

Regional Seminar Proceedings 1990

TABLE OF CONTENTS - VOLUME II

REPORT FROM SESSIONS

[1. Introduction to the Seminar](#)

1.1 Introduction

1.2 Structure of this report

[2. Low Cost Structures - local resource alternatives to high specifications materials](#)

[3. Control of Alignment - more science at site level](#)

[4. Haulage of Materials - the options from ox carts to tipper trucks](#)

[5. Self-help - a viable option for road construction and maintenance](#)

[6. Site Visit - the use of lights equipment in road rehabilitation](#)

[7. Training Materials - can there be a definite set?](#)

[8. Maintenance - does the Lengthman system work?](#)

[9. Worker Motivation - Day work, task work, piecework, what difference does it make?](#)

[10. Monitoring and Control - Forms and computer packages. Can we achieve a standard?](#)

[11. Summary and Open Discussion - where do we go from here?](#)

ANNEXES (To be found in Volume II only)

ANNEX 1 Seminar Agenda

ANNEX 2 List of Participants

ANNEX 3 Summary of Agreed Plans for Action

1. INTRODUCTION TO THE SEMINAR

1.1 INTRODUCTION

The seminar was conducted in the Karibuni Centre, Mbeya, Tanzania and took place over three days from 26 to 28 February 1990.

The seminar was organised and chaired by the ILO Regional Adviser for Labour-Based Road Technology, Mr David Stiedl, on behalf of all practitioners in the technology in Eastern Southern Africa.

1.1.1 THE PURPOSE OF THE SEMINAR

As stated in the title, the purpose of the seminar was to review current practice by gathering together the experts and practitioners in the field. All participants were engaged in working on labour-based roads projects in east and Southern Africa. The aim was therefore to have an active exchange of ideas and information based on the participants' experience in the region and also to draw on their previous experiences in other areas. A list of participants is given in Annex 2 of this report.

The increased emphasis on the use of local resources for infrastructure programmes in developing countries has resulted in a substantial increase in the number of projects adopting labour-based technology. There is now a pressing need to review and disseminate information on the various techniques which have been adopted to ensure that new and existing projects have the opportunity to modify or update their procedures to make optimum use of the labour-based approach.

Each programme should be able to learn from the problems, successes and failures of other programmes which will assist in the choice of methods of construction, management, planning etc. Also by discussing common problems, solutions or suggestions for further study could be made.

1.1.2 FORMAT OF THE SEMINAR

In order to spark off the active exchange of ideas, several participants had been approached to present short topic papers, the topics having been chosen to cover the principal areas of concern as expressed by practitioners in the region.

The topics covered the areas of:

- Low cost structures
- Control of alignment
- Haulage of materials
- Self help
- Light equipment
- Training materials
- Maintenance
- Worker motivation
- Monitoring and control

The detailed programme is outlined in this report in Annex 1 - Seminar Agenda.

Each topic presentation was followed by a discussion period and where applicable the production of an Action Plan to specify follow-up required from the participants.

The Action Plans are included in the relevant topic sections and summarised in Annex 3 of this Report.

1.2 STRUCTURE OF THIS REPORT

This report will consider each subject separately. The topic papers are presented in Volume I whereas the subsequent discussion are reported in Volume II including any conclusions or agreed plans of action. The final section - "Summary and Open Discussions - Where do we go from here?" looks at the proposals made at the seminar for the future exchange ideas and experiences.

Although the report is presented in two volumes, Volume I and Volume II should be read concurrently.

The plans of action are structured on the following basis:

What What information or assistance the experts need?

Why Why is the information needed and what benefit will it bring?

Who Who should provide the information and who should collect it and form a report?

How How should the information be gathered and from what sources?

1.3 ACKNOWLEDGEMENTS

The ILO would like to thank all the participants for attending and their programmes for allowing them to be released. We hope that the knowledge gained more than compensated for their absence.

We would also like to thank the staff for the Regional Road Maintenance (RRM) in Tanzania for providing so much assistance to the seminar in Mbeya, the staff of the Special Public Works Programme in Dar es Salaam for all their preparatory and logistic support, and Ms. Ritchie and Mr. Selvarasa for recording the discussions.

We would like to thank the Government of Tanzania and the Mbeya Regional Authorities for allowing us to hold this seminar.

Lastly, we would like to apologise to all those we were not able to invite to this, our first seminar in the region. We will try to widen the coverage for the next, and would be pleased to hear from those who would be interested in attending.

SESSION 2 - LOW COST STRUCTURES

2. DISCUSSION ON LOW COST STRUCTURES

LOCAL RESOURCE ALTERNATIVES TO HIGH SPECIFICATION MATERIALS

2.1 DRIFTS

There is only a slight difference in cost between culverts and drifts. Drifts are slightly cheaper and they have the advantage that in most cases the road can be kept open during construction.

The approaches to drifts are important as they can cause damage to vehicles and give the road users a low opinion of drifts if they are too steep. A recommended slope for approaches would be 5 %.

The importance of properly constructed aprons, especially the down stream protection, should always be emphasised. Some guidance is needed on the size and depth of the upstream and downstream protection.

2.2 AVAILABILITY OF SKILLED PERSONNEL

Availability of skilled personnel to construct dry stone masonry structures and cement bound stone arches. How can you train masons who are inexperienced in building dry stone masonry structures?

In nepal untrained workers worked with experienced masons until they had acquired sufficient skills to work independently. It would be possible for ILO to arrange short term consultancies for a skilled mason to give demonstrations and train local workers in building with stone. This training could be either in dry stone work or in more complicated cement bound masonry such as stone arch bridges.

Another source of information on low cost structures and stone arch bridges would be Indian Government publications and/or Indian University texts.

2.3 BURNT BRICKS

Burnt bricks may be used in place of stone where stone is not locally available. However care must be taken with the quality of the bricks and the implications for deforestation for the burning of the bricks.

2.4 TOOLS FOR MASONRY WORKS

In most cases road construction programmes have used the locally available tools. There is a listing of masonry dressing tools in the "ILO Tools Manual" if tools were to be procured by a project.

2.5 STONE PITCHING ON RARRIAGEWAYS

Stone pitching has been used successfully in different countires, to assist on steep sections of road. If cobbles or setts are to be used they must be placed properly to be effective and durable.

2.6 TIMBER ALTERNATIVES

The use of timber for bridges is a wide topic and would have to be tackled as a separate issue.

In Makete, Tanzania the roads project has successfully used timber for constructing culverts, at the cost of US\$25 per culvert, with a life expectancy of five years.

Using timber for a large number of structures may pose a problem for future repair or replacement of decks as where previously there may have been a plentiful supply of timber deforestation may drastically reduced supplies.

2.7 UNREINFORCED CONCRETE PIPES

None of the participants reported problems with performance of the unreinforced concrete pipes, however, there were a few reports of breakages during transportation and breakages due to poor backfilling of the culverts on site.

Culverts can either be produced in casting yard or adjacent to the road site. Having a casting yard close to the engineers office may allow closer supervision and greater quality control. A casting area at site may reduce the need for transport if located close to the sources of sand, gravel or stone for aggregate. In addition the delivery distance for the finished culverts would be reduced. Quality could perhaps suffer from less frequent supervision and less skilled staff. There are arguments for both options but the expense of transport should be carefully considered when deciding on the location for casting unreinforced culverts.

