MECHANISATION ON COCONUT ESTATES, III

By RAY WIJEWARDENE

The preceding articles in this series dealt mainly with mechanisation as applied through the medium of the conventional four-wheeled tractor as used on the larger estates. During the last two years, however, machines suitable for smaller properties were introduced into this country and have now worked long enough for their relative advantages and shortcomings to be discussed.

One of the earliest of the smaller tractors was a track-layer type of machine with a 5 h.p. air-cooled engine, developed in the U.K. mainly for market garden cultivation. These did not, however, gain much popularity due largely to their slow speed of travel, low output of work, lack of manoeuvrability over the unevenness of the average coconut estate, and relatively high capital cost. These tractors also suffered through being rather complicated in construction, particularly in the region of the tracks, and, being also of somewhat low construction, got pretty well fouled up with gravel, sand, etc. resulting in rapid wear. The range of implements too was unfortunately not particularly suited to tropical cultivation practises.

Around the same time came the various rotary cultivators, comprising a two-wheeled tractor equipped, at the rear, with a set of high speed rotary cultivating blades. The operator walked behind, guiding the machine by means of handle-bars. These machines too failed to catch on and the reasons for this are clear. Usually the engine, of about 4 to 5 h.p. was located too low, and also got fouled up with the usual litter on coconut estates, apart from the grit that covered it almost completely. These machines were also not protected, with oil seals, etc. against the ingress of grit and moisture into the gear box, chain case, etc. and thus soon required expensive maintenance. As regards cultivation operations, the machine could do little more than whirl its high-speed rotary blades through the soil, pulverising it, and tending rather to destroy what little structure is present in tropical soils. Once again the price of this machine was against its practical usage, particularly when coupled with a limited range of operations.

Recent Development

Comparatively recently, however, a development of the rotary cultivator principle, came to this country from Japan, where it had already found acceptance by the farmers, cultivators and orchardists, there. It began its history as an American market garden tractor, and was adapted by the Japanese, whose farming is comparable, as far as extents of land cultivated per farmer, with those of the American market gardener; extents between 5 and 30 acres of intensively cultivated land. The Japanese are reported to have harnessed their ingenuity into developing this machine further, making it more suitable for use in mudded paddy fields, extending its range of usefulness with a wide range of versatile implements, and cleaning up the 'bugs' on the machine to make it as fool-proof as possible for trouble free operation by unskilled farmers. Their objective was to make it simple enough to be repaired by the village bicycle mechanic, and thus not require the expensive luxury of a call for a service van whenever a breakdown occurred.

Fig. 1
The MERRY TILLER, described in this article, is here shown ploughing between the rows of palms.

Fig. 2
A close-up view of the ploughing operation which clearly shows the Japanese style of

Basically this machine was similar to the rotary cultivator, but with none of the drawbacks of the latter. The engine, 2 to 3 h.p. air cooled, was located high above the pair of wheels, and drove them through a ' Vee ' belt (which doubled as a clutch) and a totally enclosed chain case. This chain case was equipped with double neoprene oil seals to prevent leakage of oil as well as entry of mud or water, and had the added advantage of requiring no grease points—a drawback with all the larger machines, for the more grease points on a machine, the more parts there are to be missed and left unlubricated with the result of heavy maintenance and repair bills ! The machine as a whole was simple and had none of the complications of gear-box and differential—nor did it appear to require them ! As a result it was very cheap, the original machine costing about Rs. 2,000/- complete with a wide range of implements adequate for most purposes.

Some of the more precision parts such as needle bearings, neoprene seals, etc. were turned out in America, as also the engine.

Particularly interesting, was the direct method of application of power to the work, be it soil cultivation, irrigation, or anything else ! This direct application of power to the work being performed appears the secret of a great deal of the success and high output for such a small light machine.

Wide Range of Implements

One of the implements is the reversible plough, fitted flexibly behind the wheels, and adjustable both for depth of cultivation as well as width. Usually the Japanese style of plough is used for the advantage of easy replacement of worn shares, and reversibility of the direction of throw. In fact the whole machine becomes a powered plough, as the function of the wheels —pneumatic rubber tyred for hard lands and spade lugged steel rims for operation in soft soils —is almost entirely to propel the plough. The operator walking behind can guide the machine with only the tips of his fingers, in straight lines or in circles, on level or sloping and undulating land. Ploughing can easily be effected in circles of 4 foot radius, such as round the base of a palm, or within the sharp corners of paddy field ' liyaddes '. Ploughing depth can be varied up to 6 or 7 inches, from as fine a shave as 1 to 2 inches, depending of course, on the soil. Outputs of 1 to 2½ acres a day are commonly achieved, or in terms of coconut plantation terminology, about 80 to 200 squares per eight hour day. Weed growth is well inverted, and for those who plough in their fertiliser between the rows of palms, this operation becomes very rapid and inexpensive, particularly when one remembers that for this output of work, only 1½ to 2 gallons of petrol are used per day !

