

OTOWEY: AN IN-FIELD FFB TRANSPORTER WITH ELECTRONIC WEIGHING SYSTEM

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The oil palm industry is very labour intensive, and with its present chronic shortage of workers, it has had to mechanize to alleviate its difficulties.

DESCRIPTION OF THE OTOWEY WEIGHING SYSTEM

A load cell is an electronic device that converts a mechanical force into a proportionate electrical signal so that the force applied can be quantified by the strength of the electrical signal. The conversion of mechanical force to electrical signal occurs in two stages. The mechanical force deforms a strain gauge which then converts the deformation into an electrical signal by means of the proportionate change caused to its resistance. Typically, a load cell is made with four strain gauges, arranged head-to-tail to form a 'Wheatstone Bridge' which can detect

a voltage difference between two points in the connection. This voltage difference is proportional to the force or weight applied on the load cell.

Load cells are used in nearly every electronic weighing system. There are many types available, such as the double bending beam, shear beam, 'S' beam, ring torsion, pancake, membrane, *etc.* Some of the applications are truck weighing, floor scale, force measurement and electronic crane scale. A basic electronic weighing system consists of four main components - load cell, cable, junction box (to sum up all the load cell signals to one output) and instrumentation (*i.e.* an indicator or display panel).

The OTOWEY system consists of a transporter (Iron Horse), fitted with four load cells, one in each corner of its chassis just under the FFB hopper (*Figure 1*). The system is calibrated by

SPECIFICATIONS OF THE 'IRON HORSE' AND WEIGHING SYSTEM: OTOWEY

Iron Horse	Model	• 7Y-950D
	Country of origin	• China
	Engine	• No: 250700712 • 15.2 hp @ 2 000 rpm
	Turning radius (min)	• 4200 mm
	Battery	• 12 volt, 100 Ah
Weighing system	Overall dimensions	• (L x W x H): 3 930 x 1 420 x 1 950 mm
	Weighing indicator	• C1-2001AS/BS
	Loading capacity	• 500 – 1 505 kg

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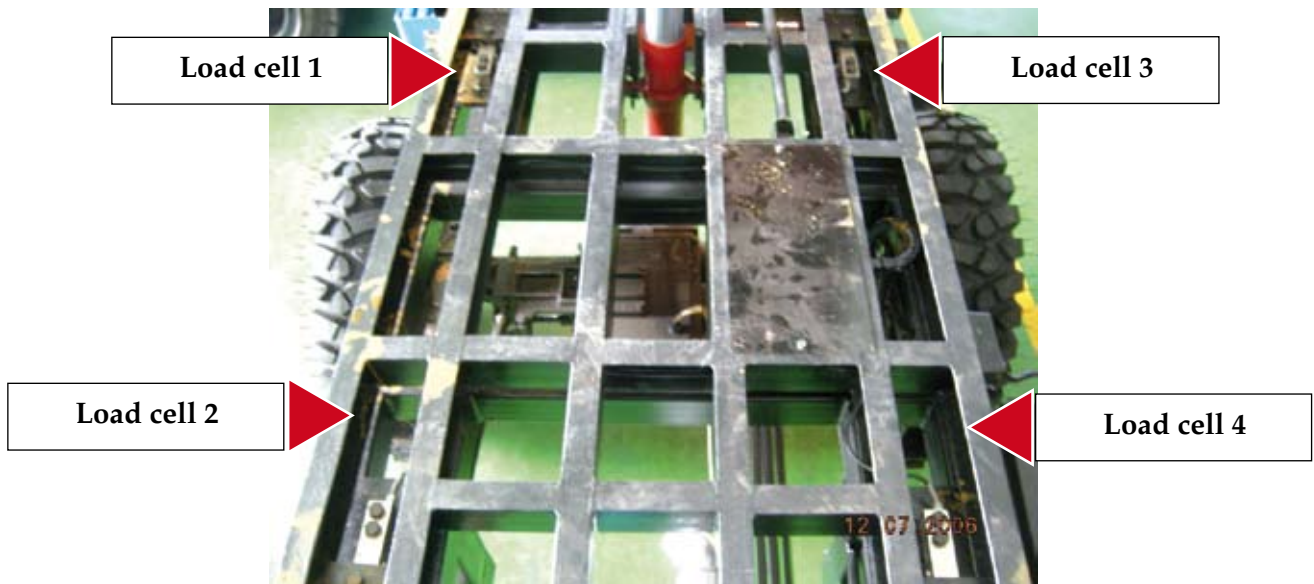


Figure 1. Placement of load cells in the four corners of the Iron Horse chassis.

placing a known weight in the bucket (Figure 2) and adjusting the figure displayed on the panel to that of the weight (Figure 3).

FIELD TRIALS

Field trials were carried out at MPOB/UKM Research Station, Bangi on slightly rolling to undulating terrain. Harvesters cut the bunches and gathered them at the base of the palms, collected the loose fruits in bags and stacked the fronds. The fruits were then collected, weighed and transported to the roadside by two teams – one using the manual system and the other the OTOWEY system. For the manual system, a wheel barrow was used for the transport and a spring balance to weigh the bunches (Figure 4).

With the OTOWEY system, weighing was automatic, just by loading the bunches in the hopper. The accrued weight of the bunches was displayed on the panel (Figure 5), increasing as more and more bunches were loaded. With the machine, the number of workers for yield recording could be reduced from three to two, increasing the output of the harvesters by 96% (Table 1). Time and labour were very much reduced with the higher production, generating all-round satisfaction by both the workers and management. Apart from reducing the drudgery of bunch weighing, the data were also more accurate.



Figure 2. A known weight placed in the bucket for calibration.



Figure 3. Display panel showing the weight.

Manual system



Harvesting the bunches.



Bunches in a basket being weighed by a spring balance. Lifting the bunches is strenuous for the workers.



Wheel barrow used to transport FFB to roadside.



Bunch weight displayed on spring balance.

Figure 4. Manual bunch weighing.

OTOWEY System



FFB just dumped into hopper.



Panel display automatically showing the accrued weight of bunches.

Figure 5. With the OTOWEY system, weighing the bunches is automatic and concurrent with their loading in the hopper.

TABLE 1. COMPARISON OF PRODUCTIVITY BETWEEN MANUAL WEIGHING AND THE OTOWEY SYSTEM

Weighing method	Performance
OTOWEY	Gross output = 118 FFB hr ⁻¹ No. of workers: 2 Productivity: 59 FFB man hr ⁻¹
Manual	Gross productivity = 90 FFB hr ⁻¹ No. of workers: 3 Productivity: 30 FFB man hr ⁻¹
Improvement in productivity: $(59-30)/(30) \times 100 = 96\%$	

CONCLUSION

The OTOWEY electronic weighing system uses four strain gauges, each mounted at one corner of the FFB hopper. As and when bunches are loaded in the hopper, their weights compress the strain gauges, causing an electrical signal to be generated which is captured and converted to a weight reading on a panel display. The magnitude of electrical signal generated is proportional to the weight of the bunches. With the system, the number of workers for yield recording is reduced from three to two. Apart from reducing the drudgery of the work, the data were also more accurate.

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