

Case Studies of Operating Conditions for Local Drilling Entrepreneurs in Rural Water Supply in Africa

Identifying key factors for private sector success



Sudan



Nigeria



Ethiopia

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Introduction

The overall goal of the RWSN is to accelerate sustainable rural water supply service provision as measured against the Millennium Development Goals (MDGs).

It is estimated that about 600,000 to one million boreholes will be needed in Africa in order to meet the MDG in water supply coverage. Africa also has the highest costs of boreholes compared with other regions. Cost savings and increases in efficiency in borehole production will have a significant impact on the ability of African countries to reach their coverage goals within their budget envelopes.

In many countries, traditionally, government fleets were drilling the majority of the boreholes needed for the provision of safe water to the rural population. Under sector reform, most governments, like Kenya, Sudan and Nigeria, formulated rural water policies in which the provision of services is clearly assigned as the responsibility of local authorities including the provision of services as the responsibility of the private sector. In Ethiopia the public enterprises at regional level are considered the main responsible entities for drilling and other construction activities. Government owned drilling fleets are slowly being absorbed into the private sector. At the same time, with additional funding becoming available for meeting the MDGs, the market is expanding. Establishing additional capacity in a thriving, local drilling industry is critical to ensure accelerated access to safe water for the rural poor. The existing private sector drilling industry is the basis for such development and can make a significant contribution.

Indigenous drilling companies would be best suited to meet the demands of the market. However, African companies often find it difficult to enter into the market. Private operators are reluctant to reach out to isolated rural areas where risks and costs are high. They are equally hesitant to take on public contracts given non-transparent bidding processes, the potential for delays in payment for services, and poor supervisory practices, to name a few concerns. Problems with equipment operation and maintenance, spare part supplies, human resources, tax laws, business registration, code compliance, affordable credit, severe seasonal and annual fluctuations in demand, among many others, make it potentially ruinous to invest significant amounts in drilling equipment and trained staff, which oftentimes result in higher than expected cost structures and sub-optimal operations.

Many local entrepreneurs, however, have taken up the challenges of operating a drilling company. As part of the Rural Water Supply Network's "Cost-Effective Boreholes" flagship (CEB) and the Water and Sanitation Program's "Drilling Entrepreneur Support Initiative" (DESI), the personal experiences of drilling entrepreneurs in three countries have been documented and summarized in order to shed light on the lessons they have learned throughout the process of finding the route to profitability while providing a critical service to rural populations. Entrepreneurs in three countries – Ethiopia, Kenya, and Nigeria are keen to share their perspective.

Objectives

The study objective was to gain an improved understanding of the problems associated with the rural borehole drilling industry from the point of view of the private sector entrepreneur, and based upon these lessons learned suggest policy mechanisms and business approaches that would improve public/private relations in the endeavour to provide cost-effective and sustainable water supply to the rural poor.

Methodology

In consultation with the RWSN Cost-Effective Boreholes coordinator the consultant developed a work plan and methodology for obtaining common information from each entrepreneur, while giving each of the driller's freedom to describe their individual experiences regarding the challenges of borehole entrepreneurship in their specific contexts. The consultant visited the three countries and drillers identified. A considerable number of structured and semi-structured interviews were held with selected partners and other key sector informants. Both qualitative and quantitative approaches were utilized as appropriate. The resulting reports have been co-

authored by the consultant and each driller. The driller's individual stories are highlighted rather than conducting a methodical evaluation of their operations. The following issues, and others, should be highlighted:

- private sector perceptions, knowledge, approaches, rationale, and practices, regarding, among others: national policies, the rural environment, technology choice, risk management, maintenance of equipment, spare parts, productivity, tender and contracting issues, demand analysis, training, financing, human resources, supply of equipment, etc;
- institutional and sector policy frameworks, procurement regulation, applicable tax laws, standards and specifications, and contract supervision arrangements;
- the role of support agencies and or measures that can boost the private sector participation and efficacy, and other recommendations or areas for dialogue between entrepreneurs and contracting entities.

Preface

The review of the working conditions of three small local drilling companies was highly interesting. Drillers are a special breed. The profession does have a special attraction. Drilling is a unique mixture of scientific know-how, tacit knowledge, engineering flair, hard physical work, management ability, and gambling. Therefore drillers are generally unusual people, drilling is more a vocation than a profession. And most of it, it is hard work that needs dedication and innovation.

The following study tries to illustrate examples of resourceful approaches to establish local drilling capacity in Africa. The countries visited are very different. Kenya has a market for boreholes for irrigation of cash crops, mainly flowers for export. The drilling industry has geared themselves up to drill high production boreholes for the flower farmers. This market as such is quite predictable and the relationship between the service providers (consultants and drillers) and the customers is cordial and business like. The big problem created through these boreholes is a degradation of the aquifer and the long term sustainability is questionable. Presently the government does not appear to take enough effective action to preserve the environment.

The South of Sudan has just come out of nearly 30 years of war. The peace process is still very vulnerable. The SPLA government is still in the process of being established and is not yet fully functioning. Communications are difficult and many roads are still full of landmines. On the other hand with the peace agreement large sums of money are flowing into the country. For instance the Multi donor Trust Fund has earmarked USD 76million for rural water supply in the years 2006 and 2007. This amount of funding exceeds the capacity of the government, NGOs and the private sector. Therefore the drilling market in the short term will be expanding and offers opportunities for the local private drillers.

In Nigeria the effects of many years of military rules are still very much felt. The government still needs to find effective ways to fulfil its role as a promoter and regulator. Decentralisation is taking place and the authorities in the Local Governments need to establish their capacity. The drilling market is still characterised by tender processes that are not fully transparent. Contracts are generally given to middlemen. These middlemen then subcontract the drilling work to private sector drillers of various capabilities. Since the supervision capacity of the LGA is limited the quality of the work is not always up to standard. A driller that produces good quality boreholes within the time frame can find a good niche in the market. With growing local capacity for planning, supervision and quality control Nigeria definitely represents a good market potential for small drilling companies.

Ethiopia has undergone a long period of military rule, political conflicts and natural disasters. This resulted in a neglect of the rural water sub sector in the recent past. Only with the change in Government and the opening up from the socialist principles the opportunities for the private sector started to appear. The very young private sector drilling industry is still in the process of building the capacity to meet the demand. With the influx of additional funding for big projects

these young companies are willing to invest in capacity building and equipment. One of their main concerns is that the regulation and directives include several administrative hindrances that make it difficult for local industries to get established in the market.

Accordingly the personalities of the three company owners were somewhat different. In Nigeria and Sudan the companies had been established for many years on a shoe string with little capital and therefore both Sunday Arafan and Tom Armstrong have some strong similarities:

- They both come from the field, and graduated from being drillers into being owners of drilling companies
- They moved into borehole drilling because for them drilling is not a job, it is a vocation. They want to do no other job but drilling.
- They do not mind getting their hands and feet dirty
- They are hands-on professionals who find it easier to solve technical problems than to be great administrators or deal with bureaucratic hassles.

In a way this characteristic puts a special challenge on the drillers. The business environment with development work requires more and more administrative skills.