Dissatisfaction was expressed over the quality of the concrete pipe moulds. Some participants were of the opinion that those moulds being produced at present should be used, despite some problems, whereas other participants felt there should be a continued search for better quality moulds.

The Zambia project has ordered moulds from Malawi but they have not been tried out yet. Kenya and Tanzania projects are using locally produced moulds.

There are two criterion for producing better quality moulds:- a good design, and good quality control during manufacture. An incentive to ensure quality control during manufacture would be the placing of large orders rather than small orders for six or eight moulds only.

2.8 ALTERNATIVE STRUCTURE

As a general principle all road structures should be designed and costed with alternatives. The decision on which type of structure is to be built will therefore be based on an economic comparison of each proposal.

2.9 AGREED PLANS FOR ACTION, LOW COST STRUCTURES

WHAT	WHY	WHO	HOW
Masonry Trainer/Guidelines (identify and prepare)	Increased use of local resources through technical information and costing	Regional Adviser Experts	Inputs from Experts Consultations
Culvert Moulds proven sources	Reliable moulds	Regional Adviser/RRM (Tanzania)	Inputs from projects

SESSION 3 - ALIGNMENT CONTROL

3. DISCUSSION ON ALIGNMENT CONTROL

MORE SCIENCE AT SITE

3.1 DEFINITIONS

For the purpose of the discussion the method outlined in this paper and other similar methods will be termed as the profile method, also the method using slots to create a level platform from which to excavate the drains and create the camber, will be termed as the slot method.

3.2 PROFILE METHOD

The method proposed in this paper was wholeheartedly supported by the participating experts from Botswana and Zambia (who were using this method). In Zambia the project had slightly modified the approach but found it to be successful in a variety of terrain including steep terrain. Other participants found level control for drainage also very important in rolling or flat terrain.

Using this method engineering advice on site should only be necessary in difficult areas after the foremen have been trained to carry out the design/setting out functions.

Casual labourers are good at ensuring the correct shape of road cross-section during construction but the longitudinal control is not there unless there is 100 to 200 metres set out and properly adjusted for level at one time in advance of the work. In comparison the levelling of slots tends not to be carried out over long sections of road therefore making it difficult to produce a good vertical alignment.

Fears were also expressed that the large number of profiles needed for setting out in the profile method would interfere with the increased traffic levels expected in Minor roads in Kenya and Regional roads in Tanzania. Those using the profile method said that the profiles once aligned could be replaced by pegs and string lines thus reducing any interference with the traffic.

3.3 METHODS USED BY DIFFERENT PROJECTS

Mbeya has employed a method which uses slots plus mobile profile for vertical alignment. Tanga is using the slotting method as is Mozambique. Rukea has used the slotting method but has proposed to try the profile method on the next road to be rehabilitated. Kenya are continuing with the slotting method which they find is perfectly adequate on green field sites. However in the coming year they will be assessing alternatives as some problems have arisen when upgrading badly eroded roads or roads in restricted areas such as those adjacent to fields with high value crops. They will be producing a technical manual from their findings.

3.4 SLOTS METHOD

The slot method has proven very successful for the rural Access Roads Programme in Kenya, but there are reservations about its suitability for the Minor Roads Programme. It was argued that some of the difficulties in producing a good finish to the road were problems with management rather than at site

level and therefore a change in method would not solve these problems.

One of the advantages of the slot method is the ease with which the foremen can calculate the task rates for the casual labourers once they have created their level platform. Using the profile method the volume of work will be constantly varying. In Zambia, the project has issued tables to the foremen so they can read off the quantities and task rates for a given depth of excavation thus easing this problem.

3.5 LIGHT GRADING OF THE ROAD SURFACE PRIOR TO GRAVELLING

When dealing with the question of the quality of the road surface finish, there was a suggestion that light grading could smooth the surface of an earth road before the placing of gravel. The argument for carrying out this work was a better finish to the road and a saving in the quantity of gravel used. The arguments against were that if people know a grader is coming they will take less trouble to ensure a good standard of finish by hand. The grader is an additional cost and may not be sustainable and will not remove large ruts.

3.6 GUIDELINES

It was proposed that John Marshall and Walter Illi look at the different methods used in various projects and prepare general guidelines on the methods for producing an acceptable road alignment with functioning drainage. They were asked also to co-operate with Gary Taylor who will be carrying out a similar study in Kenya. The suggestion was made that those projects using the profile method should not be too rigid in their recommendations as the method was developing all the time.

3.7 TRAINING

Trainers should have clear guidelines stating what the engineers need from trained foremen and supervisors. There is a need for an urgent decision on method and training, in Tanzania, before the Ministry of Communication and Works start their large training programme.

3.8 AGREED PLANS FOR ACTION, CONTROL OF ALIGNMENT

WHAT	WHY	WHO	HOW
Revised level control guidelines	Improved and sustainable road Standards	John Marshall/Walter Illi	Information from current projects/site Implementation(RRM will support) setting out manuals from each project.

SESSION 4

HAULAGE OF MATERIALS

4.HAULAGE OF MATERIALS

THE OPTIONS FROM OXCARTS TO TIPPER TRUCKS

4.1 ANIMAL HAULAGE

Amongst the participants, the experience with animal haulage was mostly with donkeys rather than oxen. In Makete, Tanzania they have successfully gravelled a section of road using a donkey with panniers hauling gravel up to a distance of one kilometre (km). They have calculated that in equivalent costs 1 tractor and trailer is equal to thirty donkeys.

If a roads programme is to look at the possibility of using animal drawn carts the following must be considered.

- Will the cart and the animals be owned by the roads programmes?
- Will the carts only be owned by the programme and the animals hired from local farmers on a daily basis?
- Will the carts only be owned by the programme and the animals hired from local farmers on a contract basis with a fixed rate per trip depending on the haulage distance?
- Will the animals and the carts be hired by contract from local farmers/ businessmen?

The contracts listed above include the excavation, loading, hauling, off loading and spreading of the material. From the trials in Tanga where the project owned some of the donkeys, they would recommend that the animals, at least, should be hired on a contract basis. It may be advantageous for the programme to purchase the carts as they can be specifically designed for roadworks. Farmers may have difficulty in securing credit to buy carts and this could prove a stumbling block to the introduction of animal haulage in certain areas.

The roads project in northern Zambia are purchasing donkeys and requested any available information on harnesses.

4.2 EQUIPMENT CHOICES FOR ROADS PROGRAMMES

Before deciding on the haulage equipment to order for roadworks several factors must be taken into consideration:

- (i) The haulage distances from sources of good material to the road sites. The World Bank has given the following guidelines on haulage distances:
- (ii) The haulage needs of the different sites in the region.
- (iii) The possibility of using equipment produced in the country where the work is to be carried out.
- (iv) The ease of repair and stocking of spare parts if the same vehicles and equipment are ordered.

(v) The possibility of using container tippers

(vi) The possibility of hiring private contractors, either businessmen with trucks or farmers with tractors. Suitable trailers may have to be provided for the tractors by the programme.

4.3 ADVANTAGES AND DISADVANTAGES OF USING CONTRACTORS FOR HAULAGE

The advantages for the roads programme is that they do not need to purchase expensive equipment, they do not need to keep large stocks of spare parts, they do not need a large mechanical workshop, also vehicles assigned to the roads programme are not available to be diverted into other activities.

The disadvantages of using contractors are if insufficient vehicles are available, if the rate set by the region or government for haulage is uneconomic and therefore uninteresting to the private sector, and the need for close supervision to ensure that the correct quantities of gravel are being delivered and properly placed on site.

