AGRICULTURAL IMPLEMENTS*—I

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THE INDIAN SEED DRILL

THE utility of a seed drill depends on its capacity to distribute the seed uniformly over the whole area sown. Each tube of a drill should sow at the same rate, and uniformly at all points in its line of motion. The characteristic feature of a drill is the presence of seed coulters for depositing the seeds in lines under the surface of the soil.

The Indian seed drill is a convertible implement. It can be used as a grubber when the seed tubes and the seed cup are not fixed on. But owing to the arrangement of the coulters in one line it cannot operate throughout the whole area it passes over.

The drill is made up of four main parts: the body, the draught pole, the seed tubes, and the seed cup. Like the blade harrow the body consists of a log of wood, preferably rectangular in shape, into which the draught pole is attached at such an angle that the latter rests easily on the yoke of the bullocks used for drawing it. The draught pole is attached to the body by the mortise and tenon joint, secured further by means of a split pin also of wood. Into the lower surface of the body are fixed 3, 4, or 6 coulters of iron or of wood at right angles to the body so as to reduce penetration to a minimum. If the coulters are fixed at greater angles, the seed will correspondingly be deposited deeper in the soil. This is undesirable. The coulters are spaced equally about 9, 12, or 18 inches apart according to requirements. The spacing and the number of coulters and of seed tubes depend on the particular crop to be sown.

Circular holes depending on the number of seed tubes are drilled through the body, spaced equally, at a slight angle for

*This series of articles describe a number of simple implements used in India and Ceylon which are suitable for general adoption by the village agriculturist.—Editor T.A.

the reception of the tubes. Pieces of small piping 2 to 2½ inches shorter than the coulters, are fixed in the holes on the lower surface of the body at an angle inclining forwards and exactly behind the coulters. The number of seed tubes should correspond to the number of coulters. These lower tubes could conveniently be made by sawing off pieces from old discarded exhaust pipes of motor cars. Well seasoned bamboos about 2 to 2½ inches in diameter and about 3 feet in length with the joints at the nodes disconnected and smoothened out serve the purpose of the upper seed tubes. Bamboo tubes are not very permanent as they are liable to be damaged by weevils. Strong and durable seed tubes could, however, be turned out of any light and strong timber such as halmilla or sapu. The piece of timber is planed to a cylindrical shape and then sawn longitudinally into two halves which can be joined together and tied securely in three or four places with thin wire. The irregularities of the walls of the excavated portion can be evened out by passing a red-hot iron rod through the cavity. The length of the seed tubes should be such as to enable the sower to perform his task without bending. For a four-coulter seed drill, seed tubes two feet six inches in length have been found suitable at the Wariyapola Farm. As the seed tubes are placed to converge at the top, the two extreme tubes should be about three inches longer than the two inner ones. The seed tubes are fixed on the upper surface of the body.

The seed cup, shaped like an ordinary bowl, is fixed on to a square block of wood. The diameter of the cup is about 8 inches and the height 10 inches. The cup is scooped out to about half its depth in such a manner as to divide it into 3 or 4 compartments, the number depending on the number of seed tubes. The edges of the walls of all the compartments converge to a point with a gradual curve upwards where all the four walls meet resembling a cone. This device causes all the seeds to be evenly distributed into the compartments. At the base of each compartment a hole about half to three quarters of an inch in diameter is drilled at an angle which would provide a continuous passage to the seed tube. When the seed is dropped over the conical projection in the centre of the seed cup, it passes into the upper seed tubes and thence to the lower ones, being finally

deposited in the shallow furrows made in the soil by the coulters. The coulters do not work more than one and a half to two inches deep, but if deeper penetration is desired, a weight should be placed on the head piece. The seed cup and the tubes are braced to the body by an ingenious arrangement of strings. The whole drill could easily be dismantled when it is required to be transported long distances.

When the drill is required for sowing operations, the seed cup and the upper seed tubes are braced together securely by means of a thin hemp rope, the two longer seed tubes being fixed at the extreme ends. The seed cup when fixed on to the upper tubes should be perfectly level, or the seeds will be unevenly distributed into the compartments.

The selection of a yoke of the proper length so as to prevent the bullock from treading on the furrows already sown is important. If a three-coulter 18-inch drill is used, the distance between the extreme coulters will be 36 inches. The bullock should be made to walk about 9 inches away from each of the extreme furrows. Then the distance from the centre of the neck of one animal to that of the other will be 36 + 9 + 9 or 54 inches. Leaving six inches at either end free the length of the yoke required will be 66 inches. A simple formula for selecting the proper yoke for a drill is to multiply the number of coulters by the space between two coulters and to add 12 to the result. For example, the yoke required for a 6-coulter 12-inch drill will be $6 \times 12 = 72 : 72 + 12 = 84$ inches. The yoke is tied to the draught pole in the same manner as the blade harrow.

