bareilly	5·3
Budaun	5·7
Etah	6·5
Mainpuri	5·9
Shahjahanpur	5·7
Farrukhabad	5·3

	Average size of tenants' holding (in acres)
Central Doab—contd.	
Etawah	6·0
Hardoi	5·6
Unao	4·7
Cawnpore	6·3
Lucknow	4·9
Bara Banki	4·8
Rae Bareli	4·5
Fatehpur	6·6
Eastern Doab	
Fyzabad	4·2
Sultanpur	4·2
Partabgarh	4·0
Allahabad	5·7
Azamgarh	3·4
Jaunpur	3·5
Benares	4·6
Ghazipur	4·9
Ballia	5·1
Trans-Jumna	
Jhansi	11·7
Jalaun	12·4
Hamirpur	11·9
Banda	10·9
Mirzapur	5·0

It would appear from this Table that the size of the average holding is largest in the western districts, *e.g.*, Muzaffarnagar, Saharanpur and Muttra. In the central districts, holdings are of intermediate size. In the east, the size of the average holding shrinks to very small proportions, *e.g.*, 4·1 acres in Gorakhpur, 4·0 acres in Basti and 3·4 acres in Azamgarh. In the west, chiefly in the Meerut division, the average holding would consist of about forty per cent superior land with a good water supply and well-manured and sixty per cent inferior or unirrigated land. Of the latter, about one-third would be irrigated and manured, and the rest unirrigated and unmanured. In the east, *e.g.*, in the Gorakhpur division, about one-fifth of the typical holding would consist of single-cropped rice land, about one-fifth superior and three-fifths inferior land. In Lucknow, there would be rather less rice land and rather more loam. In the Jhansi division, conditions are peculiar. On account of the nature of the soil, a much smaller proportion of the land is utilised for the growing of crops and these are chiefly of an inferior type requiring little irrigation. The economic position of a cultivator depends not only upon the quantity of land he holds and its quality, but also upon the conditions attaching to his tenure. He may be (1) a proprietor, (2) an inferior proprietor, (3) a superior tenant, (4) an ordinary tenant, or (5) a sub-tenant. His rights vary according to the tenure on which he may be holding land. If he is a proprietor, he has no rent to pay but only land revenue to Government, which is moderate. His economic position as proprietor is strengthened by the legal rights which he possesses in land under his proprietary cultivation. They are of two kinds, *sir* and *khudkasht*. *Sir* land is the home farm or land which the landlord or co-sharer holds directly in his own management, either cultivating it himself, or by his farm servants or personal tenants. *Khudkasht* is also land cultivated by the proprietor for himself but for this he pays rent to the whole body of co-sharers. If the landlord or co-sharer loses his proprietary right in his *sir* land, as he may do in certain circumstances defined in the laws, he retains possession of it as an occupancy tenant, with a certain privilege as to reduced rental. The value to the cultivator of such a right is, therefore, that he cannot be without land to cultivate on favourable terms. It is not unreasonable to assume that, with a progressive reduction in the level of the land revenue, with no rent to pay to a superior landlord and with a steady rise in the price of agricultural produce, the peasant owner in the United Provinces is in a position of undoubted economic advantage.

A cultivator holding land as inferior proprietor may be an under-proprietor in Oudh or Agra, or a permanent tenure holder or a fixed rate tenant in the permanently settled districts, or a lease holder in Oudh. The point of importance in connection with these tenures is that the cultivator possesses under them a transferable right conferring absolute security of tenure. Subject to the payment of rent to a superior proprietor, a cultivator has full proprietary rights and his rent cannot be varied during the currency of a settlement after it has been determined by a settlement officer.

As a superior tenant, a cultivator may be an occupancy or an ex-proprietary tenant in Agra; and in Oudh a privileged holder, an occupancy tenant, an ex-proprietary tenant, or holder of a heritable, but non-transferable, lease. About 53·1 per cent of the holdings area in Agra is held by these two classes of superior tenants. In Oudh the area held under these tenures is small and unimportant, being about 1·6 per cent only.

Both in Oudh and Agra the security of tenure enjoyed by tenants, of the categories mentioned above, is more or less complete. Their rents are controlled and rarely are they ejected for arrears of rent.

The majority of ordinary tenants in Oudh held on short leases previous to the passing of the Oudh Rent Amendment Act of 1921, when life tenancies were created. Similarly, in Agra, life tenancies were conferred by the passing of the Agra Tenancy Act in 1926. Before the enactment of these two great measures of agrarian reform, the security enjoyed by ordinary tenants both in Agra and Oudh was small and could rarely be obtained except by the payment of a heavy price, known as *nazrana*, for continuance of a tenancy. The policy of landowners in general was directed against the acquisition by tenants of rights of occupancy and so they had to change tenants or give fresh leases. In giving these leases they exacted the premium known as *nazrana*. One consequence of this practice was that rents on which the land revenue is based were kept nominally low. In Agra, the non-occupancy tenant had no security and made no improvements. In Oudh, under the system of seven years' leases, the tenant on the better managed estates had in practice a fair degree of security and constructed a large number of wells, but he had no legal guarantee of security and depended entirely on the good will of the talukdar. No one takes the trouble to repair the roof of a caravanserai, in which shelter is enjoyed for a night only. Many landlords were also opposed to the sinking of wells as they gave rise to claims for compensation and thus interfered with their right of ejectment.

All this has now been changed. The statutory tenants in Oudh who held 66·4 per cent of the holdings area in 1924-25 and the ordinary tenants who had 22·9 per cent in Agra now enjoy security of tenure for their lives and their successors for five years after their death. The incentive to careful cultivation of land and the making of permanent improvements has now been provided in the shape of life tenancies and beneficial results are sure to follow in course of time.

The interest of the tenant in land revenue is only indirect. His concern is with the rent he pays. The striking fact about rents in the United Provinces is their gradual decrease in amount as we pass from west to east. Rents are rather low in the sub-montane districts, and very high in the Upper Doab, except in the trans-Jumna portion of Muttra and Agra, moderate in the central, and very low in the eastern portions of the Doab. Holdings are large in the western districts and the high rents per acre are due to a large extent to the large size of holdings.

In the sub-montane districts, except Gonda, Basti and Gorakhpur, holdings are large but rents are kept down by the relative scarcity of tenants and the unhealthiness of the tract. Some castes, *e.g.*, Brahmins and Thakurs in Oudh, by custom pay low rents.

The cultivators who till the land of the United Provinces belong to the following castes and tribes: Bhar, Bhoska, Jat, Kachhi, Kisan, Koeri, Kurmi, Lodha, Murao, Saini, Tharu and Meo. The graziers are represented by Ahars, Ahirs, Gadariyas, Gujars and Ghaddis. Agricultural labourers are drawn chiefly from the Chamars, Dhanuks, Dusadhs, Koris, Luniyas and Pasis. The landowners are Bhuinhars, Rajputs, Sainthwars and Tagas. There is no clear cut division in respect of all these classes. Members of the same caste or tribe very often are found in the category of landowners, tenants and labourers. The cultivating classes are, from the point of view of race, of mixed origin. The Aryan has blended with the aborigins and waves of later invaders have produced new complications. The majority of the cultivators are Hindu by faith. It is difficult to disentangle the various strands of the popular religion, but a few features, which have an important influence on practical morality, may be briefly noticed. For example, belief in the doctrine of Karma is universal. As a man sows, so shall he reap in another existence. The hill people believe in the power for evil of the ghost of injured persons. The effects of dying in debt are very much dreaded. These beliefs have an important influence in restraining people from wrong-doing and their practical result is seen in the fact that in the hills hardly any police are required. Both in the plains and in the hills, caste also has an important bearing in keeping people to right conduct. Fear of caste penalties acts as a powerful deterrent. The peasant is devout in observing religious ceremonies and rituals, performing pilgrimages, and bathing in the sacred rivers of the province. Veneration of the cow is entwined in the heartstrings of the peasant, but the cow derives little practical advantage from the existence of this excellent sentiment. The peasant receives little religious instruction. The book which has most influenced him is Tulsi Das's Ramayana, which he cannot read but knows from recitations, which he frequently listens to at night. The cultivator gives away a fair amount in charity and, considering his income, his expenditure on social and religious ceremonies is heavy. He frequents the law courts, also, but not willingly. Very often he is drawn into a law suit to defend his rights. There are such matters as ejectments, arrears and enhancements of rent, for which he is summoned and for which he has to pay. He understands little of the language or the argument or of the decision except the word "Dismissed". There are a number of dialects spoken in the provinces but the people with whom he comes into contact speak or write a language which to him is unintelligible. An amusing example of the style of language as used in books, newspapers and for oral instruction is given by Mr. (now Sir) Richard Burn in his Census Report of 1901. He quotes a passage from a High Hindi book which, with its Sanskrit verbiage, would be almost as intelligible to the peasant of the United Provinces as its

translation with the substitution of Latin for Sanskrit words would be to an English peasant. The original passage and its rendering into English with the appropriate stuffing of Latin are given below :

"*Parantu* us men ek *Kathinai* parti thi. *Manushya matra* ki *ganana* ki *apeksha* thori hi ganon ko yih yog tha ; is *karan* is chepka *bahudha abhaw* bana rahta tha."

