

Department of Agriculture, Bombay.

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INDIGENOUS IMPLEMENTS

OF THE

BOMBAY PRESIDENCY

BY

Rao Saheb G. K. KELKAR,

Acting Deputy Director of Agriculture, Bombay Presidency.



BOMBAY

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PREFACE.

During my College experience as an Assistant Professor of Agriculture at the Agricultural College, Poona, for about 5 years, it has been observed by me that it was very difficult to impress upon the students the various methods of cultivation practised in different parts of the Presidency without giving them a correct idea of the local and indigenous implements in the various tracts. Although this difficulty was partly overcome by the description of implements given by Mr. Mollison in his standard Book on Indian Agriculture, I undertook a survey of the indigenous implements in order to obtain further details. This work of survey was very much facilitated as I was in charge of several districts and had opportunities to see implements personally and talk about them directly with the people concerned.

As a worker in the Agricultural department it has been my experience that foreign implements, though valuable and efficient in certain cases, are not in general so suitable in the present economic condition of the agriculturists, as to replace the indigenous ones, on account of their cost and want of facilities for repair, etc. I have already published a book on useful foreign implements in Maráthi and I thought to have a similar book regarding indigenous implements, so that a student caring to improve upon indigenous implements can have a detailed ready reference. For, I am of opinion that every detailed information on a particular agricultural subject is quite essential before we can suggest any improvement.

Moreover this will serve as a record of the implements used at present as it is likely that some implements might become extinct altogether or may be changed in form. For example, the Khándesh hand gin is becoming practically extinct on account of the introduction of the ginning factories.

In this book I have not made any attempt to discuss the merits and demerits or to suggest any possible improvements in the implements described by me, as a good deal of thorough and exhaustive study and experimental work has to be done before any definite opinion can be formed. Unfortunately I had no time at my disposal to take up this phase of the work.

I am very thankful to various members of the Agricultural Department and others, who have helped me in collecting information for this work. Almost all the photos referred to in this book have been taken by the Departmental Artist Mr. Tilak for which my thanks are due to him.

INDIGENOUS IMPLEMENTS OF THE BOMBAY PRESIDENCY.

INTRODUCTION.

In this book, an attempt has been made to make a general survey of the indigenous implements of the Presidency proper. It is impracticable to make a complete survey of the local implements, as they vary very much in different tracts. There is a saying that दर बारा कोंसार शें ि बदलते, *i.e.*, the cultivation changes at every 12 kos (24 miles). This is quite true, because the nature of the soil, climate and season vary to a considerable extent, even in the two adjoining districts—nay even in some cases in two neighbouring villages. In the Deccan the variation in the soil is so great, that even in one field light, *murmad* and stony, as well as deep, black soil is found.

In North Gujarát, the soil is sandy in nature, and therefore the fields are accessible soon after the rains; but the case is different in Southern Gujarát, where the soil being deep, black and sticky, the fields remain inaccessible for several days after the fall of the showers. The same condition is found along the black soil tracts of Tapti in Khándesh, the Godávri in Nagar and the Krishna in the Belgaum, Bijápúr and Sátára districts. The other soils become accessible soon after the rains, or after a break of about a couple of days.

On account of these variations it is quite natural that the implements of husbandry used in different districts should vary in size, make, angles, design and adjustment, the quality of iron used and the wood utilised to make them.

The variation in the construction of the implements does not depend solely on the nature of the soil, but it also depends on the kind of treatment given to soils by different cultivators for different crops and at different seasons of the year. The plough used in rabi crop preparation is generally smaller than the plough used for ploughing in the fair weather; as the field in former case is usually worked during the breaks in the rain, a smaller implement does efficient work on account of sufficiency of moisture.

Again local custom varies very much in different parts. For example, in West Khándesh, the land is lightly ploughed every year soon after the harvest of *bájri* or *jowári*, but after cotton, the land receives only harrowing. In some places deep ploughing is given to black soils almost every year, and this is specially so in the irrigated lands. Similar differences are noticeable in the case of other implements such as harrows, drills, interculturing implements, tools, carts, etc.

In spite of all these variations, even a general survey as is intended to be made in this book will in my opinion be very useful in comparing the various local practices and introducing the implements of an advanced tract into another where inferior kinds of implements may be in use. Such a record will be further helpful to anyone who intends to modify or improve upon such local implements as may be found defective. It will be seen from what has been written hereafter that the indigenous implements show great variety and ingenuity of adaptation to the varying needs of each locality, and I am of opinion that many of these are at present the most suited to the existing conditions of agriculture.

To facilitate easy reference and comparison of the various types of implements under each class, I have adopted an arrangement by which the types of one class are brought together. In the beginning the general outline of each class of implements and its functions as applied to the Presidency in general are given. This is followed by a summary for the distinct tracts of the Bombay Presidency, such as Gujarát, Deccan, Karnátak and Konkan; and at the end are appended detailed statements giving particulars of each individual type, observed by me, almost all the implements, tools and appliances noted in the statements being illustrated so as to give at a glance a complete perspective of each.

A glossary of vernacular words used in this book and the vernacular names of different parts of implements with English equivalents are given as Appendices G and H.

PLOUGHS.

The indigenous ploughs of the Bombay Presidency may all be said to have been built on almost on the same principle and have evolved from a small hand plough called *kudavana* (Plate XXXIV, No. 4) which is still used in stirring the soil in the most hilly parts of the Presidency such as Konkan and Dangs. The present plough consists of four principal parts (Plate I, No. 1).

1. Body.
2. Beam.
3. Plough share.
4. Stilt.

All the parts but the share are made out of wood of babul, teak, tanach or tiwas, ain, ryan, etc., according to its availability. The share is made of iron and varies in size and shape.

The body and shoe are either in one piece or in two separate pieces. When in one piece it is elbow shaped. The head is always thicker, and the shoe portion tapers to a point, being usually flat at the top and rounded or triangular at the bottom. Into the head piece is mortized the back end of the beam so as to form an acute angle which varies from 28° to 61° , according to the depth of cultivation required. The shape of the beam is either straight or more or less bent, the latter being specially the case in heavy ploughs. In heavy ploughs it is rounded, and in light ones rectangular. The length of the beam varies from 8' to 12'.

The share is fixed on the top of the shoe with its front end projecting forward beyond the point of the shoe and the back end is either directly, or with an intermediate wooden peg, fixed to the lower end of the head. Where the head and the shoe are in two separate pieces, the share with its point projecting more or less is fixed on to the shoe (*chowra*). In the Karnatak, the plough share is nailed on the shoe and does not extend up to the head.

The stilt is again either separate from the head or is in continuation of the body, the latter occurring when the shoe and the head are in separate pieces. When separate, it is fixed on the back end of the beam and behind the head.

The plough is drawn by bullocks in pairs by the attachment of the yoke to the beam. The centre of the yoke is fastened to the beam by ropes either by bracing the whole body or by directly tying the beam to the yoke, the second being common in small ploughs. The rope in the latter case is prevented from slipping by inserting wooden or iron pins or by notches made on the underside of the beam. When more than one pair of bullocks is used, the ropes for subsequent pairs commence from the head.

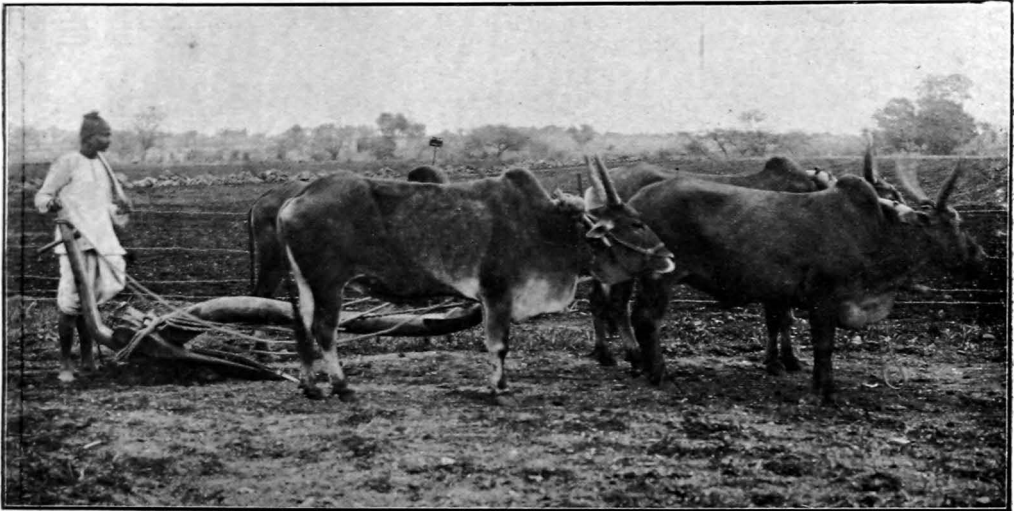
When at work the point penetrates first and then the shoe, thus tearing off the ground in triangular shaped furrows to a depth varying from 2" to 10" and then throwing clods on either side. The weight of the plough varies from 40 lbs. to 200 lbs. and the prices from Rs. 2-4-0 to Rs. 15. Ploughs of heavier description are generally found in stiff and deep soils, whilst the lighter ones are met with in loose and shallow tracts. By ploughing the soil is stirred and pulverized. Thus the soil is exposed to the action of various disintegrating agencies such as wind, water, heat and biological action which help in the preparation of the plant food. Ploughing increases the capacity of the soil to hold more water, eradicates weeds and helps to control fungus diseases and insect pests. The plough is also used, in some places as an interculturing implement, for ridging or making furrows for irrigation and for sowing.

The various types of the ploughs may be divided into four classes according to the following tracts :—

Gujarát, Deccan, Karnátak, Konkan.

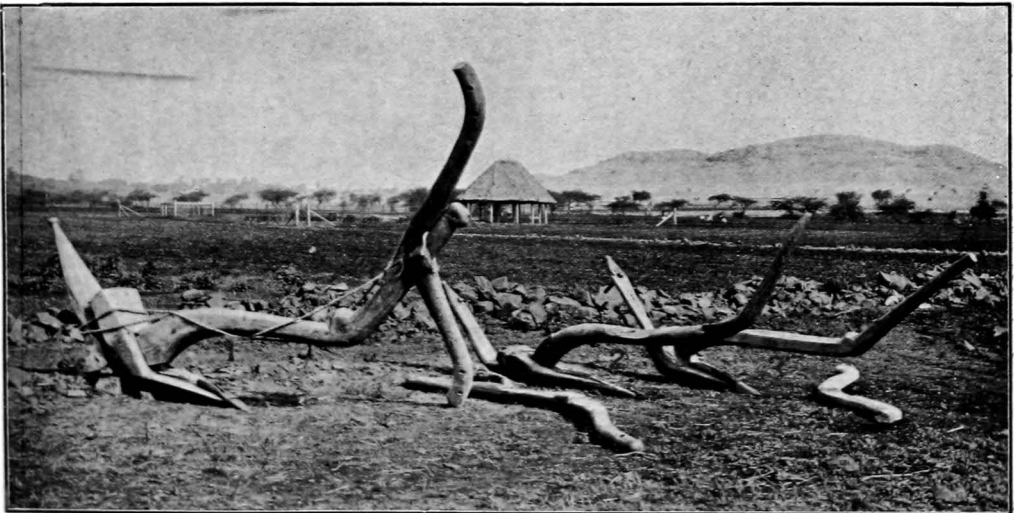
Gujarát ploughs.—The ploughs of Gujarát are lighter in weight comparatively than those of the other parts of the Presidency. Generally Gujarát ploughs are worked with two bullocks. The chief characteristic of these ploughs is that the body and stilt are made out of one piece, whilst the chowra (shoe) is separate (Plate XVI, No. 1) which is the principal wooden wearing part. This part wears out sooner or later according to the nature of the soil. At times in sandy soils two are required in one season. The plough works to a depth of 4 to 6 inches. The depth is adjusted in two ways in Gujarát ploughs—one by shifting the point of attachment of the yoke on the beam forward or backward and the other by means of a wedge fitted above or below the shoe (chowra) adjustment with the body. The inclination which the share makes with the draft pole varies from 33° to 61°. The plough shares are of different sizes—in some they are long square pieces of bar iron, in others they are small pieces attached to the *chowra*. The wood used for these implements is either babul, teak, tanach,

I



Deccan plough.

II



Deccan ploughs with yokes - 1 Sholapur. 2 Poona. 3 Satara.

ryan and sisam. Poles are generally made of tanach, although teak, ryan and babul are found here and there where available. The prices vary from Rs. 2-4-0 in Panch Maháls to Rs. 12 in Surat.

The principal use of the plough is to break the land preparatory to sowing. However in Gujarát it is also used for the last interculturing of jowár, cotton and maize crops. Almost all the rabi sowings in Gujarát are done by means of a plough with a tube attached to it (Plate XVI, No. 3) except in the case of *Bhal* (parts of Dholka and Dhanduka) tracts of Ahmedabad and *bara* lands of Surat and Broach, where it is sown by a two-coultured drill. A very heavy plough is used in the Surat district, for planting sugar-cane (Plate V, No 3).

Deccan ploughs.—The weight of the ploughs varies from 65 lbs. to 180 lbs. and they are worked by two to ten bullocks according to the nature of the soil, the size of the ploughs and the depth required. The inclination between the draft pole and the share varies from 30° to 36°. For general working a small two bullock plough is always used. In Khándesh and Násik only one pair is used. But in Poona, Sátára, Ahmednagar and Sholápur, where the soil is heavy and stiff, two to four pairs are invariably found. The stilt in the Deccan ploughs is quite separate from the body and shoe, which are in one piece (Plate II, No. 1). The length, breadth and the make of the shoe varies very much in different districts. It is shorter and more wedge shaped below in Khándesh and Násik than other tracts, where it is flat, long and narrow. The bend of the beam is more marked in the ploughs of Sholápur, Nagar, Sátára and Poona districts where the practice of yoking more than one pair is found. The plough share varies from a long square bar of iron as in Khándesh and Násik (Plate XVII, No. 2) to a flat spoon shaped piece (Plate II, No. 3) which is always adjusted to the shoe by means of a ring in front. At the back it is adjusted by a wooden wedge. In Khándesh the share extends the whole length of the shoe, which is not the case elsewhere. The depth is regulated by shortening and lengthening of the ropes which always brace the plough. The plough works from 4" to 10" deep.

The first yoke is always single and generally very long, the subsequent yokes being double and short. The wood used is usually babul, though teak is sometimes used for the beam. The prices vary from Rs. 5 to Rs. 20. The ploughs used in the heavy rainfall tracts of Poona, Sátára and Násik bordering the western gháts are on the some pattern as these used in the eastern Desh tracts, only they are very light, weighing about 30 lbs. or less (Plate XXXIV, No. 5).

Karnatic ploughs.—These ploughs have about the same inclination as the Deccan ones. Three kinds of ploughs are found in the Karnatic. The small one, weighing about 50 lbs., is found in rice tracts of Belgaum; medium sized ploughs called *ranti* (Plate III, No. 4) weighing about 80 to 90 lbs., are found everywhere in general cultivation. When the land is to be ploughed for sugarcane or for eradicating deep rooted weeds the heavy plough called *negalu* (Plate III, No. 1) is used, weighing about 200 lbs. This plough requires from 3 to 4 pairs to work it, while the small and medium sized ones are worked by one pair. The plough shares vary in length from 1'-6" to 3'-2". In Belgaum the share is broader and tapering to the point, whereas in Dhárwár it is a square bar of iron with a pointed end. This share is secured to the shoe by a staple. In the case of the light ploughs used for rice, the length of the head piece is the same as that of the shoe, while in the case of *ranti* and *negalu* the shoe is longer by about a foot than the head piece. The stilt has one projection, which fixes itself in the groove, made above the head piece.

In the case of the ordinary plough double yoke is used, unlike the Deccan and Gujarát system where a single yoke is the rule. In the case of heavy ploughs the yokes used are of different lengths. The first one is single and is about 9½' long, while the second and subsequent yokes are double and gradually decrease in length down to 3'-8". The depth of cultivation is regulated by shortening or lengthening the distance between the head and the point of attachment of the yoke on the beam.

The wood used is mostly babul, and matti (ain). The prices vary from Rs. 4 to Rs. 15.

The details regarding all the ploughs are available in Appendix A.

HARROWS.

Harrows come next in importance to ploughs and they are of almost the same type all over the Presidency. The harrow consists of five parts (Plate IV, No. 1).

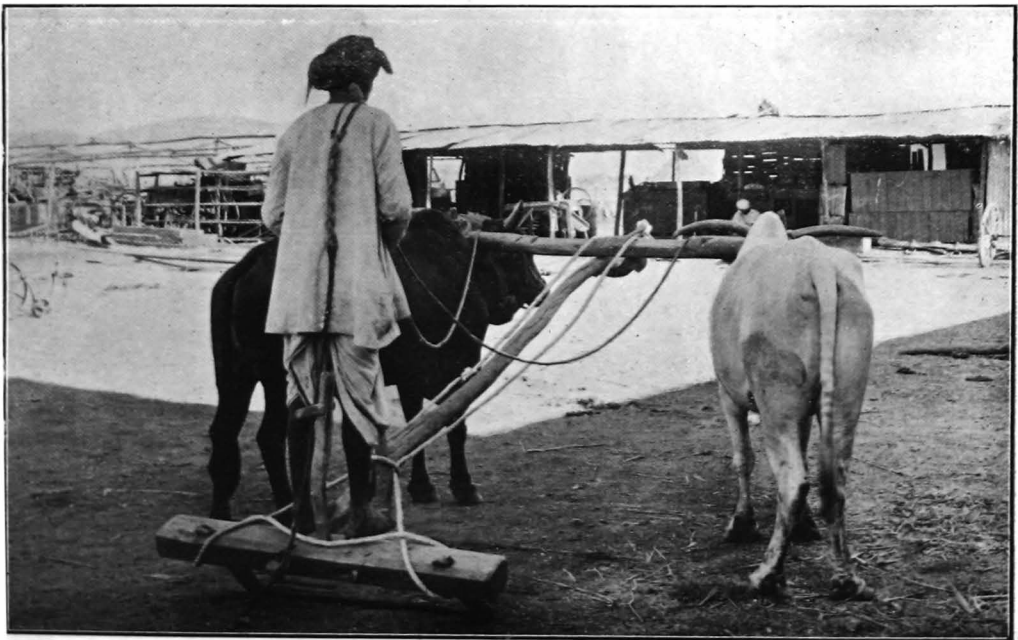
1. The head piece.
2. Prongs.
3. The blade.
4. The pole, and
5. The stilt.

III



Karnatak—1 Negalu (heavy plough). 2 Dabbi Naga (Double yoke). 3 Naga (single yoke).
4 Ranti (light plough).

IV



Deccan harrow.

The head piece is made of babul, tanach or tiwas, sisam, teak, etc. It is either straight, curved or scooped out in the middle. The head piece has two prongs in the front, fixed into it in a slanting direction downwards at an angle of 50° to 60° with the pole. These prongs are made of iron in Gujarát, but in other parts of the Presidency they are made of wood. The blade is made of iron and varies in length, thickness, width and curvature in different tracts. This is the principal working part, which enters the soil. While at work the ends of the blade are inserted into the ends of the prongs and secured by means of rings in the case of wooden prongs. The rings also prevent the wooden portion from wearing out.

The pole is either single, with a short brace or bifurcated. In some cases there are two. The stilt is fixed on the top of the head piece in the centre and this completes the implement.

The harrow is drawn by one, two or even more pairs of bullocks. While working, the head piece and the pole are braced by ropes and then fastened to the yoke. The working depth is adjusted by shortening or lengthening the distance of the pole between the head piece and the point of attachment of the yoke. It is also adjusted by means of wedges put above or below the part of the prong which enters the head piece. When it is intended to work the implement deeper pieces of stones are tied on the head piece. In some cases a man stands on it and this increases the weight. The work done per day varies from 1 to 3 acres and in covering of seed goes up to 5 acres.

In black soil tracts where the plough is only occasionally used the harrow is the principal implement for preparatory tillage. It loosens the surface soil to a depth of 2" to 4" by scarifying the earth:

The weight of the harrow varies from 38 lbs. to 98 lbs. and the prices vary from Rs. 2-8-0 to Rs. 11.

Harrowing is required in addition to ploughing for the formation of a good seed bed. Harrowing breaks the small clods and further pulverizes the soil, and makes it level and thus brings the soil into a favourable condition for the reception and even distribution of seed. It eradicates the surface weeds. It prevents the loss of moisture by making a fine mulch of earth on the surface. It is also useful for covering seeds after sowing. During the rains when the weather permits it is the principal implement for rabi preparation. Harrow is also used for removing stubbles of previous crops, mixing manure, interculturing cotton in Surat and Broach, sowing cotton seeds towards Taloda, Shahada and Chopda (Khándesh) with the attachment of one sowing tube, and for harvesting ground-nuts towards

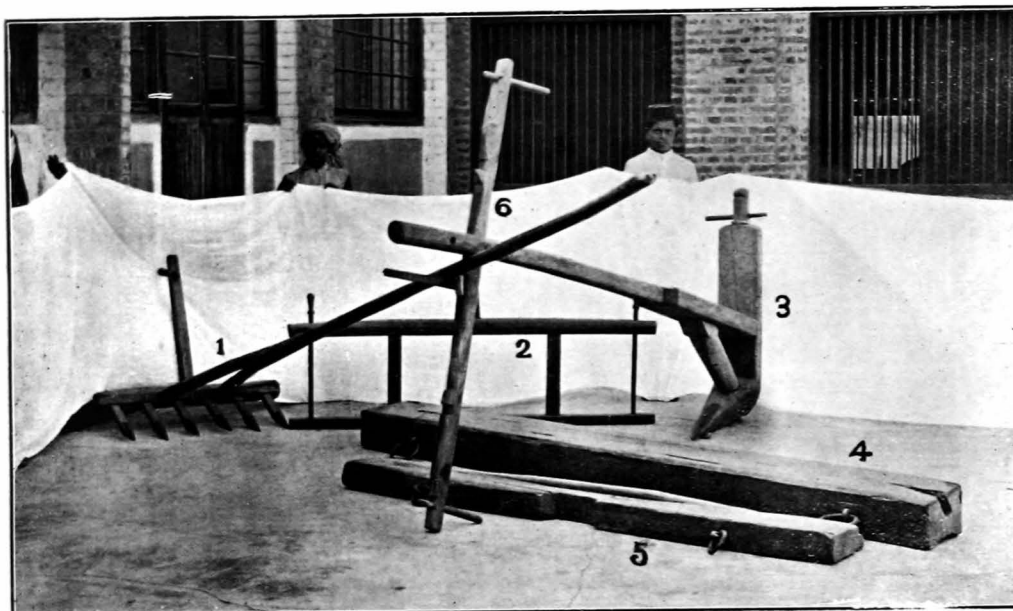
Sátára. It is also used for moving earth and for levelling inequalities by interweaving the space between the two prongs with ropes.

Gujarát harrows.—The harrows are generally of the same type varying only in dimensions, make, length and breadth of the blade in different parts of Gujarát. In the black soil tracts, harrow is the principal cultivating implement. The head piece is made of babul, sisam, ryan or tanach and the poles of teak rafters. The length of the head piece varies from 2' to 4' and it is 4" to 5" thick being either round or square. It is generally straight, but in Surat and Broach, it is scooped out from the middle (Plate VI, No. 5), to facilitate the passing of clods and partly crush them. The length of the prongs from the head piece varies from 9" to 10". The inclination of the prongs is about 50°. The blade varies in length from 18" to 3' and in breadth from 1½" to 3" according to the heavy or light work. The blade is fixed into the prongs which are made of iron and have a tubular receptacle at the front end to receive the ends of the blade. It is either straight or arched as in Broach and Surat. The pole is bifurcated or two poles separately fixed and joined at the yoking point.

Particularly heavy harrows, made of sisam or babul, are found in Viramgám representing Bhal tract of Ahmedabad. These are worked by two men and four bullocks. The same head piece is made to take the longer and shorter blades by boring spare holes in it. The durability of the head piece is increased by several thin iron braces.

Besides these there are two different types of harrows used for special purposes in Kaira, Ahmedabad and Surat. One of these is called *Dantal* (Plate IX, No. 7). It has six tines fixed in a wooden body six inches apart, which are tipped with iron. This implement is specially used for thinning out kodra mixture in Kaira and bájri in Surat district. The other type is called *ghanio* (Plate IX, No. 6). It has 6 to 8 tines which pass through the head piece on the top side of the head. The upper ends of the tines are shorter than the lower ends. These tines are not tipped with iron. It is used for mixing and puddling mud in rice fields before transplanting. Unlike Deccan and Karnatic the harrow is hitched directly to the yoke by means of a loop of rope which goes round the pin on the pole fixed for the purpose.

The harrow is used for all the purposes mentioned in the general description, except for levelling inequalities and sowing. In *vahasil* (fallow) cultivation of Broach this is the only implement used.



Surat Implements—1 Dantal. 2 Chokiu (Double yoke). 3 Nangar (Sugarcane planting plough)
4 Sammar (large clod crusher). 5 Patiu (small clod crusher). 6 Zusari (single yoke).



Broach Implements—1 Karpi or karabdi (Hoe). 2 Dariu. 3 Hal. 4 Single yoke for plough.
5 Karab (harrow). 6 Phavdi. 7 Vakhelu (2 coultered drill). 8 Single yoke for hoes. 9 Tarfen
(3 coultered drill). 10 Dhariu (scythe). 11 Karapdi (weeding hook).

Harrows with shorter blades (18") are used for interculture of cotton in the Broach district when the plants are 8" high and upwards.

In *barra* tract of the Jambusar táluka the head piece of the harrow is made to fit the coulters of a drill and it is then used for sowing wheat.

The weight of the implement (38 lbs. to 68 lbs.) varies according to the nature of the soil—heavier for rabi and lighter for kharif cultivation.

The price of the implement varies from Rs. 2-8-0 in Kaira to Rs. 10 to 11 in Surat and Broach according to its size and kind of materials used.

Deccan harrows.—The head piece of the harrow is generally made of babul wood with teak, tiwas or babul pole. It differs from Gujarát harrow in having wooden prongs with rings at the end for receiving the blade, instead of iron ones and in having a less acute inclination which varies from 52° to 59°. The shape of the head piece varies to some extent in different districts. It is rectangular and straight in most of the districts but is arched with upturned ends in the Nagar district. Harrows may be divided into two classes—heavy (Plate XVII, No. 3) and light (Plate XVII, No. 4). The former works the soil deeper to nearly 4" in depth, whilst the latter is used for covering seed after sowing and for harrowing during the rains. The length of the blade of the heavy harrow varies from 24" to 28" and that of the other varies from 32" to 42". This latter implement is specially light and goes about 2" deep. The yoke is attached generally to the pole by means of a rope which passes through the *kondka* (wooden groove) (Plate IV, No. 1) on which the further end of the pole rests. The work performed by the implement varies very much from one to three acres a day according to the season and soil. Similarly the *dankia pharat* or *rasan* works from 3 to 5 acres a day. In some parts of Khándesh (Sháháda Taloda) the harrow is used for sowing cotton, by attaching a tube on one side, only one line being sown at a time. By working the harrow *didka* (overlapping half) the covering operation is also done hand in hand.

In Khándesh the harrow is in general use for uprooting cotton stalks.

The weight of the heavy harrows varies from 50 lbs. in Khándesh to 70 lbs. in Nagar, whilst the light ones weigh from 45 to 60 lbs. The prices vary from Rs. 3 to Rs. 5-8-0.

A very heavy type of harrow having the head piece 3' long, 10" broad and 5" thick, weighing about 110 lbs., and having a blade 2' long and 3" broad, is used for harvesting groundnut in the Sâtára district.

Karnátak harrows.—The harrows of Karnátak resemble those of the Deccan in most respects. Two principal kinds are found—one is heavy with a comparatively short blade. The blade is about 33" long and 3½" broad. This is called *harguv kunti* and is used for preparation of land in the hot and cold weather. The weight of harrow varies from 60 to 78 lbs.

The lighter harrow called *balesal kunti* has a narrower, thinner and longer blade and is used for covering seed as well as for working the land after the commencement of the rains. The weight of this implement varies from 48 to 55 lbs.

A small but rather heavy harrow weighing about 55 lbs. is used for stirring and removing jowár stubbles. It is called *kir kunti*.

Another harrow called *dodd kunti* is used for harvesting groundnut. It weighs about 98 lbs. and is a strong and stout implement. The blade is 2' 4" long, 3" broad and about an inch thick.

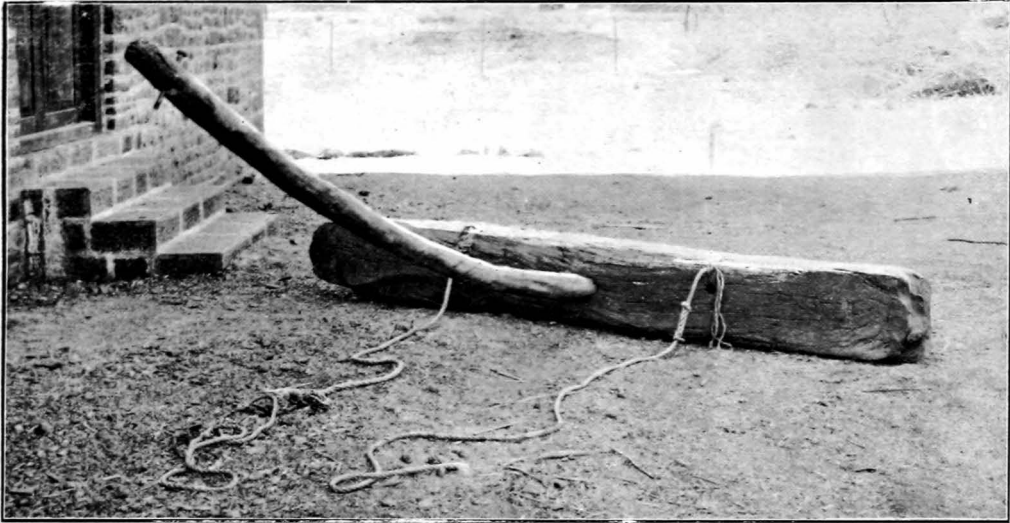
The work performed by the harrow varies according to the season. It works about an acre in the hot weather and about 2 acres during the rains—but when it is used for covering seed, it goes as much as 4 to 5 acres a day.

The statement printed as Appendix B fully details the information regarding harrows.

CLOD CRUSHERS.

In every part of the presidency clod crushers of some form or the other are found. They are generally heavy pieces of wood, half split palms as in *bhata* lands of Narbudda or planks 8 to 10 feet long and 8" to 10" wide called *sammar* in Gujarát. Huge clod crushers are common in Khándesh and Poona district (Plate VII, No. 1). Clod crushers are more common in the Deccan in the irrigated tracts. Where the clods still remain uncrushed, there they are broken by mallets and by the butt ends of *kudali*. They are made of any available wood, such as babul, ryan, mowrah, sadad and nim. In some places they are in one piece and in others two pieces are joined together as in parts of Belgaum and Surat. To hitch the implement for work, either iron rings or wooden pegs are driven in. Ropes are tied to the rings or pegs and the other ends are fastened to the yoke while at work. These are driven by one or more pairs

VII



1 Deccan clod crusher.

VIII



1 Deccan 4 coulter drill. 2 Moghna for sowing a row of subordinate crop.

of bullocks according to the weight of the implement. The weight and price of the crusher vary very much.

Clod crushers break the clods and make the soil finer by pulverizing it. They smoothen the surface of the soil for distribution of finer seeds, and give a certain degree of compactness to soils which are loose, pressing in some of the surface stones and clods which interfere with the sowing operations.

Detailed information regarding clod crushers appears in Appendix C.

SEED DRILLS.

The drills used in this presidency are designed more or less on the same pattern. They may be divided into different classes according to season, crops sown, and the nature of the soil in which they are to be worked. Generally speaking heavy drills are used for *rabi* crops and light ones for *kharif*. The number of coulter in the drill varies from two to four. Two coulters drills are common in deep black soil tracts, three coulters drills in medium and four in light soils. The distances between coulter vary according to the kind of crop sown. Six coulters drills are found only in the rice growing tracts of Karnatak (Plate XXXVI, No. 5). In almost all districts of Gujarát and Khándesh, the plough with a tube attached is used for sowing *rabi* crops, especially in the case of gram, lang, peas, etc. In the Panch Maháls (Jhálod and Dohad) the plough and the tube is the only implement used by Bhils both for *kharif* and *rabi* sowings. In the Deccan and Karnatak cotton is sown through the funnel shaped tubes which are fastened to the head piece of the drill in the rear by means of a rope which is about 4 feet long (Plate XVII, No. 5). As the drill works two women hold these upright tubes in their hands and feed them as the tube runs in the track opened by the coulter. In mixed crop sowing, only one tube is attached and fed and worked as described above.

