ABSTRACT

Seed drills are being increasingly used in the country with the fast development of farm mechanization. However, adoptions of seed drills in Chhattisgarh are still meager because of unavailability of suitable design. In the design of such machines emphasis has been given to mechanical perfection and limitation of animal and operators. Keeping all above points in view the work on design and development of seed cum fertilizer drill from mechanical and ergonomical consideration has been undertaken to identify a suitable design with a view to make it suitable for both, Kharif and Rabi sowing. Prior to the design of the seed drill, three different types of metering mechanism viz. stationary horizontal orifice type, rotary drum orifice type and fluted roller were evaluated in laboratory for most suitability of crops grown in Chhattisgarh. Investigations were carried out under clay soil on Shoe, Shovel and Inverted – T type furrow openers commonly used in animal drawn seed drill. The performance index was developed for the furrow openers on the basis of output, quality of work and energy input. In consideration of overall performance index, the inverted –T furrow opener was found most suitable for sowing of paddy crops in Kharif and Rabi seasons. Die cast aluminum fluted roller type metering mechanisms were selected for uniform and consistent delivery of seed and fertilizers. The seed rate found close to recommended seed rate under laboratory and field test.

Proper matching of machine requirements with the operator’s capabilities is necessary to achieve better performance. Therefore, anthropometric data of male workers of all the district of Chhattisgarh were collected. The anthropometric data for the various body dimensions and the estimates of mean, standard deviation coefficient of variation and percentile values (5th, 50th and 95th) are presented. The overall dimensions of seed drill matching with the farmers of Chhattisgarh were worked out. The safe limit of draughtability of medium size bullocks for whole day work of Chhattisgarh is around 50 to 70 kgf. Therefore, 3 numbers of furrow openers has been decided so the operator can walk only optimum distance (theoretically 16.7 km) for sowing in the ploughed field. Scaling of workload and work rest cycle was suggested. This study presents a useful compilation of anthropometric data of farmers of Chhattisgarh. This has taken a guide to designing of seed drill suiting to the human capabilities and limitations of Chhattisgarh’s farmers.
An animal drawn, 3-row multicrop seed drill was designed and developed. Design dimension of seed cum fertilizer drill were worked out through CAD process and drawings were prepared. The major components were designed on the basis of mechanical consideration e.g. main frame, ground wheel, seed and fertilizer box, power transmission unit, seed metering device, inverted ‘T’- type furrow opener, telescopic depth control cum transport wheels, hitch and handle. The design considerations were given on furrow openers should be such that they penetrate well in hard soil in Rabi and do not get chocked with wet and sticky soil in Kharif. The testing was carried out in the laboratory in the year 2003. The seed rates in the field test were found 80, 98.5, 29.6 and 99.7 kg/ha for paddy, wheat, pigeon pea and soybean respectively. The average draught and field capacity of the seed drill were 48 kgf and 0.10 ha/h respectively.

Under rainfed conditions of Chhattisgarh direct seeded rice cultivation requires total energy input (direct + indirect) in the range of 10900 to 12300 MJ/ha. Out of total energy input, share of direct energy input was in the range of 3980 to 5175 MJ/ha and gives an output of 73750 to 102550 MJ/ha. (Yield 2.5 to 3.42 t/ha). Energy output – input ratio varied from 5.9 to 9.4 for broadcast and row seeded rice. The specific energy, energy productivity and labour productivity were in the range of 4.9 to 3.12 MJ/ha, 0.204 to 0.32 kg/MJ and 10.3 to 19 kg/man-day respectively for traditional broadcast and row seeded method. The row seeding method of cultivation is most effective in view of energy saving and better yield as compared to traditional broadcast biasi system of cultivation of rice. Row seeding by seed drill saves about 40 to 45 % of energy for weeding operation as compared to traditional broadcasting system.