Translation : "*Autem* there was a *difficultas* in this. *Visus* the *numerus* of the *humanum genus*, few cows had this disease (cow-pox) ; for this *ratio* there continued to be *magna paucitas* of this serum."

High Urdu shows similar absurdities. The natural ability of the peasant of Hindustan is bound to wither under the shade of such verbiage. No wonder the peasant's education has not gone far and he is not to blame if he discards this kind of education as soon as he comes out of the village school.

There is reason to believe that the standard of living is rising. There is no outward sign of change in the mud hut of the Indian cultivator ; he consumes the same kind of foodstuffs as before, but he is beginning to sell his *rabi* crops. The money so obtained is spent in paying his rent or revenue, in meeting the claims of the moneylender who finances him, and in buying with the surplus commodities of ordinary comfort and convenience ; *e.g.*, tea, cigarettes, matches, lanterns, buttons ; pocket knives, looking glasses, cotton cloth, foreign or Indian. The peasant indulges in railway travel also.

The household utensils inside the mud hut are not the same as they were, say, forty years ago. Brass and enamelled ware take the place of leaves and the pots made by the village potter. The chief feature of importance, however, is the sense of economic security which has come into his life. He is not so helpless as he was before. A continued rise in the standard of living depends upon two factors : an increase in purchasing power due to higher productivity and, secondly, some control in increase of numbers.

No definite answer can be given to the question whether ultimately the standard of living will break under the stress of population or whether some conscious check will be imposed for maintaining intact the standard of living.

6. THE AGRICULTURAL DEPARTMENT.

The United Provinces took the lead in establishing a provincial department of agriculture in 1875. The first model farm was started on rented land near Cawnpore in 1881 ; a school of agriculture was opened in 1893, also at Cawnpore, with the object of training teachers and revenue officials. The superior staff consisted of the Director of Agriculture with a deputy and an assistant up to 1905. The province was divided into two circles with Cawnpore and Partabgarh as centres, for purposes of administration. The collection of facts and figures rather than investigation and research constituted the main work of the department in its early days. The grant of a donation of Rs. 3 lakhs by the

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Government of India enabled the department to expand its activities and to strengthen its personnel. An agricultural engineer was appointed in 1908. Between 1914 and 1918, rapid development was hindered by the exigencies of the great war. In the three years after the termination of hostilities, a number of officers were appointed to the Indian Agricultural Service. Research work was started in various new directions and many new farms were opened. Work in connection with cattle-breeding was made over to the Agricultural from the Veterinary Department. In 1920, the Agricultural Department, after its separation from that of Land Records, was placed under a Director chosen from the expert staff.

The organisation of the department at present is based on the division of the provinces into six circles, each in the charge of a deputy director. In a circle there are one or two officers of the United Provinces Agricultural Service, besides the field staff for demonstration work and managers of demonstration farms. The circle is a self-contained unit. The cattle-breeding work, extending over the entire provinces, is under an expert deputy director. Similarly, the engineering section embraces the whole of the provinces. Operations in connection with well-boring and installation of small power plants are carried on by an expert staff under the control of the agricultural engineer.

The ideals which the department has placed before itself are, firstly, to introduce improvements in the existing system of agriculture and, secondly, to develop, as far as possible, a better system. It seeks the attainment of these ideals by the following means: (*i*) organised research work; (*ii*) demonstration and propaganda; (*iii*) provision of agricultural education and (*iv*) assistance to the public.

Research is carried on by experts and also by officers in charge of circles.

Cotton was the first crop studied and work on it has been carried on along two definite lines (*i*) hybridisation and (*ii*) selection. Hybridisation seeks to evolve a plant combining the two desirable characters of high yield in lint and long staple.

It has been established generally that cottons capable of spinning the higher counts have a low ginning percentage and *vice versa* but recently varieties have been produced by hybridisation in the botanical section and are under trial on a fairly large scale on cultivators' fields which give a distinctly better staple (capable of spinning 10s-12s counts) than the indigenous cottons which have a high ginning percentage (38 to 40).

Experts are of opinion that this work has not yielded practical results as quickly as it was at one time hoped.

Selection work has yielded Aligarh 19 and JN 1. Aligarh 19, being most profitable to the ordinary cultivator is in great demand. It has a moderate staple, a good colour and a high ginning percentage. In the most important cotton tract of the United Provinces, *viz.*, the dry districts between Meerut and Fatehpur, along the course of the Jumna

this variety is rapidly displacing the inferior cottons grown hitherto. JN 1, which has a better staple than Aligarh 19, is spreading in the districts south of the Jumna.

The pink and spotted boll-worms have also claimed much attention. The pink is more destructive than the spotted boll-worm. Its ravages may reduce the value of a crop from 25 to 50 per cent. Experiments carried out by heating the seed to a temperature of 140° Fahrenheit and protecting the growing plant by means of wire cages have produced startling effects in coping with these pests.

Large experiments on the heat treatment of seed are being carried out on several controlled areas.

The sugarcane crop requires more detailed notice on account of its importance. The area normally put under this crop in the United Provinces is 1,200,000 acres, being about half of the total area in India. The crop is grown in a large belt of country, parallel to the Himalayas, which may be divided into three tracts, *viz.*, (*i*) the western, or Meerut; (*ii*) the central, or Bareilly and (*iii*) the eastern or Gorakhpur tract. The great bulk of the canes of the United Provinces are of the thin variety, either red or white in colour. They are reed-like, of medium height, have a hard rind and are very fibrous and hardy. They survive in climatic conditions fatal to canes of the medium and thick varieties. The red canes predominate in the Meerut tract and the white ones in the eastern districts. The central tract grows both varieties, red and white.

Medium canes require more careful cultivation and are more susceptible to damage by animals and to diseases such as red-rot and mosaic. The yield per acre is about fourteen tons of cane.

Thick cane, introduced from the tropics, is grown near large cities on account of the manure available from large centres of population. It is largely used for chewing. The area under this type is 75,000 acres and the yield per acre is about twenty tons of cane.

The crushing of canes is done in small two and three roller mills worked by bullocks. The manufacture of *gur* (solidified juice without having been purified) and *rab* (juice reduced to a stiff syrup) is a cottage industry.

The percentage of extraction of juice is poor and the strain on the animals heavy, the task being beyond their strength. The exhausting labour disables the animals for ploughing and other work connected with the proper preparation of the soil for the sowing of the *rabi* crops.

The questions before the Agricultural Department were firstly, to improve the quality of the canes; secondly, to evolve a small power plant for the proper crushing of the canes and so to relieve the cultivator's bullocks of the heavy strain, and, thirdly, to provide an economical and effective furnace for the preparation of the juice.

Agricultural research tackled the question of improvement of the cane and the skill of the mechanical engineer had to find a solution for the difficulties involved in the processes of manufacture.

Serious research on sugarcane dates from the year 1908. After four years of preparatory study, the agricultural chemist began work on the lines laid down by the Board of Agriculture in 1907, on a special farm, opened in 1912 in Shahjahanpur. His investigations showed that indigenous canes did not respond to good cultivation and high manuring.

It became necessary to import varieties of foreign canes for trial. Careful selection yielded valuable types, the chief of which are S/48, Uba, and Mauritius 16. These three varieties are now widely distributed and their cultivation to be profitable requires deeper tillage, regular watering and good manuring. Hybridisation work carried on at Coimbatore has also yielded valuable results and it is expected that this work will revolutionise the cane industry of northern India. These Coimbatore canes are of various types; some are suitable for intensive cultivation and others have been evolved for conditions in tracts in which cane-growing has not been successful.

A farm was established in the hills with a view to investigating the possibility of producing disease-free and vigorous seed for the plains. Later investigations indicate that deterioration was mainly due to mosaic disease and that the production of mosaic-free planting material can be carried out successfully in the plains.

Poor crushing is the result of lack of power. Many farms with oil engines for lifting of water for the purpose of irrigation are installing power-driven mills. The McGlashan furnace which enables boiling to keep pace with crushing is being extensively taken up. Its merits are that it boils the juice more quickly and consumes less fuel. In many areas in the United Provinces, oil engines, tube wells, pumping plant, and power-driven mills, now make up the equipment of a farm. An industrial atmosphere is beginning to pervade the countryside. The small holder has not benefited as yet from these modern appliances. It is hoped that co-operation, the cure for so many of the ills of the small man, will enable him to reap the advantage associated with improved processes and the use of mechanical power.

