

CHAPTER IV.

PRODUCTION AND DISTRIBUTION.

SECTION A.—AGRICULTURE AND ARBORICULTURE.

Table No. XIV gives general figures for cultivation and irrigation, and for Government waste land; while the rain-fall is shown in Tables Nos. III and IIIA and III B. Table No. XVII shows statistics of Government estates. Table No. XX gives the areas under the principal staples, and Table No. XXI the average yield of each. Statistics of live-stock will be found in Table No. XXII. Further statistics are given under their various headings in the subsequent paragraphs of this chapter. Land tenures, tenants, and rent, the system of agricultural partnerships, and the employment of field labour, have already been noticed in Chapter III Section E.

The total annual fall of rain and the manner in which it is distributed throughout the year are shown in Tables Nos. III, IIIA, IIIB. The agricultural or *fastí* year begins, according to the almanac, at the middle of Chet; but in practice the agricultural year begins with the day after *Dasahra*, or the 11th of the second half of Jeth, on which date agricultural partnerships are formed for the ensuing year. The year is divided into three equal seasons, the hot season or *kharsa*, including Phágan, Chet, Baisákh, and Jeth; the rains or *chaumása barkha*, including Sárh, Sáwan, Bhádon and Asauj; and the cold season or *syála*, including Kátik, Mangsir, Po and Mágh. The two annual crops are known as *sáwani* for the autumn or *khariíf* crops, and *sárhí*, for the spring or *rabi* crops. Work begins with the first rains or, where irrigation is available, even before that. Maize and cotton are sown, and a little early *javár* sown and irrigated for the bullocks. As soon as rain falls, the land is ploughed up for the autumn crops. When they are once sown, they do not require very much attention, as most of them are not irrigated at all, and but seldom weeded. But the cultivator is hard at work, ploughing his land for the more valuable spring crops; and it is the amount of labour then expended on the ground that chiefly decides their out-turn. When it is too wet to plough, there are the banks and ditches to be looked to, canals to be tied up, and plenty of odd jobs to occupy the time. With the

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cessation of the rains comes the busiest season of the year. The land has to be finally dressed and sown with the spring crops, and the autumn crops have to be harvested. During the cold weather the irrigation and weeding of the spring crops absorb most of the available labour; but if good Christmas rains (*mahawat*) set the bullocks free from the well, land will then be ploughed for sugar-cane, tobacco, and even for the autumn staples. Irrigation is continued almost up to the spring harvest, which generally comes with a rush, all the crops ripening almost at once; and labour at this season often fetches extraordinary prices. When the spring crops are fairly garnered, little can be done beyond finishing up the tobacco, watering the cane, sowing early maize and *jawar* for the cattle, and getting in the maize and cotton; and even this can only be done where irrigation is available. Consequently this is a season of comparative leisure; and the people occupy themselves, the stars permitting, in marrying themselves and their neighbours.

The weather.

The east or cold damp wind (*parwa*) is the abomination of the cultivator. It breeds, especially when the weather is cloudy and the ground wet, all sorts of pests and diseases, animal and vegetable; and the only point in its favour is that it does not dry the land and shrivel up the plants, as the fierce west wind will do, and that it is often the precursor of rain. It is specially obnoxious when the pollen is ripe and the seed forming, or about Asauj and Phagan. The west or hot dry wind (*pachwa*), on the other hand, if it is not too strong, is hardly ever unwelcome so long as there is plenty of rain; for it does no harm beyond drying things up. It is specially desirable when the plants are young, as it forces them on; and again when the pollen is ripe and the seeds forming; and again when the crops are ripening; but if too strong or too hot, it is called *jhola*, and blows off the pollen, shrivels up the grain, and blows down the plants: while in autumn it dries up the moisture upon which the spring sowings depend. After the spring crops the fiery hot wind cannot be too fierce or too continuous, as it dries the grains and makes winnowing easy; and, best of all, it presages a good rainy season. Rain can hardly be too plentiful, in the autumn at any rate, till the pollen forms. While that is ripening, rain washes it off and does much harm; and again when the grain is ripening rain rots it and diminishes the yield. But the injury is reduced to a minimum if a good west wind is blowing. And rain, after the crops are cut, is especially injurious, as the produce rots on the ground; and even if the grain is saved at the expense of the straw, the cattle suffer from want of fodder. The ideal season is one in which rain falls early, so as to allow the autumn crops to be sown over a large area; and falls heavily at the end of the rains, so as to leave the ground moist for the spring sowings. This last desideratum is expressed in the proverb "*saman Mangsir par parakhiye; aur dhini Phagan men; aur tiri jab parakhiye nirdhan ho bhartar:*" "the season is tested in Mangsir; cattle in Phagan (when they are pregnant); a wife, when her husband is poor."

Seed time and har-
vest.

The approximate sowing and harvest times are given on the opposite page. These are the ordinary times. In an exceptional season the sowing may be further delayed a fortnight or even more, but to the injury of the produce:—

STAPLE.	Seed time.		Harvest.	
	From	To	From	To
Coarse rice ...	20th May ...	5th July ...	5th Sept. ...	5th October.
<i>Bijra</i> ...	1st June ...	15th „ ...	20th „ ...	20th „
<i>Jawār</i> ...	10th June ...	5th August.	20th Octr. ...	20th Novr.
Maize ...	Do. ...	20th July ...	5th Sept. ...	20th October.
<i>Mūng</i> ...	Do. ...	Do. ...	20th Octr. ...	20th Novr.
<i>Moth</i> ...	Do. ...	15th August.	Do. ...	Do.
Gram ...	1st Sept. ...	10th Octr. ...	10th April ...	13th April.
<i>Masūr</i> ...	5th Sept. ...	Do. ...	Do. ...	Do.
Mixed wheat, gram, barley ...	20th Sept. ...	30th Nov. ...	25th March...	Do.

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vest.

For the *khari* crops rain is most needed in June and the first week of July, and it cannot be too plentiful. They are also greatly dependent upon the rains in the end of July and first-half of August. If it is either too plentiful or too scanty, it injures the crops. Too much rain at the end of September also injures the crops, as it washes off the pollen from the flowers. For the *rabi* crops rain is most needed in August and the beginning of September; and it can hardly be too plentiful; good rain in December and January is also most beneficial. Rain after the first week of March is injurious, as it affects the flower, as above. In both crops rain at harvest time does infinite damage, as the grain when cut lies in the fields for weeks, and both it and the straw are liable to damage from wet.

The three main kinds of soil, *dakar*, *raush*, and *bhur* have been described in Chapter I (page 2). Of these, *bhur* is by far the least valuable; in fact, in all the early reports it is described as unculturable. The yield is always poor; and if there is much rain, the soil becomes so soft that the crops fall down. At the same time it is cool, and retains its moisture for a long time; and when the covering of sand is thin and overlies better soil, which is only very occasionally the case, very good crops are produced.

Soils.

Dakar is terribly stiff and hard to work, and will yield nothing without water. But when there is plenty of that, it gives splendid rice and gram crops, one after the other, in the same year. As a soil, *dakar* is inferior to the fertile and more tractable *raush*. But where there is no irrigation, its position in all the hollows and drainage lines gives it great advantages, as whatever rain water there is collects on the *dakar*, and it will give crops in seasons when those in other soils fail for want of water. In the canal tract, on the other hand, where water is plentiful and swamps only too frequent, this very position is a drawback instead of an advantage.

Agricultural Appliances.

Table No. XIV gives details of irrigation. Further information will be found at pages 177 to 203 of Major Wace's Famine Report, compiled in 1878. At that time 20 per cent. of the cultivation was irrigated from canals, 19 per cent. from wells, 1 per cent. was flooded, and the remaining 60 per cent. was wholly dependent upon rain.

Means of irrigation.

Chapter IV, A. The following figures show the number of wells then existing in the district, with certain statistics regarding them:—

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Means of irrigation.

Number of wells.	DEPTH TO WATER IN FEET.		COST IN RUPEES.		BULLOCKS PER WHEEL OR BUCKET.		Cost of Gear.	ACRES IRRIGATED PER WHEEL OR BUCKET.	
	From.	To.	Masonry.	Without Masonry	Number of pairs.	Cost in Rupees.		Spring.	Autumn.
1,930	...	20	150	5	2	100	25	8	6
3,752	20	30	225	10	2	125	25	8	6
125	30	40	300	...	4	300	30	7	3
1,464	40	60	550	...	4	400	35	7	3
992	Above	80	{ 800 to } { 1,200 }	...	4	500	40	6	2

The irrigation is by Persian wheel in the Khádar and in the Powádh tract to the north of the Ghagar; and elsewhere by rope and bucket. Water is found within 30 feet of the surface in the Powádh circle in Kaithal, in the riverain of the Jamná, and on the edges of the canal tract; at from 30 to 40 feet in the lower Nardak and on the Jamná water-shed; between 40 and 60 feet in the middle Nardak and in the Chika circle of Kaithal, and over 60 feet in all the central and higher Nardak. In the Kaithal Nardak and Bángar the water level is generally below 100 feet. Of the wells shown above 671 are unbricked.

Well-sinking.

As a well must be begun on a Sunday, on Saturday evening five small vessels full of water called *bholra* are put out in various spots near where the well is to be, and a lighted lamp is put by each. Next morning that spot is selected for the well where the vessel has lost least water by evaporation. A circle is formed to limit the excavation, and digging is begun so as to leave the central clod with its tuft of grass undisturbed. When the clod is a fair height they cut it off at the bottom and bring it out whole, they call it *Khawája ji*, salute it, and feed Bráhmans to it. If it breaks the omen is bad, and the site is abandoned; but if the water omen gives any very marked result in favour of the spot, they "take great care of *Khawája ji*." The pit is dug out till water begins to soak in; a well curb (*nimchak*) is then made of 12 felloes (*gadwál*) bound together with iron. *Dhák* is the best wood; after that *gúlar*. The carpenter takes Re. 1 for every hand (18 inches) in the breadth of the well, the iron costs Rs. 10, and the wood Rs. 6. All the friends from the whole *thappa* are collected, the *nimchak* is lowered with great ceremony and many invocations of Narain and *Khawája ji*, and *gúr* is divided. The cylinder of the well (*kothí*) is then built up on the curb to a height of 10 or 12 feet above the ground level. A platform is made on the top, and it is weighted with earth, a winch is set up and a sort of pile-driver. A dredge (*ihámb*) is then worked at the bottom of the well within the cylinder, the pile driving it in and the winch lifting it up. The operation is superintended by skilled divers (*charian*, *dabolia*, or *dubia*), usually Jhínwars, who fill the mud and slush into baskets in which it is raised to the top. As the earth is dug out the cylinder sinks, and is, if necessary, built up now and then.

The water-bearing strata in the Bāngar are popularly fixed at 24, 32 and 52 hands of 18 inches each from the surface. The two upper are covered, and the lowest is supported by a pan (*garh*) of clay, and below the two upper ones and above the lowest one lies blue sand in which water is found. A permanent supply of spring water is called *būm*; mere soakage water is called *sār*. The *būwani* or lowest stratum holds the real spring water; and a well that reaches it is called *sultāni*. The two upper supplies fail in droughts; and the highest, even if the canal stops for a time. In the Khādar, there is no spring water; and close to the canal the soakage (*choa*) is so great that wells cannot be sunk to any depth; while for the same reason the *būwani* cannot be reached at all in the canal tract.

When the pan which the well is meant to tap is reached, the pile is driven through the pan so as to pierce it, and the water rushes up. If the well is once carried so far as to pass through the clay into the sand, it must be carried on to the next pan, otherwise it will eventually fill up with the sand, or even break with its own unsupported weight. When the supply seems satisfactory, two leather buckets are rigged up, and every effort made to exhaust the supply so as to test its permanency. If they fail, the well is practically finished. The earth is filled in all round, the upper part of the cylinder (*man*) is built up so as to give command of the surrounding fields, and a gear put on. A niche (*āli*) is left in which to burn lamps to Khawājā Khizr on *Holi*, *Dīwālī*, and Sunday; and Brāhmans are again fed. The ceremony of marrying a well is usually performed by rich Brāhmans and Baniās, hardly ever by agriculturists. In the Khādar the well is stopped when a fair supply of water has been obtained and a stratum reached stiff enough to support the cylinder.

A brick well for a single bucket or wheel is about 7 to 8 feet in diameter; if for two, about 11 to 12 feet. In the Khādar the single well will cost Rs. 250 to Rs. 325; in the Bāngar Rs. 350 to Rs. 500; in the Nardak any price up to Rs. 1,300, according to depth. The cost of a well built by Government at Rajaund was Rs. 2,300; but it was nearly 200 feet deep. Ordinarily, of course, a good deal of the amount of cost is on account of labour which will not be actually paid for; either that of the makers themselves, or of their friends in the village. Of late years a new kind of brick has been introduced called *gadwāla*. It is very long, and broad, and thin, and forms a small segment of an annular disk. It has a tooth at one end and a notch at the other. Wells are made of a single thickness of these built up dry without mortar. They are cheap, a well built of them costing not more than a third as much as a good brick and mortar well. But it will not last long, while the other will last at any rate 60 or 70 years, probably more.

In the Khādar unbricked wells (*kūi* or *kachcha ka*) are made by digging out the sand and lining the lower part, which is of greater diameter than the upper, with a lining (*jhāl*) of woven withies of *jhao* or *simbhālū* or *tūt*. They are made in a few days, and at a cost of Rs. 5 to 10, spent in buying the lining, and feeding the friends who come to help in the digging after water is reached, which must be hurried on.

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Well-sinking.

Unbricked wells.

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sian wheel.

They fall in during the next rainy season. Unbricked wells used to be made in the stiff Bángar soil, and lasted many years; but the soakage from the canal now renders it impossible to dig them.

Throughout the Khádar, where the water is never more than 25 to 30 feet from the surface, the Persian wheel alone is used for irrigation. Throughout the Bángar and Nardak, even if the water is near, the leather bucket is used on wells. But wheels are used to lift canal water where necessary, and are then called *jhalárs*. The Persian wheel or *harat* consists of a horizontal cogged wheel driven by bullocks yoked to a beam (*gádal*) fixed to its vertical axis (*balaur*). This wheel gears into and drives a vertical toothed wheel (*chakli*), half of which is under ground, and the horizontal axle of which (*belan* or *lát*) projects over the well. On this axle and over the well is fixed a vertical lantern wheel (*bár* or *od*) on which hangs the *mál*, a sort of rope ladder made of two side ropes and cross sticks. To the cross sticks are tied the earthen vessels (*tindar*) which raise the water. As they come up they discharge the water through the lantern wheel into a water-trough (*nisár*) inside the wheel, which returning on itself twice at right angles, passes out of the wheel on the outside, or that further from the centre of the well where there are no spokes, and delivers the water into the cistern (*párcha*) whence it flows off by small channels (*khánd*) to the fields. But as they are tied rigidly on to the *mál*, they spill some of their water before they are over the water-trough; and the waste of labour thus occasioned is very great. The driving gear costs some Rs. 15, and lasts 6 or 8 years. The lantern wheel and subsidiaries cost about Rs. 10 more, and only last about a year. The *mál* is made at home, always of *dáb*, which resists the action of water better than any other fibre. The whole gear is said to include 360 separate pieces of wood, which enjoy some 70 or 80 separate names among them.

The rope and buc-
ket.

The leather bucket (*charas*) consists of a buffalo hide bag swung from an iron ring and handle (*mandal*). It is drawn up by a strong rope (*láo*) made of *san* fibre, and passing over a small strong wheel *bhon* or *chák* fixed over the well. The oxen who draw it run down an inclined plane (*gaun*) dug out by the side of the well, the driver sitting on the rope to bring the strain more horizontal, and return by a less steep incline parallel to it. When the bucket reaches the top, the man who stands at the mouth of the well seizes the rope and pulls the bucket on to a masonry apron (*panhár*) on which he stands. He then bids the driver unloose the rope. This releases the bag, which collapses, and the water shoots into the cistern (*párcha*). The empty bucket is then flung into the well, the rope being held under the foot to prevent it falling too quickly. When the oxen reach the top, the rope is fastened on again, and the operation recommences. The directions to the driver, intermixed with prayers for protection, are delivered in a song, the cadences of which the bullocks soon learn to recognise, and stop, turn, and start of their own accord at the proper moment. In this song, and there only, the driver is called *Rám*, and the bucket *bará*. The work at the well mouth is very dangerous, as any mistake will precipitate the man into the well. The bucket costs Rs. 6 to 8 and lasts a year; the iron ring and wheel Rs. 3 each. The *láo* is made at home. The bucket will lift 320 to 400 pounds of water each time, and there is no waste.

Table No. XXII shows the number of cattle, carts and ploughs in each *tahsil* of the district as returned in 1878-79.

Agricultural work is entirely done by oxen. Male buffaloes are occasionally yoked in carts, but very rarely indeed in anything else. In the light soil of the Khádar, with water near the surface, small cattle costing Rs. 20 to Rs. 25 each will do all that is needed. But for the stiffer soil of the Bángar plough cattle now cost Rs. 35 to Rs. 40 each; while oxen that can do a full day's work on the deep wells of the Nardak cannot be got under Rs. 50 or Rs. 60 each. An ox begins work when rising 4, and works for 10 years. For a bucket well, eight oxen is the full complement; for a Persian wheel, four. A plough is now always reckoned at two bullocks. It used to be reckoned at four; but the change is due only to the greater sub-division of land owing to increased population, as many of the agricultural accounts are kept by ploughs.

Fodder in general is called *nyár*. The fodder of the autumn crops consists of the stalks of the great millets and of maize, which are carefully stacked on end in a stack called *chhor*; of rice straw which is merely piled up in a heap (*kunjra*); and of the *bhús*, or broken straw left after thrashing of the pulses. The spring crops give *bhús* only, also called *túri*, if of wheat or barley. *Bhús* is stored in a *kup* made of a wisp of straw (*thandu*) wound spirally round and round upon a foundation of cotton stems so as to form a high circular receptacle in which the *bhús* is packed and preserved and thatched when full. A long low stack fenced in by cotton stems alone is called a *chhán* or *bhusári*. Near the city the people store their *bhús* in mud receptacles (*khuta*) and plaster it all round the top. The *bhús* is taken out from a hole at the bottom as wanted. Stems of millet and maize are chopped up into small pieces (*sáni* or *kúti*) before being given to the cattle. An ox during ordinary work will eat 20 seers of grass and a seer of grain daily; if working at the sugar-mill or well bucket, nearly twice that. The cost of stall feeding may be taken at about 2 *anas* a day. Of course the fodder varies according to the season. The mass of it consists of grass and straw of cereals; a little pulse straw is always added; and green food when obtainable. In the cold weather *methi* and rape and carrots, and at all times the weedings, are given to the cattle. Besides this some cotton seed or oil-cake, or either *gawnr*, *moth* or gram is daily given. The best fodder of all is the straw of the small pulses, and is called *míssa*; after that, that of wheat and barley, called *túri*; after that the *jawár* stems or *chari*. *Bajrá* stems are seldom given alone. They are chopped up and mixed with one-third of *múng* fodder, or failing that, with some oil-cake (*khal*) or pea-meal of gram.