4.4 TRACTOR TRAILER COMBINATIONS

All the participants had different experiences of using a variety of tractor and trailer combinations. The tractors ranged from 45 to 80 horsepower (hp) with the simplest mechanics to sophisticated hydraulics and 4 wheel drive. The trailers ranged from 2.8cum to 4.5cum in capacity, with either single axles, single axles with twin tyres or double axles.

The size and sophistication of the tractors purchased depended on the job to be done, and the facilities for maintenance. In Mozambique an 80hp, 4 wheel drive tractor was used for rolling and grading but a 48hp tractor was used with the single axle 3cum trailers.

In general participants were not in favour of double axle trailers as previous experience had shown them to be difficult to manoeuvre and too heavy to towing by normal agricultural tractors. In Tanzania, Valmet Tractors are readily available and familiar to the mechanics as they are assembled in the country. Although they may not be as powerful as other makes, their availability and the availability of spare parts may be a consideration when deciding on which tractor to use. An interesting alternative tractor, which must be imported, is the Tugwell 480 which is designed for Africa using no hydraulics, and a mechanical spring rather than electric starter.

The largest problem faced by all participants was finding a reliable supplier within the Southern and Eastern Africa region of a well designed, well manufactured trailer. Certainly countries such as Kenya and Tanzania could support manufacturer with sufficient orders once a good trailer had been produced. Kenya have had great difficulties with their trailers and Tanzanian projects are still trying out various designs. The most promising is RRM Mbeya's newly purchased trailer manufactured in Zimbabwe, but this has not been in operation long enough for assessment.

Many participants felt there was a need to gather together a list of the types of tractors and trailers in use with comments on their performance, individually and their suitability as tractor trailer combinations.

4.5 TIPPERS AND CONTAINER TIPPERS

An alternative to tippers or flat bed lorries is the container tipper. It has been successfully used in projects in Somalia and Thailand. The container tipper gives one truck multipurpose possibilities for all phases of the road construction including use as a water tanker.

Some participants were concerned about the efficiency of loading tippers by hand and the alternative expense of a mechanical loader. It was pointed out that the ease of loading by hand is determined by the setting up of the gravel pits and Lesotho LCU had no problem with efficient hand loading of tippers. In Tanga they used wheelbarrows to load the excavated gravel into the tippers. Leaflets on container tippers are available from ILO Geneva.

4.6 AGREED PLANS FOR ACTION, HAULAGE OF MATERIALS

WHAT	WHY	WHO	HOW
Trailer sources and designs/td>	More appropriate trailers	Regional Adviser	Information from Projects
Circular guidelines on haulage	Facilitate decision making on economic Haulage	Regional Adviser	Information from projects and Archive data

NOTE: Trailers are also discussed in Session 6 of this report, under the heading of "Site Visit".

SESSION 5

SELF-HELP

A VIABLE OPTION FOR ROAD CONSTRUCTION AND MAINTENANCE

5.1 INTRODUCING LABOUR-BASED TECHNIQUES

When labour-based techniques were first introduced it was to replace equipment with manpower, i.e. to replace machines with paid labour. With this policy rural communities would benefit in the short term from the money paid as wages.

A period has now been reached when African Government are facing extreme economic difficulties and pressure is increasing to hand over maintenance of roads to self-help labour. This is a departure from the original idea and can it be sustainable?

5.2 COMMENTS AND EXPERIENCES FROM DIFFERENT COUNTRIES

In Malawi the building of self-help village access roads was successful in the areas where people wanted the roads and where they knew there would be no alternative to self-help such as Government funding. Also the interest increased the further the villages were from an existing road.

The self-help projects in Ethiopia have a reasonable output, but not to the standard of the district roads.

In Rukwa Region Tanzania the self-help works were next to the paid labour works and therefore those working on self-help road works taking place in a different part of the Region and they were successful, so there could be self-help without force.

In Ilege District of Mbeya Region, a dynamic leader is "inspiring" the people to do self-help roadworks to avoid collapse of the roads. This is not happening in other districts of the Region.

Two trials for self-help have been carried out in Tanga Region and both have failed. A third trial has been started but again the numbers of people reporting for work has been very small.

In Makete District, a remote area of Iringa Region, Tanzania self-help roadworks are progressing well. No Government funds were available for feeder roads and the communities realised the only way to have access was to rehabilitate the roads themselves. Some villages even started repairs to the roads in advance of the arrival of the project team. On the regional road self-help was used over a period of three months to provide an adequate drainage system. Perhaps in this case some of the people were forced to join the roadworks. In the Matamba area of Makete maintenance is being carried out on a self-help basis.

Self-help in Botswana will work for rehabilitation if the initiative has come from the people, however maintenance on this basis is not a success.

Attempts to use self-help in Mozambique have been unsuccessful as people did not wish to participate.

Kenya, and other countries, have had successful water supply lends itself more easily to the use of volunteer labour as the work is carried out over a short period of time and water is recognised as important for the whole community.

Zambia has also had successful water supply schemes but the participants did not know of any self-help road rehabilitation works being undertaken.

5.3 FUNDING OF MAINTENANCE

It may be possible for communities in areas producing cash crops (i.e. coffee or tea) to fund their own road maintenance. For example rich farmers may not want to come and work on the road but the village council could charge them a levy to be excused work, and then use the money to pay the people who do come forward to work on the road.

The Rural Road Maintenance unit in Mbeya Region have calculated that with Government funding alone, only 25% of the present road network could be maintained. Therefore there may be no option but to include self-help maintenance on many stretches of road.

The Tanzania Government has a system of funding a certain number of community projects proposed from each region. The projects are proposed through the Development Committees and the people provide labour and sometimes money with financial and material support from the Government.

5.4 GENERAL POINTS RAISED

The ILO has prepared a convention on forced labour which has been ratified by most countries in which has been ratified by most countries in which we are working. ILO project staff should try and ensure that conventions are not violated and it is essential to ensure an involvement at grassroots level in the event of the introduction of self-help projects. Dealing with the village chairman or a political party representative does not ensure that the project is the wish of the majority of the community

Care should be taken to ensure communities are not overloaded with demands for their free labour. Enquiries as to other commitments for self-help work must be made.

Maintenance using self-help could prove to be unsustainable and the quality of the finished road very substandard.

In Mozambique as in other countries food for work road rehabilitation schemes have been very successful, however this should be considered as a form of paid labour.

5.5 CONCLUSION

Generally it was felt that self-help should not be used on roads included in the Government road network. Self-help could be used on roads that fall outwith the network and which would receive no funding. Important for all self-help schemes are consultations with the community and their involvement as early as possible in the planning process. The roadworks should only continue if the villages involved agree it is their own priority, otherwise there will be very poor attendance, or a situation of forced labour.

SESSION 6

SITE VISIT

THE USE OF LIGHT EQUIPMENT IN ROAD REHABILITATION

6.1 GRADING DEMONSTRATION

RRM Mbeya are using a double axle towed grade manufactured by Arthur Garden in Zimbabwe. The grader is towed by a 75hp tractor. It is used for removing corrugations on earth roads or returning gravel from the shoulders to the carriageway, on gravelled roads.

