

# **LABOUR BASED TECHNOLOGY IN ROAD CONSTRUCTION AND MAINTENANCE - *experience, opportunities and challenges in TANZANIA***

by

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## **ABSTRACT**

*Labour based technology in road works could be termed as an approach whereby major means of production or inputs is labour using non-mechanical tools and for the activities that cannot be performed efficiently and effectively by labour, simple or intermediate equipment are deployed. Appropriate techniques have been developed to ensure that this approach is applied with effectiveness and efficiency utilization of all required and locally available resources as well as achieving the required quality. The issue of building local capacity and transferring knowledge appropriately to those involved at different level with the aim and ability to have sustainable arrangements gives this approach an upper hand in comparison to other technological approaches in the environment of many developing countries*

*It has been well proven over the past decades that employment is an essential ingredient in many poverty-focused development strategy. The level of investment directed in road works in Highly Indebted Poor Countries (HIPC), Tanzania being one of them is quite substantial. This amount, when compared to the related amount that can be used to engage idle people by paying them to execute works they can afford, labour-based techniques in road works comes to the surface as one of many options available in alleviating poverty as a by product of producing good, reliable and stable maintained roads. With Tanzania facing the unemployment problem, unstable and non-well maintained road network, it is of great benefit in having effective strategies purely designed and implemented to abate poverty and unemployment.*

*The purpose of this paper is to give the experience, opportunities and challenges with respect to the use of Labour Based Technology in Road Construction and Maintenance being the right choice as an appropriate approach in Tanzanian environment. Together with that, this paper is meant to create more awareness on how the technology in question can easily be transferred to different people at different level thereby allowing a sustainable and stable capacity. Also it will allow discussions on how LBT could be appropriate and affordable in the environment, which is to be applied.*

## **1.0 INTRODUCTION**

The total area of Tanzania is 945,000 km<sup>2</sup> and has an estimated road network of about 85,000 km out of which only about 5% is paved. The total network is composed of Trunk Roads 10,300 km, Regional Roads 24,700 km, District Roads 20,000 km, Feeder Roads 27,550 km and urban roads 2,450 km. Many roads are in poor condition and may need rehabilitation before considering it for normal routine and periodic maintenance.

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The majority of the population in Tanzania estimated to be 31.8 million (1999) lives on the periphery of the country and it is the same population that is responsible for the most of the agricultural products, which contributes about 50% of the Gross Domestic Product (GDP). It is further known that more than 55% of the country's foreign exchange earnings come from agricultural products while the sector employs about 75% of the population who are earning much far below their actual demand of needs.

Most of the agriculture's output is produced by small farmers scattered in small rural communities, while the major market and processing centres for crops, as well as distribution points for agricultural inputs and fuel are concentrated in urban centres located at considerable distances from each other. Because of this structure of human settlements and the mode of production, roads assume an extraordinary important role in the poverty eradication strategy and enhancing rural income.

In Tanzania like in many other developing countries, the need for new roads, continuous repair and improvement of existing roads as the demand of users increases, need not be over emphasized. Improving rural transport infrastructure is therefore an essential component of agricultural development and poverty eradication. The government has been addressing these issues through different programmes set up to improve transport policies and to strengthen institutional capacity with assistance from various donors thereby emphasizing the use of locally available resources one of them being labour. The level of investment directed in road works is quite substantial implying that it is and will still be of great benefit in having effective strategies purely designed and implemented to abate the two giants i.e. poverty and unemployment. With this in mind and basing on various projects' outcome, currently the road sector is having on top of the agenda, the need of mainstreaming the use of Labour Based Technology (LBT) especially in rural areas

## **2.0 EXPERIENCE OF THE LBT IN TANZANIA**

Labour Based Technology in Roadworks has been promoted and realized as an acceptable and viable option among others in Tanzania. The significant experience that can be recorded and referred to stems from a number of technical assistance programmes on road improvement and maintenance projects that had components of promoting the use of LBT mostly supported by donors. Planning and operations of these projects have been and still are in isolation and uncoordinated manner whereby sharing of vital data and information between projects depends on personality.