The following description of the use of manure as practised in the district, was furnished for the Famine Report of 1879 (page 247). Rotation of crops is discussed at the end of this section:—

“Of irrigated land some 31 per cent. is manured, while 15 per cent. is double cropped. Of unirrigated land 13 per cent. is double cropped, but manure is little used. No land but the very small area immediately round the cities is constantly manured, if by that is meant every year. On the other hand, no land is ‘occasionally manured,’ if by that is meant at considerable intervals. In manured land sugarcane, cotton, tobacco,

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Manure.

maize or fine rice is ordinarily sown, to be followed by wheat, *methi*, *jawár*, gram, &c., without additional manure. The amount of manure given varies from 350 to 200 maunds per acre, usually every second year (see also table on page 72 below). Besides this, top-dressing is used near the cities to the extent of some 30 maunds."

The dung-heap (*kurri*) is started when the rains are over. A great hole is dug in the ground, and straw, cattle-bedding, sweepings of horse and cattle-sheds, and all sorts of refuse, are thrown into it. During the rains the cow-dung is too wet to be patted up into fuel-cakes, and is all thrown on to the heap. The rain is allowed to fall freely upon it, and it is periodically turned over and worked up by the sweepers. As soon as the rains are over, it is fit for use. It is taken to the field in carts, sprinkled by the sweepers, and ploughed in. Manure proper (*khár* or *khát kára*) is not very often used as a top-dressing. But the market gardeners largely use the nitrous efflorescence (*rehi*) found about the village homesteads as a top-dressing for young wheat. The similarity of the name has led to statements that the injurious saline efflorescence or *reh* which covers so much of the country is used for manure. This is not the case in Karnál. *Reh* consists chiefly of sulphates, and is injurious; *rehi* of nitrates, which, of course, are the best of manures. Weeds, grass, and plant stems, and roots which cannot be used as fodder, are generally burnt on the fields, and the ashes ploughed in. The great object of the cultivator is to get enough manure for his sugar-cane. After that, what is over is divided between fine rice, cotton, maize, and the best wheat land; but these crops, excepting rice, are often sown after sugar-cane, when no fresh manure is given. In the Nardak manure is little used, as the people say that in the stiff unirrigated soil, with often scanty rain-fall and very careless cultivation, it only burns up the plants.

Use of dung as fuel.

The people are often abused as ignorant and careless because they use so much of their cow-dung as fuel. But they are quite as keenly alive to the value of manure as we are, though they have not yet arrived at feeding for manure. Of course wood fuel (*indhan*) is simply not obtainable in the Khádar and Bángar in anything like sufficient quantities. But even where the supply is unlimited, as in the Nardak, it does not answer the purposes of the people. In the first place, the vessels of unglazed pottery in which all, who are not rich enough to afford a complete stock of brass vessels, cook their food, will not stand well any fire fiercer than the smouldering one given by dung; and in the second place, the wood fire would need constant attendance. What the house-wife wants is a fire over which she can put her pot of *dál* or vegetables, and go off to the fields, or to the well, or to spin in the alley, feeling sure that the fire will smoulder on and gently simmer the food. And dung gives her exactly what she wants.

The sugar press.

The sugar press or *kolhú* consists of a stump of a *kákar* tree hollowed out and bound with iron, and firmly fixed in the ground. The hollow is lined with pieces of hard wood (*rorá*), which are renewed when worn out, and are so shaped as to form a large upper cavity for the reception of the pieces of cane, and below that a small socket in which the ball of the crusher works. The crusher (*lát*) is a long beam of *kákar* with a knot at the lower end which works in this socket; and above that a conical-shaped enlargement (*chúran*) which crushes

the cane against the sides of the *kolhā* as it moves round in the cavity. The beam to which the oxen are fastened (*pāt*) has a curved bearing (*gali*) at one end which travels round a groove outside and at the bottom of the *kolhā*; it is heavily weighted at the other end. To it is fastened a connecting rod (*mānak*, *thamba*) which projects upwards and is tied at the top to a flat piece of wood (*mākri*) with a socket in its highest end. Into this socket the top of the crusher fits. Thus the weighted beam and the crusher form a system which is supported by the bearing of the *gali* against the outside, and by that of the conical crusher against the inside of the press; and as the system revolves round the press, the cane is crushed by this latter bearing, and the juice runs down past the ball and socket joint and passes out by a small hole at the bottom of the press. The oil press has the same name and is identical in construction with the sugar press. Within the last few years the Beheea mill with iron rollers, has been introduced, and is rapidly growing in favour. General Parrot, the local agent, writes in 1883, "the first year only 4 were sold, the second year 93, the third 395, and next season I hope to dispose of at least 500. I sometimes have as many as 70 carpenters and 16 smiths at work on them." The price per mill is Rs. 100. As the Karnāl people do not make rope of the cane refuse, no objection is felt, as in the Panjāb, on the score of its being destroyed by excessive pressure. The mills save a large percentage of the labour; and can be repaired in the villages with the exception of the rollers, which with proper care are practically indestructible.

The ordinary village cart is made on the ordinary Indian pattern. It is exceedingly small, costing Rs. 20 to Rs. 35, and is used for agricultural purposes only. When used to carry manure, a *kiri* or basket-work lining of cotton stems is put inside the frame-work to keep the contents from falling out. It is always drawn by two bullocks, and will carry 10 to 15 maunds.

The plough consists of a wooden body (*hal*) with the bottom cut off horizontally, and the nose cut off nearly vertically. The top of the body has a long peg in it which forms the handle and is held in one hand, while the other is employed to twist the bullocks' tails. It is drawn by a beam (*hātis*) passed through a mortice in the middle of the body, which is fastened to a yoke (*jūa*) consisting of a straight piece of wood which rests against the humps of the oxen, 4 small pegs keeping it from shifting laterally. The coulter (*phāli*) passes through a mortice through the bottom and nose of the plough. The share is of two different shapes. The *panyāri* is a broad cutting blade of wood passed through the same mortice with the coulter, and is used for stiff soil. The *pātha* is a thick, round, conical-shaped continuation of the nose let into a notch in the latter, and secured by the coulter which passes through it. It is used for the light Khādar soil. Both ploughs are ordinarily called *nāg* ploughs, though the *panyāri* plough is occasionally called *mūnd*. But the *mūnd* or *lothan* is really a very large heavy plough drawn by large bullocks, and used only on the Rohtak border. In the Khādar the share is shod with iron, otherwise the sand wears it out. The plough should be all of *kikar* wood; and costs from Re. 1-12 to Rs. 2.

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The sugar press.

The cart.

The plough.

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Minor agricultural
implements.

The other implements used by the cultivators are *sohdgga*, a flat board of *kikar* or *jánd*, to which several bullocks are yoked. The drivers stand on the board, and it is dragged over the field, crushing the clods. It costs Re. 1 to Re. 1-4. *Girri* or *úd*, a heavy wooden roller of *kikar* or *shisham* used for the same purpose, and costing, Rs. 10 to Rs. 20 according to size. *Jandra*, a flat board with or without small teeth, worked by two men, one holding the handle, and the other pulling it towards him with a string. It is used as a rake for making the beds for irrigation (*kyári*). *Sera*, a pitchfork with 6 teeth of *kikar* or *kendú*, the handle being of *ber* or bamboo. If with two teeth called *dosinghá*, if with four, *chausingha*. *Dinga*, a piece of wood bent at an angle with the short end sharpened, used for raking up and spreading out straw, &c. A rake with long iron teeth called *dínga* or *pháorá* is used, but not commonly. *Kassi*, a spade costing Re. 1-8. *Phàora*, a flat broad shovel, costing Re. 1-4. Both the above are set at right-angles to the handle, and used chopping fashion. *Kasoli*, a tiny one-handed *kassi* used as a hoe; costs 4 annas. *Khurpa*, a flat blade used to grub up weeds and grass; costs 3 annas. *Dantí* or *Darantí*, a toothed sickle, costing 2 annas. *Kohári*, an axe costing 8 annas to 12 annas. *Gandássa*, a chopper consisting of a sharp heavy blade set in a back which forms a continuation of the handle, and used for cutting up stalks of *javár*, &c., for fodder, costs 8 annas. *Dánt* a fine curved blade set in a flat board which is held under the foot while vegetables, &c., are sliced or split up against the blade; costs 2 annas. *Ukhal*, *ukhli*, a large mortar of *shisham* or the hill *khair* or *jind* used for husking rice; costs 4 annas. *Musal*, the pestle used with the above, consisting of a heavy bar of *kikar* or *jind* some 5 feet long, worked with both hands. The lower end is shod with an iron ferrule, the edge of which projects beyond the wood and is rounded off. Thus it nips the rice grains between the round iron edge and the side of the mortar, and squeezes the seed out of the husk, not crushing it as it would do were the end flush; it costs Re. 1. *Chháj*, a winnowing shovel shaped like a dust pan, and made by *Jhinwars* of the top joint of the culm of the *sarkara*; it costs 2 annas. The cultivator will also have four or five broad flat baskets (*tokra*, *tokri*) made by *jhinwars* from withies (*mála*) of *dhák*, *simbháli*, *tánt*, *jháo*, or *kajúr*, for carrying grain, fodder, or manure; several rope nets (*jháli*) for carrying fodder; some muzzles (*chínka*) of netted string for his cattle when thrashing or going to pasture; some *sántás* or leather whips; some *nárka* or leather thongs to tie the yoke to the plough; a *nár* or a similar but larger thong for the cart; and a good supply of ropes and string called *rás* or *dámras*, *jeora*, *rassi*, and *jeori* or *bán* as they decrease in thickness. The implements, for which no price is given, are either made at home, or furnished by the village menials as part of their *begár*.

Agricultural operations.

Breaking up and
ploughing.

In breaking up new land the first thing is to cut down the bushes and grub up the stumps (*jhúnditor*). A thorny bush weighted with clods, and called *godal*, is then drawn over the land to collect the grass and weeds, (*kabár*). Ploughing (*báhna*) is then begun. Two oxen are yoked in each plough, and several ploughs often work side by side. A furrow is called *khúd*, a land *halai*. The

bullocks always turn from right to left. The first ploughing is called *pár*, the succeeding ones *dosri*, *tisri*, *chausri*, *pesri*, *chesari*, and so on; each ploughing being at right angles to the last. For the more valuable, and especially for the spring crops, the land is often ploughed 12, 14, or even 16 times. The plough only turns up the soil some 3 inches deep, and the furrows are about the same width. As the share is flat, the soil is only scratched up, and not turned over.

A yoke of oxen will plough for 6 hours, then rest 3 hours, and plough 6 hours again. But if possible there should be two yokes, each working half the day. The labour of the ploughman (*háti*) is very severe, and he cannot continue it many days running. A man to feed the bullocks (*nyár wála* or *báldi*) is needed for every two ploughs; and in fact the recognised establishment is four men per plough; two in front, the ploughman and the hedger and ditcher, and two behind to bring food and weed, &c. These two latter may be women. In five days 3 to 5 acres can be ploughed according to the quality of the bullocks. The year's ploughing must not be begun on a Monday or on a Saturday, or on the 1st or 11th of the month; and on the 15th of the month the cattle must rest entirely. Every day when the plough is brought out the ploughman makes obeisance to it. When the season's ploughing is first begun a prayer is offered up generally to *Dharti Māta* or Mother Earth; the common form of the agriculturist's prayer being "*Sáh Bádsháh se surkhráh rakhīye, aur is men achkha náj de; to Bádsháh ko bhī paisa de, aur sáh ká bhī utar jáwe;*" or "keep our rulers and bankers contented and grant a plentiful yield; so shall we pay our revenue and satisfy our money-lender." The plough is carried to and from the fields by being hung over the yoke between the bullocks (*sot lena*).

The *sohága* and *girri* are used for this purpose; the latter if the land is dry, the former if wet. Both are seldom used at the same time. They are used between the ploughings, and also after the last ploughing. The land has to be gone over three or four times, each time at right angles to the last direction; more if stiff, less often if very sandy. Each takes four oxen and two men to work it, besides the man for grass; and will do 5 to 8 or even 10 acres once over in five days.

Sowing is called *bijna*, seed time *boáwa*. The seed is sown either broadcast (*phánt*, *khidána*), or in the furrows by a man following the plough (*burri mūthi*); or by a drill (*orna*) made of a bamboo tube with a leather cup at the top, tied on to the plough. This last method is adopted if the soil has dried up much, so as to ensure the seed reaching the *ál* or moist subsoil. After sowing, the *sohága* is passed twice cross-ways over the field except when sown with a drill, in which case the *sohága* is not used. When sown with a plough, the area sown is limited by the capacity of the plough. A man can sow 20 acres broadcast in five days. The limitation as to time and season, and the prayers when beginning the sowing are the same as for ploughing. A certain amount of care is taken to get good seed-grain. With maize and great millets they select the best heads for seeds; and they will often go some distance to buy good seed. But there is no attempt at real systematic selection; and worst of all, no attempt at introducing new blood from other places.

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Well irrigation.

Wells are seldom the property of a single person. The sharers irrigate in turn for a day or half a day each, according to a rota (*bári, osra*) fixed by lot, each having a number of turns in proportion to his share, but not necessarily consecutive. If heavy rain interrupts irrigation, the rota starts afresh after it; if the rain is light, it goes on from where it was broken off. There are often two wheels or buckets on the same well, in which case the land appertaining to each is called its *adda* or *sek*. The people irrigate (*sínina*) from wells either by bucket or by wheel. For irrigating with the leather bucket five men are needed; two men to catch the bucket (*bairia*) working half a day each, as the labour is very severe; two drivers *khambi* or *kilia* from *kili* the peg, which fastens the *láo* to the yoke; and one *panyára* to look after the channels and let the water successively into the irrigation beds. There should also be four yoke of oxen, two working at once, one coming up while the other goes down the incline, and changing at noon. The well is worked from dawn till sunset, with 3 hours rest in the hot weather. Four yoke of oxen will water 3 to 4 acres in five days according to the depth of the well; two yoke will water $2\frac{1}{2}$ to 3 acres in the same time.

The labour at the Persian wheel is much easier, as expressed by the saying "*Harat ek ánk se chalta,*" "one eye is enough for a *harat*;" for the driver (*gaderia*) who sits on the beam to which the yoke is tied may be blind, and the *panyára* only needs one eye. But of course a man for grass is needed. It is better to have four yoke of oxen to change every 3 hours, as the rotary motion soon tires the bullocks, but there are very generally only two; of course in the former case the bullocks would do other work also, and in any case very weak cattle are sufficient to work the wheel. The well is worked as long as it is light; but seldom at night, except when the spring crops are ripening under a hot wind. A well will water 3 acres of fair soil in five days; but sandy soil absorbs so much water that only 2 to $1\frac{1}{2}$ acres, or even less in very sandy soil (*thali*) will be watered in that time. The soil on the unbricked wells is generally of this description.

When there has not been sufficient rain, it is necessary to irrigate the land for ploughing, or sowing, or both. All such irrigation given before the crop is above ground is called *paleo*. The first watering to the young crop is called *kor*, the second *dosra*, the third *tisra*, and so on. When the ground has dried slightly after the *paleo*, or rain, so as to be neither too wet nor too dry for ploughing or sowing, its state is called *batáo*. The water is conducted from the well in small channels called *khái* or *khánd* to the fields. The field, except for *paleo*, has been divided off into beds or *kyáris* by the use of the *jandra*, and the water is let into each successively. This economises water in two ways: *first* by confining the area to be covered at once with water, and so reducing the average depth of water when the ground is on a slope; and *secondly*, by giving the water less irrigated ground to travel over in order to reach the furthest point of the bed, and so reducing absorption in excess of what is needed.

The water passes from the canal by a head (*mohand*) into the main distributaries (*rájábáha*). From them it is distributed by small channels (*khánd, khál*) to the fields. Each main channel supplies many villages; and each village has its turn of so many days. The

period while the water is shut off is called *tātil*; and if hot wind blows during this time, or if, when the turn comes round, the water fails, great loss is the result. Irrigation from the canal is practised in two ways. If the water is delivered above the level of the fields, the irrigation is called *tor*, or flow; if below them, *dāl* or lift. In flow irrigation all that is needed is to cut a hole (*nāka*) in the channel and let the water on to the field. Hitherto it has not been the practice to divide the fields into beds, and the result has been that the land has been flooded with an inordinate quantity of water. But under the rules now in force double rates will be charged for fields without beds, except for rice-fields, in which a considerable depth of water is absolutely necessary. The area that can be irrigated in this manner in five days is only limited by the supply of water; one good opening will water 30 to 50 acres. Irrigation by lift is practised thus. The water is brought up by a low-level channel, which is met by a high-level channel into which the water has to be lifted. The end of the lower channel is enlarged and a small pool (*chái*) dug out; on either side of this standing places (*penta*) are dug in the banks. The end of the higher channel is also enlarged into a basin (*nyaini*) which is cushioned with grass to prevent the falling water from scouring. Two men called *dālia* then stand, one in each *penta*, and swing between them the *dāl* or scoop. This is in the shape of a small canoe, and is made of thin planks of *dhāk* wood sewn together with leather, costs 8 annas, and lasts a year. It is swung by four strings, two at each end on either side of the point. The *dālias* take a string in each hand and swing the scoop, dip it into the water, swing it out full of water up and over the *nyaini*, and tip the water out by tightening the upper strings. The operation is performed with wonderful skill; but the labour is very severe, and a man can only work for an hour consecutively at it, and cannot work two days running. The outside height of the *mathik* or bank over which the water has to be lifted is $4\frac{1}{2}$ feet; if the total lift is greater two lifts are used, one above the other. It takes four *dālias* and one *panyāra* to work a *dāl*, and they will water 3 to 5 acres in five days, according to the height of the lift. Irrigation by *dāl* is sometimes practised from the village tanks and swamps, but, as a rule, only for small plots of valuable crops.

Weeding is called *naulāi*. It is chiefly confined to the more valuable crops. It is performed by men, women and children, the petticoats or wraps being gathered into a bag (*jholi*) in which the weeds are collected. The weeds are valuable as green food for cattle. As they must be got under while the crop is young, hired labour often has to be resorted to. One person will weed a sixth of an acre in five days; and in the rains, where the soil is heavy and the weeds long, not nearly so much. Fields should be weeded once, twice, thrice or five times. It is unlucky to weed them four times.