When in operation the grader uses 5 passes on each side of the carriageway with a maximum cut of 10cm. It can cover a distance of 2km of road per day. The team working with the grader consists of the tractor driver, one or two grader operators and two labourers. The job of the labourers is to remove stones and grass from the centre of the road once the grader has passed. They are assisted by the maintenance lengthmen on the road who also ensure that all drains are kept open during grading. RRM Mbeya would hope to grade each road, under maintenance, 2 or 3 times per day.

During the small demonstration the depth cut by the grader was much less than the maximum of 10cm, therefore this figure depends very much on ground conditions.

6.1.1 THE FOLLOWING DISCUSSION RESULTED FROM THE GRADING DEMONSTRATION

Questions were raised which could be tested in the future.

- Would it be possible to have a group of labourers working behind the grader raking the soil into shape and therefore reducing the number of passes of the grader.
- Could the tractor be used for grading, then in the latter part of the day tow a roller to compact the loose soil of gravel which has been brought back onto the carriageway by the grading operation?

There are fears that the road surface can be damaged by traffic when rain falls on an uncompacted newly graded road.

The possibility of using the towed graders for heavy grading was generally not recommended by the participants. Arthur Garden also produces a single axle towed grader which would be easier to manoeuvre but needs to be carefully teamed up with the correct tractor.

6.1.2 EXPERIENCES FROM DIFFERENT COUNTRIES

In Mozambique they have been using a light tractor towed blade for very light grading. The advantage of this blade is the ease of transportation from site to site. RRM Tanga are also doing some work with a blade attached to the tractor. In Botswana the normal maintenance set up is one tractor, one trailer, one towed blade plus 10 men. In Zimbabwe one overseer, 20 men with one tractor, one trailer and one blade are responsible for the maintenance of 300 km of road.

6.1.3 GENERAL

Training of grade operators is important for the correct results on the road and for the care of the grader itself. In Mbeya the operators spent 2 days in the classroom followed by 3 months training in the field. They are issued with tools to carry out routine checks on the graders including the frequent tightening of bolts as they have a tendency to work loose. Blades must be regularly replaced to ensure a good cutting edge.

6.1.4 CONCLUSION

It is vital to team the correct power and weight of tractor with the correct weight and size of grader. A light tractor will not be able to pull a heavy grader trying to make a deep cut. Any purchase of grader should be carefully considered in terms of the job it is required to do and then the most suitable tractor for towing. If a project is confined to the use of a particular tractor then this must have a bearing on the choice of towed grader. More information on grader/tractor compatibility is available from EMP/INFRA, ILO Geneva.

6.2 REHABILITATION AND GRAVELLING ROAD SITE

The road visited which was under rehabilitation, was a loop road and therefore work was started at both ends. The first group started in May 1989 and the second in September 1989. Thirteen kilometres have been rehabilitated, gravelled and compacted. The productivity is 1800 mandays per km (md/km) for road construction and 1300 md/km for gravelling. There is no shortage of labour and rehabilitation can progress at the rate of 1 to 1.5 km per month however gravelling was progressing at a rate of 0.8 km per month. At the time of the site visit rehabilitation had stopped and the labour force were concentrating on excavation of gravel.

Graders had not been used on this site as there was a plentiful supply of labourers and a good quality finish to the road surface.

The visit to this site afforded the opportunity to look at the rollers and trailers in use at RRM Mbeya.

6.2.1 COMPACTING ROLLERS

Two types of rollers were on site. The first was the pneumatic tyred towing roller with the top tray which could be filled with earth for extra weight and the second was a towing vibrating roller. The pneumatic tyred roller is performing well in most soil conditions however on the road site visited there were areas where the vibrating roller was more effective.

An alternative discussed for use on labour-based sites was the pedestrian roller which would be suitable for the speed of progress on labour-based sites.

RRM Mbeya have also done compaction trials using an ox-drawn deadweight roller. Using the sand replacement test the ox-drawn roller gave 85% compaction in moist conditions dropping to 65% in dryer conditions. Compaction took place after every step of rehabilitation thus the maximum thickness to be compacted was 10cm. In Kenya they found that a manually pulled roller gave as good results as the animal drawn and was an easier option than engaging animals. Botswana do not use compaction equipment but rely on traffic compaction, however they have a much longer dry season than in Southern Tanzania. In Rukwa traffic compaction only had been used but this may only be possible on lightly trafficked roads. The Kenyan Minor Roads Programme are not using compaction equipment but rely on vehicles despite the much higher traffic flows. Various reports from TRRL have shown good results can

be obtained from traffic-only compaction, however this has been based on low traffic RARP roads in Kenya. Lesotho has found compaction, using 1.25 tonne vibrating rollers, to be essential under all circumstances because of poor soil types.

It was noted that projects should be very careful in deciding their compaction requirements at an early stage, based on both traffic and soil conditions in their particular circumstances. Traffic only compaction is not always satisfactory, but mechanical compaction represents a major initial recurrent investment.

6.2.2 TRAILERS

Two types of trailer were looked at and discussed. The first was the Kenyan trailer and the second a recently purchased trailer from Tinto Industries Harare. Both trailers were non-tipping. The Kenyan trailer has had a lot of design problems and has had to have extensive repairs carried out in the workshop. This trailer is very heavy when loaded (4.5 cu.m.) and the axle location places a large proportion of the weight on the tractor. However the most popular feature of this trailer is the low loading height. Until a major redesign has been carried out this trailer would not be recommended because of the damage to the tractors and the need for constant repairs.

The Tinto trailer has a good basic design combined with good quality workmanship. There were some weaknesses in the bolted connection for the drawbar so RRM added welds in their own workshop. They are also not entirely satisfied with the opening mechanism for the side doors (which are to facilitate unloading) but have approached the manufacturers to reassess the design of these features. The one disadvantage is that the loading height is greater than that of the Kenyan trailer. The Tinto trailer had only been in use for two months at the time of the site visit and therefore a further report should be made after a longer period of service.

6.3 ACTION TO BE TAKEN

A request was made that all project staff should carry out tests if they are using compaction equipment. This would give figures for the future discussions on compaction methods and remove the present subjectivity when discussing animal drawn versus tractor towed etc.

NOTE:Tractor and Trailer combinations are also discussed in Section 5 of this report under the heading of "Haulage of Materials".

**SESSION 7
TRAINING MATERIALS**

7. DISCUSSION ON TRAINING MATERIALS CAN THERE BE A DEFINITE SET?

7.1 COMMON TRAINING MATERIALS

Basic courses in mathematics and technical English . For example, could be designed to cater for different countries. All other training material needs to be tailored to suit the specific needs of each country or each project . The Botswana Training Unit now has 17 modules covering all aspects of their training course.

7.2 LENGTH OF TIME FOR TRAINING

Present arrangements are:

- Zambia: Three months formal training with 25-30% of that time spent in the classroom. The trainees then spent several months on site near to the project headquarters and afterwards a member of staff will follow them to their own districts to advise.
- Botswana: The gangleaders course lasts 16 weeks; eight weeks in the classroom and eight weeks on the training site.
- RRM Mbeya, Tanzania: All recruited trainees will have worked for one year as headmen with the project. They then spend one month in the classroom, followed by two months on a nearby site then a further nine months under general supervision.
- RRM Tanga, Tanzania: The trainees start with two weeks familiarization on site, then four weeks in the classroom followed by four and a half months on a training site. After this first six months period they are allocated to sites with the trainers following up over the second six month period.

Part of the reason for the RRM projects using a twelve month training programme is to gain approval from the Ministry of Communication and Works for official recognition of the course.

