CHAPTER 5

IMPLEMENTATION OF THE LABOUR-BASED WORKS PILOT PROJECTS

5.1 Overview of the Chapter

This chapter discusses the implementation of Phase 1 and 2 of the pilot projects, using labour-based works principles and methods in Namibia. The technical aspects, administration and management, labour issues, productivity, costs and performance of contractors etc. are systematically reviewed. Achievements and lessons learned are summarized, and problems experienced are investigated and discussed.

5.2 Management and Organization of the LBW Programme in Namibia

5.2.1 DOT Head Office Level

A Labour-Based Works Unit was established in the DOT for the coordination and management of the LBW programme. The unit resorted under the Division of Construction and Rehabilitation in the Directorate Transport Infrastructure Maintenance and Construction (DTIMC) of DOT. It was headed by a National Coordinator, who was an expatriate civil engineer recruited from Kenya. The coordinator was designated as a Chief Engineer in the establishment of DOT. The dispensation within the MWTC and DOT is shown in Figure 5.1 below.

The National Co-ordinator was responsible for the overall planning, co-ordination and monitoring of labour based projects (DOT, 1995(1)). Some of his principal responsibilities included:

- Liaison with other Government Ministries and non-Governmental organizations to ensure a high level of co-operation among those involved in the promotion of Labour-Based activities.
- Liaison with the representatives of donor and multilateral agencies in matters relating to all LBW technical assistance and other inputs.

- Preparation of annual budget estimates and forward planning.
- Co-ordination of resource allocation including trained manpower, equipment and funds, among the fields units in order to meet the requirements of the approved labour based projects.
- Liaison with the relevant organizations in order to ensure sufficient and timely training of manpower for the implementation of projects.
- Authorisation of the procurement of certain equipment and hand-tools for the projects.
- Employment of consultants
- Authorisation of expenses relating to the payment of labour, site staff and consulting fees.

The sub-division received adequate support from various divisions within the DOT in the following services.

I. Division: Transport Infrastructure, Planning and Design
- setting design standards
- ensuring conformity to design standards
- support to structure design

II. Division: Construction Materials and Road Management Systems
- provision of testing materials equipment
- testing materials

III. Division: Maintenance Roads and Aerodromes (North/South)
- provision of transport for goods and equipment
- monitoring material acquisition (regional offices)
- supply fuel
- supply construction material

The maintenance division had a good set-up at regional level, and was thus able to provide adequate emergency support to the Labour-Based Works Unit.

IV. Division: Construction and Rehabilitation

- supply construction material
- all labour-based road construction
- labour-based training
- labour-based maintenance
- formulation of labour-based policy

V. Division: Plant and Equipment

- supplying the site with plant and equipment
- maintaining the plant and equipment
- providing mechanical backup and support to the site
- providing transport for the equipment

5.2.2 Site Level

The site organogram made provision for a Site Engineer. He was responsible for all activities on site and was accountable for all the work done (ibid). The site engineer received specialist technical support and advice whenever needed; e.g. material specialists, hydrologists etc. The site engineer remained responsible for all site operations irrespective of the presence of any specialist or support personnel. When the engineer was in charge of several sites, the establishment provided for a Senior Technician who became in charge of the daily site operations at each site. Site organization chart is shown in Figure 5.2

5.3 Implementation of Labour-Based Pilot Project Phase 1.

5.3.1 Design Aspects of DR3619

No engineering design of the pilot project road and associated structures was done prior to commencement of construction (Williams, 1992). A basic design philosophy was given in a two page summary in the project document, including standard cross-sections. Broad design parameters were set in line with the then existing DOT policy and labour-based methods considerations. A “design as you build”

approach was adopted. Geometric standards and road cross sections were specified as follows in the project document:

- Marked road reserve width: 30.0m
- Cleared width: 12.0m
- Carriageway width: 5.5m
- Gravelled width: 5.0m
- Min radius of curvature: 160
- Camber: 5%
- Design speed: 60km/h

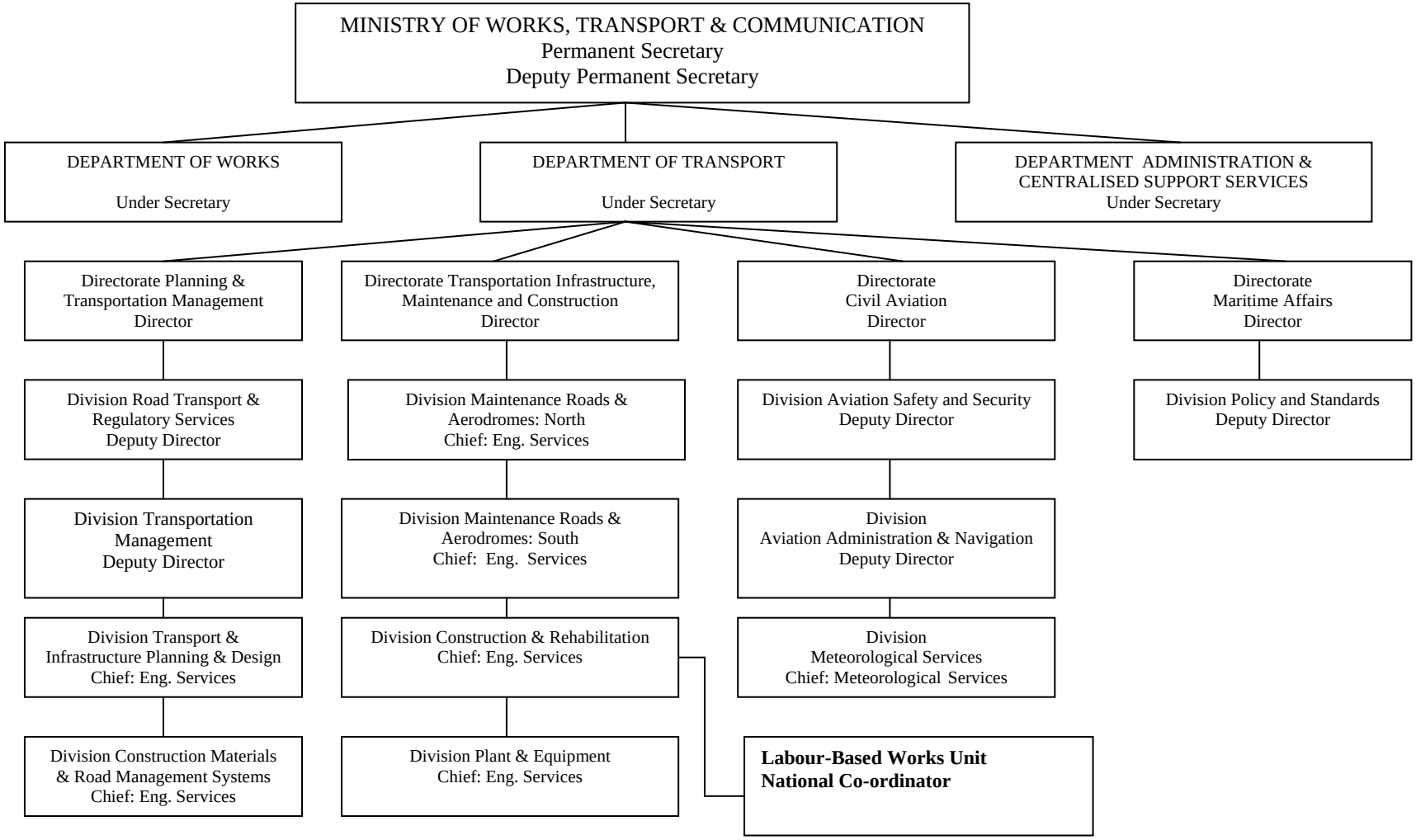

Figure 5.1: LBW within the Ministry Organization in Namibia (1995). (Source: MWTC).