In Ethiopia Etsegenet Berhe is slightly different breed. He is more the manager type who clearly saw the opportunities in an emerging market and was willing to risk his own capital investing into top class equipment. This decision was based on the concept that a well equipped, well managed company that employs well trained staff can establish itself quickly on the market and will reach the capacity to successfully compete for tenders. Thus it will develop the ability to eventually repay for the capital outlay.

Despite the differences the philosophy of the three companies is based on hard work and the belief that good work and job ethic will eventually bring success. Accordingly the companies do not have flashy promotion materials and the three logos are an indication that they spent more time on planning and executing the actual field work than on the design of a corporate image through marketing.



FATIGEN DRILLING (NIG.) LTD.



Figure 1: Logos

Sudan - Kenya

RWS Situation in Sudan

Improved access to safe and secure water supplies is a fundamental need of the people of south Sudan. There is potential for the drilling tens of thousands of boreholes throughout a vast area. The annual production of boreholes in 2003/04 was 400 boreholes, which for 40 rigs represents a low average of just 10 boreholes per rig. Unit and transportation costs are high. Constraints include remote difficult access to areas where seasonal rains inhibit movement for 4 to 6 months of the year.

It is anticipated that donor funding will be increasingly available, particularly if peace is signed. The Multi Donor Trust Fund (MDTF) foresees to spend USD 76 million in the sector. The annual production of boreholes will increase to 1,200 or 1,600. The local drilling sector is unlikely to be in a position to respond to this expanded market. Foreign companies will enter the market; however the already established companies will definitely have an opportunity to expand.

Drilling JB Drilling - Company structure

JB Drilling Kenya, JB Drilling Sudan, and Medic (a NGO and a non-profit company) are a businesses owned by Sudanese and American families. The various units are strongly interlinked and it is somewhat confusing to understand how the units work together. The complicated structure was chosen to react to demand of the market, which sometimes will or can not work with the private sector or in other times requires a private sector partner.



Figure 2: MAN Trucks from the Rhein Army



Figure 3: The Base in Wulu

JB Drilling Sudan – Private sector

JB Drilling (S) was founded in 1981 by Tom Belknapp who previously worked for UNICEF in Sudan and then decided to form his own drilling company operating in the south of Sudan. Over 800 boreholes were completed for various water supply programs between 1982 and 1992. The company relocated its operational base to Kenya due to civil war and insecurity in Sudan. Since 1996 JB continue to drill in south Sudan and had its base in Maridi. Customers were largely international aid programmes for rural community water supplies.

The field base inside Sudan was located in Maridi, Western Equatoria Province where workshop, stores, and office serve as the main direct support to field activities. Field bases for Bahr al Ghazal are established in Mapel, Wau County and Wulu, near Rumbek to support water drilling and lulu projects in that region. New field bases are being established at Bor and Ayod in Central Upper Nile and Leal in Western Upper Nile. Due to security reasons the base was recently relocated to Wulu.

JB (S) over many years worked closely with the SPLM. It is registered with the new Sudanese government as company No. 004. The company has considerable experience in undertaking

borehole drilling not only in remote diverse areas but also in varied geological conditions. The rigs are operating in Western Equatoria, Bahr al Ghazal, and Upper Nile.

JB (S) profits from the Kenya based PMU; projects are primarily supplied and supported from the base in Nakuru. If possible project supplies are procured locally in Northern Ugandan markets close to project areas.

Equipment owned by JB Drilling (S)

No	Drilling Rigs:
1	Bucyrus Erie 20W Percussion/Cable Drilling mounted on M.A.N
1	Ingersoll Rand TH60 Air Hammer/Rotary with integral compressor truck mounted (not in commission)
1	Atlas Copco Air Hammer/Rotary Aqua Drill, mounted on trailer
1	Atlas Copco Air Hammer/Rotary Aqua Drill, mounted on MAN truck
3	PAT 301 Mud Circulation, trailer mounted,
2	PAT 301 Air Hammer/Mud Circulation, trailer mounted
1	PAT 501 Air Hammer/Mud Circulation, mounted on MAN truck
	Compressors:
1	DetToit Sullair, 500 cfm (highpressure), MAN 4WD truck mounted
1	Deutz&Gardner-Denver, 300 cfm (medium pressure), MAN 4WD truck mounted
1	Atlas Copco 186, 400 cfm (medium pressure), 4WD truck mounted
1	Atlas Copco 186, 400 cfm (medium pressure), trailer mounted
1	Atlas Copco 350, 750 cfm (medium pressure), 4WD truck mounted
	Generators:
10	Honda/Yanmar 5 KVA, Welder gensets and submersible test pumps
	Support Vehicles:
20	MAN Supply Truck 7 ton (4WD)
1	Mercedes Container Supply Truck 10 ton
1	Magirus Supply Truck 5 ton
6	Toyota Hilux(4WD)
4	Toyota Landcruisers (4WD)
1	M.A.N Fuel Tanker 7 to
2	Magirus Deutz Bowser/Support Trucks 15 ton

JB Drilling Kenya – Private sector

JB Drilling (K) Ltd was registered in Kenya as a borehole contractor in 1988. Since beginning drilling operations in Kenya in 1991, the company has developed a sound reputation and has steadily expanded its operational capacity. JB Drilling (K) Ltd's base of operation is in Nakuru, Kenya, where the workshop, stores and offices are located. The company operates a variety of equipment. The main operations are borehole drilling, well repair and rehabilitation. Drilling is undertaken throughout Kenya, clients principally being private customers, commercial firms and farms, international donor and non-government agencies. JB (K) avoids drilling for government since government contracts are difficult to handle administratively and payment is slow.

The company engages independent professionals for hydro-geological consultancy as and when required.

Interest rates for bank loans and the inflation rate in Kenya were (and are still) at a very high level for many years. Also terms and conditions for credits to private sector companies are unfavourable, thus for a private entrepreneur it was very difficult to repay bank loans from the

income from work done with equipment bought on credit. Therefore the JB management decided on a long-term company policy not to take any bank loans for buying new machineries and purchased only second hand equipment. Most profits were reinvested in the expansion of the company. JB gradually and steadily invested the proceeds from the drilling operations in building up its fleet of equipment. This decision was also influenced by the fact that Tom Belknapp comes from a long established drilling family in the United States. His father runs a drilling company in California and therefore JB has very good contacts to the second hand market for drilling equipment. Crafty observation of the market allowed getting hold of bargains. The MAN trucks were bought when the British Rheinarmy was dissolved and the vehicles were auctioned off. During my visit a 6-wheel truck with 20,000 km on the clock arrived that JB had purchased from the German Technische Hilfswerk for USD 10,000 landed cost. Considerable skills are required to keep old drill rigs, compressors, and trucks functional. JB has the technical and administrative personnel to maintain this old fleet going. JB Drilling employs a permanent staff of some 30 persons including the drilling managers, drillers, mechanics, and drivers etc. The technical personnel has considerable experience and expertise within Kenya, and in the challenging lithology of the Rift Valley. JB drills in all the different ground conditions and for both moderate and high yielding drinking water and irrigation wells.



