

**Transport Power Points:  
10-minute briefing**

**Intermediate Equipment for  
Road works and Small &  
Medium Enterprises**



# Rationale – Best use of Available Resources

## Typical features

**Developed countries: wage rate >US\$100/day and credit <10%pa**

**This suggests capital intensive, labour saving approaches are most appropriate**

**Emerging Countries: wage rate <US\$10/day and credit >20%pa (if available)**

**This suggests Low-Capital, Low-cost equipment, labour & local materials approaches are most appropriate:**

***i.e. Local Resource Based Technology***



# What is 'Heavy Equipment'?

Sophisticated civil engineering equipment designed for, and generally manufactured in, high-wage, low-investment-charge economies, to maximise the power and performance in the hands of a high cost operator.

Expected to operate with close support and high annual utilisation. Usually designed for a single function with high efficiency operation.



# Heavy Equipment Problems in Developing Countries - 1

## *Operational:*

- Dedicated function (designed to be used for one task only)
- Inter-dependence (e.g. dozer, loader, trucks, motorgrader, bowser, roller all required for gravelling – fleet idle when ONE link in the chain breaks down)
- Lack of continuity of workload for plant items of dedicated function
- Usually based at locations remote from worksites – plant transporters required and long mobilization/demobilization distances involved

## *Technical:*

- High pressure hydraulic and electronic systems
- Sophisticated mechanisms and hydraulics
- Disposable components; difficult to repair or refurbish



# Heavy Equipment Problems - 2

## ***Local Support and Equipment Maintenance:***

- Limited local market for equipment sales of each model
- Specialist repair and maintenance skills, tools and facilities required (often only available in the capital city)
- Few dealers able to provide the necessary close support
- Long spares supply lines and delivery times
- Frequent model “improvements” causing spares stocking , procurement problems and obsolescence

## ***Cost:***

- All equipment and spares imported – consuming scarce foreign exchange
- High capital and finance costs
- High costs of stocking and provision of spares

***TYPICAL RESULT - low availability & high overall costs!***



# What is 'Intermediate Equipment'?

Simple or intermediate equipment designed for low initial capital outlay and operating costs, durability and ease of maintenance and repair in the conditions typical of a **limited-resource environment**, rather than for high theoretical efficiency.

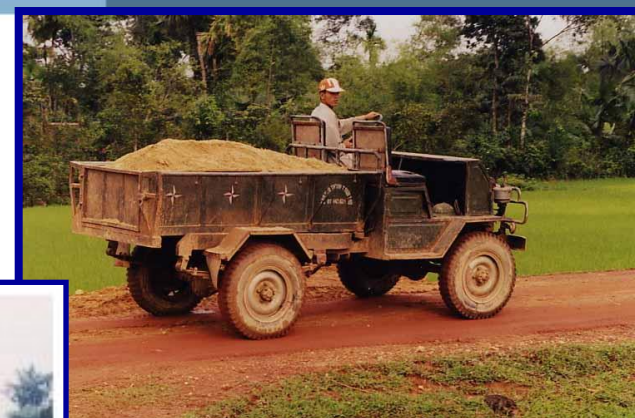
It is preferable if the equipment can also be **manufactured or fabricated locally**.

Agricultural Tractors are a versatile example - can be used for a range of tasks with locally fabricated attachments.





# Some Examples



Intech  
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# The Versatile 2 axle Agricultural Tractor

- **Agricultural Tractors are the simplest and cheapest mobile flexible power source**
- **There are many road works applications for tractors that can boost cross-sector utilization and profitability for owners outside of traditional agricultural applications**
- **Local fabrication of tractor attachments creates local employment and support capacity**