The normal area under wheat amounts to seven million acres. The crop needs thorough tillage, is sown in the latter part of October, and ripens in March or April. Three varieties of wheat have been introduced, (*i*) Muzaffarnagar; (*ii*) Pusa 12 and (*iii*) Pusa 4. The Pusa wheats are good yielders but since they are beardless, the ears shed the grain. The Muzaffarnagar variety is bearded but suffers from rust, particularly in Oudh and Rohilkhand. Cloudy weather in February produces the evil in the dry tracts also. Further research on wheat is necessary.

Research on rice was started only four years ago. The work of classification and separation of unit species is now proceeding. Chemical studies of the soil are also being made. Selection has yielded good results.

In 1923, a preliminary survey of castor and sesamum was undertaken. Investigation, in close association with the Technological Institute at Cawnpore, is directed towards separation of pure strains and

determining the quality, percentage and acidity of the oil. As regards linseed, the United Provinces require a variety which has a high yield and is also rust resistant.

Among fibres, an improved variety of *sann* hemp has given good results. Retting, on which depend the lustre and quality of the fibre, is also receiving attention. In the absence of large quantities of clean water, decortication has been proposed as an alternative, to save the colour of the fibre. Jute has now been established on thousands of acres in the districts of Kheri and Sitapur, where the climatic conditions approximate closely to those of Bengal.

The potato is becoming an unfailing companion of the *chupatti* (Indian bread). Investigation has shown that the rot which affects the potato when stored can be prevented by adopting cold storage.

The formation and loss of nitrates in the alluvium has also been studied and the accumulation of nitrates as the result of green manuring is being investigated. The process is most active in June and July and in October.

Usar land can be reclaimed at reasonable cost in the eastern districts. As regards the western dry tracts, the question is whether water can be more profitably used for the irrigation of good land or for flooding *usar* land and making it available for cultivation. As an alternative, raising of fuel and fodder opens out very good possibilities.

So much for investigation and research. Demonstration and propaganda take various forms. Considerable use is made of the annual district fairs, at which improved seeds, implements, pumping machines and other paraphernalia are displayed prominently and audiences of rustics are exhorted by lecturers. Conviction is carried home to them by actually growing the crops right under their eyes. The department is moving away from demonstration farms to demonstration plots, situated in the fields of the cultivators. The method consists in sending down an energetic and persuasive man who knows the rustic mind and the art of cultivation. He hires a plot, sows it with the improved seed, makes use of the improved methods of cultivation he wishes to introduce, interests the people in his work and leaves conviction to the harvest. The improvements are talked about and spread in the group of neighbouring villages. This is the group method of influencing the customary practices. Another procedure is to hire a plot, share expenses with the owner and divide the profits. This method makes zealous cultivators and ardent friends who have experienced the weight of extra profits in their pockets. In other cases, when the department is helping the more substantial man, the landholder undertakes to reserve a certain area for a term of years, as a condition of the subsidy which he receives from the department for sinking a tube well on his estate. The department gets the land free of cost, manages it as a demonstration farm and expects that it will influence the neighbouring cultivation. The next stage is reached when landholders come to the department for help and advice for starting similar farms themselves, thus creating further nuclei of influence.

By the provision of good seed from its own seed farms through its seed stores which numbered 148 in 1926-27, by drawing upon seed raised on private farms under supervision of the department and by making use of the methods of propaganda sketched above, the department has been able to put 750,000 acres under improved wheats and 200,000 acres under improved cottons. It is estimated that the extra profit has been Rs. 15 per acre from each of those improved varieties. The work of seed distribution now entails a heavy burden on the department.

Assistance to the public is given generously by the engineering section. It is divided into four circles with headquarters at Cawnpore, Meerut, Partabgarh and Hardoi, each in charge of an assistant agricultural engineer. Wells are a very important means of irrigation. The water of the rivers of the provinces has been fully used for irrigation by means of canals and only the underground supplies remain. The work of this section is to make those supplies available by effecting improvement in the existing masonry wells and by sinking tube wells, which will bring forth larger quantities of water. Since 1910, 16,000 borings for ordinary wells have been made and, between 1913 and 1926, 200 tube wells have been sunk and 97 were in course of construction in 1927. Government subsidise the construction of tube wells and pumping plant to the extent of Rs. 6,000 per well, exclusive of assistance in the form of *taccavi* and grants-in-aid.

The running cost of a single irrigation works out to Rs. 7-10-9 per acre where the water has to be lifted 40 to 50 feet to the surface. A comparison of this figure with the pitch of water rates is illuminating. The seasonal charge for the irrigation of sugarcane is Rs. 10 per acre when the canal water flows on to the land. Where it has to be lifted, the rate is Rs. 4 only. For rice the seasonal flow rate is Rs. 7-8 and the lift rate Rs. 3. For wheat and barley the flow rate is Rs. 5 and the lift rate Rs. 2-8 respectively per acre. The canal rates given above are those in force on the Upper Ganges and the Eastern Jumna canals. It would appear from the comparison made above that where canals and tube wells are in competition, the latter do not pay unless the water is used for a high priced crop, grown under an intensive system of cultivation.

Cattle-breeding work is carried on at the Madhurikund farm in the district of Muttra and at the Manjhra farm in the district of Kheri. The quality of the United Provinces cattle leaves much room for improvement. The cows give very little milk; for this article chief reliance is placed on the she-buffalo, specially of the Murrah breed of the dry western districts. The draught power of a pair of bullocks does not go beyond an area of 7·7 acres. The problem in the United Provinces is to raise the efficiency of the cow as a giver of milk and that of the bullock for purposes of draft. The cattle-breeding section is tackling this problem along the following lines: (*i*) improvement of the existing breeds by keeping up a supply of selected bulls; (*ii*) exploring the possibility of developing a dual purpose type of animal and (*iii*) studying the technique of dairying. For improving the cattle a scheme of controlled breeding areas is in operation. The

section concentrates its attention on small areas, to which it has loaned its bulls. As the inferior stock is replaced and as the offspring of bulls from the government farms grow up, they are bought back and distributed over other areas. The farms cannot provide the large supply of bulls required for grading up the cattle of the provinces. Hence advantage is taken of the willingness of cultivators to raise young stock for extending the improvement to other areas. A provincial cattle committee keeps the department in touch with the requirements of the provinces.

The educational institutions maintained by the department with the object of providing technical education in the science and art of agriculture are a college, equipped both for research and teaching, at Cawnpore, and a vocational school at Bulandshahr.

The college offers two courses: one is a four years' course, divided into parts, leading to the diploma of L.Ag. with an intermediate diploma controlled by the United Provinces Board of High School and Intermediate Education. The examination for the final diploma of L.Ag. is conducted by the department.

The second course is in the vernacular. Its duration is two years and it is meant for the sons of large landholders, who may not possess the educational qualifications necessary to enable them to profit by the course in English. The ideal before the authorities of the Agricultural Department is to offer a training at Cawnpore to the sons of zamindars equal to that which they could obtain at a university, to make the college, in fact, into a university of the landholding classes. The college has five sections and maintains a farm of 381 acres, a portion of which has been converted into a dairy farm. Estate management and the economics of agriculture form a prominent part of the course. The college is residential.

The numbers on the rolls during the last two years were:

	1926	1927
For the diploma course	78	115
For the vernacular course	50	46

A Governing Body, of which the Director is the chairman and the Principal its secretary, manages the institution.

The vocational school at Bulandshahr was opened in 1921. It is meant for the sons of tenants of substance and those of the smaller zamindars. The course lasts two years and is in the vernacular. The students themselves cultivate the land of the farm. Since 1924, a teachers' training class has been opened. District boards are introducing the subject of agriculture in vernacular middle schools and this course, lasting for one year, is meant to provide technical training to those who are going to teach the subject of agriculture in these middle schools.

A fieldmen's class has also been opened, its object being to provide a short course of instruction for those who cannot attend the regular school course for two years or who desire to learn special methods of cultivation. In addition to this, there is a class for engine drivers, its object being to train men to work oil engines and power plants and to carry out the simple repairs required in modern farm machinery.

It is intended to open two more schools of the Bulandshahr type. The initial cost is estimated at Rs. 2·75 lakhs and the annual at Rs. 30,000.

The institution of short courses in special subjects, *e.g.*, dairying, and intensive cultivation of sugarcane on certain farms, is also under contemplation.

Training in horticulture is to be given at the Cawnpore Agricultural College. Horticulture has been in the executive charge of a deputy director since 1922. There is considerable scope for the development of the fruit industry in the plains and in the hills. The substitution of market gardening for farming on the small holdings in the provinces, as a possible future development, is not to be underrated.

The budget of the department increased from Rs. 7·14 lakhs in 1913-14 to Rs. 20·13 lakhs in 1925-26 and Rs. 24·46 lakhs in 1926-27. The amount voted in 1926-27 was distributed among the various branches as follows:—

(*i*) General: Rs. 5·4 lakhs; (*ii*) agricultural circles: Rs. 6·1 lakhs; (*iii*) cattle breeding: Rs. 2·1 lakhs; (*iv*) agricultural engineering: Rs. 3·4 lakhs; (*v*) agricultural education and research: Rs. 3·9 lakhs; (*vi*) gardens: Rs. 2 lakhs and (*vii*) works: Rs. 1·6 lakhs.