Figure 4: Heavy duty Drill Rig



Figure 5: Trailer Mounted Compressor



Figure 6: MAN Truck under Repair



Figure 7: Spare Parts Supply

Equipment owned by JB Drilling (K) Kenya

No	Drilling Rigs
1	Hands England 139 Air Hammer/Rotary to 400m depth, mounted on Magirus Deutz truck with all 3 axle drive
1	Ingersoll Rand TH60 Air Hammer/Rotary to 400m depth with integral compressor 600 cft per ~ AEC mounted with all 4 axle drive Atlas Copco Air Hammer/Rotary to 250m
1	Belknapp III Air Hammer/Reverse circulation rotary to 200m depth
1	Bucyrus Erie 22W Percussion Drilling to 300m
	Compressors:
1	Atlas Copco XR 350 750 cfm (low/medium pressure), MAN 4WD truck mounted
1	Leroy 500 cft per minute (medium/high pressure), MAN 4WD truck mounted
	Generators:
1	10 KW for test pumping, (trailer mounted)
1	15 KW for test pumping (trailer mounted)
1	40 KW for test pumping (trailer mounted)
	Electro-submersible Pumps:
1	Grundfos SP5-42, for test pumping
1	Grundfos SP8-19, for test pumping
1	Grundfos SQ3-65, for test pumping
	Support Vehicles:
2	Foden Supply Truck 15 ton
1	Supply Truck (Crane + 6WD) 7 ton
6	Land Cruiser Pick-ups (4WD) 1.5 ton
2	Toyota Station Wagons (4WD)
2	Land Rovers (4WD)
4	Saloon cars (3 Nos Subaru 4WD)

MEDIC

A France based NGO –and a private Company

The NGO

MEDIC (Medical Emergency Development International Committee) is a non-profit international association which was established in November 1988 and is registered in Paris France. The organization was founded and constituted by a group of international aid workers who had worked previously with health and development projects in various countries but especially South Sudan.

Its mission statement defines its purpose as follows:

- To bring development assistance to the populations in distress as a result of natural disasters, collective calamities, or situations of belligerence
- To establish community-based services oriented to self-sufficiency using local resources with appropriate projects.

Started as a rural health care project in Western Equatoria, MEDIC undertook initially medical interventions but moved later to the construction of boreholes in South Sudan, to promote disease prevention due to better access to potable water. MEDIC undertakes to organize

responsible community user groups around borehole and support participatory activities for health and hygiene promotion.

MEDIC has implemented from mid-1997 through 1999 a community-based road maintenance and repair project under USAID funding in Western Equatoria and Bahr al Ghazal. MEDIC capacity building activities have led to the establishment of viable Sudanese road construction companies and transport enterprises.

MEDIC support of small-scale enterprises, businesses, and women groups include village level edible/cosmetic oil processing and soap making projects using "Shea butter" from the lulu (Arabic for Shea) nut.

The private Company

In Kenya, MEDIC Ltd is a registered non profit company which supports operations. The headquarters for coordination of MEDIC and JB operations are in Nakuru. There is a liaison MEDIC office in Nairobi which also serves the Lulu programme (LLP) and construction programmes. The Kenya offices are well placed to serve as the telecommunications and supply link between MEDIC projects in the field and regional/international suppliers, markets, and banking services.

The Project Management Unit

Access to safe and secure water supplies is an elemental need for the people of south Sudan. Tens of thousands of boreholes would need to be drilled in the vast area. About 40 rigs produced 400 boreholes in 2003/04. This 40 represents a low average of just 10 boreholes per rig. Unit and transportation costs are high. Constraints include remote difficult access to areas where seasonal rains inhibit movement for 4 to 6 months of the year. Communication is very difficult during the dry season with many roads still blocked by landmines and during the rainy season it is not possible to move heavy equipment.

With the peace accord signed increased donor funding has become available. Over the next two years, the Multi Donor Trust Fund (MDTF) forecasts spending 76 million USD in the rural water sector. The annual production of boreholes will increase to 1,200 or 1,600. The local drilling sector must be in a position and able to respond to this expanded market.



Figure 8: Solar Powered System in Rumbek

Even during the time of conflict, MEDIC set up a Programme Management Unit (PMU) for the coordination of water drilling activities and the design and construction of small water distribution systems in south Sudan. The purpose of the PMU is to provide professional logistic and management support to small drilling companies that would not have the means to set up efficient support units on their own.

The PMU approach is quite unique as it does not require any financial support from outside. JB (S) for many years relied on the MEDIC support for their drilling operation in Sudan. The novel approach was to offer these services of management and logistic capacity to its competition, small drilling companies. These small drillers would not have been able to establish support structures that function efficiently. To take advantage of the already established support facility and sharing it with a larger user group allows MEDIC to utilise its capacity better and helps the small companies. It is cheaper and more efficient for all drilling companies to make use of the services offered by the PMU than to try to do all by them selves. In all, it promotes the establishment of a robust drilling sector in south Sudan.

Presently the PMU supports the following Sudanese member drilling agencies:

- JB Drilling (S); 10 rigs,
- Kico; 1 rig,
- Kija Engineering; 2 rigs,
- Sudd Enterprise; 2 rigs, and
- Gardos (which is the only NGO in this partnership); 1 rig.

It is interesting to see that private companies and NOGs take advantage of the services offered by the PMU.

Much of Medic's work has been funded by USAID (OFDA) under sub-grants with International Aid Sweden (IAS) and more recently in 2005 and 2006 with PACT. The PMU has been contracted to take charge of the production of some 300 boreholes in 2006.

The function of the PMU

The PMU carry out the following supporting functions for its members:

- coordinates drilling operations between its members (to select the appropriate drilling technology, the right rig in the right place)
- represents the drilling contractors in discussions with donors/government
- provides coordinated management capacity towards donors and customers
- provides support to its members in technical advice, procurement, logistics, survey, reporting, financial matters.
- consolidates output and increase/maximise annual production per rig and thus lower borehole drilling costs
- coordinates centralised procurement of key elements (casing, fuel, gravel, cement and hand-pumps) and arrange the logistics to secure stores at key locations within the regions (say Rumbek or Poktap) for drillers to access.
- provides capacity for site survey/selection and hydrogeological study.
- organizes quality assurance, certifies works and ensures that reports are filed timely.
- gives management capacity and is answerable directly to the fund managers/donors for the regions concerned
- provides periodic status reports
- coordinates with SRRC Water Secretariat counterparts.

It is envisaged that the fund managers/donors will award software elements to individual NGO applicants. The PMU has some capacity to reinforce the social/hygiene education component.

Institutional Context

The PMU is financed by contributions from its member drilling agencies, i.e. each member pays 8% of the borehole costs to the PMU. It is planned that the PMU will be established as a non-profit making company and in the future will be based in Rumbek with Liaison Office in Nairobi.