The drill consists of 6 parts (Plate VIII, No. 1) :—

1. Head piece.
2. Coulters.
3. Tubes.
4. Bowl.
5. Pole.
6. Stilt.

1. The head piece and the coulter are generally made of babul, tanach, tiwas, ryan, etc. This piece gives attachment to all other parts.

2. The coulters have holes about the middle and are fixed into the head piece in a slanting direction, at an angle of 40° to 62° with the pole. In some places, the coulters are shod with iron while in some the iron pieces are detachable and are fixed to the coulters when required. In Khândesh, the iron pieces are specially big. In places where the shallow sowing is desired the iron pieces are altogether removed at the time of sowing.

3. The tubes are usually made of bamboos and are adjusted on the holes of the coulters, inclining upwards to one another till they join in the seed bowl.

4. The seed bowl is usually made of mango, sisam, teak or some other light wood. Sometimes it is round, and at times, it is square in shape. These bowls have 2, 3 or 4 holes corresponding to the number of coulters in the drill.

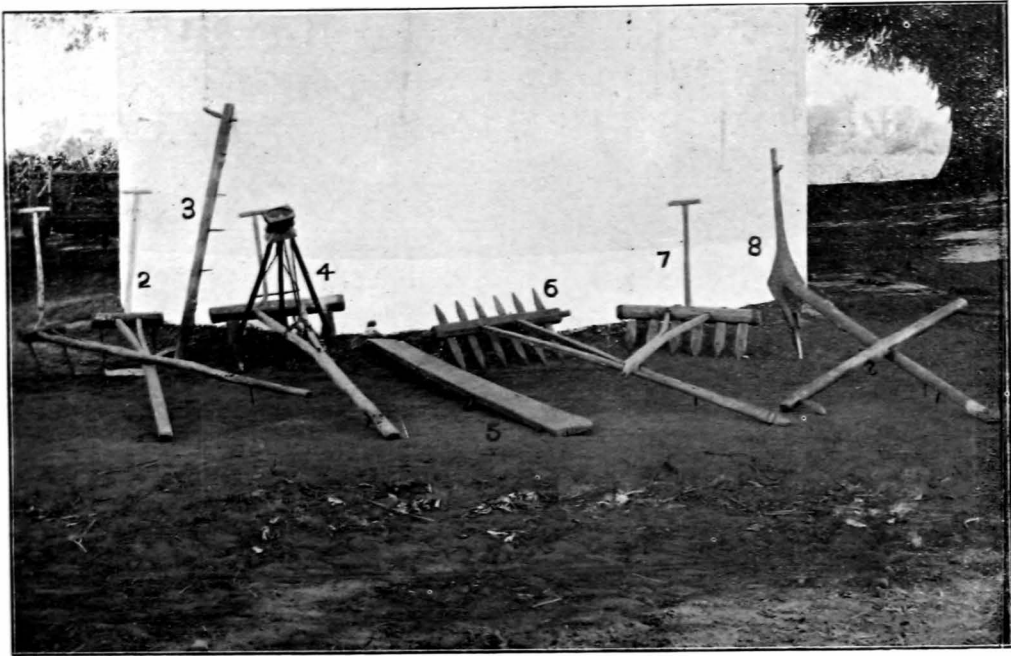
5. The pole is 8 to $9\frac{1}{2}$ feet long. It is made of teak, babul or bamboo and is either single, double or bifurcated.

6. The stilt is fixed on the top of the head piece and is used while lifting the drill at turnings.

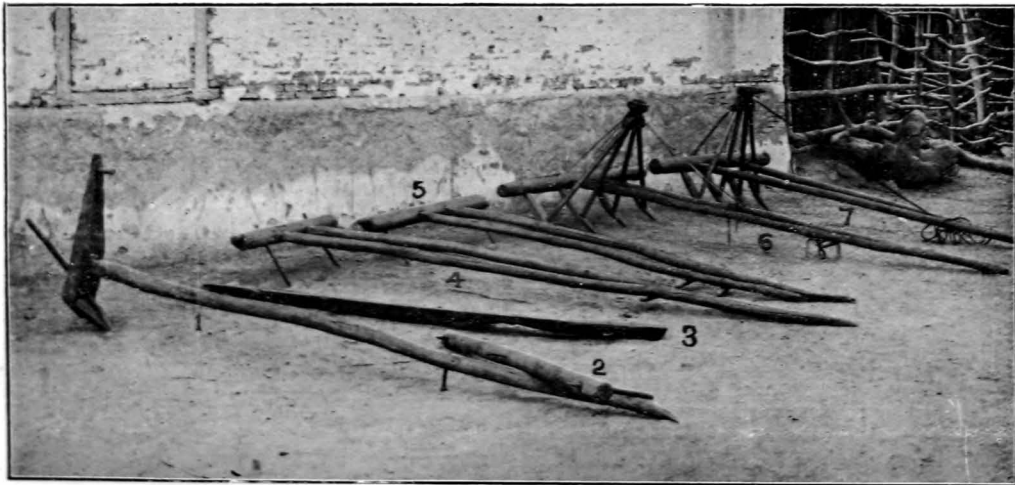
In order to get the drill ready for work the tubes are placed on the coulters and the bowl is fitted on the top end of the tubes. All these parts are tightened by attaching a rope to the neck of the bowl and stretching in both the directions in front and behind. While sowing in some places a bag is hung behind the bowl for holding seed. In others a separate man feeds the bowl with seed from the cloth which is tied round his waist. One drill can sow in a day from 3 to 6 acres according to the distance between coulters of the drill and the condition of the soil.

The weight and the price of the drills vary very much from place to place.

The drill is a very ingenious implement and is intended for even distribution of seed in lines as compared with the broadcast method, which is still in vogue in a few places. It also drops the seed to the same depth. But uniformity of spacing the seed in the row depends solely on the sower. In addition to sowing of crops the drill is used as a grubber, instead of karab, in the Charotar. It is also used for marking lines for transplanting bavto. A four coultured drill without tubes is used for loosening the surface soil after harvesting of the crops.

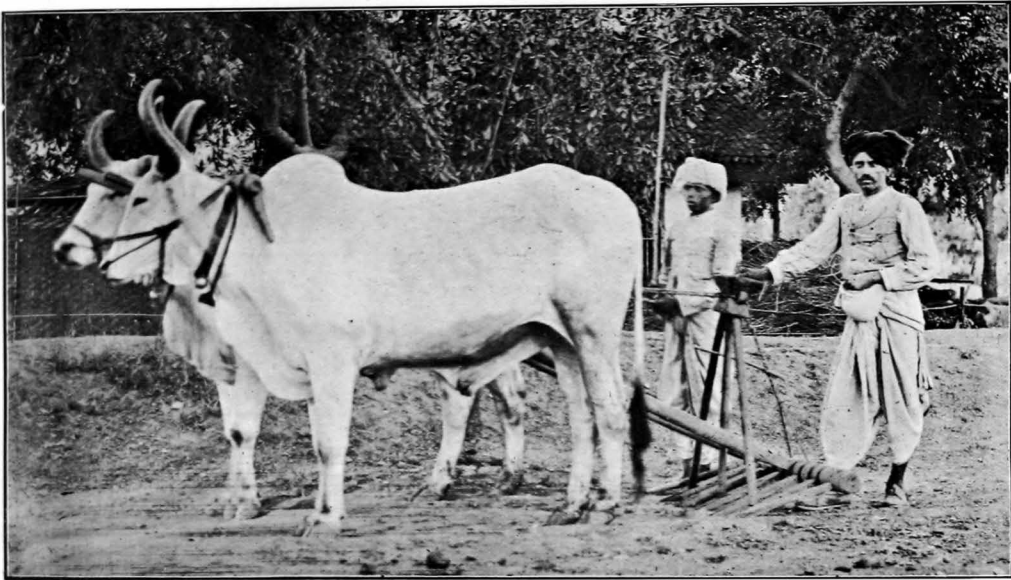


Kaira and Ahmedabad Implements—1 Karabdi or Rampdi (8" hoe). 2 Karabdi or Rampdi (12" hoe). 3 Single yoke for hoes. 4 Trifan (3 coultured drill). 5 Sammar. 6 Ghanio (toothed harrow). 7 Dantal (toothed harrow). 8 Hal (plough) with yoke.



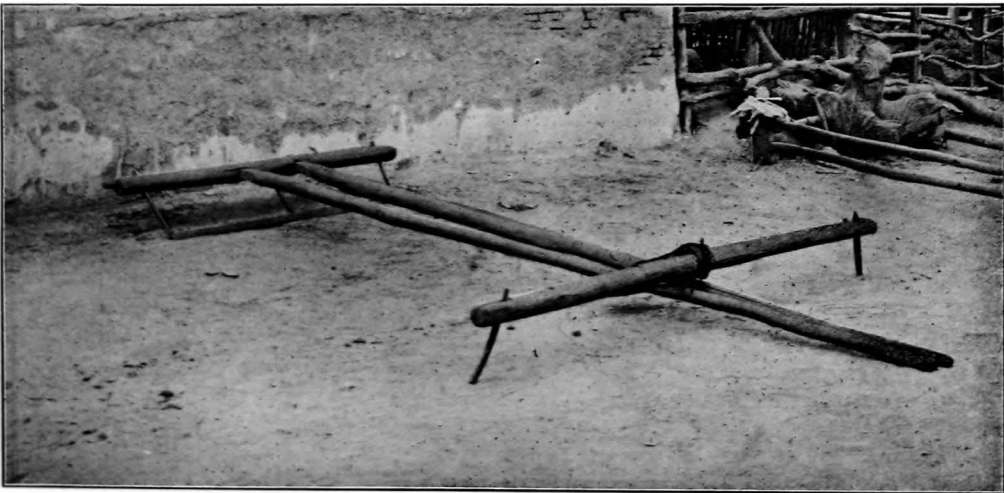
Ahmedabad Implements (Bhal tract)—1 Hal (plough). 2 Single yoke. 3 Sammar. 4 Dhundi (hoe). 5 Kaliu (harrow). 6 Dantal (4 coultured drill). 7 Chaval (4 coultured drill).

XI



Ahmedabad Implements—1 Wavnio—3 Coultured drill (Bhál tract).

XII



Ahmedabad Implements—1 Rupto (harrow with 3 prongs) (Bhál tract).

In some districts straight sowing is the practice whilst in others less attention is paid to straightness. Generally in the Gujarát tract straight sowing is in vogue. This depends mainly upon the training of the cattle and the steadiness of the eye of the driver. In some parts of the presidency a small hand plough with tube is in use. This is used chiefly in sowing very small areas and also in filling up gaps in field crops.

Gujarát drills.—Most of the crops in Gujarát are sown by means of drills. The drills have two to four coulter with varying distances between them. These coulters are set in the head piece at an angle of 40° to 53° with the pole. These distances are adopted according to the requirements of various kinds of crops grown and nature of the soil. Thus four coulters drills with tines one foot apart are used in the sandy tracts of Ahmedabad and Kaira districts for sowing bajri, sundhia, kodra, etc. Drills with three coulters are in common use in the goradu tracts of all the Gujarát districts for sowing bajri, kodra mixtures and for cotton in the Ahmedabad district. In Broach district where cotton and rice are sown together in separate rows (2 side ones being cotton with one row between of rice) the three coulters drill is used. The distance between two coulters is 18". Specially heavy three-coulters drill called *wavnio* is used in the bhal tract of the Ahmedabad district for sowing wheat. This drill has in all seven coulters. The odd coulters have no holes. These serve the purpose of grubbing up the soil between the sown lines. The sowing is done by even coulters which are three in number. All the coulters are tipped with iron except the first and the last which mark the line for the next turn. (Plate XI, No. 1).

Two-coulters drills are common in the southern districts (Broach and Surat). They are used for sowing cotton and jowár. The distance between the coulters varies from 18" to 36", 18" to 24" being common in Surat and 30" to 36" in the Broach district. A specially heavy two-coulters drill with coulters 18" apart is used for sowing wheat and rabi jowár in the Surat and Broach districts. In *bara* (sea side) tract of Vágra and Jambusar ordinary harrow head piece is made to fit coulters with tubes and bowl by removing the prongs and is used as a drill for sowing wheat and jowár.

Almost all the rabi sowings (except wheat) in Gujarát are made by means of a plough with a tube attached to it. In the Dohad and Jhálod talukás of Panch Maháls both the kharif and rabi sowings are made by such a plough, which is the only implement used by the Bhils (Plate XIV, No. 2).

The head piece and the coulters of the drill are made of babul,

tanach or ryan wood. The coulters are generally tipped with iron excepting in the case of a drill used for sowing cotton and rice in *vahasil* fields of the Broach district. The pole is generally bifurcated teak rafter. The tubes are of bamboo and the bowl is generally made of teak or sisam.

The weight of the drill varies from 30 lbs. to 100 lbs. and its price varies from Rs. 5 to Rs. 12.

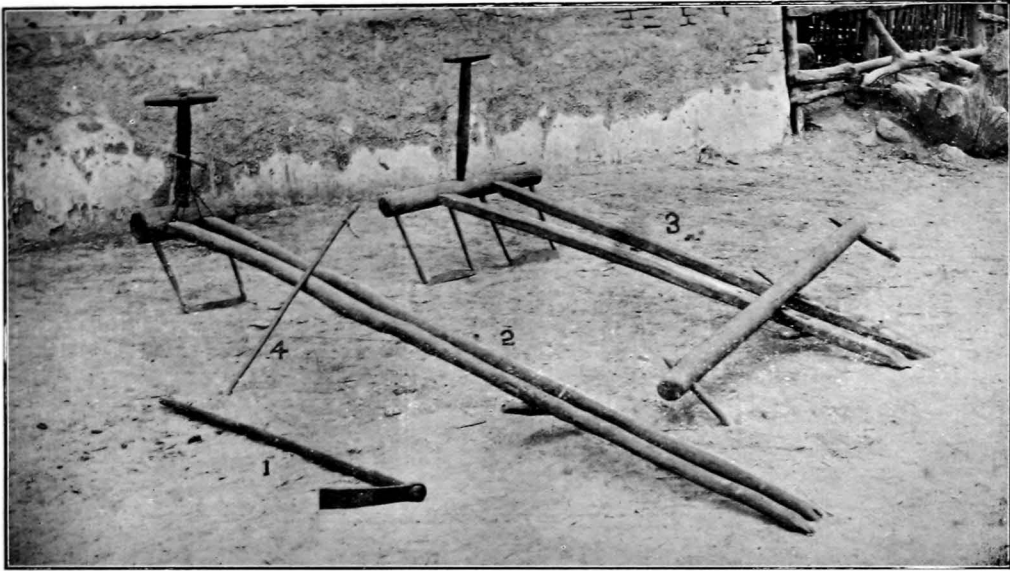
Deccan drills.—Seed drills of the Deccan may be divided into two classes, according to season kharif and rabi. The kharif ones may be again of two kinds, one for grain crops and the other for cotton. They may further be classified according to the number of coulters they carry (2, 3 and 4 coulters).

The drills are generally made of babul or tiwas. The angle between the pole and the coulters varies from 52° to 62° and is on the whole greater than that of the Gujarát drills. In some places the coulters are shod with iron, whilst in others they are detachable and fixed to the coulters when required. The shoes vary from place to place. In the case of drill used in kharif grain sowing in Khándesh, these shoes (locally called kusalis) are tied to the coulters and for rabi grain sowing they have one of their ends fixed in the head piece (Plate XVIII, No. 1). In Nagar district the iron shoes are triangular in shape and are capped on to the coulters at the time of sowing. In Poona, Sátára and Sholápur the ends of coulters are tipped with iron.

The distance between coulters varies greatly in different seed drills. In the case of kharif grain crops, the distance varies from 9" to 18". Bájri—one of the staple crops—is sown at a distance varying from 9" to 12" and jowár 15" to 18". In the case of cotton variations are more marked. In Khándesh alone the distance between the coulters varies from 12" on light soil to 16" to 23" in heavy soils. Cotton is generally sown by 2 or 3-coultured drills according to the nature of the soil. In heavy soils of Sháháda, Chopda, Shirpur and Sindkheda, cotton sowing is done by a harrow with a tube attached, only one row being sown at a time. In this case a separate implement for covering is unnecessary, as in the return journey of the harrow the seed is covered. In Nagar and Násik districts cotton is sown by an ordinary drill, the distance between rows being 9" to 12".

The kharif drills are usually light and the rabi heavy and steeper and are called moghdya. They are generally two and three coultured. In East Khándesh and Násik all rabi crops are sown

XIII



Ahmedabad Implements—1 Kodali for removing weeds. 2 Kharpio (hoe). 3 Hemarni Beli (Double hoe). 4 Stick on the Kharpio—scraper for removing mud from the implements.

XIV



Panch Mahals Implements—1 Double yoke. 2 Hal (plough) with tube. 3 Single yoke. 4 Vakhar (harrow). 5 Single yoke for wheat sowing. 6 Kadel (Stirring hook). 7 Datardi (Sickle). 8 Kharpdi (weeding hook). 9 Kodali (spade). 10 Kohadi (hatchet). 11 Sammar.

with a two-coultered drill, while in the West Khándesh, Nagar and Pooná they are three coultered. The distance between coulters varies from 10" to 18".

In Taloda and Nandurbár the *nal* plough (Plate XIX, No. 1) is used for sowing gram, and the practice is common throughout all the districts where the sowing is late. In the Deccan gram is often dropped by hand in the furrow opened by a light plough.

Karnátak drills.—The word *kurgi* (4 acres) is very significant in the Karnátak. It means the land sown by one drill (*kurgi*) in the course of a day, and thus it has in fact become the local measurement of land. The land possessed by a cultivator is always expressed in the number of *kurgis*.

As in other parts of the presidency, two, three and four-coultered drills are commonly met with in all the drier tracts of the Karnátak and are almost similar to those in the Deccan. In heavy rainall tracts of Belgaum and Dhárwár (*mallad*) a six-coultered drill is used for sowing rice. The distances between coulters vary according to the nature of the soil, crops and season.

Two-coultered drill is generally used for sowing cotton, the distances between the coulters varying from 18" to 20" for Kumpta and 20" to 24" for the newly introduced Broach cotton in the black soil areas of Belgaum and Dhárwár Districts.

Three-coultered drill with distances between coulters varying from 11" to 15" is used for drilling jowar, maize, wheat, sesamum, bajri and gram.

Four-coultered drill is common in lighter lands and is generally used for sowing kharif and rabi crops in the Dhárwár District.

A small hand plough with a tube attached is found in Belgaum and Dhárwár. It is about 20 lbs. in weight, and is worked by hand for filling up gaps.

The head piece of the drill and the prongs are made of babul. The head piece is $5\frac{1}{2}$ " to $6\frac{1}{2}$ " broad and $2\frac{1}{2}$ " to 3" thick. The length of the prong below the head piece varies from 12" to 16". Prongs are always shod with iron. The poles are always in double, and the point of attachment to the yoke varies from $7\frac{1}{2}$ ' to 8' according to the height and length of the bullocks. The adjustment of the implement and the method of hitching is similar to that in other tracts.

The work done per day varies from 3 to 4 acres. It sometimes goes up to 6 acres.

The weight of the drill varies from 50 lbs. to 90 lbs. and the price from Rs. 2-8-0 to Rs. 7.

When crops are raised from transplanted seedlings, as in the case of tobacco, chillies, brinjals, etc., they have to be planted at regular and equal distances. For this purpose markers are found in some localities.

Jisali (tobacco liner-marker), (Plate XXXVIII, No. 6), price Re. 1 to Rs. 2. This marker is common in Kaira and Ahmedabad Districts. In this hand implement 4 to 6 tines of wood or iron are fixed in a straight line to a straight rafter at a distance of 18" to 21" or 24". This distance varies with the variety of tobacco grown. To this rafter a forked pole is fixed about the middle to facilitate the working of the implement. When the field for planting tobacco is levelled by the *sammar*, then the *jisali* pole is held by two hands, laying the pole on the shoulders. First it is worked one way and afterwards cross-wise; the points where the cross lines intersect is the place where tobacco seedlings are transplanted. This implement facilitates the planting of tobacco in straight lines both the ways.

The same implement is used for marking lines for chillies, brinjals, variali, etc.

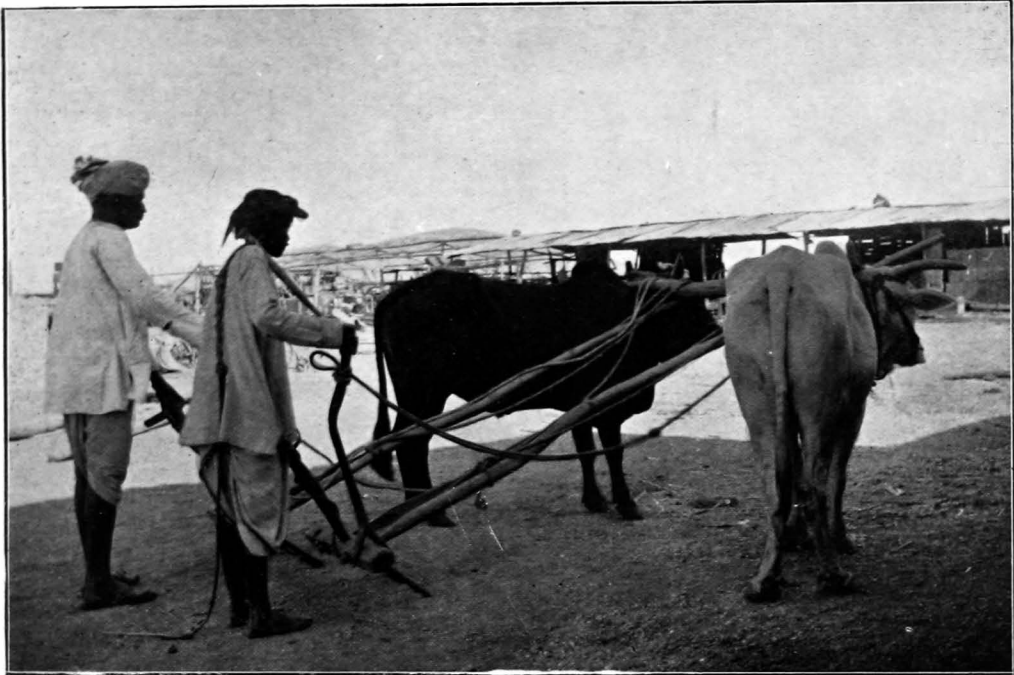
Yedtak (Belgaum).—A similar marker called *yedtak* is used for marking lines for transplanting tobacco in the Belgaum District. In *jisali* the tines point downwards, whereas in *yedtak* the pointers slant backwards.

In some parts of the presidency long ropes with coloured rags at the desired distances are used to obtain this regularity.

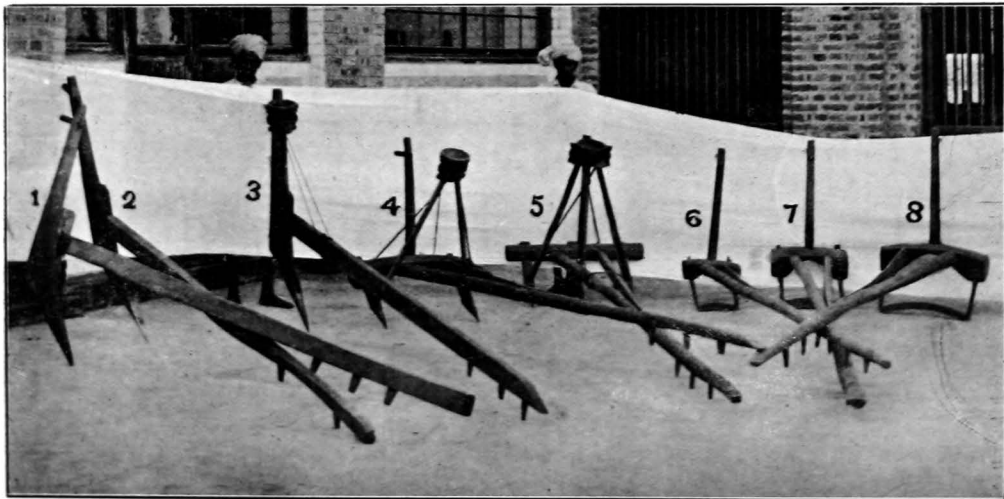
The various types and patterns of seed drills are described in full detail in Appendix D.

INTERCULTURING AND WEEDING IMPLEMENTS.

Interculturing implements are really miniature harrows, the size of the head piece and the blade varying according to the distances at which the various crops are sown. The angle is nearly 50° to 58°. All the hoes in Gujarát have entire blades, whereas in other parts of the presidency two kinds are found, entire as well as double bladed. In the case of harrows the prongs and the blade are made of iron all over Gujarát, but in the Deccan and the Karnatak the two bladed hoes are made of iron, while the entire bladed ones have prongs made of wood and the blade of iron. In *bhal*



Deccan Kolpas (interculturing hoes).



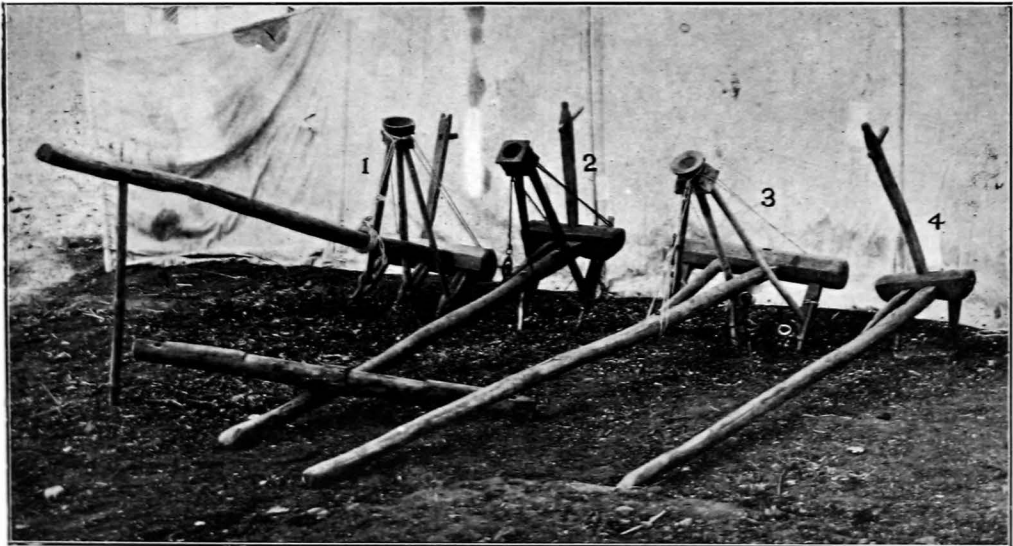
Surat Implements—1 Hal with broad share. 2 Hal with pointed share. 3 Hal with sowing tube. 4 Faidko (2 coultured drill). 5 Trifan (3 coultured drill). 6 Karpi or Karabdi (Hoe) Ardhya. 7 Karpi or Karabdi (Hoe) Ponia. 8 Karab (harrow).

XVII



Khandesh Implements—1 Juvadi or Jodni (double yoke). 2 Nangar with Dussar (single yoke). 3 Vakkhar (heavy harrow). 4 Dhaya or Dankia Vakkhar (light harrow). 5 Dussa (cotton drill) with yoke and sowing tubes.

XVIII



Khandesh Implements—1 Moghadya (3 coultured wheat drill). 2 Dussa (2 coultured drill with yoke). 3 Pabhar (3 coultured bajri drill). 4 Kolpa (hoe).

tract of Ahmedabad it is a common practice to have two hoes fixed on one head piece, whereas in other parts single hoes are general.

Generally two hoes are worked on one yoke (Plate XV, No. 1), but sometimes even three or more are used. In some parts of Madras 4 hoes are commonly used; the two side ones have their poles tied to the yoke, the middle two having each a short crooked handle instead of a pole. A rope is tied to the handle, the other end of which is fastened to the yoke.

For interculturing implements, the yokes are specially long. Each hoe needs a separate man to hold and guide it between the rows of the standing crop. In the Deccan and the Karnátak, the two bladed hoes having a slit in the middle are used for bajri and jowar crops. This implement needs very careful handling, especially when the crop is young.

In Broach and Surat Districts the ordinary plough is worked between the rows of jowar and cotton as the last operation especially when the late rains fail. In parts of the Panch Maháls a plough is used for interculturing maize and the hoe is not used at all.

In Karnátak there is a special heavy hoe for sugarcane and is called *kabin dumkunti*. In this implement the head piece is 8" wide and 4" thick and about 1' 3" long. The prongs receiving the blade project above the head piece, and are used for pressing the implement while earthing up the sugarcane crop.

All over the Presidency in addition to ordinary hoes there are special hoes for special crops—brinjals, chillies, tobacco, etc., have their own hoes.

The work done per day varies to some extent. In Gujarát a pair of hoes interculture 3 to 8 acres, *i. e.*, as much as a drill can sow in a day. In Khándesh they work up to 5 acres and in the Deccan and the Karnátak 2 to 3 acres.

But when the weeds are larger, either growing in the vacant place or in the row of the crop, they can be removed only by weeding hooks. These vary in size and form in different districts. In some cases the blades are entire and in some they are serrated. Some have one sharp edge, others have both edges sharpened. The various kinds can be seen in various illustrations. They are named *kharapdi* in Gujarát, *khurpi* in the Deccan and *kurchigi* in Karnátak and cost from one to three annas.

Cultivators could increase their crops by preventing the growth

of weeds. This could be accomplished by applying better methods of cultivation in preparing the land before sowing as well as by giving after cultivation to the crop by interculturing and hand weeding. Weeds injure the crop in various ways :

1. By robbing the soil of moisture and plant food.
2. By crowding the sown crop and thus depriving light, air and space.
3. By harbouring fungi and insects. Deep rooted weeds are eradicated by deep ploughing and frequent harrowing. Annual weeds, when they are very small, can be uprooted by giving a turn of harrow before sowing of the crop and afterwards by working the hoes often in the space between the rows of the standing crops.

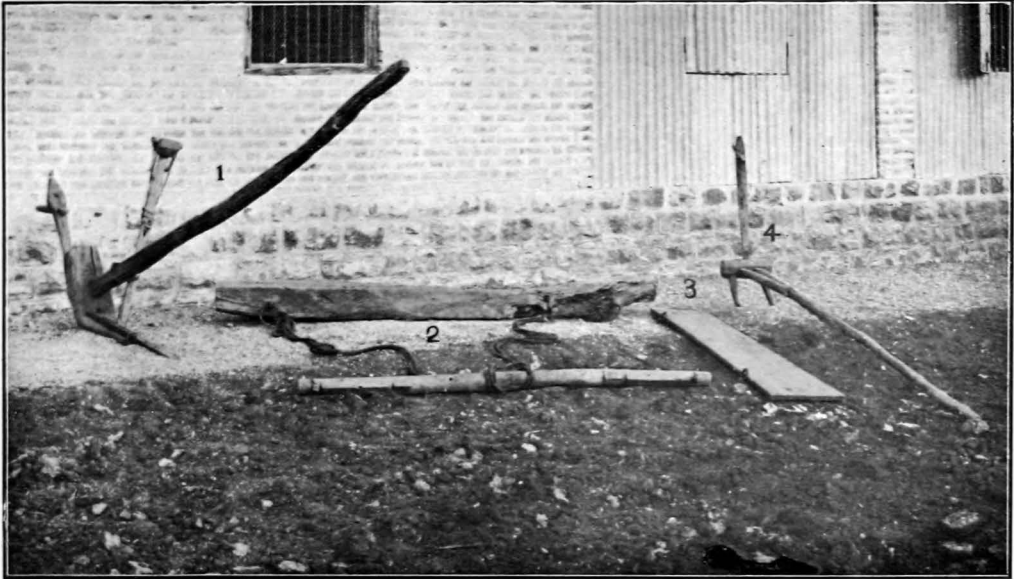
The operation of interculturing also loosens the surface soil, makes a fine mulch and thus conserves moisture. It aerates the soil and promotes nitrification. It partly earths up the plants and eradicates the surface weeds.

The detailed information regarding the interculturing implements surveyed is given in Appendix E.