7. IRRIGATION.

The two large rivers, the Ganges and the Jumna, which traverse the United Provinces, are holy. The reason why they are and have been so considered is not far to seek: their waters make life possible. The people depend for their livelihood upon agriculture and agriculture, without water, is out of the question. Over the greater part of the Indo-Gangetic plain, irrigation is necessary for the *rabi* and sometimes for the *kharif* crops also, when breaks occur in the monsoon. The sources of water are (*i*) rains; (*ii*) canals, bringing water from the great rivers; (*iii*) local streams, *jhils* (lakes or depressions) and tanks and (*iv*) wells.

Canals play, and have played in the past, a great part in ameliorating the conditions of the people. When the first great project was sanctioned by the Directors of the Honourable East India Company in 1841 they laid down a policy which is still applicable to the conditions of to-day. Canals, they said, should be constructed to remove the horrors of famine, to assure the cultivator the means of existence and to ameliorate the conditions of the people.

They were thus constructed, not primarily for revenue, but to protect the people. Throughout the nineteenth century, State effort centres round construction of canals.

The backbone of the canal system in the United Provinces is formed by the Eastern Jumna, the Upper Ganges, the Agra and the Lower Ganges canals. The Eastern Jumna takes off from the river, in the north of the Saharanpur district, about 100 miles from its source. It is the most remunerative canal in the province and, with one exception, the most remunerative in India. In 1926-27, it irrigated 350,000 acres.

The Upper Ganges Canal, the greatest in the province, was completed in 1854. In 1926-27, it irrigated 1,180,400 acres. In 1920, its permanent headworks were completed at a cost of Rs. 39 lakhs. The unsatisfactory system of throwing temporary dams across the river every year for diverting supplies of water into the canal was thus rendered unnecessary.

The Lower Ganges Canal, opened in 1878, was constructed to irrigate the lower portion of the *doab* and to supplement supplies to the tail portions of the Upper Ganges Canal. In 1926-27, it irrigated 776,300 acres. The two canals, the Upper Ganges and the Lower Ganges, form one system.

The Agra Canal takes off from the Jumna near Delhi. It was opened in 1874 and was designed to irrigate 280,000 acres in years of drought. It actually irrigates an average area of 111,000 acres of *rabi*, and 123,000 acres of *kharif* crops.

Between 1840 and 1860, smaller canals, drawing their supplies from hill streams, which had fallen into disrepair, were reconstructed and considerably extended in Rohilkhand.

Since 1880, attention has been directed to the rivers in the south of the province. The rivers of Bundelkhand, the Betwa, the Ken and the Dassan, do not, like the Ganges and the Jumna, receive abundant supplies of water from the snows of the Himalayas. They are subject to floods in the rains but shrink to very small dimensions in the cold weather and would be entirely ineffective for irrigation but for the fact that the configuration of the country and the presence of rock make the construction of reservoirs, for impounding the flood waters, possible. These reservoirs involve the construction of huge dams and submergence of extensive areas of land and are expensive. The following protective works have been opened in this part of the province: the Betwa, in 1885, with a storage capacity of 3,000 million cubic feet; the Ken, in 1906 in the district of Banda, with a supplementary reservoir at Gangao, completed in 1917; and the Dhasan, in 1910, protecting the district of Hamirpur. The district of Mirzapur is served by the Gorai and the Ghagar canals, completed in 1918. The reservoir of the Ghagar has a storage capacity of 5,000 million cubic feet, commands an area of 250,000 acres and is the largest lake in the province. In 1926-27 it irrigated 13,300 acres.

Smaller works and extensions of old productive works have also been undertaken. The Majgawan tank and canal in Hamirpur and the Barwar lake and canal were completed between 1917 and 1923.

Since 1880, no productive works of any magnitude have been completed. One productive work, however, which is the largest in the province, is now under construction and will be completed in 1930. The Sarda

Canal project, combining in itself the two projects of Sarda-Kichha and Sarda-Oudh, with headworks at Banbassa, on the border of Nepal, is designed to irrigate the Sarda-Ganges *doab*. The canal will have a discharge of 9,500 cusecs as compared with the 8,000 cusecs of the Upper Ganges. The estimate of its cost is Rs. 9·5 crores; the return 7·7 per cent on the capital outlay; and the area it will irrigate will be 1·7 million acres. The average area irrigated at present from canals amounts to a little over 3 million acres. With the completion of the Sarda project, this area will be increased by more than fifty per cent. If the scheme proves successful, its complementary work, the lower Sarda Canal, will be taken in hand.

Supplementary storage reservoirs for the Betwa, the Ken, the Dhasan and Ghagar canals and small projects taking off from the Paisani and Ohen rivers in Bundelkhand might add another two or three hundred thousand acres in future to the irrigated area of the province.

The maximum area irrigated from canals will be nearly four-and-a-half million acres. This limit is fixed by the supplies of water available. Any further expansion of the area irrigated can only take place by a more economical and scientific use of the limited supplies of water. It is estimated that fifty per cent of canal water is at present wasted, chiefly by the cultivator.

The statistics relating to the system of government irrigation works are summarised below. In 1926-27, the length of main canals was 1,903 miles, that of distributaries 10,216 miles, of drainage cuts 3,680 miles and of escapes 344 miles. The total length was thus 16,143 miles in 1926-27. In 1931, it will be 22,530 miles and in 1941, 22,600 miles. The capital outlay on all government irrigation works up to 1926-27 was Rs. 19·69 lakhs. By 1931, it will be Rs. 2,230 lakhs. The gross revenue in 1926-27 was Rs. 163 lakhs. It is estimated that it will rise to Rs. 175 lakhs in 1931 and to Rs. 240 lakhs in 1941. Working expenses were Rs. 65·5 lakhs in 1926-27, and for 1931 and 1941 they are estimated at Rs. 75·0 lakhs and Rs. 82·0 lakhs, respectively. The net revenue in 1926-27 was Rs. 97 lakhs. For 1931 and 1941, the estimated amounts are Rs. 100 lakhs and Rs. 158 lakhs, respectively. The interest charge amounted to Rs. 73·7 lakhs and will be Rs. 88·0 lakhs in 1931 and 1941. The net profit was Rs. 23·3 lakhs in 1926-27 and for 1941 it is estimated at Rs. 70 lakhs. The total area of crops irrigated by all sources of irrigation, both government and private, in 1926-27 was 10,816,000 acres or 26 per cent of the total cropped area.

The direct benefits of canals are: (1) an increase in the cultivated area; (2) substitution of the more valuable for less valuable crops; (3) avoidance of famines; (4) increase in land values; (5) increase in out-turn of crops. In regard to increase in land values, it may be mentioned that, in 1877-78, the price of land varied between Rs. 30 and Rs. 80 per acre for land near the Deoband branch of the Upper Ganges Canal. In 1909 the branch was remodelled and Government had to pay from Rs. 88 to Rs. 146 per acre. In some areas, the increase has been fourfold.

Supplementary benefits consist in the provision of power produced at the canal falls for mills, the raising of plantations for fuel and timber, production of grass on the canal banks for cattle and supply of water to the tanks in Bundelkhand for the use of cattle.

The charges for water are fixed in relation to (1) the amount of water necessary to bring a crop to maturity, and (2) the value of crops. Rates are higher for the more valuable crops, grown usually in the *rabi* season. Sugarcane, which is on the ground for a whole year, pays the highest rates. In America, the ratio of water rate to the value of the crop is one-fifth or one-sixth ; in Egypt one-seventh and in India about one-tenth. In 1926-27, the average value of an acre of sugarcane grown under irrigation was about Rs. 150 and the charge for water on the main canals only Rs. 10 per acre. The average value of wheat raised on an acre was Rs. 73 in the same year and the water rate Rs. 5 ; the value of rice Rs. 46 and the water rate Rs. 7-8. It may be mentioned here that the charge for water for any one crop is not uniform on all the canals. Each tract served by a system of canals has its own rate which is uniform throughout that tract. Again, flow rates are higher than lift rates.

Careful attention has been paid in the past to the question of drainage. Construction of canals has been undertaken in such a manner as to avoid interfering with the drainage of the area. No waterlogged areas have consequently manifested themselves.

The attention of the Irrigation Department of the United Provinces is being directed more and more towards questions of research. Prevention of avoidable losses, *e.g.*, through seepage, faulty design and construction of the water courses of the cultivator, defective preparation of the fields for receiving the canal water by the omission to divide the fields into suitable compartments, and determination of the amount of water necessary for a crop, should result in spreading the benefits of canal irrigation over a wider area.