The PMU does not curtail competition and does not promote restrictive practices. Competition is maintained within the work, rather than for it. The PMU acquires work for all local established drillers within the MEDIC umbrella but promotes competition among its members for the work that the PMU could get hold of. The more productive rigs undertake more boreholes. Presently the physical productive output per drill rig is averaging 10 boreholes in a season. This relatively low productivity is due to the particular climatic, environmental conditions and difficult communications of southern Sudan. The PMU aims through good organisation and logistic support to maximise efficiency of the drillers. It is considered possible for a drilling unit to achieve as many as 50 boreholes per year, although at this stage an annual target of up to 30 is a reasonable expectation.

Tom Armstrong's view on building capacity

Donors follow the policy that they are not operating drill rigs by themselves any more. They have the tendency to provide rigs to NGOs. These gifts are distorting the market as the NGOs will soon start using the rigs for commercial work. The reason why NGO drilling is normally not efficient is that successful drilling operation needs experienced and dedicated long term staff. Normally, NGOs first need to build up the capacity to manage drilling operations efficiently. Their staff is often replaced after some years and therefore new members need to start again at the bottom of the learning curve. Companies like JB have managers and drillers who learned their business over many years. Many of the skills needed to be a good driller is tacit knowledge which can only be obtained in long term on-the-job training. JB provides this type of training and keeps their staff for many years.

A sensible idea to help the under capitalised local drillers would be for donors to provide them with a financial loan to purchase equipment. At the same time the company should be given a contract of let's say 50 boreholes. The repayment modus of that loan could be that the driller has to repay with a certain percentage from each borehole, i. e. if the loan is USD 100,000 to be repaid over 50 boreholes the driller would have to pay USD 2,000 per borehole that means he would be paid USD 8,000 instead of 10,000. At the end of the contract the drilling company has repaid its loan. Such a support to local drilling companies would be of great help to them as they are notoriously underfinanced and find it very difficult to raise money for necessary investments for expansion and renewal of equipment.

JB Drilling has a policy not to take any bank loans as they feel the conditions offered by banks are unfavourable, i.e. in the drilling industry investments made with bank loans do not have a return high enough to allow repaying the loans.

Nigeria

Market in Nigeria

It is currently estimated that about 35% of the rural population have access to safe and reliable water supply.

Nigeria has a policy of requiring community ownership and operation of rural water supply and sanitation. The situation in rural water in Nigeria is characterised through the federal government system. Rules and regulations are set by central government, by the state governments and the Local Government Authorities (LGA). Thus, government policies and guidelines exist but the federal structure of the nation makes enforcement of regulations difficult. Uncoordinated, conflicting programs have been adopted by various national agencies, not in line with the stated policy. Many communities have been served by multiple programs, many served by none, and a majority of facilities that have been provided are not operational.

The national water and sanitation is based on the principles that individual communities must (i) choose the level of service that they are willing and able to pay for and make their own rules as to the use of water; (ii) take full responsibility for all aspects of maintenance and operation of their water supply systems; and (iii) pay the full price for maintenance and operation of their systems and a part of the capital investment. The policy also stipulates that a cost sharing arrangement between federal government or donor (50%), the state government (25%), the LGA (20%) and the communities (5%) should be in place. Most of the funding comes from the federal government and some from donor input. Since the fund releases to states and the LGAs are unpredictable and they hardly ever receive the full allocation the planning is done on an ad hoc basis.

Investment needs can only be estimated in the broadest of terms. However, assuming simple motorized systems for small towns and boreholes with handpumps in rural areas would require nearly USD 10 billion investments for water supply. Thus the market for boreholes is very big.

The LGA normally award contracts for drilling to private sector companies through competitive bidding processes. The procurement process is not transparent. Genuine drilling companies, like Fatigen, hardly ever are awarded the contracts. Most of the business is done through middle men. Most of these middle men are politically well connected. Often the contractor does not get paid the full amount. Usually the contractors insist on 70% advance before he enters a contract. If the rest payment does not materialise he breaks at least even. Breaches of contracts from both sides are common. Once a middle man has been awarded a contract, he subcontracts a drilling company that will do the job for him. Most of Fatigen's work is like this.

Prices mentioned for turnkey installation of boreholes with handpumps were quoted from 1.2 to 1.6 million Naira (paid to the middle man). (exchange rate: 1,000 Naira = 7,5 USD). If 30% are taken off that price (because of non payment of the rest) the amount paid by the state is 0.8 to 1.0 million Naira. The middle man pays 250,000 to 400,000 Naira for the drilling and he has to supply the handpump. The quality of the private sector drilling companies is questionable. The middle man will usually first opt for the cheapest driller. Such companies have unreliable equipment and unskilled staff, accordingly the often perform poorly and cannot finish the work.

The quality completes is

This is a Fatigen. The contracted that other complete. At the deliver, the brought to a



of the boreholes doubtful.

market niche for company is often to finish work drillers fail to this point, when contractor has to prices can be realistic level.

Figure 9: Drilling in Rural Nigeria

Fatigen Drilling (Nig) Ltd

Founded in 2001

JOBS EXECUTED

Over the years, Fatigen drilled for boreholes for governmental organisation, NGOs, and individuals, mostly in Plateau, Bauchi Kaduna, Abuja and Benue States, it constructed water points with handpumps or mechanised systems.

Fatigen provided consultancy training on geophysics and borehole drilling

The key Staff of the company are:

- 2 Hydrogeologists.
- 1 Geophysicist
- 2 Experienced drillers/rig operators
- 2 Trained mechanics
- 4 Drilling Assistants
- 1 Secretary/Accounts clerk.

Fatigen owns the following major Equipment:

- 1 PAT 301 TP Drilling Rig
- 1 Dando Geotec 5 Drilling Rig (under agreement with WaterAid/BERWASSA)
- 1 Ingersoll Rand Air compressor (under agreement with WaterAid/BERWASSA)
- 1 ATLAS COPCO XAS 186 Air compressor (400 cfm-12Bar).
- 1 ATLAS COPCO XAS 80 Air compressor.
- 1 Set of hydraulic power pump (10hp)
- 1 Pump testing kit
- 1 Set of ABEM Terrameter for geophysical surveys.
- 3 Geophysical interpretation software (Zorby, Resound and 1 PIZ Win).
- 4 Land Rover Vehicles.

Fatigen drills also for NGOs like WaterAid, DEC, WIN etc. The prices charged per borehole are about 700,000 Naira, including handpump.

Several donors, including UNICEF, provided and still provide drill rigs and equipment to the states and the LGA. They operate government owned drilling fleets. Experience showed that the state operated rigs are not operational after a very short time. Lack of management capacity and lack or misallocations of funds for maintenance are the main reasons for this low performance. Because of their inability to drill effectively these state operated drilling units hire private contractors to drill boreholes for them.

The inefficiency of the state operators was the reason why WaterAid and DFID decided to look for a different approach when the drill rig brought to Nigeria, Benue State by DFID for exploratory drilling was to be utilised for borehole drilling for vulnerable communities. They decided to select a private sector drilling company to operate and maintain the drill rig.