Of course any division between individual fields, save the *ād* or boundary ridge, is unknown. But the masses of cultivation are always surrounded by dead hedges of thorny bushes (*dhinkar*), very often very formidable obstacles indeed, to keep out the cattle and wild animals. They are also often surrounded by a bank (*kara* or *kot*), and ditch (*khāi*); and in the Khādar, where bushes are scarce,

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this is their chief protection, the bank sometimes having a euphorbia hedge planted on it. Access is given by a stile or *deva*, a Y-shaped piece of wood firmly fixed in a gap. Young sugar-cane is generally surrounded by a low wall round the individual field till it has grown old enough to take care of itself. But nothing avails to keep out the deer and pigs which do terrible damage to the crops, or the monkeys which are worst of all. The crops are also watched night and day by men called *rukhwāla*, literally "the man in the tree." In the fields of the great millets these men sit on platforms (*junḍa*, *dawnja*) raised well above the crops, from one to another of which stretch strings (*patān*) which the watchers ever and anon jerk so as to swing the great plants about and frighten the birds. They are also provided with slings (*gopiā*) with which they sling mud pellets (*gola*); while the crack of the sling greatly enhances the effect. The lower crops are watched from the ground, the men wandering about armed with long thongs (*tatiāla*) which they crack like a stock-whip. Scare-crows (*darāwa*) of sorts are set up in every field. And the village which is fortunate enough to obtain a license to carry a gun in the name of one of its menials, sleeps happy and dreams of fat crops.

Reaping.

Reaping is called *lāwṇi*, hired reapers *lāwa*, and their wages *lai*. The great millets are cut and collected into bundles (*pāli*) which are stood up on end in a stack (*sawa*) to dry. The smaller grains are collected and tied up into sheaves (*bhrā*) if carried to the thrashing floor on the head, and into small bundles (*pāli*) if carried in a cart. They are then taken to the thrashing floor and piled up in a *kūndra* or stack. The straw with the ear and grain is called *lān*. One man can reap about an acre in five days. Reaping for the season must be begun on a Monday and must be finished on Wednesday, the last bit of crop being left standing till then. Hence the saying *Mangal lāwa, Budh badhāwa*. "Tuesday for the reaper and Wednesday for the finishing." A prayer is offered up on first starting reaping. And a little is always left under the name of *marīla* for the poor as gleanings (*sillā*).

Thrashing.

To thrash is called *gahnā*. The pair or thrashing floor is swept and plastered by the *Chamārs*, and a pole (*mēd*) set up in the middle. The straw with the ears is then spread out round the pole, and four to ten or twelve bullocks, according to the quantity of grain, are tied up in a row and one end fastened to the pole. Their collective name is *daim*. The bullocks then go round and round the pole treading out the grain, the straw being turned over three or four times so as to expose all parts to their feet. The straw is then taken away, and the ears and grain remaining which is called *tār* or *dhar*, is roughly winnowed, and again thrashed in precisely the same manner. The resulting grain is again winnowed, and the broken ears, called *būndar*, thrashed a third time. With the great millets they cut the heads (*tusri*) off and thrash them only. With maize, the cobs (*kūkri bhūta*) are stripped of their sheaths, dried in the sun, and beaten out (*chhetna*). So, too, small quantities of grains are thrashed out with sticks instead of by cattle. The flail consists of a crooked stick and is called *gesla* or *kutka*. Five oxen will thrash 50 maunds of fine rice, 25 maunds of coarse rice, gram, or *jawār*, 12 maunds of *bājra*, or 8 maunds of wheat or barley in the day.

To winnow is called *udāna* or *barsāna*. The operation is wholly dependent upon the wind, the mixed grain and chaff being taken up in a *chhāj* and shaken slowly out from a height of several feet. The heavy grain falls perpendicularly, while the wind blows the chaff to one side. The chaff (*tās*) is useless except to burn. With a good wind four men will winnow 25 maunds in a day.

The clean grain is collected into a heap called *rās*, or *thāpa*, or *bohāl*. Preparatory to measuring the greatest care has to be observed in the preparation of this heap, or evil spirits will diminish the yield. One man sits facing the north and places two round balls of cow-dung on the ground. Between them he sticks in a plough coulter (*phāli*). This symbol is called *Shāod*, the goddess (*sic*) of fertility. A piece of the *ak* tree and some *dūbh* grass are added, and they salute it saying "*Shāod māta, suphal phaliye; Sāh Bādshāh surkhrāh kariye.*" "Oh I mother *Shāod*, give the increase, and make "our bankers and rulers contented." The man then carefully hides the *Shāod* from all observers, while he covers it up with grain which the others throw over his head from behind. When it is well covered, they pile the grain on it, but three times during the process the ceremony of *chāng* is performed. The man stands to the south of the heap and goes round it towards the west the first and third times, and the reverse way the second time. As he goes round he has the hand furthest from the heap full of grain, and in the other hand a *chhāj* with which he taps the heap. When the heap is finished, they sprinkle it with Ganges water, salute it, and put a cloth over it till it is time to measure the grain. A line is then drawn on the ground all round the heap, inside which none but the measurer must go. All these operations must be performed in profound silence.

Then follows the measuring. This must not be done on the day of the new or the full moon (*parwa*), and Saturday is a bad day for it. And it must be begun at dawn, or midday, or sunset (*sic*), or midnight, when the spirits are otherwise engaged. Four men go inside the enclosing line with an earthen measure (*māp*), and nobody must come near them till they have finished. They sit facing the north, and spread a cloth on the ground. One fills the *māp* from the heap with a *chhāj* (*minna*), another empties it on to the cloth (*mandhāna* or *risāna*), and the other two carry off the full cloth and empty it out (*dhona*), substituting an empty one for it. If the grain is to be divided into shares, for instance two to one, two measures are put together in one spot, and the third separately, and so on, the separate heaps being called *dheri*, a word really signifying a heap, but used commonly for a share. The man who has the *māp* puts down for each measure filled a small heap of corn (*bohālī*) by which the account is kept. Perfect silence must be preserved till the whole operation is over; and especially all counting aloud the number of measures must be avoided. But when once the grain is measured it is safe from the evil eye, and the people are at liberty to quarrel over it. The offerings to the Bráhmaṇ and Saiyad (*seori*), usually 25 seers for the former and 5 for the latter for Hindus, and 25 each for Musalmáns, are made over to their recipients, a Musalmán *faqír* taking the Saiyad's share. The dues of the *Chamárs* are paid; and the sharers divide the remainder. The weight is got by weighing one

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māp full, there being no recognised capacity for the measure, as in the Panjāb.

In the canal tract five ploughs with ten good bullocks and 20 men will cultivate 60 acres of land, which will be distributed somewhat as follows:—Cane, 5 or 6 acres; cotton, 5; rice and *jawār*, 30 between them, the low swampy land bearing rice; wheat, 20. The small pulses will be sown among the *jawār*; while gram or mixed grains will follow the rice, and *methi* will be sown among the cotton in the same year. On the canal a plough will cultivate a much larger area than in the Khādar, because the oxen are not wanted for irrigation; but the number of men must correspond with the area, and not with the number of ploughs.

In the Khādar a Persian wheel will, in highly cultivated villages, have some 16 acres attached, of which 12 will be irrigated yearly. There will be two ploughs on it, with 4 oxen, and 4 or 5 men where the women work, and 6 or 7 where they do not; and these same ploughs will perhaps cultivate some 4 acres of unirrigated land in addition. On five such wheels the 80 acres of land will be distributed somewhat as follows:—Cotton, 8 acres; sugarcane, 6; maize, 6; *jawār* 20; *gawār*, 4; *moth*, 4; wheat, 28; gram, 4. *methi* will be sown among the cotton, and the maize will be followed by barley or wheat in the same year. Among bad cultivators the area per plough will be greater; but it will probably include a good deal of unirrigated land, and the total yield per plough will be smaller.

In the Nardak, where the Rājput runs his plough over the ground, flings in the seed, and trusts to God for the produce, the area which can be cultivated by a plough is capable of extraordinary extension in a favourable season. Five ploughs with their 10 oxen and 12 men (for here weeding is not practised, and few men are required) will cultivate some 100 acres, almost all unirrigated, as follows:—Coarse rice, 30 acres; *jawār*, 25; cotton, 5; sesame, 7; maize, 5; gram and barley, 10; gram, 20; and a little rape. But if the early rains are heavy, coarse rice will be sown in every available acre of land fit for it, up to 50 to 70 acres; for the preparation of the ground involves little labour, and the seed time has wide limits. And a great part of that will be followed by gram in the spring. So, again, if the late rains are heavy and last long, the Rājput goes out rejoicing and ploughs the whole country up for gram. On the other hand, if the rains fail, hardly a sod will be turned or a seed sown in the high Nardak.

Cost of cultivation.

On this subject Mr. Ibbetson writes:—

“It is impossible to estimate the cost of cultivating any particular staple by itself; or at least, the estimate, when made, is meaningless. Take tobacco, for instance. The necessary labour of both men and oxen would, at market rates, amount to a good deal more than the crop is worth. But the men and oxen are both there; and their labour is for the most part given at a time when it could not be used profitably in any other way, the tobacco season being the slack-time of the year. The only estimate that is worth making is that of the whole cost of cultivating the land under one plough. Taking two oxen costing Rs. 35 each, eating one *anna* a day, and working 10 years; three men with their families at Rs. 3 a month each, (I take three so as to include the labour of the village menials); half the

interest on the Rs. 200, the cost of a well ; and allowing for wear and tear of implements, we have for yearly expenses—

	Rs.
Keep of bullocks ...	45
Deterioration ...	7
Keep of cultivators ...	108
Interest on cost of well at 20 per cent. ...	20
Wear and tear of gear ...	5
	<hr/>
	185

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or Rs. 185 for, say, 10 acres, or Rs. 18-8 per acre. But the actual expenses will be less ; the cattle will be home-bred ; the fodder, food, and clothes will be home produce ; and much of the cost of the well will have been extra labour not paid for, and which bears no interest.

“ In the canal tract there will be four men in place of three, and instead of interest on the cost of a well, there will be about Rs. 2 an acre all round for canal water rates. This will bring the cost of cultivating 12 acres to Rs. 225, or Rs. 18-12 an acre ; practically the same as in the Khádar. But such estimates are, I believe, very unprofitable, and give us little information about the real cost of production as it comes out of the cultivator's pocket. There are some further remarks on the subject at § 132 of my Printed Assessment Report on *tahsil* Pánípat.”

Agricultural Staples.

Table No. XX shows the areas under the principal agricultural staples. The remaining acres under crop in 1880-81 and 1881-82 were distributed in the manner shown below :—

Principal staples.

Crop.	1880-81.	1881-82.	Crop.	1880-81.	1881-82.
<i>Kangni</i> ...	409	493	Other drugs and spices	312	526
<i>China</i> ...	5,638	2,426	Linseed ...	8	7
<i>Mattar</i> ...	41	9,326	Mustard ...	2,960	7,930
<i>Másh</i> (Urd) ...	6,346	5,467	<i>Til</i> ...	2,262	2,280
<i>Múng</i> ...	4,526	6,082	<i>Tára Míra</i> ...	193	79
<i>Masúr</i> ...	2,531	4,900	Hemp ...	825	938
Coriander ...	29	43	<i>Kasumbh</i> ...	90	102
Chillies ...	880	1,279	Other crops ...	...	879

The table over-leaf shows various particulars concerning the cultivation of each of the chief staples. The figures refer to well cultivated crops ; but of course there is always a good deal of land in which the cultivation falls far short of the standard. Most labour is naturally bestowed on the irrigated and manured land, the other getting the leavings of the cultivator's time. The seed time and harvest for each of the principal food grains is given at page 157. The cultivation of vegetables, drugs, spices, pepper, and the like is wholly confined to the market gardens round the town, and to a corner of a field here and there which satisfies the private needs of the villagers. The cultivation of opium has been forbidden in the Dehli territory since 1825 ; indigo used to be grown largely by the Skinners, but its cultivation has been discontinued. It is not cultivated as a rule in the villages, though there are a few vats near the town, and it is occasionally grown for seed.

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Principal staples.

Native names.	English name or description.	Botanical names, and references.	No. of plough-ings.	Mounds of manure per acre.	No. of water-ings after sowing.	No. of weed-ings.	Seers of seed per acre.
<i>Ikh</i> ..	Sugarcane ..	<i>Saccharum officinarum</i> : A. C. 59; S. 260; B. P. 1052ff.	10 to 15, or more	600	4 to 5	..	..
<i>Bari</i> ..	Cotton ..	<i>Gossypium herbaceum</i> : A. C. 25; S. 22; B. P. 1781.	2	400	0 to 1	3	7½
<i>Makki</i> ..	Malzo ..	<i>Zea mays</i> : A. C. 34; S. 263; B. P. 799ff.	5 to 6	180	1 to 2	2 to 3	7½
<i>Dhan (siri)</i> ..	Fine rice ..	<i>Oryza sativa</i> : A. C. 31; S. 257 B. P. 808ff.	2	?	?	1 or more	?
<i>Dhan (santhi or manji)</i> ..	Coarse rice ..	<i>Oryza glutinosa</i> (as above).	2 to 3	0	0	1	22½
<i>Jauwar for grain</i> }	Great millet, {	<i>Holcus sorghum</i> : A. C. 20; S. 262; B. P. 830.	2 to 3	0	0	1 to 2	7½
<i>Jauwar for fodder</i> }		<i>Holcus spicatus</i> : A. C. 23; S. 259; B. P. 837.					
<i>Bajra</i> ..	Spiked millet		2	0	0	1	1½ to 2
<i>Mandwa</i> ..	A small cereal	<i>Eleusine coracana</i> : A. C. 26; S. 254; B. P. 839.	2	?	1	1	?
<i>Moth</i> ..	A small pulse	<i>Phaseolus aconitifolius</i> : A. C. 35; S. 73; B. P. 817.	2	0	0	0	5
<i>Urad</i> ..	" "	<i>Phaseolus radiatus</i> : A. C. 38; S. 73; B. P. 846.	2	0	0	0	5
<i>Mung</i> ..	" "	<i>Phaseolus mungo</i> : A. C. 38; S. 73; B. P. #4.	2	0	0	0	5
<i>Gawaur</i> ..	A pulse	<i>Dolichos psoraloides</i> ; B. P. 849.	2	0	0	0	5
<i>Til</i> ..	Sesame	<i>Sesamum orientale</i> : A. C. 56; S. 149; B. P. 1,623.	2	0	0	0	5
<i>San</i> ..	A fibre	<i>Hibiscus cannabinus</i> : A. C. 43; S. 22; B. P. 1,758.	..	..	..	..	..
<i>Sani</i> ..	" "	<i>Crotalaria juncea</i> : A. C. 44; S. 64; B. P. 1,753.	1	0	0	0	20
<i>Gekun</i> ..	Wheat	<i>Triticum aestivum</i> : A. C. 45; S. 262; B. P. 762ff.	10 to 12	400	4 to 5	2	37½
<i>Jao</i> ..	Barley	<i>Hordeum hexastichum</i> : A. C. 48; S. 256; B. P. 779ff.	2 to 4	?	?	0	30
<i>Channa</i> ..	Gram or chick pea.	<i>Cicer arietinum</i> : A. C. 50; S. 63; B. P. 850.	1 to 4	0	0	0	12½ to 20
<i>Masur or Masri</i> ..	Lentils	<i>Ervum lens</i> : A. C. 38; S. 68; B. P. 851.	2	0	0 to 4	0	12½
<i>Sarsam</i> ..	Rape	<i>Brassica campestris</i> : A. C. 55; S. 11; B. P. 1,618.	2	0	0	0	12½
<i>Methi</i> ..	Fenugreek	<i>Trigonella fenugrecum</i> : A. C. 65; S. 77; B. P. 881.	2	?	4 to 6	0	12½ to 20
<i>Tambaku</i> ..	Tobacco	<i>Nicotiana tabacum</i> : A. C. 72; S. 158; B. P. 110ff.	8 to 10	300 to 600	7 to 10	7 to 10	?
<i>Karar</i> ..	Safflower	<i>Carthamus tinctorius</i> : A. C. 50; S. 124; B. P. p. 464f.	..	..	..	..	..

Note.—A. C. is Wright's *Agriculture of Cawnpore*. S. is Stewart's *Panjab Plants*. B. P. is Baden Powell's *Panjab Products*.

Diseases and enemies of plants.

Many of the evils to which plants are subject are peculiar to particular staples, and are noticed in their places below. But a few are very common. Much information on the subject has been collected by Mr. Baden-Powell.

Pála or frost is very injurious if severe and not accompanied by rain, or if a west wind blows at the time. There is a saying: *girta mín pachheta pála; yih kirsán ká gála*: "tardy rain and frost are the husbandman's loss." It especially attacks cotton, sugarcane, gram, rape, and early wheat while in the ear.

Kág, kágwa or smut is produced by east winds with cloudy damp weather. It attacks wheat especially; and also *javár* and sometimes barley. But it is, as a rule, sporadic in the two latter.

Al or *álá* is a black oily appearance upon the leaves of cotton and sugarcane. But it is also the name of a gregarious caterpillar, which especially attacks cotton, rape and sesame.

Kungi or rust is produced by the same influences which produce smut. It attacks wheat chiefly, and is exceedingly destructive.

Jackals do most harm to maize, of which they "do not leave even the bones," and to sugarcane. They also eat *methi* and safflower.

Pigs are catholic in their taste; but if they have a preference, it is for rice, *javár*, maize and cane.

White ants eat most things, especially gram, cotton and cane. They cannot move in *dákar*, as it is too stiff and moist for them; and plenty of water will always keep them away.

Ujála or general withering up from any reason, and *sokhá*, or withering from want of water, are of course evils common to all plants.

The principal varieties sown are *Surtá* or *Sotha*, with a long, soft thick, white cane; the best of all, but somewhat delicate, and especially fancied by jackals. *Lálri* with a hard, thin, red cane; very hardy, and will not spoil even if the cutting be long delayed; but not very productive of juice. *Merati* or *Merithi* with a thick, short, soft cane, and broad leaves: it is very productive, but requires high cultivation, and suffers from excess of rain; it is not much grown. *Pondá*, a thick sweet variety; grown near the cities for eating only, as its juice is inferior. Cane grows best in fairly stiff loam, and worst in sandy soil. It likes abundant rain, and will stand a good deal of swamping, though too much makes the juice thin. It is occasionally grown in flooded land without irrigation; but the yield is precarious. Its cultivation is far more laborious than that of any other staple. The land must be ploughed at least ten times, and worked up to the finest possible condition. The more manure given the better the yield; and it is never sown without. If the soil is impregnated with *reh*, the juice becomes watery, and yields but little sugar.