The second source of irrigation is from small streams and *jhils* (lakes). The use of water from these is governed by customs, which are recorded in the village papers. These customs secure to the different interests something like a fair share of the limited supply available. This source serves to help the late maturing rice and there may be enough for a first watering of the *rabi* crops. Generally, it gives out when the need for water is greatest, *e.g.*, in a dry year.

The third source is tanks, a word which may cover a huge modern reservoir impounding the flood waters of the vast catchment area of a river in Bundelkhand or it may mean an excavation in the level ground covering a few acres of land in the *doab* proper. Tanks in the latter sense are usually shallow and are not capable of providing irrigation on a large scale. The cost of excavation increases with the depth and thus water cannot be stored in large quantities. These tanks provide water for the use of man and beast, besides giving a first watering to a certain amount of *rabi*. Like *jhils*, they cannot be relied upon in periods of drought, when the need for water is greatest. The cultivator

understands from long experience the technique of their construction. Their bed is of clay, to reduce the loss of water to a minimum.

Wells, however, form the most important source. In 1926-27, the total net area irrigated was 10·3 million acres out of which wells were responsible for 5·4 million acres. South of the Jumna, wells are sunk into rock to a great depth. In the Indo-Gangetic plain, the conditions are specially favourable for the successful digging of wells. The depth at which water is found may vary from 10 to 100 feet. The ordinary wells are of two kinds, percolation and spring wells. The depth of the latter is the greater; they draw water from beds of saturated sand, enclosed in clay; they are more reliable in times of drought, since the water exists in larger quantities and, even if they dry up, they remain serviceable afterwards. Percolation wells are cheap, but not durable, and, since only the percolation level is tapped and not the more abundant supply found in beds of coarse saturated sand, the quantity available for irrigation is limited. The cost of a well is determined chiefly by the need for lining. No lining is ordinarily necessary for stiff clay soil; with sand or loam, it is different. The whole or only a part of the well may require a lining. If it is a part only that requires protection, either twigs, (usually *arhar* stalks and coarse grass) are fixed in, or pieces of wood, or a cylinder of bricks. If the entire well is to be protected, cylinders of masonry, cemented or uncemented, are either built up from below or sunk down from above.

The methods in common use for lifting of water are: (1) an ordinary basket, closely woven, held at both ends by ropes, for lifts of less than four feet. Two men are necessary for working the basket and four for a full day. This method is wasteful of effort, as much of the water spills back, but it is cheap. (2) An alternative method to the basket lift is the chain pump, which consists of a series of discs on an endless chain passing over a wheel and through a pipe. As the wheel is turned, the discs bring up a constant stream of water. (3) For shallow percolation wells, the water is lifted by means of a *charkhi* or a *dhenkli*. These are simple arrangements consisting of a wooden frame and a pole, at one end of which there is a weight to counterpoise a jar or bucket which is dipped in. For lifts under twenty feet no other method has yet been devised which can compete with these indigenous contrivances. (4) For deeper wells, a huge leather bucket drawn by bullocks, walking down on inclined plane by the side of the well, is used. In the western districts, two pairs of bullocks are used and in the eastern, one pair. (5) In the extreme north and extreme south, the Persian wheel is used. (6) Lastly, mechanical power, chiefly from the use of oil engines, is slowly coming in. The ordinary cultivator cannot afford the initial cost and its economical use requires a minimum supply of water which must be kept up. The expense of raising water is very much less than that involved by the indigenous methods.

The amount of water required per watering and the total number of waterings necessary to bring a crop to maturity vary with the soil and the crop. Very sandy soils absorb a very large quantity. Heavy clay does not require irrigation. Between these two extremes there are

well-drained sandy soils and rich loams. The former require more water than the latter.

The cultivator does not use canal water with that care and economy which he shows in the case of water drawn from wells. In his use of well water, he prepares the land first with great skill, dividing it into small compartments and the more valuable the crop the smaller the size of these compartments. For instance, a poppy field will have much smaller divisions than a barley field. Compartments are much larger in tracts served by canals than in those under irrigation from wells. Again, within irrigation tracts, the size of the compartments will be larger for flow than for lift irrigation.

The grant of life tenancies is expected to induce the cultivators to increase the number of wells and, if the co-operative movement develops in the province, the question of the supply of capital will not be such a hindrance as in the past.

8. FORESTRY IN RELATION TO AGRICULTURE.

The cultivator dwelling in that small part of the United Provinces in which forests exist looks upon them as a source for the satisfaction of his immediate needs. He does not realise that needs have an awkward tendency to recur. He sees no point in a judicious and economical exploitation of forests, with a due appreciation of all needs, of the future as well as of the immediate present and of the general public as well as of the dweller on the forest borders. Such matters as the value of timber supplies to the economic welfare of the whole province and the steady and unseen influence of forests in retarding the rapid flow of water, and thereby saving agricultural land from injury and destruction produced by erosion, and floods, are hardly appreciated. Further, the cultivator perceives no connection between forests and well-regulated supplies of water in canals, which are so important for the welfare of the people in the plains. These matters pre-suppose a degree of insight into scientific treatment of forests which he does not possess.

State action in the interests of the general welfare and to protect the cultivator from the consequences of his own recklessness has taken the form of control of forest areas. Forests have been divided into two classes, reserved and protected. Greater latitude is usually allowed in protected than in reserved forests.

The area under forests controlled by the Forest and Revenue departments amounts to some 12,267 square miles, being eleven per cent of the total provincial area. Out of this total, 5,167 square miles are classed under reserved and 7,100 under protected forests.

With the exception of some small forest areas on and near the Central Indian hills of Bundelkhand, all the forests lie in a narrow belt along the borders of Nepal and along the foot of the Himalayan hills and within the hills. There are no forests in the Gangetic plain proper. In the plains, thousands of acres of good agricultural land have been destroyed by the destructive action of water in the past. In one district alone, it

is estimated that 400 *bighas*, equivalent to 133⅓ acres of land, are eaten up by water every year. In such areas, known as ravine lands, the Forest Department is attempting the policy of afforestation, the objects of which are (1) to prevent the further erosion of agricultural land by water and the spreading of ravines, (2) to create a local supply of fuel, (3) to improve the grazing and (4) to create fodder reserves where none existed before.

The special afforestation division has had on hand a yearly programme of 2,000 acres. There are other large areas in the plains which can be made to serve the needs of agriculturists, if only the Forest Department can control reckless grazing by devising a suitable system of rotation, and if stall feeding becomes common. Afforestation is proceeding in the districts of Etawah, Agra, Cawnpore, Unao and Aligarh and also in Bundelkhand.

Apart from ravines and waste land, there are interspersed all over in the plains considerable areas of heavy clay soil, impregnated with salts to such an extent that cultivation is impossible. Attempts are being made to afforest such areas and, even if they do not prove financially successful, it has been demonstrated that good crops of fodder grass can be produced by simple protection. The fuel and fodder supplies would be considerably increased, if progress were more rapid and public opinion realised the importance of action in its bearing on the advancement of agriculture.

In the montane and sub-montane tracts lie the bulk of State-managed forests. Reserved forests are always under the direct management of the Forest Department. Protected forests are in some places in the charge of the Revenue and, in others, of the Forest Department. The chief species of trees in these Himalayan forests are *sal*, deodar, oak and pines.

The benefits which cultivators derive from forests are firstly, grazing, which may be free, or at privileged, or at full rates; secondly, the right to extract timber, possessed by cultivators living in or near forests; thirdly, such right-holders may take away fuel; fourthly, they may appropriate bamboos, within limits, for the satisfaction of their requirements. Minor forest products, *e.g.*, leaf litter and humus are also taken without let or hindrance. Building stone, lime, slates, fibre for ropes, materials for baskets, berries and fruits for various uses are also available for the use of cultivators in forest areas.

Grazing is provided annually for over a million animals, excluding large numbers in Kumaon, which are never counted. The value of free or privileged grazing foregone by the Government comes to nearly Rs. 3 lakhs a year and that of forest produce, given away, to about Rs. 2¾ lakhs.

To meet the requirements of the bulk of the population, which lives in the plains, a more active policy of afforestation of uncultivable waste, ravine and *usar* lands is necessary. The forests cover only eleven per cent of the total area, and their distance from the chief agricultural tracts is a serious obstacle. The needs of the population in the plains

can be met satisfactorily if production of fuel, timber and grass is in their immediate neighbourhood.

The question of communal management of small village forests is receiving attention in the Kumaon Hills.

9. GENERAL EDUCATION.

There are in the United Provinces 5 universities, 34 intermediate colleges, 127 English middle and 188 high schools. Four of the universities are teaching and residential; the fifth, that recently created at Agra, is an affiliating and examining institution. For the supply of teachers to the English school system, three training colleges are maintained by Government and one each by the universities of Benares and Aligarh. The rural population does not frequent any of the higher institutions in which instruction is given through the medium of English. Education for the mass of the people is provided by the vernacular school system. It is, therefore, proposed to consider only this system.