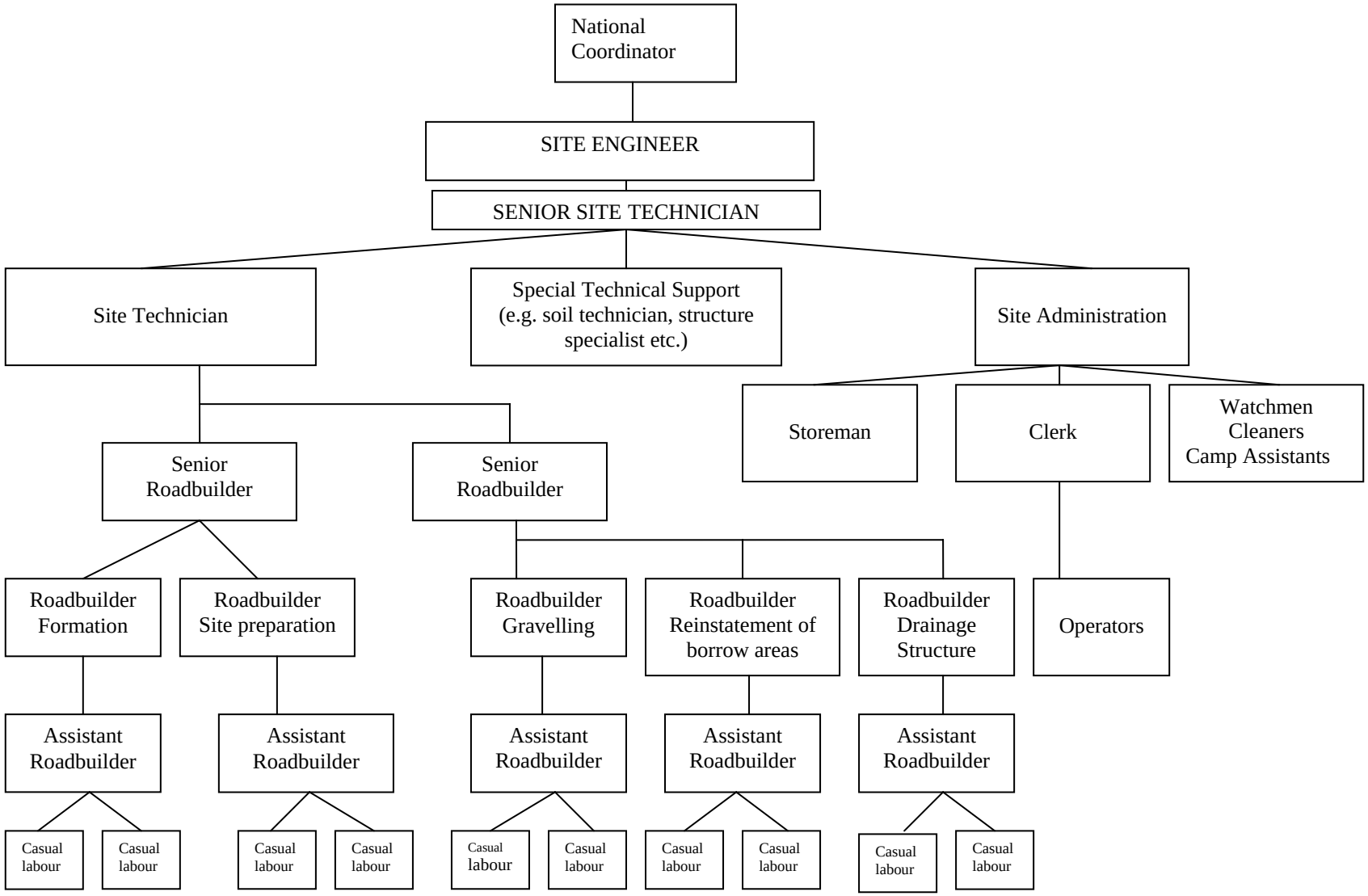

Figure 5.2: Site level organization of labour-based works in Namibia. (Source: MWTC)

5.3.2 Recruitment of Workers

Construction workers were recruited from the villages in the project area. The recruitment of labourers required a careful consideration. This is where employment is created and the poor and the women are targeted. The poor were many in the project area and all required work to earn some living. Job seekers were at the same time part of a community structure or local authority in the area. Order and discipline of approach in recruitment was therefore necessary. Ownership of the project is furthered in the recruitment process. Although these important aspects were considered in the recruitment process adopted the process was beset by a number of problems and challenges (Girvan, 1993).

The first large employment exercise required 80 labourers. Although recommendations for the procedure to be followed in the recruitment of labourers were given in the Project Document, these suggestions were not followed (Pets and Byrnes, 1993). There are two accounts of what happened. In one account, the project watchmen, who was also a headman, was asked to “spread the world” to the local population. Labourers were employed from among the people he informed. In another account, the ILO Technical Advisor contacted only one local headman and asked him to organize 100 labourers. The headman brought his family members and friends, some from distant villages. The recruitment process degenerated into chaos, and site acceptance criteria were devised to exclude people, when more arrived at the gate than required. This led to extreme ill feelings from the people who stood at the camp gates for weeks hoping to be employed. The system was essentially one of exclusion, and was prone to nepotism and corruption. It had a danger of disorienting the public/community regarding all project aspects, including ownership (Girvan, 1993).

This recruitment matter was not taken lightly by other headmen, and through political channels, this dissatisfaction was conveyed to the MWTC and the political bureaucracy in Windhoek. In response, the MWTC/DOT head office directed that a ballot system of recruitment be used in the recruitment process. The handling procedure of the ballot system that was recommended were;

(i) “Decide on the maximum distance from which the labour will be chosen. Locally identify the area by landmarks or villages so that the local population will understand.

(ii) Post notices in English and Oshiwambo at the camp gate, local churches, at local villages and at meeting places. The local chiefs should also be informed (their authority must not be undermined).

(iii) The notices must stipulate:

a. The area from which the people may come
b. How many people are required
c. That everyone who wishes to work may apply, male or female, young or old, weak or strong
d. The date and time they should arrive at the camp gate.

(iv) At a recruitment meeting, a brief explanation about the work and conditions of service should be given to all prospective candidates

(v) The required numbers of candidates are selected using a ballot system. Absolute fair play must be ensured.

(vi) The successful candidate must be given a detailed explanation of the work required and conditions of service. Among the important details are:

- The wage rate
- The system of task work
- The pay periods and first pay date
- Hand tool allocation and responsibility
- Discipline and dismissal
- Probable period of employment
- Medical liability

(vii) Ideally, a small leaflet containing this information in English and Oshiwambo should be distributed.

(viii) The recruitment day is not a working day, and thus not a wage-earning day. After recruitment the people must be informed on which day to report for work" (Source: DOT).

It was also planned in the pilot project to employ supervisory staff as occasional workers, however with a higher wage. This arrangement did not meet the approval of the Public Service Commission (PSC), which directed that such staff should be engaged on contract basis (Pets and Brynes, 1992). The implication of this was that supervisory staff had to be recruited and paid employment benefits like normal civil servants. The process of recruitment, employment and payment of salaries within the public service was a major project nightmare. In addition, renewal of contracts where required had to be accomplished through public service bureaucratic procedures (ibid).

Other problems experienced with the employment of contract staff were that;

- Discipline among contract staff was a problem, and the mechanism to deal with it was bureaucratic. It was easier to wait for the contract period to lapse.

- Selection of contract staff was a problem. There were no trial periods, and it was easy to employ – inappropriate people. Equipment operators are cases in point, which were entrusted with expensive pieces of equipment.

- The administration of contract worker's details was demanding, adding to the already existing administration work.

5.3.3 Construction of DR3619

Construction on DR3619 started in mid-December 1991, after the arrival of the ILO Technical Adviser, and was carried out by force account. Due to project and site management problems arising mainly because of the bureaucracy in the DOT and MWTC, Bicon-Namibia, a consulting engineering and project management firm, was appointed to render site management from September 1992 up to project completion. It was estimated that the project would be completed in November 1992, by which time 14.00 km would have been completed. Although work had been done on many sections, no section of the road had been completed by December 2002 (ibid). The project was completed in June 1993.

Construction issues are discussed in the following paragraphs;

(i) Construction equipment

The basic labour-based works equipment needed for the LIPP was procured through a SIDA financing support. Equipment delivered included tractors (2x4 and 4x4s), graders, trailers, compactors, rollers, fuel tanks and water bowser. Also provided were a fully equipped mobile soil laboratory, testing equipment, field offices and supervisors and staff camping equipment.

Procurement of equipment was made through the Government Tender Board, whose inefficiency led to the delays in the delivery of equipment. The first set of equipment was delivered on site between February and May 1992, against a delivery schedule of January 1992. Haulage trailers delivered were later discovered to be faulty, and required modifications. Records show that it took six (6) months to deliver six (6) trailers for modification from the site in Ovamboland to Grootfontein, 300 km away for allegedly lack of transport in the DOT and MWTC. Tender Board approval was also required to engage private transporters.