The amount of seed is fixed in the following curious manner:—As many canes as will make up a total length of 21 hands is called a *panjá* or handful. Twenty-one *panjás* are a *púli* or bundle; and 30 bundles are sown in one acre. The word *panjá*, though common, generally in the Panjáb, is not used or known in the tract in any other connection than this. The seed cane will be worth Rs. 5 to Rs. 6 per acre. The seed cane is buried in the ground till wanted next year. Generally whole canes are buried; but a custom is growing in the Khádar of using only the top 18 inches or so of the cane for this purpose, as this is the piece which makes the best seed and gives the least juice. The seed cane is cut up into *pári* or slips with two knots in each, and they are laid down a foot apart in the furrow by a man following the plough, who presses each in with his foot. The plough has a bundle of canes tied under the share to make a broad furrow. Nine men will sow an acre in a day. The *sokhága* is then passed over the field. On the first day of sowing sweetened rice is brought to the field, the women smear the outside of the vessel with it, and it

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is then distributed to the labourers. Next morning a woman puts on a necklace and walks round the field, winding thread on to a spindle. This custom is now falling into disuse. Three days afterwards they hoe the field all over with *khodilits* and follow with the *sohágga*. This operation is repeated four times at intervals of 10 days. Ten men will work an acre in a day. The field is then watered.

The *panchha* is then given. They spread more manure, hoe it in, beat the ground with sticks to consolidate it, water, hoe, and beat, again, and so on two or three times; it taking twenty men to do an acre once over in a day. A month after this they water again, and go on hoeing and watering till the rains set in. During the rains it must be weeded once at least; after the rains it is watered once or oftener according to the season, and if it shows any tendency to droop, tied up into bundles (*jura*) as it grows. As soon after *Diwáli* as the cane is ripe it is cut. If it is allowed to stand too long, the flower (*nesari*) sometimes forms, and it is then useless. Cane is occasionally grown a second year from the old roots, and is then called *mánda*. The cane is cut down and dressed (*cholna*) on the spot by stripping off the leaves and cutting off the crown (*gaula*). These are given to the cattle to eat. This work, and the crushing, are done by the association or *lána* described in Chapter III (page 133), there being one pair of bullocks for every acre of cane. When the cane is brought to the press it is cut up into *ganderi*, or pieces 6 to 8 inches long. The press is started on Sunday; and an altar called *makál* is built by it, where five *ganderis* and a little of the first juice (*ras*) expressed, and $1\frac{1}{4}$ seers of the fist *gur* made are offered up, and then given to Bráhmans on the spot. The press is tended by two *peria*, who feed the press with cane, opening out the canes in the press with an iron spike or *káil*, and driving new canes well in by beating them on the top with a leather glove faced with iron (*hatarki*); two *muthiás* who drive the bullocks and hand the cane from a basket fastened on the beam to the *peria*; two *kárigars*, who look after the boiling and make the *gur*; and two *jhokas* or firemen who feed the furnace. For each twenty-four hours the *perias* get 9 seers of *gur*, and their food and tobacco; the *muthiás* get 2 seers and food; the *kárigars* 8 seers; and the firemen the same. The *kárigars* are generally *Shimvars* and get $2\frac{1}{2}$ seers on the first day in the name of *Báwa Kálu*, their *Guru* or spiritual chief. A certain amount of juice and cane is also given to the workmen. The blacksmith gets $\frac{3}{4}$ of a seer, the carpenter 2 seers, and the potter $\frac{1}{2}$ seer of *gur* per diem. The hire of the iron pans is from Rs. 9 to Rs. 12 each for a season.

As the juice runs out it is received in an earthen vessel (*báha kundi*) sunk in the ground, and holding some 60 to 70 seers. A press will crush an acre of average cane in five days, working night and day. The juice is dipped out of the *kundi* into a large pan called a *kúnd*. When the *kúnd* is full the juice is transferred to a *karáha* or *karáhi* or *bel*, an iron evaporating pan let into the top of a furnace and is there boiled. After being similarly treated in a second evaporating pan, the inspissated juice is put to cool into a broad shallow earthen pan (*chák*) and worked about with a flat piece of wood (*hái*, *hátwá*). When cool it is called *gur*, and is ladled out with a wooden spoon (*dolera*) and scraper (*musad*), and made up into balls (*bhelí*)

weighing 4 seers each, of the shape of a cottage loaf. The first ball is given to the Bráhmaṇ at the *makál*; the others are taken to the *bania* and credited to the account. The crushed cane (*khoi*) is used to feed the fire with. The cane saved for next year's seed is buried in the corner of the field. Young sugarcane is attacked, when about a foot high, by a worm called *kansua*, especially if the east wind blows. A smut called *ál* also attacks it under the same circumstances. Mice do much harm; and also white ants and frost.

No varieties of cotton are recognized by the people. It grows best in stiff loam; worst in sandy soil. It is better, if possible, to grow it by the aid of rain alone, and without irrigation, after sowing at any rate, till the rains are over. The more manure the better; but it often follows sugar, when no fresh manure is given; and in the Nardak it is grown without manure. On the canal it is sown a full month earlier than elsewhere, as the ample supply of water enables them to make the land moist enough before sowing to carry it through the rains. The ground is ploughed twice and the *soháḡga* used; the seeds are rubbed in cow-dung to prevent their sticking together, and sown broad-cast. When the two seed-leaves appear it is weeded, and twice again after that; the saying being—

“*Naulai nahin dopatti*”
 “*Kya chugáoye kupatti.*”

‘If you don't weed when there are two leaves, you will pick nothing.’ When it begins to flower it especially wants water, which must be given if necessary; for if it dries, and especially if the east wind blows at the same time, the flowers fall off and the pods don't form. It generally gets watered again with the other crops which are sown among the plants.

When the pods (*tind*) open and the cotton is ready to pick (*chugna*), the women go round the field eating rice milk, the first mouthful of which they spit on the field towards the west. This is called *phurakna*. The first cotton picked is exchanged for its weight of salt which is prayed over and kept in the house till the picking is over. The picking is done gradually as the pods open. It is performed by the women of the house when they are not secluded; otherwise by the poor women of the village who take $\frac{1}{2}$ of the pickings, in the earlier pickings when there is plenty of cotton, and more up to $\frac{1}{4}$ as less and less remains to pick. The last gleanings are left for the poor. The cotton as picked is called *kapás*, and is passed through a small hand-mill (*charkhi*), consisting of a wooden roller revolving in contact with a very small iron roller, the latter nipping the cotton and drawing it through, and so tearing it off the seeds (*binola*) which are left on the other side. The *kapás* consists of about a third cotton and two-thirds seeds. The cotton thus ginned (*rúi*) is scutched (*pinjna*, *dhunakna*) by the *pumba* or *tehi* with a large double-stringed bow (*pinan*, *dhunaka*) hung from a flexible bamboo, the strings of which he twangs violently with a heavy plectrum of wood (*tára*), and the vibrations toss up the filaments and form them into a fleece, leaving the dirt at the bottom. For this he takes the weight of the cotton in grain. The women spin the cotton and give it to the weaver to weave, paying him one rupee for weaving about 60 yards. After the

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cotton is picked, the cattle are turned into the field to eat the leaves, and the dried stems (*bansati*, *banchatti*) are cut down and used as whities for various purposes, or for fuel. The seeds are a valuable food for cattle, as they are very full of oil. Cotton is especially liable to the *âl* smut, and to attacks of caterpillars, and of a red worm in the pod.

Maize.

Two sorts of maize are grown; the *peri* or early yellow maize, and *dhaulî* or late red maize. The former has the better grain, and the latter is the more productive. Maize must have plenty of water and must have at any rate a little *frash* manure, even if sown after sugarcane. It grows best in light soils and well in sandy ones. It will not grow in very stiff soil. The ground is carefully dressed and the seed sown broadcast. It is weeded on the 10th, 22nd and 35th day after sowing, or thereabouts. It cannot go a month, and should not go more than three weeks, without water; and it is only in very good years that it need not be irrigated. If it once dries up, no after-watering will save it. A little early maize is often grown as fodder for the cattle; it produces hardly any grain. The maize is cut down and the cobs (*kûleri*) picked off, stripped, dried in the sun, and beaten with sticks to separate the grain. The unripe cobs (*bhûta*) are often roasted and eaten. The stalks (*karbi*) are good fodder, though not good as *jawâr*. Maize suffers from a worm in the knot of the stalk, and especially from pigs and jackals.

Fine rice.

Rices are divided into two well-defined classes; the fine rices, varieties of *oryzasativa*, the grains of which cook separate, and which are known to the people under the generic name of *ziri*; and the coarse rices, varieties of *oryza glutinosa*, the grains of which agglutinate when boiled, and of which the principal sorts are *mânji* and *sârthi*. This and the following paragraphs refer to the fine rices only. The *ziri* proper is a small rice with a short straw; the principal varieties are *ramdli* and *ramjamâni*, the latter of which has a particularly hard fine grain. *Sunkar* and *ansâri* are coarser rices, chiefly grown where there is fear of too much water, in which case their long straw gives them an advantage. Rice grows only in stiff soil. It is usually grown in lowlying *dâkar* so as to take advantage of the drainage water; but if the water-supply is sufficient, the best rice is grown on fine stiff soil on a slope where the water is perfectly under control. The seed beds are ploughed four or five times and carefully prepared, manure is spread on them, and the seed sown broadcast and very thickly on the top of the manure. More manure is then spread over the seeds, and the whole is watered. Four days after they are again watered, and after the fifth or sixth day, they must be kept wet till they are ready to plant out. The rice field is ploughed twice, and such manure given as can be spared. It is then flushed with some three inches of water, and a *sohâgga*, toothed if there are weeds, is driven about under water (*gôr* or *gôn dena*). If the weeds are obstinate, the plough must be used again under water. When the *sohâgga* has worked up the mud into a fine pulp, *Shimvars* and *Chamârs* take the seedling (*pod*) in handfuls (*jûti*) and plant them one by one in the water pressing in the roots with their thumbs. An acre will take 500 to 600 *jâtis* which will cost, if bought, Re. 1-4. It will take

ten men to plant it in a day, and they get $2\frac{1}{2}$ to 3 seers of grain each daily.

The field is weeded once at least. At first the whole field must be kept under water continuously; for each seedling throws out five to ten new shoots, which cannot make their way unless the ground is pulpy, and it is on the abundance of these shoots that the crop depends. The water must not be more than 6 inches deep, or the shoots will be drowned before they get to the air, and it must not be changed, as it would carry away all the strength of the manure and the soil. When the ears once begin to form, the ground must be kept well wetted, but not too slushy, or the plants will fall. If the crop is wholly under water for more than four days, it dies. The reaping must be done directly the grain is ripe, or it will fall out of the ears into the water. Thus hired labour is a necessity, and the payment is 5 or 6 seers of unhusked rice. If the water is deep and the plants, as cut, have to be put on bedsteads to keep them out of the water, the reaping is slow: otherwise the same as other small cereals.

The rice is thrashed in the ordinary manner; but the grain has to be husked in the *okal*. Standing rice is called *dhán*, as is the unhusked grain, in contradistinction to husked *cháwal*. The husking is generally done by the women of the house. If done by a labourer, he returns 18 seers of *cháwal* from every 30 seers of *dhán*, keeping about 2 seers of good rice and as much of broken bits which he will grind up and eat as bread. The rest is husk, which is useless. The straw (*puráli*) is very poor fodder, and is used largely for bedding for cattle, and for mixing with manure, or is even ploughed in fresh. But it is also given to cattle to eat. Rice suffers much from *khud* or *kokli*, apparently aquatic larvæ or other animals that eat the young sprouts. Water birds, too, play terrible havoc with it when it is ripening. If the whole plant dries up, it is called *malain*; if the grain only, *patás* is what is the matter with it.

Coarse rice (see *supra*) is of two kinds, *múnjí* and *sánthi*. The peculiarity of the former is that it cannot be drowned out, the straw lengthening as the water deepens. It is therefore sown in spots liable to flooding. It will stand two feet deep of water; and if the ripe plant falls into the water, the grains do not fall out as they do with *zíri*. The peculiarity of *sánthi* is that it ripens within an extraordinarily short time (nominally 60 days hence its name) from the sowing; it is sown all over the Nardak, and generally wherever there is no irrigation, as the rains will usually last long enough to ripen it. Huen Tsang noticed its, quick growth with admiration when he visited the Nardak 1,500 years ago. *Sánthi* has a short straw, and does with but little water, it being sufficient if the soil is thoroughly moist after the shoots are once up. The young shoots are liable to be eaten, and if the water gets very hot they will sometimes rot; but the plant is wonderfully hardy, and when the stalks have once grown up, hardly anything hurts it. Both kinds are sown at once where they are to grow. After two or three ploughings cattle are sent in to the water to walk about and stir up the mud, or the *gán* or toothed *sohága* is used under water. The seed is sown broadcast on the *gádal* or fine mud. No manure is

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used nor is the crop irrigated. The *puráli* or straw is better fodder than that of *zíri*, but still not good. The coarse rice forms a staple food of the people, the fine rices being sold and seldom eaten by them.

Jawár.

There are two varieties of *jawár*; the *pili* or *alípíri* which gives a sweet large grain, but is delicate; and the *daul*, which is very hardy. *Jawár* grows best in medium loam, and is not grown at all in very sandy soil. It is seldom either manured or irrigated; but it is grown on well-land in the Andarwar circle or Bángar land between the Ghagar and Suraswatí. The land is ploughed two or three times, and if very dry, a *sohága* is passed over it. The seed is thus sown broadcast,—if grain is wanted, very sparsely, the plants growing large and strong, and yielding fine heads of grain; if fodder is the object, very thickly, the plants growing together with thin stalks, giving little grain, but an immense deal of fine sweet fodder. If sown for grain it is weeded once at least—twice, if possible; and small pulses are often sown with it. When the crop is cut, the heads (*tasri*) are picked off and the stalks (*chari*) stacked for fodder. The finest heads are selected for seed and thrashed with sticks, and the others thrashed in the ordinary way. The seed heads are covered with a down which irritates the legs of the labourers. If the fodder crop in any field is very inferior, from late sowing or scanty rain, it is cut green, and is then called *chib*. *Jawár* suffers from worms in the *gába* or bud; and a worm also eats the stalk, which then turns red and hollow inside, and no grain forms. But the plant is exceedingly hardy; and if there is plenty of rain, hardly anything hurts it. It is said to exhaust the soil more than most other crops. Most of the bread eaten by the people during the cold weather is made of *jawár* flour.

Báira.

There are no varieties of *báira* recognized in the tract. In fact it is not very largely sown, but it is the chief crop in the Kaithal Bángar, and is also largely grown as a well crop in the Andarwar circle in the Chika *parganah*. It thrives best in sandy soil, and will not grow in stiff soil. It is sown the moment the first rainfalls, as the sandy soil retains the moisture for a long time. The mode of cultivation is just the same as for *jawár*; but it is always sown exceedingly sparsely, and some small pulse is generally sown with it, and grows between the plants. The stalks are called *dándar*, and are seldom used for fodder while *charri* (*jawár* stalks) is available. In the higher villages of Kaithal, however, the *báira* stalks are carefully stacked and are sometimes preserved for years, and are given to the cattle chopped up with green fodder, or even with the *áta* of gram. If rainfalls on the flower (*búr*) it washes the pollen off; but hardly anything else affects it. The flour makes good bread, but is said to be heating.

Mandwa.

No varieties are recognized. It is grown in fairly stiff soil, but chiefly in the Khádar, and there only in small quantities. It is sown in seed beds carefully dressed and manured. The seedlings are then planted out in land which has been twice ploughed, and dressed with the *sohága*. It is watered once, or twice if the rains are late, and weeded once. The heads ripen slowly, and the ripe heads are picked off and the grain beaten out. The *blús* is very bad fodder, and is generally burnt as it stands, or grazed down. The flour is used for

bread, but is very indigestible ; but it has the advantage that it may be eaten on fast days, as it is plucked, not reaped like other cultivated cereals. It is the *rāgi* of southern India. In dry seasons its cultivation as a food crop is largely increased, it being put in fields intended for *zīri* which cannot be planted out owing to the drought.

No varieties are recognized. It is sown in light or sandy soil, as soon as the first rains fall. It will not grow in stiff soil ; and in the Nardak, where there is no sandy soil, is grown chiefly for fodder, the yield of grain being insignificant. The ground is ploughed twice over, and the seed sown broadcast, and neither weeded, manured, nor irrigated. It is often sown with *javār* or *bājra*. The *bhūs* of this and of *urad* and *mung* is the best of all fodder. The seeds of all of them, when husked and split, are called *dāl*, and eaten largely by the people, generally boiled. If the east winds blow when it is flowering, it yields but little grain ; otherwise it is a very hardy plant.

The remarks on *moth* apply to *urad*, except that it will grow in stiff soil also, and is generally sown alone. The *dāl* is of the finest description.

The remarks on *moth* apply to *mung*, except that it is almost always sown and reaped with *javār* or *bājra*. The *bhūs* is not nearly so good as that of *moth* or *urad*, but is still very good indeed.

Gawanr is a pulse cultivated in much the same manner as those above mentioned. It is grown for cattle only, the seeds producing flatulence, and having to be given cautiously even to cattle. The *bhūs* is worthless ; but the green plant is cut and chopped up and given to bullocks. It grows only in light soil, and is sown with the first rains, and always alone.

No varieties of *tīl* are recognized. It must be grown in good stiff soil ; and the soil must be new to give a good crop, which is probably the reason why it is chiefly cultivated in the Nardak where virgin soil abounds. It is generally sown with *javār* or *urad* ; and the mode of cultivation is the same as that of the latter. When the plants are cut, they are put up on end to dry. As they dry, the pods open, and the seed is then shaken out. The stems (*dānsra*) are of no use. The seed is taken to the oilman, who returns two-fifths of the weight in oil, keeping the oil-cake (*khal*) which he sells. The oil is good for burning, and is the best of all oils for purposes of the kitchen. *Tīl* is very subject to attacks by caterpillars (*dāl*). And if it once dries up it never recovers it. It is, however, never irrigated.

San * is sown, seed by seed, on the edges of the sugar-cane field, or in rows among the cotton, and takes its chance with them. It is cut in *Kātik*. The plants dry for two or three days, and are then, or when wanted, weighted down under water in the pond or in a well. They soak for 40 to 60 days in the cold, or 20 days in the hot weather. The fibre is then stripped off, washed thoroughly, dried, and is ready for use. The sticks are called *sankokra*, and are useless. The fibre is especially used for the *lào* of the well, as it is very strong, and stands water without rotting. It is also used for ropes in general ; but does not wear so well as *sanī*.