The vernacular schools for boys are of two grades (1) primary and (2) middle. In 1927, the total number of primary schools managed by district boards was 13,759 and of middle schools 576. In addition there were 4,201 primary and 12 middle schools, which were aided by local boards.

The district boards spent on education Rs. 100 lakhs, of which Rs. 73 lakhs came out of provincial revenues and Rs. 27 lakhs were provided out of their own resources. The boards' expenditure was almost entirely on the education of boys (Rs. 96·7 lakhs) and only Rs. 3·3 lakhs was spent on the education of girls. The total number of boys attending district board vernacular schools is 879,000, of whom about 822,000 are in primary and 57,000 in vernacular middle schools. The total number of boys of school-going age, between 6 and 11 years, is estimated by the Education Department at 2,500,000. With their present expenditure, the boards can provide education for one million boys. For the education of the remainder, 1·5 millions, another Rs. 1·5 crores would be required (excluding additional expenditure on direction, inspection, training of teachers, buildings and equipment). If the boards used fully their powers of taxation it is not expected that they could raise more than Rs. 14 lakhs. The difference between the amount necessary for giving education to 1·5 million boys and the additional amount which it is estimated the boards might be able to raise would fall on provincial revenues. It has been pointed out already in the section on Provincial Income and Expenditure that one characteristic of provincial revenues is their inelasticity and, should the present tendencies continue, this feature will become more marked. The above calculation takes into account only boys of school-going age. The girls whose number cannot be less, if educated apart from boys, would require another Rs. 2·5 crores, recurring. The total annual recurring expenditure on the education of both boys and girls in rural areas, would be about Rs. 5 crores, if the provisions of the District Boards Primary Education Act were generally enforced. The problems of financial ways and

means thus loom large in any scheme of free compulsory primary education for the mass of the agricultural population. So much for future developments.

In the vernacular school system, the aim is to spread literacy and to develop faculty. For the attainment of both objects, the teacher is much more important than mere syllabuses, courses of study and curricula. Unfortunately, the scholars do not remain long enough at primary schools to attain either of these objects. Attendance during the period of enrolment is also unsatisfactory. The course in primary schools lasts for five years and in middle schools for three years. The Director of Public Instruction has estimated that, out of every 100 boys who enter a primary school, 58 complete the course meant for infants, 44 reach class I, 31 class II, 22 class III and only 16 class IV. The system is thus wasteful, since boys do not stay long enough to derive permanent advantage. The reasons for this diminution in the successive classes are stated to be (1) the demand for child labour ; (2) the prejudice against schools as rendering boys unfit for the occupation of their fathers, *viz.*, agriculture ; (3) the inefficient system of teaching and (4) unwillingness of parents to send their children to schools outside their own village.

Irregular attendance arises from inclemencies of the monsoon, prevalence of malaria and other epidemics after the rainy season, and from the occurrence of numerous feasts, festivals and marriage ceremonies. The long drawn out harvests, the inadequate and unhygienic buildings in which schools are held and the inefficiency of the teaching, especially in the infant classes, also interfere considerably with regularity of attendance.

It is considered that these two evils of low enrolment in higher classes and irregular attendance during the period of enrolment can be largely diminished by introducing compulsion gradually. It is expected that the District Boards Primary Education Act of 1926, under which power has been given to district boards to introduce compulsion in the whole or any part of the areas under their jurisdiction, will materially eliminate this waste. The Director of Public Instruction considered it also desirable to amend the District Boards Act, with a view to conferring larger powers on the education committees of district boards. Nomination of public spirited gentlemen, with a keen interest in primary education, to the committee is also necessary. The members of district boards concern themselves more with questions of promotions and transfers of the teachers than with the improvement of education.

Vernacular schools are administered for the boards and inspected on behalf of the Education Department, by officers of the department. In each revenue district there are four or five sub-deputy inspectors with one deputy inspector to control and supervise the work of his subordinates. An officer of superior status, called an inspector of schools, is stationed in each revenue division, consisting of four or five administrative districts. He controls the agency for inspection working in the different districts, with the help of an assistant inspector.

The extent of literacy may be judged from the following figures which include the urban as well as the rural population, and are taken from the

Census Report of 1921. Out of every thousand of the population, there are only 37 literates: out of every thousand males, 65 and out of every thousand females, 6. The figures in 1911 were 34, 61 and 5 respectively. Measured by reference to natural divisions, Himalaya West is far more literate than any other division, the reason being that the majority of the people are of approximately equal and fairly high status. The western portion of the plain has gone ahead of the central. The plateau and the eastern plain have made considerable progress. There is retrogression in Sub-Himalaya East, in comparison with the figures for 1911.

Literacy among cultivators may be gauged by reference to figures of literacy by caste. Cultivators in the United Provinces belong chiefly to the following castes: Jat, Kachhi, Kurmi, Lodha and Tharu. The numbers of literates per 1,000 of males and females are:

Caste	Male	Female
Jat	51	2
Kachhi	10	4
Kurmi	30	1
Lodha	13	1
Tharu	54	2

For pastoral castes, the figures are given in the following Table:

Number of literates per 1,000

Caste	Male	Female
Ahir	12	0·5
Gadariya	6	0·4
Gujar	19	1·0

For castes, from which agricultural labourers are chiefly drawn:

Number of literates per 1,000

Caste	Male	Female
Chamar	2	0·2
Kori	8	0·3
Luniya	11	0·1
Pasi	3	0·1

For castes, members of which chiefly own land, the figures are:

Number of literates per 1,000

Caste	Male	Female
Bhuinhar	166	10
Rajput	114	12
Taga	69	4

The only inference that can be drawn from these figures for the various castes is that literacy in a caste varies directly with its economic and

social position. If the social position is high, the figures for literacy are also high. The more submerged a caste is in position, the worse off it is as regards literacy.

Efforts have been made in the last three or four years to introduce specially trained teachers into certain vernacular middle schools managed by district boards, to give instruction in agriculture as a separate subject. Government bear the whole of the cost of training the teachers and half the initial cost of purchasing cattle, equipment and land (about five acres) for the farm attached to each of the schools. The non-recurring cost for equipping a school to provide teaching in agriculture is Rs. 4,000. The boards bear the recurring cost, estimated at Rs. 350 per annum, and half of the non-recurring cost, *i.e.* Rs. 2,000. Manual training has been introduced into 29 vernacular middle schools, with a view to making the course less literary and more practical; a further extension of this scheme is being considered. English is being taught in about 150 vernacular middle schools thus making easier the path of boys desirous of joining English high schools from vernacular schools.

The problem of improving rural education in the United Provinces resolves itself into improving the method and quality of teaching by the provision of more and better teachers and by improving their prospects.

Better buildings for schools are also necessary. More than half of the schools managed by district boards have only a borrowed habitation. It is not the school building of the village but the house of a moneylender or the premises of the village police station, which attract a visitor's attention. A very large non-recurring expenditure, estimated at a crore of rupees at least, is required to provide adequate buildings for existing primary schools.

10. CO-OPERATION.

The beginnings of co-operation in the United Provinces go back to the year 1901, when a few credit societies were organised by Mr. Dupernex, I.C.S. A Co-operative Department was established in 1904 after the passing of the Co-operative Societies Act in that year. At the end of 1926-27, there were in existence 75 central societies, 287 non-agricultural primary societies, chiefly credit, and 5,880 agricultural primary societies, of which 5,874 were credit and 6 non-credit societies. There is no Provincial Co-operative Bank. The department is managed by the Registrar who then had the help of 2 deputies, 2 assistants and 27 inspectors. The auditors, who then numbered 52, were paid by Government but central banks and societies contributed the greater part of the expenses of their maintenance; in addition, central banks and societies maintained a staff of managers and supervisors who were not paid out of public funds and were not under the orders of the Co-operative Department. The government expenditure upon the movement in 1925-26 was Rs. 2·23 lakhs as compared with Rs. 6·36 lakhs in the Punjab and Rs. 6·28 lakhs in Madras. In 1926-27 the cost to Government was Rs. 2·15 lakhs. The progress of the co-operative movement since the organisation of the department is set out in the

following Table, taken from the provincial memorandum prepared for this Commission.

