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Maintenance,

the Headache of the Decade.

An analysis of the problematic maintenance situation of wells and handpumps in sub-Saharan Africa.

M.Sc.-thesis
by
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Preface.

This paper contains the outcome of a study at the Department of Irrigation and Civil Engineering of the Agricultural University of Wageningen, leading to the M.Sc.(Ir.) degree in Tropical Land and Water Management (Tropische Cultuurtechniek).

Rural water supply in developing countries caught my interest when I was involved in the Shinyanga Shallow Wells Project in the Shinyanga Region, Tanzania from 1974 till 1977 and I have remained interested eversince. During a short term mission in 1982, for the purpose of initiating a Rehabilitation Programme for the same project I became painfully aware of the extent of the problematic maintenance situation of the wells and handpumps installed 5 to 7 years earlier. This experience put me to reconsider the concept of rural drinking water supply programmes, which eventually led to the findings as laid down in this paper.
Based on this experiences in Tanzania I have attempted to work out an alternative and pragmatic approach for the implementation of rural drinking water supply projects. An approach, which in my view should on the one hand result in a better maintenance situation and on the other hand contribute to national development.
Various literature sources have been used to circumstantiate and refine my views on how to accomplish this. One author, whose work has been of great importance for the conception of the approach proposed in this paper requires special mentioning in this preface, namely Goran Hyden. The result of various previous publications are brought together in his latest book "No Shortcuts to Progress", which contains an excellent analysis of the African society and has been widely acclaimed by anthropologists, economists, sociologists and development workers alike. Despite the criticism - see e.g. Jiggins /30/ and Geschiere /19/ - for generalizing the African situation, the fundamentals of his analysis remain undisputed. For two reasons Hyden's work is an important contribution to the discussion on African development. First it offers a comprehensive analysis of the problems of development in Africa, its roots and it is an appeal for a greater appreciation of the peculiar African situation. Secondly his work lacks anthropological,

economical and sociological jargon, making it accessible to all who take an interest in development in Africa. In my view this book ("No Shortcuts to Progress" by Goran Hyden) ought to be compulsory reading for anyone concerned with, committed to and involved in development in sub-Saharan Africa.

Acknowledgements are due to Mr. T.Bastemeyer of the International Reference Centre for Community Water Supply and Sanitation (IRC), Rijswijk, for discussing the concepts of this paper, as well as for the opportunity to search and study literature sources at the IRC.; to Messrs. G.J.Bom and E.Roek for their readiness to discuss their own experiences in the field of rural water supply; to Professor E.Stamhuis for the enlightening exchanges about the philosophical background of this subject, which have attributed to a widening of the perspective and a more balanced view; to Mr. J.R.J.Aerts, friend and colleague in the Shinyanga Shallow Wells Project, for reading and commenting on the draft version of this paper; to my tutor Mr. G.J.J.van der Knaap, for his guidance and the inspiring comments on the draft report and to the many fellow students, who have been willing to discuss the views I held, bringing to light shortcomings and inconsistancies in earlier versions of this manuscript.

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Jan Bron.

Summary.

In this paper the author develops an alternative approach for the implementation of rural drinking water supply projects in sub-Saharan Africa.
The objective of the alternative approach to be developed is twofold:
- to achieve a better post-project maintenance situation and
- to implement projects in a way they contribute to national development.
Analysing the achievements and development of the various aspects of rural drinking water supply project implementation in the first five years of the International Drinking Water Supply and Sanitation Decade, the author concludes that in general the strategies followed only respond to symptoms of a much more fundamental problem.
The conclusion of an analysis of the peasantry and the relation between the peasantry (the rural population) and the state is that this fundamental problem is the structural non-relation between state and rural population, which is a result from the historically pre-mature socialistic policy of post-colonial governments in sub-Saharan Africa.
From this conclusion the author derives a definition of 'development', which implies that a development strategy should aim at restricting the involvement of governments in their national economies to providing the proper environment for economic growth, promoting and supporting entrepreneurialism and processes of differentiation and integration within the society.
This concept is then applied to the reality of implementing rural drinking water supply projects, offering a solution based on a Learning Process Approach and emphasizing entrepreneurialism and minimal government involvement both from the side of the donor and the recipient country.
The author concludes that the proposed approach will not produce drastic improvements in the very near future; a long and painful road is predicted, but appreciating the peculiar situation in sub-Saharan Africa, it will improve the chances of sustainability and evenly or may be more important, it contributes to national development aiming at genuine independence for African nations in the future.

Samenvatting.

In deze scriptie ontwikkelt de auteur een alternatieve benadering voor de uitvoering van drinkwater projecten op het platteland van sub-Sahara Afrika. Het doel van deze te ontwikkelen benadering is tweeledig:
- het verbeteren van de onderhouds situatie na voltooiing van het project en
- projecten zodanig uit te voeren dat ze een bijdrage leveren aan de nationale ontwikkeling van het betreffende land.

