Farm machinery

Effect of soil moisture content on power requirements

T. M. Lando, Agricultural Engineering Department, Maros Research Institute for Food Crops, P.O. Box 173, Ujung Pandang, South Sulawesi, Indonesia

We measured power requirements at different soil moisture levels, with soil moisture as the main factor and plowing depth as the subfactor in a split-plot design with four replications.

Soil was red yellow Podzolic with clayey texture. The area at Pulung Kencana Village, North Lampung District, Lampung Province, was flat and covered by cogon grass *Imperata cylindrica*. The cogon grass was cut and burned before the experiment started.

Treatments were 10, 15, 20, and 30% (wet basis) soil moisture and 10, 15, and 20 cm plowing depth. Plowing width was 20 cm and tractor speed was 5.4 km/h (1.5 m/s) using a 4-wheel 45-hp tractor IH354 and a 9-hp Kubota hand tractor.

Soil draft resistance was measured by fixing a drawbar dynamometer between the 4-wheel tractor and the hand tractor. Drawing power required was calculated as

$$Pwr = \frac{\text{resistance (kgf)} \times \text{speed (m/s)}}{75}$$

Where, Pwr = required drawing power (hp),
resistance = total soil draft resistance, and
speed = speed of tractor.

Table 1. Average soil draft resistance at 5 soil moisture levels and 3 plowing depths. North Lampung, Indonesia.

Plowing depth (cm)	Average soil draft resistance[a] (kgf)				
	10%	15%	20%	25%	30%
10	815.0 b	787.5 b	750.0 a	922.5 c	1175.0 h
15	920.0 c	907.5 c	825.0 b	1137.5 g	1290.0 j
20	1040.0 f	922.5 e	967.5 d	1225.0 i	1400.0 k
CV Soil moisture (%) 2.3					
Plowing depth (cm) 1.7					

[a] Means with the same letter do not differ significantly at 5% level by DMRT.

Table 2. Power requirements at various levels of soil moisture and plowing depth. North Lampung, Indonesia.

Soil moisture (%)	Plowing depth (cm)	Power requirement	
		hp	kW
10	10	16.3	12.2
	15	18.4	13.7
	20	20.8	15.5
15	10	15.8	11.7
	15	18.2	13.5
	20	19.9	14.8
20	10	15.0	11.2
	15	16.5	12.3
	20	19.4	14.5
25	10	18.5	13.8
	15	22.8	17.0
	20	24.5	18.3
30	10	23.5	17.5
	15	25.8	19.2
	20	28.0	20.0

Draft resistance differed significantly with soil moisture levels and plowing depths (Table 1). Highest resistance was at 30% soil moisture and 20 cm plowing depth.

For all plowing depths, draft resistance was higher at 25 and 30% soil moisture levels. At 10% soil moisture, the hard, cohesive soil was difficult to cut and invert. At 15 and 20% moisture levels, soil was easy to till and resistance was relatively low.

Plowing depth also contributed to high draft resistance: the deeper the cut, the higher the resistance, primarily because of the large volume of soil cut and inverted.

Soil draft resistance is linearly proportionate to power requirements: the higher the resistance, the more power needed to draw the plow at the same speed (Table 2).□

Postharvest technology

Uric acid content of stored rice

Y. S. Dhaliwal, Food Science and Technology Department, Punjab Agricultural University (PAU), Ludhiana 141004 (present address: Home Science Department, Himachal Pradesh Krishi Vishva Vidyalaya, Palampur 176062); K. S. Sekhon and H. P. S. Nagi, Food Science and Technology Department, PAU, Ludhiana 141004, India

Uric acid, the main constituent of insect excreta, is taken as an index of insect infestation. We studied IR8, PR108, and Basmati 370, representing coarse, medium, and fine varieties, harvested at three different times (7 d early, recommended maturity, 7 d late) with 3 replications. One lot was stored at original moisture content (IR8—23.1, 19.6, 19%; PR108—22.3, 18.8, 18%; Basmati 370—19.2, 17.5, 19%) and one lot was dried to 12% moisture with a forced air circulation dryer and stored. Both lots were stored in gunny bags under ambient conditions for 1, 6, and 12 mo.

Harvest time was not significantly correlated with uric acid content of milled rice (see table). Uric acid content significantly increased with duration of