

Introduction of tractor based rural road maintenance approaches in Zambia

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Images: Intech Associates



Why Tractor-based Technology?



Why Tractor-based Technology?

Construction work in Zambia on major regional and trunk roads require the use of heavy equipment because:

- It is powerful (high productivity when working)
- It is fast (work completed quickly, when serviceable)
- Large road projects must be completed quickly to achieve the intended benefits for the large investments

However:

- Main road construction works are very expensive
- The case for using heavy equipment on rural roads and maintenance is much weaker.



Why Tractor-based Technology?

There is a fundamental difference in the resource base between advanced economies and Rural Africa:

- LABOUR in the USA costs 10 to 20 times as much to employ
- CREDIT easily available and cheap in advanced economies.
IF available, interest rates are up to 8 times more expensive in Africa.

Therefore the High Capital, Low Labour approaches applied in the advanced economies are inappropriate for Rural Road works.



Capital Cost Advantage

For the capital cost of ONE motor grader, FIVE Tractor units with the same individual work capacity can be procured.



OR



Tractor based technology- rationale

Road applications proven in a number of African Countries

Low capital costs – more affordable to MSMEs and Local Authorities

Tractor technology is simple, yet powerful enough for roadworks

Designed for low operating costs

Durable and relatively easy to maintain and repair in the conditions typical of a limited-resource environment

Attachments can be manufactured or fabricated locally

Agricultural Tractors are a versatile , can be used for a wide range of tasks with locally fabricated attachments

Potential cost savings of 50% or more.



Road Sector - Agricultural Tractor Applications

ROAD TASK	ATTACHMENT	ROAD TASK	ATTACHMENT
Gravel Haulage	Trailer	Excavation	Back hoe/ripper
Water Haulage	Bowser		/scarifier /compressor
Personnel	Trailer		& pneumatic tools
Transport		Loading	Front shovel/backhoe
Bridge/Culvert	Trailer	Grass Cutting	Towed mower
Materials		Spreading Materials	Blade/loader/grader
Transport		Bitumen sealing	Towed/attached
Fuel Haulage	Fuel Bowser		heater/sprayer
Plant Haulage	Low Loader	Stone crushing	Crusher & screens
Towed Grading	Heavy/Light Towed	Chippings transport	Trailer
	Grader	Recycling Pavement	Milling attachment
Dragging	Towed Drag	Brushing/sweeping	Mechanical broom
Compaction	Towed rubber/steel	Mixing	Disc harrow/rotovator
	deadweight/vibrating	Slurry Sealing	Mixer and spreader
	Roller	Premix patching	Pre-mixer
Earthworks	Towed Scraper	Accommodation	Caravan
excavation &		Workshop	Caravan
haulage			

Source: Petts, 2012, Handbook of Intermediate Equipment for Road Works in Emerging Economies.

Scoping Study for Adoption of Tractor Technology in Zambia

Outcome of the Tractor Technology Scoping Study confirmed:

- There are clear cost and sustainability advantages in using tractor based technology for roadworks & other rural tasks
- Tractor technology will promote development of indigenous MSMEs (Micro Small & Medium Enterprises) in the roads sector
- Increase tractor utilization and in turn increase profitability
- Develop natural synergies with the agricultural sector
- Contribute towards local employment creation
- Agreed establishment of a Demonstration-Training Unit.



Rationale for Adoption of Tractor Technology in Zambia

- Foreign owned companies dominate the industry and crowd out local small companies with limited capacity.
- Current local private sector capacity is constrained and this project will offer small contractors a stepping stone into the mainstream sector by providing affordable opportunities to allow them to grow.
- Local Stakeholders in the roads, local government, funding, agriculture, national service, contractors' associations and human resource development sectors have come together in a Steering Forum to guide the tractor technology implementation.



Rationale for Adoption of Tractor Technology in Zambia

- Stakeholder Workshops endorsed the Scoping Study findings and vital need for a training-demonstration unit to introduce and mainstream the proven tractor roadworks technology.
- Scoping study identified the need to develop customized training modules for the tractor operators, drivers and managers to fully equip them with the necessary skills.
- The identified cooperating partners will provide adequate logistical and technical support to achieve this training.



Success of the tractor based technology

The success of this technology will depend on six building blocks:

- ☐ Political
- ☐ Institutional
- ☐ Funding
- ☐ Management
- ☐ Technical
- ☐ Operational



Success of the tractor based technology

Political

- The programme will need political commitment from the high level so that when resources are allocated, road maintenance is accorded its due rating.
- The Important role of Rural roads requires recognition.
- New construction should not overshadow maintenance.
- Any newly constructed roads should receive maintenance funding so that preventive maintenance culture is instilled.



Success of the tractor based technology

Institutional

- The institutional set up for maintenance of roads should clearly define ownership of the roads, accountability and division of responsibility among stakeholders.
- The institution has to be well equipped and resourced with adequate manpower and logistical support (vehicles, offices, computers etc.).



Success of the tractor based technology

Funding

- The maintenance of rural roads requires steady and assured funding for good planning and efficient implementation. With sound political will and appropriate institutional arrangements, maintenance of roads will be managed by the responsible institution.
- The planned introduction of good asset management and benchmarking practices will help to achieve this.



Success of the tractor based technology

Management

- The management of the road network is critical. Medium to long term plans for road maintenance based on proper data collection and inventory management will assist road agencies to efficiently maintain roads under their charge.
- Management should be aware of the technology choices, costs and benefits to the local society.



Success of the tractor based technology

Technical

- The training and demonstration project intends to provide technical support to the road agencies through formal and on the job training and mentoring.
- The RDA will provide technical guidance to the road agencies through setting of standards and monitoring performance.



Success of the tractor based technology

Operational

- Maintenance operations require good planning and programming. The training of operational and managerial staff will assist in improving the operations of the maintenance units. The choice of operational strategy will largely determine the success of the maintenance.
- The Stakeholder Forum will be used to promote and disseminate the technology and achieve the substantial cross sector benefits envisaged.



Success of the tractor based technology

Given the foregoing, the use of tractor technology offers a viable and sustainable option to rural road maintenance.

It is affordable, appropriate and simple to use for the level of service that we expect on our rural road network.

It will allow the limited available resources to achieve substantially more output.



Summary Advantages of Tractor based road Rehabilitation & Maintenance

Compared to heavy equipment for rural road works:

- Substantially Lower capital costs (and reducing)
- Substantially Lower running costs
- Lower forex requirements
- Higher availability
- Lower skills requirements
 - Operators
 - Mechanical
- Flexibility and cross sector potential
- Possibilities for local fabrication
- More affordable for SMEs (local contractors) & Councils
- Tractor technology widely established & supported
- More affordable and sustainable



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Thank you

Any Questions or Comments?