Uit een analyse van wat er bereikt is en hoe de verschillende aspecten van platteland drinkwater voorzienings projecten zich hebben ontwikkeld gedurende de eerste vijf jaren van de 'International Drinking Water Supply and Sanitation Decade', concludeert de auteur dat in het algemeen de gevolgde strategieën slechts symptomen bestrijden van een veel fundamenteler probleem. De conclusie uit een analyse van de plattelands bevolking en de relatie tussen de staat en deze plattelands bevolking is dat dit fundamentele probleem het struktureel ontbreken van een relatie tussen staat en bevolking is, die weer het resultaat is van een historisch gezien premature socialistische politiek van de post-koloniale overheden in de afrikaanse landen ten zuiden van de Sahara.

Uit deze conclusies leidt de auteur een definitie voor 'ontwikkeling' af, die inhoudt dat een ontwikkelings strategie gericht moet zijn op het beperken van de bemoeienis van de overheden in hun nationale economieën tot het scheppen van de juiste randvoorwaarden voor economische groei, bevorderen en ondersteunen van ondernemersschap en een proces van differentiatie en integratie binnen de gemeenschap.

Dit concept wordt vervolgens toegepast op de praktijk van de uitvoering van plattelands drinkwater projecten, wat resulteert in een oplossing gebasseerd op een 'Learning Process Approach' met nadruk op ondernemersschap en minimale overheids bemoeienis zowel van de zijde van het donor als van het ontvangende land.

De auteur concludeert dat de voorgestelde benadering op korte termijn geen dramatische verbeteringen zal laten zien; het voorspelt een lange en pijnlijke weg, maar omdat het rekening houdt met de specifieke situatie in Afrika, verbetert het de kans op beklijven en evenzo, zo niet nog belangrijker, het draagt bij tot nationale ontwikkeling met als uiteindelijk doel werkelijke onafhankelijkheid voor afrikaanse landen in de toekomst.

CONTENTS.

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1. Introduction.

The declaration of the International Drinking Water Supply and Sanitation Decade in the General Assembly of the United Nations on 10 and 11 November 1980 has, as yet, not yielded the impact which was hoped for.
Major obstacles on the road towards the realization of the Decade's intentions - safe water and adequate sanitation for all by 1990 - are considered to be the problems surrounding the establishment of effective and efficient maintenance systems for rural water supplies. Especially the problem of failing maintenance for wells and handpumps, which actually are relatively easy to maintain is more and more becoming the headache of the Decade. Wells and handpumps are generally considered a very appropriate water supply system for the rural areas, but this opinion is contradicted by the failing of the maintenance systems. Obviously something is being overlooked or failing maintenance is a manifestation of a much more fundamental problem.
With this thesis the author intends to contribute to the ongoing discussion on how to improve the problematic maintenance situation of handpumps and wells in rural drinking water supply projects in developing countries.
Besides that rural drinking water supply projects, implemented within the scope of rural development, provide the rural population with facilities to obtain potable water, these projects should, in the opinion of the present author, also contribute to national development. When projects aim at the first objective only they are merely welfare projects, which do not qualify for the denotion 'development project'.
This thesis will focus on and be an attempt to answer the following questions:

- In which way can rural drinking water supply projects be implemented, so that the sustainability of the projects improve?
- In which way can rural drinking water supply projects contribute to national development?
- And how can both objectives be combined in one and the same project?

Within the scope of rural drinking water supply projects,'sustainability' implies primarily that facilities, constructed or supplied during the implementation of the project, are being maintained in a way that they

continue to function as intended or desired, especially after government and/or donor support will have been withdrawn from the project.
The term 'national development' will be defined in chapter 4. of this paper.
Answers on these questions will differ significantly for the various regions in the world where rural water supply projects are implemented. Because of the affinity with and experience in African countries, this thesis is narrowed down to answering these questions for sub-Saharan Africa.
As a preliminary to answering the first question the developments in the various fields related to the implementation of rural water supply projects will be summerized in chapter 2. Each of the aspects discussed has been regarded as the key to improved sustainability at one or the other time. In chapter 2.3. maintenance itself will be analysed and discussed.
In order to answer the second question a definition of 'development' and 'national development' is required. It is the view of the present author that development can only be defined within an historical and situational context. For that matter it is deemed necessary to analyse the African rural society first. This analysis is presented in chapter 3.
In the next chapter a definition of 'development' for the particular situation in sub-Saharan Africa, as analysed in the foregoing chapter, is conceived. These analyses and conclusions are based on various literature sources.
With this analyses and aiming at a pragmatic approach, a concept for the implementation of rural water supply projects is developed; a concept, which provides the answers on the questions of this thesis.