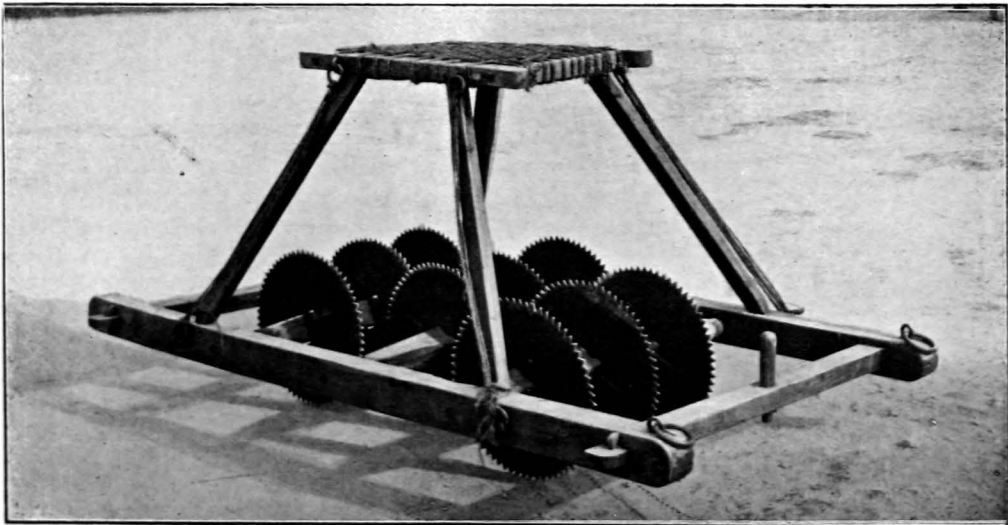
HARVESTING IMPLEMENTS.

The principal tool is the sickle (Plate XXXIX, No. 2). In some parts the cutting edge is entire, in others it is saw-edged. The sickle is useful specially in the case of crops that have strong and stout stems. In the case of wheat and similar crops when grown as dry crops, the harvesting is done simply by pulling up the stalks. Dry crops *shialu* (rabi jowar) is always pulled out, but when irrigated sometimes sickle is used for harvesting.

Groundnut is harvested partly by sickle and partly by digging with a *kudali*; in some parts harvesting is done by working the harrow lengthwise and then across. Towards Khed and Junnar groundnut is harvested by working a small plough. Towards Sangli, Sâtára, etc., a special heavy harrow is found for harvesting groundnut. Onions and garlic are dug up by *kudali*, the stalks are cut by a sickle. In the case of surans, turmeric, ginger, yams, carrots and sweet potatoes the soil is required to be dug to a great depth, an operation which is performed by a *kudali*. Sugar-cane is harvested by a sharp sickle or hatchet when ratooned. For picking mangoes from the trees a rope bag is attached to an iron ring fixed on to the end of a long bamboo called *bedi*. It costs about 12 annas.



Khandesh Implements—1 Nal plough. 2 Pathar (clod crusher). 3 Phali (leveller). 4 Bal Kolpa (small hoe for bajri).



1 Olpad wheat thresher.

THRESHING APPLIANCES.

Threshing is usually done by the bullocks, unaided by any appliance. Two to six, and sometimes as many as twelve to sixteen, bullocks are tied together neck to neck and driven round and round over the threshing yard where the material to be threshed is spread. This process is called treading out grain by bullocks (Plate XXA, No. 1).

1. While treading is in progress, the mixture is required to be stirred often; this operation is performed by a kind of rake called *panjetti* (Gujarati), (Plate XXXVIII, No. 8), *pavdi* (Marathi) and *janti kunti* (Kánarese). This consists of a small head piece into which 5 to 6 wooden pins are driven in. A short or long pole is inserted into the head piece to work the tool. It costs from ten annas to one rupee.

2. In the Panch Maháls, the stirring of chaff in the threshing yard is done by an iron hook (ankdi or kadel), (Plate XIV, No. 6), attached to a bamboo pole about six feet long. It costs from three to four annas.

3. In Southern Gujarát a thorn fork locally called *sarku* (Plate XXIII, No. 4) is used for stirring the stuff in the threshing yard. This fork is also used for carrying thorns from one place to the other and the like. It costs about four annas.

4. In Máwal a crooked branch of a bamboo with a spur like projection at one end is used for stirring the stuff on the threshing floor.

5. *Gowri halli* (Kánarese), *pavdi* (Gujarati), *phawdi* (Marathi) (Plate VI, No. 6).—It is a wooden hoe used in Karnátak for drawing grains together and then making into a heap. It costs from three to six annas.

In the case of gram, wheat and rice (sometimes) the whole straw and ears are trodden under the bullocks' feet. In Khándesh, Násik and Nagar the ear heads and stalks of bajri are trodden together, unlike other parts of the Deccan and the Karnátak. While treading is in progress the bullocks have muzzle bags put over their mouths to prevent them from picking up ears, etc. These bags are also used while interculturing crops. A pair of these costs eight annas. Rice in the Konkan is beaten on a piece of a rock or plank for separating the paddy from the straw.

Niger seed, castors, safflower, wal, tur, mug, udid, etc., are

beaten by a stick to separate the grain from the chaff. Til is separated from the capsules by shaking the stalks.

Some grains require further separation on account of their persistent glumes. Sheaves of khapli wheat are first beaten on a piece of a plank to separate ears from the stalks, then the ears are trodden under the feet of the bullocks for a short time in order to break the spikelets and the awns. Finally khapli is pounded by a stone roller worked in the ordinary chunam mill in parts of Poona District, pounded in *dang* (an appliance which consists of a mortar and wooden pestle fixed at the end of a wooden lever) in Válwa (Sátára District), ordinarily used for preparing parched rice, and crushed in large grinding mills as at Nadiád, Kaira District

Paddy too is ground in big wooden or stone mills in Belgaum and Konkan. Further pounding and polishing to remove the finer bran is done in the ordinary stone mortar.

I have stated above that the principal machinery for threshing is the bullocks' feet, but in some parts of Gujarát (Ólpád) a special machine consisting of a series of iron toothed discs is used for threshing wheat (Plate XX, No. 1). It is an indigenous implement. It consists of a wooden frame work, with a seat erected on the same. There are three parallel axles, the ends of which are fixed on the two sides of the frame. Each axle carries three toothed discs, which are fixed in such a way on the three axles that no two will revolve in the same line. A pair of bullocks tied to the front piece of the frame draws this machine round and round, thus separating the seed from the husk and cutting the fodder into fine pieces.

In parts of the Surat district, ordinary wheel carts are drawn over the jowar heads for threshing grain.

In some parts of Dhárwár a stone roller is commonly used for threshing jowar heads. It is a stone roller (Plate XXB, No. 1) similar to the one used by the Public Works Department, but it is of smaller dimensions. It is about 3 feet long with a diameter of $1\frac{1}{2}$ ' to 2'. Its price varies from Rs. 12 to Rs. 20 according to locality.

The ear heads of jowar are arranged in a circle in the threshing yard, the depth of which varies from 10" to 12." Ears from at least five to seven acres of land are needed to work the stone roller efficiently. When everything is arranged, a pair of he-buffaloes or a pair of good, strong bullocks is yoked to the beam of the roller and then it is drawn over the ears round and round. During

XX A



Treading out process.

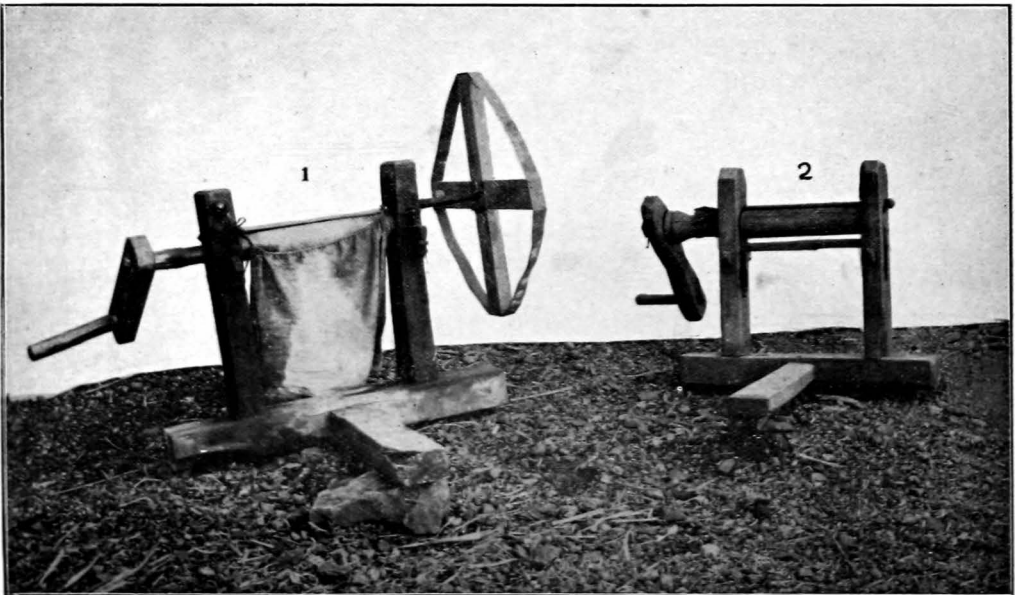
XX B



Stone roller method of threshing jowar.



Gujarat method of winnowing grain.



Gins—1 Khandesh hand-gin. 2 Ahmednagar hand-gin.

the threshing process the ears are stirred often by a small hand rake as in the case of ordinary threshing.

Details of comparative trials made on the Jalgaon Farm are given below :—

Method of threshing.	Weight of ears threshed in lbs.	Quantity of clean grain obtained in lbs.	Labour required per day of 8 hours.		Time required for threshing in hours.	Actual cost of threshing.	Cost of threshing per 1,000 lbs. of clean grain.
			Men	Bullocks.			
Local ...	5,639	4,560	3	8	H. M. 14 0	Rs. a. p. 6 14 3	Rs. a. p. 1 8 5
Stone roller...	5,363	4,320	2	2	17 20	2 13 10	0 6 7

Winnowing and cleaning appliances.—Threshing alone does not finish the work in the threshing yard. After threshing, the mixture of grain and straw are required to be separated. This is gradually done by taking the advantage of the wind. To perform this cleaning operation, the threshing yard is usually equipped with the following articles :—

1. Tripod stool (Plate XXXIX, No. 7), consisting of a plank about 6" to 9" wide, fixed on three stays. On this the man stands and holds the mixture to the wind and gradually drops it on the ground; in this process the grain falls near the stool and the husk blows aside.

2. Two or three baskets made of bamboo, cotton or tur stalks are used for filling the mixture before winnowing.

3. *Bokhari* or broom made of cotton stalks, tur stalks, palm leaves or sometimes of a special kind of grass. This broom is used for removing the husk from the grain as it falls down from the man standing on the tripod.

4. *Sup* or bamboo winnowing scoop for further cleaning the grains.

5. Sieves made of bamboo, iron sheet and cotton thread having various sized meshes. They are used for further cleaning of the grain and separating it from the dirt.

In parts of Gujarát an artificial draft is produced by tying two ends of thick cloth to two stout pegs driven into the ground, and flapping the other ends in the air (Plate XXI, No. 1).

The detailed information with regard to the threshing yard accessories is given in the statement below.—

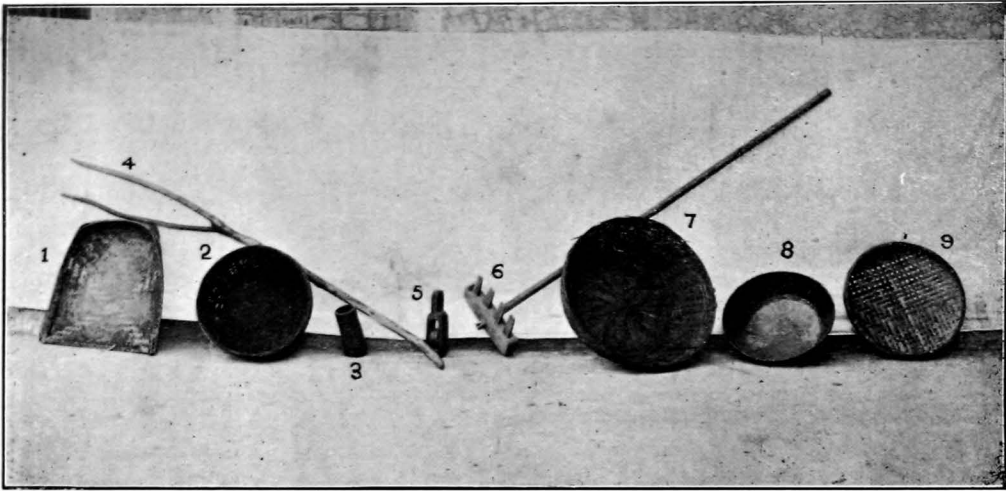
		Price in Rupees.
Tripod	(G) Ghodi or tarváys	1 to 2.
	(M) Tiwai or tiwarpath	
	(K) Turuv mettu	
Large basket	(G) Toplo	4 to 10 as.
	(M) Dal	
	(K) Jelli	
Small basket	(G) Topli	2 to 3 as.
	(M) Topli or pati	
	(K) Butti	
Iron basket	(G) Tagáru	6 to 10 as.
	(M) Gamele	
	(K) Kabinada butti	
Broom	(G) Savarni	$\frac{1}{2}$ to 1 anna.
	(M) Kersuni or bhokri	
	(K) Kasamarige	
Bamboo scoop for... winnowing grain.	(G) Supdu	2 to 3 as.
	(M) Sup	
	(K) Keruv mára	
Sieves	(G) Chalni	6 as. to Re. 1.
	(M) Chalan	
	(K) Jharadi	

The sieves may be of bamboos, cotton thread or iron. The bamboo sieve is used to separate grain from the chaff. Cotton thread sieve is used to separate large and small grains. Iron sieve is used to separate dust, dirt, ashes, etc., from grains.

Appliances in the preparation of crops for the market.—In the case of cereals, pulses, oil seeds, etc., the farmer's business is over when the grains are cleaned in the threshing yard. But the case is different with fibres, tobacco, turmeric, ginger, groundnut and such other crops. In the case of san and ambadi the fibres must be extracted by retting the stalks in water, dried, and then the fibre is ready for sale. In the case of cotton it must be ginned before it is sold. This latter work no longer falls on the farmer owing to the opening of ginning factories. Still it is very important that the cultivator should gin his own cotton so far as his seed requirements are concerned. The mixture found in the cotton field at present is due to the ginning of cotton in the factories where several varieties as well as cotton from different persons is brought for the purposes of ginning. The following is a short description of hand gins in different tracts:—

Khándesh gin (Plate XXII, No. 1).—It consists of one wooden and one iron roller. The iron roller carries a fly wheel at one end

XXIII



Surat Threshing yard appliances—1 Supdu. 2 Topli. 3 Sheiru (seer measure). 4 Sarku (thorn fork). 5 Goli. 6 Punjetti. 7 Toplo. 8 Tagaru (iron basket). 9 Chalni (sieve).

XXIV



Wooden sugarcane crushing mill.

and the wooden roller has a handle at the other. The woman who works the wooden roller feeds the seed cotton. The iron roller is turned by another woman by means of a small loose handle on the rim of the fly wheel. Fifteen to 20 lbs. of seed cotton can be ginned in a day of 8 to 10 hours. It costs about Rs. 5.

Surat gin (Plate XXXVII, No. 7).—It is similar to the Khándesh gin except that the fly wheel is kept in motion by means of a stick passing through a hole in one of the spokes and resting in the socket of a wooden peg fixed into the ground at about a distance of two feet from the wheel. By this method the iron roller is made to turn faster than in the case of the Khándesh gin. Twenty to 25 lbs. of seed cotton can be ginned in a day. It costs about Rs. 6 to Rs. 8.

In Karnátak the gin consists of one piece of sand stone upon which one iron roller pointed at both ends is moved backwards and forwards by the worker's feet. The worker sits on a low three-legged stool and feeds the seed cotton between the stone and the roller with the right hand and pulls the lint towards him with the left hand. The seeds fall in front of the stone. Fifteen lbs. of seed cotton can be ginned in a day.

Ahmednagar gin (Plate XXII, No. 2). It consists of two horizontal rollers. The upper one is made of iron. These rollers work on one another. The lower roller carries a handle at one end. One woman can work this gin by turning the handle with the right hand and by feeding the seed cotton with the left. About 12 to 15 lbs. of seed cotton can be ginned in a day. It costs about Rs. 2.

In Káthiáwár, two small gins are worked by a large fly wheel over which the leather belt passes. One hundred and twenty lbs. of seed cotton can be ginned in a day of 10 hours by two men.

Tobacco must be cured and turmeric must be boiled, dried and rubbed before marketing. Ginger must be scraped, dried, limed and sulphur fumed. Groundnut must be unhusked. This is done by beating with sticks. Sometimes the nuts are passed through the grinding stone mill to separate the kernels.

Sugarcane must be crushed in the mill, juice boiled and the gul turned into moulds (*dheps*) of convenient size before marketing. Formerly cane juice was extracted by putting pieces of cane in the stone mortar and pestle mill. This mill was similar in construction to that of the oil pressers mills. It is said that that kind of mill is still in use in some parts of Sind.

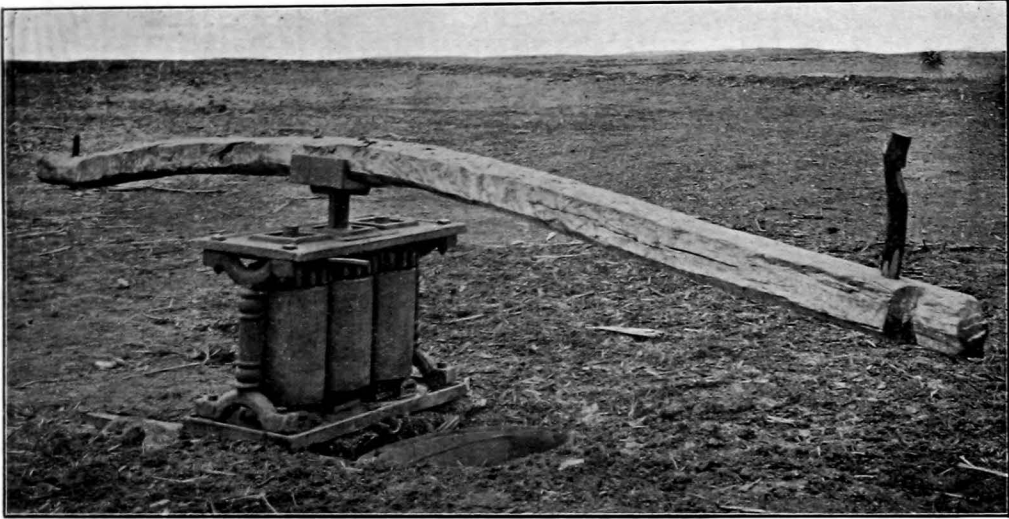
The stone mill was replaced by a wooden mill. Two patterns of wooden mill are still in use—one has two rollers and the other three. Two roller mill (Plate XXIV, No. 1) is found in Khándesh and Násik and three roller mill is commonly found all over Gujarát and Karnátak. The wooden mill used in Southern Gujarát (Jalálpur and Navsári) and Ahmedabad has three vertical rollers fixed into a frame side by side. Each roller is about $3\frac{1}{2}'$ in length with a diameter of $1\frac{1}{4}'$ to $1\frac{1}{2}'$. The middle roller has a shaft and gives attachment to the beam. In this mill a large quantity of juice remains in the residue unexpressed. The prices of the wooden mill vary from Rs. 35 to Rs. 60.

The Poona iron mill (Plate XXV, No. 1) is gradually replacing the wooden mill owing to its greater efficiency. It consists of three vertical iron rollers which have cog wheels at the upper ends, working one into another. The middle roller has a longer shaft and gives attachment to the draught pole. The height of the roller is 18" with a diameter of about 11" to 12". Three iron rollers are fixed into two horizontal cast iron plates and secured by means of long wedges made of an iron bar. When the wedges are driven in, the rollers are brought closer together. This mill is capable of expressing juice upto 72 per cent. The prices vary from Rs. 125 to Rs. 250 according to size.

The boiling and concentration of juice is done in open pans. The pan in use in the Poona District is shallower and broader than the pans used in Sátára, Khándesh and Gujarát. The Poona pan is 7' in diameter and is 10" deep. It boils 1,000 to 1,200 lbs. of juice and allows the boiling process to go on more rapidly owing to its greater bottom space. The pan costs Rs. 35 and weighs about 340 lbs.

The pan used in other parts is deeper than the above pan. In Sátára the pan in use is made of thin iron sheets and has a diameter of 7 feet and varies in height from 18 inches to 24 inches. On account of the great depth the juice requires longer time for boiling. About 1,300 to 1,500 lbs. of juice is boiled each time in this pan. The Sátára pan costs Rs. 20 to Rs. 25.

When the juice is boiled and converted into semi-liquid the pan is raised from the fire and the contents have to be cooled and ærated. In Poona and Sátára, iron pans are used for cooling. In the Dhárwár district the contents are emptied into a pit made into the ground. The pit is 3' long, $2\frac{1}{4}'$ wide and about 4" to 5" deep. The sides of the pit are lined with planks. The next day when the



Iron sugarcane crushing mill.



1 Shibe (for removing scum from the boiling pan). 2 Shibe (improved). 3 Hathia (wooden spatula). 4 Khurpa (scrapping hook). 5 Scum strainer. 6 Phavdi (wooden hoe). 7 Shovel. 8 Gul moulds. 9 Gul mould with false bottom.

gul gets hard, it is divided into small pieces like bricks. Such gul bricks can be seen in the Háveri (Dhárwár district) market.

After cooling the semi-liquid gul has to be put in, in some kind of receptacle for hardening. In Poona and Sátára when the semi-liquid gul in the second pan is sufficiently cool, it is thrown into a pit mould made specially for the purpose. The pit in the ground is lined with dungri cloth and then the gul is thrown in, which hardens into a hard block or dhep in the course of 24 hours. By this method all the treacle from the block is soaked into the ground and thus lost.

In Gujarát the gul is stored in earthenware pots. By this method there will not be any loss of treacle or molasses.

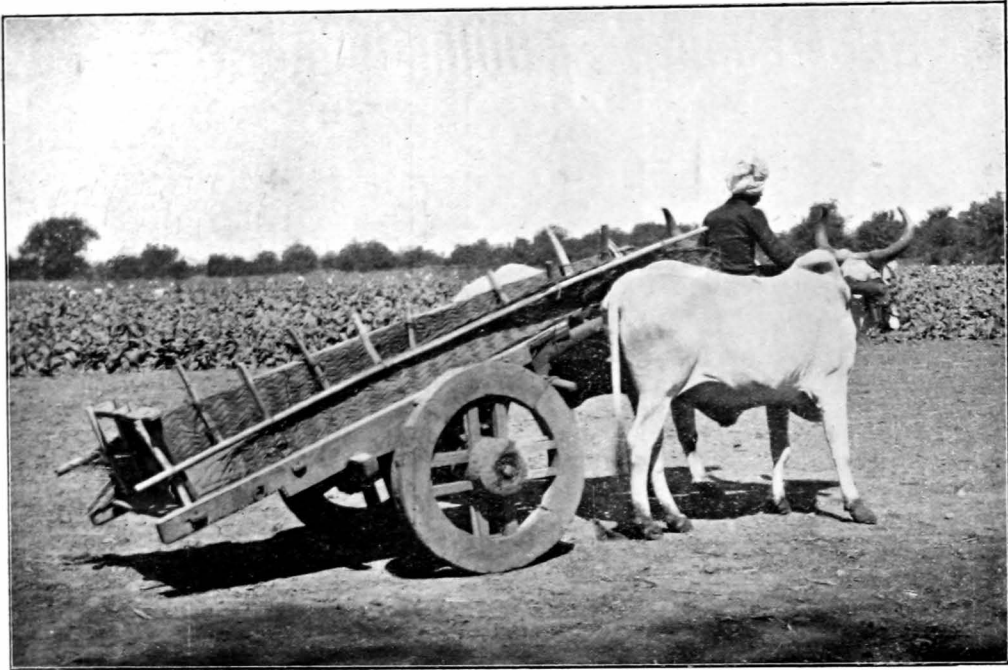
In Mangalore, north and south Kánara a wooden mould is used. It consists of a beam about $4\frac{1}{2}'$ long divided into small cells and cubes. The semi-liquid gul is thrown into these cells and taken out of it on hardening. The small pieces are sold as such in Mangalore—one pice per piece.

Very recently the pit moulds have been replaced by the bucket moulds on the Mánjri Farm (Plate XXVI, No. 8). These buckets are made of galvanized iron sheets with a perforated false bottom. The bucket is lined, as usual, by dungri cloth and then the gul is thrown in for hardening. By this process all the molasses can be collected at the bottom of the bucket. The bucket mould has the following dimensions—the diameter at the mouth is 13"; at the botom 11" and the height is about 13". Such a bucket mould costs about Rs. 2 and holds 60 to 70 lbs. of gul. About 12 such moulds are required per gul boiling furnace. By making use of these moulds about Rs. 25 to Rs. 30 worth of molasses can be saved per acre.

The following table gives details of accessories required in the manufacture of gul:—

Serial No.	Name of the article.	Number of articles required.	Price.	Remarks.
			Rs. a. p.	
1	Iron Sugarcane Mill—to express juice.	1	140 0 0	
2	Iron Vat—to receive juice when expressed by the Mill.	1	6 0 0	
3	Juice boiling pans	2	60 0 0	
4	Cisterns—for storing juice ...	2	12 0 0	

Serial No.	Name of the article.	Number of articles required.	Price.	Remarks.
			Rs. a. p.	
5	Scum strainer—for separating juice from the scum.	1	5 0 0	
6	Canvas piece—for filtering the juice in the scum strainer.	1	0 4 0	
7	Gul moulds of galvanised iron sheet—for making semi-liquid gul into blocks.	12	27 0 0	
8	Padada or one than cloth—for lining moulds.	...	7 0 0	
9	Iron tray—for keeping the gul moulds to drain off the molasses.	1	4 4 0	
10	Bent iron sheet—this sheet is placed on the off-side of the Mill. This prevents wastage of juice and facilitates its falling into the lower plate of the Mill.	1	0 4 0	
11	Planks—for covering the Vat ...	4	0 8 0	
12	Small iron vatis (cups)—for oil, etc.	2	0 8 0	
13	Dandalas (wooden rafters)—for lifting the pan from the fire.	2	1 0 0	
14	Laddles—for removing scum from the boiling pan.	2	1 4 0	
15	Pávdi (wooden hoe)—for stirring gul in the pan while being cooled.	1	0 4 0	
16	Hathia (wooden spatula)—for scraping gul after cooling.	1	0 2 0	
17	Khurpa (weeding hook) ...	1	0 2 0	
18	Ghodi (lamp-stand)—made of bamboo wicker work.	1	0 2 0	
19	Tin lamps	2	0 2 0	
20	Lamp with stand	1	1 4 0	
21	Bamboo baskets—for removing sugarcane refuse, ashes, etc.	2	1 0 0	
22	Gamela—for testing gul while boiling.	1	0 12 0	
23	Adhe (draught pole)—for the Mill.	1	5 0 0	
24	Iron pitchers (ghághars) ...	2	4 0 0	



Nadiad (Kaira district) cart.



Viramgaon (Ahmedabad district) cart.

APPLIANCES FOR TRANSPORT OF AGRICULTURAL PRODUCTS.

The crops when harvested have to be marketed, which necessitates a journey either by road, by rail or by sea. Although small quantities are taken as head-loads, on pack asses, pack bullocks, or pack horses, still the cart is the common method of transport. At least one cart is needed by each farmer. These carts vary very much in size, shape, construction, capacity and price from place to place.

Wedge-shaped carts (*i. e.*, narrower in front and wider at the back) are common in north Gujarát, especially north of the Narbudda river; they are also common in most parts of Khándesh. In the Deccan and Karnátak they are rectangular.

A very big cart called *hale bandi* with solid wheels is found in the houses of well-to-do cultivators in the Karnátak. These carts hold double as much as the ordinary cart.

The following statement gives the details of carts and accessories used in different parts.

BULLOCK CARTS.

Gádu (Gujáráti) *Gádi* (Maráthi) *Chákdí* or *Bandi* (Kánarese).

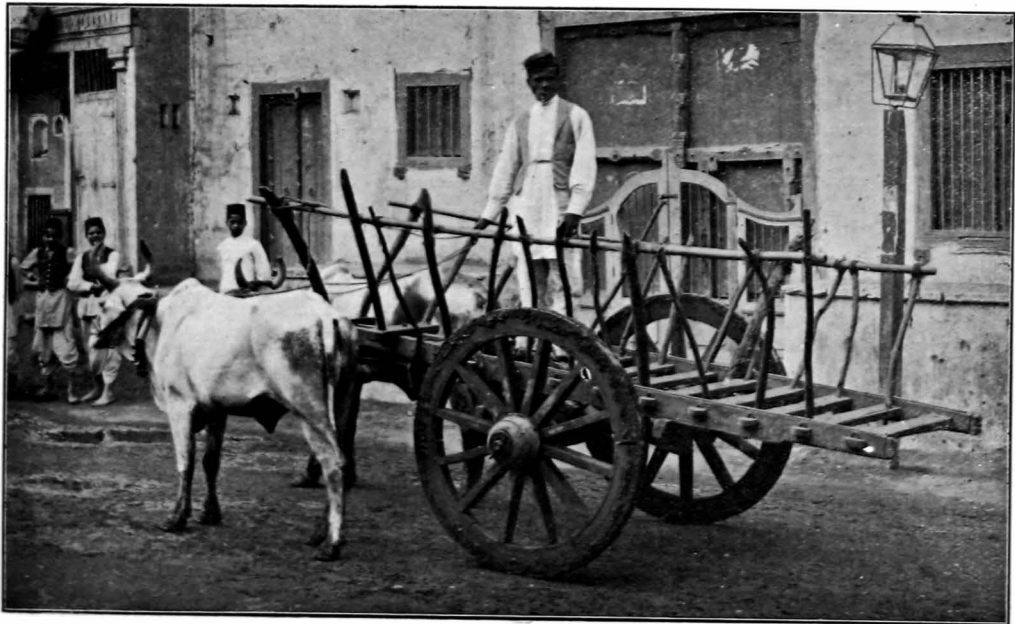
Name of the District.	Price in Rupees.	Remarks.
Ahmedabad. Kaira	75 (Babul wood). 125 (Sissu wood) 75	<p>The whole frame of the cart is wider at the back and narrower in front. The wheels have no tyres. The wheels would last for two years if the cart is carefully used. The cart would last for 10 years. It is made of Babul and Sissum. Sides are made of cotton stalks. It carries about 1,280 lbs. of grain. The length of the satti or frame is 8' 2", breadth at the back 3' 2" and height 3'.</p> <p>It is rougher in make than the Kaira cart. The wheels have tyres. The cart lasts for 10 years. Four bullocks are required to draw a loaded cart—but for empty only two. Sides of the frame work are made of bamboo-tattis. The carrying capacity is about 2,000 lbs. of grains. The length of satti or frame is 11', 1' broad in front and 4' at the back.</p>
Panch Maháls (Dohad).	50	

BULLOCK CARTS—(continued.)

Name of the District.	Price in Rupees.	Remarks.
Surat ...	100 to 125	It is a rectangular cart and measures 6' long, 3' 4" broad and 1' 11" high. It carries about 1,200 lbs. of grain.
Broach ...	100	This cart is like Nadiád (Kaira district) and lasts from 10 to 15 years. Wheels have got tyres but need repairing every second or third year. The length of the satti or frame is 8¾' long 2' broad in front and 3' broad at the back and 2' in height. It holds about 1,600 lbs. of grain.
Khándesh ...	65 to 80	The cart called <i>Maldamni</i> is like a Surat cart and can carry 2½ máps of grain (1,800 lbs.) The satti or frame is 6' long, 3¼' broad and 21" high.
Do. ...	50 to 70	This cart is smaller than the above and can carry 1½ máps of grain.
Do. ...	60 to 80	<i>Ladhe</i> is a triangular-shaped cart like North Gujarát cart but the wheels have tyres. These carts are common in Sávda, Chopda, Shirpur and other tálukas of the Khándesh district. These carts are used for carting cotton, jowar ears, Kirbi, manure etc. The carts last over eight years. The satti or frame is 11' long, 3½' broad at the back and 3½' high.
Ahmednagar..	40 to 60	The satti or frame measures 5' 5" long, 2' 9" broad and 1' 6" high.
Násik ...	60 to 80	This cart is more like Khándesh cart and holds 2 máps (1,440 lbs.) of grain. The frame measures 6' long 3' broad and 1¾' high.
Poona ...	40 to 60	It weighs 744 lbs. The satti or frame is 6' 9" long, 3' broad and 1' 7" high. It can carry 1,200 to 1,500 lbs. of grain.
Sholápur ...	70 to 80	The satti or frame is 6' long, 3' broad and 2' high. The cart can carry about 1,125 lbs. of grain.
Sátára ...	80	The satti or frame is 6' 6" long, 2' 7" broad and 1' 9" high. The cart can carry 1,200 lbs. of grain.