The harrowing operation with this machine is equally interesting as the two wheels come off in a few seconds, and are replaced by scimitar shaped blades called ' mulching rotors '. A skeg or rake is fitted to the rear hitch of the machine, through which the operator regulates forward speed and depth of cultivation. The mulching rotors cultivate with a gentle stirring action on the soil, not so fast as to pulverise it, but with an action similar to breaking up the clods between one's fingers. The mulching rotors can be used either after ploughing, when they perform a sort of harrowing action for the preparation of a seed bed, or ' neat '—on unploughed land. In this latter instance, they cultivate but leave most of the trash on the surface of the soil to protect it against erosion and oxidation.

The operator applies only a very gentle downward pressure on his handle-bars when he wishes to cultivate deeper, or raises his hands for shallow cultivation and faster forward motion.

Fig. 3

The mulching rotors are here being used by a small coconut estate owner on his own land for turning in the fertiliser around the base of the palm. A fast and economical method of 'ring manuring'.

Fig. 4

No power is lost supporting the machine, or dragging a harrow as with a tractor, as the rotors support the machine, while cultivating the soil, and also propel it forward naturally.

For normal cultivation operations on a coconut estate, the writer prefers the mulching rotors alone, unless of course a seed-bed is being prepared for the sowing of cover crops, for a seedling nursery, or when heavy undergrowth needs to be turned in, when, of course, the plough is used first. We have found the mulching rotors ideal for turning in broadcast fertiliser on compost and manure, either along the avenues between the rows of palms, or in circles round the base of each palm. In the latter case, the fertiliser dose is first applied in a circle round the palm and the machine driven round it with its mulching rotors turning in the fertiliser, and yet leaving the trash on the surface. Most branches, leaves, etc. are also turned into the soil during this operation, which is very quick—about 3 to 4 acres of palms can easily be fertilised in this manner each day utilising one spreader and one machine operator, at a cost of around three cents per palm (plus of course, the price of the fertiliser or manure used). The speed of operation is also very useful when cultivation of a large extent has to be effected during the few months of suitable weather.

Various other combinations of rotors and ' drags ' or rear attached implements, are available for operations such as inter-cultivation between rows of seedlings in the nursery, or for pineapple and vegetable cultivation, now that these crops are becoming popular for growing in the avenues between the palms. The machine is so small and handy it can easily work inside a ' pathola messa ' or snake-gourd trellis. Ridging, ditching, and weeding are all possible using the correct combination of rotor and implements for each particular job.

A very useful implement in the range usually available with such machines is the rotary weed-slasher which, acting very much in the manner of the ' veesi-kattie ' or slashing sword, flails all weed growth in its path, with its whirling chains, and leaves them on the surface of the soil, thus avoiding any cultivation operations which might otherwise damage the soil if carried out excessively. Extents of between 3 and 6 acres can be ' flailed ' in this manner each day. This is, however an implement to be used with great care, as also the ' veesi-kettie ', as the flails can cause serious damage if operated too near other workers in the field.

Most coconut estates are associated with strips of paddy land, and machines of the type described are ideally suited for the complete, and intensive cultivation of these fields. Ploughing and harrowing can be carried out just as easily on moist or water-logged soils, while puddling and levelling operations are ' a cinch ' with the special ' paddy field rotors ' and harrowing rake (similar to the Burmese harrow used with bullock). The writer has personal experience of puddling and levelling paddy fields too soft even for buffalo to work in, thus bringing under cultivation these almost ' impossible ' lands too. A very noteworthy feature is that the machine appears to be able to clamber over bunds, through channels, and into any paddy field without causing any damage at all to the land, or to itself—and even if it does get stuck, it is easily lifted out weighing only about 150 lb.

The writer usually uses a multi-row seed dispenser which dibbles about ten rows at a time of seed paddy over the surface of the levelled field. The paddy thus grows in rows, very much like a transplanted crop, and can be intercultivated with the Japanese weeder to yield very large crops—certainly as large as, if not larger than, a transplanted crop—and at a fraction of its cost !

The writer has also found the water-pump attachment useful for the irrigation of paddy fields, and more recently for the sprinkler irrigation of seedling nurseries, vegetable and fruit

Fig. 5

The rotary weed slasher slashing the weed growth on the estate. This is particularly useful in the underplantation where the usual grazing herd would not be permitted to enter in case they damage the young plants.

