

## Rhyno: A MULTIPURPOSE WHEEL TYPE TRANSPORTER FOR OIL PALM ACTIVITIES ON UNDULATING TERRAIN AND SOGGY AREAS

MOHD SOLAH DERAMAN; ABD RAHIM SHUIB; ZAPRUNNIZAM MOHD ALI; AMINULRASHID MOHAMAD and HARTINI MD HASAN\*



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The oil palm industry is very much dependent on manual labour to carry out operations in estates. Mechanisation has been proven to be one of the strategic ways to improve productivity significantly and reduce workers requirement. It is well recognised that mechanisation of harvesting and the evacuation of fresh fruit bunches (FFB) are the activities in oil palm plantations which requires high number of workers. MPOB and MIZOU Holdings had earlier developed and commercialised a track-type vehicle, the *Beluga*, for the evacuation of FFB. Building on the success of *Beluga*, the partnership proceeded to introduce a wheel-type vehicle for infield collection of FFB on peat, narrow terraces, undulating terrain and soggy ground conditions.



Figure 1. Rhyno – transporting FFB in the oil palm field.

### TECHNICAL SPECIFICATION

Engine	Lombardini 25 LD 19 hp/3600 rpm
Ignition	Electric starter motor
Main transmission	6 speed synchromesh with 5 FW and 1 RV
Auxiliary transmission	Drive (2WD or 4WD) / transmission PTO or drive + PTO
Clutch	Single dry plate
Brake	Hydraulic operating by pedal with front discs and rear drums
Drive	Drive shaft with universal joint and double taper wheel bearing
PTO (power take off)	Variable speeds
Frame	Central oscillation pivot to optimise the ground pressure of axle
Suspension	Vibroisolating rubber on the connecting parts between front axle, rear axle and frame
Steering	Hydraulic power steering
Dumper	Dumping by hydraulic cylinder, high pivot
Tyre	Floatation tyre 29*12.5*15-6PR
Payload	700 kg
Travelling Speed	28.5 km hr <sup>-1</sup>

\*MIZOU Holdings Sdn Bhd.

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Malaysian Palm Oil Board, Ministry of Plantation Industries and Commodities, Malaysia  
P. O. Box 10620, 50720 Kuala Lumpur, Malaysia. Tel: 03-8769 4400 Fax: 03-8925 9446 Website: www.mpob.gov.my



## ADVANTAGES



Fitted with four-wheeled low pressure tires to reduce soil compaction on the terrain.

Incorporated with power take off (PTO) for other activities such as fertiliser application and weed control.

Designed with central oscillation pivot for balance and stability on uneven terrain.

Easy to operate and is manoeuvred by a hydraulically powered truck-type steering.

High pivot tipping to reduce repetitive work (double handling)

- Adoption of Korean technology.
- Granted JPJ Vehicle Type Approval. Thus, can be provided with a vehicle registration card.

### OBJECTIVE

The main objective of developing a multipurpose wheel-type transporter is to transport FFB in difficult areas such as peat, narrow terraces, undulating terrain and soggy ground.

### THE MACHINE

The wheel-type multipurpose transporter, the *Rhyno* designed with a single chassis is compact and robust, with the most efficient weight distribution ratio for superior floatation and excellent capability in manoeuvring and navigation.

The *Rhyno* has a compact turning radius and it can be easily manoeuvred by a hydraulically powered truck-type steering wheel along the undulating harvesting path. The central oscillation pivot on its frame and excellent suspension system contribute to better traction on uneven ground. *Rhyno* is capable of carrying 700 kg of FFB payload, utilising a minimal diesel fuel consumption of about 8 litres a day.

### PERFORMANCE OF THE *Rhyno*

Field trials were carried out at Ladang MPOB Keratong and Tradewinds Estate, Jabor, Terengganu. Both estates have a mixture of soft soils, hilly and peat areas. It was found that the machine was able to operate as designed. Productivity of the *Rhyno* is shown in *Table 1*.

**TABLE 1. PRODUCTIVITY OF THE *Rhyno* IN TWO ESTATES**

Item	Estate	Productivity per day
1	Ladang MPOB Keratong, Pahang	20 t
2	Cherul Estate, Tradewinds Terengganu	13 t

\*Average weight of FFB 7 kg  
(1500-1800 FFB)





Figure 2. Rhyno in operation at the plantation.



Figure 3. Unloading of bunches into bin.

## ECONOMIC ANALYSIS

The indicative price for one unit of *Rhyno* in 2013 is RM 58 000 and is subject to change. Using a 10% discount factor, the investment in *Rhyno* production is attractive, with a payback period of 3.1 years (Table 2). As the benefit:cost ratio (B:C) is greater than unity, the Net Present Value (NPV) is positive and the Internal Rate of Return (IRR) is higher than the opportunity cost of capital. Thus, the investment proposition is financially feasible.

TABLE 2. FINANCIAL ANALYSIS OF *Rhyno* PRODUCTION

Internal Rate of Return (IRR)	31.2%
Benefit:cost ratio (B:C) @10%	1.21
Net Present Value (NPV) @10%	RM 171 149
Payback period (PBP)	3.1 yr

For more information, kindly contact:

Director-General  
MPOB  
P. O. Box 10620  
50720 Kuala Lumpur, Malaysia.  
*Tel:* 03-8769 4400  
*Fax:* 03-8925 9446  
[www.mpob.gov.my](http://www.mpob.gov.my)