It should be a precondition that in all projects involving training, a counterpart contribution should be written into the project document for cooperation in the institutionalising of training. The training courses should be accepted by the relevant ministries as quickly as possible to enable local staff to advance within their own government system. The Zambian project is taking its first step towards integrating their training with the Ministry of Works.

7.3 MOTIVATION OF TRAINEES

Generally younger new recruits show a greater willingness to learn than "old hands" who are being introduced to new methods. However refresher courses for "old hands" are important to introduce them to the new system even if they cannot cope with the main training programme.

Rewards such as promotion on addition of a salary increment will encourage staff to train and perform well on courses, especially those returning for a second or third course.

The roads programme in Kenya has been running for at least fifteen years and they are now experiencing

difficulties in finding people.

One suggestion to ease this difficulty was to run problem solving courses instead of refresher courses. The training could take the form of discussions on site problems brought forward by the participants and therefore would be more relevant to the practising foremen/supervisors.

7.4 TRAINERS OR TECHNICIANS - WHO SHOULD BE TRAINING

Ideally a person who combines both skills should be the best trainer. It was felt that the person who is doing the training must be technically capable as a lot of the training takes place on site and he must be able to answer the questions that arise. However a technician must have the ability to communicate well if he hopes to impart knowledge as a trainer. The question was raised as to the possibility of experienced engineers being offered training as trainers.

7.5 ASSISTANCE FROM LOCAL TRAINERS

It is a great advantage if the expert can be assisted by a local trainer as early as possible to assist with local problems, language difficulties and accurate feedback from the trainees.

It is important that there is a good relationship between the trainer and the engineer at site. Innovation should come from the site and be fed back to that the course and course notes can be adapted to suit the new development.

In Mozambique the on site training was carried out by the local supervisors, who were used as instructors. All material was prepared in Portuguese by them. Botswana has courses for training trainers and are assisted by the local teaching college on subjects such as lesson plans. Lesotho has also trained trainers successfully. Kenya offers a course for training trainers in the Kenya Technical Training Institute.

As a result of the proposed expansion of labour based work in the road sector in Tanzania there is an urgent need for co-ordinated training. The presently available Government courses do not offer any practical training which is essential in such a practical subject, however need for proper training in labour based techniques is not always appreciated.

7.6 SHOULD TRAINING BE KEPT ON A SEPARATE SITE

By keeping training sites separate from the other project sites, the trainer can concentrate on achieving the quality of finished road he would like the gangleaders or foremen to produce. There were mixed opinions as to whether the construction techniques should be tried on site first, then the training materials developed and courses started, or whether the training should be done before any start to construction work. The fear in leaving the training to after the start of construction is that its importance is lost when production targets are being given priority.

7.7 CHOICE AND AVAILABILITY OF TRAINING MATERIALS

A lot of training material which has been prepared for road projects can be adapted to suit new projects in different countries. The problem can be in getting this material quickly and easily. It was therefore suggested that a list be drawn up of the available training material which could be circulated to all projects.

As a lot of manuals are large and expensive to reproduce and post, there was a suggestion that ILO Geneva could circulate training manuals and other training materials on computer diskettes. They would be easier to send and could be easily edited and altered by the project staff who receive them.

There were several requests for more videos, some on specialist subjects such as stone arch bridge construction, and other more general ones but filmed in Africa. At present the ILO training videos are from Thailand.

Some projects were making their own videos and if copies were sent to ILO Geneva perhaps they could be edited and used generally. There could be technical difficulties with the quality and durability of the video tapes if taken on a home video camera. A video camera was recommended for all projects as an aid to training.

7.8 COURSES

At present, the emphasis for funding of courses by donors, lies in the funding of PHDs and Mscs. Donors should be encouraged to look at the possibility of funding training for the lower levels of staff such as promising technicians. They could be offered further training in local institutions as well as overseas courses. This would not exclude the continuing funding of PHDs and Mscs.

ILO provides training courses through their training centre in Turin. A syllabus is available from ILO Geneva. In addition the ILO is offering courses in the management of labour-based programmes in Kisii, Kenya. This is aimed primarily at engineers but it is hoped to expand to other target groups in the near future. Information is available from the ILO Regional Adviser in Nairobi, and from EMP/INFRA in Geneva.

7.9 AGREED PLANS FOR ACTION, TRAINING MATERIALS

WHAT	WHY	WHO	HOW
Improved access to existing training manuals	Development of tailor made courses made easier	Geneva/Nairobi/ Projects	Use of computerised data. Listing of materials Editing of project made tapes?
More videos on specific subjects and regions	Improve quality and ease of training	Geneva	Improved distribution of videos Video cameras on projects Ask projects about video subject needs

**SESSION 8
MAINTENANCE**

8. DISCUSSION ON MAINTENANCE

DOES THE LENGTHMAN SYSTEM WORK?

8.1 LENGTHMEN SYSTEMS IN OPERATION

Kenya: There are approximately 5,500 lengthmen covering at least 8,000kms of roads for routine maintenance. The supervision is arranged as follows:

Maintenance Inspector (1) (Officer in Charge O.L.C)	1	
Overseer (2)	1	1
Headmen (20)	10	10
Contractors/Lengthmen (160 to 200)	8 to 10	8 to 10

One hundred lengthmen cover a length of approximately 150kms.

A study was carried out in Kenya which showed that overseers spent only 25% of their time actually supervising the work. 60% of their time was spent travelling on their motorbikes and the other 15% was taken up with administration. A second study in 1987, showed that the lengthmen system was only working to 50% efficiency so that the monitoring was tightened to try and improve the situation.

Botswana: Out of 9 districts 8 operate in groups of maintenance workers and the remaining district operates a lengthmen system. People generally prefer to work in groups of about 5 under a team leader. The team leader will have attended a training course. Tasks are assigned and checked in both systems to ensure reasonable productivity.

Lesotho: The lengthmen have chosen to work in pairs in Lesotho to enable them to work with company over two lengths of contract.

Mozambique: Lengthmen work for 5 days every week covering a length of 2.5km each, for the maintenance of gravelled roads. Gravel is dropped every 500m to assist them in the maintenance.

Mbeya, Tanzania: There are two systems in operation (I) lengthmen, (II) Gangwork. There is a headman for every 6 to 8 people depending on the terrain. The main supervision is to follow up these headman. The foremen/overseer goes to each site every 2 days. The District Inspector goes to each site once a week. To date Mbeya have had better results from the lengthmen than from the gangs. The headmen are selected from the rehabilitation sites and given 3 weeks training.

8.2 HEADMAN

There are three options for the headmen.

(i) A headman who has a length of road to maintain but also has a responsibility to supervise others.

- (ii) A headman who has no road to maintain but solely supervises the lengthmen under his charge.
- (iii) A headman in charge of a small group of workers that cover a longer stretch of the roadworking together rather than individually.

In a study in Kenya the non-working headman in charge of individual lengthmen showed the best results for maintenance. If an emergency occurs then the headman has the authority to group his lengthmen and tackle the urgent problem as a single gang.

Mbeya also believes that the lengthman system is more efficient than the gang work system.

8.3 COSTS OF MAINTENANCE

For Mbeya Region, the lengthman system would need 80,000,000 Tsh per annum, but the Government is proposing to provide only 40,000,000 Tsh for the next financial year. In Kenya 80% of road work funding is from donor and maintenance uses approximately 33% of the funds. The Government is only able to provide 60% of the funds needed for maintenance if it carries out no rehabilitation works at all. The Kenyan costs for routine maintenance are roughly US\$300 per km.