Surat cart.



Broach cart.

BULLOCK CARTS—(continued).

Name of the District.	Price in Rupees.	Remarks.
Belgaum ... Dhárwár ...	50 to 60	The ordinary cart called Bandi has a long and narrow frame. It is 8' 6" long, 3' broad and 2' 6" high. The cart can carry 1,750 lbs. of jowár grain. The big cart is called Hali Bandi and costs about Rs. 100. Its frame is 10' 6" long and 3' 3" broad. There are holes in the longer side of the frame. Wooden posts of varying length are inserted into these holes according to the kind of produce to be loaded. Ordinarily this cart carries 5,000 lbs. of jowár grain.
Bijápur ...	70 to 80	The frame or satti is 7½' long, 2¾' wide and 1¾' high. The cart can carry about 1,500 lbs. of grain.
Thána ... Kolába ...	55	The frame measures 4½' long, 3' broad and 1½' high.
Ratnágiri ...	45	The frame is 7' long, 3½' broad and 1' 1" high.

Note.—The Gujarát and Khándesh carts are provided with shutters at the back as well as in front. In Khándesh it is called *Panjari*.

ACCESSORIES TO CARTS.

Carts are required by farmers for various purposes, such as carting manure to the fields, moving implements, carting crops and other produce to the village or to the market, conveying passengers, etc.

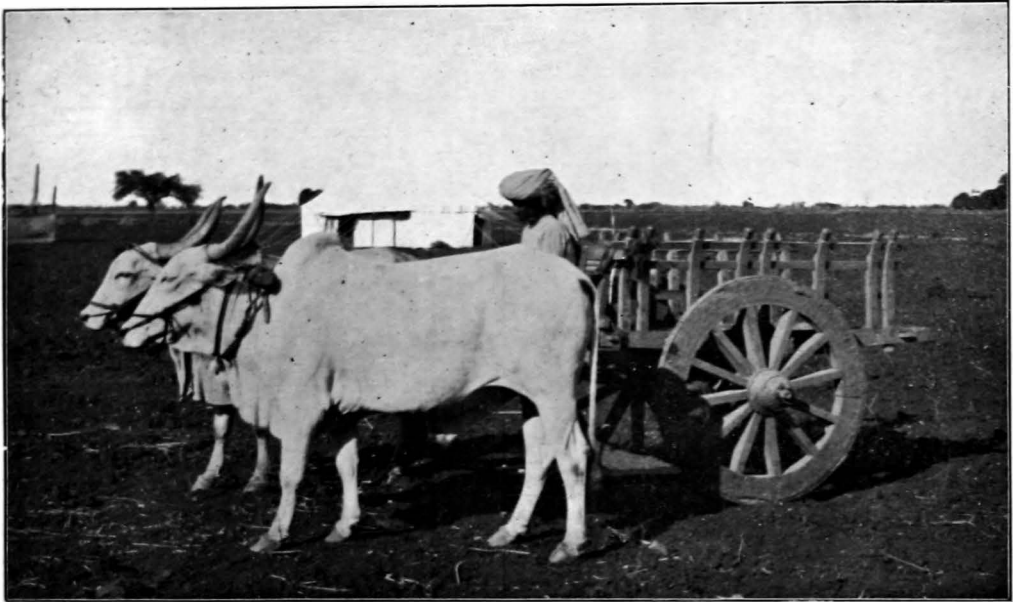
On account of the varied uses to which the cart is put it is in need of several accessories.

Name of the cart accessories.	Price.	Remarks.
Dor or Sarkas (G); Odhni or Nada. (M); Valle (K).	Rs. 2½ to 3.	These are long ropes, medium in thickness and are used for tying loads of grass and kadbi.

ACCESSORIES TO CARTS—(continued).

Name of the cart accessories.	Price.	Remarks.
Goli (G); Mani or Kharadi (M); Guddi (K).	6 to 8 annas.	These are small wooden pulleys used for stretching ropes when tying loads of grass, kadbi, cotton, etc.
Panjara (G); Talanta. Shitre (M); Tatti (K).	Rs. 1-12-0 to Rs. 2.	These are made of bamboo or cotton stalks to form the sides of the carts.
Panjari (G); Panjari (M);	Rs. 2 to 3	These are back shutters of the cart.
Mod or Athar (G); Bhodh (M); Batara (K).	Rs. 15 to 20 Rs. 18 to 20	Rs. 18 to 20 when made of <i>zoriyas</i> (thick cotton thread cloth made for this purpose) and Rs. 4 to 6 when the <i>bhodh</i> is made of gunny bags or <i>bondries</i> (a sort of thin gunny cloth). In Karnatic a rope net is attached to a cart while chaff, etc., is carted. It is called <i>hottin kalli</i> . A cart with such a rope-net would carry 2,000 lbs. of chaff.
Jotara (G); Jupni (M); Jattigi (K).	4 to 8 annas.	Throat bands.
Parani (G); Chabuk (M); Barikolu (K).	4 annas.	Parani is a goading stick for driving bullocks. In the Deccan and Karnatak a whip is used instead of Parani.
Achhoda (G); Kasara (M); Hanihagga (K).	6 to 8 annas.	These are ropes tied to the nose strings for controlling the bullocks while driving.

XXXI



Khandesh cart.

XXXII



Panch Mahals cart.

IMPLEMENTS USED IN MAKING PERMANENT IMPROVEMENT OF LAND.

Permanent improvement of land may take the form of the construction of *tals*, embankments and *bunds*, terracing and levelling, laying drains or fencing.

In order to effect such improvement various kinds of implements are in use in different tracts and they (*phali*, *lodh*, *kiran*, *keni*, *chen*, *petari*) are termed levellers. They vary in make, size, shape and efficiency. In *Charotar* the leveller is called *chen* (Plate XXXIII, No. 2). It consists of a platform 3' long and $2\frac{1}{2}$ ' wide, carried on an axle working in two wooden very low wheels about 13" in diameter. The front lip is shod with an iron sheet (6" broad). It is used in *Charotar* to fill up inequalities in rice beds. In the Deccan and Karnatak they are made of elbow-shaped or straight planks. Towards Sangamner and Akola of the Nagar district they are made of an iron sheet. They are worked on the edge for carrying earth to fill up inequalities and gaps and for repairing old and making new *tals* or embankments. Sometimes the operation of carrying earth is done by interweaving the prongs of the harrow by coir ropes. The *petari* of *Mawal* is of a different shape. It is made of a wooden frame or of an iron frame as in Kolaba, which is interwoven with bamboo splinters. These levellers have bifurcated poles fixed into the body, which are fastened to the yoke. Sometimes the planks have holes at the ends or rings driven into them. Ropes are tied into the holes or to the rings, the other ends being fastened to the yoke.

As the implement is drawn over the ploughed land it gathers the loose earth and delivers it to the places of inequalities and depths and thus it levels the land and fits it for increased production.

Making *bunds* and embankments is common in the rice tracts of the Konkan and hilly parts of the Deccan. The rice beds are annually ploughed or hand-dug and the *bunds* repaired in the fair season by means of *petari*, *alvat* or *phali*.

Considerable attention is also paid in levelling the lands irrigated from wells as well as from canals. But it seems very little care is taken of the vast areas where dry crops are annually grown.

If these vast areas, situated in insufficient and irregular rainfall tracts, are divided into one or two-acre beds by putting embankments, the outturn of the land would be considerably improved, for by this method all the water that falls could be made to soak into the ground and will prevent washing and erosion.

The prices, etc., of the levellers used in different districts are given below :—

Name of the district.	Vernacular name.	Weight in lbs.	Price in Rs.
Kaira	... Chen	... 70	4 to 5
Ahmednagar	... Keni	... 39	2 to 3
Násik	... Kiran	... 42	3 to 3½
Poona .	... Pharandi	... 60	1 to 2
	... Petari (Máwal)	... 9	1 to 2
Belgaum	... Phali (plank board leveller)	... 54	4 to 5

KONKAN IMPLEMENTS.

The implements of husbandry used in the Konkan are very few—the plough, the leveller and the clod crusher—and are therefore described under one head rather under the several sub-headings. They are similar in construction to those found all over the Presidency but they are lighter. The staple crop of the Konkan is rice, the soil is for the most part light, sandy and stony, although in north Konkan it is black and rather heavy. The bullocks are small, though the size improves as one goes towards Kolába and Thána.

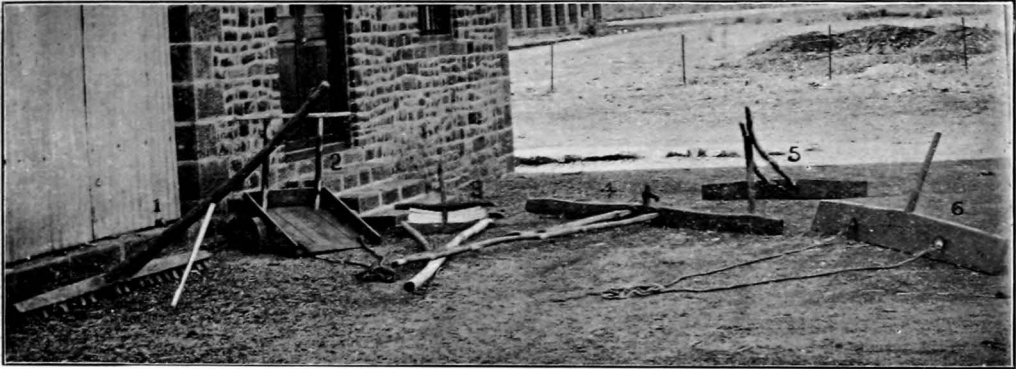
The plough consists of four parts :—

1. The head and the shoe are in one piece.
2. The beam is straight with notches at the end to facilitate yoking.
3. The plough-share is of iron, it is about 9 to 10 inches long, it is laid on the shoe and kept in position by a *pháletu* (a wooden piece).
4. Stilt is separate with the handle forming a part of the stilt.

The beam is generally made of palm, and it is mortised into the head and kept in position by means of a wedge. The inclination between the draft pole and the shoe is 45°. The share is fixed and the putting in of the stilt at the end of the beam completes the plough.

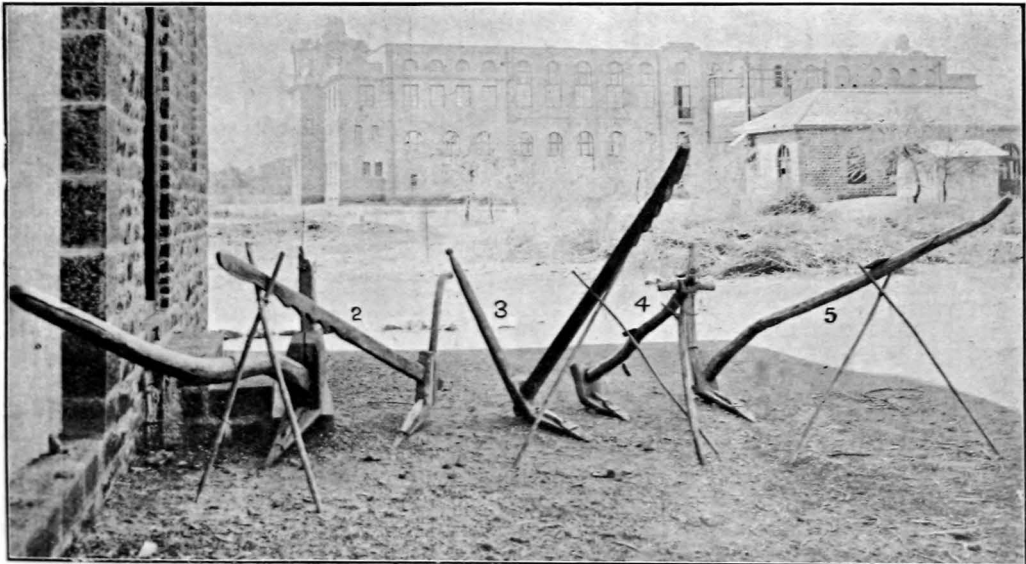
While at work the beam is directly tied to the yoke by a loop of rope which connects the notch and the yoke. The method of hitching is more like Gujarát. The depth at which the implement works is adjusted by means of a wedge as well as by lengthening or shortening the point of attachment.

XXXIII



Levellers—1 Gutephalli (Konkan). 2 Chen (Kaira). 3 Petari (North Konkan). 4 Phali (rice land leveller, Belgaum). 5 Phali (dry land leveller) Belgaum. 6 Alwat (dry land leveller) Deccan.

XXXIV



1 Belgaum rice land plough. 2 Ratnagiri plough. 3 Konkan plough used in rabi cultivation. 4 Kudavana (hand plough). 5 Mawal plough.

The plough goes 2" to 3" deep and even more when it is used for puddling the land. In south Konkan the same plough is used for *rabi* cultivation of land, but towards Kolába and Thána a rather heavier plough (*kathanya nangar*) is used for opening the land for *wál* and gram. For increasing the depth of the furrow a heavy stone, 30 to 35 lbs., with a V-shaped slit is placed on the beam.

The weight of the plough varies from 15 to 20 lbs. The *rabi* plough weighs upto 30 lbs. The prices vary from Rs. 2-4-0 to Rs. 3. The work done per day is about 16 to 20 *gunthás*.

The second very common implement is the leveller (toothed harrow). This is used in rice-growing tracts for smoothening the mud and puddling the field before transplantation. It also brings to the surface the weeds that are uprooted in ploughing. The implement consists of a plank 4 to 5 feet long, about 6 to 7 inches broad and 2½" thick. Into this plank, wooden tines, about 6 to 10 inches long, are fixed vertically about 3 to 4 inches apart. A pole is fixed about the middle or into two holes bored about 1½ feet apart. It is called *guthephali* in south Konkan, *alephali* in the north and *halhi* in Kánara. It weighs from 20 to 35 lbs. and costs from Re. 1-8-0 to Rs. 2-8-0.

In the fair weather as well as in the *rabi* cultivation, when small clods are left over by the plough, they are broken by a clod crusher. This implement consists of a log of wood with a flat base about 6' long and 6" to 9" in thickness. A pole is inserted about the middle to drag it. The crusher is called *ragas* in the south Konkan and *maindh* in the north. It weighs from 60 to 140 lbs. and costs from Re. 1 to Rs. 3.

In north Konkan the levelling of the rice beds, as well as repairing of the embankments, is undertaken in the fair weather. For this purpose the land is first ploughed or hand-dug and the earth is moved by means of a leveller called *petari*. It consists of a small concave, rectangular frame of wood with a base plate made of iron or wooden plank. The interspace is woven by bamboo slips. The split bamboo with its ends fixed to the ends of the frame serves the purpose of the pole. It is worked on the edge and held in a slanting direction for gathering the earth, which is removed in the same way and emptied in the place where it is required. It weighs about 20 lbs. and costs upto Rs. 3. This implement is not found in south Konkan. There is only one kind of yoke for working the implements mentioned above. The yoke in use consists of a round pole about 5½' to 6' long, with two holes bored at each end for

putting in the rope for fastening the neck of the bullock. The neck space between two holes is 7" to 8". It is called *ju* in north Konkan, *jokad* in the south and *noga* in Kánara. The yoke weighs about 10 lbs. and costs annas 12 to Re. 1.

In the Konkan tract the harrow, the drill and the hoe are not found.

Besides the three or four bullock implements described above there are some hand implements :—

1. *Lania* or *vila* (M.), *halakatti* (Kánara)—a small sickle. This is either saw or plane-edged. It is used for harvesting crops as well as for weeding. It costs about annas six.

2. *Koyata* (M.), *baikatti* (Kánara)—large sickle.—This is similar to small sickle but has a heavier and broader blade. It is used for cutting *táhal* (loppings of trees) for making *ráb*. Its price varies from ten to twelve annas.

3. *Kudai* (M.), *gudli* (Kánara)—pick.—It is a one-bladed pick used for digging. Its price varies from annas eight to Re. 1.

4. *Tikav* (M.)—pickaxe.—This foreign tool with two blades—one flat and the other pointed—is common everywhere. It is used for digging as well as in shaping laterite blocks. It costs 12 annas to Re. 1.

5. *Kurhad* (M.), *kodli* (Kánara).—It costs about a rupee. It is used for cutting trees, wood, etc.

6. *Dutonde* (M.)—pickaxe.—This is a kind of pick met with in north Konkan. It is used for digging cocoanut beds while manuring. It has two blades—one blade is flat like an axe and is used for cutting side roots of cocoanut trees, while the pointed one is used for digging. Its price is about 12 annas.

7. *Dantale* or *karle* (M.)—rake.—It is a wooden hand rake having about five tines. It is used for making onion beds in the north Konkan. Its weight is $3\frac{1}{2}$ lbs. and costs Re. 1.

8. *Baila* (M.)—head load carrier.—It consists of a wooden pole with a wooden ring and coir netting fixed on one side about the middle of the pole. The load rests on these netted ring which rests on the head. The pole is held in the hand by the man. With the help of the *baila* a man can lift up a larger load and can remove it from his head at any time to take rest, on his way by placing the pole with the load on the ground vertically. This carrier is used to carry

loads of *táhal* and grass from the forest to the fields for making *ráb*. Its weight is about 6 lbs. and costs annas 12.

9. *Ghadwanchi* or *bank* (M.)—threshing bench.—This is a kind of bench having the following dimensions :—length 7', breadth 2' 3" and height 2'. This bench is used for threshing rice in straw, by beating the bundles on it. The bench costs about Rs. 5 to Rs. 6.

10. *Tiwani* or *tiwate* (M.)—It is a tripod seat 9" to 12" high. It consists of a plank 6" by 6" mounted on three short legs. It is used by women to sit upon while lifting seedlings in the rice beds. This stool gives the workers a resting support and prevents the labourers' clothes from getting dirty. It costs about annas six.

MALLAD (HEAVY RAINFALL TRACT OF KARNATAK) IMPLEMENTS. (PLATE XXXVI).

In the *mallad* tracts of Belgaum and Dhárwár districts the rice is generally drilled, although in some remote hilly tracts like Chandgad, where the rainfall is very heavy, rice is transplanted to a certain extent. The implements used in rice cultivation in Belgaum and Dhárwár are :—

1. Plough.
2. Harrow (*kunti*).
3. Clod crusher (*hendore kodda*).
4. Seed drill (*kurgi*).
5. *Phali* (plank board leveller).
6. Wooden hoe (*halka*).
7. Hoe with T-shaped prongs (*huttkunti*).
8. Hoe with spear-shaped prongs (*repni*).

The plough used in rice cultivation is similar to the light plough of Belgaum. The head is 5" broad, 4" thick and 1' 3" long; the shoe is 1' 3" long; the share is 1½' long and 1½" broad. It is generally made of *ain* (*matti*) wood. It weighs about 50 lbs. and costs from Rs. 3 to Rs. 5. It lasts about 4 years and the share needs sharpening once in the season. It ploughs 30 *gunthás* to one acre in a day.

The harrow (*kunti*) consists of a head-piece about 3' long, 8" broad and 4" thick. The prongs are 9" long and the blade 2' 7".

It works about $2\frac{1}{2}$ acres per day. The blade needs sharpening once a year. The harrow costs about Rs. 2.

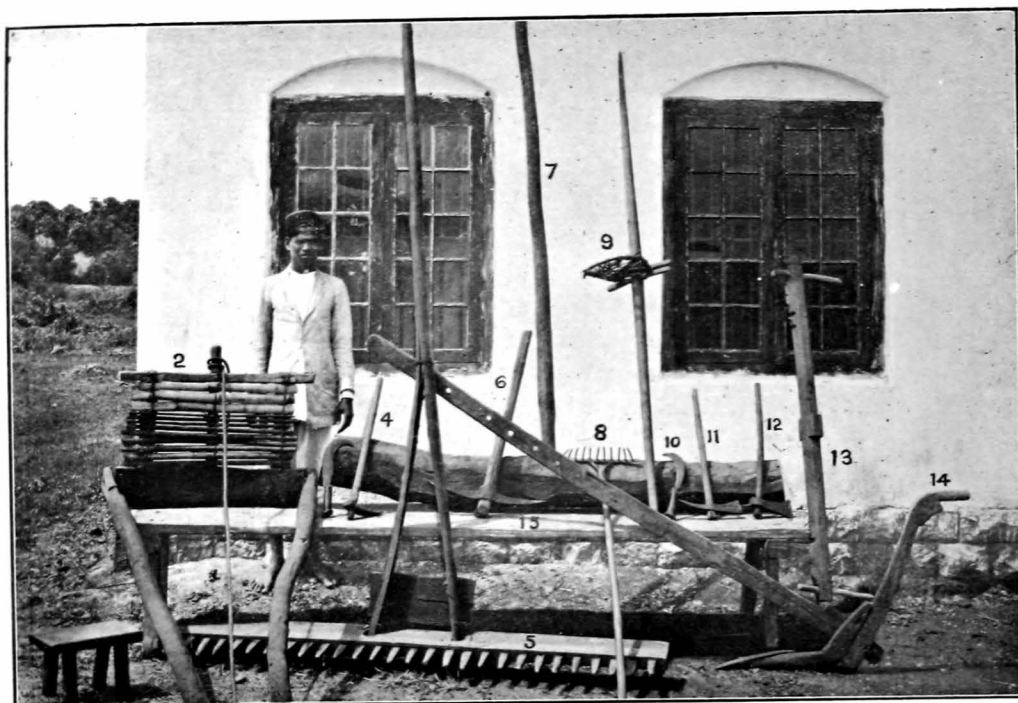
The plough and the harrow are not used during the rains. Lands near Belgaum are ploughed and harrowed for *rabi* preparation. If no *rabi* crop is taken, the land is ploughed in the cold weather and left over for weathering. It is usual to take two crops in rice fields—Rice followed by lentils, peas, mustard, *wál*, etc. For rice the land is simply harrowed after harvesting of the *rabi* crop. The length of the pole in both the implements varies from $7\frac{1}{2}'$ to $9'$.

The clods in the field are broken by a clod crusher, called *hendore-kodda*. It consists of two pieces of wood joined together, into which two wooden pegs are driven in to work the same over the field. This crusher is $7' 5''$ long and $11''$ wide and weighs about 100 lbs. To work the implement two men and two bullocks are required.

Six-coultered drill for sowing rice is peculiar to this tract. When the land is sufficiently moist rice is drilled or in some places the seed is sown even in anticipation of rains. The drill has its head-piece about $4' 10''$ long, $3\frac{1}{2}''$ broad and $2''$ thick. The length of the coulter is $1' 3''$, the distance between two coulters being $7''$ to $9''$. The drill weighs about 58 lbs. and costs Rs. 8 to Rs. 10. It is worked by two men and two bullocks.

There are three kinds of interculturing implements, each being used at different stages of growth of rice. When the seedlings are quite young the hoe called *halka* is passed between the rows of the standing crop. This implement is made entirely of wood. It consists of a head-piece which is $5' 7''$ long. Into the head-piece 22 straight wooden pins, each about $9\frac{1}{3}''$ long, are inserted, the distance between two pins being $3''$. The pins often break and require frequent replacing. Two stilts are inserted on the top of the head-piece to guide the implement. It weighs about 39 lbs. and costs about Rs. 4. To work the implement two men and two bullocks are required.

When the crop grows about $5''$ to $8''$ high another hoe called *huttkunti* is used. It consists of a head-piece about $4'$ long, $4''$ broad and $1\frac{1}{2}''$ thick. Into the head-piece six T-shaped iron bars, each about $8\frac{1}{2}''$ long, are inserted. The distance between two Ts is $8''$ and the length of each of these cross-bars is $6\frac{1}{2}''$. On the top of the head-piece there is one hole to hold the stick to steady the implement. This hoe is worked two or three times. It scrapes up the soil and uproots weeds. It weighs about 32 lbs.



Konkan Implements—1 Tivne (stool). 2 Petari (leveller). 3 Koyta (large sickle). 4 Kudali. 5 Gootephalli (toothed harrow). 6 Pickaxe. 7 Maindh (clod crusher). 8 Datale (rake). 9 Baila (head load carrier). 10 Lania (sickle). 11 Dutonde (pickaxe for digging cocoanut beds). 12 Kurad (axe). 13 Ju (yoke). 14 Nangar (plough). 15 Bak (long bench for threshing rice).



Implements used in Rice cultivation, Mallad—1 Plough (Ranti). 2 Kunti (harrow). 3 Hendore (clod crusher). 4 Halka (wooden hoe). 5 Kurigi (6 coultured drill). 6 Repni. 7 Hutt Kunti.

and costs Rs. 5. One man and two bullocks are required to work the implement.

The third interculturing implement used in rice cultivation is termed *repni*. It is used when the rice plants are 8" high. In this hoe the head-piece is 4' long, 4" broad and $1\frac{1}{2}$ " thick. Into the head-piece 6 spear-shaped iron tines are inserted. Each tine is one foot long. The distance between two tines is 8". When this hoe passes between the rows of rice it eradicates surface weeds and earths up the plants. The attachment of the stilt on the top of the head-piece completes the implement. The weight and the price of the hoe is the same as that of *huttkunti* described above.

The three hoes mentioned above are worked singly on one yoke and are peculiar to the Belgaum and Dhárwár districts.

There is only one kind of yoke used for working all the implements described above. It is a single yoke, about 8' 6" long. The distance between neck to neck is 6' and the neck space is 5". The double yoke found in rice tracts is used for working the *mhots*. It is 6' 10" long, the distance from neck to neck being 4' 9".

Besides the common hand tools found in the dry as well as in wet tracts of Belgaum, there is one big sickle (*halli koyuva kodgotu*) used in the *mallad* tract for trimming and repairing head-lands of rice beds. The length of the inner curve of the sickle is 4' 8". It weighs about 7 lbs.

HAND TOOLS.

For digging two kinds of tools are ordinarily found all over the Presidency—*kudalis* of various types and pickaxes. The latter although of an English make has become quite common and is found everywhere.

In Gujarát three types of *kudalis* are found. One costing 4 to 6 annas is used for digging surface earth and shrubs. The second called *chanchari kudali* has a pointed end and is used for digging crops like potatoes, groundnut, ginger, turmeric, etc. The third kind called *chanchvo* is a bigger and a stronger tool and is used for digging deep-rooted weeds like *khavo*, *dabdho* and *gunderdo*. It costs Re. 1-4-0.

Naraj (crowbar) is used for making holes for putting up the ordinary shrub fence. *Rambho* is a substitute for an iron crowbar. The upper portion of this tool consists of a wooden handle into which a small iron crowbar is fixed.

Kudali,	price	4 to 8 annas.
Chanchavi,	„	4 to 8 annas.
Chanchvo,	„	Re. 1-4-0 to Re. 1-8-0.
Rambho,	„	8 to 12 annas.
Naraj, (crowbar),	„	Re. 1 to Rs. 2.

In the Deccan also three kinds of kudalis are met with. One ordinary for digging surface earth and cutting shrubs. It is called *pan kudal* in Khándesh and Násik. Another kind is called *sumb kudali* and is used for digging *kunda* and *hariali* from heavy and deep black soils. There are special kudalis for digging and earthing up sugarcane.

Pan kudali, ordinary,	price	8 to 10 annas.
Sumb kudali,	„	14 annas to Re. 1-4-0.
Sugarcane kudali,	„	12 annas to Re. 1.

In the Karnátak two types of kudalis are common. One ordinary kind is called *bai gudali* and other *mani gudali*. The latter is used for digging and eradicating *hariali*. This weed is very troublesome in the Karnátak.

Bai gudali,	Price	12 annas to Re. 1.
Mani gudali,	„	Re. 1-4-0 to Re. 1-8-0.
Pavdo (G)	}	„ annas 8 to Re. 1.
Khore (M)		
Salaki (K)		

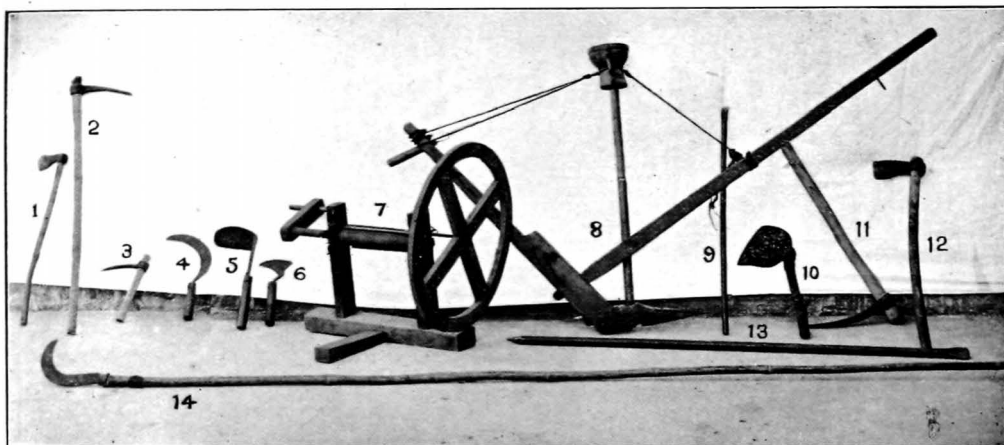
Shovels of English make or local make are in use all over the presidency. They differ in make and size and the prices vary accordingly. There are several uses of this hand tool such as digging surface earth, repairing and making beds, making water channels, holding water while irrigating, stirring the soil and filling baskets. There is one large shovel which is used by *vaddhars* in earth work. It costs about a rupee.

Pavdi (G)	}	Price 4 to 6 annas.
Pavdi (M)		
Badmani (K)		

It is a wooden shovel commonly used for collecting cow-dung in the cow shed. It consists of a semi-circular piece of plank into which a small handle is inserted. In some parts of Karnátak it is also used for collecting grain in the threshing yard.

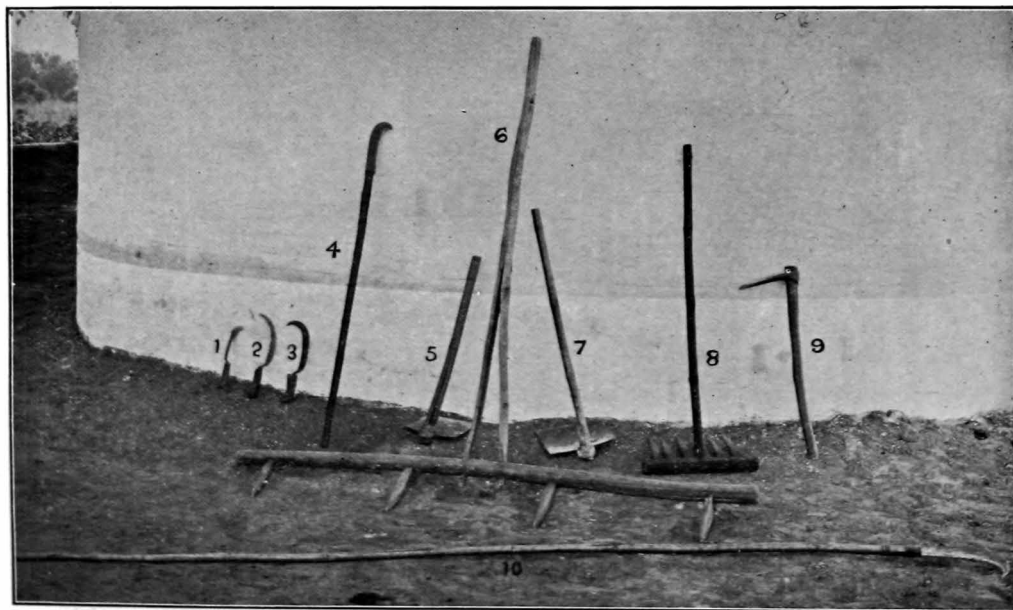
Panjeti (G)	}	Hand rake, price about 8 annas.
Datale (M)		
Jetti kunti (K)		

XXXVII

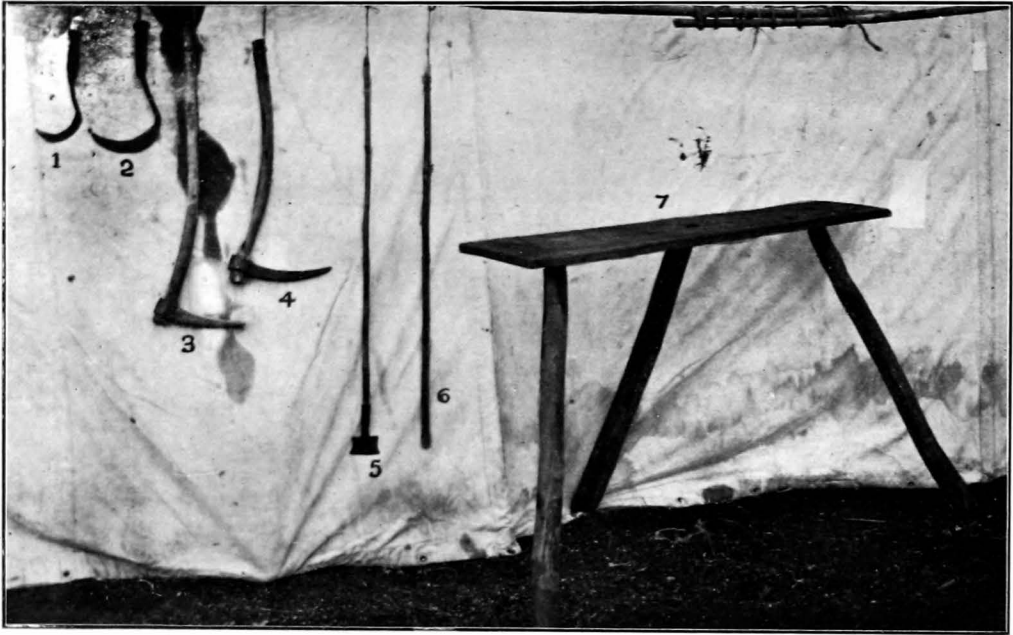


Surat hand tools—1 Kohadi (axe). 2 Kodali. 3 Chanchvi Kodali. 4 Datardu (sickle). 5 Hath Dhariu (weeding hook). 6 Datardi (weeding hook). 7 Charku (hand gin). 8 Hand plough. 9 Parai (goading stick). 10 Pavdo. 11 Chanchvo. 12 Kohado (hatchet). 13 Naraj (crowbar). 14 Dhariu.