* Mr. Baden-Powell, in his Panjáb Products, warns the reader against confusing *san* and *sanī*. He has, however, exchanged their names. *Sanī* is the leguminous *Crotalaria*, and *san* the malvaceous *Hibiscus*.

Mandwa.

Moth.

Urad.

Mung.

Gawanr.

Til.

san.

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Sant is sown in the best of soils only. The land is ploughed once, the seed is sown broadcast, and no further trouble is taken with it. It is sown in *Sárh* and cut in *Kátik*. It is dried and then steeped for 8 to 10 days in the cold, or half that time in the hot weather. The stems are then washed, dried, and put away whole, the fibre being stripped off as wanted. It makes the best ropes of all, but will not stand constant wetting. The sticks are called *sunki*, and are useless. There does not seem to be the same prejudice in *Karnál* against the cultivation of *sant* that there is in the adjoining *tahsil* of *Pipli*, where no *zamindár* of good caste will sow it.

Wheat.

Wheat forms the chief spring staple of the irrigated portions of the tract. The principal varieties are the *píla*, the best of all wheats; *kunjá*, with a long straw, and full ear, of somewhat inferior grain; *jogia*, a short red wheat of good quality; and *lál* a very hardy and productive wheat of good quality, which does with less water than the others, and is sown in the inferior soils and in the unirrigated portions of the tract. These are all bearded, wheat without awns (*múndla*) being but little cultivated.

Wheat will grow in almost any soil, except the very stiffest where barley takes its place; and if there are good Christmas rains (*mahawat*) a fair crop may be got without irrigation. It is not grown as an unirrigated crop in the *Indri Nardak* nor anywhere in *Kaithal* except in the trans-Ghagar villages north of *Chíka*. The soil is worked up in the most careful manner during the rains; and the oftener it is ploughed the better. It is generally sown after cane or cotton, when no fresh manure is added; otherwise manure is almost always given, and the *Máhs* and *Ráíns* use a top-dressing of *rehi* of some 12 or 15 maunds to the acre, when the plant is six inches to a foot high. The field is dressed laboriously with the *sohágga*, and the seed sown broadcast. It is watered 20 to 30 days after sowing, according to the original wetness of the soil; and then, at intervals of a month, three times more on the canal, four times more in the *Khádar*. It is weeded after the first watering; and once again, in the *Khádar* at any rate, where the *piázis* are numerous. It ripens suddenly; and hired labour is generally needed for the harvest, the labourers getting 5 to 7 seers a day in the ear. The *bhús* is very fine fodder. The grain of wheat alone is not much eaten, it going to the *Baniá*, while the people eat the mixed grains mentioned below. Wheat is very liable to smut, often called *dharunchi* in this case, and rust. Sometimes the east wind in dull weather will make the ears curl and twist up; and this is called *maroria*. Late frost does it much harm if it has been sown so early that the ear is then forming, but not otherwise.

Barley.

No varieties are recognised. It is the hardiest of all the small cereals, will grow in any sort of soil, and will stand either excess or deficiency of water. It may be sown later, too, than any other of the spring crops; and men may be seen sowing barley at the very end of the season on the edges of a swamp which were still too wet to plough, with the intention of ploughing it in as the soil dried. The limit to the sowing is expressed by the proverb, "*boya Po, diya kcho,*" "sow in *Po*, and you lose your seed." The field is ploughed two to four times, the *sohágga* is passed over it, and the seed sown broadcast.

Manure is given if there is any to spare, which there seldom is ; and water is given if the needs of the other crops allow of it. It is seldom weeded unless the weeds are very bad. The grain is much used by the people for bread ; and the *bhús* is admirable fodder, though not so good as that of wheat. Barley sometimes suffers slightly from smut ; but nothing else seem, to touch it, wind and weather of course excepted.

No varieties of gram are recognized. It grows best in the stiffest soil, and hardly at all in sandy soils. It is generally sown broadcast before ploughing, and is often mixed with wheat or barley. In the very stiff rice fields the *dákar* is ploughed up once after the rice is cut, so as to break it up into large hard clods, in the crevices between which the gram grows. Lighter land is ploughed two or three times, and is sown more sparsely than stiff soil. No manure is used ; and irrigation rots the plants, so that the soil should be very moist for sowing. If this is the case, and the Christmas rains are good, a fine crop is almost certain. Gram is never weeded. The grain is used as *dál*, and for bread ; often in the later case mixed with cereals. The *bhús* is admirable fodder. The young plant is used as a vegetable, the green seed is eaten raw, and at harvest time the plant is thrown on to a fire of grass, and the roasted seeds (*hole*) rubbed out and eaten. Either the phosphoric acid which the leaves deposit, or the down with which they are clad, is exceedingly irritating to the skin. The plant is exceedingly sensitive to frost ; and a green worm called *sundí* attacks the seed, especially if the Christmas rains are late so that the ground is damp when the seed is forming.

Masúr is a small pulse, growing chiefly in the very light soils of the *Khádar*. The ground is ploughed twice and dressed, and the seed sown broadcast, often mixed with barley. No manure is used ; but it is irrigated if the labour can be spared. The grain makes very good *dál* ; but the yield of fodder is insignificant.

There are two kinds of *sarson* grown in the tract ; the black in the *Nardak*, which is more hardy but less productive, and the yellow in the less arid parts. It is grown chiefly for its oil, though the green plant is much used as a vegetable, and as green meat for cattle. It is generally grown together with wheat or gram, often in rows (*ár*) along the field, and takes its chance with them. If sown separately, it is neither weeded nor manured, and seldom watered. It ripens in *Phágan*, the earliest of all the *rabi* crops except *toria* ; and the plants are picked out from the crop with which they are growing. The seed is called *bhakar*, and yields an oil which is the finest of all oils for burning, and is also good for cooking purposes, though inferior in this respect to that of *tíl*. The oilmen return one-third of the weight of seed in oil if yellow, and one-fourth if black, and keep the oil-cake. The *bhús* is called *túri*, and is worthless. The plant is subject to the attacks of a gregarious red caterpillar (*ál*), and is very sensitive to frost.

Toria is an insignificant oil-seed, one of the *brassicæ*, deriving its value from the rapidity with which it ripens. It is sown in *Bhádon* and ripens in *Po* ; coming in just when oil is dear, and before the other spring oil seeds have been reaped. Hence the proverb—

*Toria hal joria, urdon chhoti bel,
Bhawan kitna bhagle, pakunga tere gel.*

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Agriculture and
Arboriculture.

Barley.

Gram.

Masúr or *Masri*.

Sarson.

Toria.

Chapter IV, A.

Agriculture and
Arboriculture.*Toria.*

"The plough is yoked for the *toria*, when the *urad* creepers are already long. But hasten as you will, I will ripen along with you." The land is ploughed twice after the rains, and the seed sown broadcast. It is neither weeded, irrigated, nor manured; but it is, like the other *brassicæ*, often plucked as green meat for cattle. The oil is good; the *bhûs* valueless.

Methi.

Methi is a trefoil, used only as green fodder for cattle, or as a pot herb. It is generally sown, sometimes with a little gram or *sarson* mixed with it, between the cotton plants; more being sown in stiff than in light soil. Before the pods open, the ground is grubbed up with a hoe and the *methi* sown. It is watered the day after; and again at intervals of 20 days or less, as it needs a great deal of moisture. It grows very thick and close, and is cut green. It only yields one cutting.

Tobacco.

Tobacco is very generally grown in the villages, but mostly for private consumption only, except where local peculiarities are especially favourable. The *desi* variety is almost exclusively cultivated, of which *bugdi*, *surnâli*, and *khajûri* are forms distinguished by the shape of the leaf. The plant grows best in a nice loamy soil, neither too stiff nor too open. A slight saline impregnation rather improves the plant; and the water of bitter wells, or of the dirty village ponds, is best. Canal water is too pure. There is a well in the village of Phûrlak, the tobacco of which is celebrated throughout the district. The seed is scarcely ever sown by the villagers, who obtain the young seedlings from the market gardeners of the towns, paying Re. 1-4 for enough to plant an acre. The land is ploughed 8 or 10 times, dressed most carefully, and laid out in ridges some 2 inches high and eight inches apart, the seedlings being planted half way up the ridge on either side alternately and about 8 inches apart; for if water lies about the stem, it injures the plant. This is done in Mâgh or Phâgan. They are then hand-watered with manure dissolved in water. Soiled manure is generally used as a top-dressing, as less is thus required. The dung of goats and sheep is the best, and old dry cow-dung mixed with ashes. The field is watered every 10 days or so; and the hoe is then freely used, so as to keep the earth about the roots open and the weeds removed. As the leaves grow they are sprinkled with *reh* or ashes to keep off insects and improve the flavour; and the flower-bearing pedicles (*gol*) are nipped off as fast as they appear. The plant is ready to cut in Jet or Sârh. The whole plant is cut in the morning, and left in the field for 24 hours to dry. Next day they are piled up and left to dry further. A hole is then dug and the plants are packed into it, covered up with *dhak* or *âk* leaves, and left to ferment for five to ten days. The leaves (*pât*) are then stripped and either tied up into hands (*jûti*) or twisted into a thick rope. They are, if necessary, further fermented; and are finally dried and kept for use. When tobacco is wanted, the leaves are cut up and powdered with an equal weight of *gur* in a mortar. After the plant has been cut, leaves sprout from the stump, and are picked and used by the poorer classes.

Karar.

Karar or safflower is usually sown very sparsely with gram or on the edges of the fields, seldom by itself. Only small quantities are sown. The soil requires little preparation and no further care. When the flowers open, the women pick out the petals; three days

later they repeat the operation ; and again a third time after the same interval. If hired they take a quarter of the picking as their wages. The petals are bruised the same day in a mortar, rolled between the hands, and pressed slightly into a cake. Next day they are rolled again, and then spread in the sun for two days to dry, or still better, one day in the sun and two days in the shade. One seer of petals will give a quarter of seer of dry dye. Any delay in the preparation injures the dye. The dry dye is called *Kasumbh*, and is the yellowish red colour with which the clothes of the village women are ordinarily dyed. The dyer (*nilgar*) has the cloth and dye brought to him, retains one-fifth of the dye as a perquisite, and is also paid for his trouble. A bitter oil is expressed from the seeds, which is used for burning only. Forty seers of seed will give $3\frac{1}{2}$ seers of oil.

The mixed crops proper are confined to the spring harvest, for the small pulses so commonly grown among the huge millets in the autumn are reaped and thrashed separately. In the spring, however, mixed gram and barley (*jauchani*), wheat and gram (*gochani*), wheat and barley (*goji*), and all three mixed (*berra*), are commonly sown and reaped together, especially the two former. This custom has brought on the Indian cultivator much very undeserved hard language. It is true that the mixed grains have no export value ; but then he does not grow them for export, or even, as a rule, for sale. In one village the people complained that their *Baniàs*, to whom they were in debt, would not let them grow mixed grains. The peasant devotes his best soil, his manured and irrigated fields, sown at the proper season, and when neither too wet nor too dry, to the single grains which he will sell to his banker. In the remaining land he grows mixed grains which he eats himself, liking the varied flavour, and especially finding the nitrogenous pulses an indispensable substitute for the animal food which religion or poverty forbids to him. Besides this, the three crops which are sown together flourish under different circumstances ; and a season which destroys one will very likely suit the other, and so gives a fair yield in the end. If it is rather late to sow gram alone, he sows gram and wheat ; and if the soil appears very wet, he will sow gram and barley. The damp will suit the barley, while if there are no Christmas rains it will save the gram. The frost which will kill the gram will spare the others ; while the dew on the gram leaves will help the wheat, and the wheat and barley will shelter the young gram from the sun.

Such rules as are observed by the people regarding the rotation of crops are, of course, founded upon experience, and not upon scientific knowledge of crop-foods and soils. But they have their reasons for them. The soil in which the spring crops are grown is called *dathoi* or *bhadwâr*, according as it has or has not borne a crop in the autumn immediately preceding ; the former name from *datha* a stalk, as the stalks are generally left in the hurriedly prepared ground ; the latter from *Bhádôn*, the month in which they begin to plough the field. In single cropped land the chief consideration is the full utilisation of manure, care being taken to sow in land which has been heavily manured, and which will not have been exhausted by the single crop, only such valuable crops as must have manure to bring them to perfection. In double cropped land the nature of the crop to follow is chiefly determined by the date at

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Rotation of crops.

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Rotation of crops.

which the autumn crop is cut, and the interval thus afforded for the preparation of the soil. Thus maize, which is cut early and always manured, is generally followed by wheat. Cotton is, for the same reasons, usually followed by cane, which is also often sown after *jawár*, manure being added. Cotton is often sown after cane or wheat; and wheat will often follow cotton or cane, with a season's interval. *Jawár*, which is very exhausting, is seldom followed by any spring crop except gram. Rice, except in Indri where nothing but rice is usually sown in rice land, is almost always followed by gram or mixed grains; the stiff wet soil being in many cases incapable of producing anything else, while the pulse following the cereal does not seem to suffer, judging from the crops often produced. And in the swampy canal villages, where the whole area is often too wet to grow anything but rice, barley is perforce sown in every field in the spring, not because there is much hope of a tolerable grain crop in the swampy fields, but because some sort of fodder *must* be had, and rice straw is of but little use. Manured land is never allowed to rest more than one season at a time, while the highly-manured land close to the town will yield, with the help of vegetables and *chína*, three or even four crops in a year. Even unmanured land is not often given more than one season's fallow, *jawár* and gram being commonly grown year after year without intermission. But, except in rice land and swampy villages, land is seldom double cropped without manure.

Jawár, cotton, wheat, sugar-cane and *mandwa* are considered the most exhausting crops. Very little fallow is left if the year is a good one; while in a bad season all the high lands which are without irrigation are left unsown. Irrigated land is seldom left fallow unless the owner has more land irrigable by his well than it can water in one year. However in Indri Bángar and Nardak very little of the well land bears more than an average of one crop each year. There the almost universal system is by a two-years course. The same is true of some well-lands in Kaithal. For example, in the Andarwar circle (Chfka) the well-lands are divided into two blocks. In the first year block A is sown with an autumn crop and block B with a spring crop. In the second year block A is sown with a spring crop and an autumn crop is taken from block B. That is every field gives two crops running spring and autumn, and then is left fallow for two harvests. Manured land is practically allowed *no* fallows. Repeated ploughing is chiefly used for irrigated land, in which wheat, cotton, sugar-cane, or maize is to be sown, and for unirrigated land, which is to grow *jawár*. The use of manure has already been discussed at pages 161, 162.

Average yield. Pro-
duction and con-
sumption of food
grains.

Table No. XXI shows the estimated average yield in lbs. per acre of each of the principal staples as shown in the Administration Report of 1881-82. While the table on the opposite page gives the more detailed estimates which were used by Mr. Ibbetson to calculate the value of the gross produce for purposes of assessment in the Settlement of 1880. The average consumption of food per head has already been noticed at page 69. The total consumption of food grains by the population of the district as estimated in 1878 for the purposes of the Famine Report

Grain.	Agriculturists.	Non-agriculturists.	Total.
Wheat ..	613,432	794,823	1,408,255
Inferior grains..	788,699	430,530	1,219,229
Pulses ..	788,699	430,530	1,219,229
Total ..	2,190,830	1,655,883	3,146,713

is shown in maunds in the margin. The figures are based upon an estimated population of 6,10,927 souls. On the other hand, the average consumption per head is

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Average yield. Production and consumption of food grains.

believed to have been over estimated. A rough estimate of the total production, exports and imports of food grains was also framed at the same time; and it was stated (page 151, Famine Report) that some nine lakhs of maunds, principally wheat, were annually exported to Dehli and Ambála and about 312,000 maunds of wheat, barley, gram; *bajra* and smaller pulses imported from Patialá and Bhiwáni.

	IRRIGATED.					UNIRRIGATED.					MOIST.		TOTAL.					
	Bengar.		Khadar.			Bengar.		Khadar.					Bengar.		Khadar.			
	Nardak.	Karnal.	Panipat.	Karnal.	Panipat.	Nardak.	Karnal.	Panipat.	Karnal.	Panipat.	Karnal Khadar.	Nardak.	Karnal.	Panipat.	Karnal.	Panipat.		
Cotton ..	186	230	20	239	352	88	125	161	124	215	144	123	224	270	228	340		
Sugarcane	625	843	762	887	..	847	450	354	400	250	..	606	843	689	828		
Maize	392	492	..	510	612	155	181	..	208	208	127	299	478	..	467	555	
Fine rice	342	571	574	436	461	178	866	390	803	347	..	231	565	571	432	429	
Coarse rice	320	324	..	346	..	142	238	..	259	276	147	322	..	323	..
<i>Jowar</i>	159	163	186	157	177	113	145	144	112	107	107	116	155	166	138	152	
<i>Bajra</i>	160	162	163	123	135	113	129	130	114	112	109	118	140	141	117	118	
<i>Moth</i>	98	96	78	81	..	80	73	56	56	54	..	84	84	67	70	
Wheat	414	496	598	363	489	218	230	322	250	289	192	366	490	593	382	454	
Gram	433	546	606	390	440	225	374	447	316	374	536	240	476	563	360	413	
Barley	475	482	351	..	..	320	351	245	..	189	..	454	479	283	..	
Wheat and gram	421	495	386	443	..	356	380	250	296	227	..	401	476	347	407	
Barley and gram	341	366	..	380	..	204	301	..	261	..	244	210	347	..	305	..	
<i>Masur</i>	104	..	..	..	..	91	..	63	..	..	..	75	..	

Table of produce estimate.

Table No. XVII shows the whole area of waste land which is under the management of the Forest Department. The principal trees and shrubs have already been noticed in Chapter I, (pages 15 to 19).

Arboriculture and forests.

SECTION B.—LIVE-STOCK.

Table No. XXII, shows the live-stock of the district as returned in the Administration Reports for various periods. The employment of cattle in agriculture and the fidders used have already been described at page 161. In a tract like the Nardak, where Rájputs predominate, and only a small portion of the area is under the plough, it will be readily understood that cattle-farming forms no unimportant element in the means of subsistence. In the large Rájput villages, it may, in fact, be said that cultivation holds an entirely subsidiary position.

Live-stock.

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Live-Stock.

Live-stock.