All procured equipment was managed and serviced by the Plant and Equipment Division of the DOT. Additional equipment required was hired from the same Division. Hire rates are shown in Appendix 4.

(ii) Construction activities

The construction team on DR3619 started with bush clearing and grubbing operations after determining the horizontal alignment. Permanent chainage markers and road reserve demarcation was done ahead of construction teams. Records show however that the construction sequence was poorly organized due to poor supervision and management. At some point, work was progressing on locations throughout the 14km chainage of the road. Delay in covering completed stages of the work resulted in the loss of moisture, and damage by traffic and weather, requiring considerable rework at substantial costs.

The excavation of material was done in standard excavation bays of 3.1m wide x 0.5m deep x 3.3m long were allocated to each labourer. This dimensional standardization was necessary to avoid volume calculations and set and report excavation tasks by length of excavation bay. The approach was necessary since team leaders and supervisors had little formal education, if any. The excavated material was hauled by wheelbarrows up to 15 metres, and tractor and trailers were used beyond that. Loading gangs of 8- people were used and 4-people were required for tipping. Tractors used were not of uniform capacity, so materials loaded was estimated for each tractor, and was not levelled off due to the problems of balancing the tipping trailers. A productivity of $3m^3$/man-day was achieved by wheelbarrows and a productivity of up to 36 trailer loads per tractor day was also achieved using tractors. A gang of 4-people spread and levelled the dumped material (Williams, 1992).

The excavation of material for surfacing was reportedly well organized and efficiently executed (Petts and Byrnes, 1993). This is in respect of the quarry layout, entrance and exit ramps for tractors, tractor parking bays and loading

positions. Excavation and stockpile was organized and executed in tasks. Task rates of 5m^3/manday were achieved in the sandy-clay material when the materials was moist, and the rate was reduced to 3m^3/manday in hard material in the dry season.

A major problem experienced in the haulage of materials was that the trailers were not designed with a sufficient tipping angle to discharge all the loaded material in one lift. The tractor driver had to jerk the machine violently backwards and forwards until the material in the trailer was completely discharged. This procedure damaged the completed road formation with tractor tyres and the back of the trailer body. This anomaly was so severe that all the trailers had to be sent back to the manufacturer for correction.

(iii) Activity Tasks

Work was carried out by task-work. At the start of each day, individual or group tasks were given to labourers. Task work remuneration was as follows;

- Workers were allowed to go home before the end of the working day and paid for the full day, if they finished the tasks to the satisfaction of the supervisor.

- If task worker completed 8 hours of day work and did not complete the task, such worker was also paid in full for the day.

- Tasks were remunerated at N$10.00[1] for temporary workers (casuals, labourers). Road builders and other contract staff were remunerated slightly higher on a daily basis.

As this was the first pilot project on labour-based works, and both labourers and supervisors were learning, the first task rate schedule was simplified

[1] N$10.00 in 1992 was equivalent to US$3.00 (1992 Exchange rate: 1US$=3.3N$).

and task rates were low. The activity task rates initially specified were later rationalized as shown in Schedule 5.1 below, based on experience from other countries, particularly Botswana whose LBW programme had many similarities to the Namibian programme.

Schedule 5.1: LBPP1: Activity Task Rates Schedule (Rationalized)

Activity	Task	Unit	Task rate
Site Preparation	Setting out	m	60
	Bush clearing	m^2	850
	Stripping	m^2	160
	Grubbing	m^2	160
	Tree/Stump removal	m^2	110
Formation	Alignment	m	Group task
	Excavation (hard)	m^3	2.5
	Excavation (soft)	m^3	5
	Spreading	m^2	75
	Shaping	m^2	50
	Compaction	m	Equipment
Gravelling	Pit preparation	m^2	1000
	Stump removal	m^2	350
	Grubbing	m^2	160
	Excavate to stockpile	m^3	3.5
	Loading	m^3	5
	Haul to offload	m^3	Equipment
	Spreading	m^2	75
	Shaping	m^2	50
	Compaction	m^2	Equipment
Drainage structures	Excavation	Str	1/300
	Construction	Str	1/300
	Backfill	Str	1/300
Reinstate Borrows	Backfill	m^2	200
	Back sloping	m^2	3.6
Finishing work	Borrow pit backfill		1/200
	Road furniture	Group task	
	Fencing	Group task	

(Source: Williams, 1992(2))

(iv) Construction supervision

The supervision plan on this project was poor. At the beginning the ILO Technical Advisor did not get the necessary support and spent the first three (3) months supervising the construction of the camp. Up to mid-year, the ILO Technical Advisor was alone on site, attending to both technical and administrative issues (Pets and Byrnes, 1993). A Site Engineer was seconded to the project by DOT midway through the year, in order to release the ILO Advisor to perform the intended functions of advice and training. The seconded "site engineer" was actually a Surveyor, and engineering input still required the Technical Advisor. A project Foreman was also appointed at about the same time. This "Foreman" entered the project with absolutely no road construction or related experience. As a consequence, operational efficiency fell, workers and task workers were poorly controlled and tasks varied on an adhoc basis. Workers were engaged on marginally productive tasks, record keeping became poor, and construction was not to the design standard (ibid).

According to a report by the ILO Technical Advisor, the calibre of supervisors at all levels proved disappointing and their capacity was lower than that encountered on similar projects elsewhere. The problem was manifested in two areas. First, academically, a low standard of mathematics appeared to be evident in the whole of Ovamboland, with most standard 8 certificate holders having ceased mathematics many years before reaching standard 8. The majority of supervisors had difficulties even in the most basic calculations, and most lacked the motivation and leadership required of a supervisor. Secondly, supervisors were reluctant or unwilling to exercise authority over people from their own community, and paradoxically, the workforce was reluctant to accept directions from people recruited outside the immediate project area (Williams, 1992(1)).

The observation of the Technical Advisor towards the end of the project was that the supervisors on site were far from proficient and that a considerable

amount of further training, on-site supervision and handholding was inevitable (ibid).

(v) The employment of women

The donor for this project, SIDA, required that both men and women be given equal opportunities for employment in the project. Initially it was not advertised that the work was also available for women, and only a few showed up enquiring for employment. Using the local headmen, a special effort was used to advertise and inform the community that women were welcome to work. Subsequently, many women were employed in most activities.

Women employment varied between 35% and 48% of the total workforce. Women proved to be fully capable of performing all activities, and task levels like their male counterparts. In heavy work, women took an average of one to two hours longer than male workers to complete tasks. No work was reserved for women. Also, no women were found suitable for supervision.

(vi) Training

Due to the limited background and capacity of the unskilled labourers and supervisors, the original syllabus was reduced in scope to a level where only subjects deemed essential to a basic operating knowledge were covered. A major constraint in the training programme was that it has not been a full time occupation for either the supervising staff or the ILO Advisor. Both had been principally occupied by construction operations.

It was also envisaged that during the pilot phase, use would be made of external training facilities (DOT, 1995(1)). However, the resources available to the pilot project fell far short of those required to conduct an effective programme of formal training. The internal capacity of DOT was also limited.

(vii) Site administration

Numerous administrative problems beset the project. An attempt to reduce the workforce in September 1992 from about 250 to the then required optimum of about 90 met a concerted resistance from labourers, resulting in a strike and work stoppage. All workers were eventually dismissed and work resumed after seven (7) weeks, with the reduced number of workers.

A review of records of workers grievances advanced and reports of supervisors show that the main problem was lack of communication between the employer (DOT/MWTC) and the workers on site. Site meetings also started six (6) months into the project, and were many times skipped. Communication structures and facilities, workers committees etc were set up after the resumption of work.

(viii) Payment of wages

Payment of wages was made at the end of the month based on attendance from the 26th of the previous month to the 25th of the current month. It was further approved that time and a quarter should be paid for working on Saturdays or public holidays. To avoid complication, the hours worked on such days were multiplied by 1.25, so that the basic hourly rate could still be sued. Thus a labourer completing a standard task on a Saturday would be marked as having worked for 8x1.25=10 hours, for which payment of 10x0.9= R9 would be payable. This allowed pay calculations to be made directly on the attendance register for each gang, with a separate attendance register being used for all the staff.