XXXVIII

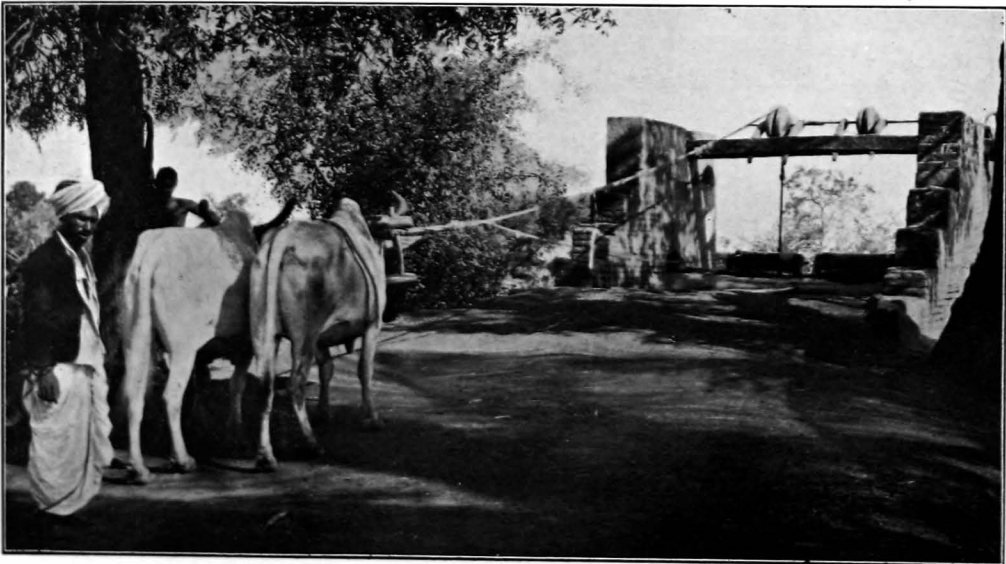


Kaira hand tools—1 Kharapdi (weeding hook). 2 Datardu (ordinary sickle). 3 Datardi (sickle for cutting tobacco plants). 4 Dhariu. 5 Pavdi. 6 Jisali (tobacco liner). 7 Pavdo. 8 Panjetti. 9 Kodali. 10 Dhariu with long pole.



Khandesh hand tools—1 Khurpi (weeding hook). 2 Vila (sickle). 3 Pan Kudali. 4 Sumb Kudali. 5 Purana with Vilti (goading or driving stick with mud scraper). 6 Purana. 7 Chahoor or Tivai (stool for the man to stand while winnowing grain).

XL



East Khandesh—Backing system of Mhot.

It is a small hand rake found all over the presidency. It has several uses, namely, stirring the crust of the earth, preparing beds in irrigated lands, for stirring grain and chaff in the threshing yard, mixing ashes and earth in *rab* preparation.

Kuhadi small	} (G) }	Price 4 to 8 annas for a small one and over a rupee for a large one.
Kuhado big		
Kurad (M)		
Kodali (K)		

Make of hatchet varies from place to place. Two kinds are generally found—one small and the other large. Small hatchets are used for cutting shrubs, shaping small parts of implements in emergencies and for cutting new cane. The large ones are used for cutting and splitting wood.

Myarkolu (K), price 6 to 8 annas. This is found only in Karnatak. It is a small hook fixed to the end of a bamboo. It is used for drawing and mixing chaff in the Kutar (chaff) house.

A similar hook with a short handle is found in Dohad and Jhalod. It is used for stirring grain and chaff in the threshing yard. It costs from 4 to 6 annas.

Dharia or vansi (G), price Re. 1 to Rs. 3. This is used for cutting babul shrubs, Euphorbia and other hedges. The dharia has a plane but sharp edge and the vansi has a serrated edge. The bamboo pole of the latter is lighter and longer. The blade has a very little curve at the top. This hand tool is also commonly found in the Surat and Broach districts, where it is used for chopping down babul shrubs and cactus hedges.

WATER LIFTS.

The principal sources of irrigation are—

- (1) Canals fed from reservoirs, lakes and rivers.
- (2) Tanks fed from the catchment area of the surrounding country.
- (3) Wells.
- (4) Perennial streams and springs.

Total area irrigated during the year 1912-13 as returned in the crop and season report in the Presidency proper amounts to about 955,000 acres. Out of this area 200,374 acres are

irrigated from Government and private canals, 205,935 acres from tanks and other sources, and 548,525 acres from wells.

The area under canal irrigation is greater in the Deccan, under tank irrigation in Gujarát and Karnátak, and the well irrigation is very widely distributed all over the presidency. Irrigation from perennial springs and streams is found only in the coastal districts, specially in Ratnágiri and Kárwár.

The best and easiest method of irrigation is by flow, but this is possible only in the case of canals and tanks. Even from these sources water is required to be lifted if the land to be irrigated stands a few feet higher than the water level in the canal, tank, stream or river. Of course from wells, water must be lifted before it is put on the land. For lifting this water some kind of power is needed.

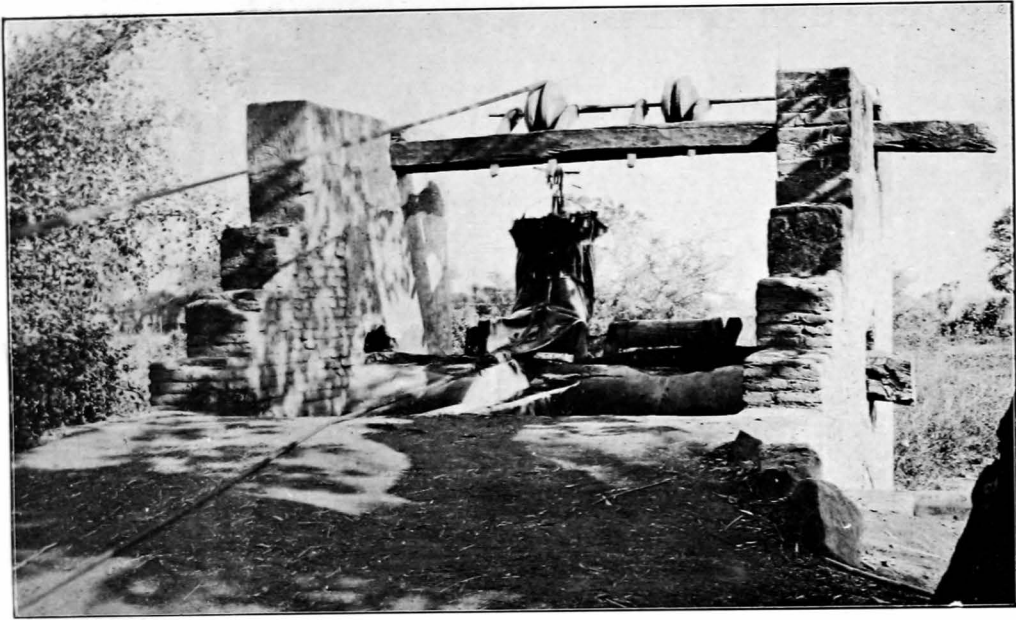
Various kinds of water lifts and devices are in vogue in different tracts of the Bombay Presidency. The kind of water lift varies according to the depth of water in the well, tank or canal. The depth of water in the well varies according to locality or district. The wells in Surat and Ahmedabad are shallower than those of Kaira. An average depth of a well in Ahmedabad and Surat is about 30 feet, whilst in Kaira it is 40 to 70. In the Deccan the average depth is 40 to 60 feet. In the Karnátak, Belgaum has a water level at a small depth (20' to 30'), whilst in Bijápur and Dhárwár the water level is deeper, and in the Konkan the water level varies from 20 to 30 feet.

The supply of water in the well depends upon the amount of rainfall and many other circumstances. The greater the diameter of the well the larger will be the storage. Generally speaking it is a practice all over the presidency of constructing round wells, and the *wadap* (frame work of *mót*) and the water trough are constructed of wood and stone respectively. This rule is not observed in Khándesh, where one will see rectangular wells. These are well suited for the wooden *wadap* and they are common in West Khándesh.

In Gujarát and parts of Khándesh the side supports are made of masonry, on which the *chakpatti* (the wooden piece on which the wheel works) is fixed.

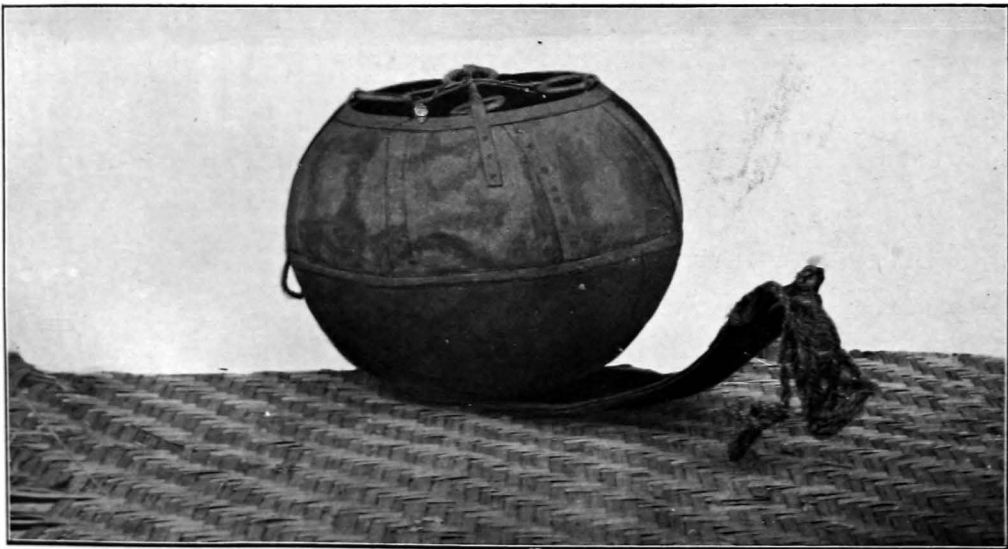
For small depths there are various kinds of water lifts, but when the water level in the well exceeds 20' there is no better or cheaper method of raising water than the ordinary *mhot*.

XLI



East Khandesh—1 Mhot in emptying state. 2 Motwan or Vadap. 3 Roller (kana). 4 Chak (pulley).

XLII



Panch Mahals—Iron Mhot with leather tube.

The area irrigated by a *mhot* depends upon the depth of the well, time of watering, nature of the soil and the season in which the water is given to the crop.

In Gujarát two kinds of *mhots* are met with: one is called *ramio*, having no opening at the bottom for discharging water and therefore a separate man is required for emptying the same at the head of the well; the other is called *sundhio* and has a self discharging trunk.

In the Kaira and Surat districts where the wells are 40' to 60' deep *ramio mhot* is in general use. With two *mhots* on a well the area irrigated will amount to about 24 gunthas in a day of 8 hours. One well on an average can irrigate 3 to 5 acres.

Towards Ahmedabad the water level in the well is shallow, *i. e.*, 30 to 40 feet, where the *mhot* is double the size of that used in the Kaira district and can irrigate about 24 gunthas in a day. If two pairs of bullocks are worked in relays it can even irrigate one acre. The intervals in waterings are 7 days in the hot weather and 10 days in the cold weather. Generally one *mhot* is sufficient to irrigate 4 acres of ordinary crops. *Sundhia mhot* is commonly used towards Dholka (Ahmedabad district).

In the Surat and Broach districts *Ramio mhot* is used on deep wells whilst on shallow wells *sundhio* is common. In the Broach district wells are sometimes very deep (70 to 80 feet).

In Panch Maháls *sundhio mhot* is common. In some places an iron drum with a leather tube is found; in others the *mhots* are wholly made of leather. The former costs Rs. 8 and the latter about Rs. 10. The capacity of both is about 25 gallons.

In the case of *ramio mhot* the bullocks are detached at the bottom of the slope by removing the pin called *bhad*; they turn round and walk up the second less inclined track for reattachment to the rope.

In the case of *sundhio mhot* they are not detached but back up the slope slowly. This practice is quite common in the Deccan and Karnátak. However some variations are found. In East Khándesh turning the heads of the bullocks without unfastening the *nada* (rope) is met with in several places. The *nada* and *sond-dor* hangs on one side of the neck yoke (Plate XL).

In Belgaum two kinds of inclines are found on the well. One is very steep and the other with a gentle-slope. Two pairs

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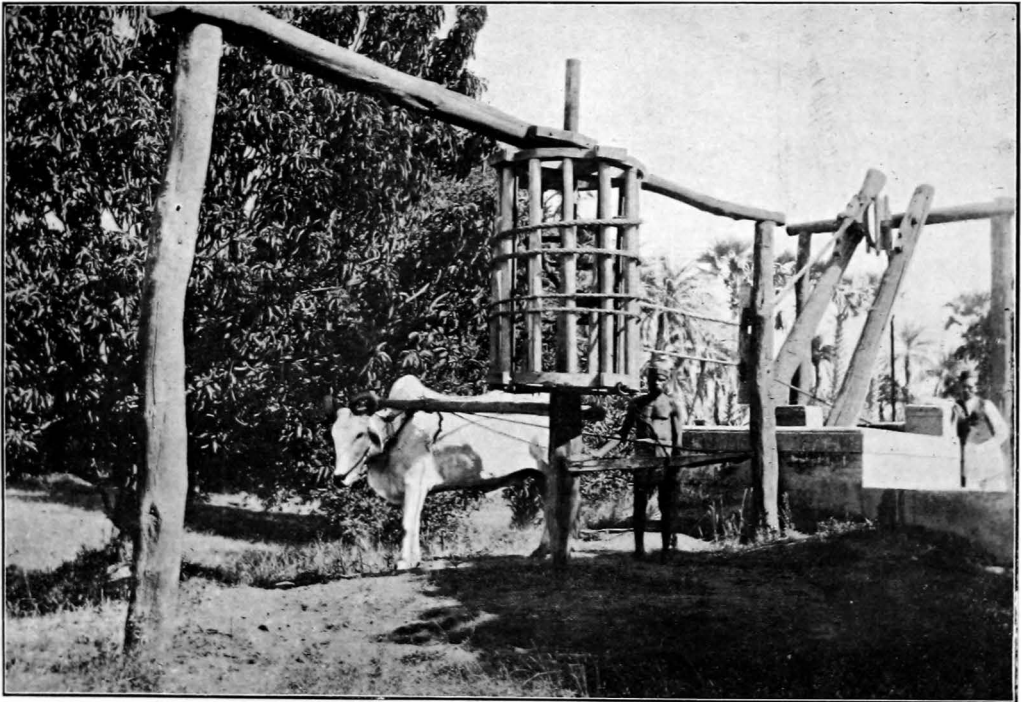
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in relays are commonly used for drawing the *mhot*. One pair runs down the steep incline drawing up the *mhot* at the bottom. It is unfastened and then it walks up slowly by the less steep path and stands near the well for rehitching. By that time another pair standing near the well has already drawn down another *mhot*. The general practice is to run the bullocks on the incline of the well while drawing water with the *mhot*.

In localities like Broach, Surat and Khándesh another contrivance is found as a substitute for the bullock run. In this contrivance there is a saving of space and labour. The machine consists of a vertical drum (Plate XLIII, No. 1), 6 feet in length and 4 feet in diameter. This drum is fitted with a wooden axle, one end of which works in a socket of another axle which is fixed into the ground. The other end of this small axle, is held in the hole of a beam resting on the wall of a roof. One end of the yoke is fixed to the lower axle in a slanting direction. The upper drum and the lower axle are connected by a short, strong chain which is hooked at one end and does not allow the drum to move in an opposite direction. When the bullock is yoked and walks round, the *sond-dor* and *nada* wind round the drum and the *mhot* comes up gradually and discharges in a trough in the usual way. But when the drum and the lower axle are disconnected by removing the chain, the drum automatically works in an opposite direction, and the *mhot* once more goes into the well with great force on account of pressure of gravity. Then the chain is rehooked and the process is repeated.

As this machine has the advantage of a lever, less power is required. A space of 12' in diameter is quite sufficient for the run of the bullock. At Dhulia satisfactory work of this machine has been observed in one of the gins where it is worked by one buffalo bull on a well where the water level is about 50 feet below the surface. The approximate cost of this machine including fittings comes to about Rs. 150.

In other parts of the presidency, except Gujarát, *sundia mhot* is generally found. The capacity of a *mhot* varies from place to place. Generally *mhots* of three types are met with: 7 pavlis (steps), six pavlis and 5 pavlis. The prices vary according to size and locality. Seven and 6-pavli *mhots* are worked by four bullocks, whilst 5 pavli are worked only by a pair of bullocks.



Working the Mhot by bullock gear.

CHAMPARA.

E

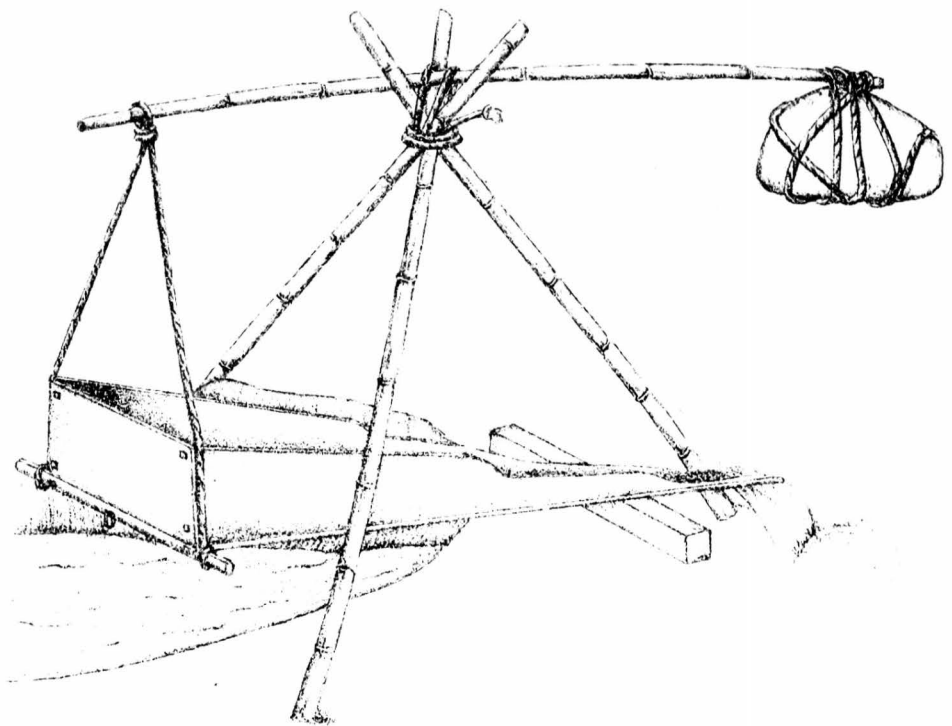
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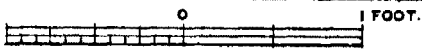
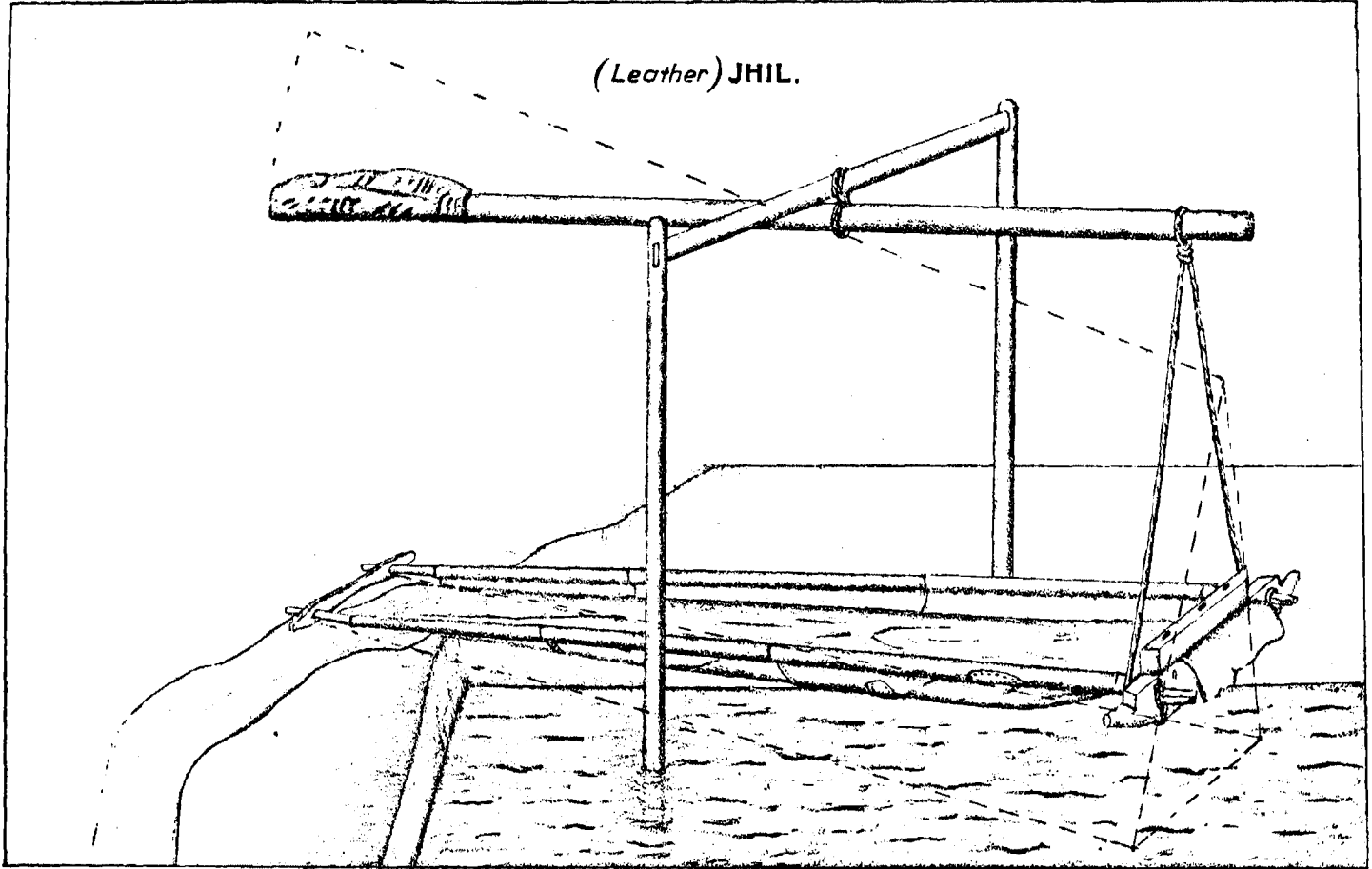
1 FOOT

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K. R. TILAK.



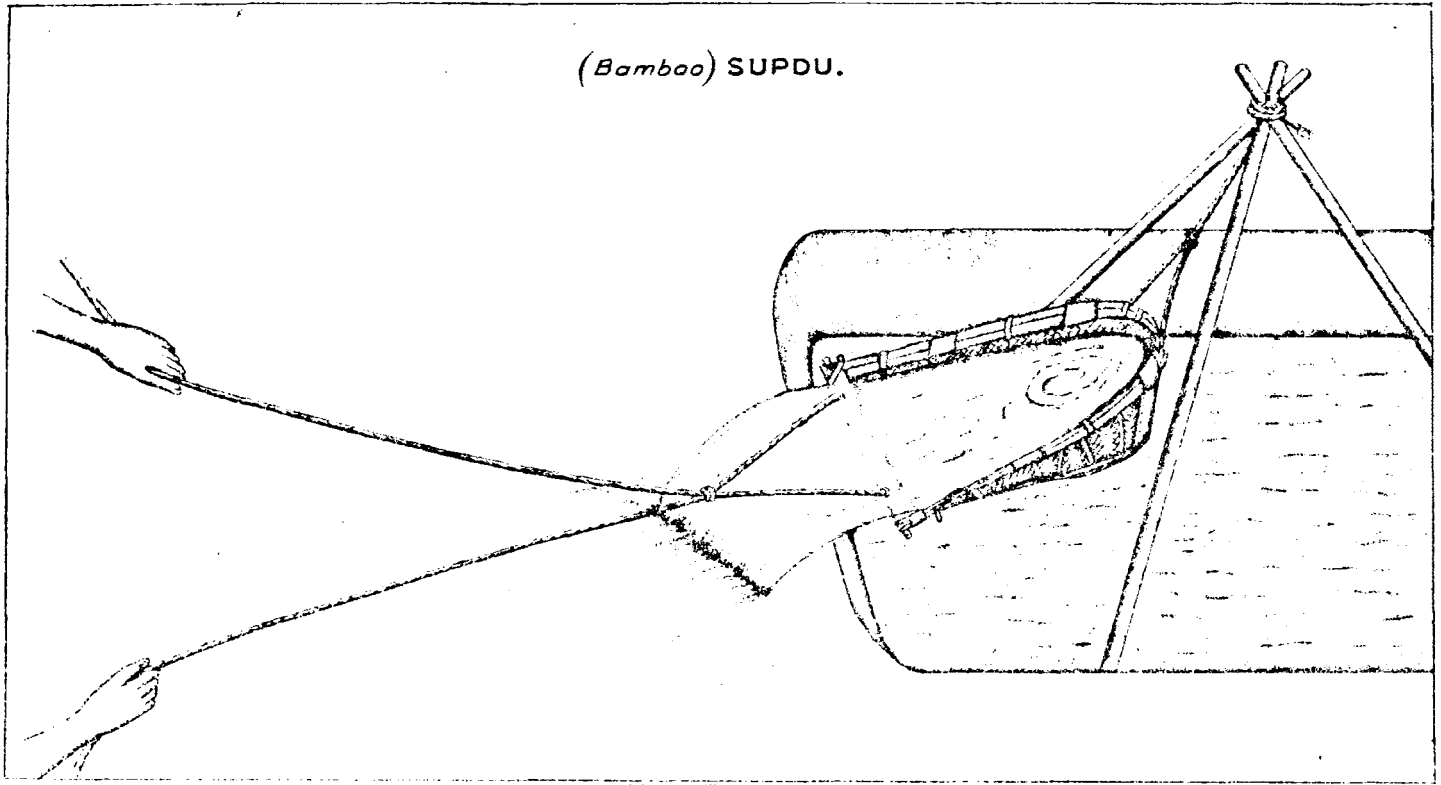
(Leather) JHIL.



Govt. Photo Engraving Office, Poona, 1914.

K.R.TILAK.

(Bamboo) SUPDU.



0 1 FOOT.

K. H. TILAK.

The following table shows the prices of the mhot and its accessories obtained in different tracts.—

Name of the District.	Prices of							
	Ramio mhot.	Sundhio mhot.	Pulley.	Roller.	Large rope (Varat or Nāda.)	Small rope Sond-dor.	Double yoke.	Vadap (frame work.)
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Ahmedabad...	6 to 8	18 to 20	3	1	2 to 3 (coir) 10 to 16 (leather)	1½ to 2	3	10 to 12
Kaira ...	6 to 8	18 to 20	3	1	4 to 5 (coir) 15 to 20 (leather)	1½ to 2	3	10 to 12
PanchMahāls.	6 to 8	8 to 10	2	1	4 to 5 (coir)	1½ to 2	2½	5 to 8
Surat ...	16 to 20	18 to 20	4	2 to 3	7 to 8 (coir)	1½ to 2	4	15 to 40
Broach ...	16 to 20	18 to 20	4	1½ to 2	6 to 8 (Ambadi or Bhendi)	1½ to 2	4	12 to 15
Khāndesh ...	...	17 to 20	3 to 6	2½ to 4	4 to 6 (aloe)	2½	3	15 to 40
Nagar ...	...	15 to 20	2 to 2½	1 to 1½	3 to 3½ (aloe) 10 to 15 (leather)	0 12 0	1½	3 to 5
Nāsik ...	...	8 to 13	1½ to 2	1 to 1½	1½ to 2 (aloe) 2 to 3 (coir)	0 12 0	1½	10 to 15
Poona ...	...	15 to 25	2½ to 3½	2 to 2½	4 to 6 (aloe)	1 0 0	1½	4 to 7
Sholapur ...	...	20 to 28	3 to 4	1 to 2	6 to 8	2 to 2½	1½	10 to 12
Sátara ...	...	20 to 25	2	2	6	1 to 1½	1½	8 to 10
Beigam ...	...	16 to 20	1½ to 2	2	4 to 4½	1 to 1½	2	10 to 15
Dhātwar ...	...	16 to 18	2 to 2½	2	4½ to 5	1 to 1½	2½	10 to 15
Bijapur ...	...	14 to 20	2 to 3	3 to 4	4 to 4½	2 to 2½	2	8 to 9

Note.—I. (1) The prices of wood work vary according to the kind of wood used.

(2) The prices of mhot or kos vary according to the water holding capacity of the mhot and locality.

In Nagar 7 *pavli mhot* (the drum having the diameter of 7 steps), costs Rs. 20

In Nagar 6 *pavli mhot*, costs Rs. 15.

" 5 *pavli mhot*, costs Rs. 12.

The first two are worked by two pairs of bullocks and the third by one pair only.

(3) The prices of ropes vary according to the quality of fibre and kind of rope used.

II. *Vadap* or mandwan consists of the following :—

- | | |
|--|---|
| (1) धांबला (G) (<i>thāmbla</i>). | } Side uprights. |
| सुळे (N) (<i>sule</i>). | |
| किवीकंबा (K) (<i>kiwikamba</i>). | |
| (2) मोभ or मोभियूं (G) (<i>mobh or mobhiu</i>) | } Horizontal wood connecting the upright posts. |
| चाकपटी (M) (<i>chakpatti</i>) | |
| ताली (K) (<i>tali</i>). | |
| (3) तर्गत or मोतिआं (G) (<i>targat or motia</i>) | |
| Two upright posts, the upper ends of which rest on <i>mobhiu</i> and the lower in the water trough. The axle of the pulley rests on these posts. | |
| (4) कांडिया (G) (<i>Kāndia</i>) | These are two wooden brackets for holding the axle of the pulley in position. |

In the Deccan and the Karnatak the *sules* have braces on both the sides and are called धीरा (*dhira*) while Nos. 3 and 4 are found only on Gujarát wells.