For the second half of the Decade 'more of the same thing' is not the answer; an assertion few will argue. This thesis does not have the pretension to supply final answers or best solutions, it merely is an attempt to shed a light on an approach, which is often too easily discarded, but at the same time has a promising potential, which does not seem to be recognized.
The present author strongly believes that when adopted, not only in the field of rural water supply, but in all other fields of development as well, the approach as proposed in this paper may, on the long run, lead to genuine independence of African nations. This believe is supported

by the stunning results of pilot projects in the field of irrigation, which were implemented with a comparable approach (e.g. Norman T. Uphoff: A case study of learning process applied to farmer organization and participation in water management in the institutional organizer program in Gal Oya, Sri Lanka, 1982).
Therefore an approach as proposed in this paper deserves serious consideration as alternative to the blueprint approach for rural drinking water supply programmes in sub-Saharan Africa.

2. Halfway the Decade.

In the General Assembly of 10-11 November 1980, the United Nations designated the period 1981-1990 as the International Drinking Water Supply and Sanitation Decade. The slogan for the Decade is: "Safe Water and Adequate Sanitation for All by 1990, If Possible!". The scope of the Decade is so vast that it has already led some people to mark the goals of the Decade as irrational, unrealistic and impossible.
The task is enormous indeed. As indicated in table 2.1. an estimated 2.000 million people have to be supplied with safe water and an even greater number with adequate sanitation facilities.

Table 2.1. Population of developing countries (excl. China) (millions).

	urban	rural	total
Population (1980)	703 (100%)	1612 (100%)	2315 (100%)
without safe water	177 (25%)	1143 (71%)	1320 (57%)
without adequate sanitation	331 (47%)	1399 (87%)	1730 (75%)
Estimated population by 1990 (WHO estimate)	1047	2080	3127
increase during 1980-1990	344	468	812
No. of people to be supplied with safe water during the Decade	511	1611	2132
No of people to be supplied with adequate sanitation during the Decade	675	1867	2542

The estimates of the costs invclved to provide the necessary services in order to meet the Decade goals range from US$ 300 billion to well over US$ 500 billion (or US$ 15 - 25 per capita/year). This is indeed a huge amount of money, but to put it in perspective one should remember that throughout the world an amount of US$ 800 billion (= US$ 200 per head of the world population) was spent on military research and armements

in 1984 alone (newspaper reports on June 18th, 1985, quoting the annual report 1984 of the Stockholm International Peace Research Institute, SIPRI). The year 1985, halfway the Decade seems an appropriate moment to review the achievements and developments sofar.

2.1. Achievements.

The first five years of the Decade have shown a steady increase of project proposals and requests for assistance in the water and sanitation sector from the developing countries. The number of projects implemented in this field only show an increase during the last year (see /61/).
Although an estimated 530 million additional people will have received reasonable access to safe water by the end of the first half of the Decade, due to a population increase of about 15% during the same period, this still leaves some 1.200 million people without a safe water supply halfway the Decade; hardly a significant decrease since 1980. The number of people without adequate sanitation will actually rise to some 1.900 million (/61/ issue of June 1985).
These figures might even be worse than they appear at a first glance. The reliability of the figures giving the number of people with access to safe water is questionable. In many cases they are arrived at by simply multiplying the number of water supply systems by its respective number of users irrespective of the working condition of the system.
According to the first official progress report on the Decade from the UN Secretary General (/61/ issue of June 1985) most of the developing countries have now developed Decade plans and targets, compared to only nine at the start of the Decade. However 22 countries are reported to have felt it necessary to modify their targets - downwards in most cases. In many countries targets still appear to be set too high in view of the progress to date.
A small number of countries have reviewed their organizational infrastructure in order to plan and manage projects more efficiently, attract talented professionals and provide better services. Others have established special units to deal with the special aspects of water supply and sanitation, or have devolved responsibilities from central to lower levels of government.

On manpower the report sees "encouraging progress" in all regions, but effective use and overall inadequacy still as a problem. In sub-Saharan Africa many countries have established grade courses and diplomas for technicians.
To realize the aims of the Decade a significant increase in national spending in the sector would be required. The UN report finds little encouraging evidence of this. Besides a few exceptions most developing countries still spend one to six percent of their budgets on water supply and sanitation. A notably increase is recorded however in efforts to promote community participation in order to lower the costs of water supply systems.
In the case of sub-Saharan Africa donor spending does not show a rising trend. Although sectoral breakdowns are lacking there are no indications to suggest an increased allocation to the water supply sector at the expense of other sectors.
It must therefore be concluded that during the first half of the Decade the required acceleration in development of the sector has not taken place. Water supply has barely kept pace with the population growth and sanitation provision has certainly not kept pace. The prospects for the second half of the Decade are bleak unless there is a great acceleration in development and a marked slowdown in population growth.

2.2. Developments in the field of water supply.

2.2.1. Handpumps.

The declaration of the Water Supply Decade has revived the interest for handpumps and well technology in the developed world. A great number of industries have started to develop and produce handpumps and have engaged in well construction techniques. Competition between manufacturers has led to new developments in the field of handpumps such as footpumps and direct action pumps, bypassing the problems of hinge points, or monopumps, eliminating valve and plunger problems (see appendix).
The Rural Water Supply Handpumps Project of the World Bank and UNDP [57,58,59 and 60] has greatly contributed to set quality and ergonomic standards as well as defining appropriateness for handpumps.