The selection criteria were, the company has to:

- Be registered for at least two years with a proven track record of successful rig operations.
- Have the technical capacity to: (a) site, drill and develop boreholes (skilled drill crew), (b) maintain the equipment, (c) finance the operations (working capital), and (d) to prepare comprehensive reports of their work.
- Good working relationship with BERWASSA, NGOs and CBOs
- Knowledge of the hydrology in Benue State
- Deposit 1 million Naira in a title deed

The main utilisation of the rig was to drill boreholes for vulnerable communities as directed by BERWASSA and WaterAid. However, if not required for vulnerable community work the operator is free to use the rig for commercial work.

The operator has to pay Naira 50,000 per borehole for vulnerable community work and Naira 100,000 per borehole for commercial work into a WES account. WaterAid, BERWASSA and MWRE are signatories on the account. Any transaction needs two signatures and WaterAid is a required signer.

The money in the WES account is used for major repairs of the equipment. The day to day maintenance of the rig and compressor is to duty of the driller, he also has to pay for all consumables.

The driller has to submit monthly financial and progress reports to WaterAid and BERWASSA.

Sunday Arafan has drilled 68 boreholes between November 2004 and 31 December 2005. The total meters drilled were 2,391, which gives an average borehole depth of 35.2 metres. With paying into the WES account for the work done, the account has accumulated in these 14 months 4.2 million Naira.

The agreement has some open ends, it does not determine when the contract ends and leaves it open what will happen to the rig and the compressor when the equipment has reached a given age (or number of boreholes drilled). It is not clear whether the rig can eventually be sold to the operator.



Figure 10: Dando Rig under WaterAid MOU

Figure 11: The Compressor

The deal with WaterAid helped Sunday to establish himself. Before he got this opportunity to use the drilling equipment he was dependent on hired drill rigs. Now because he could find regular work it was possible for him to invest into new equipment. He has bought a small trailer mounted drill rig that has the capacity to drill about 80 m deep boreholes up to 200mm in sedimentary ground and 160mm with DTH hammer. This is adequate for rural water supply with handpumps. At the moment he has more than enough work and is considering buying a further small rig. He is presently in negotiation with the rig supplier and hopes soon to be able raising enough money for the down payment so that he can place an order. Buy the time this third rig is delivered, he estimates December 2006; he is confident that he has earned enough money to pay fully for the rig. He is negotiating with the manufacturer that he has not to pay the full amount at the ordering stage but can pay at delivery.

For operation and maintenance Sunday has good connections to England. That means he can place an order for spare parts or consumables with his representative in the UK. This contact person, who also has the technical know how, will expedite the order immediately and arrange the shipment. The arrangement is such that Sunday can reimburse the contact in England. Thus he does not depend on the somewhat slow banking facilities in Nigeria and has speedy access to spare parts.

Fatigen employs two hydrogeologists. These professionals are responsible for the siting and geophysics as well as they permanently supervise the drilling operations. This arrangement is quite different from other private sector drillers. When the third rig is purchased the company will employ a further hydrogeologist.

Suppliers of locally purchased spare parts and consumables are not always reliable.

An Example:

When we visited the drill site near Oju we realised that the rig did not make any more progress, despite the fact that the hammer was drilling in dolomite which should normally not be a problem. Sunday instructed the crew to retrieve the hammer and to inspect it. When the drill pipes were removed and the DTH bit was looked at it was found that the shank that goes into the hammer to let the air pass through the drill bit was leaking. Thus the hammer did not function properly. It was the second hole in which this bit had been used.

The DTH bit had been purchased from a dealer in Kano. The dealer claimed that the bit was new and charged 115,000 Naira for it. It appears that the bit was actually a reconditioned part that was spray painted to look new. And the reconditioning job was not even a good one.

By pure coincident Sunday had a brought replacement bit along, which we could fit and continue drilling. If this had been the case the drill crew would have lost at least two days waiting for a new bit to be brought from Jos.

It is unlikely that Sunday will be able to get some money refunded from the dealer who was trying to cheat him.



Figure12: The Drill Bit

Ethiopia

The Drilling Market in Ethiopia

During the International Conference and Exhibition on Groundwater in Ethiopia (25 – 27 May 2004) at the UNECA Conference Centre in Addis Ababa, a UNICEF Consultant presented a paper that for meeting the MDGs, in Ethiopia 80,600 deep and shallow boreholes for domestic water supply need to be drilled until the year 2015. This would require an investment of about USD 1 billion over the next 10 years. Over 220 properly functioning drilling rigs are required to drill the above number of boreholes.

A recent study by RWSN/WSP made an inventory of existing drilling rigs and found that 103 drilling machines operate in the country; many of them are old and low in efficiency.

Ethiopia's drilling sector is characterised by significantly increasing financial commitments in view of the MDGs. The following major RWSS programmes are in the pipeline in Ethiopia:

- World Bank/IDA-financed Water Supply and Sanitation Project, Duration: 2004–2008, Total funding is USD 116m. The funds are managed through Ministry of Water Resources (MoWR); most drilling contracts will be subject to international competitive bidding.
- African Development Bank (ADB) Water Supply Project, Duration: 2006–2008, Total funding for RWSS is USD 61m. The funds are managed through Ministry of Finance and Economic Development (MoFED); most drilling contracts will be subject to international competitive bidding.
- European Union (EU) Water Supply Projects, Duration: the project is not yet approved; Total funding is USD 53m, of which about half are for RWSS. The funds are managed by MoWR, UNICEF and NGOs, drilling contracts will be subject to the procurement procedures of the above partner agencies (MoWR, NGOs and UNICEF).
- Netherlands Government programme, Duration: Phase1 starts in 2007 for two years, Phase2 will be 4 years. Total funding is USD 25m for Phase1 and USD 100m for Phase2. The funds are managed by UNICEF; drilling contracts will be subject to the procurement procedures of UNICEF.

A large part of the capital investment by these programmes will be spent on groundwater development. Some of the programmes are not yet defined in terms of amounts of money and the timings, however it is predicted that the annual spending in the water sector will at least double from the USD 68m in 2002. The rapid expansion of service delivery creates a very dynamic market in which the private sector plays an increasing role.

The operating environment

During the 70ties and 80ies Ethiopia underwent a period of civil war, environmental disasters recurrent drought and economic stagnation. The previous military regime established a centrally-planned economy which was dominated by the state. The Government dissuaded private investment and set up state monopolies, public construction enterprises and some NGOs carried out drilling and water supply construction works. No private drilling company operated in Ethiopia before 1991.

With the new Government in charge the economy was opened to market reform and foreign investment. The drilling sector was one of the areas that benefited from the Government's new economic and investment policies and as a result private investors started establishing drilling companies.

Ethiopia has a decentralised structure for the provision of water in rural areas. In respect to the drilling sector the Federal Government (Ministry of Water Resources, MoWR) has the function of a service provider; setting sector policy and strategies, channelling funding and providing guidance to the Regions, and regulating the private sector. The Regional Water Resources Bureaux (RWBs) are the major implementers of water programmes. They use donor and nationally generated funds to purchase contracted services, such as borehole drilling.

Different to other countries, the service providers in are a mix of state owned (para estatal) drilling enterprises, the private sector and NGOs.