Sometimes, when the seed bed is thoroughly prepared, the coulters work deeper than 2 to $2\frac{1}{2}$ inches thereby blocking the seed pipes. This happens particularly in light types of soil. This defect can be overcome either by using light timber for making the drill or by fixing two wheels at either end of the body of the drill. The wheels should be fixed so that they can be adjusted to the required depth in the same manner as the land wheels of iron ploughs. The vertical iron rod connected to the axle of the wheel could be clamped on to an iron bracket driven into one end of the body.

To work the seed drill in an efficient manner the seed bed should be well prepared. There should be no stumps or stubble

of the previous crop left over. All clods should be thoroughly pulverised and the seed bed levelled as far as possible by working it with the blade harrow or the Diamond mesh harrow. A pair of bullocks trained for ploughing, interculturing between rows of plants, and for drilling should not be used for carts. In working the drill the driver should strive to get the pair of bullocks to walk perfectly straight and at the same uniform speed. Once the man and the pair of bullocks are trained the sowing can be done in perfectly straight rows. The bag of seeds is suspended below the seed cup. Before commencing to sow, the drill should first be tested by dropping some seeds into the seed cup to see if the seed tubes and pipes are functioning properly. Two men are required to work the drill, one to drive the pair of bullocks and the other to sow the seeds. But with experience one man could perform both the operations. The sower stands just behind the drill, and as the animals start walking, the seeds are dropped at a uniform rate from one hand to the top of the conical shaped projection in the centre of the seed cup. Before one handful is finished, the next handful should be ready, which means that the sower has to use both hands alternately. By this means the seeds are dropped continuously without a break until the headland is reached. If any time is lost between one handful and the other, the result will be a corresponding space left unsown. Every time the headlands are reached, the seed pipes should be examined to see if they are blocked. Before proceeding on the homeward trip the drill should be shifted towards the unsown area to a distance equivalent to the space between two coulters. Otherwise the drill will go over the last furrow a second time.

The seed rate is calculated on the number of handfuls of seeds to be sown for a particular distance. Suppose a crop of Sunnhemp is to be drilled in a one-acre field, 363 feet long and 120 feet wide at the rate of 100 pounds per acre, with a four-coulter 12-inch drill. The number of foot steps required for one trip from one end of the field to the other is found by driving the pair of bullocks with the drill hitched on, and the sower, whilst walking behind the drill, counts the number of steps taken for the trip. Suppose he takes 160 steps for this trip. On each trip the drill covers a space of 36 inches. But when

the drill reaches the headland and proceeds on its homeward trip, it is shifted towards the unsown side to a distance equivalent to the space between two coulters, lest the last furrow be sown a second time. Thus the drill, in reality, covers a space of 36 + 12 inches or 48 inches per trip. The number of trips to be done to cover the whole field, 120 feet in width, will be $\frac{120}{4}$, or 30. For each trip from one end of the field to the other the sower took 160 steps. Therefore 4,800 steps will be taken for the 30 trips. Next, the number of handfuls for a pound of seed is calculated. Suppose it is 12. Then 100 pounds of seed will be equivalent to 1,200 handfuls. 1,200 handfuls of seed have to be sown in 4,800 foot steps. Thus one handful of seed has to be sown in four steps. The practical agriculturist would, perhaps, not find this method of calculation to be necessary. He will soon learn by experience at what rate he should feed the seed cup to obtain the best results.

It requires an experienced skilled labourer to operate a seed drill for the distribution of the seed depends on the sower. In this drill, the spacing is determined by the distance of the seed tubes from each other and cannot be regulated. A careful Indian cultivator sows with these drills in a very skilful and effective manner. With a three-coulter 18-inch drill about $2\frac{1}{2}$ to 3 acres could be drilled in a day of 8 hours. Sometimes it is necessary to sow a mixed crop in alternate rows (one row of one crop and the adjoining row of another kind). In such cases a simple device could be adopted. A separate seed tube fitted with a seed cup is attached a little distance behind the drill by means of a piece of coir rope. A coconut shell fixed on the seed tube forms a good seed cup. This seed tube should be in charge of a separate sower, and should follow in one of the furrows left by the coulter of the drill. In conducting such mixed sowing operations the corresponding holes in the seed cup of the drill should be blocked. Experience at Wariyapola Farm shows that in well worked sandy loam soils covering the seeds was not necessary. As the coulters penetrate the soil, the soil particles owing to their loose texture fall back to the furrows thus covering the seeds. A shower of rain covers the seeds completely. In heavier types of soil it may be necessary to cover the seeds after drilling. This may conveniently be

done by working a plank harrow immediately behind the drill. Any closely spaced crop could be drilled with this drill, such as *Calopogonium mucunoides*, *Centrosema pubescens*, Green Gram, Cowpea, Groundnuts, Sorghums, Maize, Hill paddy, Sunn-hemp, etc.

Among the advantage of sowing seed with a drill are : (1) Economy in seed. (2) Even distribution of the seed. Uniform seedling is essential for regular growth and regular ripening. (3) The seed is sown in rows. This facilitates inter-culturing operations with implements and is economical.

One of these drills could very easily be constructed by the ordinary village blacksmith or by the skilled cultivator at a cost of about Rs. 12 to Rs. 15.