III. Details of *mhot* working equipment—

(1) Pulley.	<i>Weight in lbs.</i>
चकली-चाक्रो (G) (<i>chakli or chakro</i>)	40
चाक (M) (<i>chak</i>)	10 to 20
गढगडी (K) (<i>gadgadi</i>).	...
(2) Two pegs in which the axle of the pulley moves—	
बावल्या किंवा खुट्या (M) (<i>bawalya or khutalya</i>).	
(3) Roller	<i>Weight in lbs.</i>
गराडी or गरेडी (G) (<i>gargadi or garedi</i>).	40
कणा (M) (<i>kana</i>).	15-28
कदरू (K) (<i>kadaru</i>).	...
(4) Big rope—	
वरात (G) (<i>warat</i>).	
नाडा (M) (<i>nada</i>).	
मिणी (K) (<i>mini</i>).	
(5) Small rope—	
राहडी (G) (<i>rahadi</i>).	
सौंदर (M) (<i>soundar</i>).	
सोंडी हग्या (K) (<i>sondi haggá</i>).	
(6) Double yoke—	
तरेला (G) (<i>tarela</i>).	...
शेळ्वट (M) (<i>shelwat</i>).	18 to 23
नगा (K) (<i>naga</i>).	...

The following table gives interesting details regarding the working of the *mhot* in different tracts of the Bombay Presidency :—

Name of the <i>mhot</i> .	Weight of <i>mhot</i> when wet in lbs.	Cost of <i>mhot</i> in Rs.	Capacity of <i>mhot</i> in gls.	Lift in (height) feet.
Nadiad Ramio	17	7 0 0	22	50
Surat-Sundhia	48½	32 8 0	40	27'-2"
" Ramio	43	15 to 20	50	31'-8"
Iron Mhot (Bhide) of Sàngli, Surat trial.	71	15 6 0	52½	27'-6" to 32'-2"
Dhulia Leather	53	17 0 0	44.4	44
Iron Mhot (Bhide) of Sàngli, Dhulia trial.	70	12 to 14	50	44
Poona Leather	58	15 2 0	68½	17-24

Name of the <i>mhot</i> .	Average number of <i>mhots</i> lifted per hour.	Gallons lifted per hour.	Labour required		Day of working hours.	Cost per 1,000 gls. of water in Rs.
			Men.	Bullocks.		
Nadiad Ramio	73	1,606	2	2	7½	Rs. a. p. 0 2 88
Surat-Sundhia	52.33	2,093	1	2	8	0 1 13
" Ramio	59.33	2,966	2	2	8	0 1 10
Iron Mhot (Bhide) of Sàngli, Surat trial.	47.33	2,486	1	2	8	0 1 0
Dhulia Leather	37	1,643	1	2	8	0 1 62
Iron Mhot (Bhide) of Sàngli, Dhulia trial.	37.25	1,706	1	2	8	0 1 55
Poona Leather	80	5,480	1	4	8½	0 0 87

On account of high prices of leather the mhot is getting dearer and dearer day by day. During the last 10 years the prices have almost doubled. To remedy this evil, mhots of different patterns, made of iron sheets, have been manufactured and put into the market.

Name of Manufacturers.	Description.
Messrs. Kirlosker Brothers, Belgaum.	It is a self-emptying mhot, made of galvanized iron sheet. It weighs 50 lbs. and holds 40 gallons of water.
Do. Sholapur.	It is similar to the above, but with a false bottom for filling in water. It weighs 68 lbs. and holds 40 gallons of water.
Mr. Chavan of Nàsik.	It is a cylindrical self-emptying mhot, with a valve at the bottom for filling. It weighs 34 lbs. and holds 35 gallons.
Messrs. Sultan & Co., Madras.	It is a round clumsy barrel much heavier than that of Nàsik. It weighs 55 lbs.
Iron drum mhot with leather tube.	This is met with in some parts of the Deccan, as well as in Panch Maháls.
Messrs. Bhide & Sons and „ V. R. Phadke & Co., Sàngli.	It is a wedge shaped mhot with a square body at the back. It is provided with a valve at the bottom for filling in of the mhot. The valve is lined with canvas to make it water-tight. Arrangement for emptying the mhot in case of difficulty has been provided by fastening a thin wire connecting the valve and the <i>sonddor</i> . There are three sizes of the pattern manufactured. According to the capacity of the mhot they cost from Rs. 10 to Rs. 13-8.

Chrome tanned leather mhots are manufactured in the School of Arts, Madras, as well as at Navsári in this Presidency. In this case the ordinary leather is tanned with chromic acid, which does not allow the leather to rot. It does not require oiling like other mhots, but remains soft and does not crack. It is more lasting than the ordinary mhot, but on account of high prices of these mhots they have not become popular.

Oiling the mhot.—The cost of the mhot does not include oiling charges. The mhot when newly purchased is oiled once and then it is reoiled every six months. It requires 8 lbs. of oil to soften newly purchased mhot, whilst 4 lbs. of oil is sufficient on subsequent occasions. Charges for oiling first time are as under :—

	Rs.	a.	p.
8 lbs. of sesamum oil	2	0	0
2 lbs. of curds	0	3	0
3 tolas turmeric powder	0	1	0
1½ lbs. catechew (inferior sort)	0	4	0
	<hr/>		
	2	8	0
	<hr/>		

When the new mhot is used for about a month a fresh dressing of about 4 lbs. of castor oil is given. This costs about 13 annas. The first application softens the leather and prevents it from cracking. The castor oil prevents the rotting of the mhot in water.

STATEMENT.

The following table gives the details of different kinds of water

Name of the water lift.	Short description.	Price in Rs.	Depth to which the lift can be worked in feet.
Champara (G) Doni (K)	It is a boat-shaped counterpoise lift, one end of which is fixed into the water channel where it is to be emptied.	3 to 10	3' to 5'
Zil (G) Dol or Saras or Sheral (Konkan) (M)... ..	It is a shovel like scoop made out of भेरल मढ (beral madh) palm. It is suspended from a tripod and swung by means of ropes by one or two men from a pond of water.	1 to 1½	2' to 3'
Supdu or Topali (G) Topli (M) Goodi (K)	It is a triangular bamboo basket lined with leather in some places. It is swung by ropes.	6 to 10 annas.	2½ to 3
Dhekudi (G) Okti (M) Yata (K) Dotte (Kánara)	It is a lift used in raising water by a lever from shallow wells and tanks. It is a hand lever and bucket lift. To the other end of the lever is tied a stone to act as a counterpoise. Dhekudis are erected on the banks of rivers in Gujarát.	5 to 10	5 to 10
(Persian wheel) Rhent (G) Rahat (M)	It is a Persian wheel with large barrel like wheel made of wood. The axles of this wheel rest on a platform on one side and the other side rests on a raised pillar of stone. On this wheel rests an endless chain of ropes to which earthen or iron pots are tied. The distance between two pots varies from 1' to 1½'. When the wheel is moved round and round the pots empty themselves in a wooden trough adjusted to rest in the middle of the barrel wheel. When bullock power is to be used then one end of the axle is kept long to which two cogwheels are attached and then it works like a bullock gear.	25 to 100	5 to 20

lifts other than the *Mhot*, in use in the Presidency proper :—

Other facilitating features of the work.	Quantity of water raised per hour in gallons.	Power required.	Localities where used.	Remarks.
It is used in tank irrigation. It is used by manual power and the man is required to stand in water.	1,200 to 1,500	Two men in relays.	The implement is used in tank irrigation in Gujarát and K o n k a n (Kárvár).	Plate XLIV.
It is portable ...	900 to 1,000	Two men in relays.	It is used in rice cultivation in Konkan and Gujarát and in Sugarcane cultivation in Bhor State.	Plate XLV.
It is portable. It is used in shallow water tank irrigation.	1,500 to 2,000	Four men in relays.	It is commonly found all over the presidency.	Plate XLVI.
It is useful where the area to be irrigated is small.	600 to 1,500	Two men in relays.	It is commonly found all over the presidency.	The quantity of water drawn per hour would vary according to the size of the bucket and depth of water. In Kanara two kinds of counterpoise water lifts are in use. One has a copper bucket and costs about Rs. 15 and holds 50 lbs. of water. About 60 buckets are drawn per hour. The wooden bucket lift costs Rs. 1½ and weighs 18 lbs. It holds 20 lbs. of water. About 80 buckets are drawn per hour.
The Persian wheel works even when the water depth in the well is shallow.	500 to 2,000	One or two men or one man and a he-buffalo or a bullock.	Very commonly used in Konkan and Sindh.	Prices of Persian wheel worked by hands and feet. Persian wheel worked by bullock gear. Rs. Rs. Ratnágiri... 25 50 Kolába ... 40 80 Bassein ... 100 125 Sarat 80 to 100 Improved with brass bearings and buckets ... 300 to 350 In Mahim and Pálghar brass castings are used for roller bearing axles. It greatly reduces the friction. The improved <i>Rahaf</i> can be seen in one of the Dandeker's bungalows near Pálghar Station.

Name of the water lift.	Short description.	Price in Rs.	Depth to which the lift can be worked in feet.
Cawnpore chain pump ...	In this an endless chain carries wooden blocks with leather washers at an interval of about a foot. It passes through a pipe and then over a grooved wheel to which handles are fixed for working the lift.	Rs. 45 to 60	5' to 10'
Bullock gear chain pump.	Do. do. ...	Rs. 225. This includes the value of 2 pipes, each 20 ft. long. With 3" diameter and the gear.	12' to 20' 15' is advisable.
Shelne (Hand irrigator)...	It is a light, handy, small boat-shaped scoop about 2' long. It is made of Pangara (Erythrina Indica) wood. It is used for splashing water from a small pond to crops like chillies, brinjals, etc., where the water does not flow through ordinary channel.	4 to 8 annas.	.....

Other facilitating features of the work.	Quantity of water raised per hour in gallons.	Power required.	Localities where used.	Remarks.
The pump is portable. It is useful when the area to be irrigated is small.	2,500 to 3,000	Four men. Two men in relays at a time.	.....	Washers need renewal when worn out.
The water level should be always at 20' in the well.	5,000 to 8,000	Two men and four good bullocks.	.....	Do. do.
.....	.....	.....	Konkan.	

YOKES AND HITCHING.

Yokes.—Only two kinds of yokes are found. One is single and the other double. The single yoke is used to work almost all the farm implements and serves as well for the yoke of the bullock cart. The double yoke is used to work the mhot as well as in cases where a second pair of bullocks is required to be used to work any implement. In Dohād and Jhālod Tālukas of the Panch Mahāls and in most parts of the Karnātak the double yoke is commonly met with.

The length of the yoke varies according to the implement for which it is used. The first yoke of the plough is always longer than the subsequent ones. The gradual variation is specially noticeable in the case of Karnātak ploughs. At Gokāk the length of the first single yoke is 9'-8", the second and the third are double and have lengths 3'-11" and 2'-8", respectively.

Comparatively the yokes are longer in the Karnātak than in the Deccan and Gujarāt. In Konkan they are shorter.

A yoke with four holes on each side is met with in the Dhārwar District and its length is 9'-4". When three hoes are to be worked on one yoke the inside two holes are used for tying the bullocks and when four hoes are to be worked then the outer pair of holes is used.

In Gujarāt and Karnātak yokes pins of iron or wood are inserted in the middle of the yoke to facilitate tying of the implement.

The space intended for the movement of the neck of the bullock when yoked is greater in Gujarāt and Deccan yoke than it is found in the Karnātak. This is only 5½" to 6" in the latter case.

Most of the yokes used for working the agricultural implements are straight, but the first single yoke of the Deccan plough has always a bend. This bend is also specially noticeable in single and double yokes of Nagar. Single yokes have one or two wooden pins to hold the neck of the bullock. One of them is permanent and the other is moveable. Sometimes only one pin is found and this is either permanently fixed in the outside or inside hole.

In the case of double yokes two wooden or iron pins are common. The inside one is permanent while the outside is removable.

Throat bands in use are of various types. They vary from a very thin rope down to fashionable bands made of *sax*, *ambadi* or leather. The method of tying them also varies.

In Gujarát, yokes are made of teak, bor or tanach; in Khándesh of tiwas and in the other districts of the Deccan of bábul and teak; and in Karnátak, bábul, teak and bamboos.

The details regarding the yokes used in different kinds of field work are given in Appendix F.

HITCHING.

Two methods of hitching implements are common in this Presidency. The bracing of the implements with ropes which start from the body of the implement and pass round the yoke and the beam, is prevalent in the Deccan and the Karnátak when the draught is heavy, whilst tying the end of the beam directly to the yoke by means of a loop of a rope is practised in Gujarát and Konkan where the draught is light. In the former tract the draught rope is passed through a wooden groove (*khondka*) at the point where it secures the yoke to the beam. This arrangement prevents the wearing out of the rope. In this case the end of the beam rests on the *khondka*. In some cases a separate loop of rope passes through a groove and the draught rope passes through the back end of this rope. The lengthening and shortening of the implements for adjustment of depth is done by making use of this loop only.

When more than one yoke is used in the heavy work of ploughs and harrows, it is joined to the beam directly, by means of a rope, independent of the first yoke. The ropes of all subsequent yokes are attached severally to the beam direct. In a single pair implement the yoke is always single but when more than one pair are used the first yoke is single and the subsequent yokes double.

In Gujarát and Konkan implements, there is no bracing of ropes; but to facilitate hitching of the beam to the yoke small iron or wooden pins are inserted on the underside of the beam about 6" apart. These are generally three, fixed vertically except in the *bhal* tract where they are horizontally fixed. In Konkan instead of pins the poles have notches on the underside.

The following types of ropes are used in hitching and guiding the bullocks while working the implement. They are made of aloe, *ambadi* fibre or leather.

		Price in Rs.	
1.	Nada (G) Nada (M) Mini (K)	2 to 5	This rope is used for bracing the plough with the yoke.
2.	Dorda (G) Kadhni or Sola (M)	0-12-0	It is an ordinary rope used for tying all implements while working generally.
3.	Nadi (G) Nar (M)	3 0 0	This is a leather rope used in fastening the pole with the yoke.
4.	Achoda(G) Kasra (M)	4 to 6 annas.	Rein ropes tied to the halters and nose strings of the bullocks for controlling them.

The driving stick has a small iron blade called *villi* or *arti* attached to its thicker end. This is used, for scraping and cleaning the blade, tines and shares of hoes, harrows, drills and ploughs.

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APPENDICES.

APPENDIX

PLO

Serial No.	Local Name.	English Name.	Weight in pounds.	Price.	Labour employed to work the implement.		Locality where the implement is used.	Reference to illustration.	
					Men.	Bullocks.		Plate.	Number.
1	Hal	Plough	50	Rs. 3-8 to 5	1	2	Gujarat tract. Ahmedabad.	...	...
2	Do.	Do.	51	Rs. 51	1	2	Kaira P a n c h Mahals.	IX XIV	8 2
3	Do.	Do.	40	Rs. 2-4-0	1	2			
4	Do.	Do.	45	Rs. 7 to 12	1	2	Surat	XVI	2

A.

UGHS.

Short Description.	Efficiency.			REMARKS.
	Depth.	Work done per day.		
		Acres.	Gunthas.	
<p>The plough consists of four parts:—</p> <p>1. The body and stilt are in one piece and are generally made of bábul or rayen. This is nearly a straight piece of wood about 10' to 12' broad and 5" to 6" thick. It is thin at the top and thick at the bottom. The small pin fixed to the stilt projects more inwardly and is used for handling the implement.</p> <p>2. Chowra is a separate piece. It is made of bábul wood and fixed at the lower end of the body. It measures about 1 foot.</p> <p>3. The plough share is a square bar of iron and is about 2' long with a broad and sharpened point. Share is adjusted on the chowra which is inserted into the body and kept in position by means of a wedge at the back.</p> <p>4. Pole is made of teak or bábul or any available wood. It is fixed nearly in the centre of the body with a wedge by which the angle can be adjusted as required. It is 9' to 11' long having two to three pieces of iron inserted at its end about 5" to 6" apart. These pins are inserted on the underside and are of great use while yoking the bullocks.</p> <p>Similar to No. 1</p> <p>This varies from No. 1 in that it has (1) a plough share 13" to 15" long with a broad point (2) wooden pins to the pole instead of iron ones.</p> <p>The plough differs from No. 1 in the following points:—</p> <p>1. Body—18' long, 8" broad and 2½" thick.</p> <p>2. Chowra—18" long and is more conical than in No. 1.</p>	4" to 6"	1	0	<p>The plough is used for ploughing Gorádu lands during the monsoon as well as for interculturing bájri & cotton. It is also used for opening furrows while sowing gram and castors.</p> <p>The plough used in Bhal tract (plate X, No. 1) is almost similar in construction to the Ahmedabad and Kaira plough but it is heavy (about 85 lbs.—plough share alone weighs 8 lbs). The soil in this tract is black, main crops being wheat, cotton and jowár.</p>
	4" to 6"	1	...	<p>This is the whole and sole implement used for cultivation in this tract. It is used for ploughing in both kharif and rabi seasons in all kinds of soils. It is also used for sowing maize, gram, wheat, etc., by attaching a tube.</p>
	4" to 6"	...	25 gunthas during rains.	<p>The plough is used for ploughing black and Gorádu soils after the commencement of the monsoon. It is used for interculturing cotton, jowár, chillis and brinjals</p>

APPENDIX

Serial No.	Local Name.	English Name.	Weight in pounds.	Price.	Labour employed to work the implement.		Locality where the implement is used.	Reference to illustration.	
					Men.	Bullocks.		Plate.	Number.
							Gujarat tract— <i>contd.</i>		
5	Hal	Plough	47	Rs. 7 to 12	2	2	Surat	XVI	3
6	Nangar	S u g a r-cane planting plough.	106	Rs. 15 to 20	3 men & 2 boys.	4	Do.	V	3
7	Hal	Plough	42	Rs. 6 to 7	1	2	Broach	VI	3
							Deccan tract		
8	Nangar	Do.	125	Rs. 7 to 12	1	2 to 4	Khândesh	XVII	2

A—continued.

Short Description.	Efficiency.			REMARKS.
	Depth.	Work done per day.		
		Acres.	Gunthas.	
<p>3. Share—10' long but small and pointed and is nailed down on the chowra.</p> <p>4. Pole—10' long usually made of tanach.</p> <p>The pins fixed to the pole are made of wood generally.</p> <p>Similar to the above except in that it has a rather broad share. Chowra has a hole for fixing the tube for sowing Vâl and castors.</p> <p>The plough is of a heavier construction—broader and thicker in parts. It has a tube bored through the body and the shoe through which the seed canes are put in by a man sitting on the top of the broad portion of the pole who feeds the canes. Two men direct the bullocks and the two boys supply the seed canes.</p> <p>Similar to Surat plough No. 4 in general construction as well as in dimensions of parts.</p> <p>The ploughs used in the Deccan differ from those used in Gujarât in that the body and the stilt are in different pieces. In Gujarât plough the body and stilt are in one piece and the shoe (chowra) separate—but in the Deccan plough the head piece (doke) and the shoe (da'nt) are made out of one block of wood.</p> <p>Body—Head is 1'-7" long 9" wide and 6" thick; shoe is 1'-7" long, share is a square bar of iron about 2'-6" long. One end of the share is secured into the socket of the body, the other end is secured to the shoe by means of a ring—the sharpened point projects about a foot beyond the end of the shoe. The beam is made of tivas and is about 11' long.</p>	<p>4" to 6"</p> <p>6" to 8"</p> <p>4" to 6"</p> <p>6" to 9" according to the nature of the soil and time of ploughing.</p>	<p>1</p> <p>1</p> <p>...</p> <p>...</p> <p>...</p> <p>...</p>	<p>...</p> <p>30 to 35</p> <p>30 during rains.</p> <p>*20 to 30</p>	<p>and for mixing and puddling mud in rice fields. The same plough is used for making ridges and water channels by fixing a board to the body of the plough.</p> <p>The plough is used for sowing rabi Vâl and castors in rice fields.</p> <p>This plough is worked only after the land is thoroughly prepared by 8 or 10 ploughings. It is used for planting whole canes on Gorâdu and Besar soils in Jalâlpur, Chikhli and Gandevi talukas.</p> <p>The plough is used for ploughing the lands after commencement of the monsoon, ploughing vashil (fallow) fields in the months of October and November and ploughing between the rows of cotton in August.</p> <p>*This varies according to the size of the bullocks, time of ploughing and nature of the crop after which it is to be ploughed.</p> <p>Towards Taloda, Nandurbâr and Prakâshe, a lighter plough is used for ploughing stiff black wheat lands. The ploughing is exclusively done during rains. A still smaller plough with a hole in the shoe</p>

APPENDIX

Serial No.	Local Name.	English Name.	Weight in pounds.	Price.	Labour employed to work the implement.		Locality where the implement is used.	Reference to illustration.	
					Men.	Bullocks.		Plate.	Number.
						Deccan	tract— <i>continued.</i>		
9	Nangar.	Plough.	100	Rs. 10 to 12	1 or 2	4 to 6	Ahmed-nagar.	...	...
10	Do.	Do.	65	Rs. 8 to 10	1	2	Násik	...	...
11	Do.	Do.	150	Rs. 9 to 10	2	10	Poona	II	2
12	Do.	Light plough.	100	Rs. 5 to 6	1	4	Poona	...	...

A—continued.

Short Description.	Efficiency.			REMARKS.
	Depth.	Work done per day.		
		Acres.	Gunthas.	
				to receive the sowing tube is used for sowing gram in the Tápti Valley. This plough is called Nál (नाळ) plough. It is sometimes used for sowing wheat when the moisture goes deep down.
				The work of Khándesh plough is superior to the two bullock Deccan or Karnátak plough. When deep ploughing is necessary a heavy stone is placed on the body of the plough and then it is worked by 4 bullocks.
Similar to Poona plough, head 18" long, 9" broad and 4" thick; shoe 26" long, share 15" long and 3" wide.	4" to 9"	...	15 in hot weather, 20 in cold weather.	Used for ploughing heavy and medium black soils.
Similar to Poona plough, head 20" long, 12" wide and 14" thick; shoe 2'-6" long; share 1'-9" long and projects 8" beyond the shoe.	4" to 6"	...	25 to 30	Do. do. Násik plough is more like Poona and that of Málegaon more approaching Khándesh plough. Towards Trimbak the plough has similar construction but it is light and is used for ploughing and puddling rice fields. It costs about Rs. 3.
Head 1'-5" long, 12" broad and 4" thick. The shoe is 1'-10" long. The share is flat and sharp at the end and is about 1½' long. It is laid on the shoe and is secured to the main block by a small piece of wood called <i>phalkamb</i> . The front end of the share projects about 6" beyond the point of the shoe and is secured by means of a ring. The pole is bent and about 9½' long. The back end of the pole is inserted into the body and projects about three inches which gives support to the stilt. All the parts of the Poona plough are made of bábul wood.	6" to 9"	...	12 to 20	Used for working heavy soils, eradicating weeds and for making ridges and water channels in sugarcane lands.
Similar to the above, head 18" long, 9" broad and 4" thick; shoe is 26" long, share 15" long and 3" wide.	4" to 6"	...	15 to 20	Used for ploughing medium black soils in Khed and Junnar and for making ridges for planting potatoes.

APPENDIX

Serial No.	Local Name.	English Name.	Weight in pounds.	Price.	Labour employed to work the implement.		Locality where the implement is used.	Reference to illustration.	
					Men.	Bullocks.		Plate.	Number.
13	Nangar.	Heavy plough.	285	Rs. 12 to 15	2	8 to 10	Deccan tract—concluded.	II	1
14	Do.	Light plough.	...	Rs. 7 to 8	1	2	Do. ...	...	...
15	Do.	Heavy plough.	180	Rs. 15 to 20	4	10	Sátára. ...	It	3
16	Do.	Light plough.	133	Rs. 10 to 12	3	8	Do. ...	...	...
17	Negalu	Heavy plough.	125	Rs. 6 to 8	2 to 3	6 to 8	Karnatak tract. Belgaum.	...	...
18 4	Ranti ...	Light plough.	82	Rs. 3½ to 4	1	2	Do.	...	...
19	Negalu.	Heavy plough.	200	Rs. 8 to 10	3	8 to 12	Dhárwár...	III	1
20	Ranti.	Light plough.	84	Rs. 4 to 5	1	2	Do. ...	III	4

A—continued.

Short Description.	Efficiency.			REMARKS.
	Depth.	Work done per day.		
		Acres.	Gunthas.	
Body—the head is 20" long, 12" broad and 7" thick; shoe is 2'-3" long; share is 16" long and about 3" to 4" broad. The pole is bent and about 12' to 13' long.	6" to 11"	...	13 to 15	The plough is used in ploughing heavy and deep black soils.
.....	4" to 6"	...	20	This plough is in general use and is used for ploughing in bāgāyat and jirāyat lands.
Body—the head is 1'-8" long, 12" broad and 8" thick; shoe is 2'-2" long; share is spear-shaped about 18" long and 4" to 5" broad and projects about 5" beyond the shoe. The beam is bent and is 9' to 10' long.	6" to 9"	...	20 to 25 during cold and hot weather.	This heavy plough is used once in three to five years.
Body—head is 1'-9" long, 9" broad and 6" thick, shoe is 1'-10" long; share is spear shaped 16" long and 3" to 4" broad. The length of the beam varies from 7' to 10'.	4" to 6"	...	25	This plough is in general use. It is used during the monsoon to prepare land for tobacco or for rabi preparation after the removal of the kharif crop.
Similar to heavy plough used in the Sātāra District (Sāngli). Body—head 1'-9" long, 7" broad and 6½" thick; shoe 1'-9" long; share is flat spoon shaped, it is 1-10" long and about 5" wide in the centre.	7" to 9"	...	12 in hot weather.	This plough is used for ploughing heavy lands, hariāli bound and sugarcane lands.
Similar to the Ranti of Dhār-wār. Body—head is 1'-9" long, 7" broad and 5" thick; shoe is 1' 9" long. Share is flat in front and narrow at the back. It is 1' 6" long, 3" wide and projects 6" beyond the shoe.	5" to 6"	...	20	This plough is in general use. It is used during rains as well as in cold weather.
Body—head 2' long, 10" broad and 5½" thick; shoe 3 feet long, share is flat 3'-2" long, 2½" wide and ½" thick. The share is laid on the shoe and fixed to it by driving in staples: the share does not project very much beyond the shoe. Length of the stilt is 3'-4" and that of the beam is about 9'.	6" to 9"	...	15 to 20	This plough is seldom used. It is very heavy and specially suited for ploughing and eradicating hariāli from deep black soils of the cotton tract.
Similar to Negalu but lighter in construction. Body—head 1'-9" long, 6½" broad and 4½" thick; shoe 2'-7" long; share is small thin piece of iron and is secured on the shoe with staples. It is 1'-5" long, 1" broad and ½" thick.	4"-5"	1 during rains.	...	This plough is in general use and used for ploughing after the commencement of the monsoon.

APPENDIX

Serial No.	Local Name.	English Name.	Weight in pounds.	Price.	Labour employed to work the implement.		Locality where the implement is used.	Reference to illustration.	
					Men.	Bullocks.		Plate.	Number.
21	Negalu	Heavy plough.	185	Rs. 12 to 15	2	8	Karnatak tract— Bijapur. ...	...	...
22	Madiki	Light plough.	95	Rs. 6 to 7	1	2	Do. ...	...	...

A—concluded.

Short Description.	Efficiency.			REMARKS.
	Depth.	Work done per day.		
		Acres.	Gunthas.	
<p>Body—the head is 2' long, 11" broad and 7" thick; the shoe is 2'-3" long; the share is 18" long and projects about 6" beyond the shoe. The length of the pole is about 10.'</p>	6" to 10"	...	10 to 12	This heavy plough is used for ploughing once in 5 to 7 years.
<p>Body—the head is 2' long 10" broad and 6" thick; the shoe is 2'-2" long; the share is about 18" long and projects 4" to 6" beyond the shoe.</p>	5" to 7"	...	15	This plough is in general use. It is worked both in the hot season and after the rains.

APPENDIX
HAR

Serial No.	Local Name.	English Name.	Weight in pounds.	Price.	Labour employed to work the implement.		Locality where the implement is used.	Reference to illustration.	
					Men.	Bullocks.		Plate.	Number.
1	Kaliu or Ramp.	Harrow (Bhal tract).	68	Rs. 7.	2	4	Gujarát Ahmedabad	tract. X	5
2	Havedu.	Harrow (Bhal tract).	47	Rs. 4.	1	2	Do.	...	...
3	Rupto.	Harrow (Bhal tract).	57	Rs. 7.	1	2	Do.	XII	1
4	Karab.	Harrow	55	Rs. 2-8	1	2	Do.	...	...
5	Dantal.	Toothed harrow.	35	Rs. 4.	1	2	Kaira.	IX	7
6	Ghanio.	Do.	38	Rs. 3.	1	2	Do.	IX	6

B.

ROWS.

Short Description.	Efficiency.			REMARKS.
	Depth.	Work done per day.		
		Acres.	Gunthas.	
<p>The harrow consists of five parts :—</p> <p>(1) The head piece is straight and round. It is 4'—2" long and about 5½" in diameter.</p> <p>(2) The head piece has two prongs in front fixed in a slanting direction. They are made of iron, being 1'—3" in length.</p> <p>(3) The blade is made of iron—while at work the ends of the blade are inserted into the ends of the prongs. It is 3' long, 2½" broad and ½" thick.</p> <p>(4) Two poles are separately fixed. They join at the yoking point. They are about 10 feet long.</p> <p>(5) The stilt is fixed on the top of the head piece in the centre.</p>	2" to 3"	2	...	It is a heavy harrow used for stirring up the black soil as well as for removing stubbles of jawar.
<p>Head piece is 2' long, 7" broad and 6" thick. Blade 16" long and 2" broad. The length of the prong is 11".</p>	1½" to 3"	2	...	It is used for stirring the soil as well as for interculturing cotton.
<p>Head piece 6'—3" long and about 3" in diameter. Blade is 5'—2" long. It is adjusted to the head piece by three iron prongs, one being about the middle. The length of the prong is 10". There is no stilt to this implement.</p>	1½" to 2"	8	...	It is a light harrow used for stirring the soil as well as for covering seed.
<p>The head piece is 2' long, 6" broad and 6" thick. The blade is 18" long and 1½" to 2½" broad. The length of the prong is about 10".</p>	1½" to 2"	3	...	It is used for stirring up the soil, only a few cultivators have this harrow.
<p>In this implement 6 tines are fixed in a wooden body (36" long) 6" apart.</p> <p>The tines (1½' long) are tipped with iron. The pole is made of teak rafter and the body and the tines of Babul wood.</p>	2" to 3"	3	...	Its action is like a grubber. When this implement is used for weeding and thinning out kodra mixture then it is worked crosswise to the direction in which the rows are sown. It is also used for harrowing muddy rice fields before transplanting.
<p>In this implement 6 to 8 tines having points at both the ends are fixed into the body (34" long). The upper ends are shorter than the lower ends. The tines are not tipped with iron.</p>	3" to 4"	3	...	It is used for mixing and puddling mud in rice fields before transplantation. The front tines lift up the weeds and the back tines which are shorter in size distribute

APPENDIX

Serial No.	Local Name.	English Name.	Weight in pounds.	Price.	Labour employed to work the implement.		Locality where the implement is used.	Reference to illustration.	
					Men.	Bullocks.		Plate.	Number.
							Gujarát tract	<i>continued.</i>	
7	Vakhar.	Harrow.	36	Rs. 2-8-0	1	2	Panch Mahals.	XIV	4
8	Karab.	Do.	47	Rs. 9 to 11	1	2	Surat ...	XVI	8
9	Valkhal Karab.	Do.	54	Rs. 10 to 12	1	2	Do. ...	...	...
10	Dantal.	Toothed harrow.	34	Rs. 10 to 11	1	2	Do. ...	V	1
11	Karab.	Harrow.	68 (heavy) 36 (light).	Rs. 9 to 10	1	2	Broach ...	VI	5
							Deccan tract.		
12	Vakhar.	Heavy harrow.	53	Rs. 5 to 6	1	2	Khándesh .	XVII	3
13	Dhaya or Dankiya Vakhar.	Light harrow.	45	Rs 4 to 5	1	2	Do. ...	XVII	4

B—continued.