At the time of implementing the LBPP1, the Regional Engineers' office in Ovamboland was not yet functional. Administrative support was therefore obtained from the Road Superintendent in Tsumeb, and the Regional Engineer in Grootfontein, about 450 km from the project site. This arrangement had logistical problems. Constant problems were experienced with regular, timely and correct payment of the workforce. It is recorded that

this situation continued for a whole year and could not be solved by the DOT or the MWTC, despite constant complaints from site. In addition, payment periods were constantly changed to suit changing administrative procedures in head office. This created confusion and frustration to both workers and supervisors on site.

Although all the basic pay calculations could readily be carried out on site, it was necessary that some higher authority was also involved in the recruitment, discipline, and payment of casual employees. The control of the project budget was done centrally from DOT's head office in Windhoek. Payments for labourers and other project employees were therefore left to be managed in the DOT offices in Windhoek. This arrangement is similar to other countries in which labour-intensive projects have been implemented; a specially created autonomous Department within the parent Ministry coordinated these functions centrally.

(ix) Output and construction costs

Up to November 1992, 22212 man-days had been utilized. It was estimated that an additional 12000 man-days were required to complete the project. The total project man-days would approximate to 2400 man-days per kilometre.

The construction cost of the LBPP1 pilot project was N$5 300 000. The direct costs to the project was N$4 250 000. Adjusting for "pilot costs" (capital cost of plant and equipment and about 10% of repetitive works and delays due to the learning process), the net cost of physical works was N$2 740 000. This translates to an average cost of N$196 000 per kilometre. At the time, the cost of a machine-based gravel road constructed during the same period, under similar conditions in the Ovamboland was N$230 000 per kilometre[2].

[2] In 1992 the exchange rate was 1US$=3.3N$. The cost estimates excludes the Consultant's supervision costs.

5.4 Successes, Failures and Lessons Learnt in Pilot Project Phase 1.

The main success was that labour-based works technology was introduced to Namibia, and a road was built to Onaanda giving local people access to a surfaced road. Project failures were mainly institutional.

The main project failures were the following (Bicon, 2005);

- Poor community liaison lead to the following:
  - Initial rejection of the labour-based road construction method;
  - Inappropriate recruitment procedure which resulted in clashes and increased community hostility;
  - Clashes with landowners who refused to let the road pass through their properties;
  - Construction camp being erected around a tree used as a community meeting place.

- The DOT failed to provide adequate support to the assigned ILO Technical Advisor, and to second experienced technical staff to the project.
- Lack of commitment from many DOT senior managers led to poor communication, poor planning, long delays for repair of broken equipment and delays in the procurement of goods.
- Inappropriate construction methods and poor supervision resulted in a relatively poor complete road.

This project however was the first labour-based works pilot project in Namibia, and there were many lessons learnt. The main lessons were;

- Experience gained in other countries has to be customized to the local environment, as socio-economic and cultural environments differ.

- The main stakeholders in a LBW project (i.e client, consultant and contractors) have to understand labour-based methods and be committed to its principles.
- Community liaison is extremely important, and liaison has to be done with the right community representatives, otherwise the project implementation will not be smooth.
- Recruitment of labour must be pre-planned, transparent and fair.
- Road alignment has to be selected in conjunction with the local community, and should avoid agricultural land as much as possible.
- Construction methods, plant and materials have to be sorted out before work commences.
- Payment to workers and contractors has to be done regularly, correctly and on time. Payment procedures, calculations, deductions etc has to be transparent and correct.
- Proper operational planning, task control, resources control, record keeping and task control has to be done in a labour-based works project.

5.5 Implementation of Labour-Based Pilot Project Phase 2 (LBPP2).

5.5.1 Project Description

The LBPP2 was implemented in Omusati region. The project road covered the area from Anamulenge to Onelago, a distance of 18km. The road alignment covered several communities along the route, and three main growth centres namely Anamulenge, Onawa and Onelago. The route consisted of a multitude of tracks.

The project-road was divided into two equal sections, DR3608A from Anamulenge to Onawa, 9.0km, and DR3608B from Onawa to Onelago, also 9.0km. Design, documentation and construction supervision was done by Bicon-Namibia.

5.5.2 Design Considerations for Phase II

A proper engineering design process was undertaken for this phase of the pilot project, with due regard to labour-based methods and limitations.

5.5.2.1 DOT's design and construction standards

DOT construction standards for new roads vary with prevailing soil conditions and projected traffic levels. Roads in Namibia are classified into three classes; A, B and C. For Class C roads, with projected traffic of less than 25 vpd, a carriageway width of as low as 5m can be provided. For roads expected to carry traffic over 50 vpd, the standard carriageway width is 8m. The standard camber used by the DOT is 3% for Class A roads, increasing to 4% for Class C roads in Ovamboland. These provide an adequate shape to ensure effective drainage of the carriageway.

The DOT material specification for Ovamboland permits the PI of up to 15, and particle sizes of up to 37mm. Field trials in northern Namibia have shown few problems resulting from gravels with a high PI. Gravels with lower PI but larger particle sizes cause difficult driving conditions, and are difficult to maintain as large sized stones often become exposed.

5.5.2.2 SATCC standards

There are nine (9) standard SATCC cross-sections for rural roads. The lowest standard, Type 9, has a single-lane 3m carriageway, with a 2m shoulder on each side, giving a total road width of 7.0m. The lowest 2-lane standard is Type 8, with a 5.5m carriageway and 1m-shoulder width. Type 8 standard corresponds with Class C standard of the DOT.

5.5.2.3 Design philosophy

Roads built by labour-based methods tend to be relatively narrow. In part this results from the provision of an appropriate standard for the low traffic levels that are generally encountered. In addition however, it is experienced in labour-based

road works that costly double-handling of material excavated from ditches can only be readily avoided if the distance from ditch to the centre-line (to where most material should be thrown) is less than 4 metres.

5.5.2.4 Design and construction standards in Namibia

In general, it was particularly important that high construction standards are achieved on the LBPP, as this would set the benchmark for any future labour-based projects in the expanded programme. Nevertheless, unjustifiably high standards were also unwarranted. The standards used in labour-based roads in Namibia and arguments are summarized in the following sections;

- The standard road reserve for DOT in all proclaimed roads is 30m wide. It is normal DOT practice to protect this from encroachment by fencing it, clearing it and establishing white marker posts every 50m. It was considered that on the pilot project such an approach risked alienating the local community, and unnecessarily destroys trees and shrubs. It was recommended instead that the reserve should be clearly marked, but that only about 12m total width should be cleared.

- A design speed of 100km/h was adopted. A minimum radius of 160m was proposed, with a preferred minimum of 225m.

- A 4.5 metre road width was likely to be too narrow, in view of the high speeds in Namibia on relatively straight horizontal alignments and, in some areas, the need for embankments. In addition, in order to keep any standing water away from the road, relatively wide and shallow side-drains were necessary, even though this increased the throwing distance for excavated material.

- The standard of road compaction was designed to be higher than in Botswana, so there was no problems in achieving a constructed camber of 5%, which is expected to settle to close to 4% through ongoing compaction caused by the effects of traffic and weather.

- Embankments are necessary where oshanas occur in Ovambo. Embankment construction can readily be constructed to a high standard by labour-based methods, by simply adding, watering and compacting an extra 150mm layer each day. Typical embankments are up to 500 mm high, occasionally more at culverts of at particularly deep oshanas.

- Pipe concrete culverts are the most common form of cross drainage structure used by DOT in Ovamboland. It was considered that site casting of culverts would be prohibitive as virtually no aggregate is readily available in Ovamboland. In addition the DOT had a strong preference for using reinforced pipes pre-cast in Windhoek. In order to minimize costly earthworks, it was decided to use 600 mm diameter pipes, although these are admittedly difficult to clean when the road width exceeds 5 metres. Drifts were to be constructed using concrete or hollow blocks, with marker posts being used to define the width of the road.

5.5.3 Construction of DR3608

Construction of DR3608A commenced in April 1994 using force account, after a 3-month site training phase for road supervisors. Construction was completed in August 1995. DR3608B commenced in May 1994 and was completed 24 months afterwards in May 1996. The latter was built in two sections referred to here as DR3608B (i) and DR3608B (ii), and construction was done by small contractors on site.

The recruitment approach described in Section 4.6.3 for casual labourers with more emphasis on community participation was used. This approach was successful as complaints were minimal. It was also planned to recruit a total of 27 support staff of various categories, but the actual staff present on site varied from time to time.