Pumps are judged on the basis of their possibilities to be manufactured in developing countries, their safety, operation as experienced by users, performance when new and after 4000 hours endurance, and installation, maintenance and repair requirements. Besides that the pumps undergo an endurance and abuse test.

This testing programme has gained so much authority that manufacturers scramble to obtain a good rating for their pumps. A damaging verdict from the testing laboratory is realy felt by the manufacturers and is likely to reduce sales considerably. Handpumps, modified according to the recommendations of the testing laboratory, are quickly presented for retesting in order to polish up the damaged reputation of the pump and manufacturer.

Sweden's University of Lund has started a testing programme of pump parts on mechanical and strength qualities in order to get a better insight in the quality of materials and constructions (/61/ issue of June 1984). This is in fact a realization of the proposals of Prasad in 1980 /44/.

The involvement of UNICEF in the development and manufacture of the India Mark II pump (see appendix) has greatly contributed to large scale production of handpumps in developing countries by setting standards and developing a tight system of quality control.

Since the farmyard handpump has been replaced by piped water systems in most developed countries, developments in handpump technology have come to an almost standstill till the UN Water Decade was proclaimed. This proclamation has caused a renewed interest in handpumps and has resulted in the use of modern technologies and materials in handpump manufacturing. Not every innovation has proved successful but many can be considered an improvement in view of the adaption of the former farmyard handpump to the requirements of a community water supply pump. The conditions under which such a handpump has to operate are much more harsh than for the farmyard pump; the major difference being the intensity with which it is used.

Some manufacturers have developed systems of interchangeable parts to assemble pumps for different purposes and with different capacities in order to obtain a flexibility to adapt to a variety of requirements and situations. An example of such a pump is the SWN range of DHV /14,15/ (see appendix).

The most recent development in the field of handpumps is the development of VLOM specifications (VLOM = Village Level Operation and Maintenance). Although the excact specifications of VLOM pumps are still being discussed and adjusted from time to time, the VLOM principle has gained so much momentum that again manufacturers are scrambling to modify their pumps in such a way that they can be designated VLOM-pumps. Unfortunately there is no legal protection on the label "VLOM" and any manufacturer could call his pump a VLOM-pump.
The pump approaching the VLOM qualifications best, according to the World Bank testing laboratory is the Volanta pump (see appendix).

2.2.2. Well survey and construction.

Developments in the field of well survey and construction are characterized by adapting existing machinery to the specific circumstances in developing countries - smaller drilling rigs and more simple to operate. Manufacturers of drilling equipment in the developed countries showed a tendency to produce ever bigger and more powerful machines. This machines have proven to be almost useless in developing countries, because of the vulnerability of this pieces of high technology, the shortage of proper spares and lubricants, and the requirement of highly qualified and experienced operators, of which there is an acute shortage in the developing countries. The call for smaller and more robust equipment which is simple to operate is now being honoured; manufacturers have started to produce again drilling equipment better adapted to circumstances prevailing in developing countries.
Some projects have abandoned the use of drilling machines completely and resorted to handdrilling as is the case with the Shinyanga Shallow Wells Project /8/, and later the Morogoro Wells Construction Project /10/ in Tanzania and the Lake Basin Shallow Wells Pilot Project /12/ in Kenya. This development has led to the establishment of a grade course in Tanzania for handdrill technicians (/61/ issue of March 1985).

2.2.3. Appropriate technology.

Since Schumacher introduced the concept of 'intermediate technology' in the mid-1960s /47/, it is more and more realized that the promise of high technology from the West is fading. The concept of intermediate technology is to choose from different kinds of technology, such as traditional, modern and scientific, labour intensive, capital intensive or requiring heavy energy consumption, the one that makes maximum use of local resources and requiring only an intermediate or low capital investment - it would be a form of technology whose benefits could be made widely available among the people who most needed them. In water supply the emphasis was thus to be on low-cost systems available to everyone, using self-help and voluntary labour wherever possible to reduce the capital investments required. Basically this concept is primarily an economic one, to do with choosing techniques which make a more modest use of capital resources and a more rational use of available labour and local materials. During the following years this concept evolved to what is known as appropriate technology. Although this development cannot solely be attributed to the proclamation of the UN Water Decade, disappointing experiences in large scale water supply projects have, just as all other projects involving communities (e.g. irrigation, housing, health and sanitation), initiated a reassessment of project concepts, resulting in the wider concept of appropriateness of projects. A great number of authors have busied themselves with this subject and congresses, seminars and workshops have been organized in order to define the elements of appropriateness of projects.
In the field of water supply Pacey /39/ has given a very useful analysis of appropriateness. Quoting Voltaire, that the best is the enemy of the good, he proposes carefully to define goals for water supply development, distinguishing immediate objectives and further goals, in order to prevent that one is distracted from good and useful improvements by the vision of what may be best, but is not really attainable (see for example table 2.2.). Appropriateness, in his view, is not only a matter of economic appropriateness as is intermediate technology, but what is required also is social appropriateness, environmental appropriateness and an appropriateness from the health point of view. The term