### **2.1 Road Works in Region**

Since early seventies, to late 1980s, donors pioneered the introduction of improved labour based methods through pilot projects to many regions injecting the capacity of executing works using force account approaches. In total for the period of more than 15 years, about 6,000 km were rehabilitated and improved. Unfortunately each project was implemented in isolation leaving the gap such that tracing of data related to actual field performance from a

single source to be impossible. One obvious fact is that all rehabilitation and improved roads received minimum attention of maintenance when or after donors' input came to an end. An interesting experience is after the launch of the multi million dollars donor funded Integrated Roads Project (IRP) in 1990. This project had among others the objective of addressing the issue of continued maintenance and rehabilitation of core roads in the country. It also aimed at addressing the issue of institutional capacity building within the government implementing agency and the private sector. Under IRP the government decided to take a step towards institutionalising the use of labour based methods within the Ministry of Works through the programme known as Appropriate Technology Advisory and Training Project (ATATAP) with the financial support from NORAD. Under this project basing on the past experience, two (2) training institutes were established and later they were merged into one, which is known as Appropriate Technology Training Institute (ATTI), and it is in Mbeya. Also at the Ministry level the Appropriate Technology Unit (ATU) was established to undertake studies, advise, create awareness and develop technical guidance and training with respect to the use of LBT within the MOW – HQ and Regions. NORAD provides funding for Technical Assistance and institutional capacity development and the Government of Tanzania (GoT) provides support staff, accommodation and part of operational funds.

Alongside with that, through the National Construction Council (NCC) as a government local implanting agency, the contractor's training project was launched in 1992, which ended up with a successful training of 12 contractors from Kilimanjaro region and 12 contractors from Shinyanga region. The project was financed by the United Nations Development Programme (Technical Assistance), IDA (Equipment), USAID (Investment Component - Roadworks) and the GoT (support staff, accommodation and some operational funds). Two (2) international experts worked with five (5) local professional engineers and seven (7) new graduate engineers who were recruited with respect to local capacity building. With this experience NCC was also recruited to conduct a similar training for 6 contractors from Arusha and 12 from Mwanza Region. Also NCC was involved in the training of 27 contractors in Morogoro region but now under SDC funding. All these were pilot projects, which aimed at establishing a labour based contracting capacity in different places of the country to effectively execute road rehabilitation and maintenance works as well as establishing the local capacity with respect to training and contracting process.

The programme in Mwanza started in 1995 is still in progress. The financial supporter UNCDF, engaged Norconsult in the training thereby conducting training even to local consultants. The important issue is that roads are rehabilitated and improved during such training thereby imparting local capacity of road works using LBT not only to those who are being trained but also to implementing agencies and the community.

Apart from imparting practical knowledge as well as institutional capacity achievement during training the after math of trained groups is another experience that deserve an attention. Trained contractors in Kilimanjaro and Shinyanga regions couldn't secure works from Regional Engineers Offices to the extent that some have abandoned the profession altogether. The training for the contractors in Arusha region was abandoned mid-way due to lack of funds to accomplish the exercise. In Mwanza, contractors will accomplish the

training cycle after six (6) years since they started (1995 - 2001). Another fact is that training has been supply driven rather than being demand driven whereby the capacity and capability of the trained groups with respect to appropriate access to appropriate equipment is very little and no assistance was planned in those lines. Lastly, most of training programmes focused on road rehabilitation with the presupposed fact that the trained contractors will continue with rehabilitation contracts employing more than 150 workers and five (5) supervisors. Where as, with maintenance, contractors will find it not profitable to maintain the five (5) trained supervisors considering the value of contract to be executed. All these assumptions have negative impact on the final result and actual situation.

Another experience was in the other part of the country (in Mtwara and Lindi regions). The FINNISH funded Rural Integrated Project Support (RIPS) is still putting emphasis on the use of LBM in roads rehabilitation and improvement. Original concentration was on providing capacity within the Regional Engineers Offices (REOs) in Mtwara and Lindi to execute the works by force account approach covering more than 300 km in 1988 - 1993. Since 1998 another phase started with the thrust of training contractors using NCC expertise and 22 contracting firms have joined this move. With DANIDA funding in Rufiji district and the Coast region as a whole there are efforts to promote the use of labour based methods in road works involving local contracting firms and district staff training.

There are other projects in Rukwa, Morogoro, Ruvuma, Iringa and Kagera regions which emphasized on the use of LBT in road rehabilitation and maintenance. The attention is on the use of the private sector in the process and many firms have indicated big enthusiasm to participate but their thereafter involvement and achievement remains questionable because of uncertainty of sustainability. Many questions do surround issues of local authorities capacity in relation to road works workload as well as the private sector capability to afford the limited access to appropriate equipment, training and credit.