From these figures it looks as though Governments will have difficulty funding their road maintenance activities even when using the economic lengthman system.

8.4 SUPERVISION VEHICLES

In some roads programmes it is possible to share supervision vehicles for maintenance with other activities such as regravelling and rehabilitation. This would spread the cost of the vehicle over three activities and ensure that it stayed in the roads sector.

The Zambian roads programme is based at district level and because of the shortage of funds some district councils do not have any vehicles. Can they afford to have a vehicle for the roads inspector? Can they fuel it and repair it?

8.5 ALTERNATIVE METHODS OF MAINTENANCE

The questions to be considered are:-

Which is the best system?

Which is the affordable system?

Could the local community be relied upon to put pressure on the headman to maintain their road properly. The evidence suggests that this does not work, and that the road will not be maintained properly, if at all, therefore supervision is needed.

There were three proposals:-

- (i) Use of labour contractor to carry out maintenance.
- (ii) "Periodic" routine maintenance where a gang of workers, under close supervision, would carry out road maintenance work once every two or three months.
- (iii) A lengthman system where the workers would be laid off during 3 to 5 months of the dry season.

Any lengthman system will have difficulty in operating in areas where villages are far apart i.e. 20km. Can a system of carrying out maintenance once every three months be sustained, or if there are administrative problems and the Supervisor does not appear, will all maintenance work stop. With the lengthman system perhaps it can continue more easily even if there are administrative problems as it is routine and continuous. Is 1.5km with a three day working week the optimum output for each lengthman?

To be able to assess the various methods some investigations must be carried out. In Kenya they are about to start a study in different climatic regions, over section of road with varying gradients and soil types to assess the optimum length for the lengthmen working in these different conditions.

Practical, not theoretical trials are needed on the alternative proposals as they have not been tested. Each roads programme should try out the different methods and compare costing, transport etc. These factors may change from region to region and country to country, thus making it necessary for each programme to run its own trials.

8.6 MAINTENANCE OF ROADS WHICH HAVE NOT BEEN REHABILITATED

A clear distinction must be made between the routine maintenance that can be carried out on a properly rehabilitated road and the spot improvements or emergency repairs carried out on an unrehabilitated road. If, as is the case in Tanzania, a priority road network for the Regions has been decided, these are the roads that are to be rehabilitated and properly maintained using routine and periodic maintenance. Some of the roads that fall outside the network may have to be kept open and so will receive "maintenance" in the form of emergency repairs or spot improvement. Care must be taken that the funds set aside for the priority road networks are not lost in frequent emergency repairs on non-priority roads.

Donor policy may have been at fault in the past in encouraging the rehabilitation of roads without considering the implications for the cost of regular maintenance. A world Bank study stated that for every kilometre of road rehabilitated in Africa, two kilometres are lost from lack of appropriate maintenance.

8.7 CONCLUSIONS

All roads programmes should make trials of the various maintenance methods listed in Section 9.5 above and compare the results for their own area, with those obtained using a straight forward lengthman system. Without trials any advice on maintenance will be based on speculation only.

SESSION 9 - WORKER MOTIVATION

9. DISCUSSION ON WORKER MOTIVATION DAYWORK, TASKWORK, PIECE WORK

WHAT DIFFERENCE DOES IT MAKE?

9.1 PIECE WORK

As a result of the introduction of piece work in Tanga Region the supply of labourers is just about adequate to meet demand.

Using the task rate system the percentage of worker days used for Adjustment and Support Tasks was 40% of the total worker days used to complete the roadworks, however under piece work this figure dropped to between 17% and 25%. Average productivity is 3 pieces per labourer per day on earth works. Previously if the output had been compared with that suggested in the ILO manuals it was only 50% of the suggested values. Under the piece work system this has increased to 75% showing a 25% improvement. The speed of completion of work had increased and the costs decreased.

After some difficulties RRM Mbeya reached agreement with the Region to try piece work based on the work being carried out in Tanga. The risk that labourers would earn more than the headman was avoided by awarding the headman the average number of pieces his labourers achieved and increasing his rate per piece above that of the rate for labourers. RRM Mbeya stopped using piece work for two reasons.

(i) The administration of piece work had become too complicated.

(ii) The site productivity using task rate was good, 1800 md/km, and in the areas of the Region they are now working in there is no shortage of labourers prepared to work on the road sites under the task rate system.

The difference between Tanga and Mbeya may be that people in Mbeya Region have their own farms to attend to and are happy to complete a task, then be free to attend to their own work, whereas in some areas of Tanga Region there are no other income generating possibilities so that the workers are interested in staying on site longer and completing more pieces.

Many Governments and organisations are wary of piece work as the labourers involved could be subject to exploitation. To guard against this it should be a requirement that all piece work tasks are completed during the length of a normal working day or in less time.

Some participants expressed concern that if piece work was introduced, the quality of the work would deteriorate due to the overseer being stretched and unable to supervise properly, or because of the labourer being anxious to finish one piece to begin the next. Other participants were of the opinion that the increase in wages afforded by the piece work system would increase the workers' motivation and therefore the standard of work would be improved.

9.2 GROUP PIECE WORK AND PETTY CONTRACTING

Group piece work has been tried using groups of people ranging from 3 people working together to much larger numbers working together to complete an agreed section of roadworks.

Only a short stop away from group piece work is the possibility of petty contracting. There are arguments for and against petty contracting. A dishonest contractor could collect his money for completing the roadworks and then disappear without paying the labourers. Close supervision would be needed to ensure that the quality of work was satisfactory and that laws were being observed by the contractor, such as not employing underage children. Would the system of petty contracts be sustainable by the Government after the withdrawal of donors support?

Petty contractors have the advantage that their wages are not compared to the wages of officials as they are outside the Government system. If a contractor carries out poor quality work he can be penalised by not being re-employed and by having payment withheld. This action also acts as an incentive to others to do well if they want to be kept on the approved list of petty contracts. Most government officials are familiar with the concept of using contracts, therefore there should be less obstacles from administration than could be met with new systems such as piece work.

One example for the setting of contract size and price is from Nepal.

In Nepal the project used their own productivity data to work out the rates to be offered to the contractors. The cost was based on worker days x wage rate + 10%. They also limited the maximum size for the contracts. The work had to be completed inside one month and cost in total not more than US\$2000. Any larger contract had to be put to tender and could not be considered as a petty contract.

Ghana has an established system for petty contracting in the roads sector as do many countries in Asia. Madagascar has opted to try a petty contracting system in the near future.

If petty contracting was to be used in Tanzania realistic rates of payment would have to be agreed in advance. If a system could be set up, the financial adviser for RRM Mbeya thought that the administration of petty contracts would be perfectly possible.

9.3 WAGE LEVELS

The daily wage paid by the different projects represented at the Seminar were as follows:

COUNTRY/PROJECT DAILY WAGE
Botswana 2.35
Kenya 1.30
Mozambique 1.10
Zambia 0.50
Tanzania RRM Mbeya 0.40
RRM Tanga 0.40 - 0.80
RUDEP 0.45
Makete 0.30
Ruvuma 0.45

Note: 1 US\$ does not have the same purchasing power in every country.

