RESEARCH PAPER | International Journal of Agricultural Engineering | Volume 5 | Issue 2 | October, 2012 | 249 –253

Development and evaluation of maching rotavator for low horsepower tractor

D. PADHEE, B.M. NANDEDE AND RANJEET KUMAR

Received : 18.07.2012; Revised : 27.08.2012; Accepted : 29.09.2012

See end of the Paper for authors' affiliations

Correspondence to:

D. PADHEE
Department of Agricultural and Food Engineering, Indian Institute of Technology (IIT), KHARAGPUR (W.B.) INDIA

ABSTRACT : Software for design of rotavator for low hp tractors were used to design the rotavator and based on the results of the software a rotavator was developed and evaluated its performance in the field. It comprised a rotary unit with overall width and rotor diameters were 0.79 m 440 mm, respectively. The rotary unit was consisting of 20 'C' type blades arranged spirally on a shaft of diameter 62 mm. The angular interval between the blades was kept 18^0 to prevent clogging. The speed of rotation of rotor shaft of the developed rotavator was found to be 185 rpm and 230 rpm corresponding to the PTO speed of tractor at low and high gears, respectively. For designing the matching size rotavator, a computer programme was written in Visual Basic 6 and compared with some of the commercially available rotavators in the power range of 9.6 kW. The developed rotavator was evaluated in actual field and its performance parameters such as field capacity, field efficiency, tillage performance index and fuel consumption was found to be 0.14 ha/h, 68 per cent, 0.796 k and 1.56 l/h, respectively.

KEY WORDS : Rotavator, Tillage performance index, Matching rotavator, Performance

HOW TO CITE THIS PAPER : Padhee, D., Nandede, B.M. and Kumar, Ranjeet (2012). Development and evaluation of maching rotavator for low horsepower tractor. *Internat. J. Agric. Engg.*, **5**(2) : 249-253.

The Indian tractor market is flooded with tractors in the power range of 15-30 kW which are suitable only for large holdings. The tractor industry has divided their product range into 5 main segments namely, below 15 kW, 15-30 kW, 30-40 kW, and above 40 KW (Anonymous, 2012). Being the world's largest tractor industry, the market is flooded with tractors in the power range of 15-30kW which are suitable only for large holdings. As they are highly priced, they are beyond the reach of small and marginal farmers which comprise about 80 per cent of farmers of India. The alternative of purchasing of tractor can be thought of hiring a tractor during the peak period of crop production. The average land holding of an Indian farmer is very small and in these small pieces of lands, maneuverability of the large sized tractors is difficult. Farm mechanization level in India is only 1.75 kW/ha (Kulkarni, 2005), which is very low as compared to other developing countries. Dalin and Pavlov (1950) conducted several experiments by using pick type tine and 'C' type tines operating in forward and reverse rotation. In each test, rotary power requirement was found greater for forward than for reverse rotation. The horizontal component to move the tiller was found negative during the reverse rotation. Tsuchiya and Honami (1963) conducted studies on the power reduction of rotary tillers. It was found that reducing the rotor speed reduced the power requirement. They also found that torque variation drastically reduced when two or three tines cut the soil at the same time. Matyashin (1968) reported that at shallow tilling depths (*i.e.* H<R), forward rotation requires 10 to 15 per cent less energy than reverse rotation. When tilling deep (H>R), reverse rotation reduced the energy requirement by 20 to 30 per cent. Butterworth (1972) has presented a brief description of favorable design features of available rotary tillers. The use of 'C' type tines were recommended for deep tillage and 'L' shaped tines for shallow tillage. Bite length of 100 mm was found to be optimum for power and cultural optimization. Raheman and Sahu (2006) designed a rotary cultivator with 'L' type blades and developed a computer program to assist with the design calculations. The working width of the machine with the number of working sets were predicted for 30, 35 and 45 hp tractors by varying the forward velocity and the ratio of peripheral to forward velocity. Taking maneuverability into account, the optimum dimensions of rotary cultivator for each of these tractors were determined. The predicted values of working width, number of working sets and dimensions of the shaft and blade of rotary cultivator were compared with the market available rotary cultivator for a 35 hp tractor indicating a maximum variation of 4.5 per cent. Keeping these factors in mind, a study was conducted to develop a rotavator for low