In conclusion, the experience gained in the use of labour-based methods in Tanzania has a long and widespread nature. Each project has reported the viability and success in achieving their intended goals, although the question has remained the same, what about sustainability or the future performance after each project period? In actual fact almost all projects didn't or doesn't have reliable indications on both aspects. Experience has shown that from local authorities there is no commitment and full support especially on financial basis after the end of projects. Also, the issue of fragmented donor driven in isolation has imparted lack of local feeling of project ownership and non-joint efforts towards solving issues related to access to appropriate equipment, training and credit.

## **2.2 Achievement**

Many roads in isolation since the introduction of LBT in Tanzania have been rehabilitated and some maintained using appropriate LBT. All of them have been performing accordingly improving accessibility to the community. Awareness campaign has made the idea of using LBT in road works to be known and advocated more widely. Technical guidelines and local advisory capacity have been developed. As mentioned earlier institutional and technical

capacity have been imparted (in project areas) in the government implementing agencies as well as the private sector.

Analysing the issue of capacity building (training) let us look the following information and comments. Records indicate that by 1995 in REOs there were 222 staff in total who had some training and experience in LBT and the number kept on increasing due to efforts done during the implementation of ATATAP. Data from KISII indicates that Tanzania has been a very good customer by training 101 Engineers and Technicians on international courses (1988 – 2000). Training of contractors indicates that not less than 70 firms have sent their staff for training in LBT and there are six (6) consultants who have a formal training in this field. It is interesting to realise that the distribution; location and utilisation of all those trained personnel and groups is not known or monitored so as to realise the current impact.

One consultant's study report included the following comment:

*“From a survey of many written and presented papers one could say; LBT is at the forefront of much current thinking and debate; there is a wealth of local experience, knowledge and research capacity available within Tanzania to tackle the poverty alleviation problem; all sections of the construction industry, the institutions and the academics have a role to play.”*

Then it concluded:

*“But the concern remains as to how such ideas and policy recommendations can be translated from the written page into the reality of implementation. Such papers should be required for reading and meditation by the main decision makers and resources' planners, but such people are generally those already overburdened who have little time.”* (Peter H. Betall, 2000).

Regarding technical guidelines, the experience has demonstrated that adopting design standards and ensuring that these standards are applied by using suitable management and supervision procedures ensuring quality control can achieve the necessary quality of works. Therefore, in Tanzania the Technical Manual named, **“Appropriate Technology Labour Based Road Works Technical Manual”** has been prepared and produced to be used as a technical guidance.

This manual; sets out guidelines on policy and recommend standards on technical matters; describes technical procedures; gives guidance on planning, organising and controlling road rehabilitation, spot improvement and maintenance; and applies to paved and unpaved roads and is aimed primarily to road Engineers, Planners, Inspectors, Supervisors and Managers involved with the development of labour-based road maintenance and improvement methods.

The manual is in four (4) volumes, each covering one of the aspects of LBM in road works: Volume I - Road Rehabilitation Works; Volume II - Road Maintenance; Volume III - Design and Specification; and Volume IV - Contract Documentation (Samples).

Volume I – III are already in use and more that 435 copies have been circulated or distributed to users at local and international level.

All these indicate that, the complete enhanced impact on the ground can't precisely be realised by just counting the number of trained personnel and groups. Also there could be a negative impact because of the fragmented approach; non-mainstreaming of the use of LBT; and non-coordination of the existing demand on roads improvement in relation to the size of the country. Technical experience exists together with knowledge and ability but the actual utilisation has missed the necessary support and commitment. Translation of written pages and majority thinking as well as wishes into the reality implementation has remained missing. Actually deliberate coordination, monitoring and transfer experience to all in need may give a way into solving these problems.

### **3.0 OPPORTUNITIES OF LBT IN TANZANIA**

Findings from different studies and documents have shown that adoption of labour-based methods on road rehabilitation and maintenance is a viable option in Tanzania where there is an abundant human resource, which is under-utilised. The growing employment problem and poverty also explains the importance of employing labour-based methods, which can create employment and inject direct cash into local communities. For example it is estimated that 12.5 million people, live in absolute poverty in rural areas spending about 0.5 USD or less per day.

Many road works executing agents including Regional Engineers and District Engineers as well as the private sector do appreciate the use of LBT in their applications. In fact most of rehabilitation and maintenance works are done using labour but lacking the required modern techniques that makes labour-based methods effective and efficient. Another revealed fact is that a lot of donor-aided projects on rural roads are demanding the use of labour-based methods to maximise the impact on the overall development achievement including sustainable arrangements.