Table 2.2. Goals and objectives for water supply improvement in rural areas of developing countries. (adapted from Pacey /39/)

Immediate Objectives	*Further goals—stage I* (these follow as consequences when the immediate objectives have been met)	*Further goals—stage II* (these follow from previous stages if complementary inputs are provided)	*Further goals—stage III* (these are consequences of reaching the previous goals which follow if there are also inputs on many other fronts)
FUNCTIONAL to improve the quality, quantity, availability and reliability of the supply **OTHER** to carry out this improvement in a manner which (a) secures the support of users, (b) conserves scarce resources (e g capital), (c) avoids adverse environmental consequences (e g lowering water tables, encouraging mosquitoes)	**HEALTH** to reduce incidence of water-borne and water-based disease **ENERGY/TIME (ECONOMIC)** to save time and energy expended in carrying water **SOCIAL** to arouse interest in the further health and economic benefits which may arise from the water supply **ECONOMIC** to provide more water for livestock and garden irrigation, (water may be used for this even if it is intended solely for domestic supply)	**HEALTH** to reduce incidence of water-washed infections (*inputs required* improved hygiene, health education, improved sanitation) **SOCIAL/TECHNICAL** to ensure good long-term maintenance of water supply and sanitation facilities (*inputs required* training, clear allocation of responsibility, build-up of local maintenance organization) **ECONOMIC** to use energy/time savings and increased water availability to achieve better agricultural output (*inputs required* extension work, fertilizer supply, etc)	to achieve the greater well-being of the people through (a) social change—greater self-reliance in the community, better organization better deal for the poor women etc (b) improved standard of living health, nutrition income, leisure

appropriate technology which is frequently encountered is therefore too limited and one should speak of appropriateness of projects instead. Pacey comes to more detailed criteria for appropriateness derived from his analysis of project objectives as stated in table 2.2. (see table 2.3.) Ideas about appropriateness have not fundamentally changed in the years following. However it seems applicable to state here explicitly that appropriate should be interpreted as 'appropriate to development'. This is usually left unsaid, but is quite crucial for mutual understanding when discussing or working on this subject. Hereby a new point of discussion is introduced by the definition of the word 'development', a subject which will be discussed in chapter 4.

Because of the many criteria involved, which may be contradicting and in many cases will be, the final project proposal will surely be a compromise. Depending on the weight given to each criterion appropriateness signifies different things to different people in different environments. A blue-print on appropriateness is therefore impossible and each project is unique in this way.

The "Small is Beautiful" slogan of Schumacher /47/ in defiance of the trend of the 1960s of "The Bigger the Better", should not be regarded an ultimate truth. It must be realized that small sometimes can be very

Table 2.3. Some criteria of appropriateness in relation to the water supply objectives from which they are derived (Stage III goals are not considered) (adapted from Pacey [39]).

Criteria derived from IMMEDIATE OBJECTIVES	Criteria derived from STAGE I GOALS	Criteria derived from STAGE II GOALS
1 Criteria of TECHNICAL APPROPRIATENESS		
Functional appropriateness fitness for purpose	*Health and Sanitary appropriateness* water-borne disease data and water quality	*Health and Sanitary Appropriateness* water-washed disease data and water quantity and availability
Environmental appropriateness fitness for hydrological conditions, avoidance of environmental damage		
2 Criteria of SOCIAL APPROPRIATENESS		
Community appropriateness felt needs and stated preferences in the community. scale in relation to community size and organization	*Consumer appropriateness* changes in water carrying and in water use patterns	*Maintenance appropriateness* organization, administration, village/government responsibilities, spare parts supply, training, record-keeping
Work appropriateness organization of labour force (whether self-help or paid)	*Educational appropriateness* degree of interest created in health, hygiene and other development	
3 Criteria of ECONOMIC APPROPRIATENESS		
Resource Utilization appropriateness capital and labour intensity, import bill, fuel consumption, scale economies		*Production appropriateness* amount of time/energy saving and volume of water available for productive purposes

painful; economics of scale is defenitely a factor to be considered. In some cases it may be very appropriate to embark on a large scale project. Neither is modern high technology in contradiction with appropriateness at all times.

There is by now a general agreement that appropriateness is vital for project success. Differences however still exist about the implementation of this concept. Has the past shown an overvaluing of economic appropriateness, the reaction seems to be an overvaluing of social appropriateness. It has also become clear that community participation is essential to define the criteria of appropriateness.