Short Description.	Efficiency.			REMARKS.
	Depth.	Work done per day.		
		Acres.	Gunthas.	
The head piece is made of Bābul wood about 22" long and 6" in diameter. The blade of iron is 15" to 18" long and 2" broad. The pole is attached to the head piece by bifurcating one of its ends. It is about 10' long.	½" to 3"	2	...	the weeds in lines and prevent clogging. Its special action is that of weakening weeds. This implement is used for harrowing after the harvest of gram and wheat. It is found only with the well-to-do cultivators of Dohad and Jhalod Tālukas. Ordinary cultivators do not keep harrow.
The head piece is concave shaped and is scooped out in the middle for allowing the clods to pass freely. It is made of Bābul or Tanach. It is 2' long, 6" broad and 6" thick. The blade of iron is slightly curved. It is 1'-8" long and 2" broad. The length of the iron prong is 9". Pole is bifurcated and made of teak.	½" to 3"	2 to 2½	...	It is used for harrowing jowār and cotton fields, for removing jowār stubbles, for mixing manure and covering seed. It is used in the preparation of land for rabi crops like wheat, tur, til, etc.
Same as No. 8 but with a longer and thinner blade which is about 27" long.	½" to 1"	5	...	It is used for covering seed.
Similar to No. 5 used in the Kara District.	1" to 2"	2 to 3	...	
Similar in construction to the Surat harrow No. 8. The head piece is 25" long, 6" broad and 5½" thick. The blade of iron is curved. It is 21" long and 3" broad. The prong of iron is 5½" long.	½" to 4"	2½ to 3 according to season and bullocks.	...	It is used in kharif and rabi preparation of land for all the crops. It is also used for interculturing cotton when 8" high and onwards. Number of harrowings given vary from 1 to 8. Specially Vashil fields receive more harrowings.
The head piece and prongs are made of Bābul and the pole of teak wood. The head piece is 2'-10" long, 7" broad and 6" thick. The blade is 2'-3" long and 2½" broad. The prong of wood is about 9" in length.	2" to 4"	1½ to 3 according to the nature of soil, time of harrowing and the bullocks.	...	In the Tāpti Valley the Vakhar is rather smaller in size. A small Vakhar having 18" blade is used for interculturing chillies, plantains and sometimes used for sowing cotton after removing the blade. The harrow is used at all seasons of the year for preparation of land. It is used also for uprooting cotton stalks.
Similar to No. 12. The head piece is 4'-6" long, 5" broad and 4" thick. The blade is 3'-8" long and 1½" broad. The prong of wood is 10' in length.	1½" to 2½"	4 to 5 in covering and 3 in harrowing.	...	It is used for covering seed and harrowing during rains.

APPENDIX

Serial No.	Local Name.	English Name.	Weight in pounds.	Price.	Labour employed to work the implement.		Locality where the implement is used.	Reference to illustration.	
					Men.	Bullocks.		Plate.	Number.
							<i>Deccan tract—continued.</i>		
14	Kongi Vakhar or Aut.	Heavy harrow.	70 (blade alone 7 lbs.)	Rs. 4-8-0	1	2	Ahmed-nagar.	...	...
15	Pharát.	Light harrow.	60 (blade alone 5 lbs.)	Rs. 3-8-0	1	2	Do.	...	...
16	Kokarya Kulav.	Harrow.	56	Rs. 5-8-0	1	2	Násik	...	...
17	Rakhia.	Do.	50	Rs. 5	1	2	Do.	...	...
18	Kulav.	Heavy harrow.	70	Rs. 3.	1	2	Poona	IV	1
19	Pharát.	Light harrow.	45	Rs. 3	1	2	Do.	...	...
20	Kulav.	Heavy harrow.	65	Rs. 3	1	4	Sholápur.	...	...
21	Do.	Harrow.	45	Rs. 5	1	2	Sátára	...	...

B—continued.

Short Description.	Efficiency.			REMARKS.
	Depth.	Work done per day.		
		Acres.	Gunthas.	
Head piece is bent but the blade is almost straight. All the parts except blade are made of bābul wood. Head piece is 3' long, 5" broad and 3" thick; blade is 23" long and 2½" broad.	2" to 4"	2	...	It is used for kharif and rabi preparation of land. In rabi preparation 4 bullocks are used. It is then called <i>Chahuri Vakhar</i> .
Ends of the head piece are bent upwards. It is 3' long, 4" broad and 3" thick. Blade is 2'-8" long and 1½" broad.	½" to 2½"	2 to 2½	...	It is used for covering seed and for 2nd and 3rd harrowing. There is another kind of harrow called <i>Rakhia Pharāt</i> . Its whole construction is of a lighter description. It is used for covering seed as well as for making <i>kharad pallis</i> during the hot weather. It costs about Rs. 3.
The material used for the construction of this implement is bābul. The upper side of the head piece is rather curved. It is 3' long, 6" broad and 4" thick. The blade is 2' long and 2" broad. The length of the wooden prong is 10".	2" to 4"	3	...	It is used for harrowing at all seasons of the year; but during the hot weather a rather heavy harrow called <i>kongia</i> is used for giving <i>unal pallis</i> (hot weather harrowing.)
The head piece is 4'-10" long, 4½" broad and 4" thick. The blade is 3'-8" long and 1½" in thickness.	1½" to 2½"	5½	...	It is used for covering seed.
All the parts are made of bābul wood. The head piece is 3'-9" long, 6½" broad, 4" thick. The blade is 2'-7" long and 2½" broad. The prong is 9½" in length.	1½" to 3"	1½ to 2	...	It is used for harrowing at all seasons of the year.
The head piece is 4'-8" long, 5" broad, 3½" thick. The blade is 3'-4" long and about 1½" broad. The length of the prong is 9".	1½" to 2"	4	...	It is used for covering seed
The head piece is 4' long, 8" broad and 4" thick. The length of the prong is 12"; the blade is 3½' long, 3" broad and ½" thick.	1½" to 3"	1 to 2	...	It is used for scarifying the soil at all seasons.
The head piece is 4' long, 5" broad and 4" thick. The length of the prong is 7". The blade is 3' long and 2½" broad.	1½" to 3"	2	...	It is used for scarifying the soil at all seasons. When the work is heavy, then 4 bullocks are yoked. A lighter harrow is used for covering seed. The work done per day is about 4 acres.

APPENDIX

Serial No.	Local Name.	English Name.	Weight in pounds.	Price.	Labour employed to work the implement.		Locality where the implement is used.	Reference to illustration.	
					Men.	Bullocks		Plate.	Number.
22	Kulav.	Heavy harrow for harvesting ground-nuts.	110	Rs. 9	3	8	Deccan tract Sátára ...	... ...	<i>concluded.</i> ...
23	Kunti.	Harrow.	65	Rs. 3	1	2	Karnátak tract. Belgaum. ...	... ...	...
24	Balisal Kunti.	Light harrow.	50	Rs. 3	1	2	Do. ...	... ...	...
25	Dodd Kunti.	Do.	98 (blade alone 16 lbs.)	Rs. 4	2	4	Do. ...	... ...	...
26	Harguv Kunti.	Heavy harrow.	78 (blade alone 15 lbs.)	Rs. 5 (blade alone Rs. 2.)	2	4	Dhárwát ...	......	...
27	Kir Kunti.	Light harrow.	55 (blade alone 10½ lbs.)	Rs. 5 blade alone Rs. 1-4-0.	1	2	Do. ...	... ...	...
28	Balisal Kunti.	Light harrow.	53 (blade alone 10 lbs.)	Rs. 5 blade alone Rs. 1-4-0	1	2	Do. ...	... ...	...
29	Ukki Kunti.	Heavy harrow.	75	Rs. 8 to 10	2	4	Biájpur ...	......	...
30	Kunti.	Light harrow.	48	Rs. 4 to 5	1	2	Do. ...	... ...	...

B—continued.

Short Description.	Efficiency.			REMARKS.
	Depth.	Work done per day.		
		Acres.	Gunthas.	
The head piece is 3' long, 10" broad and 5" thick. The blade is 2' long and 3" broad. The length of the prong is 11".	3" to 4"	1	...	It is used for harvesting groundnut. While working 2 men sit on the head piece.
All the parts are made of bābul excepting the pole which is made of teak. The head piece is 3'-6" long, 7" broad and 4" thick. The blade is 2½' long and 2½" broad. The prongs are 9" in length.	½" to 2½"	1 in hot weather and 1½ afterante-monsoon showers.	...	It is used for harrowing as well as for covering seed after removing the blade and the prongs. It is also used for making beds.
The head is 4'-2" long, 5" broad and 3" thick. The blade is 3' long and 1½" broad. The length of the prong is 9".	½" to 2"	4	...	It is used for covering seed.
The whole implement is strong and stout. The head piece is 3'-3" long, 8" broad and 5" thick. The blade is 2'-4" long, 3" broad and ½" thick. The length of the prong is 10".	3" to 4"	1	...	It is used for harvesting groundnut.
The head piece is 4'-2" long, 7½" broad and 4" thick. The blade is 2'-10" long and 3½" broad. The length of the prong is 10".	½" to 2½"	1 to 1½	...	It is used for stirring and breaking clods after ploughing.
The head piece is 3'-9" long, 6½" broad and 2½" thick. The blade is 2'-8" long, 2½" broad and ½" thick. The length of the prong is 8½".	½" to 2"	2	...	It is used for stirring the soil and removing jawār stubble. The first harrowing is done by this implement and the second is done by Balisal Kunti.
The head piece is 4'-10" long, 5" broad and 2" thick. The blade is 3'-8½" long and 2½" broad. The prongs are 9½" long.	½" to 2"	4	...	It is used for covering seed and second and third harrowing.
The head piece is 4'-6" long, 15" broad and 15" thick. The prong is 1½' long. The blade is 2'-3" long and 3" broad. The pole is about 7½' long.	½" to 3"	...	20	It is used for scarifying heavy and stiff black soils.
The head piece is 4'-6" long, 6" broad, and 4" thick. The length of the prong is 9"; the blade is 3½' long. The pole is about 7½' long.	½" to 2½"	2 to 3	...	This is the ordinary harrow used for scarifying the soil as well as covering seed.

APPENDIX
CLOD

Serial No.	Local Name.	English Name.	Weight in pounds.	Price.	Labour employed to work the implement.		Locality where the implement is used.	Reference to illustration.	
					Men.	Bullocks.		Plate.	Number.
1	Samar.	Leveller or clod crusher.	65 ⁷ to 120	Rs. 3 to 5	1	2	Ahmedabad.	X	3
2	Do.	Do.	70	Rs. 3	1	2	Kaira ...	IX	5
3	Samar or Gahan.	Do.	180	Rs. 4	2	4	Panch Mahals.	XIV	11
4	Moto Samar.	Do.	283	Rs. 3 to 5	2	4	Surat ...	V	4
5	Patiu (small) Samar.	Do.	80	Rs. 3 to 5	1	2	...	V	5
6	Samar.	Heavy clod crusher and Leveller.	100	Rs. 3	2	8	Broach ...	...	...
7	Do.	Light leveller.	65	Rs. 4 to 6	1	2	...	...	...
8	Pathar.	Heavy clod crusher and leveller.	80 to 100	Rs. 8 to 10	1	2	Khandesh.	XIX	2
9	...	...	...	...	...	...	Ahmadnagar.	...	...

C.

CRUSHERS.

Short Description.	Work done per day.		REMARKS.
	Acres.	Gunthas.	
It is made of babul or rayan wood. It is a plank 7' to 9' long 9" broad and 4" thick. Two rings are provided for tying ropes and attaching them to the yoke.	4 to 5	...	It is used for levelling and crushing small clods; for covering seed and for rolling the bajri crop to encourage tillering. In the <i>Bhal</i> tract the Samar used is of heavier description; when it is used for breaking clods 2 men and 4 bullocks work the implement.
It is made of the same material as No. 1. It is made of a plank about 10' long, 8" broad and 1½" thick. Two iron rings are fixed about the middle 1½' apart from the centre. At one of the ends an iron hook is fixed to carry the implement to the fields.	4 to 5	...	It is used for levelling, covering seed and crushing small clods. When the <i>Samar</i> is used for breaking large clods then two pairs of bullocks are yoked and 5 or 6 men stand on it.
It is made of Mowra or Sadad wood. It is 13 to 14' long, 10" broad and 6" thick. Two wooden pegs are driven into the body to work the implement by attaching ropes to it.	3 to 4	...	It is used for breaking clods and levelling the land after sowing maize, gram, &c.
It is a square wooden beam about 11' long, 1' broad and 7" thick. The working side is scooped out; for working 2 rings are fixed into the body 8' apart.	4 to 5	...	It is used for breaking large clods and for levelling the land.
It is a wooden plank about 7' long, 11" broad and 3" thick.	4 to 5	...	It is used for breaking small clods and levelling lighter and <i>Goradu</i> soils. It is also used for covering broad-casted seed of rice, wal, Diwella in rice fields (kiaris.)
It is a half split beam of toddy palm about 20 feet long. It is specially used for crushing clods in <i>Bett</i> and <i>Bhatta</i> lands when tobacco and jawar are grown after subsiding of the floods.	4	...	While working 8 to 12 bullocks are yoked to the beam and about 12 men stand on it.
It is similar to No. 2	4 to 6	...	It is used for levelling <i>Goradu</i> soils in Jambusar and Ankleshwar talukas. It is also used for covering seed in <i>Bett</i> lands.
It is a square log of wood 5 to 8 feet long, 8" broad and 5" thick. It is drawn over the lands by attaching ropes to the rings or holes made into the body.	1 to 1½	...	It is rarely used in dry crop cultivation but mostly used for crushing clods in irrigated lands.
.....	...	...	The work of crushing clods in this District is done by working the harrow several times. In the sugarcane areas the clods are broken by small mallets. Recently some of the Saswad cultivators have introduced a maind (clod crusher) for breaking clods.

APPENDIX

Serial No.	Local Name.	English Name.	Weight in pounds.	Price.	Labour employed to work the implement.		Locality where the implement is used.	Reference to illustration.	
					Men.	Bullocks.		Plate.	Number.
10	Phali.	Clod crusher.	200	Rs. 6 to 8	2	4	Nasik ...	...	...
11	Kabade.	Leveller.	60	Rs. 2	1	2	...	...	...
12	Maind.	Clod crusher.	166	Rs. 5 to 8	2	6	Poona ...	VII.	1
13	Hendore.	Clod crusher.	128	Rs. 2 to 3	2	2	Belgaum.	XXXVI	3
14	Doni	Do.	76	Rs. 3	1	2	Dhárwar.	...	...

C—continued.

Short Description.	Work done per day.		REMARKS.
	Acres.	Gunthas.	
It is a plank 12' long, 11" broad and 9" thick. It is drawn over the land by tying ropes through the holes made into the body.	2	...	It is used for crushing clods.
It is a bent piece of wood about 6' long, 6" broad and 3" thick. It is drawn over the land by attaching a pole about the centre.	3	...	It is used in <i>Mawal</i> tract (Dindori, Kalwan, &c.) for levelling mud in rice cultivation.
It is a huge log of Babul wood about 10' long, 1' broad and 9" thick.	2½ to 3	...	It is used for crushing clods. It crushes clods but leaves them pressed which are again required to be brought up by means of the harrow. In <i>Mawal</i> a smaller maund made of the mango wood is used to level fields after ploughing which are intended for sowing wheat or gram, &c.
It consists of one big plank to which another small piece is joined lengthwise. The surfaces of these two planks being uneven help in crushing clods. The whole implement is 8' 4" long, 5" broad and 3" to 5" thick. Two pegs of wood are inserted about the middle at a distance of 2' for tying ropes while it is drawn over the land.	3 to 4	...	It is used for crushing clods in rice as well as in dry crop cultivation.
It is a plank scooped out from below. The scooped side touches the surface and breaks clods. It is 6' long, 9½" wide and 3" thick. Two pegs are provided for drawing the implement.	4	...	It is used for crushing clods.

APPENDIX
SEED

Serial No.	Local Name.	English Name.	Weight in pounds.	Price.	Labour employed to work the implement.		Locality where the implement is used.	Reference to illustration.	
					Men.	Bullocks.		Plate.	Number.
1	Trifan.	3 coultered drill.	50	Rs. 4	2	2	Gujarat Ahmedabad.	Tract.	...
2	Wāvniō.	Do. (Bhal tract.)	84	Rs. 6	2	4	Do. ...	XI	1
3	Chawad.	4 coultered drill.	53	Rs. 4	2	2	Do. ...	X	7
4	Dantal.	5 coultered drill + 2 more coulters on the out side for marking the lines.	80	Rs. 6	2	2	Do. ...	X	6

D.

DRILLS.

Short Description.	Work done per day.		REMARKS.
	Acres.	Gunthas.	
<p>The drill consists of 6 parts—</p> <p>(1) The head piece is made of babul or teak and it gives attachment to all other parts. It is 4' 4" long with 4" in diameter.</p> <p>(2) Coulters—They have holes about the middle and are fixed into the head piece in a slanting direction; the distance between coulters being 18." The length of the coulters is 18."</p> <p>(3) Tubes are usually of bamboos and are laid on the holes of the coulters; as they rise they incline towards each other and join in the seed bowl.</p> <p>(4) The bowl is usually made of teak, sisam or some other light wood; it has three holes for receiving and dropping the seed into the tubes.</p> <p>(5) Pole is bifurcated and made of teak; it is about 9' long.</p> <p>(6) Stilt is fixed on the top of the head piece and is used for guiding as well as for lifting the drill at turnings.</p>	6	...	It is used for sowing cotton in Daskroi and in the talukas bordering Kaira District.
<p>The head piece and the poles are heavy and long. It is 5' 9" long and 5½" in diameter; coulters are 18" long and the distance between coulters is 16" to 18". Two separate poles are fixed into the head piece and they join at the yoking point.</p>	6	...	It is used for sowing cotton; the implement is worked by 2 men and 4 bullocks in the Bhal Tract; it is also used for sowing wheat in Sanand, Virámgam and Dhanduka Tálukas of the Ahmedabad District, where the distance between two coulters is 12."
<p>Similar in construction to No. 1 except that it has 4 coulters and the distance between coulters is 1 foot.</p>	5	...	It is used for sowing bájri, jowári, kodra and pulses; it is specially found on Kaira side of the Ahmedabad District. In the Bhal Tract it is called Hemarni Chawad; it is strong and weighs about 90 lbs. and costs about Rs. 10. The head piece is 5' 9" long and it is used for sowing rabi jowar, gram and sesamum.
<p>Similar to No. 2; the distance between coulters being 1 foot.</p>	4	...	It is used for sowing, bájri, jawár, kodra, til, etc. The implement is known in Bhal as 'Ovio. Towards Sanand, Viramgam side the Dantal is heavy while towards Kaira it weighs only 55 lbs.

APPENDIX

Serial No.	Local Name.	English Name.	Weight in pounds.	Price.	Labour employed to work the implement.		Locality where the implement is used.	Reference to illustration.	
					Men.	Bullocks.		Plate.	Number.
5	Trifan.	3 coul-tered drill.	42	Rs. 3 to 4	2	2	Kaira ...	IX	4
6	Orni.	Sowing tube.	...	Rs. 0-2-0	...	...	Panch Maháls.	...	...
7	Faidko.	2 coul-tered drill.	48	Rs. 10 to 12	2	2	Surat ...	XVI	4
8	Do.	2 coul-tered drill.	58	Rs. 10 to 12	2	2	Surat ...	...	...
9	Do.	2 coul-tered drill.	60	Rs. 10 to 12	2	2	Do. ...	...	...
10	Trifan.	3 coul-tered drill.	48	Rs. 10 to 12	2	2	Do. ...	XVI	5
11	Vakhelu.	2 coul-tered drill.	30	Rs. 5 to 6	2	2	Broach ...	VI	7
12	Tarfen.	3 coul-tered drill.	35	Rs. 5 to 6	3	2	Do. ...	VI	9
13	Karab (used as drill.)	2 coul-tered drill.	36	Rs. 6 to 7	2	2	Do. ...	...	...

D—continued.

Short Description.	Work done per day.		REMARKS.
	Acres.	Gunthas.	
The head piece is made of rayan, the coulters and the pole are of babul or teak. The head piece is 2' 8" long, 4" broad and 2" thick. The coulters are 16" long and the distance between 2 coulters is 12".	4	...	It is used for sowing kodra and bajri mixtures and sundhia, etc. Furrows are made by the tines and these lines are used for transplanting bawto (Náchni). Towards Baroda, the drill is used at times as a grubber for stirring the surface soil. Towards Mátar (Kaira District) a 4 coulters drill is used; it is called <i>chawad</i> .
It is made of bamboo about 3' long the bowl is made by splitting one of its ends and stitching it with leather; this funnel-shaped tube is tied behind the body of the plough at the time of sowing.	1 of maize and 20 to 30 gunthás of wheat or gram.	...	There is no seed drill in Dohad and Jhálod Tálukas and all sowings are done by this method.
The head piece is made of babul or tanach; it is scooped out in the middle; it is 2' 7" long, 5 $\frac{3}{4}$ " broad and 5" thick. The coulters are 11" long and the distance between 2 coulters is 1' 6".	5 to 6	...	It is used for sowing cotton and jowár in southern tálukas (Jalál-pore) of the district where soil is heavy. A similar but heavy 2 coulters drill is used in the Olpád Táluka for sowing wheat.
Similar to No. 7; coulters 24" apart ...	6 to 8	...	It is used for sowing cotton, til, jowár in the northern talukas (Chorásí, Olpád and Bárdoli) of the district where the soil is less heavy than that of the Jalálpore side.
Similar to No. 7; coulters 36" apart ...	6 to 8	...	Towards Broach side it is widely used for sowing cotton.
Similar to No. 7; coulters 12" apart ...	4 to 5	...	It is used for sowing fodder crops, bajri, sundhia, groundnut, etc.
It is similar to No. 9 Surat drill; distance between 2 coulters varies from 2' 5" to 3'.	5 to 8	...	It is used for sowing cotton.
When cotton and rice are sown, two side tubes are used for sowing cotton; on the middle coulters a separate bamboo tube with a bowl is fixed and through this tube rice is sown. Length of the head piece is 3' 3". It is 4 $\frac{1}{2}$ " broad and 3 $\frac{1}{2}$ " thick. The distance between coulters is 18".	5	...	It is used for sowing cotton and rice mixture. When the drill is used for sowing Vahsil field, the coulters are not shod with iron. When a 3 coulters drill is used for sowing bajri, kodra, etc., on goradu soils the distance between 2 coulters is 15".
A small harrow, with its head piece about 3' 3" long, 4" broad and 3" thick is taken, its prongs and blade are removed and coulters substituted instead. The length of the coulters is 10 $\frac{1}{2}$ ". When tubes and bowl are tied the drill is ready; the distance between 2 coulters is 1' 9".	5	...	It is used for sowing rabi crops like wheat, shialu, etc.

APPENDIX

Serial No.	Local Name.	English Name.	Weight in pounds.	Price.	Labour employed to work the implement.		Locality where the implement is used.	Reference to illustration.	
					Men.	Bullocks.		Plate.	Number.
14	...	Plough & tube.	...	.....	2	2	Broach ...	...	...
							Deccan Tract.		
15	Dussa.	2 coultered cotton drill.	43	Rs. 4½ to 6	1 man 2 women	2	Khândesh ...	XVIII	2
16	Moghadya.	3 coultered wheat drill.	95	Rs. 7 to 9	2	2	Do. ...	XVIII	1
17	Pambhar.	3 coultered drill.	57	Rs. 4-8-0	1 or 2 men.	2	Do. ...	XVIII	3

D—continued.

Short Description.	Work done per day.		REMARKS.
	Acres.	Gunthas.	
It is similar to No. 6	3	...	It is used for sowing lang and gram.
The head piece of the drill is 2' long, 7" broad and 6" thick; the length of the coulters is 14"; the distance between coulters is 18". In the case of Khândesh drill the coulters are not shod but a separate square bar of iron with flat point called <i>Kusali</i> is fixed on to the coulters by means of a ring in front and ropes at the back. While at work two <i>magnis</i> (artis) are tied to the drill by means of ropes; the length of the rope is about 4'. Two women hold the funnel-shaped sowing tubes in their hands, walk behind and drop the cotton seed through in the furrows opened by the coulters.	4 to 5	...	It is used for sowing cotton and kharif jowâr. When jowâr is sown the tubes and the bowl are attached as in the case of an ordinary drill. According to the nature of the soil, the distance between 2 coulters or rows of cotton varies from 12" to 20". In the Tapti Valley cotton seed is sown by harrow; only one row is sown at a time by attaching one tube to one end of the prong. The distance between two rows varies from 24" to 28". When the moisture in the soil is not enough then the covering of the seed is done by tying a blade of the hoe behind the sowing tube. In case it is raining at the time of sowing a branch of a <i>Palas</i> (Butea Frondosa) tree is attached to the tube to cover the sown seed. When there is deficiency of bullocks in some parts of Dhulia Taluka, even two rows are sown with one Vakhar or harrow.
It is a drill of heavier construction, the <i>kusalis</i> are long, slightly bent near the hole of the coulters to facilitate the fixing of the tube. The <i>kusalis</i> project nearly 6" beyond the end of the coulters. The opposite ends are inserted into the head piece of the drill. The head piece is 22" long; it is 7" broad and 7" thick. The length of the coulters is about 11"; the distances between coulters is 9" to 11". Towards Jalgaon a 2 coulters drill (<i>Moghada</i>) is used for sowing dry crop wheat; the distance between coulters being 12" to 13".	2	...	Both 2 and 3 coulters drills are used for sowing rabi crops (wheat, jowâr, linseed, coriander and gram.) In the Tapti Valley the drills are comparatively lighter than in other parts of Khândesh. The drills are weighted down with stones at the time of sowing.
The head piece is 32" long, 5" broad and 3" thick; the length of the coulters is 10"; the distance between 2 coulters is 9" to 12".	4	...	It is used for sowing jowâri, bājri, and maize. In the Tapti Valley 3 coulters drill with coulters without iron points is used for sowing bājri (Taloda and Shahada) when the soil is soft and friable.

APPENDIX

Serial No.	Local Name.	English Name.	Weight in pounds.	Price.	Labour employed to work the implement.		Locality where the implement is used.	Reference to illustration.	
					Men.	Bullocks.		Plate.	Number.
18	Nál or Nagari.	Small plough with tube.	68	Rs. 3-8	2	2	Khándesh ..	XIX	1
19	Pambhar.	3 coul-tered drill.	58	Rs. 4-8 to 6	1	2	Ahmed-nagar.	...	...
20	Do.	4 coul-tered drill.	96	Rs. 6-8	1	2	Do. ...	...	...
21	Meghad.	2 coul-tered drill.	80	Rs. 5	1	2	Násik ...	...	...
22	Tiphan.	3 coul-tered drill.	62	Rs. 5	1	2	Do. ...	...	...
23	Pambhar (Chowphan).	4 coul-tered drill.	70	Rs. 5	1	2	Do. ...	...	...
24	Tiphan or Moghad.	3 coul-tered drill.	70	Rs. 4	1	2	Poona ...	...	...
25	Pambhar.	4 coul-tered drill.	65	Rs. 4-8	1	2	Do. ...	...	...
26	Tiphan.	3 coul-tered drill.	85	Rs. 3 to 3-8	1	2 to 4	Sholápur...	...	...
27	Kuri.	4 coul-tered drill.	70	Rs. 5 to 5-8	2	2	Sátára ...	...	...
28	Hadgi	3 coul-tered drill.	100	Rs. 7 to 8	3 or 4	8	Do. ...	...	...

D—continued.

Short Description.	Work done per day.		REMARKS.
	Acres.	Gunthas.	
It is a small plough to which a sowing tube and bowl are attached; the tube is fixed into the shoe of the plough by boring a hole. It is almost similar to No. 14.	2	...	It is used for sowing gram in the Tapti Valley when the moisture in the soil goes down deep. This implement is common in the Tapti Valley.
The head piece is 3' 4" long, 7" broad and 3" thick; the length of the coulter is 12" and the distance between 2 coulters is 10".	2	...	It is used for sowing early crops in medium and heavy soils. The distance between coulters varies from 10" to 15" when it is used for rabi crops (jowar and wheat); on heavy soils the middle coulters are removed and only 2 coulters are used when it is called <i>Moghad</i> .
The head piece is 3' 2" long, 6½" broad and 4" thick; the length of the coulters is 10" and the distance between 2 coulters is 8".	3	...	It is used in shallow and medium soils for sowing bajri, gram, safflower, jowar, etc. The implement is also used as a grubber (<i>Phan</i>) for stirring the soil after harvesting the crop.
The head piece is 3' 9" long, 9" broad and 8" thick; the length of the coulters is 15" and the distance between coulters is 18".	2	...	It is used for sowing rabi crops like wheat, gram, lentils, lang and peas.
The head piece is 3½' long, 6" broad and 4" thick; length of the coulters is 13" and distance between coulters is 14".	4 to 5	...	It is used for sowing cotton.
The head piece is 3' 11" long, 6" broad and 4" thick; the length of the coulters is 13" and distance between coulters is 11".	4 to 5	...	It is used for sowing jowari, bajri, til, kulthi, linseed, etc.
The head piece is 4' 10" long, 9" broad and 5" thick; the length of the coulters is 15" and distance between coulters is 12".	2	...	In Moghad the head piece is heavier and the coulters are longer. It is used for sowing rabi crops like wheat, gram and shalu. It is specially used in Desh tracts where the seed is required to be dropped deeper to ensure germination.
The head piece is 3' 8" long, 6" broad and 4½" thick; the length of the coulters is 12" and the distance between coulters is 9".	2½ to 3	...	It is used for sowing early crops like jowari, bajri, til, fodder crops, etc. It is used in Mawal for sowing rabi crops.
The head piece is 4' long, 8" broad and 4" thick; the length of the coulters is 12" and the distance between coulters is 10" to 12".	2½	...	The drill is used for sowing rabi and kharif crops.
The head piece is 3' 4" long, 5" broad and 5" thick; the length of the coulters is 16" and distance between coulters is 10".	4	...	The drill is used for sowing kharif crops.
The head piece is 4' long, 7" broad and 4" thick; the length of the coulters is 18" and the distance between coulters is 1' 7".	2	...	The drill is used for sowing rabi crops and it is also used as a grubber.

APPENDIX

Serial No.	Local Name.	English Name.	Weight in pounds.	Price.	Labour employed to work the implement.		Locality where the implement is used.	Reference to illustration.	
					Men.	Bullocks.		Plate.	Number.
							Karnatak		Tract
29	Kurgi.	2 coult- ered drill.	55	Rs. 2-8	2	2	Belgaum ...	...	...
30	Do.	Do.	75	Rs. 3	2	2	Do. ...	...	...
31	Do.	3 coult- ered drill.	64	Rs. 3-8	2	2	Do. ...	...	...
32	Do.	Do.	67	Rs. 3-8	2	2	Do. ...	...	...
33	Naktal Kurgi.	4 coult- ered drill.	70	Rs. 3-8	2	2	Do. ...	...	...
34	Hatti Kurgi.	2 coult- ered drill for cotton.	37	Rs. 4	1 man and 2 women	2	Dhárwár ...	...	...
35	Do.	3 coult- ered drill.	72	Rs. 5	1 man & 3 women	2	Do. ...	...	...
36	Kurgi.	Do.	49	Rs. 6	2	2	Do. ...	...	...
37	Do.	4 coult- ered drill.	65	Rs. 6	1 man & 1 woman	2	Do. ...	...	...
38	Do.	Do.	89	Rs. 7	1 man & 1 woman	2	Do. ...	...	...
39	Do.	3 coult- ered drill.	60	Rs. 5	1 man & 1 woman	2	Bijápur ...	...	...
40	Do.	4 coult- ered drill.	68	Rs. 6	2	2	Do. ...	...	...

D—concluded.

