

THE SUPERCRAWLER - AN INFIELD TRANSPORTER FOR DIFFICULT AREAS

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OCTOBER 1999

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PORIM TT No. 17

PORIM INFORMATION SERIES

ISSN 0128-5726

The SuperCrawler is a track machine designed for infield transportation of fresh fruit bunches (FFB) from palm base to roadside platform particularly in difficult areas. A vehicle with wheels normally has maneuvering problem in soft and soggy areas. The normal FFB evacuation practice in this soil condition is to use wheelbarrow or manual carrying. In high clay content and swampy areas, high rainfall will cause the field to be wet and soggy, and rutting will occur when inappropriate machines are used. A tracked vehicle is most suitable to work in these conditions where the soil-bearing capacity is low. Vehicle with track exerts low ground pressure, hence minimising rutting.

PROTOTYPE MACHINE

With the potential of this machine to be used in the oil palm industry, PORIM developed SuperCrawler with the following design considerations:

- Low ground pressure
- Suitability for operation in wet swampy or soggy conditions, and in steep slopes
- Rutt reduction
- Robust use in plantation
- Minimal breakdown frequency
- Simple operation
- Ease of transporting FFB from palm base to roadside.
- High payload (one tonne)

The basic machine of the SuperCrawler was derived from the soil-drilling machine used in the construction industry. Modifications were made to the original machine to make it suitable as an infield transport vehicle. These modifications were:

- Installation of a suitable bucket for FFB
- Installation of track tensioner
- Changing the transmission system from mechanical to hydraulic. This change results in:
 - Skid steer capability
 - Elimination of brake system
 - Minimum rotating parts, hence minimising wear.
 - Easy handling
 - Ability to extend the hydraulic capability for other purposes or implements.

Before field trials were carried out, functional



ISSN 0128-5726



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tests of a prototype machine were done at estates under different working environments (wet and soggy as well as hilly areas) as mainline transport vehicle. From these tests, technical improvements were made.

FIELD TRIALS

The field trials were carried out at estates in the east coast of Peninsular Malaysia, where this machine is most suitable. The trials were carried out with the aim of:

- Assessing the machine efficiency
- Establishing the machine operating system
- Establishing its productivity
- Monitoring the robustness of the machine
- Carrying out the basic economic analysis

The machines were tested on flat and undulating wet areas and on hilly areas during the wet season. From these trials, it was found that the productivity ranged from 20 to 30 tonnes per day (eight effective working hours). A normal cutter-collector gang working manually would require a total of 20 workers to achieve this productivity. Thus, the SuperCrawler reduces the labour requirement by 45%. The field trials resulted in the following specifications:

- A diesel engine of 30kW with 36 litres fuel tank capacity
- Hydrostatic transmission system with:
 - The pump input speed of 3600 rpm
 - Max operating pressure of 245 bar
 - Tank capacity of 54 litres
 - Maximum flow rate of 210 litres/min

- Crawler
 - Maximum speed of 10km/hr
 - Ground clearance of 200mm
 - Track width of 300mm
 - Payload of one tonne
 - Turning system of skid steer

A typical team for this machine is made up of 11 workers consisting of one driver, two loaders and eight cutters.

From the field trials it was estimated that the operating cost ranged from RM0.85 to RM1.28 per tonne, consisting of:

- Fuel, lubricating oil and oil filters
- Maintenance costs – hydrostatic oil and its filters and battery
- Repair costs – tracks, bearings, sprockets, rollers and general components. The tracks were found to last for 1,500 working hours.

CONCLUSION

In general, the SuperCrawler works well in areas, which are soft and soggy because of the low ground pressure exerted by the tracks. The development of this machine as an infield transportation vehicle met the criteria required. The rutting problem, normally caused by wheel vehicle is eliminated. The only disadvantage of using metal tracks was the rapid wear of the undercarriage, especially the tracks. More investigation will have to be made on the tracks so that the life could be prolonged to at least 3,500 working hours.

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