Year	Total number of societies and central banks	Total membership of primary societies	Total capital involved in the movement	Total owned capital of central banks and societies.
	No.	No.	Rs.	Rs.
1904-05	150	12,215	....	....
1905-06	123	10,234	....	47,018
1906-07	170	17,404	....	1,67,612
1907-08	187	38,985	....	2,79,431
1908-09	369	55,067	....	4,76,136
1909-10	789	49,963	....	5,63,862
1910-11	1,258	63,035	....	7,63,189
1911-12	1,946	76,812	....	10,25,452
1912-13	2,530	94,042	....	13,58,282
1913-14	2,800	108,023	....	17,82,066
1914-15	2,962	107,781	....	23,15,601
1915-16	3,190	113,251	....	28,47,691
1916-17	3,246	109,233	76,66,966	33,76,462
1917-18	3,087	97,638	73,21,910	36,31,206
1918-19	3,406	98,527	75,22,107	40,70,571
1919-20	3,721	97,086	75,74,992	42,33,713
1920-21	4,493	110,620	80,83,433	46,04,540
1921-22	5,137	128,113	80,73,042	51,62,101
1922-23	5,609	136,423	1,00,80,342	57,50,738
1923-24	5,755	144,482	1,05,14,167	64,34,263
1924-25	6,000	155,149	1,12,51,865	72,05,319
1925-26	6,238	159,647	1,88,49,170	77,04,460
1926-27	6,242	163,983	1,97,75,823	82,99,282

It is an interesting Table, with its array of figures. No conclusion can, however, be drawn from them. They are merely arithmetical numbers and they can tell us nothing about the societies, whether they are good or bad, dead or alive, co-operative or un-co-operative. The figures for membership may include good co-operators as well as those who may never have heard of co-operation, its principles, practice or message. The capital involved in the movement may represent either genuine or merely paper transactions.

These doubts and difficulties have been brought to light recently by a committee appointed by the Government of the United Provinces. It examined the whole movement and its findings on matters of fact make dismal reading. Briefly, the main conclusions of the committee are that (1) the co-operative movement is not spreading by the momentum of its success and the moneylender is not having sleepless nights; (2) central banks have drawn all threads of authority into their own hands; (3) primary societies are generally effete; (4) the principles of co-operation are not understood; (5) the staff is insufficiently trained and unsuited for work in the villages; (6) the staff is very often corrupt and has in many cases succeeded in corrupting the headmen of the *panchayats* also.

The main concern of central banks is to recover their advances. They are not carrying out satisfactorily the duties devolving upon

them in connection with the organisation, and supervision of primary societies.

The officials of central banks interfere too much with primary societies and have practically killed all co-operative spirit in them. In the opinion of the committee, the primary societies have sinned and are sinning against every canon of co-operation. The members understand neither the purpose nor the business of their society and as their education in co-operative principles is defective, the affairs of the society get into the hands of either servants, who are very often corrupt, or the headmen of *panchayats* (*sarpanchas*) who batten on the members. There is no careful selection of members; loans are not granted for productive purposes only; when granted they are not applied to the purpose stated; there is no supervision by members; loans are recorded as repaid when they are, as a matter of fact, only renewed. Further loans are not recalled and sureties are not held to their obligation; loans are monopolised by *panchas* and their friends. The obstacles to the spread of co-operation in the United Provinces are (1) illiteracy, (2) lack of honorary workers, (3) the hostile attitude of moneylenders, landlords, and the indifference of others, who should be the leaders of their tenantry, and (4) the lack of government staff, the dishonesty of the bank staff and group secretaries, and the tenancy law and social conditions which, till recently, gave very little security of tenure to the tenants.

Some instances of outrageous malpractices have been recorded by the committee. In the district of Budaun, there were 159 societies under the district bank; there are none now. The manager of the central bank had swindled the primary societies for a number of years. When the Registrar came to inspect these societies, the manager sent out a message to the members not to show their pass books, otherwise they would have to pay. No pass books were shown and no redress was consequently obtained. In Sultanpur, the managing director, who was an honorary magistrate as well, enrolled litigants who appeared before him as members of primary societies and advanced loans to them which he took back as his remuneration for selling justice to them. Similarly he would enrol defaulting debtors, give loans to them and thus recover bad debts for his friends. In Moradabad an easy way was discovered of realising irrecoverable arrears of rent due to bad seasons. Societies of tenants were formed and loans instead of being paid to members were retained by the director and others in lieu of their rental demands. Bad seasons came again. The members sank under this load caused by adversity and added to by human ingenuity.

In the words of the committee "if facts are not faced, if drastic action to rid the movement of make-believe is not taken and if supervision is not made real and effective, the collapse of societies in many other areas is inevitable."

11. COMMUNICATIONS AND MARKETING.

The economic changes which have resulted from the introduction of modern means of communication, *viz.*, roads, railways, the post and the telegraph, are seen in the knitting up of internal markets among

themselves and in linking the local to the wider markets of the world. Before 1850, the price of any agricultural staple varied by much more than the costs of transportation from one internal market to another. At the present day it does not. There is a uniformity of price for all markets in the United Provinces. Again, as there was no connection between internal markets, similarly there was none between local and foreign markets. To-day, variations of price in wheat, cotton and oilseeds are felt by the cultivator. Moreover, the means of communications have rendered an exchange of goods easy. The surplus means now so much purchasing power. Formerly, it represented no economic gain. All these changes are, in the main, due to roads and railways, which have been and are influencing, unseen, the traditional economy of the village. The railway lines in the United Provinces are either broad or metre-gauge. In the first category are the East Indian, North Western and the Great Indian Peninsula railways. The East Indian Railway traverses the provinces from south-east to north-west; the North Western passes through the Meerut and Muzaffarnagar districts and the Great Indian Peninsula Railway connects Bundelkhand with Lucknow and Delhi and Allahabad with the Central Provinces.

Among metre gauge railways are (i) the Bengal and North Western, connecting the north-eastern districts with Bengal on one side and Cawnpore, the commercial and industrial centre of the provinces, on the other; (*ii*) the Rohilkhand and Kumaon Railway bringing into touch the north-west of Oudh, Rohilkhand and the high lands of the Himalayas; and (*iii*) the Bombay, Baroda and Central India Railway, which passes through the western portion of the province. Mention may also be made of the Shahdara and Saharanpur Light Railway which opens up the rich tract of the country served by the Eastern Jumna Canal. The province is now opened up except in the montane tract in which there are no railways.

The complaints of traders relate mainly to a seasonal shortage of wagons, on account of which agricultural produce is sometimes held up for a few days more than the patience of traders will allow.

The next agency which has facilitated the free circulation of goods is roads. There are at present 7,710 miles of metalled and 27,670 miles of unmetalled roads. The roads fall into two classes, provincial and local, the major portion of the latter being unmetalled. The first class is comprised of the main arteries of communication. The agriculturist relies mainly upon the unmetalled roads of the second class, before he gets on to the principal roads. There is a provincial Board of Communications, the activities of which are handicapped by the absence of funds. Motor traction is slowly coming in. Its progress would be more rapid if finance permitted an active programme of improvement of old, and of construction of new, roads.

The cultivator sells his produce either to the village shopkeeper, to whom he is very often indebted and thus does not get the benefit of free sale in a market, or to itinerant buyers, called *bhartiwalas* (literally, corn-gatherers), who also squeeze him out in the matter of a fair price.

Sometimes the cultivator may have sold his crop in advance to big firms dealing in raw produce. These firms may be indigenous or foreign. If the crop is an exhausting one like sugarcane, there is the risk of the cultivator being forced to put his land for a second season in succession under that crop, if he has not been able to deliver the stipulated amount of the produce owing to an unfavourable season. With an increase in his resources and with an improvement of the local roads, the cultivator is getting more and more into the habit of trying his luck in the nearest market, which very often is the headquarters town of the district. In such a market, the cultivator experiences all the influences of distant markets.

The busy months are naturally after the *kharif* and *rabi* harvests. The people with whom the cultivator comes into contact are (1) weighmen, (2) commission agents and (3) dealers. The following particulars are taken from the Census Report of 1921 and are applicable to a market typical of the poorer rural areas. In the market of Mau, in the Jhansi district, Bundelkhand, the weighmen's dues are two pies per rupee for grain and one anna per *maund* for *ghi*. The commission agents charge twelve annas to one rupee for their labour. The rate of net profit may be half to three-quarters of an anna per rupee for wholesale and twice as much for retail dealers. The commodities which the cultivator buys are salt, tobacco, *gur*, kerosine oil, cotton yarn and cloth. The rates of profit are summarised below :—

Commodity	Rate of net profit per cent	
	Wholesale	Retail
	Rs. a.	Rs. a.
(1) Salt	3 2	6 4
(2) Tobacco	6 4	from 9 6 to 12 8
(3) Gur	from 1 9 to 6 4	from 6 4 to 11 8
(4) Kerosine oil	3 2	4 6
(5) Cotton yarn	3 2	6 4
(6) Cotton cloth (imported)	6 4	12 8

The value of these figures lies not in their absolute correctness but in the relation which they tend to indicate between wholesale and retail prices. The purchases of the cultivator are retail. Consequently he has to pay far higher prices. The real benefit of an increase in his purchasing power is to be judged in relation to the prices he has to pay.

12. LOCAL SELF-GOVERNMENT.

Local self-government includes both municipalities and district boards. District boards only will be considered in this section, as they are mainly concerned with the welfare of the rural population. Under the District Boards Act of 1922, the boards were reconstituted. Their

number is 48; the total sanctioned number of members is 1,503, of whom 1,407 are elected and 96 nominated. All the boards are under non-official chairmen, elected by the vote of members.