Fig. 6

The same machine, the MERRY TILLER, used for ploughing the estate paddy fields. Even when working under water, a very fine turn of the furrow is achieved. After a week or two, *this field will* be puddled and levelled, also by the same machine, prior to sowing.

groves, etc. Outputs of up to 4,000 gallons per hour, depending upon the head, makes this a very useful attachment indeed.

A trailer is also available, and a ' must ' on most estates, for the transport of fertiliser, tools, implements, etc. for the field. It can carry up to 1 ton on normal estate roads and operate at between 3 to 6 m.p.h.

While involved in underplantation work, the writer found the rotary saw attachment very useful for felling old coconut trees, and dropping them exactly between lines of young palms, and thereafter for chopping the trunk into short logs for easy removal. Although the rotary saw blade is only 24 inches in diameter, it is best used to make a cut first on the side of drop of the tree, and then once again on the other side, a little higher than the first cut. In this manner, trees upto 25 to 30 inches in diameter at the base can be felled. A certain amount of skill however has to be acquired to drop the tree exactly where intended ; but so also when using the axe ! The latter however takes very much longer, and is far more tiring on the wielder.

Easy Operation and Maintenance

A particular feature of these machines, apart from their versatility, is their ease of maintenance, apart from an occasional oil change, a few pints each week—and adjustment of the belt tension, no further upkeep is required. When repairs are necessary, they can usually be attended to by the village blacksmith in his traditional capacity as the farmers help, or by the local cycle mechanic.

It is also a very warming sight to see farmers and cultivators in span cloth using these machines without any trouble at all. In fact, any good buffalo ploughman becomes the ideal operator of this machine. Most of them soon learn to make the simple adjustments to obtain most effective cultivation, and are very quick to praise its effortless operation in comparison with the ordeal of cajoling, pleading with and whipping its four-legged counterpart —the buffalo.

The writer has had the opportunity in the last few months of meeting many users of these machines, and hearing their views and opinions on it. Some few, about 5 per cent were not very happy with it, and in most of these cases it was found that it was hardly the machines fault when the operator tried to work it on land that was rock hard and should never have been cultivated in that condition at all ! Usually the fault lay with the operator who was invariably a ' mechanic ' with no interest in agriculture and who looked upon agricultural work as a ' bind '. He was usually able to spend sufficient time messing about with the machine and constantly adjusting it, so as to reduce his working time to a minimum ! Some owners hired out their machines to others who naturally hacked it and misused it to the point of damaging a plough-share or some such component. Invariably the machine was blamed again !

However it was very satisfying to note the vast number of educated young men who find in these machines, a means, at a price they can afford, of working their own lands themselves, without recourse to a large labour force. It would appear that this machine is truly helping restore the state of intelligent landed gentry working themselves, on their own lands in contrast with their absentee-landlord parents, restricted as they were to the mammoty or the buffalo !

It was interesting also to ascertain the average extent cultivated comfortably by this machine, and the writer was not little surprised to see quite a few coconut estates of approximately 200 acres in extent being cultivated entirely by one such machine, and well

too—all operations being carried out within the very few months of rainy weather granted us by the Gods these past two years! One estate of 360 acres finds two of these little machines ample for all cultivation and allied operations, and which have, incidentally, on this property replaced one large 40 h.p. tractor which originally cost four times as much.

Where however, intensive paddy or vegetable cultivation was also carried out during the monsoon the machine had to accomplish upto about 25 acres of this work first and could then only cope with about 80 to 100 acres of plantation land during the remaining brief spells of wet weather during the year.

Operating costs can be worked out on the basis of two gallons of petrol or Rs. 5/- per day; operator (if the land-owner himself does not work his machine), at Rs. 3/- per day; and depreciation, repairs, etc. at Rs. 4/- per day, at the maximum; a total of Rs. 12/-; which considering its output and low initial cost puts it way above the level of any other form of agricultural machine available to the smaller farmer or planter in this country at present.

It is the writer's hope that this type of machine will be still further developed and improved towards increasing its adaptability to the local economy crops and allied soil and weather conditions, widening its range of versatility and lowering its initial cost so as to bring it even more within the range of the small farmer and planters purse. Perhaps the fact that there are already four manufacturers in Japan alone copying the original machine is indicative of the demand already created for this type of machine in tropical and far-eastern countries, and of its acceptance by farmers and cultivators all over this part of the world as a sound practical and economic agricultural machine.