Estimates indicate that more than 20,000 km under the MoW can be maintained using LBM and another 10,000 km can be provided with Periodic Maintenance and Rehabilitation using LBM. Also about 15,000 km of district roads may be rehabilitated using LBM apart from another more than 15,000 km of unclassified roads (ATU, 1995).

Currently there are efforts towards poverty reduction strategy under the Highly Indebted Poor Countries (HIPC) initiative programme whereby in Tanzania about 2,326 km of regional roads will be rehabilitated (being part of 9,768 km proposed under URRP (Urgent Roads Rehabilitation Programme, dated June 2000) for five years) and 6,290 Km of district roads will be rehabilitated or improved to all weather roads. Most of the roads earmarked are located in areas where the application of LBM is appropriate and there is a great push requiring the use of this approach because of its link with poverty reduction.

Demand of labour-based technology is also found in other sectors of the economy such as: agricultural sector; water and sanitation; building construction; mining and quarrying; and urban infrastructure.

In fact, the market for the application of labour-based technology in areas of construction, rehabilitation and maintenance of infrastructures is quite enormous. Altogether, to satisfy such demand there should be deliberate moves toward ascertaining appropriate application rather than an ad-hoc fragmented arrangements. Also the issue of commitment and support from all levels allowing the necessary coordination will be required to explore these opportunities. The situation now in Tanzania indicates that the climate for LBT development at large scale is better than ever been. Taking into consideration the increasing link between the use of LBT and poverty reduction, the demand for appropriate application of associated modern techniques will keep on growing.

The thrust of adopting this approach at scale in infrastructure therefore should be tied with the promotion of the adoption of proper employment intensive investment policies. This can be achieved through the creation of policy and legislative environment supportive to local resources based methods. In this regard, it is proposed that it will be of benefit to develop for adoption, an Employment Generation Assessment (EGA) criterion (similar to Environmental Impact Assessment) which will indicate the minimum level of labour involvement to be realized for all public investment projects. Also, the guide to each actor or investor (public, private, donor, etc.) at least those engaged in the construction sector to answer the fundamental question “to what extent has the programme or project alleviate poverty” with particular emphasis on direct and indirect impact and benefit to the urban or rural poor individual or community.

## **4.0 CHALLENGES**

### **4.1 Coordination**

Tanzania is a very big country such that the available resources are scattered and non-coordinated communications do hinder prompt sharing of experience between key players. Individual ongoing projects involving LBT continue to show the differing approaches in: access to equipment; training arrangements; contract documentation; and choice of roads priorities. These illustrate the perception that cooperation and coordination is highly needed even if only on an informal level.

### **4.2 Policy**

For any successful enhanced efforts to be deployed at scale, there should be a clear support from the policy level. Currently in Tanzania, there is no firm explicit policy document that might lead major investments programmes to take off but there exist actions and statements towards pushing the use of LBT from all levels of policy, implementation and research.

To sight out few examples, in 1996 the MoW issued the policy statement on the use of LBM in the road sector basing on the statement in the letter of Transport Sector Policy of March 1994 declaring encouragement of the development and use of LBM. The statement insisted that the planning and design of road construction and maintenance works shall consider the use of LBM except where such methods are clearly either not cost effective or cannot

produce the required quality. Monitoring and follow-up on the implementation or adoption of this policy statement never materialised.

Of recent, His Excellence the President of the Republic of Tanzania Hon. Benjamin William Mkapa, underscored the significance of Labour Based Technology in road works. In his opening speech while addressing the road sector stakeholders on 31<sup>st</sup> May 2000 he said:

*“Government acknowledges that a well-managed road network is one of the important conditions for economic growth and for poverty reduction.....road construction projects in rural areas have proved to be a sources of dependable rural incomes and distribution of wealth ... Greater consideration should be given to building and maintaining transport infrastructure especially the rural roads by labour-based methods,.....these approaches can create short/long-term employment and contribute towards reducing poverty. I therefore ask the Road Fund Board and Tan Roads to ensure that not only is maintenance given priority, but also that the use of labour based techniques are given due importance ”*

He further said,

*“I have been advised that according to studies made, if the current due collections for the road fund (over 45 billion a year) are directed towards road maintenance projects, 28% of it (i.e. Tshs. 12.6 billion) will be the labour component. This amount will generate jobs for 35,354 people. This will greatly reduce the present army of unemployed youths, apart from ensuring the sustainability of the local contracting industry itself”.*

He then directed

*“I am told most of the contractors who were trained in LBT under IRP were not given work opportunities and hence they have abandoned the profession altogether. This must now change, without affecting transparency and the quality of work.”*

This indicates that awareness with respect to the use of LBT has been extended to the highest level but translation of these words into action is what is the next step. How to achieve the intended goal smoothly is the next challenge.