2.2.4. Community participation.

Community participation is often regarded as a means to reduce the costs of projects. Voluntary labour provided by the beneficiaries of the project, the community, is expected to lower the capital investments. In most cases this has not materialized. To economize on recurrent costs (operation and maintenance) communities are often supposed to perform a number of maintenance tasks. Disappointments in this have led to the believe that community involvement during the project implementation would create a feeling of responsibility and achievement in the community, which then would result in better operation and maintenance at community level. This approach also did not come up to expectations. Nevertheless the interest in community participation is growing and recognized as a vital element to project success.
Advocates of community participation allege a great number of positive effects, which may be summarized as follows:

- with participation more will be accomplished,
- with participation services can be provided more cheaply,
- participation has an intrinsic value for participants,
- participation is a catalyst for further development,
- participation encourages a sense of responsibility,
- participation guarantees that a felt need is involved,
- participation ensures that things are done the right way,
- participation uses valuable indigenous knowledge,
- participation frees people from dependence on other's skills,
- participation makes people more concious of the causes of their poverty and what they can do about it.

Sceptics, pointing at the meager results of participatory projects, view this as wishful thinking. Advocates impute the disappointing results to an hostile attitude from the project environment towards community participation. Indeed community participation involves more than the community in question alone. To become successful the political, economical, social, physical and historical environment of the project also have to be favourable as will become clear from the remainder of this paper. This complicated nature of effective community participation is being recognized more and more in recent years and many seminars, workshops

and publications are devoted to this subject.
White /51/, voicing the trend of present day thinking on this subject, distinguishes three dimensions in participation: involvement of all those affected in **decision making** about what should be done and how; mass contribution to the development effort, i.e. to the **implementation** of the decisions; and sharing in the **benefits** of the programme. Local participation in **evaluation** might be considered a fourth element, however, this could also be seen as part of the **decision-making** process.
In this light, only the involvement of the population in the physical work during the implementation of a project can hardly be considered as community participation. On the other hand, it may be unrealistic to insist that 'true' community participation is only achieved when the community is in full control of the process and decide entirely for themselves which activities should be embarked upon.
It should be realized that governments, sectoral agencies and donor agencies do not posess the organization, capacity and often the desire to effect this (yet).
Community participation is expected to be stimulated and be more effective when accompanied by a parallel development of decentralization. The decentralization envisaged here implies:

> "... the devolution of decision-making authority and control over the management of development initiatives and resources from the center toward the periphery." (Morss /36/, p. 107).

The following constraints for effective community participation are often noted to impede decentralization, which is generally accepted as a prerequisite for community participation:

- Lack of political commitment.
  Political commitment is usually restricted to rhetoric at political gatherings, while it should result in a national policy and legislation, supporting decentralization and participatory development.
- Bureaucratic resistance.
  Even when the political will exists, implementation of decentralization and participation initiatives will be difficult to effect when the political leadership has to deal with

powerful ministries and sectoral agencies that are unsympathetic, if not openly opposed to these initiatives.

- Poor project design.
  Planning and design documents often call for community participation, but the rigid planning and design itself hardly leaves room for community initiatives besides providing cheap labour.
- Inadequate resources.
  The reluctance of central governments to provide adequate revenue-raising authority to lower levels of authority or sharing national revenue with them makes it unlikely that decentralization and participation initiatives will ever become self-sustaining.
- Constraints in the immediate project environment.
  The effectiveness of decentralization and participation initiatives may be limited by historical factors, the role of local leaders and the lack of infrastructure. Development initiatives introduced by outsiders might be received with sceptisism when there are negative experiences with previous projects or with suspicion when there is a history of forced labour during the colonial past. Local leaders are not likely to give up their power, which they often use for personal gain, unless out of enlightened self-interest that will yield them some future pay-offs. Inadequate transportation facilities, roads and communication networks create enormous difficulties for local administrations in mobilizing resources, supervising field personnel, distributing services, co-ordinating activities and disseminating information; all elements vital to effective community participation.

White /51/ distinguishes ten forms of community participation listed in an order of increasing depth of involvement on the part of the community members, but also within each of the catagories there may be a greater or less depth of involvement. The ten forms of community participation are:

1. Consultation.

1a. Consultation with community representatives, or leaders, to ensure that a programme introduced by the outside agency is adapted to the needs of the community and avoids difficulties in implementation.

1b. Consultation with other members of the community, or specifically, the poor to ensure that the programme meets their requirements.

2. A financial contribution by the community towards construction.

3. Self-help projects in which a specific group of beneficiaries contribute labour (perhaps also materials), especially in construction work, to reduce costs. There is a large input from the external agency.

4. Self-help projects in which the whole community collectively contributes labour (perhaps also materials), especially in construction works. There is also a large input from an external agency.

5. The training of one or a few community members to perform specialized tasks (e.g. village health worker or operator).

6. Mass action: collective work aimed directly at an environmental change of general benefit, e.g. draining waste water (distinguished from self-help by the relative unimportance of any input by an external agency)

7. Collective commitment to change personal behaviour, and collective social pressure for the realization of such changes (e.g. construction and use of a latrine, frequent handwashing with soap).

8. Self-reliance in the sense of the autonomous generation, within the community, of ideas and movements for the improvement of living conditions, as opposed to stimulation by outside agents. The community may well have recourse to external agencies to help with implementation of these improvements.