Activity tasks for Phase 2 were reviewed as shown in Table 5.1, using the experience gained in Phase 1.

Table 5.1: Activity Task Rates for LBPP Phase 2.

Activity	Task	Unit	Task Rate
Site Preparation	Bush Clearing	m^2	900
	Stripping	m^2	160
	Grubbing	m^2	160
	Tree/Stump Rem.	m^2	160
	Backfill Holes	m^2	160
Formation	Excavate/Load/Haul	m^3	3
	Spreading	m^2	75
	Shaping	m^2	100
	Compaction	M	200
Gravelling	BP Stump removal	m^2	350
	Grubbing	m^2	160
	Excavate to s/pile	m^3	3.75
	Loading	m^3	5
	Offloading	m^2	
	Spreading	m^2	75
	Shaping	m^2	100
	Compaction	M	
	Trimming shoulders	m^3	3.75
Reinstatement Of Borrows	Slopping	m^3	4
	Backfill	m^2	250
Finishing	Road Furniture	man-days	40
	Fencing	man-days	20
	Reinstatement BP	man-days	90

(Source: Bicon, Namibia, 1994)

5.5.4 Analysis of the Construction of DR3608

5.5.4.1 Analysis of Section I: DR3608A

The estimated construction cost of DR3608A was N$1.2 million, which translates to N$136 364/km[3]. The planned monthly requirements and actual

[3] This was equivalent to US$ 38961.00 at the 1995 exchange rate of 1US$=3.5N$.

labour on site during the period April 1994 to February 1995 is depicted in the Figure 5.3 below;

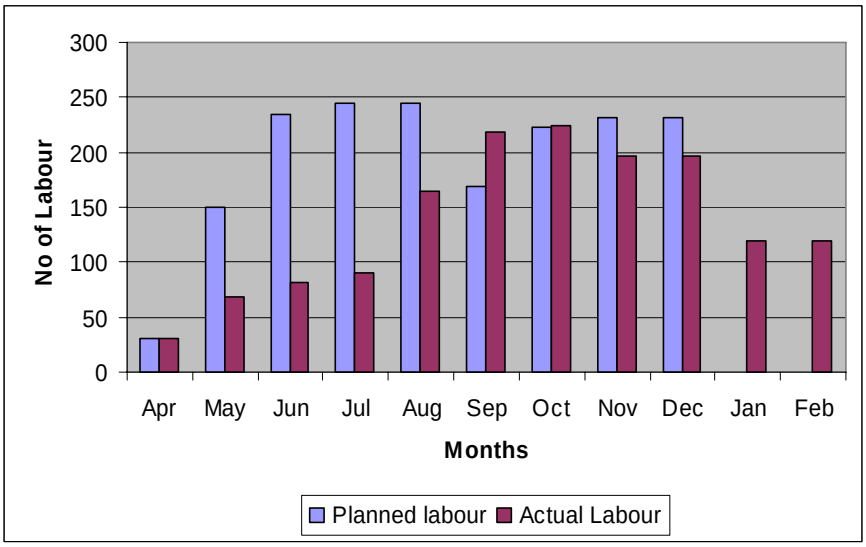

Figure 5.3: DR3608A. Actual vs planned labour requirements.

It can be seen that the actual labour employed in the first five months of the project was far less than requirement projections. A total of 1512 casual workers were employed the project, about 86% of the projections.

The average monthly planned and actual labour requirements for each activity are showed and compared in the Figure 5.4 below. It can be seen that road formation and gravelling activities are the most labour intensive, and the actual manpower utilized approximates the estimated requirements.

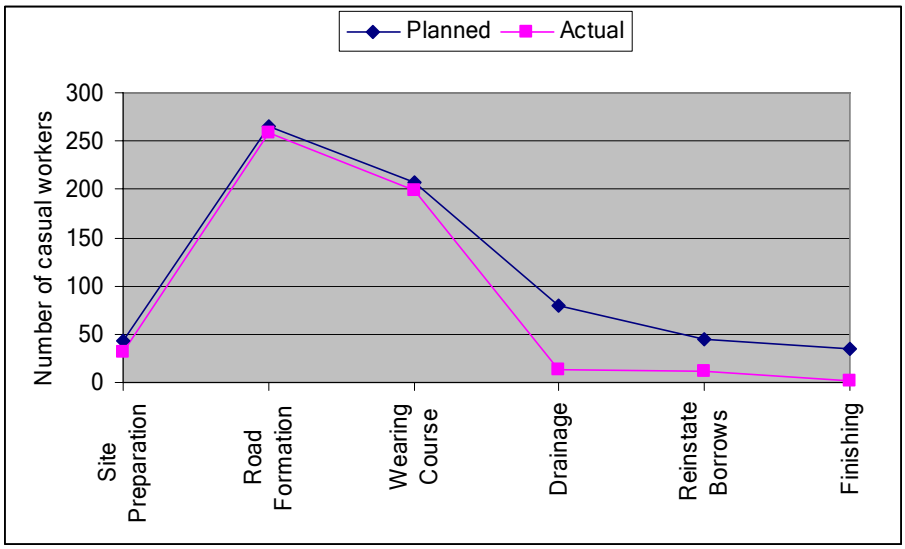

Figure 5.4: DR3608A. Actual vs planned labour requirements per activity.

A total of 27315 man-days of work were projected for section A. This translates to an estimate of 3035 man-days per kilometre. At the completion of construction work, 26637 man-days of work had accumulated, resulting in 2873 man-days per kilometre. The planned and cumulative man-days per main activity and sub-activity are shown in Table 5.2. The monthly distribution of actual man-days is shown in Figure 5.5 below.

Table 5.2: DR3608A; Activity man-days.

Activity	Planned man-days	Actual man-days	Actual/Planned
Site preparation	1672	1603	0.96
Formation	9400	10283	1.10
Gravelling	7566	9320	1.23
Drainage structures	372	2309	6.21
Finishing work	57	1424	24.98
Reinstate borrows	798	1698	2.13
Improvement work	612	0	0
Gravelling improvement	379	0	0
Total	20856	26637	1.27

(Source: Bicon-Namibia, 1994)

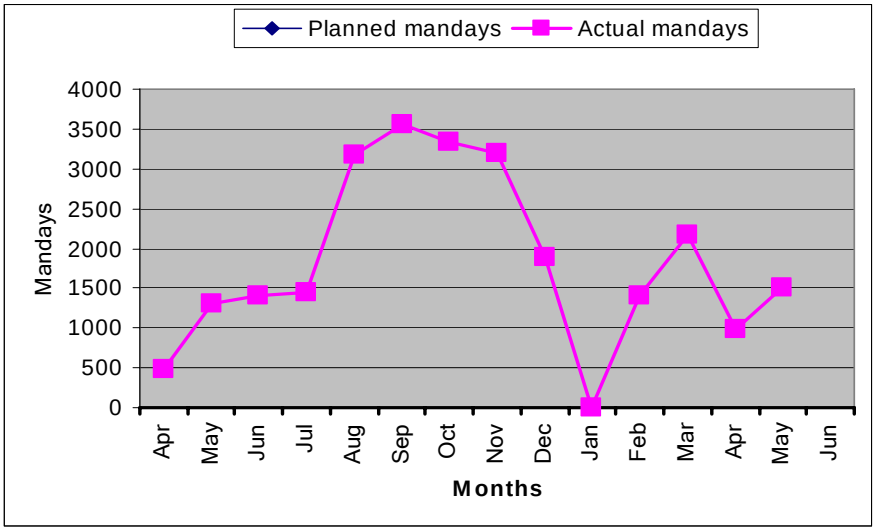

Figure 5.5: DR3608A: Monthly distribution of actual man-days.

The proportions of casual wages to the total labour cost are compared in the following Figures 5.6, 5.7 and 5.8. On average casual labour wages were 53% of the total wage costs.