# Road Sector - Agricultural Tractor Applications

ROAD TASK	ATTACHMENT
Gravel Haulage	Trailer
Water Haulage	Bowser
Personnel Transport	Trailer
Bridge/Culvert Materials Transport	Trailer
Fuel Haulage	Fuel Bowser
Plant Haulage	Low Loader
Towed Grading	Heavy/Light Towed Grader
Dragging	Towed Drag
Compaction	Towed rubber/steel deadweight/vibrating Roller
Earthworks excavation & haulage	Towed Scraper

ROAD TASK	ATTACHMENT
Excavation	Back hoe/ripper /scarifier /compressor & pneumatic tools
Loading	Front shovel/backhoe
Grass Cutting	Towed mower
Spreading Materials	Blade/loader/grader
Bitumen sealing	Towed/attached heater/sprayer
Stone crushing	Crusher & screens
Chippings transport	Trailer
Recycling Pavement	Milling attachment
Brushing/sweeping	Mechanical broom
Mixing	Disc harrow/rotovator
Slurry Sealing	Mixer and spreader
Premix patching	Pre-mixer
Accommodation	Caravan
Workshop	Caravan



# Most road tasks have a choice of technology

E.G.

CONSTRUCTION OF NEW ROAD BASE LAYER FROM EXISTING BASE & BITUMINOUS SURFACING					
TECHNOLOGY OPTIONS FOR EACH OPERATION: TRACTOR OPTIONS SHOWN EMBOLDENED & HIGHLIGHTED					
1. BREAK UP EXISTING PAVEMENT	2. BREAK DOWN PAVEMENT MATERIAL TO ACCEPTABLE SIZE	3. APPLY BITUMEN EMULSION	4. MIX EMULSION & RECYCLED PAVEMENT MATERIALS	5. SHAPE MIXED MATERIAL TO FORM NEW ROAD BASE LAYER	6. ROLL ROAD BASE LAYER
Labour with picks, mattocks, sledgehammers, crowbars, shovels	Labour with sledgehammers, stone hammers and steel mesh	Labour using fixed volume containers per unit area	<b>Wheeled tractor with heavy duty disc harrow</b>	Labour with rakes and shovels	Labour with twin drum pedestrian vibrating roller
Labour with compressor and breaker tools	<b>Wheeled tractor with adapted towed roller</b>	Labour with one barrel hand lance	<b>Wheeled tractor with reciprocating harrow</b>	<b>Wheeled tractor with heavy towed grader</b>	<b>Wheeled tractor with towed deadweight roller</b>
<b>Wheeled tractor with ripper attachment</b>	<b>Wheeled tractor with pulverising / milling attachment</b>	<b>Wheeled tractor with towed/ attached bitumen distributor</b>	<b>Wheeled tractor with heavy towed grader</b>	Motor grader	<b>Wheeled tractor with towed vibrating roller</b>
<b>Wheeled tractor with pulverising / milling attachment</b>	Self propelled pulverising /milling equipment	Truck mounted distributor	Motor grader		Self propelled deadweight roller
Tracked tractor with ripper attachment					Self propelled vibrating roller
Self propelled milling attachment					

Source: *Agricultural Tractors in Road works* by R C Petts



# INTERMEDIATE EQUIPMENT SUB-SECTOR NEEDS

- **Awareness** creation concerning availability and performance (Leaders-agencies-media-private sector)
- **Real Cost-awareness** regarding all equipment (& particularly intermediate equipment)
- Stable, specific & diversified **Market** for contractors
- **Designs and specifications** for procurement
- **Procurement** guidelines
- **Management and support** guidelines
- **Training-Demonstration** & skill accreditation
- Availability of **finance**
- Availability for **hire**
- **Dissemination** & mainstreaming of Knowledge

*Source: based on Agricultural Tractors in Roadworks*



# Further Information

**Some of these issues are addressed in the Handbook of Intermediate Equipment**

Further information may be obtained from the e-mail address below

**Handbook of Intermediate Equipment  
for  
Road Works in Emerging Economies  
(Selection and Costing)**



**Robert Petts - Intech Associates  
Edition 1 - October 2012**



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