The people look up on the manual labour of agriculture as to some extent derogatory, while the proudest of them thinks it no shame to tend his herds; the yield of their fields is eminently precarious, and only follows on the expenditure of labour and capital, while their cattle yield *ghí* and calves in the exercise of their natural functions. Thus the Nardak Rájput's chief agricultural care is to secure a plentiful supply of fodder from his *javár* fields. The general area of the tract is a high flat slope from which the rain water runs off almost as fast as it falls; and what scanty grass does spring up, is eaten at once before it disappears under the burning heat of the sun. But every village is situated on a drainage line of greater or less magnitude; and in the hollows, where the earth is protected by the shadow of thick *dhák* jungle, grass grows with great luxuriance, and is both pastured and cut and stored for use in the hot weather. The hedges, too, which surround the cultivation, generally enclose a good deal of uncultivated land, and large blocks are often fenced off as grass preserves (*bír*). In these spots a plentiful crop of grass is to be found in fairly favourable seasons. Notwithstanding this, by the beginning of April the supply begins to run short, the pools in the jungle have dried up, and the mass of the cattle are taken away in large herds (*gol*) either to the *dúns* of the Siwálíks, or, where the existence of friendly relations with the villagers renders it possible, to the riverain and canal villages. As soon as the first rains promise a supply of grass and water, these cattle return, accompanied by the herds of the canal and riverain tracts which the rising floods have driven from their homes, and often by those of the arid tracts of Hariána, where the season has been less favourable. Thus the cattle-farming capacity of individual villages depends not so much upon the actual area of pasture land as upon the extent to which that area is occupied by hollows and drainage lines. Many villages are compelled to fall back for pasture upon neighbours who have a smaller but more favourably situated area; and in some villages considerable sums are yearly paid as grazing fees to other communities. Besides cattle, a large number of sheep and goats are pastured in the tract, chiefly by the non-proprietary community.

Horned cattle.

Kine or *dhenú*, consisting of buffaloes and cows, are kept by almost all villagers, and their milk furnishes the only animal food which they, as a rule, enjoy. In the Nardak, where pasture is extensive and agricultural produce precarious, they form the mainstay of the people; while in every village the surplus *ghí* produced forms a substantial addition to their income. Of the two kinds of kine the buffalo is infinitely the more valuable. If a villager loses his cow, he only grumbles a little harder than usual; if he loses his buffalo, he sits down and cries. A female buffalo (*bhains*) is worth Rs. 40 to Rs. 100. After four years old she will give a calf every 18 months, to the number of seven or eight or even more. The heifers (*jhotri*, *katri*) are not sold; but the steers (*jhotra*, *katru*) are gelt and sold when some two years old to be used as pack-animals. They are called *jhota* when grown up. The buffalo eats all the coarse swamp grasses which the cow will not touch, and which would otherwise be useless; and as long as they have a daily bath in the pond, are hardy animals. The cow (*gái*) is worth from Rs. 10 upwards. After four

years old she will calve once in every twelve to eighteen months on the average, generally in Chet or Baisákh. She will calve about six times. The steers (*bahra*, *bachhra*) are gelt and kept for the plough as oxen (*balad*), or sold at three years old for from Rs. 15 to Rs. 20. The heifers (*bahri*, *bachri*) are seldom sold unless they drop their young. No care is taken about the breeding of oxen, the bulls (*bijar*, *khaggar*) being simply the young bull calves let go on the occasion of a death. The buffalo bull (*bhainsa*) is sometimes chosen by a group of villages and let loose; but it is often let loose in the name of *Devi* or of the *Pir*, and these latter may be of any sort of breeding. Both sorts of bulls roam about the jungles and mingle with the herds at pasture. To give the bull to a cow is *dhanána*; to a buffalo *phalna*; to calve is *biána*.

The cattle are grazed in herds (*gol*) by herdsmen (*páli*), usually boys and lads except in the Rájput tract, where men go also for fear of attempt at theft. In the cold weather they go out as soon as the dew is off the grass, and return at sunset. In the hot weather they graze from dawn till 11 A. M. and from 2 till evening, returning to the village to drink in the middle of the day. In the rains they also graze for three hours before dawn, returning to the village to be milked. This last is called *pasar*, and has a great effect upon the milk, the cattle grazing more freely when not teased by heat and flies. The plough cattle often go for *pasar* both before dawn and after sunset, in the rains. When a cow is in milk, she gets about half a seer of grain and if there is no good grazing, 5 seers of fodder daily; a buffalo in milk gets twice as much. The kinds of fodder have been described already in Section A of this Chapter at page 161.

The principal kinds of grass have been described in Chapter I. During the rains a splendid crop springs up, and all the ponds fill with water. In the Nardak the villages fence off grass-preserves (*bír*) and cut and stack the grass for hay when it is ripe. During the rains and cold weather large herds come, if the season is a good one, from the sandy Bángar, and settle down in the Nardak jungles, leasing blocks of pasture, or paying so much per head. By the end of the cold weather the grass is all eaten and the ponds dry; and the cattle have to leave the Nardak for the canal and riverain tracts, or for the valleys of the Siwálíks. On the other hand, the cattle of the canal and Khádar tracts are in many parts driven out of their villages by the floods in the rainy season, and have to take refuge in the higher parts of the country.

A buffalo will give 6 to 10 seers of milk daily for eight months, and each seer will make a *chitánk* of *ghí*; a cow will yield 3 to 5 seers daily for five or six months, but each seer will only produce half a *chitánk* of *ghí*. The first milk after calving is offered to *Bhúmic* and the Snake-god, or sometimes given to the beast herself to drink; otherwise the milk will turn bloody. The calf has all the milk for 10 days; on the 11th it has a rope put round its neck, and the owner begins to use the milk. The milk is boiled at night in a vessel called *karhauri*, and a little sour curd (*dahi*) put in to turn it, which is called *jamána*. Next morning the milk is turned into a *jhaulí* or churn, and the churn staff (*reyi*, *ravi*) made of *kair* wood with four arms at the bottom, is put in, and a cover (*chákra*) put on through which the *reyi*

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passes. A string (*nota*) is wound round the staff, and it is spun alternately each way by pulling the ends of the string. This churns (*bilona*) the milk. The butter comes in little globules (*rawa*), and is skimmed off and put into a vessel. Its collective name is *tíndi* or *naini*, and the butter-milk is called *lhasi*, and is drunk. The butter is then melted, and the water with its impurities (*chhách*) being strained off, *ghí* remains. This is put into a vessel called *bára* till enough is collected to take to the *Baniá*, or as they express it, to change the *bára*. The word is probably from *Bár*, Saturday, as no *ghí* must be made from the Sunday's milk.

Diseases of cattle.

The chief diseases to which cattle are subject are as follows:—

Garar or *garva*.—This is the most fatal of all, especially to buffaloes. The mouth and nose run, the tongue and throat swell, the papillæ of the tongue stand erect, and the animal dies in a few hours, apparently suffocated. *Rora* or *paira*.—The feet and mouth swell and fester, and colic and diarrhœa are present. The animal generally recovers. *Mând* is dysentery, which generally kills the patient. *Jar*.—In the rains when the grass is young the cattle get giddy and fall down, especially buffaloes. It is seldom fatal. The *reh* of the canal tract gives the cattle glandular affections and diarrhœa, and pulls them down; they are therefore sent after a year or two to the highlands to recruit, which they do in a few months. *Rora* is used also for any epidemic cattle plague. When it attacks a village, the first animal that dies of it is buried instead of being given to the *Chamárs*, and water is sprinkled on the track (*ghasít*) along which the corpse was dragged. The beam of a plough (*hális*) is buried upside down in the gate of the village with the top sticking out, and a charm (*totka*) consisting of a garland of *siras* or mango leaves, with a mud platter inscribed with mystic words by a *faqír*, is hung across, so that the cattle must pass under it. If an animal gets lame, an oval mark with a cross in it, or Solomon's seal, or Shiv's trident, or the old Aryan mark of the need-fire, in general shape like the Manx arms, is branded on the limb affected. A *nála* or piece of the coloured thread used in religious ceremonies is a powerful charm if tied round the leg of the animal. All cattle that die on Saturday or Sunday are buried instead of being given to the *Chamárs*.

Traffic in cattle.

The cattle-dealers of the tract are Banjárs, the commissariat agents of the old Emperors since the time of the Lodís. These men come up from the east in the cold weather with letters of credit to large amounts, buy up all the young steers, and take them back again for sale. Of course a good deal of local traffic goes on also, and the people will go great distances to get good animals. The best cattle come from Hissár and its neighbourhood. Ownership is transferred by putting the rope by which the beast is tied into the purchaser's hand, and the latter giving Re. 1 or so of the price as *sáyi* or earnest-money. Milch cattle are sometimes taken on trial for a day or two; but if the seller wishes to settle the matter at once, he flings his stick on the ground in front of the beast, and if the buyer takes the animal over the stick, the bargain is irrevocable. No Hindu will sell *yokru* or *goká*, which includes everything born of a cow, to a Musalmán, for fear it should go to the butcher. And no villager will buy or sell cattle, leather, or *ghí* on Saturday or Sunday,

or on the great *Divāli*. When he has bought a beast, he will watch to see whether it dungs or stales first; the former is a good omen, the latter a bad one. He will also make obeisance to the first dung. A buffalo calf born in *Mágh* is unlucky, and must be given to the *Gújrāti* and not sold.

Considerable flocks (*rewar*) of these animals are kept in the *Nardak*, and in such *Khádar* villages as have large pastures. Where the villagers are *Musalmán*s, the flocks sometimes belong to them; but they are more commonly the property of the city butchers, who send them out to graze in the villages. The sheep are all of the ordinary black small-tailed breed. They are generally tended by *Gadariás* who make blankets of the wool. The dung is used for manuring tobacco, but is not much valued, and never bought.

There are singularly few mares in the tract, and what there are, are as a rule, poor. There are three Government stallions kept at *Múnak*; and the stud stallions serve branded mares free. But the local breed is not good; and in fact it is only the richer headmen and notables that keep a horse at all. A foal dropped in the day time is so unlucky that nobody would knowingly buy it; and it should have one ear cut at once, so that a purchaser may not be deceived. The expression used for selling a horse is "to marry" it (*shādi karna*).

Pigs (*bad*) are kept in large quantities by the sweepers in the villages, and the *Khatíks* in the town. The *Karnál* breed of pigs, which is a very fine one, dates from the time of the old cantonments; and large droves of "very superior and strictly home-bred pigs" may be seen constantly going from *Karnál*, where they have already attained a considerable age, and acquired the local tastes of their race. Donkeys are kept solely by potters, and do all the petty village carriage. There are many of them in every village. The sweepers of almost every village keep fowls in some quantities.

Horse-breeding operations were introduced in the *Karnál* district under the Stud Department in 1853. Since the abolition of the Home Stud in 1876 the operations have been carried on under the Superintendent of the Horse-breeding Operations, North-Western Provinces. Four stallion stands have existed under this department, *viz.*, *Karnál* itself, principally consisting of the private stud of Major-General B. Parrott, *Múnak*, *Kohand* and *Basdhára*. *Múnak* stand was first established in 1861 under the Stud Department, and was, it is reported, at one time a large stand requiring the services of four or five stallions, and having a register of between three and four hundred mares. Years of famine and scarcity, together with other causes, tended, however, to reduce the number of mares considerably; so that in 1877, on the first visit to the stand by the Assistant Superintendent of Horse-breeding Operations, only 47 mares were branded. On account of the paucity of mares, and as the stallions were either badly cared for or the climate unsuitable for them, the stand was abolished in June 1879, the mares being transferred to the *Kohand* and *Basdhára* stands.

Kohand stand.—The precise date of the establishment of this stand under the Stud Department is not known, but it is believed it was at one time closed and reopened again in 1871, when some of the *Múnak* stallions were removed there; so as to add to the convenience

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Live-Stock.

Traffic in cattle.

Sheep and goats.

Horses.

Other animals.

Government breeding operations.

Chapter IV, B.
 Live-Stock.
 Government breeding operations.

of breeders living at a distance from Múnak. The Assistant Superintendent visited the stand in 1877, when only 17 mares came forward for branding; and as only 6 mares were branded in the four following years, the stand was closed in June 1882 as being unproductive, the mares being transferred to the Basdhára stand.

Basdhára stand was established in 1871, and looked upon by the Stud Department as an offshoot of Múnak. The mares numbered in 1876 about 98; but the Assistant Superintendent, on visiting the stand for the first time in 1877, only succeeded in branding 40. The number of branded mares, however, has since then increased to 102, and hopes are entertained of still further improvement.

Basdhára is the only stand in the district at which mule-breeding has been attempted. A donkey stallion was standing there from September 1879 to February 1881, during which time only 12 mares were covered; the stallion was consequently removed. Another attempt is, however, now being made to introduce the industry, and it is hoped with more prospects of success. A donkey stallion was again given to the stand in January 1883; 26 mares have been covered; mares are not being branded for mule-breeding, as there is no restriction as to soundness, age, size or otherwise regarding the services of a donkey stallion.

The Government stallions at present located in this district are "Muleiber" T. B. E. at Karnál; "Performer," Norfolk trotter, at Basdhára; and a Persian donkey stallion at Basdhára. Castration, like mule-breeding, shows signs of becoming popular. The year 1881-82 may be said to be the first year for which any return can be shown; in that year 3 colts were castrated; in 1882-83 the number rose to 18. There is a Government *salitri* whose duty it is to castrate any colt or entire horse he may be called upon to operate on in this district; but as he has also part of the Saháranpur district to attend to, as well as to periodically visit the stallion stables in his circle, he cannot devote the whole of his time to castration work in the Karnál district.

With regard to the rearing of young stock by the breeders, it is reported that they prefer selling them to dealers as youngsters. The number of remounts supplied from this district is not known; but it is reported that about 40 and 50 colts and fillies are annually sold to dealers; and as they change hands, it is difficult to say how many of these may have been purchased by the Military authorities as remounts. General Parrott has, however, sold 17 from his stud for army purposes. No horse fairs are held in the Karnál district.

Karnál branch cattle farm.

On the abolition of the late Home Farm Stud Depôt the lands and buildings belonging to it were transferred to the Hissár Farm in December 1876 as an auxiliary farm, for the purpose of sending a portion of the Hissár Farm cattle there in seasons of drought at Hissár and in cases of emergencies, *i. e.*, in cases of any epidemic or sickness breaking out among the cattle at Hissár. The lands now occupied by the farm at Karnál consist of 2,128 acres, and are situated to the north and north-west of the town of Karnál. The natural produce consists principally of *dúib* grass and one or two other kinds of coarse and inferior grasses and *kákar* trees; with the latter the *birs* or grazing lands are overrun, and from this fact it would

appear that this forest plant is indigenous to the soil. Generally a thousand head of cattle, consisting of young and growing stock, are kept at this farm under charge of a European Overseer.

On the abolition of the Government Home Stud in 1876, some of the buildings and lands were made over to General Parrott, the Superintendent. Some of the mares were sold to him, Government stallions were placed under his charge, and he set on foot what appears to be an exceedingly promising experiment in horse-breeding. He has kindly furnished the following account of his stud:—

“I commenced horse-breeding operations at Karnal in November 1876 with thirty mares, now increased to thirty-nine. One hundred and thirty foals have been dropped up to date, and the casualties have been nine, four of them from snake-bites. The stock are reared on the liberty system, and are never groomed or clothed until three years old. Several of my stock are on the turf, and two of them, namely, “Mary Queen” and “Avenger,” performed well during the past racing season. Two others were awarded first prizes for country-breds at Calcutta and Lahore. In addition to ‘Lord in Waiting’ given to me by Government, two other thorough-bred English stallions stand at Karnal under my charge to cover my mares and any private or *zemindari* ones arriving to be served.”

Chapter IV, C.
Occupations,
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Commerce.

Karnal stud.

SECTION C.—OCCUPATIONS, INDUSTRIES AND COMMERCE.

Table No. XXIII shows the principal occupations followed by males of over 15 years of age as returned at the Census of 1881. But the figures are perhaps the least satisfactory of all the Census statistics, for reason explained in the Census Report; and they must be taken subject to limitations which are given in some detail in Part II, Chapter VIII of the same Report. The figures in Table No. XXIII refer only to the population of 15 years of age and over. The figures in the margin show the distribution of the whole population

Occupations of the
people.

Population.	Towns.	Villages.
Agricultural ..	16,916	314,880
Non-agricultural ..	61,412	229,413
Total ..	78,328	544,293

into agricultural and non-agricultural, calculated on the assumption that the number of women and children dependent upon each male of over 15 years of age is the same, whatever his occupation. These figures, however, include as agricultural only such part of the population as are agriculturists pure and simple; and exclude not only the considerable number who combine agriculture with other occupations, but also the much larger number who depend in great measure for their livelihood upon the yield of agricultural operations. More detailed figures for the occupations of both males and females will be found at pages 69 to 78 of Table No. XIIA, and in Table No. XIIB of the Census Report of 1881.

The following sketch of agricultural occupations is taken from the District Census Report of 1881. More detailed information will be found in the Section on Tenures (Chapter III Section E.)

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Occupations,
Industries and
Commerce.Agricultural occupa-
tions.

“The agricultural system is that of a peasant proprietary, supplemented by a tenantry of about $\frac{1}{4}$ of the numbers of the proprietors, and differing in no material degree from them either in position, resources, or the extent of their holdings. Paying rent is not absolutely unknown, but it is rare; and the rent when it exists is not often a rack rent unless when taken in kind. The great majority of the tenants are of the same caste and even near relations of the proprietors. The more important exceptions are the tenants of the Skinner estate, the Saiyads of Barsat and Faridpur, the Shekhs, Patháns, Ansáris, and Rájputs of Pánipat, and of Mahájans and Kayeths wherever they hold land. I have distributed the agricultural castes which contain nearly all the owners of land into 4 classes. First there are the Játs, Rors, Rains, Gaddís, Málís, who are by far the most skilful cultivators, and spare no labour and care to ensure success. Their whole families are devoted to the work. Their women take part in every agricultural operation save ploughing and tending the sugar-mill. As a rule, they cultivate their own land in addition to a good deal of their neighbours', and they very rarely employ *sánjis* or *kámerás*. If they cannot cultivate all their own land, they usually make it over to a member of the brotherhood without asking any rent save the Government revenue. Next come Tagás, Gújars and Bráhmans, who are not indeed above work, but want energy, perseverance and skill. They have often larger holdings than they can manage, and they frequently take *sánjis* to assist them. Their women and children give but little assistance. Perhaps they may take food to those labouring in the fields, gather cotton, and the like. In the third place comes the Rájput who is above labour and slothful. He cultivates a large holding very badly, or makes over as much of it as he can to *sánjis* and hired servants.