Many programmes in different countries face the problem of poor worker motivation due to the low level of wages often set by the government of these countries. With low wages for labourers it is very difficult to maintain reasonable task rates. This can result in an increased number of worker days per kilometre. However due to the variation in wage rate it may be possible that the overall cost per kilometre of road will be roughly equivalent between a high productivity lower wage site. Therefore economically the outcome could be the same for the two sites.

Can the setting of wage levels be decided by the Engineer alone if some flexibility is allowed by Government. The setting of wages may be a multi-sectoral decision, influenced by industry in the area, agriculture nutrition, or social problems. All Engineers should be aware of the impact a road rehabilitation scheme may have on an area. In busy agricultural periods people may be too occupied with their farming to attend the roadworks. Allowances should be made for this. Could a high wage rate attract people away from their farms and result in neglect of their agriculture on which they are dependent once the roadworks are complete? Economists have carried out studies which suggest that even if high wages are offered most rural communities will continue to plant crops as an insurance for the future.

In Mozambique work stops during the monsoons which is the heaviest agricultural period, therefore there is no conflict between roadworks and agriculture.

9.4 DATA AND COSTS

There is a lot of data available on the productivity of the daily work, taskwork and piece work methods of road rehabilitation, however there is little available information on the relative costs of each. Would it be an advantage if engineers could show Regional or National Authorities the relative costs of say daily paid work and task work? There is still a need for easier comparison between regions and countries; but this can be looked at later under the heading "Monitor and Control", Chapter II of this report. Will government accept data from other countries or does each country need their own studies as proof that labour-based methods are appropriate for them? Many participants felt that local trials would help convince people in the area and ensure the most suitable method of working was adopted. Many programmes are now past this experimental stage and have settled either for task rates, piece work or petty contracting.

9.5 WOMEN

The project in Zambia has discovered that foremen acting on their own initiative are giving women, especially women with babies, the lighter road construction tasks. There could be a danger in this if a petty contracting system was to be introduced. The contractor may hesitate to employ women if they are only to be given light tasks, thus resulting in unequal employment opportunities for women.

9.6 CONCLUSION

There is a need for accurate data and costing of the different working systems. The most appropriate system may not be the same for different countries or regions within countries depending on the influence of external factors such as agriculture. The gathering and use of data will be covered in Chapter II "Monitor and Control".

In many cases an improvement of worker motivation is restricted due to the wage levels set by Government and this may be where petty contracting can solve the problem.

To answer the question posed - "Daywork, Taskwork, Piece work, what difference does it make? The answer seems to be that there are differences and that by choosing the system most appropriate to each region an increase in output and reduction in cost can be realised.

**SESSION 10
MONITORING AND CONTROL**

10. DISCUSSION ON MONITORING AND CONTROL

**FORMS AND COMPUTER PACKAGES
CAN WE ACHIEVE A STANDARD?**

10.1 REPORTING FORMS

All programmes have developed their own reporting system, often based on systems used in other established programmes then adapted to suit their own special circumstances. However, a stage may have been reached when sites are generating information and completing forms which may not be used by office staff. Even if the information is used by the office staff it may not be fed back to the sites to enable action to be taken on the site performance.

Perhaps a more satisfactory system would be to reduce the number of forms issued to site and ensure that the information gathered would be useful to management and site staff. A basic two form system of reporting could be introduced using a weekly form and a monthly form. The results from the weekly form could be fed back to the sites on a weekly basis, and the monthly report submitted to management for overall appraisal.

The Botswana programme is using a reporting system with diagrams to clearly indicate the site performance on the feed back to the sites. They are requesting only 4 forms to be completed on site.

On many reporting forms for use on site there is also a planning section to assist the foremen/overseers to plan the days work. Most participants felt that the planning part of the form should only remain in use during training and that once the foreman/overseer had gained sufficient experience in site organisation it should be removed, leaving the reporting section only.

10.2 ILO MICRO MANAGEMENT PACKAGE (MMP)

10.2.1 SETTING UP THE MMP

There is a new manual now available from ILO Geneva which should enable anyone to set up the MMP system on their computer. It has been designed to assist everyone, even those people with no previous computer experience. A request was made for a tutorial disc. A demonstration disc is already available based on a roads project in Mafeteng but a complete tutorial disc could be considered.

The MMP should be delivered to projects before the beginning of construction to avoid any backlog of information building up which would be time consuming to enter. The recruitment or secondment of a suitable operator should also be dealt with at the start of the project.

10.2.2 MANUAL REPORTING SYSTEM

Many participants expressed fears that dependence on the computer alone could create problems therefore most were in favour of a back-up manual system using the same forms and information as the computerised MMP. In Zambia, where the roads programme is operated on a district basis, it could be

impractical introduce computers in each district. The districts could continue manually and at Regional or National level the results could be combined using computer.

The Tanzanian Rural Roads Engineers present were interested in adopting a parallel system of manual and computer reporting.

10.2.3 SUSTAINABILITY OF THE MMP

As with all road programmes one of the important issues is the sustainability of any system introduced using donor funds. The MMP was designed as a management tool to be left with the national organisation once the donor finance and expertise was withdrawn. The back-up of a manual system could help in the event of a failure in the computer system, however the MMP has been deliberately designed so that it can be operated by a trained clerk or secretary and will not therefore rely on the engineer in charge of road rehabilitation being able to set aside time to enter the data.

Problems such as the continued gathering of information from the site and the feedback to the site can affect the sustainability of both the computerised and manual system. Some of the participants felt that as computers will be more and more in use, in all parts of the world and in all sectors of industry, we should accept this and consider making good use of this versatile tool. Encouragement in training in the use of the computers as a management tool should continue and help to ensure sustainability.

10.2.4 OUTPUT AND COMPARISON

The MMP is a project based program therefore the input and output can be tailored to suit the type of construction activity i.e. dam building, irrigation schemes, maintenance activities etc.

Using the MMP will give a certain uniformity in the presentation of results from site work. This uniformity will enable easier comparison of projects between different areas or countries. (This could, on a regional scale, provide healthy competition between districts based on their comparative results). Having comparable information may highlight differences in performance that could be fed back by national headquarters or ILO to the individual project's managers.

The monthly output from the MMP includes a cost report for the month and the cumulative total for the project up to the end of that month.

These figures are to provide the manager with an estimate of cost compared to progress and the distribution of costs within the project. They are not an auditable accounts statement.

The program may have limitations when used in a region employing both machine-based and labour-based techniques. In this case additional forms may be required to cover the machine-based section.

10.3 GENERAL COMMENTS

When engaged in a national programme it is important to identify who needs what information. The mandays per metre of ditching is information that is of interest at site level in order to highlight problems which affect overall output. (There could be a danger that detailed information such as the number of mandays per metre of ditching is passed on to headquarters who are interested in the overall outputs and costs.

10.4 AGREED PLANS FOR ACTION, MONITORING AND CONTROL

WHAT	WHY	WHO	HOW
Feedback on MMP by Geneva	To assess usefulness and to improve Package	Project Experts	Information from use in the field

SESSION 11 - SUMMARY AND OPEN DISCUSSION

WHERE DO WE GO FROM HERE?

11.1 PROPOSALS

All participants agreed that the seminar had been extremely useful and that it should be repeated. After some discussion the following proposals were agreed upon:-

Format:

Papers to be presented could be circulated in advance to the participants to enable them to prepare any comments.

The number of topics presented could be reduced to allow a greater depth of discussion and consensus.