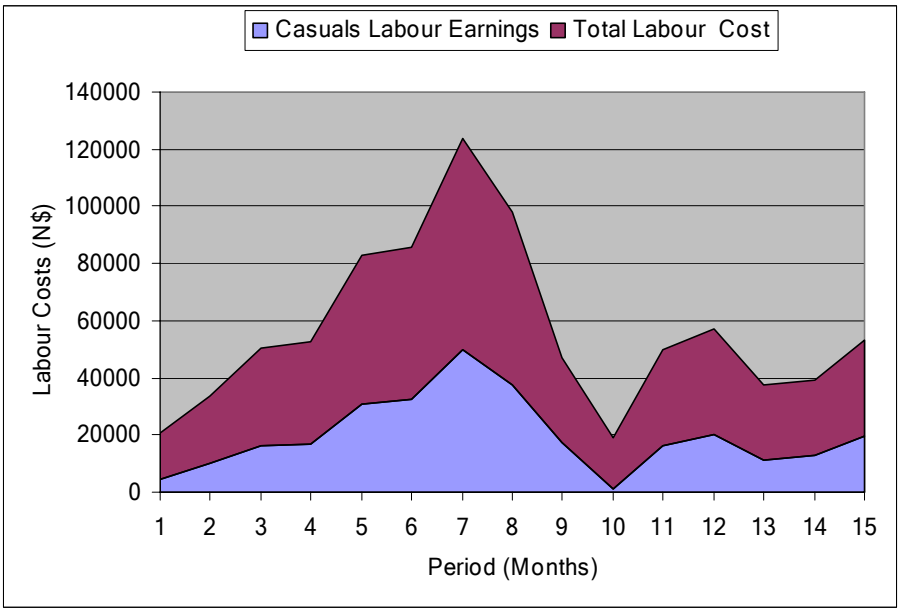

Figure 5.6: DR3608A. Casual wages and total labour costs.

In relation to the total project costs, the percentage ratio for the total labour costs and casual labour wages are shown in the figures below.

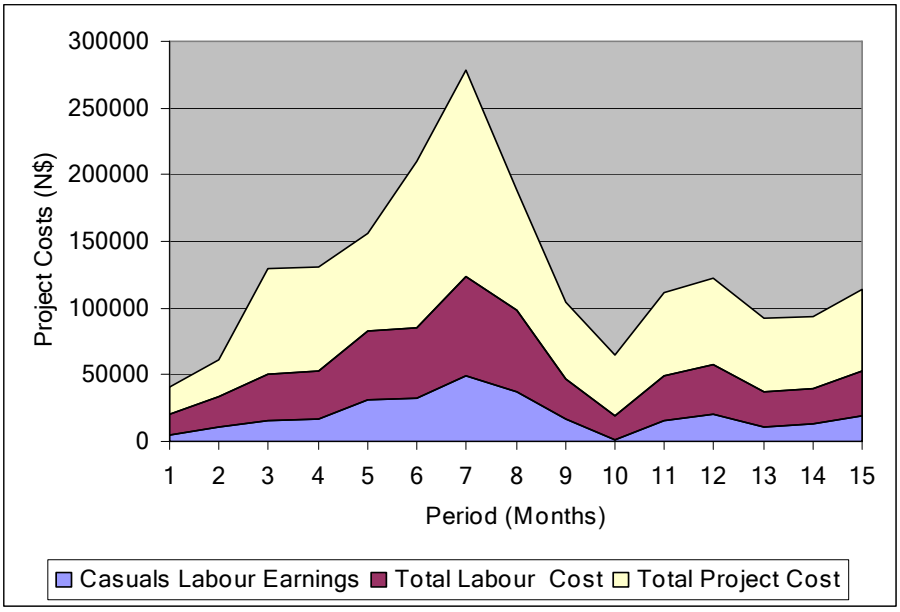

Figure 5.7: DR3608A. Casual wages, total labour and project costs.

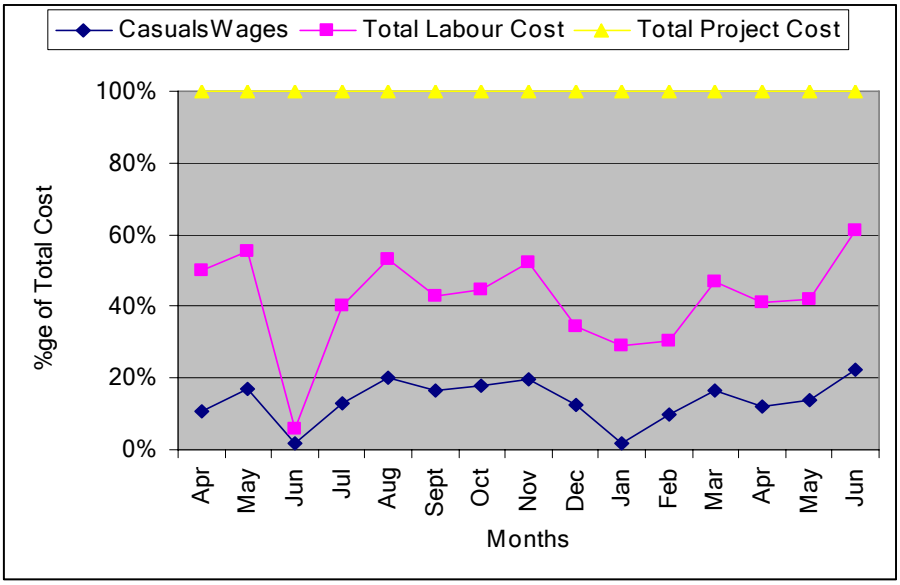

Figure 5.8: DR3608A. Casual wages, total labour costs and total project costs.

5.5.4.2 Analysis of Section II: DR3608B

The construction of DR 3608B was divided into two sections; DR3608B (i): 5.50km and DR3608B (ii); 3.50km. Section (i) was used for the training of small labour- based contractors. Work commenced on section DR3508B (i) on 10th May 1995 from Onawa towards Onelago, and was completed in December 1995, a period of seven (7) months.

The outputs of the resource and activity planning process for DR3608B (i) are summarized in Table 5.3 below. It was estimated that about 10000 man-days would be required to complete this section of the road.

A total of 622 days were used in the construction of DR3608B(i). On average of 106 casual labourers were employed per month, and approximately 12700 man-days of employment were created. Figure 5.9 show the breakdown of days worked per activity and Figure 5.10 shows the monthly labour distribution of labour.