“Last of all come the Skinner estate, Shekhs, Ansáris and others—Patháns, Mughals, Saiyads, Mahájans, who do not think of cultivating themselves, but let their lands to tenants, taking a share of the produce, or a rent in kind or in money. A number of persons of miscellaneous castes also own or cultivate land, and they are on an equality with the second class. Cultivators cultivating for the fourth class, whoever they may be, and cultivators of such castes as Dhobi, Lohár, Juláhá, Lodá, Chamár, Kumbhár, Teli, generally pay rent in one shape or another, while the others are nearly on an equality with the owners. The *sánjis* are of two descriptions, the *ji ká sánji*, who gives his personal labour only, and the *káchwa ká sánji*, who supplies also one of the plough bullocks. The *Kámerás* are boys under 15, who drive the Persian wheel, tend the bullocks and the like, and get Rs. 1 to 2 per mensem, or 20 seers to 1 maund of grain, or they are men fit for any agricultural work who get Rs. 3 to 4 per mensem. The *Gwálá* tends the cattle of a number of persons, taking a rupee a head for male horned cattle, and 8 annas for female.”

Principal industries
and manufactures.

Table No. XXIV gives statistics of the manufactures of the district as they stood in 1881-82. The only manufactures prosecuted in the villages are weaving in cotton and wool, rope-making, making pottery and bricks, and minor handicrafts, such as the making of baskets and mats. They are all conducted either by the people themselves or by the menials; the latter either providing the finished articles as part of their *begár*, or being paid for their work, almost always in grain. The products are always of the roughest description, and for better finish the people have to go to the towns. Below

are a few notes on some of the principal manufactures. Spinning and weaving are described fully by Mr. Baden-Powel.

The fibres used for rope, in order of excellence, are *sani*, *san*, *múnj dáb*, and *khajár*, the preparation of each of which has been described under the head of the plant from which it is obtained. The villagers make all their ropes themselves. They take the raw fibre (*punja*) and spin it (*batna*) into thick string by rubbing it between the hand, and winding it round cross stick (*dhera*) which they spin round as they gradually form the strand. If the rope is too thick to treat so, two men take it, one by each end, and twist it between them (*antna*); or the following very ingenious spindle (*charkha*) is used. One end of the rope is tied to a stick fixed in the ground, and the other to the end of the spindle. The latter is rotated by a man pulling alternately each end of a string which is wound round it and has its middle passed in a loop round an upper spindle, the two ends being brought round the lower spindle both in the same direction, so that whichever is pulled the spindle turns the same way, the other end slipping loosely round it. If a stranded rope is to be made, two or three strands (*lar*) are taken, tied at one end to a tree, and the strands twisted tightly together (*saletna*) by means of a small stick inserted between them. Thin rope or thick string is called *bán* or *jewari*. It is made of *ménj* or *dáb*, and is used for bedsteads and as string. An ordinary rope is called *jewara*; a very thick rope for carts, *rás* or *dámvas*. These are generally made of *sani*. The *mál* and *láo* are made of strands as above; but three small strands (*tanda*) are first twisted into a *ladda*, and two *laddás* into a *mál*, or three into a *láo*.

The potter seeks for the stiffest clay he can find, beats it, chops it up, works it well with sand and water, and makes it into rolls (*pindi*). He has a wheel (*chák*) made of clay, with a heavy rim hanging down below it so as to keep the centre of gravity low. This rests on a wooden bearing called *khili* or *távla* and is spun by a stick (*chagreti*) inserted in a groove (*gulli*) near the edge. The roll of clay is put on the centre, and hollowed out and shaped between a flat wooden dubber (*thápa*) with which it is pressed outside, and a piece of clay of the shape of an inking pad (*kuneri*) held inside and opposite it to give a firm resistance. Water is sprinkled on with a dab of cloth called a *parola*. The finished vessel is cut off with a string called *chíwan*. It is ornamented with stripes (*chitta*) or gashes, and set to dry. The kiln (*áva*) is made by building up three sides with bricks. In the back of this the vessels are piled up one on top of another (*jet'h*) with dung-cakes filled in between. The whole thing is then covered up with shards mixed in among straw and refuse, and a little earth on top. It is lighted from below, and burns for two or three days. No attempt is made to regulate the fire, except by the distribution of the fuel in the first instance.

The people make their own unburnt bricks for themselves. They dig the clay from the tank, work it up with water into *tagár* spread it out into a layer of the required thickness, divide it into bricks by two sets of cuts crossing each other at right angles, and allow them to dry in the sun. If they are to be burnt, the potter

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takes a contract at some Rs. 30 to Rs. 40 per *lakh*. He moulds them in a small mould, ranges them in stacks to dry, and bakes them piled up in a brick kiln (*pasāwa*) just as he does earthen vessels, with manure and refuse.

In the city of Karnál several handicrafts are carried to great perfection, being relics of the days of the old cantonments. Especially it is famous for its shoe-making, many thousands of boots being sent from it to regiments all over the country. The city of Pánípat is famous for the manufacture of copper and brass vessels and of skin jars (*kípa*) for holding *ghí* and oil, and exports them in considerable numbers. There is also a glass foundry, the operations at which are fully described by Mr. Baden-Powel at pages 237f of his Panjáb Manufactures.

Mr. Lockwood Kipling, Principal of the Lahore School of Art, has kindly furnished the following note on some of the special industries of the district :—

Trinkets.

“Pánípat in this district has long been noted for small wares in metal of various kinds. A peculiar kind of bead-like ornament, known as *motis* or pearls, skilfully made in thin silver is one of the specialities of the place. A necklace of six rows costs about Rs. 30, of threerows about Rs. 10. There is no chasing or ornament of any kind, but the silver is a good colour and the beads are perfectly round. Captain Roberts reported in 1882 that this small industry is declining. Betel-nut cutters (*sarotas*) are here made in fanciful forms, the handles being of brass with quaint projections, in which small mirrors and pieces of coloured glass are fixed. A good one costs two or three rupees. Scissors are similarly ornamented; the handles being made of brass with bits of coloured glass rudely simulating jewels set therein. A pair of scissors costs about 6 annas. These articles are made for export.

Fabrics.

“The fabrics produced in the district are of no special interest. The Internal trade report for 1881-82, says that blankets of the ordinary native description are largely exported to other districts; and that the Kaithal *chautahí*, a cotton-cloth with its borders, red or blue is exported towards Patialá and the Panjáb.

Glass-blowing.

“Karnál itself has long had a name for glass blowing. The silvered globes of thin glass, which, when broken up are used for mirror-worked, walls and also sewn into *phulkáris*, are invariably said to come from Karnál. In the descriptive catalogue of the Panjáb contributions to the Calcutta Exhibition 1883-84 Mr. Baden-Powel writes:—“In Karnál rude globes are made for ornaments, the inside being silvered with quick-silver and tin-foil; the large aperture necessary for the manipulation is awkwardly covered with *ozidue*. The Karnál glass-makers also prepare the large, thin, pear-shaped glass retorts or carboys, in which the native manufacture of salammoniac (*naushadar*) is effected. It would be interesting to know whether this slender manufacture is a survival of more important works carried on in either Hindu or Mughal times. There has never apparently been any lack of small phials for *attar* of roses and similar articles blown at one operation; but few examples of more substantial forms survive.

“Major Cole, R. E., shewed at one of the Simla Art Exhibitions a glass *guláb-pásh* and a *hukka* bowl found at the Muhammadan capital Bijapur—(Bombay). These he described as probably of the 16th century and “as rare examples of how glass was formerly used by Native Kings and Chiefs.” They are so exceedingly rare and abnormal, that it appears doubtful whether glass

was used at all by Native Kings and Chiefs in this part of India. To judge by the photographs, these vessels are of thick, white glass, cut or moulded in a hexagonal diaper pattern with fluted necks, all it must be admitted of Indian design. Nothing could be more unlike the thin, horn like glass of modern make, grey in colour and full of air bubbles. It has often been remarked that in this country there is abundance of material for glass making, and certainly there is no lack of soda. Flint sand is also to be had, nor are lead or borax prohibitively dear. But the difficulty in this as in so many industries is the lack of fuel. It would probably be cheaper to carry such glass making materials as are to be found, in the Punjab to the hearths of Staffordshire and bring them back made up into glass than to attempt the manufacture on a large scale here. Nor is there any use for glass in the native scheme of life, except to contain *attars*. At all Punjab fairs one of the most popular toys is a glass tube terminating at each end in a bulb and enclosing a small quantity of water. The tube is narrowed in the centre by a ring of thread, and the slow procession of air bubbles that ensues on reversing the tube is the point and interest of the toy. Not one in fifty of these brittle tubes survives the journey home; but this, with bangles and rings are the only uses to which this beautiful material is put."

There are no statistics available for the general trade of the district. The exports and imports of food-grains have already been noticed at page 185. There is no material available such as would render it possible to give anything like a complete view of the trade of the district. But a slight sketch of its general course will be interesting; and as a foundation for it, an abstract of the customs returns for the trade passing east and west through the Pánipat district in 1832-33 may be attempted. At that time that trade north and south went chiefly *viâ* Hānsi-Hissār, and not through Karnal, excepting salt, which passed up from Jhajjar through Karnal to the Panjáb in great quantities:—

Trade passing into the Doab.

Goods.	Maunds.	Customs dues in rupees.
		Rs.
Oil seeds ...	58,616	8,794
Cotton ...	20,520	10,260
Salt ...	65,107	90,057
Salammoniac ...	2,583	2,067
Iron ...	4,766	3,400
Timber ...	"	5,200
Wool ...	641	481
Miscellaneous ...		3,008
	...	1,23,261

Trade coming from the Doab.

Sugar ...	2,75,017	87,082
Gur ...	2,42,546	24,554
Cloth ...	167,880 pcs.	5,183
Leather ...	...	1,502
Safflower ...	3,248	2,820
Miscellaneous	3,580
		1,24,721

Ghi is not mentioned, and probably did not pay duty.

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and Measures,
and Communi-
cations.Course and nature of
trade.

The course of trade thus indicated has been entirely changed by the construction of the Railway and Grand Trunk Road, the mass of the external traffic now passing down these two arteries, the former being used for long distances, while the latter is still preferred for short ones. The only really important traffic east and west is that which flows to the great sugar mart of Shámli in the Muzaffarnagar district, the carts generally taking salt there from Bhiwáni, or *bájra*, *moth*, oilseeds and *ghí* from the highlands, and bringing away *gur*. The Khádar and canal portions of the tract produce a surplus of wheat, cotton, gram, and fine rice for export, and import salt, *bájra*, oil, and oilseeds, iron and piece-goods. The Nardak exports *ghí*, hides, wool, and in a good year large quantities of gram; and imports the same things as the rest of the district, with the addition of sugar.

The local trade is principally conducted through the village *baniás* who deal with the larger traders at the three marts of Kaithal, Karnál and Pánipat, the last of which towns lies on the direct road to Shámli. But it is surprising how very considerable a trade is locally conducted by the villagers themselves, and especially by Játs from Rohtak. These people in the hot weather, when the bullocks would otherwise be idle, start with their carts, bring salt from Bhiwáni or *bájra* and *moth* from Hánsi and Hissár, exchange it for *gur* or cotton in the villages, take this up into the highlands and exchange it for gram, and finally sell the gram at Karnál or Pánipat, either buying sugar to take back, or carrying piece-goods, &c., for hire. So, too, men from Kaithal and Patiálá will bring down gram or *ghí* on pack buffaloes, cross into the Doáb where they buy oil or oilseeds, and return and exchange them for *gur* to take home. And the Dehli traders often send up agents for cotton or *ghí* in the villages, and bring it direct to Dehli. This local traffic is of immense advantage to the people, as they deal direct with the carters instead of with the local *baniá*, and always get a better price than he would give. When the people of the tract themselves engage in similar operations, of course the profit is still greater. But this is not often the case, as in irrigated tracts the bullocks are seldom at leisure.

Such *gur* as is not absorbed in this manner goes to Shámli, the cotton and wheat to Dehli and Ambála, and the *ghí* and hides to Dehli. Oil and oilseeds come from the Panjáb and the Doáb; *til* and *sarsam* from the former, *arhar* and *tára míra* from the latter. Timber comes from Ambála, iron and piece-goods from Dehli, salt from Bhiwáni, Dehli or Ambála. The petty articles needed by the people and not produced in the villages are supplied by small hawkers, who buy them in the cities and travel about the villages, exchanging them for grain. Gangs of travelling blacksmiths, too, are not uncommon, who do finer work than the village blacksmith can attain to.

SECTION D.—PRICES, WEIGHTS AND MEASURES,
AND COMMUNICATIONS.

Prices, wages, rent-
rates, interest.

The village prices of the chief agricultural staples used for the conversion of produce estimates into money at Mr. Ibbetson's Settle-

ment of 1880 are shown below. They are based upon the average prices of the 20 years ending with 1874, prices of certain staples being excluded, in the calculations of the Nardak averages, for those years in which these staples were not produced because of drought. Table No. XXVI gives the retail *bazār* prices of commodities for the last twenty years. The wages of labour are shown in Table No. XXVII, and rent-rates in Table No. XXI; but both sets of figures are probably of doubtful value:—

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Prices, Weights
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cations.

Prices, wages, rent-
rates, interest.

Staple.	Nardak.	Karnal Khādar.	Karnal Bāngar.	Pānīpat Khādar.	Pānīpat Bāngar.
Cotton	13	12	12	11	12
Gur	...	18	18	18	18
Maize	43	36	37	35	...
Fine rice	41	35	36	35	34
Coarse rice	48	45	44	...	...
Juār	42	35	36	35	35
Btjra	35	29	29	29	29
Moth	39	34	34	34	34
Wheat	32	31	30	29	29
Gram	49	38	39	38	37
Barley	...	43	44	...	43
Wheat and gram	45	37	37	35	35
Barley and gram	50	42	43	...	40
Masīr	...	40	...	...	...

The figures of Table No. XXXII give the average values of

Period.	Sale.	Mortgage.
1868-69 to 1873-74	14-13	18-12
1874-75 to 1877-78	15-6	12-4
1878-79 to 1881-82	24-3	20-9

land in rupees per acre shown in the margin, for sale and mortgage; but the quality of land varies so enormously and the value returned is so often fictitious, that but little reliance can be placed upon the figures.

Mr. Ibbetson thus discusses the history of prices in Karnal:—

Changes in the value
of agricultural pro-
duce.

“The prices of agricultural produce which ruled in the villages between 1830 and 1874 have been obtained from the *banīds'* books in the manner already described, and are summarised in the following table, which shows average prices in seers per rupee in the Pānīpat *tahsil*. The table at pages 199 and 200 give the details:—

Period.	Cotton.	Gur.	Maize.	Rice.	Juār.	Wheat.	Gram.	Barley.
1830 to 1834	16	21	67	53	68	45	58	46
1835 to 1839	16	18	43	42	42	31	45	45
1840 to 1844	18	21	42	33	38	34	39	45
1845 to 1849	18	20	43	38	39	33	39	44
1850 to 1854	21	24	52	37	55	41	50	58
1855 to 1859	16	21	55	43	50	40	58	62
1860 to 1864	10	16	31	33	32	23	34	40
1864 to 1869	9	16	27	27	23	22	27	31
1870 to 1874	11	16	31	31	32	25	31	37

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duce.

“Special circumstances have combined to render the rise in prices, which has been so general all over India, somewhat less marked in this district than elsewhere. The large frontier cantonment which was kept up for so many years at Karnál created a local demand which its transfer to Ambálá did not much diminish; and the populous city of Delhi is so near that the metalling of the Grand Trunk Road, always a good one, which was done about 1863, did not affect prices so much as new communications would do in an isolated tract. The same thing may be said of the great mart of Shámli, to which the present road existed before last Settlement, though doubtless it is better now than then. Another cause which tended to keep prices up was the immediate proximity of the arid tracts of Hariáná and the Bágar, the normal state of which appears to be scanty rain relieved by frequent droughts. The influence of this cause is often noted in the early correspondence; but the extended use of canal water in these tracts has lately tended to equalise the local supply with the demand.

“The prices tell their own tale. The first five-yearly period is marked by the famine of 1833; the second by the drought of 1837-38. In the third, during which the Settlement was made, the rain-fall was somewhat scanty throughout; but the prices may probably be taken as the normal rates of the time, as they tally with those of the preceding period, and for the next five years remain almost unaltered, although the seasons were favourable. The supplies needed by the army operating in the Panjáb between 1845 and 1847 were largely drawn from this neighbourhood. The fifth period, from 1850 to 1855, is marked by a sudden and extensive fall in all prices, which continued to 1858; and this must, I fancy, have been owing to the opening out of the Panjáb, and to its surplus stuffs pouring into a market from which no railway existed to carry them away. The famine of 1859-60 only introduced the cotton famine, which began in 1861 and continued for five years, during which time it is estimated that £63,000,000 sterling of silver was poured into Bombay. This enormous addition to the circulation of the country drove up prices with a rush, and before equilibrium had been restored, the introduction of steam carriage from Dehli threw open the markets of the world to India, and perpetuated the high level which had been reached.

“The famine of 1869 created a temporary disturbance, but for the last five years the seasons have been fair, the opening of the Panjáb railway in 1870 has completed the connection between Lahore and Bombay, and prices have stood with an extraordinary steadiness at what may be considered their normal rates. Since then the drought of 1877-80 has again raised prices considerably; but the rise is probably only temporary. Taking the periods from 1840 to 1845 and from 1870 to 1875 as giving normal rates for last Settlement and for the present time, which I think we may fairly do, we find the rise in prices to be as follows:—

		Wheat.	Craun.	Barley.	Jandér.	Rice.	Cotton.	Maize.	Cur.
Settlement rates	...	100	100	100	100	100	100	100	100
Present rates	...	136	126	121	119	106	163	135	131

And the general result may be said to be that prices have risen by about one quarter.

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duce.