The State Enterprises are the major service providers for the RWBs. Six of Ethiopia's Regions (Tigray, Amhara, Oromia, SNNPRR, Somali and Afar) have Enterprises which drill boreholes and construct water systems. In some regions the Water Resource Bureaux have direct control over their drilling capacity. The State Enterprises are expected to operate like private companies and to be financially viable. They do not receive subsidies and compete with the private sector. They are fully government owned, and mainly Government personnel are placed on their boards. They often receive preference treatment over the private sector when contracts are awarded.

Some of the Regional Water Bureaux carry out drilling operations directly mainly with rigs provided by UNICEF. UNICEF tries to retain some influence over the use and management of this equipment.

Drilling through the private sector in Ethiopia is relatively young. The first private drilling contractor in Ethiopia started in 1991. Since then around 25-30 private drilling companies operate now in Ethiopia. They number of drill rigs is about 40% of the total drilling capacity. The emergence of the big water programmes in recent years has attracted foreign drilling companies from China and India to compete in the market. They appear to be operating at lower costs than the Ethiopian companies.



Figure 13: The T3W Drill Rig

Some NGOs carry out borehole drilling work in Ethiopia having their own drilling equipment. An additional risk for the drillers is the security situation in some parts of the country. Some regions (northern Tigray and Afar, and Somali) are affected by internal and external conflicts. The Governments of Ethiopia has a resettlement programme in which more than 2 million people are moved from vulnerable and drought-prone areas to the low lands where more favourable living conditions prevail. This programme requires drilling activities that resemble more an emergency operation than a regular development programme.

Tana Water Well Drilling (TWWD) PLC

Tana was founded in March 2004 by Etsegenet Berhe a professional water resources and civil/sanitary engineer with extensive experience in the areas of water supply, environmental sanitation and civil works both in Ethiopia and abroad. Etsegenet used to work as a programme officer for UNICEF in Tigray and later in Iraq for the Food for Oil Programme.

The strategy followed by Tana PLC is to invest initially into high quality and new equipment. The rationale for this decision was that starting a business from scratch with old and unreliable equipment would be too risky, even though much less capital would be required for second hand rigs. The business strategy of Tana is that new and reliable equipment would give for

some years to come trouble free operations which would allow the company to become established on the market. Also the cost for maintenance and repairs of the equipment would be kept to a minimum in the first years of operation. Thus the need to set up repair workshop facilities could be deferred.

Therefore the company opted initially for a one brand new Ingersoll Rand T3W drilling machine with a capacity of drilling up to 500m depth at 12" diameter. The rig is equipped with a 1070/350 IR Compressor and a 5x6 Gardner Denver hydraulic powered mud pump.

At the time of the study another brand new Ingersoll Rand T3W Deep Hole Model with 50,000lb pull back capacity had just arrived in Djibouti and was on its way to Ethiopia. It is expected that this rig will be operational by end of May 2006. The company has recruited key management and technical staff with vast experience and skills in the sector.

The equipment owned by TWWD PLC

	Drilling Rigs
1	Ingersoll Rand - T3W complete with IR compressor 1070cfm/350psi, 5 x 6 GARDNER DENVER Duplex Piston mud pump and complete accessories
1	Ingersoll Rand - T3WDH complete with compressor IR 1070cfm/350psi, 3 x 4 Mission MAG Centrifugal mud pump and complete accessories
	Equipment
1	Welding generator
1	Welding machine
2	Grinders
1	Dewatering pump
1	Submersible Pump Model 613/30, 9.2KW CMS, Italy
1	Submersible Pump Model 624/23, 22KW CMS, Italy
1	Submersible Pump Model FX8-90/7, 37KW f.el.som, Italy
2	VM Generators
	Vehicles
2	IFA Germany, L-60 Trucks, For transporting fuel and water
1	FIAT 159 NC20 Truck, For transporting casings, drill pipes, gravel, etc.
1	ISUZU Truck, For transporting pumping test equipment & materials
2	TOYOTA TACOMA Pick up, 4WD, for drilling crew

The company is presently trying to expand its capacity to perform the work by adding on additional equipment, like a truck with a mounted crane and a generator to be used for pump testing.

The Process of setting up a new company

The operating environment for the drilling market in Ethiopia is characterised by strong political and state control. Importation is subject to rules such as those requiring the use of national carriers. All imported equipment has to be brought into the country with letters of credit, which makes fast and flexible importation difficult. Registration and licensing of groundwater professionals and drilling companies is an onerous process and rules and regulations are based on public sector operations not necessarily conducive for modern management principles in the private sector.

Starting a business

In order to process an application for license and financing, it is a requirement by the investment authority and the financing bank that a detailed feasibility study is submitted. The feasibility

study, basically a business plan has do point out the main objectives, operational region/area, type of machinery to be imported and economic viability of the company.

The registration of a business enterprise has to be done with the Ministry of Trade and Industry (MOTI) and the Acts and Documents Registration Office. Once these steps are taken an application for an investment license can be made. The Authority issues an investment license to the applicant, after reviewing the application and the project feasibility report.

Credit facilities

Due to the high capital investment required for the purchase of rigs, accessories, tools, equipment, and construction of maintenance workshop, warehouse and office building private companies need to have access to bank credits.

The Development Bank of Ethiopia is one of state owned Banks that was set up primarily to finance strategic development investments, limits it's financing only to manufacturing and export oriented investments. Water well drilling companies are not financed.

Consequently, drilling contractors have to use private banks which have unfavourable conditions in terms of collateral requirement, loan period and interest rates. Banks review the request for financing of companies very critically.

In the best case a private bank finances 50% for the purchase of drilling equipment without additional collateral requirement but keep 100% of machinery purchased as collateral. Other banks give credit up to 50% but require 100% additional collateral in a form of building, beside the machinery to be procured. Some banks finance up to 70% provided that the company has good loan history and makes available collateral in the form of building to cover the extra 20%. The interest rate of up to 9% is ominously high. Further a payment of 1% of the loan taken from banks is charged by the Inland Revenue. It may therefore be difficult to find enough interested investors that have the technical, financial and managerial capacity to enter into the drilling game.

Only registered companies can apply for a loan to finance procurement of equipment to a private bank. The application for loan should needs the following documents:

- proforma invoice of the machinery, accessories and spares to be procured,
- copies of the Articles of Association and Article of Memorandum,
- copies of the business registration and investment license certificates,
- copy of the project feasibility report,
- evidence of cash to cover part of the investment and collateral (preferably in a form of building), and
- application letter detailing the financing requirement.

Procurement of Equipment

Once the financing has been ensured the company can apply for establishing letter of credit (L/C) for the procurement of drilling equipment, accessories and spare parts. If all documents required to establish an L/C are ready, the process to open an L/C does not take much time. Among the documents required to open L/C are:

- proforma invoice from supplier(s),
- business license and investment certificate, and
- L/C permit from the National Bank of Ethiopia.

The bank charges for opening a L/C is 3.5% of the C&F value of imported items.