The matters to be administered by the boards are laid down in the Act and include, among other things, the construction, repair and maintenance of roads, bridges and other means of communication; the planting and preservation of trees; the establishment, management and maintenance of hospitals, schools, pounds, works of public utility, *e.g.*, ferries, wells, drainage works, etc.; the holding of fairs and shows; and works and measures likely to promote the health, comfort and convenience of the public.

The income of the boards, exclusive of balances for the year ending March 31st, 1926, was 190·84 lakhs of rupees and the total expenditure 191·41 lakhs. The main sources of income were (*i*) government grants, (*ii*) local rates and (*iii*) receipts from pounds, ferries and schools. Grants-in-aid amounted to Rs. 85 lakhs and Rs. 72·37 lakhs were raised from local rates. The bulk of the expenditure was on education, Rs. 95·39 lakhs; public works (*i.e.* engineer, staff, roads and buildings), Rs. 48·46 lakhs; medical relief, Rs. 18·44 lakhs; public health, Rs. 5·74 lakhs; veterinary assistance, Rs. 2·94 lakhs, apart from Rs. 10·15 lakhs for general administration and collection charges.

Panchayats were constituted in the United Provinces under Act VI of 1920, mainly for the purpose of providing the villages with local courts and checking the volume of litigation in the courts of the stipendiary magistrates and the munsifs. The *panchayats* in the United Provinces are almost entirely judicial in character and very little use has hitherto been made of *panchayats* for village administration. Nor is the *panchayat* supported in any effective way by powers for raising a village rate. The *panchayats* discharge their official duties and their income consists mainly of fines which are imposed and realised by them. The question of developing an administrative *panchayat* is now being specially considered. Departmental or special committees at headquarters of the district boards have met with success.

The district boards held in the year 1925-26 altogether 945 meetings. There is a tendency to multiply their number. This practice is inconvenient and expensive; it discourages regularity in attendance and is largely responsible for the great number of abortive and adjourned meetings. The average percentage of attendance in 1925-26 was 62·60.

The incidence of taxation was Re. 0-2-8 and of income Re. 0-7-10 per head of the total population in 1925-26.

13. PUBLIC HEALTH AND SANITATION.

Until 1919, the Public Health Department consisted of a Director, four assistant directors for general duty and one assistant director for work on malaria. There was no whole-time personnel working in rural areas except the staff for vaccination. Civil surgeons were supposed to look after prevention, as well as cure, of disease in such areas.

Twenty-six of the forty-eight districts have now been brought under the district health scheme which will be extended to the remaining districts as funds allow, and as doctors and sanitary inspectors who have passed the special public health course become available. The province is now completing a fully equipped hygiene institute which gives complete facilities for the training of men in adequate numbers. As funds allow, a trained health staff will then be appointed to the remaining districts and a supplementary staff will be attached to those districts which are already under the health scheme.

The object of the health scheme is that public health questions in each district should be directly in charge of a specially trained medical officer who will be able to instruct the local boards in public health duties and by practical work carry out health propaganda all through the district. The district medical officer of health has one assistant and, in later stages, will have more than one. He also has a trained sanitary inspector for each subdivision, and a special gang of workmen at his disposal. Travelling dispensaries are attached to the district staff for special duty in the case of plague.

The district health staff have been appointed at first in those districts which are specially liable to epidemics of cholera and plague. Their services in checking cholera epidemics have already been most marked and the incidence of cholera mortality has been reduced to half the figure at which it stood five years ago. Epidemic work is under the direct charge of the Collector of the district and arrangements are made by which the subordinate revenue staff and the village watchmen assist the public health staff in reporting and in dealing promptly with the outbreak of any epidemic. It may be mentioned that this epidemic work is in addition to that which is done by the Public Health Department at the big fairs and on occasions when large bodies of pilgrims move about the province.

The district health staff are also intended to devote much time to village sanitation. They are systematically examining each village. They are introducing more sanitary methods of disposing of sullage water, they are teaching the villagers to copy these methods themselves, to clean up waste spaces and to remove manure heaps to a more suitable distance from the inhabited sites. They examine the condition of the wells in each village and are steadily taking action to improve these wells and to protect them from pollution. The simple measures which the public health staff are taking have already had considerable effect and are appreciated by the villagers though the latter are not as yet prepared in many cases to spend money or labour on this class of improvement. Progress is, however, being made and the example will, it is hoped, spread gradually over the province.

For the cure of disease there are fixed dispensaries in every district but their number is low and seldom exceeds ten dispensaries for a rural population of a million. These dispensaries are staffed partly by government servants and partly by district board officers all of whom have received training in the medical colleges and schools of the province.

The expansion of dispensaries is checked by the lack of funds, but a general scheme is slowly being put into operation by which, if the district board contribute half the cost, recurring and non-recurring, of a dispensary, the Government contribute the remainder. This applies also to dispensaries founded by philanthropists; a few dispensaries are added every year by the bequests or grants of private individuals. The larger towns have their dispensaries, but there are still a number of small towns which have at present no dispensary and, as has been indicated, the village population is far from adequately served with medical relief. Special attention has been given to the reduction in the cost of buildings in order that the limited funds at the disposal of Government and the boards may be used as widely and effectively as possible. Another scheme in which assistance is given from provincial revenues is intended to establish doctors in the outlying villages, but this so far has not met with any general success as the doctors are usually unwilling to leave the towns and settle in the rural area.

The central administration of public health now comprises a Director, three assistant directors in charge of ranges, and three assistant directors in charge respectively of the malariology branch and the training at the research institute of hygiene and the publicity bureau.

The institute has two lecturers and there are two other medical officers at the bureau in addition to the assistant director. The bureau occupies itself with preparing short stories and lessons, posters, sets of magic lantern slides, for distribution to all public health officials and travelling dispensaries. The lines of future development are indicated by the intention to divide the rural areas into blocks of convenient size, to replace travelling by fixed dispensaries for the cure, and to station a public health staff for the prevention, of disease. It will then be possible to undertake active propaganda work for removing from the rural population the fatalism which is responsible for so much misery, low efficiency and low output.

The chief causes of ill-health are (*i*) malaria, (*ii*) cholera, (*iii*) plague, (*iv*) small-pox, (*v*) other infectious diseases and (*vi*) respiratory and intestinal disorders. Cholera, plague and small-pox are short and sharp in their devastation.

The general death rate is two-and-a-half times as high as in the United Kingdom. The average excess of the birth over the death rate is 6 per mille. With this rate of increase, population should multiply considerably but it is kept down by epidemics of one kind or another. The influenza outbreaks carried off millions in a few days.

Apart from these epidemics with their terrible destruction, the chief cause of much chronic health and debility is malaria. It is prevalent all over the United Provinces but is much worse in some districts than in others. About one million are reported to die every year of malaria. There are reasons for supposing that this estimate errs considerably on the side of excess, as the village watchman ascribes every case of death which he cannot understand to malaria. Making allowance for such errors, the death rate cannot be less than one hundred thousand

from this cause, which, in addition, is responsible for a considerable proportion of deaths, as a predisposing cause for other diseases ending in death.

One-fourth of the total population of 45 millions get two attacks of malaria every year and only one per cent receive proper quinine treatment. Twenty-five per cent of the population are totally incapacitated for work for two months, besides having a lowered vitality for the rest of the year. The loss of efficiency for the workers, estimated at 18 millions in a total agricultural population of 35 millons, is put down at fifty per cent.

The chief requirement for an effective programme of combating this disease is a very much larger quantity of quinine available at a very much lower price. In 1921, the total stock available for the whole of India was 160 thousand pounds. Double this quantity would be required for the United Provinces alone.

The price of quinine is high and the supplies are totally inadequate. The rural population is now aware of the great efficacy of quinine, but high prices and limited stocks are restricting its more extensive use.

The other measures, the adoption of which would considerably lessen the incidence of malaria, are : (*i*) proper drainage schemes for the whole province ; (*ii*) filling in of shallow depressions near every village ; (*iii*) inducing the cultivator to keep his irrigation channels clean ; (*iv*) proper draining of valuable agricultural land.

Above all, the villager has to be educated and convinced by effective propaganda, so as to create in him the will to make small improvements himself, the labour cost of which would be trifling.

Hookworm is another agent responsible for lowered vitality. The moist eastern districts suffer much more than the dry western districts. About eighty-six per cent of the people in the eastern districts are infected. The incidence of infection becomes less as one proceeds from east to west. Leather foot-wear is the best protection.

Dysentery is another disease which lowers vitality and hence productive efficiency. Better methods of storing manure and proper attention to keeping the drinking water pure in wells should reduce the prevalence of this disease. Powers of taxation have been given to villages with a population of over 2,000 to improve their water-supply under the provisions of the Village Sanitation Act.

Grants are also made by Government. Only a very small amount is raised by taxation in villages to which the Act has been applied. For improving the water-supply in all the villages, a much greater amount would have to be raised by taxation. The villager has not reached the stage at which he can realise the benefits of improvements so keenly that he is willing to pay for them himself.

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