### **4.3 Attitude**

The bias against the use of LBT by decision makers, the general public, some donors and funding agencies continues to be a major impediment to the wider application of the technology. The negative attitude to it's use, despite the proven viability and clear advantages technically, economically and socially for development is a challenge that should also be carefully targeted. In most cases policy makers and the community can be convinced and realize the importance of the approach but decision makers can frustrate the whole idea. The following quote is from one community leader in an area where a project was implemented with funding from the World Bank complimenting community-based activities in Dar es Salaam.

*“We understand the rationale for granting the big contractor to construct bitumen road for it requires heavy equipment, high technical and managerial competence. But why should we go for the big contractor with the heavy equipment to undertake the*

*construction of side drains or feeder roads, which we have all along repaired ourselves? With supervision from technical people (some of them we have them here) using our own artisans we can do a lot. But, the programme implementing unit engineers do not trust the approach. They even invited big contractors to tender for this building (referring to the newly built community office), fortunately the lowest bidder quoted Tshs. 45 million whereas the budget ceiling was only 15 million. We have done the construction ourselves, employing our own skilled people and spent within the budget ceiling. Also, we have been very keen to emulate what our colleagues have done in Hanna Nassif and we have visited their project and learned how the residents there have benefited directly and indirectly from the project. We wanted to undertake our project in a similar manner but unfortunately the programme unit engineers were not interested. Our views were not considered. Decisions to engage a big contractor were made without us. To date, we do not exactly know who made that decision. We are simply told “ the financier (WB) agreed that a contractor be awarded the work. You know once a contractor is appointed, he simply does what is in the contract. We can therefore do nothing at this stage”*

He went further and concluded

*“ ... the disinterest or low willingness among most residents to contribute towards the agreed community 5% share of the project cost is at least partly due to their marginalisation in key decisions making process.*

Now the issue remains on how to change the attitude among many practitioners including emerging from university and colleges.

#### **4.4 Skills**

The lack of technical and managerial skills of engineers and technicians in the use and choice of appropriate technology may limit the use of this approach at scale. Capacity building will be required to address the inadequacies of engineers in the use of the approach in both design and supervision in a centrally coordinated manner. There is only one labour based training institute ATTI specialized in road works. The challenge will be to develop skills in the coordinated manner, the curricula for all trainees including other types of infrastructure works such that trainees will be trained even to diversify their operations.

#### **4.5 General**

The initial current challenge to all implementing agents is to transform the words into practice by addressing hindrance, which could come from the following bottlenecks.

1. Overlapping of activities and gaps due to lack of national central coordination.
2. Difficulties in accessing appropriate support equipment, finance, training opportunities and work share for implementing groups from the private sector.
3. Lack of supportive policy, documentation, procedures, analysis of practical challenges, research and evaluation of related environment in a centralised manner.

Efforts to overcome these should be enhanced whereby:

1. Awareness creation for top level decision makers should be intensified
2. Develop and institute policy guidelines for all partner organisations so as to work in a coordinated manner.
3. Ascertain funding mechanism for roadworks and defined support to LBT (short term and long term).
4. Facilitate the private sector involvement and development.
5. Intensify technical as well as other related social research and analysis.

All the above are aiming at mainstreaming the use of LBT in the implementation set up.

## **5.0 CONCLUSION**

1. Tanzania has the aim of building a self-reliant nation currently targeting at eradicating absolute poverty. Creation of enabling environment so that everyone can have an opportunity to participate effectively and efficiently is quite important. Labour Based Technology is one of the most appropriate approaches for the majority of the activities in many infrastructures development and maintenance especially road works in our environment. Therefore the appropriate application of this approach should be mainstreamed for the benefit of all.
2. Supportive creation of enabling environment to be used as a motivation to those involved in making the choice could be through firm government policy and procurement procedures that support the existing efforts. Examples are that of Namibia which was done through the white paper, Philippines where they used a Presidential declaration and South African through targeted procurement arrangements.
3. For acceptable and harmonised implementation, a strong and capable co-ordination is required and it should be well-planned and placed so as to influence the technology choice at all levels especially on technical basis covering attitude, improved skills, improved productivity and access to supportive quality tools and equivalent.

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