Registration of Vehicles and Drill Rigs

All truck mounted drill rigs needs to be registered with the Road Transport Authority to obtain a number plate. The Road Transport Authority charges 2% of the value of the machine and truck for the issuance of the number plate. This is the same for trucks, but since the value of a truck mounted rig is very much dependent on the drilling equipment it carries and the cost of a rig is

several hundreds of thousands of dollars. Thus a drill rig attracts a much higher percent than a truck alone. If the value is nearly a million the 2% payment is very high.

Duty exemptions

The company can obtain permission from the Ministry of Revenue (MoR), Duty Free Department, to import drilling equipment duty free. Drill rigs, accessories and spare parts (if the value does not exceed 15% of the cost of the rig can be imported duty free. If duties are applicable to spare parts it ranges from 10 – 15%, plus 2% withholding tax and VAT.

Licensing/Registrations

A drilling company further needs Licensing/Registration with the Ministry of Water Resources. The MoWR issues professional license to professionals, technicians and contractors involved in the water sector. They differentiate between eight grades of drilling contractors, depending on the type and capacity of machinery and other equipment and qualification and experience of the staff. In addition, the professional and technical personnel have to be licensed with the Ministry according to their qualification and experience. Licensed professionals and technicians are scarce since there are no specialised training institutions providing formal long-term training for drillers and technicians. Therefore private sector drilling companies find it hard to employ drillers.



Figure 14: The crew discussing progress

Organisation and staffing

Tana Water Well Drilling has management and support staff based in the office in Addis Ababa and field based technical staff. These are basically two drilling teams that carry out the drilling work, construction or studies.

The company employs a total of 21 staff members

Apart from the General Manager and the Deputy General Manager, who are Water Engineers, the company employs:

- 2 Senior Hydrogeologists
- 1 Junior Hydrogeologist
- 1 Drilling Superintendent
- 2 Chief Drillers
- 9 Workers (Driller, Electrician, Mechanic, Welder)
- 1 Logistics & Supply Head
- 3 Truck Drivers

According to Etsegenet Berhe the company's main assets are its dedicated well motivated staff. During the field visit this impression was clearly confirmed. I have hardly ever seen a group of workers working together in such a harmonious way.

Work experience

Since starting the operations in April 2004 Tana Water Well Drilling PLC drilled in various areas of the country (Dire Dawa, Addis Ababa, Tigray & Oromia) 39 deep wells to a total depth of 6,320m. This indicates that the average depths of the wells was 162m. The cost per metre drilled varied from approximately USD 130/m for 6" PVC lined wells to USD 270/m for deep 12¼" wells. The average rate per meter appears to be around USD 200/m.

From the reaction of the customers visited it appears that Tana Water Well Drilling has earned high respect and confidence among its clients. This is according to Etsegenet mainly due the decision to buy brand new and state of the art technology drilling machines and equipment and operate with highly efficient, effective and committed staff who have got long years of experience in the sector.

Constraints

Issues of taxation, importation, licensing, winning and implementing contracts, transaction costs, risks, and borehole specification are points that constitute a challenge to private sector drillers in Ethiopia.

Taxation

The tax exemption policy of the Ministry of Revenue, Duty Free Department gives generous tax exemptions (no tax on profit for 3 years and duty free importation of equipment and materials.) for manufacturing, agriculture, education and health. The drilling sector has to pay tax on profit; the only privilege is the duty free import of drilling rigs.



Figure 15: Well Development in Progress

Licensing by MoWR

TWWD found it difficult to comply with the skilled staff requirements for licensing drilling contractors by the Ministry of Water Resources. It is understood that licensing is very important, however it is very difficult to find qualified drillers in Ethiopia as there are no specialized training institutions for drillers. Presently, only the JICA training centre offers 3 months training for drillers. This institute is open only for Government employees. Private drilling contractors asked to have their staff trained there as well but were rejected. This licensing criteria increases competition among the drilling companies to hire the limited qualified technicians (especially drillers) working for the public enterprises in order to meet the requirement. Similarly there is a capacity drain in the public enterprises, as many are leaving them for better salary and benefits in the private sector.

For example, two chief drillers from the Oromia Water Works Construction Enterprise (public enterprise) who were paid just under Birr 2,000.00 per month joined Tana Water Well Drilling PLC for over Birr 3,000.00 monthly salary.

According to Etsegenet it is not appropriate to specify such a high number of qualified staff per rig as it drives up the cost.

Import of Spare Parts, Drilling Accessories and Consumables

Very few local dealers stock spare parts for drilling machines and accessories. They may keep very few and limited items for lack of sufficient finance. Once they received an order from a customer they start the process of importing the required items. The process is complicated as they also have to use procurement with L/C. The time for spare parts to arrive is quite long. This leads to unnecessary delays with machines standing idle in the field.

Foreign owned drilling contractors can import spare items without going through the bank process of L/C, which is a lot faster. As long as foreign owned contractors are allowed to import goods in shorter time than what it takes for local contractors, there is an unfair advantage for them.

Local companies import and sell small quantities of consumables such as casings, screens, polymer, etc. In most cases the drilling companies place procurement order to import items upon receipt of order from contractors.

Packaging of Contracts

In most cases tenders for drilling works are announced with very few wells in one lot and often the sites are very far from each other. This way of tendering affects the cost of construction. For example, one of the private drilling companies, Tana Water Well Drilling PLC, had to enter into 11 contracts to drill just 24 wells. Given the long time it takes between tendering and award of contract, there is a tendency, by contractors, to offer high cost for a contract package with few wells in order to cover the cost incurred during idle time. If the government and donors prepared tender packages with 10 – 50 wells in a cluster area, contractors could offer much lower prices, because that many wells would secure job for the companies for longer period as well as reduce time and cost of mobilization. Failure to do so could even increase the current costs, which are perceived to be very high.

Further it appears that the tendering process is not always fully transparent. Although the Government at National level claims that its policy is to empower the private sector to take over from the public enterprises, there is limited action to that effect. Public enterprises are still strengthened in terms of new equipment and training. The case in point is the JICA supported training center in Addis that only trains technicians from government departments and public enterprises. Contracts are usually awarded to public enterprises, directly without tendering. This of course discouraged the private sector. For instance TWWD won a tender in Tigray region and were waiting for the contract to be issued. Only to be told that the regional bureau had decided to give the contract to the state enterprise even though that this enterprise did not participate in the tender.

Supervision

Field engineers and hydro-geologists assigned to supervise drilling works have often limited experience and are not empowered to take decisions on the spot. According to Etsegenet project supervisors depend on their superior in the office for decisions, which can be very time consuming. These delays result in unnecessary costs for the drillers. Further it appears that due to lack of close and strict supervision, contractors use sub-standard quality materials and even sometimes they do not use the required quantity of materials such as casings, gravel etc.

Association of Water Well Drilling Contractors

There are some attempts to form an association of water well drillers in the country. Etsegenet is a member of the task force that was set up to formulate by-laws for such an association. Such an association might be helpful in the dialogue with the concerned government bodies and other stakeholders to sort out some of the constraints and irregularities. The association could express the concerns and issues of the private sector in an organized and collective manner. It would be also useful for the government in terms of setting standards and norms in design, construction and use of equipment.