Short Description.	Work done per day.		REMARKS.
	Acres.	Gunthas.	
The head piece is 2' 6" long, 6" broad and 4" thick; the length of the coulter is 14" and distance between drills is 18".	3	...	It is used for sowing Kumpta cotton.
The head piece is 3' 3" long, 8" broad and 4" thick; the length of the coulter is 12" and the distance between coulters is 24".	3 to 4	...	It is used for sowing Broach cotton seed.
The head piece is 3' 6" long, 6" broad and 4" thick; the length of the coulter is 12" and distance between coulters is 15".	3	...	It is used for drilling maize.
The head piece is 4' 2" long, 7" broad and 3" thick. The length of the coulter is 12" and the distance between coulters is 18".	3	...	It is used for drilling maize and cotton.
The head piece is 4' 2" long, 6" broad and 3" thick; the length of the coulter is 11" and distance between coulters is 12".	4	...	It is used for sowing jowár, maize, wheat, til and bajri.
The head piece is 2' 6½" long, 7" broad and 3" thick; length of the coulter is 14" and distance between coulters is 20".	2½ to 3	...	It is used for sowing cotton.
The head piece is 4' 8" long, 6½" broad and 2½" thick; length of the coulter is 15½" and distance between coulters is 20".	6	...	Do. do.
The head piece is 3' 11" long, 5½" broad and 2½" thick; length of coulter is 15½ inches and distance between coulters is 15".	4	...	It is used for sowing jowár, gram and rabi jowár in heavy soils.
The head piece is 4' long, 6" broad and 2½" thick; the length of the coulter is 16" and distance between coulters is 10".	4	...	It is used for sowing crops in light soils, such as kharif jowári, til, bajri, ragi (Náchni), millets, kulthi, etc.
The head piece is 4' 6" long, 7½" broad and 2½" thick; the length of the coulter is 16" and the distance between coulters is 16".	4	...	It is used for sowing rabi jowári, wheat, safflower, linseed, etc. In wheat sowing 4 bullocks are used.
The head piece is 3' 9" long, 5½" broad and 3½" thick; the length of the coulter is 15" and the distance between coulters is 15".	3	...	It is used for sowing rabi jowár.
The head piece is 3' 11" long, 5½" broad and 2½" thick. The length of the coulter is 15½" and the distance between coulters is 11".	4	...	It is used for sowing wheat and millets. In the northern division of this district it is used for sowing cotton; the distance between coulters being 15 inches. In the southern division the same drill is used but only two rows at a time are sown by attaching two sowing tubes on alternate coulters.

APPENDIX
INTERCULTURING

Serial No.	Local Name.	English Name.	Weight in pounds.	Price.	Labour employed to work the implement.		Locality where the implement is used.	Reference to illustration.	
					Men.	Bullocks.		Plate.	Number.
				Per Pair.	Per	Pair.	Gujrat	Tract.	
1	Rampdi.	Hoe.	35	Rs. 4	2	2	Ahmadabad.	...	...
2	Karab Ramp or Havedu.	Heavy Hoe.	47	Rs. 5	2	2	Do. ...	...	...
3	Beli (Bhal Tract.)	Double Hoe.	55	Rs. 4-12	2	2	Do. ...	...	...
4	Hemarni Beli (Bhal Tract.)	Double Hoe.	40	Rs. 3	2	2	Do. ...	XIII	3
5	Dhundiu (Bhal Tract.)	Hoe.	45	Rs. 3-2	2	2	Do. ...	X	4
6	Karabdi or Rampdi.	Hoe.	25	Rs. 2-8	2	2	Kaira ...	IX	1
7	Do.	Hoe.	27	Rs. 2	2	2	Do. ...	IX	2
8	...	...	...	...	...	...	Panch Mahals.	...	...
9	Karpi or Karabdi.	Hoe.	19	Rs. 12	2	2	Surat ...	...	...
10	Do. (Ardhya).	Do.	30	Rs. 14 to 15	2	2	Do. ...	XVI	6
11	Do. (Ardhya).	Do.	36	Rs. 14 to 15	2	2	Do. ...	...	...
12	Do. (Ponia).	Do.	36	Rs. 14 to 15	2	2	Do. ...	XVI	7

E.
IMPLEMENTS.

Short Description.	Work done per day.		REMARKS.
	Acres.	Gunthas.	
The head piece is 17" long, 5" broad, 4" thick. The length of the blade is 9".	3	...	Worked always in pairs sometimes even three are worked on one yoke. <i>Rampdis</i> are used for interculturing when the crop is small. Hoes smother weeds and stir the surface soil.
The head piece is 27" long, the length of the blade is 15".	2 to 2½	...	These are in fact harrows used for interculturing cotton.
The head piece is round and it is 3' long. In this case two hoes are fixed on one head piece; the space between two hoes being 6". The length of each blade is 12". Two separate poles run straight to the yoke for attachment.	4	...	It is used for interculturing cotton in <i>bhal</i> tract when the rows are straight and the weeds few.
Same as No. 3; but the distances and weights vary. The head piece is 1' 10" long. Distance between 2 hoes is 5"; length of each blade is 7".	4	...	It is used for interculturing jowar and bajri.
The length of the head piece is 1' 3" with a diameter of 3" to 4"; the length of the blade is 12".	5	...	It is a heavy hoe worked in pairs for interculturing cotton when there are more weeds and when it is necessary that deeper mulch must be made.
The length of the head piece is 10". The length of the blade is 8".	3 to 4	...	The <i>karbdis</i> are worked in pairs sometimes even three in urgent cases. The hoes are used for interculturing bajri, kodra, <i>sundhia</i> , <i>bavto</i> , &c. It is drawn by hand in tobacco fields when the seedlings are very young.
The length of the head piece is 16". The length of the blade is 12".	3 to 5	...	It is used for interculturing tobacco 2nd time and onwards. It is also used for chillies, brinjals, <i>vari</i> , &c.
.....	...	...	In Panch Mahals specially towards Dohad and Jhalod there is no interculturing implement.
The head piece is 9" long, 3" broad and 3" thick. The length of the blade is 4".	4	...	It is used for interculturing crops sown 1' apart like groundnut.
The head piece is 14" long, 4" broad and 4" thick. The length of the blade is 9".	6	...	Used first time for crops sown 18" apart.
The head piece is 18" long, 5" broad and 5" thick. The length of the blade is 12".	6	...	Used first time for crops sown 24" apart.
The head piece is 20" long, 5" broad and 5" thick. The length of the blade is 15".	6 to 8	...	Used first time for the crops sown 24"-30" apart. It is also used for interculturing chillies, brinjals, &c. At this time only one hoe will be worked and the area gone over will be only 2½ acres.

APPENDIX

Serial No.	Local Name.	English Name.	Weight in pounds.	Price.	Labour employed to work the implement.		Locality where the implement is used.	Reference to illustration.	
					Men.	Bullocks.		Plate.	Number.
13	Karpi.	Hoe.	47	Per Pair. Rs. 14 to 15	Per. 2	Pair. 2	Surat ...	...	...
14	Karabdi (Ponia.)	Do.	51	Rs. 8	2	2	Broach ...	VI	1
15	Karabdi.	Do.	16	Rs. 5-0	2	2	Do. ...	...	...
16	Kolpa.	Do.	19 to 23	Rs. 6 to 8	2	2	Deccan Khandesh.	Tract. XVIII	4
17	Do.	Do.	20	Rs. 4	2	2	Ahmed- nagar.	...	...
18	Do.	Do.	18	Rs. 5	2	2	Do. ...	...	...
19	Do. (Vilangi).	Do. with entire blade.	14	Rs. 4	2	2	Nasik ...	...	...
20	Kolpa landgi.	Hoe with two cutting blades.	14	Rs. 4	2	2	Do. ...	...	...
21	Kolpa.	Hoe.	18	Rs. 3	2	2	Poona ...	XV	1
22	Do.	Do.	25	Rs. 2	2 or 3	2	Sholapur ...	...	...
23	Do.	Do.	20	Rs. 3	4	2	Satara ...	...	...
24	Do.	Do.	22	Rs. 3	2	2	Do. ...	...	...

E—continued.

Short Description.	Work done per day.		REMARKS.
	Acres.	Gunthas.	
The head piece is 24" long, 5" broad and 5" thick. The length of the blade is 18".	4	...	It is used always for interculturing when the crops have received first interculture with a smaller hoe. It is used singly. It is also used for interculturing chillies, brinjals, &c.
Similar to light harrow. The head piece 1'-10" long, 8" broad and 7" thick. The length of the blade is 1'-7" and breadth 3".	4	...	It is used for interculturing cotton when the plants are smaller than 8" when the cotton plants are more than 8" high, the ordinary (karab) harrow is used for interculturing cotton.
The head piece is 1'-2" long, 5" broad and 3" thick. The blade is 10½" long and 1½" broad.	6	...	It is used for hoeing bajri, kodra and rabi jowár.
The length of the blade of the hoe is 11" when it is worked in 10" drill, 4" to 5" when it is worked in 11" drill.	5	...	Kolpas are used in pairs when the crop is small—A seven or eight inch hoe is worked first time in cotton, bajri or jowar. A small harrow is very often used for interculturing in Khán-desh.
The head piece is 12" long, 4" broad and 2" thick. It has two cutting blades with a space between of about 2". As the kolpa is worked the row of the standing crop passes through the space between two blades.	2	...	Worked always in pairs, used for interculturing jowari and bajri. These kolpas cannot be used when the crop is much advanced. Wheat and gram (rabi crops) are never intercultured.
The head piece is 1'-6" long, 4" broad and 3" thick.	2	...	The kolpa is used for hoeing cotton in Newasa and Shevgaon Talukas.
The head piece is 12" long, 3" broad, 2½" thick. The length of the blade is 8".	3	...	It is used for interculturing cotton in Malegaon and Nandgaon Talukas.
Similar to No. 16	3	...	It is used for interculturing jowari, bajri, tili, &c.
The head piece is 1'-11" long, 3½" broad and 2½" thick. The length of each component blade is 6".	4	...	It is used for interculturing jowar and bajri.
The head piece is 2" long, 3" broad and 3" thick. It has two cutting blades with a space between.	2 to 3	...	Two to three kolpas are worked on one yoke for interculturing jowar, bajri, &c. For interculturing cotton small sized harrows are used.
The head piece is 1'-3" long, 3" broad and 2" thick. It has two cutting blades with a space between.	8	...	Four hoes are worked on one yoke. These are used for interculturing crops sown with 4 coultter drill.
The head piece is 1'-10" long, 4" broad and 3" thick. The blade is 15" long and 2" broad.	3	...	Two hoes are worked on one yoke. They are used for interculturing tobacco and cotton.

APPENDIX

Serial No.	Local Name.	English Name.	Weight in pounds.	Price.	Labour employed to work the implement.		Locality where the implement is used.	Reference to illustration.	
					Men.	Bullocks.		Plate.	Number.
25	Kolpa (Dube).	Hoe.	26	Per Pair. Rs. 6	Per 2	Pair. 2	Satara ...	...	...
26	Kolpa.	Do.	65	Single. Rs. 3	Single. 1	2	Do. ...	...	...
27	Do.	Do.	70	Rs. 3	Single. 2	2	Do. ...	...	...
28	Yedi Kunti.	Do. with a slit.	25	Per Pair. Rs. 2-8	Per 2	Pair. 2	Karnatak Belgaum ...	Tract. ...	...
29	Patti Kunti.	Hoe with entire blade.	29	Rs. 2	2	2	Do. ...	...	...
30	Kabin Dumgunti.	Sugarcane Hoe.	64	Single. Rs. 1-4	Single. 2	2	Do. ...	...	...
31	Yedi Kunti.	Hoe.	25	Per Pair. Rs. 3	Per 2	Pair. 2	Dharwar ...	...	...
32	Patti Kunti.	Hoe with entire blade.	21	Rs. 3	2	2	Do. ...	...	...
33	Badni Kunti.	Hoe.	27	Single. Rs. 3	Single. 1	2	Do. ...	...	...
34	Heeli Yedi (Kunti).	Do.	24	Per Pair. Rs. 6	Per 2	Pair. 2	Bijapur ...	...	...
35	Dumgunti or Petti Kunti.	Do.	18	Rs. 3	2	2	Do. ...	...	...

E—concluded.

Short Description.	Work done per day.		REMARKS.
	Acres.	Gunthas.	
The head piece is 1'-3" long, 4" broad and 2" thick. The blade is 12" long.	2	...	Two hoes are worked on one yoke. These are specially meant for chillies.
The head piece is 1'-2" long, 7" broad and 4" thick. The length of the blade is 11".	1	...	This hoe is used for making ridges for planting chilli seedlings.
The head piece is 11" long, 7" broad and 5" thick. The length of the blade is 9".	...	25	This hoe is called <i>Tapecha kolpa</i> and is worked in the sugarcane field. This implement is followed by another kolpa, to which a wooden phavdi is attached for making ridges. The pavdi is 11" high, 11" broad and has a handle about 2½' long. The phavda weighs 18 lbs. and costs Re 1.
It is a double bladed hoe with a slit between. The head piece is 1'-5" long, 4" broad and 3" thick. The length of the prong is 10".	2	...	Worked in pairs. Used for interculturing bajri, tur and jowar.
The head piece is 1'-4" long, 3½" broad and 3" thick. The length of the prong is 8". The blade is 8" long.	3	...	Used for interculturing cotton, brinjals and chillies. Both slit bladed as well as entire bladed hoes are used for all the crops. The length of the blade varies according to the distances between 2 coulters of the drills.
The head piece is 1'-3" long, 8" broad and 4" thick; the length of the prong is 1'. The blade is 11" long and 2½" broad.	...	15	It is used for stirring up the soil and earthing up sugarcane. The prongs are projected above the head piece for pressing the implement.
It is a double bladed hoe with space between. The head piece is 18½" long, 4½" broad and 3½" thick. The length of the prong is 7½".	2	...	It is used for interculturing jowar and cotton. There is a wedge arrangement in fixing the prongs to increase the slit.
The length of the blade is 10". The head piece has the same dimensions as No. 31.	2	...	It is used for hoeing jowar when the crop grow taller. Sometimes 2 to 4 hoes are worked on one yoke.
The head piece is 2'-3" long, 4½" broad and 2½" thick. The length of the prong is 9"; the blade is 1'-10" long, 2½" broad and 1½" thick.	2	...	It is worked singly between the rows of brinjals and chillies.
The head piece is 1'-8" long, 4½" broad and 3" thick. It is a double bladed hoe.	3	...	Two or three hoes are worked on one yoke. In the northern part of the District, the hoes with slit between the blades are used for hoeing cotton, while in the southern part entire bladed hoes are used for interculturing cotton
The head piece is 12" long, 4½" broad and 3" thick. The blade is 7" long.	2	...	

APPENDIX F.
YOKES.

Serial Number.	Local Name.	English Name.	Weight in lbs.	Price.	Name of the District.	Short description.			REMARKS.
						Total length.	Length from neck to neck.	Neck space.	
1	Jusari ...	Single yoke ...	11	Rs. a. p. 1 0 0	Ahmedabad.	6'-0"	4'-0"	10"	Used for plough.
2	Do. ...	Do. ...	15	1 8 0	Do. ...	8'-0"	6'-6"	9"	" for drill and hoes.
3	Tarela ...	Double yoke...	30	2 0 0	Do. ...	5'-2"	3'-8"	15"	" for mhot or where 2nd pair is used for cart, plough, etc.
4	Jusari ...	Single yoke ...	11	1 0 0	Kaira ...	5'-6"	4'-2"	12"	" for ploughs, drills and hoes.
5	Do. ...	Do. ...	16	1 0 0	Do. ...	6'-3"	4'-8"	12"	" for hoeing tobacco as well as where three hoes are worked on one yoke.
6	Tarela ...	Double yoke...	22	1 8 0	Do. ...	4'-5"	3'-4"	9"	" for mhot.
7	Jusari ...	Single yoke ...	17	0 12 0	Panch Mabals.	4'-7"	3'-8"	12"	" for sowing wheat.
8	Tarela ...	Double yoke...	25	1 8 0	Do. ...	6'-0"	4'-0"	12"	This is a general purpose yoke in place of a single yoke.
9	Jusari ...	Single yoke ...	19	1 2 0	Surat ...	6'-3"	4'-6"	13"	Used for ordinary plough and 18" drill.
10	Do. ...	Do. ...	21	2 4 0	Do. ...	9'-6"	7'-9"	14"	" for 24" drill and for working ardhya and ponja hoes.
11	Do. ...	Do. ...	15	1 8 0	Do. ...	7'-6"	5'-10"	14"	" for 24" drill and for hoeing in crops sown 18" apart.
12	Chokia ...	Double yoke...	38	4 to 5	Do. ...	6'-0"	4'-4"	15"	" for working Mhot and iron ploughs.
13	Jusari ...	Single yoke (small)	14	1 8 0	Broach ...	6'-5"	4'-7"	13"	" for plough, harrow and drill.
14	Jusar ...	Do. ...	18	2 0 0	Do. ...	7'-7"	5'-8"	11"	" for hoes.
15	Tarela ...	Double yoke...	26	3 to 4	Do. ...	4'-6"	3'-3"	12"	" for working mhot and iron plough.
16	Dusar ...	Single yoke ...	16	1 8 0	Khandesh...	6'-0"	4'-4"	12"	" for plough, harrow, cotton and jowar drills and bullock hoes.
17	Do. ...	Do. ...	14	1 8 0	Do. ...	5'-0"	3'-4"	12"	" for drills, for sowing rabi crops (wheat, gram, jowar and coriander.)

18	Jodni or Juvadi.	Double yoke...	26	3 0 0	Do. ...	5'-3"	4'-9	12"	" for working the mhot.
19	Ju	Single yoke ...	25	2 0 0	Ahmednagar.	9'-0"	7'-6"	10"	" for plough.
20	Do.	Do. ...	16	0 10 0	Do. ...	5'-8"	4'-2"	10"	Ordinary yoke used for harrow, seed drill and bullock hoes.
21	Shivlat or Jadi.	Double yoke...	23	1 0 0	Do. ...	4'-0"	2'-8"	12"	Used for mhot and for the plough when second pair is used.
22	Ju	Single yoke ...	20	1 8 0	Nasik ...	6'-0"	4'-2"	7"	Used for plough.
23	Do.	Do. ...	16	1 4 0	Do. ...	5'-2"	4'-2"	7"	" for harrow, drill and bullock hoes.
24	Shilat	Double yoke...	15	1 4 0	Do. ...	4'-8"	3'-3"	12"	" for working the mhot.
25	Ju	Single yoke ...	40	3 0 0	Poona ...	9'-5"	7'-8"	8"	" for plough.
26	Shelati	Double yoke...	18	1 0 0	Do. ...	5'-0"	3'-8"	9"	" for harrow, mhot, etc.
27	Ju	Single yoke ...	15	1 0 0	Do. ...	6'-0"	4'-0"	8"	" for drill and hoes.
28	Ju	Do. ...	75	2 0 0	Satara ...	11'-0"	9'-5"	8"	This is the first yoke for the heavy plough.
29	Sheval	Double yoke...	32	1 8 0	Do. ...	4'-0"	2'-9"	12"	This is the second yoke for the plough.
30	Ju	Single yoke ...	36	1 4 0	Do. ...	7'-9"	5'-9"	7"	This is used for groundnut harvesting harrow and drill.
31	Ju	Do. ...	18	0 12 0	Do. ...	11'-0"	8'-5"	8"	It is made of bamboo. It is used for working kolpas in tobacco and cotton.
32	Shevlat	Double yoke...	24	1 8 0	Do. ...	6'-2"	4'-5"	11"	Used for working the sugarcane hoe.
33	Do.	Do. ...	25	2 4 0	Do. ...	5'-7"	4'-3"	10"	It is used for working the hoe and for making ridges for chillies.
34	Ju	Single yoke ...	44	1 4 0	Do. ...	7'-5"	5'-9"	8"	For three kolpas.
35	Do.	Do. ...	22	0 12 0	Do. ...	9'-6"	7'-7"	8"	This is of bamboo and is used for 4 kolpas.
36	Do.	Do. ...	23	1 4 0	Do. ...	5'-7"	4'-3"	7"	Used for working the drill.
37	Do	Do. ...	50	2 8 0	Sholapur ...	9'-0"	7'-5"	7"	" for plough.
38	.....	Do. ...	55	1 0 0	Belgaum ...	8'-6"	6'-0"	5"	Only one yoke is used for working all the implements in mallad tract.
39	.....	Double yoke...	27	1 4 0	Do. ...	6'-10"	4'-9"	10"	Double yoke is used only for mhot.
40	.....	Do. ...	28	1 0 0	Do. ...	6'-1"	4'-0"	10"	Used for harrow.
41	.....	Do. ...	27	1 4 0	Do. ...	7'-0"	5'-0"	6"	Used for 4 coultured drill.
42	Do. ...	26	1 8 0	Do. ...	9'-9"	8'-0"	6"	3 " drill 15" apart and for " interculturing implements with entire blades. " " working hoes with slit between.

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On this yoke 3 hoes can be worked at a time. 3 holes are provided on each side for adjustment of length.

APPENDIX F—continued.

Serial Number.	Local Name.	English Name.	Weight in lbs.	Price.	Name of the District.	Short description.			REMARKS.
						Total length.	Length from neck to neck.	Neck space.	
43	Double yoke...	30	Rs. a. p. 1 4 0	Belgaum ...	8'-9"	7'-1"	6"	Used for 3 coultured drills 18" and 24" apart.
44	Single yoke ...	33	2 8 0	Dharwar ...	9'-2"	6'-10"	5½"	This is the first yoke for the big and heavy plough.
45	Double yoke...	18	2 0 0	Do. ...	6'-3"	4'-0"	8½"	This is the 2nd yoke for the big plough. " " 1st yoke for a small plough. " " yoke for small harrow (kirkunti). " " yoke for 4 coultured jowar drills. " " used for interculturing cotton and jowar where only one hoe is used.
46	Do. ...	32	2 0 0	Do. ...	6'-2"	4'-0"	5½"	This is the yoke for wheat drill. " " " for Balesal kunti. " " " for 4 coultured jowar drill.
47	Do. ...	21	1 8 0	Do. ...	7'-2½"	5'-2"	5"	" " " for 2 coultured cotton drill. " " " for 3 coultured drill for jowar and wheat.
48	Do. ...	25	1 8 0	Do. ...	9'-0"	6'-6½"	6"	This is the yoke for 3 coultured cotton drills. " " for working 2 to 3 hoes on one yoke.
49	Single yoke ...	18	1 4 0	Do. ...	9'-4"	7'-2"	6"	Yoke with 4 holes on each side; when inside 2 holes are used then 3 hoes are put on one yoke; when outside pair of holes are used then 4 hoes are worked on one yoke.

50	Modala Naga.	Do. ...	48	2 8 0	Bijapur ...	10'-0"	8'-0"	4½"	This is the first yoke for the heavy plough.
51	Dabbi Naga or Kleda Naga.	Double yoke...	32	2 0 0	Do. ...	6'-0"	4'-10"	10"	This is the yoke for harrow, mhot and seed drill.
52	.....	Single yoke ...	40	2 0 0	Do. ...	6'-9"	5'-7"	4½"	Used for 3 coultered drill.
53	.....	Do. ...	32	1 12 0	Do. ...	7'-6"	6'-4"	4½"	" " 4 " drill.
54	.....	Do. ...	35	0 12 0	Ratnagiri ...	6'-3"	4'-11"	6"	Used for plough and leveller.

APPENDIX G.

GLOSSARY OF VERNACULAR WORDS OF CROPS, KINDS OF WOOD
USED IN MANUFACTURE OF IMPLEMENTS Etc, WITH
THEIR SCIENTIFIC NAMES.

English name.	Botanical name.	Vernaculars.		
		Guzerati.	Marathi.	Kanarese.
Wood.				
Babul	Acacia arabica	Baval ...	Babul ...	Jali.
Teak	Tectona grandis	Sag ...	Sag ...	Sag.
	Ogeinia dalbergioides	Tanach ...	Tiwas ...	...
	Terminalia tomentosa	Panio sadado.	Ain ...	Matti.
	Mimusops hexandra	Rayan ...	Rayan ...	...
	Dalbergia Sissu	Sisam ...	Sisoo ...	Sisa.
	Bassia latifolia	Mahuda ...	Moha ...	Ippi.
	Melia azadirachta	Limbado ...	Nimb ...	Bevu.
Bamboo (large thorny).	Bambusa arundinacea	Vans ...	Vansa, Velu...	Bidaru.
Solid Bamboo...	Dendrocalamus strictus			
Mango...	Mangifera indica	Ambo ...	Amba ...	Mavu.
...	Erythrina indica	Panurvo ...	Pangara ...	Kaliwara.
CROPS.				
Cereals.				
Wheat	Triticum sativum	Gahu ...	Gahu ...	Godi.
Great millet	Andropogon sorghum	Jowar ...	{ Jowari ... } { Jondhala. }	Jola, Yenigar.
Do.	Do. do.	Sundhia ...	...	...
	var cernuus.			
Rice	Oryza sativa	Dangar, Bhat.	Bhat...	Nellu, bhatta.
Bulrush millet	Pennisetum typhoideum	Bajari ...	Bajari ...	Shejji, chajji.
Maize	Zea mays	Makai ...	Maka, bhuta...	Goinjol.
Inferior millet	Paspalum scrobiculatum	Kodra ...	Harik ...	Harik.
Do.	Eleusine coracana... ..	Bavto, Nagli.	Nagli, Na- chani.	Ragi.
Pulses.				
Pigeon pea	Cajanus indicus	Tuver ...	Tur, turi ...	Togari.
Gram	Cicer arietinum	Chana ...	Harbara ...	Kadle.
Peas	Pisum sativum	Vatana ...	Vatana ...	Battgadde.
Chickling vetch	Lathyrus sativus	Lang ...	Lakh ...	...
Lentil	Lens esculenta	Masur ...	Masur ...	Channangi.
Cluster beans	Cyamopsis psoralioides	Guvar. ...	Govari ...	Govarkai.
Horse gram	Dolichos biflorus	Kulthi ...	Kulthi, Hulga.	Hurali.
Oil Seeds.				
Sesamum	Sesamum indicum	Tal ...	Til ...	Yellu.
Groundnut	Arachis hypogea	Bhoising ...	Bhuimug ...	Bhuimug.
Linseed	Linum usitatissimum	Alsi ...	Javas ...	Agasi.
Safflower	Carthamus tinctorius	{ Kabari. } { Kusambi. }	Kardai ...	Kusbi.
Fibres.				
Cotton... ..	Gossypium... ..	Kapas, ru ...	Kapas, ru ...	Hatti.
Sann Hemp	Crotolaria juncea	Sann ...	Tag ...	Sannabu.
Deccan Hemp...	Hibiscus cannabinus	Sheria ...	Ambari ...	Pundi.

APPENDIX G—continued.

English name.	Botanical name.	Vernaculars.		
		Guzerati.	Marathi.	Kanarese.
Garden crops.				
Sugarcane	Saccharum officinarum ...	Sherdi ...	Us ...	Kabbu.
Brinjal (Egg plant) ...	Solanum melongena ...	{ Vangan... } { Vantak... }	Vange ...	Badane.
Chillies	Capsicum frutescens ...	Marcha ...	Mirchi ...	Menasinakai.
Spices.				
Coriander	Coriandrum sativum ...	Dhana ...	Dhane ...	Havija.
Fennel... ..	Foeniculum vulgare ...	Variali ...	Badishep ...	...
Anise	Pimpinella Anisum ...		Shopa ...	Sabbasige.
WEEDS.				
...	Cynodon dactylon ...	Daroi ...	Hariali ...	Karki.
...	Cyperus rotundus ...	Gunderdo ...	Lavala ...	Jek.
...	Eragrostis cynosuroides ...	Chido	Darbha ...	Darbha.
...	Ischæmum pilosum ...	Dabhdo ...	Khavo ...	Kunda ...
Special terms.				
Winter ... ..	...	Shialu ...	Rabi... ..	Hingari.
Monsoon ... ..	...	Chomasa ...	Kharif ...	Mungari.
Fallow ... ..	...	Vashil ...	Padit ...	Pada.
Heavy rainfall tract above and along the Ghats ... ..	...	...	Mawal ...	Mallad

APPENDIX H.

Vernacular names of different parts of implements with their English equivalents.

(M) Marathi, (G) Guzerati, (K) Kanarese.

Ploughs	...	(G) Hal or santi, nagar	(हल, सन्ती अथवा नागर).
		(M) Nagar, nagri	(नागर, नागरी).
		(K) Neglu, ranti	(नेगळु, रंती).

Parts—

Body-Head...	(G) Pati or tungu	(पाटी or तुंगु).	
	(M) Doke	(डोकें).	
	(K) Kordu	(कॅडुडा).	
Shoe	...	(G) Chavdu	(चवडु).
		(M) Dant	(दांत).
		(K) Kula.	(कुळ).

In Marathi the head and shoe combined is called ankada
(आंकडा) or khadsa खडसा.

Beam or pole.	(G) Hal or ched	(हल or छेड).	
	(M) Halas	(हलस).	
	(K) Jesu	(जेसु).	
Plough share.	(G) Koslu or kos	(कोसळु or कोस).	
	(M) Phal	(फाल).	
	(K) Kuda	(कुडा).	
Ring	...	(M) Vasu	(वसु).
		(K) Balli	(बळी).
Wooden peg joining the share and the body...	(M) Phal kamb	(फाल कांब).	
Stilt	...	(G) Rumnu or khilu	(रुमळुं or पीळुं).
		(M) Rumne	(रुमणें).
		(K) Mali	(मळ).
Pin attached to the stilt—	(G) Hadeli	(हडेली).	
	(M) Muthya	(मुठ्या).	
	(K) Hidi	(हिडी).	
Yoke	...	(G) Jusru	(जुसरु).
		(M) Ju, jokhad or Dugar	(जू, जोखड or दुसर).
		(K) Noga	(नोगा).

Harrow	...	(G) Karab, ramp, vakhar	(કરબ, રાંપ, or વખર).
		(M) Vakhar, aut, kulav, pharat	(વક્રહર, આજત, વુલ્લવ, ફરાટ).
		(K) Kunti, Balisal Kunti	(કુંટી, બલિસલ કુંટી).
Parts—			
Head piece	...	(G) Lodh or lodhio	(લોઢ or લોઢીયો).
		(M) Dind	(દિંડ).
		(K) Dindu	(ડિંડુ).
Prongs	...	(G) Danta or dadha	(દાંતા or દાદા).
		(M) Janole	(જાનોલે).
		(K) Tal	(ટાલ).
Blade	...	(G) Phas or pasiu	(ફાસ or પાસીયુ).
		(M) Phas	(ફાસ).
		(K) Kuda	(કાડા).
Ring	...	(G) Dehelu or bela	(ડેહેલુ or બેલા).
		(M) Wasu	(વસુ).
		(K) Balli	(બાલી).
Pole	...	(G) Hal	(હાલ).
		(M) Dandi	(દાંડી).
		(K) Jesu	(જેસુ).
Stilt	...	(G) Rumnu or khilu	(રુમનુ or ખીલીયુ).
		(M) Rumne	(રુમને).
		(K) Mali	(મલી).
Seed drills	...	(G) Faidko, tarfan, chawal, chawar.	(ફાઈકો, તરફતુ, ચાવળ, ચાવર).
		(M) Dussa, moghadya, tifan, pambhar	(દુસા, મોઘદ્યા, તિફળ, પામર).
		(K) Kurgi, hatti kurgi, naktal kurgi.	(કુર્ગી, હાટ્ટી કુર્ગી, નાકટલ કુર્ગી).
Parts—			
Head piece	...	(G) Lodh or lodhio	(લોઢ or લોઢીયો).
		(M) Dind	(દિંડ).
		(K) Dindu	(ડિંડુ).
Coulters	...	(G) Danta	(દાંતા).
		(M) Phan	(ફળ).
		(K) Tal	(ટાલ).
Iron shoe	...	(G) Phalva	(ફાલવા).
		(M) Pharole	(ફારોલે).
		(K) Tal	(ટાલ).

Bamboo tubes.	(G) Naria, nalwa, bhungla	(नारीया, नलवा भुंगला).
	(M) Nalya	(नल्या).
	(K) Lalgi	(लर्गी).
Bowl ...	(G) Orni or chadu	(ओरणी or चाडु).
	(M) Chadq	(चाडे).
	(K) Bala	(बाल).
Pole ...	(G) Delu	(डेडु).
	(M) Dandi	(दांडी).
	(K) Jesu.	(जैसु).
Stilt ...	(G) Rumnu	(रुमनु).
	(M) Rumne	(रुमणे).
	(K) Mali	(मलि).

Hoe—interculturing implement—

(G) Karabdi, karpi, rampdi	(करबडी, करपी, रंपी)
(M) Kolpa	(कोल्पा).
(K) Yedi kunti	(येदि कुंटी).

Parts—

Head piece ...	(G) Lodh or lodhio	(लोड or लोडीयो).
	(M) Dind	(दिंड).
	(K) Dindu	(दिण्ड).
Prongs ...	(G) Danta or dadha	(दांता or दादा).
	(M) Golia	(गोल्या).
	(K) Tal	(टाल).
Blade ...	(G) Phas or pasiu	(फास or फासीयु).
	(M) Phas	(फास).
	(K) Kuda	(कुडा).
Ring ...	(M) Wasu	(वसु).
	(K) Balli	(बलि).
Pole ...	(G) Hal or delu	(हल or डेडु).
	(M) Dandi	(दांडी).
	(K) Jesu	(जैसु).
Stilt ...	(G) Rumnu or khilu	(रुमनु or खिलु).
	(M) Rumne	(रुमणे).
	(K) Mali	(मलि).