9. Self-reliance in the sense of using only the efforts of the community members themselves and not appealing to outsiders for help.

10. Self-reliance in the sense of using local materials and manpower, rather than collecting funds internally in order to purchase goods and services from outside; including increasing local capacities with this kind of self-reliance as a goal.

This list can also be regarded as successive steps towards perfection of the concept of community participation. Here also Voltaire's "The best is the enemy of the good" applies. Failing to reach goals which were set too high will reinforce forces opposed to community participation and will make furture attempts more difficult.
No matter what form or forms are chosen, some elements are essential to the participation approach. First of all there should be a continuous dialogue with as many community members as possible, involving all village categories to assure maximum acceptance and minimal constraints. This dialogue should not be pro forma, but should result in adaptions being made wherever necessary. This means that plans drawn up by the agency are flexible or, ideally, that the plans are jointly drawn up. Responsibilities should be clearly defined and adhered to and this approach demands the acceptance of a - varying - degree of decentralization.
Factors deemed necessary to facilitate decentralization and participation are:

- Supportive national policies.
- A bureaucratic culture that promotes negotiation between the center and local jurisdictions.
- Project designs that are flexible and relative simple and use existing institutional resources.
- Local authority to generate resources, combined with resource commitments by beneficiaries.
- Efforts to build local capacities to manage these resources.

To discuss all the aspects and implications of community participation into detail will be far beyond the scope of this paper. It should suffice to conclude that it received much attention lately and that implementation encounters numerous obstacles and opposition in practice.

2.2.5. Training.

Shortages of trained personnel and failure to make effective use of available personnel are often seen as the most serious obstacle to the implementation of projects. Seminars, workshops and project evaluations have stressed over and again the need for training in the field of

technical skills and management. Nowadays most donor-supported projects have some training aspects in them, although in practice training is usually still subordinate to productive goals and in most cases the results of training remain far below expectations.

Despite their awareness of the acute shortage of management and technical skills in developing countries, donors still require a commitment of human resources (qualified counterpart personnel) from the developing countries as a precondition for development assistance. As a result the limited capacity available is switched from one donor project to another in order to satisfy the most influential donor at that particular time. This process is highly demotivating for both the local and the expatriate personnel and an obstacle for the sustainability of projects.

The tenor of the workshop on training held in Lobatse, 1980 /28/ was the cognizance of a general lack of training facilities and an urgent need to train project beneficiaries in order to create an awareness of their problems and the improvements offered by the project. Malawi claims to be very successful in their efforts to educate communities and local water and sanitation workers.

To alleviate this manpower and training constraints Morss et al /36/ propose a more realistic approach and offer four alternatives to be considered:

- Make training a major project component.
- Simplify project activities.
- Do not initiate a new project.
- Use foreign advisors to perform project activities

With regard to training of personnel one should be aware of the different objectives of the donor and the recipient country. The immediate purpose of training in a donor-supported project is to make personnel able to implement project activities and ensure that those activities and the benefits that flow from them, will continue when foreign aid is withdrawn. From the perspective of the recipient country, training has several different purposes; one is to increase to the maximum degree the number of people who gain access to overseas education. Donor funding is one of the few sources available to developing countries for foreign education.

Table 2.4. Advantages and disadvantages of different types of training (adapted from Morss et al [36]).

Type of approach	Advantages	Disadvantages
Out-of-country degree programmes	Political benefits for donor as it strengthens ties and mutual understanding between donor and present and future decision makers in recipient countries.	Costly in terms of time and money; only a small number of individuals will benefit. Candidates will be away from their posts for a considerable time and must be replaced or reabsorbed into the organization when they return. Training is limited to those who speak the language of the donor country. Training in donor countries is often geared to problems and solutions appropriate to that country, and not to those of importance to the developing countries. Relevance of the training to the immediate needs of the project may often be low. Difficult to coordinate the return of long-term trainees with the departure of the expatriate technicians to ensure project continuity. Potential danger of a brain drain increases with long-term overseas training if individuals become accustomed to standards of living that cannot be supported by public service employment in their own country; persons with advanced overseas degrees are often promoted rapidly into administrative positions and thus no longer use the disciplinary expertise that they have acquired.
In-country short courses or workshops	Can be inexpensive, especially when indigenous instructors are used. Certificates of attendance or performance can be given, thus improving the credentials of trainees. Language problem is eased, assuming that the instructors are fluent in the local language	Limited to standarized topics and approaches that will be of interest to a relative wide range of staff; cannot be easily tailored to individual needs. Requires the absence of the trainees from their posts at times which, although convenient for the instructor and the class as a whole, may be inconvenient for the individual and the programme to which he or she is attached. Difficult to identify individuals who have the technical and training skills, as well as the language ability to conduct the training sessions.
On-the-job training	Is very specific to the needs of the project. There is no interruption of the work schedule; trainee continues performing his routine tasks. Low cost, assuming that an expert is available to assist in project implementation in any case.	Requires the development of a sound interpersonal relationship and incentive on the part of both parties to serve as teacher or student; these are difficult to mandate or structure into a project. No academic credentials are accorded so that the training does not benefit the trainee directly in obtaining promotions or increased responsibilities. Language may be a problem if expatriate is not fluent.