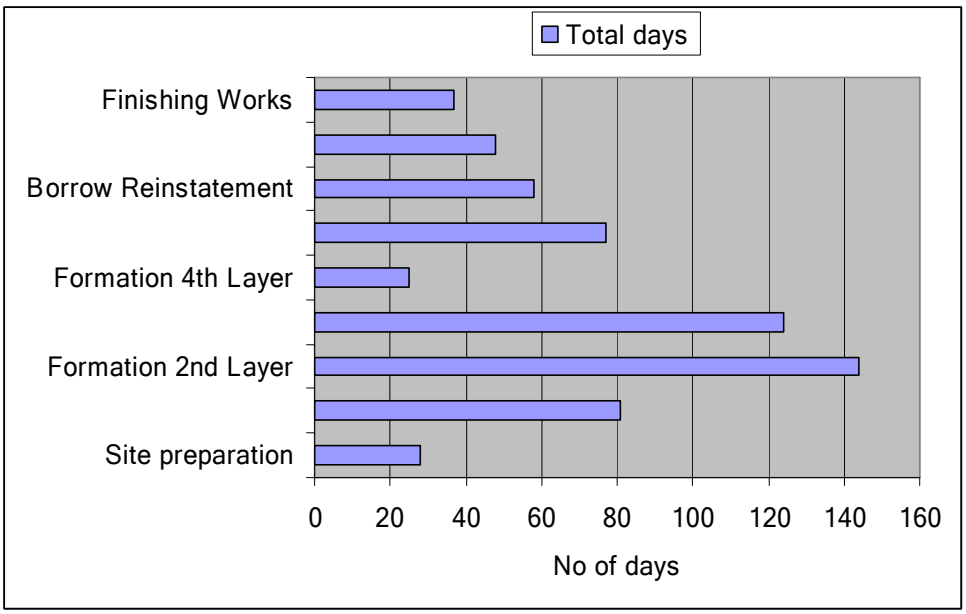

Figure 5.9: DR3608B (i). Number of days per activity

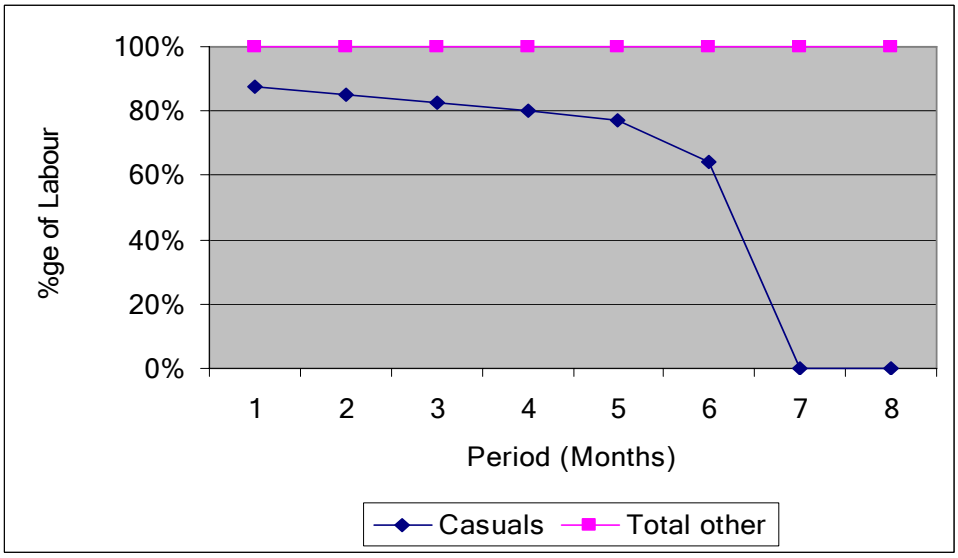

Figure 5.10: DR3608B (i). Casual labour vs Total project labour

Table 5.3: DR 3608B (i); Resource and activity planning summary.

Activity	Task	Quantity	Task Rate	Unit	Man-days	Sub totals
Site Preparation	Bush Clearing	105000	900	m^2	59	
	Stripping	29000	160	m^2	175	
	Grubbing	175000	160	m^2	110	
	Tree/Stump Rem.	73500	160	m^2	230	
	Backfill Holes	28000	160	m^2	175	**749**
Formation Layer	Excavate/Load/Haul	5338	3	m^3	1780	
	Spreading	56000	75	m^2	748	
	Shaping	56000	100	m^2	560	
	Compaction	7000	200	m	70	
Other Layers					1700	**4858**
Gravelling (+ backfill to culverts)	BP Stump removal	8776	350	m^2	26	
	Grubbing	8776	160	m^2	56	
	Excavate to s/pile	4388	3.75	m^3	1171	
	Loading	4388	5	m^3	878	
	Offloading	4388		m^3	56	
	Spreading	29254	75	m^2	391	
	Shaping	29254	100	m	293	
	Compaction	4064		m	41	
	Trimming shoulders	315	3.75	m^3	84	**2995**
Reinstatement Of Borrows	Slopping	1470	4	m^3	368	
	Backfill	17500	250	m^2	70	**438**
Drainage Structures	Culverts: Estimated man-days per Culvert =150; 150 x 4=				600	
	Drifts: Estimated man-days per Drift =250; 250 x 2=				500	**1100**
Finishing	Road Furniture				40	
	Fencing				20	
	Reinstatement BP				90	
	Excavate Waterhole				120	**270**
Grand total						**9973**

(Source: Bicon-Namibia, 1994)

The following schedule of activity data available for site preparation and roadbed formation shows that the used task rates were generally achieved and sometimes exceeded.

Table 5.4: DR3608B (i): Actual vs Planned Task Rates

Activity	Task	Task Rate		
		Planned	Actual	A/P*100%
Site Preparation	Bush Clearing	900 m^2	1468	163
	Stripping	160 m^2	160	100
	Grubbing	160 m^2	215	134
	Tree/Stump Rem.	160 m^2	160	100
	Backfill Holes	160 m^2	145	91
Formation	Excavate/Load/Haul	3 m^3	3	100
	Spreading	75 m^2	251	335
	Shaping	100 m^2	178	178
	Compaction	200 m	389	195

(Source: Bicon-Namibia, 1994)

Table 5.5 below and the figures that follow shows the actual monthly man-days utilized for each activity.

Table 5.5: DR 3608B(i): Actual monthly work man-days

		Site Preparation	Formation Layers	Gravelling	Borrow Reinst.	Drainage	Finish	**Total**
1995	Apr	0	0	0	0	0	0	0
	May	420	917	0	0	0	16	1353
	Jun	198	1521	30	0	0	79	1828
	Jul	0	858	0	28	0	96	982
	Aug	0	648	1102	873	250	96	2969
	Sept	0	1414	274	64	258	61	2072
	Oct	0	451	1390	40	342	31	2254
	Nov	0	0	534	0	80	29	643
	Dec	0	0	500	0	30	42	572
	Total	618	5809	3830	1005	960	450	12672

(Source: Bicon-Namibia, 1994)

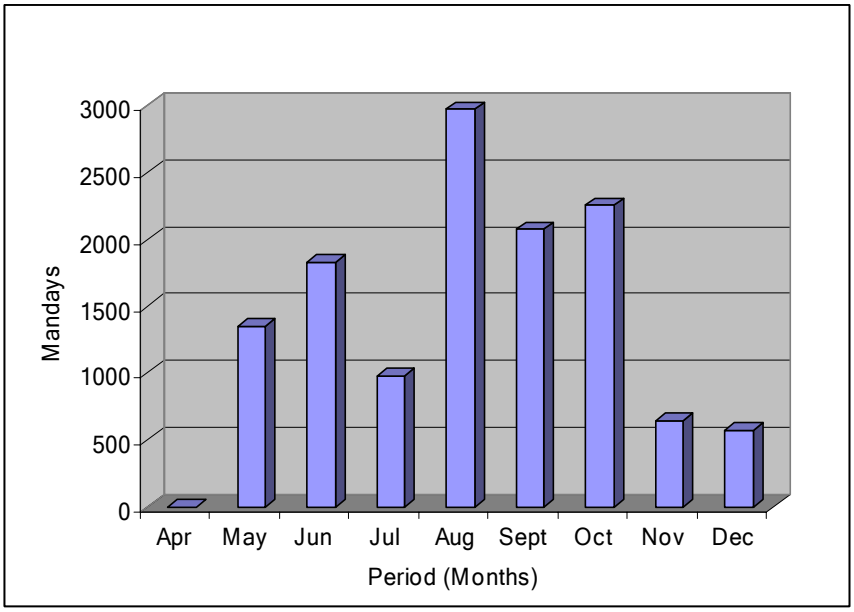

Figure 5.11: DR3608B (i): Monthly total activity man-days.

The highest man-days occurred in August. This is likely the month on which roadbed formation layers were constructed. The distribution also suggests that gravelling works (spreading, shaping, mixing and compaction) were done in the months of September and October. Formation layers and gravelling comprises 76% of the total project man-days. This is also illustrated from the figure below.

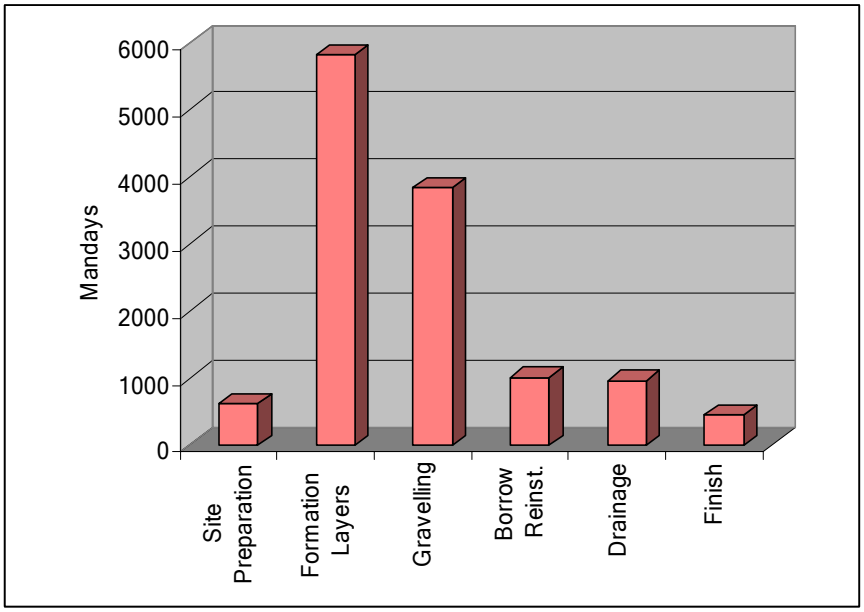

Figure 5.12: DR3608B (i): Comparison of total activity man-days.