Papers could be called for, from any participant, on the main topics for discussion.

Small working groups on special issues was not favoured as all topics would be of interest to all participants.

Issues:

Some suggested topics for the next seminar were: labour rates, maintenance - how to do it, tools and equipment - innovation.

Length of Seminar:

3 days

Timing:

October 1990 or February 1991, depending on the progress with the Agreed Plans for Action.

Location:

Kenya, within a 2 hour travelling radius of Nairobi.

11.2 GENERAL REMARKS

Counterparts would be welcome to participate in the coming seminar provided they are experienced in the field of labour-based road construction.

A report from the first seminar should be sent to all donors.

A list of all projects/programmes and the experts working in the Region should be circulated bi-annually by ILO Geneva or Nairobi.

There were no specific proposals from the participants at the seminar to alter the level of support being received from the Regional Office. However the Agreed Plans for Action contain a number of activities to be carried out by the Regional Office, principally in the areas of information dissemination and

coordination. It can therefore be concluded that the number of site coordination. It can therefore be concluded that the number of site units are appropriate but more back-up and follow-up is required.

ANNEXES

LIST OF PARTICIPANTS AND ADDRESSES

Mr Eivald Skau	Regional Roads Engineer Rural Roads Maintenance (RRM)	P O Box 811 Mbeya Tanzania
Mr Dejene Sahle	Senior Roads Inspector (RRM)	As above
Mr B J Mwangupili	Training Officer (RRM)	As above
Mr Truls Hjortnaes	Programme Co-ordinator (RRM)	P O Box 9231 Dar-es-Salaam Tanzania
Mr John Marshall	Monitoring & Evaluation Engineer RRM	As above
Walter Illi	Senior Training Engineer RRM	P O Box 590 Tanga Tanzania
Mr Beda Donasian	Engineer RRM	As above
Mr S. M. Kipande	Rural Roads Engineer	P O Box 258 Mbeya Tanzania
Mr Sosthenes Rugaiganisa	Rural Roads Engineers Regional Engineer's Office	P O Box 4 Sumbawanga Rukwa Region Tanzania
Mr K. Selvarasa	Roads Engineer Makete Integrated Rural Transport Project	C/o ILO Area Office P O Box 9212, Dar-es-Salaam
Mr Simon Gillett	Chief Technical Adviser Special Public Works Programme	As above
Mr Ulf Brudfors	Associate Expert Labour Intensive Roads Project	c/o UNDP, P O Box 54 Gaborone Botswana
Mr Bengt V Sundin	Senior Adviser Field Training Unit	As above
Mr Mukesh C. Gupta	Chief Technical Adviser Labour Based Road Construction Programme	c/o UNDP P O Box 459 Maputo Mozambique

Mr James Agingu	Engineering Advisor Technology Unit Minor Roads Programme (MRP)	P O Box 2254 Kisii Kenya
Mr Gary Taylor	Planning & Monitoring Eng. Engineer Minor Roads Programme (MRP)	c/o Swiss Development Cooperation P O Box 20028 Nairobi Kenya
Mr John de Blaquiere	Project Co-ordinator Labour Based Feeder Road Training & Production Project (LBFRTTP)	P O Box 410720 Kasama Zambia
Mr Joseph Connolly	Production Training Engineer (LBFRTTP)	As above
Mr Terje Tessem	EMP/INFRA	ILO CH 1211 Geneva 22 Switzerland
Mr David Stiedl	Regional Adviser ILO	c/o UNDP P O Box 30218 Nairobi Kenya
Ms Jane Ritchie	Consultant ILO	

**LABOUR-BASED TECHNOLOGY
A REVIEW OF CURRENT PRACTICE**

Karibuni Centre - Mbeya - Tanzania

26th to 28th February 1990

AGENDA

Day One

08.00 - 08.30	Introduction to the Seminar (Dave Stiedl, ILO Regional Adviser, Nairobi)
08.30 - 10:00	Low cost structures - local resource alternative to high spec. materials. (Garry Taylor, Minor Roads Programme, Kenya)
10:00 - 10:30	Coffee
10:30 - 12:00	Control of alignment - more science at site level? (John Marshall, Regional Road Maintenance, Tanzania)
12:00 - 13:30	Lunch

13:30 - 15:00	Haulage of materials - the options from ox carts to tipper trucks. (Walter Illi, Regional Road Maintenance, Tanzania)
15:00 - 15:30	Coffee
15:30 - 17:00	Self help - a viable option for road construction and maintenance? (Jane Ritchie, Consultant, ex project engineer, Rukwa labour-based roads, Tanzania).

Day Two

07:30 - 12:00	Site visit - the use of light equipment in road rehabilitation. (Dejene Sahle, Regional Road Maintenance, Tanzania)
12:00 - 13:30	Lunch
13:30 - 15:00	Training materials - can there be a definite set? (Bengt Sundin, Labour Intensive Road Programme, Botswana). (Joe Connolly, labour-based Feeder Road Project, Northern Province, Zambia)
15:00 - 15:30	Coffee
15:30 - 17:00	Maintenance - does the lengthmen system work? (James Agingu - Minor Roads Programme, Kenya)

Day Three

08:30 - 10:00	Worker motivation - Daywork, Taskwork, Piecework, what difference does it make? (Ulf Brudefors, Labour Intensive Road Programme, Botswana). (Walter Illi, Regional Road Maintenance, Tanzania)
10:00 - 10:30	Coffee
10:30 - 12:00	Monitoring and Control - Forms and computer packages, can we achieve a standard? (John de Blaquire, Labour-Based Feeder Road Project, Northern Province, Zambia) (Terje Tessem, ILO, Geneva)
12:00 - 13:30	Lunch
13:30 - 15:00	Summary and open discussion - where do we go from here? (Dave Stiedl, ILO Regional Adviser, Nairobi)

SUMMARY OF AGREED PLANS FOR ACTION

Low Cost Structures

WHAT	WHY	WHO	HOW	DATE
Masonry Trainer/ Guidelines (Identify and and costing prepare)	Increased use of local resources through tech. Info. and costing	Reg. Adv. Experts	Inputs from Experts Consultations	Sept.90
Culvert moulds proven sources	Reliable moulds	Reg. Adv./RRM (Tanza)	Inputs from projects	July 90

Control of Alignment

WHAT	WHY	WHO	HOW	DATE
Revised level control guidelines	Improved and sustainable road standard	John Marshall/ Walter Illi	Information from current projects/site implementation (RMM will support, setting out manuals from each project)	Sept 90

Haulage of Materials

WHAT	WHY	WHO	HOW	DATE
Trailer sources and designs	More appropriate trailers	Reg. Adv.	Information from projects	July 90
Circular guidelines on haulage	Facilitate decision making on economic haulage	Reg. Adv.	Information from projects and archive data	July 90

Training Material

WHAT	WHY	WHO	HOW	DATE
Improved access to existing training manuals	Development of tailor-made courses made easier	Geneva/Nairobi/Projects	Use of computerised data listing of materials	Proposals Sept. 90 July 90
More videos on specific subjects and regions	Improve quality and ease of training	Geneva	Editing of project made tapes? Improved distribution of videos Video cameras on projects Ask projects about Video subject needs	Sept. 90 July 90 July 90

Monitoring and Control

WHAT	WHY	WHO	HOW	DATE
Feed back on MMP by Geneva	To assess usefulness and to improve package	Project Experts	Information from use in the field	Sept. 90