YEAR.	Cotton.	Gur.	Maize.	Fine rice.	Jandir.	Wheat.	Barley.	Gram.
1830	45	...	62
1831	15	23	75	...	64	56	...	82
1832	16	24	55	42	59	42	56	56
1833	14	17	...	...	...	29	37	28
1834	20	22	70	65	80	51	...	62
1835	18	15	67	60	69	44	...	68
1836	17	20	60	...	...	38	...	59
1837	14	15	26	...	...	25	...	35
1838	16	18	35	26	33	26	...	33
1839	16	20	25	30	25	24	45	27
1840	17	20	25	20	24	23	36	32
1841	20	18	48	33	45	35	41	35
1842	18	19	38	37	36	35	43	38
1843	20	27	57	36	50	41	62	47
1844	17	22	40	33	36	32	42	42
1845	20	22	46	38	40	28	35	34
1846	23	14	40	38	36	30	47	35
1847	19	17	46	42	41	38	46	42
1848	13	22	31	35	30	31	45	39
1849	14	25	50	37	50	36	47	43
1850	18	28	54	38	51	49	78	62
1851	18	22	53	36	53	32	44	42
1852	26	23	57	34	53	38	52	47
1853	23	22	36	35	37	35	49	39
1854	22	27	60	42	80	50	65	62
1855	20	26	65	44	58	46	60	54
1856	17	20	53	49	55	45	75	72
1857	18	22	76	50	56	42	66	73
1858	12	20	41	37	42	40	59	60
1859	12	18	40	34	40	27	39	30
1860	11	13	13	18	12	15	18	18
1861	16	13	29	32	29	32	44	34
1862	11	18	48	47	49	39	54	47
1863	5	17	35	37	37	31	47	40
1864	6	18	31	30	32	25	37	32
1865	9	22	35	31	35	27	41	36
1866	11	16	28	27	29	23	33	30
1867	13	14	36	32	38	26	35	30
1868	7	10	12	23	16	16	21	20
1869	6	16	21	20	23	16	23	19
1870	9	16	31	33	31	26	36	28
1871	10	15	31	30	32	24	33	25
1872	12	15	30	32	32	26	40	36
1873	12	15	30	29	32	23	37	32
1874	12	19	32	29	32	26	38	33

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Ruling Prices in Karnal Nardak in seers per rupee.

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duce.

YEAR.	Cotton.	Maize.	Fine rice.	Coarse rice.	Jand.	Bajra.	Moth.	Wheat.	Gram.	Barley.
1855 ...	22	69	51	65	60	45	59	50	70	65
1856 ...	18	48	53	65	56	50	50	38	70	70
1857 ...	16	68	53	75	62	40	74	46	76	70
1858 ...	...	...	...	...	...	...	...	42	71	69
1859 ...	...	...	...	...	...	...	...	...	33	...
1860 ...	...	...	...	...	...	...	...	...	...	...
1861 ...	20	30	37	40	30	28	28	24	...	...
1862 ...	11	44	46	56	43	38	38	40	48	63
1863 ...	6	50	49	48	38	35	36	36	42	60
1864 ...	...	...	...	43	...	...	...	26	...	...
1865 ...	11	40	30	...	35	30	26	26	40	39
1866 ...	...	...	...	34	...	...	...	23	...	...
1867 ...	14	36	34	39	37	34	28	25	32	...
1868 ...	...	...	...	...	...	...	...	...	...	...
1869 ...	...	...	...	...	...	...	...	...	...	...
1870 ...	10	39	35	42	42	30	29	29	...	37
1871 ...	...	...	...	40	...	...	...	25	...	36
1872 ...	10	30	34	40	32	31	31	28	35	40
1873 ...	11	30	33	40	32	27	35	24	35	36
1874 ...	11	32	34	40	32	28	32	26	33	32
Average ...	13	43	41	48	42	35	39	32	49	52

NOTE.—The years for which the price of any staple is not shown are the years in which that staple was not produced in the Nardak, owing to drought.

Weights and mea-
sures.

The weights and measures of the district are divided into *kachchu* and *pakka*; the latter being the standard measures in which Government returns and records are prepared, the former, the measures used by the people in their daily life. Close to the towns the villagers often use *pakka* weights and measures; towards the Rohtak border they always use *pakka* weights and *kachcha* measures; in the rest of the tract both are always *kachcha*. But prices are always quoted in *pakka* weights. Thus when a villager says his field produces three maunds a *bigah*, and grain is 30 seers per rupee, the maund and *bigah* are *kachcha*, the seers *pakka*.

The weights used are as follows, the *pakka* weight being always double the *kachcha* weight of the same name:—

I.	
5 totals =	1 chitank <i>pakka</i>
20 " =	4 " " = 1 pao' <i>pakka</i>
80 " =	16 " " = 4 " " = 1 seer <i>pakka</i>
3,200 " =	640 " " = 160 " " = 40 " " = 1 maund <i>pakka</i> (=82·3 lbs.)
II.	
4 pao' <i>kachcha</i> =	1 seer <i>kachcha</i>
160 " " =	40 " " = 1 maund <i>kachcha</i> = (41·15 lbs.)
III.	
5 seers <i>pakka</i> =	10 seers <i>kachcha</i> = 1 dhari
10 " " =	20 " " = 2 " " = 1 dhaun
60 " " =	120 " " = 12 " " = 6 " " = 1 pând = (123·45 lbs.)

This last is the real village measure, the weights in it alone not varying from *kachcha* to *pakka*. *Dhari* is a thing put down (*darna*); *dhaun* is a thing taken up (*dhavna*). Besides these there are *gahrá*

or as much as can be carried under the arm; and *bhâr*, or as much as can be carried on the head.

The measures of length are as follows, the *kachcha* yard being three quarters the length of the *pakka*, and being always used by the people:—

I.

3	Ungli	=	1	girah			
4	"	=			=	1	muthi
12	"	=	4	"	=	3	" = 1 balisht
24	"	=	8	"	=	6	" = 1 háth
46	"	=	12	"	=	9	" = 3 " = 1 gaz <i>kachcha</i>
38	"	=	16	"	=	12	" = 4 " = 2 " = 1 gaz <i>pakka</i> = (33 inches)

II.

2	Qadams	=	1	gatha	<i>kachcha</i>
23	"	=	10	"	" = 1 jarib <i>kachcha</i> = (31.75 yards)

III.

3	Gaz <i>pakka</i>	=	1	gatha	<i>pakka</i>
60	"	"	=	20	" " = 1 jarib <i>pakka</i> = (55 yards)

The *ungli* is the finger breadth; the *muthi*, the closed fist; the *balisht* the span; *háth*, the cubit, or from the elbow to the finger tips, the *qadam*, the double pacc.

The measures of area are as follows, each *kachcha* measure being one-third of the corresponding *pakka* measure; and the people using *kachcha* measure generally:—

Pakka—

20	sq. <i>gathas</i>	=	1	<i>biswah</i>
400	" " = 1 sq. <i>jarib</i>	=	20	" = ($\frac{2}{3}$ of an acre)

Kachcha—

5	sq. <i>gathas</i>	=	1	<i>biswah</i>
100	" " = 1 sq. <i>jarib</i>	=	20	" = <i>bigah</i> = ($\frac{2}{3}$ of an acre)

The *biswah*, whether *kachcha* or *pakka*, is of course further sub-divided into *biswánsi*, *tiswánsi*, *kachwánsi*, &c., each being one-twentieth of the preceding one. The scales given above are those now used; but the real difference between the *pakka* and *kachcha bigah* is that the former is based upon the *gatha* and the latter on the *qadam* as its unit; each consisting primarily of a square with 20 units for its side.

The measure of area is, as usual, probably derived from a seed measure or *bisi*. It is curious that land paying revenue to Government used in old days to be measured with a shorter chain than land of which the revenue was assigned; and we find this short chain perpetuated throughout the Ambála district and much of the Indrí *parganah*, where the owners do not cultivate themselves, and by the Skinners or similar landlords; the chain used being the *súti* or rope chain, which gives a *kachcha bigah* of only $\frac{5}{8}$ instead of $\frac{2}{3}$ of an acre. This chain is unknown to the villagers of the tract. Up till 1826, in which year the Government introduced the *pakka bigah* of 3,025 square yards, the local *bigah* was the present *kachcha bigah* of 1,008 square yards, which is approximately one-fifth of an acre.

There are no real measures of capacity current in the tract, grain and liquids being sold by weight. The *máup*, used to measure grain, generally holds either a maund or a maund-and-a-quarter; but this is only approximate, and the contents of any particular measure are

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always weighed to ascertain the total weight. A pinch of anything is called *chugli*; a closed handful, *muthi*; and the contents of the two hands put open side by side, *anjlá*.

The figures in the margin show the communications of the district as returned in quinquennial Table No. I of the Administration Report for 1878-79, while Table No. XLVI shows the distances from place to place as authoritatively fixed for the purposes of calculating travel-

ing allowance. Table No. XIX shows the area taken up by Government for communications in the district.

The Jamná river is navigable for country craft throughout its course within the district; but is only little used for the purpose. The old canal is navigable for rafts only, from Badarpur to Hãnsi, and for boats and rafts from Rer to Dehli; the new main line, New Dehli Branch and New Hãnsi Branch, have been designed for navigation for boats 90 feet in length and 16 feet beam, and depth of water 8 to 6 feet, headway 11 feet. The principal traffic on the Jamná river as stated in the Panjáb Famine Report (1879) is shown in Table No. XXV. The mooring places and ferries and the distances between them are shown below, following the downward course of the river:—

River.	Station.	Distances in miles.	REMARKS.
JAMNA--	Chaugáon	...	Ferry and mooring places.
	Kalsora	5	Do. do.
	Dabkauli	5	Do. do.
	Begi	4	Do. do.
	Mirgáhan	10	Boat bridge.
	Sanauli	18	Do.
	Khojgipur	11	Ferry and mooring places.

The table on the opposite page is a list of canal bridges on the new and old canals and their branches with distances in miles calculated from Badarpur.

The district has no Railway, and the Grand Trunk Road passes through it, connecting it with Dehli on one side and Ambála on the other, and is the only metalled road in the district.

The unmetalled roads, so far as they lie in the canal tract, are generally bad, and when they get into the zone of swamps due to the canal, all but impassable, a single cart having but little chance of getting on alone till others come up and the cattle can be doubled. But the Khádar roads, though often heavy with sand, are otherwise good; and those in the highlands are generally admirable. Communications with Rohtak, Hissár and Kaithal are good; but the *netí* or flooded belt bordering the Saruswati and Ghaggar completely cuts off the Patiálá highlands for all wheeled conveyances; and though a road has been made beyond Kaithal towards Patiálá, it requires some further expenditure to develop its usefulness. The Ambála Railway station is 48 miles from Karnál, and the Dehli station 53 miles from Pánipt,

Navigable rivers and canals; ferries, and bridges.

Roads, rest-houses, and encamping-grounds.

No.	Names of bridges.	Distance from Badarpur in miles.	No.	Names of bridges.	Distance from Badarpur in miles.	No.	Names of bridges.	Distance from Badarpur in miles.
	<i>New Main Line.</i>							
1	Indri Regulator	8	14	Dhodpur Bridge	61	3	Jatoul	57
2	Gorgadh	11½	15	Dhindhar Ferry	63	4	Noultha	61
3	Khevi	13	16	Mahrana Syphon	65	5	Dadwari	64
4	Rambha	15		<i>New Hansi Branch.</i>		6	Palri	66
5	Kardh	17	1	Lock at Hansi Head	38	7	Chamrāra	60
6	Uchānā	19	2	Bala Bridge	40		<i>Hansi Branch.</i>	
7	Karnāl	22	3	Mor Majra Lock and fall	42	1	Rer Bridge	46
8	Kaithal	23	4	Bhuslan Bridge	45	2	Dharām Goth Bridge	51
9	Ghogripur	26	5	Dhohat Bridge on old Hansi canal	46	3	Shera Bridge	53
10	Baroutā	28		<i>Butana Branch.</i>		4	Madkouda Bridge	56
11	Jani	30	1	Butana Head	46	5	Joshi Bridge	58
12	Gogsina	30	2	Bridge No. 50	51		<i>Rohtak Branch.</i>	
13	Manak Bifurcation	34	3	Do. No. 90	53	1	Narah Bridge	60
	<i>New Delhi Branch Division.</i>		4	Do. No. 119	55	2	Adhiana Bridge	62
			5	Do. No. 150	57	3	Alupur	64
1	Dehli Branch Regulator	38		<i>Old Canal.</i>		4	Ahar	67
2	Rer Bridge	39	1	Indri suspension bridge	9	5	Karana	70
3	Rer Escape Head	41	2	Budha Khera Bridge	25		<i>Ballah Branch.</i>	
4	Bahuli Bridge	43	3	Karnāl Cantonment	27½	1	Ballah Canal Head	45
5	Satana Ferry	45	4	Do. City	29	2	Munak Bridge	46
6	Kabri Bridge	48	5	Gharounda	33	3	Do. do. No. 2	47
7	Pānpat & Allupur Road Bridge	50	6	Phurlak	38	4	Rer Wala Bridge	48
8	Do. & Jatoul do.	51	7	Rapur	41	5	Ballah Bridge	51
9	Binjaul Lock Bridge and Fall...	52	8	Rer	48	6	Goi Bridge	52
10	Mahrānā Ferry	53		<i>Bridge on old Delhi canal.</i>		7	Ram Wala Bridge	53
11	Harkari Bridge	54	1	Bahuli	50			
12	Bursham Bridge	57	2	Khukrana	54			
13	Naraina do.	59						

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List of Canal
bridges.

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Roads, rest-houses,
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the road being metalled throughout. Jagádhrí is the nearest station, being barely 40 miles from Karnál; but unfortunately the road, otherwise a good one, runs along the crest of the Khádar, and is so cut up by drainage from the Bángar as to be almost useless.

The village roads are in the highly-cultivated parts unspeakably bad. They are exceedingly narrow; and the banks which protect the cultivation being dug from the soil of the road, they become veritable sloughs in the rains; while in the canal tract the frequency of standing water, the want of bridges, and the slipperiness of the salt-impregnated soil when damped by a shower, makes the road always difficult and often almost impassable, and carriage throughout the tract infinitely laborious.

The following table shows the principal roads of the district, together with the halting places on them and the conveniences for travellers to be found at each:—

Route.	Halting places.	Distance in miles.	REMARKS.
GRAND TRUNK ROAD, METALLED.	Samalká ...	...	Encamping ground, <i>Sarai</i> , Police Rest-house, and Road Bungalow.
	Pánipat ...	10	Encamping ground, <i>Sarai</i> , Police and District Rest house, and Road Bungalow.
	Gharaundá ...	10	Encamping ground, <i>Sarai</i> , Police Rest-house, and Road Bungalow.
	Karnál ...	10	Encamping ground, <i>Sarai</i> , Dak Bungalow, Road Bungalow and Canal Bungalow.
	Butana ...	13	Encamping ground, <i>Sarai</i> , Police Rest-house, and Road Bungalow.
KARNAL AND KAITHAL, UNMETALLED.	Nisang ...	14	<i>Sarai</i> , Police Rest-house.
	Púndri ...	14	Ditto. Ditto.
	Kaithal ...	10	<i>Sarai</i> , District and Police Rest-house. This is a double road for light and heavy traffic.
PANIPAT AND KAITHAL, UNMETALLED.	Rajaundh ...	15	Police rest-house.
	Asandh ...	8	Ditto.
	Khukrana ...	22	Canal <i>Chauki</i> .
	Pánipat ...	4	Encamping Ground, <i>Sarai</i> , District and Police rest-house, Road bungalow. A double road, for light and heavy traffic.
KAITHAL TO- WARDS PARTALA, UNMETALLED.	Síwan ...	6	} This road runs towards the Ghagar river.
	Chíka ...	12	
	Arnowli ...	10	
KARNAL TOWARDS HANSI, UNMETALLED.	Jani ...	8	Canal bungalow 1½ mile from road.
	Munak ...	8	} Canal bungalow between Munak and Rer one mile from road.
	Rer ...	1	
	Jidh boundary	7	Nil.

Route	Halting places.	Distance in miles.	Remarks.
PANIPAT TOWARDS ROHTAK, UNMETALLED.	Israna ...	12	Canal <i>Chauki</i>
	Rohtak boundry	5	Nil
PANIPAT TO ALUPUR UNMETALLED.	Allupur	13	Police Rest-house
KARNAL TO WARDS JAGADHRI, 3 MILES, 14 UNMETALLED.	Indri ...	13	Canal <i>Chauki</i>
INDRI TO WARDS TANA- NESAR UNMETALLED.	Pipli ...	10	Encamping-ground, <i>Sarai</i> , Police rest-house, road Bungalow.
INDRI TO BUTANA, UNMETALLED.	Butana ...	8	Ditto. ditto. ditto.
RAJAUUNDH TO PUNDRI, UNMETALLED.	Pundri ...	13	<i>Sarai</i> , Police Rest-house.
MUNAK AND PUNDEL, UNMETALLED.	Pundri ...	19	Ditto.
NISANG TO MUNAK UNMETALLED.	Munak ...	13	Police rest-house at Nisang ; canal bungalow at Munak.
ALUPUR TO NAULTHA UNMETALLED.	Alupur ...	8	Police rest-house.

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Roads, rest-houses, and encamping-grounds

There are also unmetalled roads from—

	Miles.
Kaithal towards Pehowa	12
Do. „ Thanesar	8
Do. „ Jind	21
Karnal „ *Sabaranpur	11

* Part metalled.

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					Miles.
Karnál	towards	Asandh	26
Do.	"	Meerut	6
Do.	"	Firozpur	21
Pánípat	"	Sanauli	10
Indrí	"	*Karnál	...	...	17
Do.	"	Thánesar	...	...	8
Do.	"	Butána	...	...	8
Pánípat	"	Safídon	...	...	15
Do.	"	Nísang	...	...	26
Indrí	"	Chaugáon	...	...	12

On these there are no fixed halting places.

There is a good unmetalled inspection road available for light wheel traffic along the left bank of the new main line, New Hánsi Branch and New Dehli Branch, and a fair road along the old canal and its branches below the Bádsháhi bridge on the Grand Trunk Road. But the Canal Department do not allow these roads to be used by the public. There are inspection bungalows on the old and new canals, with furniture only; they are situated at Badarpur, 24 miles from Karnál, on the old canal; at Indrí, midway between the old and new canals, 15 miles from Karnál; at Phurlak 12 miles; and at Rer 24 miles below Karnál; also at Isráná, Lohári and Joshí; at Rambá on the new main line, 9 miles from Karnál; Karnál itself on the new main line; Jáni 7 miles from Karnál on the new main line, and Múnak 15 miles from Karnál at the bifurcation.

The Karnál *dák* bungalow is completely furnished and provided with servants. The district and Police rest-houses have furniture, crockery and cooking utensils, but no servants. The canal *chaukis* and road bungalows have furniture only. A horse *dák* and several camel and bullock trains ply along the Grand Trunk Road from Dehli to Ambála.

Post offices.

There are Post Offices with Savings Bank and Money Order Offices at—1, Karnál; 2, Pánípat; 3, Gharaunda; 4, Samalká; 5, Alúpur; 6, Asandh; 7, Nísang; 8, Púndri; 9, Butána; 10, Budláda; 11, Gúhla; 12, Kunjpora; 13, Indrí; 14, Kaithal; and village post offices at—1, Taráori; 2, Barsat; and 3, Naultha.

* Part metalled.