5.5.4.3 Analysis of Section III: DR3608B (ii)

Construction on DR3608B (ii) commenced in mid-January 1996 and it was estimated it would be completed at the end of May 1996, i.e. a construction period of 4.5 months. The estimated cost for this section was N$0.475 million which is about N$135 826/km[4].

No meaningful data was obtained for the evaluation of the construction of this section.

5.6 Successes, Failures and Lessons Learnt in Pilot Project Phase II.

There were three main achievements in this phase of the pilot project;

- Proper recruitment procedures were designed and used. A brochure was designed for distribution to the community in the project area prior to the recruitment date.
- Regular and meaningful liaison with the community and traditional leaders was established. All project aspects requiring their input were discussed.
- Appropriate construction methods and procedures were established.

As in the LBPP1, project failures were again mostly related to institutional arrangements as summarized hereunder (Bicon, 2005);

- Poor support from DOT lead to the following:
  - Long delays in procurement and delivery of supplies led to disruptions of work.
  - Payment of labour on time proved very difficult due to bureaucracy and red tape at DOT head office.
  - The Mechanical section failed completely to repair out of service equipment on time. Long stoppages and delays disrupted work.

[4] N$135826 was equal to US$ 38808 (1996 exchange rate: 1US$=3.5N$)

- Materials problems were experienced in construction on site, leading to failures and repetition of several sections.
- The LBPP2 had to establish the most efficient working methods. Several trials in processing of the dominant sandy-clayey materials, dry compaction, and compaction by traffic, etc failed, requiring repetitions.
- Culverts and drainage structures were designed without adequate information on flows and flood records in the Ovambo. During one exceptional flood, most were submerged and roads were closed.

The main lesson learned in LBPP2 was that a labour-based programme and projects cannot be fully successful without the full commitment of the sponsor. Problems that were experienced; non-payment of labour on time, long delays in procurement and supplies, inefficient handling of broken plant and equipment, poor communication etc are all considered to have been due to lack of total commitment of the DOT and MWTC.

5.7 Conclusion

The implementation of both phases of the labour-based pilot projects has been described, reviewed and discussed in this chapter. Successes, failures and lessons learnt have also been briefly presented.

The following conclusions can be made on LBPP1;

- The Labour Based Works Unit was well established as a separate management unit, within the MWTC and DOT and received adequate technical and administrative backup for its programme management activities.

- LBPP1 used task rates in activities. Initially, simplified task rates were set and later reviewed as labourers and supervisors became familiar with the work and methods. In the review of tasks, rationalization of activities was

done and some tasks were combined. Task rates used/achieved in Botswana were used as guidelines as conditions are considered to be similar.

- A total of 34200 man-days of work were used to complete DR3919, being about 2440 man-days per kilometre. Total casual labour wages amounted to approximately N$416 700.00[5].

- The LBPP1 proved that women were fully capable of performing all construction activities and task levels like their male counterparts. This challenges the logic of reserving particular activities for women.

- It was also proved in LBPP1 that it is very difficult to develop LBW contractors and supervisors from candidates without a basic or suitable education background. This is a serious limiting factor for sustaining LBWT in Namibia, if development strategies in regard of targeting of trainees are not reviewed.

- The main lesson from LBPP1 was that community liaison is an extremely important aspect of the project and has to be done throughout the project period. In this regard, the community has also to be involved in some pre-planning aspect of the project, including alignment selection, recruitment procedures, channels of communication, selection of camp sites etc.

- It is important that labour-based pilot projects are implemented within the existing labour legislation and regulatory environment. Although exemptions may be sought initially on various provisions, these create an artificial environment that is not sustainable. When small contractors are developed, they need to be exposed to the challenges of the real operating environment.

- The recruitment processes used initially in LBPP1 was confusing and had the potential to alienate the community. Equally, there was no built-in

[5] N$416700 was equal to US$119057 in 1995 prices.

mechanism for targeting the poor and ensuring the participation of women in the ballot system of recruitment adopted in LBPP1. The recruitment plan in LBW projects has to be formulated in advance and if necessary tested with stakeholders. People have to be informed in the language they understand the recruitment criteria, procedure, dates and venues. Conditions of service have to be explained to the recruited personnel in sufficient detail.

- The low efficiency level achieved in the course of implementation, assessed in terms of the prolonged construction period and relatively high overall unit costs was a weakness clearly identifiable in the first phase. The delay in completion was caused by the high turnover of senior managers, poor site management, inexperienced site labour force, repetition of work, irregular fuel supply, lengthy procurement procedures, frequent equipment breakdowns and long lead times for repairs and poor communication between site and head office.

- There is merit in exploring further the arguments of women groups that participation of women in itself is not a measure of achievement of project objectives, as they are associated with the overworking of women and the neglect of children.

- Site administration, payment of labourers and communication in LBPP1 were poorly organized and required improvement.

The following conclusions are made regarding the implementation of LBPP2 and the analysis of the construction works.

- A total of 1512 casual workers were employed in section A, which was 86% of the estimates. 28858 man-days were utilized, an average of 2873 man-days per kilometre. The estimated figures were 27315man-days and 3035 man-days per kilometre respectively. On section B, 10000 man-days were estimated and 14500 man-days were utilized. Formation and gravel layers comprise about 77% of total man-days.

- The total casual labour wages was approximately N$564 503.00 (i.e. 41815 man-days x N$13.50 per man-day). The proportion of casual labour wages was 53% of the total wage costs.

- Estimated task rates were exceeded in both sections by as much as 55% on average.

- In contrast with LBPP1, a detailed social economic survey was done in LBPP2, community liaison was improved with stakeholders, and appropriate and acceptable recruitment procedures were developed and used. Increased community involvement helped to improve relations with workers and instilled a sense of participation and ownership of the road among community members.

- The communication and support from DOT improved in this phase, but was still poor in respect of mechanical service, timely payment of labourers and procurement. In the case of the latter two, the government procedures were very bureaucratic and largely a bottleneck to the project.

- The pattern of absenteeism from work on LBPP1 and LBPP2 was studied in detail. It is apparent that many casual workers were absent from work when work was harder on the road (as indicated by longer task times and low task rates achieved) and when the walking distance to work increased. In these instances the absence of women was higher. The rate of absenteeism was also high during the ploughing season. Older men and women attended work less frequently, suggesting that they were more involved in crop fields than younger men.

In sum, it is considered that, being the first attempt to implement labour-based works project in Namibia, the projects were a success, despite all the shortcomings. The labour-based concept was proven to be technically viable and had wide community acceptance and social benefits. Contractors and supervisors were successfully trained. The primary indicator of the overall attainment of the project objectives was the decision of the Government of Namibia (DOT and

MWTC) and the donor, SIDA, to expand labour-based construction of roads in the Ovamboland, in undertaking projects outlined in the Master Plan (DOT, 1992).

In the early stages of the pilot project, most of the staff and trainees were on a learning curve, and many felt uncomfortable about some aspect of their duties (Willliams, 1992(1)). It was important therefore that the organization structure had the flexibility to allow the particular strengths of each staff member to be fully utilized, while confidence was built up in areas of weakness, through a combination of training and work experience.

Up to the time of implementation of the pilot projects, the LBW technology programme was not being implemented as a part of a coherent national strategy embodied in a specific policy of Government. The LBW policy development aspect is the subject of the following chapter.

(iv) Sequence of Operations

In a labour-based works operation, the sequence of activities is very important and must receive appropriate attention in design and execution because it has a profound impact on the efficiency of operations, construction time, quality and cost of the eventual product. Double handling is costly and must as much as is possible be eliminated. Roadworks should be planned to proceed through the road in a train of activities. For easy of control and minimizing logistical problems, activities should be spaced out by approximately 1.2 days progress and be not more than 3.0km from the first to the last activity. Structures would normally be programmed separately. An example of the sequence of roadworks activities is as follows;

- *Setting out horizontal alignment*
- *Install permanent chainage markers*
- *Fence or demarcate road margin*
- *Bushclear, remove vegetation and top soil on alignment*
- *Remove any loose sand from road foundation up to 300 mm depth*
- *Set out vertical alignment*
- *Construct roadbed (excavate selected fill, labour, haul, place, water, mix, shape, compact)*
- *Construct formation (ditto as above)*
- *Construct surfacing (excavate gravel, stockpile, load, tractor haul, place, water, mix, shape, compact.)*