Memorandum of Understanding for the Private Sector Management of the DFID Drilling Rig in Benue State

Background

At the beginning of the WaterAid Oju/Obi Water and Sanitation project in Benue State, Nigeria in 1996, a drilling rig was acquired for exploratory activities by the British Department for International Development (DFID), which was funding the project. This was to facilitate exploratory drilling to assess the underground water potentials in project area given the difficult geological formation of most part of the State.

The management of the drilling rig was situated with WaterAid as the manager of the Oju/Obi project and under the ownership of the DFID. Towards the end of the DFID funding phase of the project, WaterAid submitted a proposal to the DFID for the utilization of the drilling rig through private sector participation (PSP). The proposal was with inputs from UNICEF WES Officer, Enugu Zone and BERWASSA as major key stakeholders in rural water and sanitation sector in the Benue. The aim to put the drilling rig to use through a private sector operator was to encourage private sector participation in rural water supply in the State and also to strengthen the work BERWASSA and other sector players were doing. The overall goal is to ensure availability and sustainability of services.

Following the DFID's approval of the proposal, WaterAid worked closely in collaboration with BERWASSA with support from UNICEF to finalize arrangements for the operationalization of the rig. Several meetings were held between WaterAid, UNICEF and BERWASSA. At the end, criteria for private management of the drilling rig were developed.

On the 16th September 2004 the rig management issue was brought before the Inter-Ministerial WES Committee of Benue State for discussion, The IMC discussed the criteria for the private management recommended as follows:

- Sunday Arafan who has already been tested should be signed on to continue operating the rig on temporary basis.
- The Rig should be utilised by BERWASSA and WaterAid for drilling in self selected communities.
- BERWASSA should pay Sunday Arafan the same way WaterAid pays him. The details to be looked into by WaterAid and BERWASSA.
- The contract between WaterAid and Fatigen drilling should be used as a guide
- WES Steering Committee will manage money accruing from use of the Rig. Water Aid and BERWASSA to be signatories to the Rig Account.
- BERWASSA and WaterAid should be responsible for monitoring and BERWASSA reporting to WES Steering Committee. The Operator should render monthly operational/financial report to BERWASSA and WaterAid. Details of monitoring are presented to IMC for ratification.
- Routine maintenance of the Rig to be handled by the operator while money from the account will be for major maintenance.

Responsibility for Managing the Drilling Rig

By virtue of the present arrangement, the management of the drilling rig is saddled on the following:

- Benue State Rural Water and Sanitation Agency (BERWASSA)
- WaterAid (custodian, facilitation and monitoring of the process)
- Fatigen Drilling Ltd (private operator)
- Inter-Ministerial WES committee (Management responsibilities)

Purpose of this Memorandum of Understanding.

The purpose of this MOU is to establish the framework for co-operation between the parties for the development, implementation and Monitoring of Private Sector management of the Drilling Rig.

Guiding Principles

The participants to this Memorandum of Understanding acknowledge the guiding principles, which govern the conduct of the partnership as an entity and that of individual partners.

Terms of the Partnership

the terms of this partnership is guided by the Recommendations from the IMC's approval, the criteria for selection of private sector operator and drill rig management as stated below;

Drilling Rig Option:

The proposal is centred on the above arrangements and considered the following:

Criteria for Selection of Operator

MANDATORY CRITERIA:

- Must have company registration of not less than 2 years.
- A minimum of two-year experience in drilling rig operation.
- Technical capacity to operate drilling rig, (e.g. availability of drilling crew).
- Technical capacity to maintain the rig (knowledge of mechanics and availability of drilling rig mechanics).
- Financial capacity to operate and maintain the drilling rig. -Report writing skills
- Demonstrated track record of success in the last 2 years

DESIRABLE CRITERIA:

- Experience of relating with government agencies, NGOs and CBOs.
- Knowledge of hydrogeology of Benue State

LONG TERM CRITERIA:

In addition to all the criteria listed above long-term criteria should include:

- Ability to provide a surety in the form of title-deed to the tune of at least N1,000,000 (one million Naira)

Conditions for Drilling

- Security of storage for the rig
- Geographical coverage for drilling in vulnerable communities in the case of WaterAid and BERWASSA
- BERWASSA and WaterAid to produce work plans for drilling in vulnerable communities for the drill operator before drilling commence. This should state the number of communities, the LGA, the expected start and finish dates. Copies of the plan should be shared between BERWASSA, Private drill operator and WaterAid. Contract agreements must be signed for both drilling in vulnerable communities and for private drilling.
- Types of customers: vulnerable communities, private and public institutions and private individuals.
- Operator should be responsible for routine maintenance of the rig on regular basis, while major repairs and maintenance will carry out from the accrued funds in the account.
- WaterAid and BERWASSA/UNICEF will provide all necessary materials for drilling in vulnerable communities as the case may be
- Priority to be given to all vulnerable communities in meeting demands for boreholes.
- Operator to meet minimum requirement for a successfully completed borehole, (e.g. flushing, yields, and (water quality to be determined by BERWASSA).

- The person who does geophysics and drilling will be responsible for the abortive borehole.

Charges

- Operator charges own determined rate for commercial drilling and agrees term with the customer
- Operator will pay N100,000 for a private well drilled and N50,000 for well drilled for BERWASSA or WaterAid (This is subject to changes). Funds will be used from this for Major maintenance of the drill rig.

System of Payment

- In either way, payment would be made by the private drill operator into the Drill Rig WES account by cheque.

Management of Funds Accruing from Rig Operations

- The money accruing from the rig operations will be managed by WES Steering Committee, who would open a separate account for the funds.
- the money will be used to subsidize cost of drilling in vulnerable communities, also to support sanitation and hygiene promotion activities and for major maintenance of the Drill Rig.
- WaterAid, BERWASSA and MWRE are signatory to the WES account.
- WaterAid as the Main Signatory will sign with any one of BERWASSA and MWRE.

Monitoring and Reporting

BERWASSA and WaterAid should take responsibility for monitoring the operator and would in turn report to WES Steering Committee. The monitoring would cover the following areas:

- Charges paid for private requests: institutions and individuals
- Geographical coverage
- Records of classes of customers and number served.
- Record keeping of activities e.g. drilling logs
- Problems with the functioning of rig
- Response to community demand
- Maintenance of equipment

Reporting Interval:

The Operator is expected to render monthly operational and financial report to WaterAid and BERWASSA. In the same vein, BERWASSA will report to WES Steering Committee on quarterly basis following the report of the operator

Relationships

- Operator would get the list of vulnerable communities from WaterAid and BERWASSA as the case may be.
- The operator is expected to report in writing to BERWASSA and WaterAid, the status of completed borehole in vulnerable' communities and private boreholes and a copy of the report given to WESU. He is also expected to give information regarding yields, logs and depth of borehole to the community representatives.
- WESU. is expected to mobilize the communities in readiness for drilling operations.
- Each community should certify the work done by the driller.

Signed on 20th January 2006

by MWRE, BERWASSA, WaterAid and Fatigen Nig. Ltd