Different types of approaches may achieve the training goals, each approach has its advantages and disadvantages as summerized in table 2.4.

It may be concluded that the manpower constraints are felt as one of the major obstacles to bring about sustainability of projects.
Education of project beneficiaries is seen as a requirement for success, but in project implementation productive goals still seem to predominate overall project policies.

2.2.6. Planning.

Many project failures and disappointments are being contributed by implementers to shortcomings during the planning stage of the project.
Although there is a growing group of people who do not believe in the promises of modern western planning techniques and methods for developing countries, practice still shows an increasing emphasis on planning.
The list of publications on planning seems endless and many congresses, seminars and workshops address this topic. The call for sector planning, masterplans,etc. can be heard all over. Lincklaen Arriëns /32/ has made a strong case for a systems approach to the sector development process and calls it a main issue for continuity.
As a remedy to the disappointing results in the past, intensive training programmes in planning and management are proposed.
Just as there is a school which expects everything from modern technology, there is another shool which expects everything from modern planning and management methods. In the technological field this school has lost considerable ground and appropriate technology already is a generally accepted concept.
In the field of planning however, alternative concepts are only starting to be developed but the advocates are gaining ground.
Although in practice most project planners and designers still adhere to their known methods, publications on this subject more and more call for flexible planning and design, as well as less emphasis on productive goals and stressing more to build local capacity and the development of evaluation methods to monitor this, which, in effect should be used as a valuable feedback system.

The fact that people involved in project identification, in planning and in design of the project are usually not the same as the ones who implement the project and are hardly accountable for project performance, is frequently mentioned as an obstacle toward more realistic and appropriate project preparation.

Key players in the cycle of a project, both institutional and individual, expatriate and local try to achieve different and sometimes contradicting ends. Morss et al [36] summarize the different agendas of the key players and its influence on the project as laid down in table 2.5.

Table 2.5. Differing agendas of keyplayers in development projects. (adapted from Morss et al [36]).

Planner	Agenda	Influence on project
Donor agency	Programme monies for development activities that comply with substansive directives and procedural regulations.	Project design blueprints will be written to obtain approval; as a result, possible implementation problems will be suppressed.
Central Bank or Treasury of recipient country	Maximize immediate hard currency inflows, minimize short-run government budget and personnel commitment.	High level of project outlays in early years; little concern for project substance or long-term inputs.
National functional ministries and Lower-level government entities	Each wants to maximize control over resources and how they are used.	Little local involvement in project decision making; little cooperation or support for project by government agencies that are not primarily responsible for its implementation.
Lower-level politicians	Want to take credit for project and ensure that existing power structure remains in place.	Distribution of project benefits will reflect desires of existing power structure.
Foreign technicians	Want to perform in their technical area of expertise.	Little attention is given to capacity building and technology transfer, thereby reducing chances that project benefits will be sustained.
Local project staff	Want career advancement and quality of life not offered by rural areas.	Rapid turnover and absence, which reduces effectiveness of capacity-building efforts and threatens sustainability of project benefits.
Intended project beneficiaries	Are hesitant to risk existing standard of living for new approaches advocated by project; are concerned about their relationships with other members of local power structure.	Resistance to changes advocated by project; project takes longer to achieve sustainable benefits than anticipated.
Other members of local population	Threatened by or envious of project activities and benefits.	Further delays in getting project to achieve objectives.

Proposed solutions to this problem are:

- Changing incentives of donor agency staff, which should bring about a shift from productive goals towards local capacity building.

- Upgrading project management.
  Instead of technicians managing projects more emphasis should be on selecting project managers with management skills and experience.
- Involvement.
  Lower-level project staff and beneficiaries should be given more influence on project policy.
- Creating new incentives.
- Improving institutional linkages.
  Cultivating relations with other institutions involved in development may improve overall project performance.
- The use of outsiders.
  Outsiders can often identify issues unbiassed; project staff has a tendency to defend past decisions, continue on the way once set about and have difficulties seeing totally different approaches to their problems.

For the field of planning it can be concluded that in practice the promises of modern planning methods are fading. Alternatives are proposed but have not been thoroughly tested in practice. It is however clear that a different approach is required, the problem is: Which one?!

2.2.7. Project implementation.

In general most water supply projects implemented since and before the start of the Decade were reasonable successful in reaching their productive goals, although most of them suffered some delays as compared to the planned production scedule. A field inspection team /27/, investigating 16 out of the over 100 drinking water activities undertaken by the Dutch development assistanc agency during the period 1975-1980, notes that a comprehensive policy in this field is lacking; that the efficiency of the projects concerning reporting, management and feedback is rather poor in most cases and that the effectiveness of reaching target groups averaged about 50%. The report notes, apart from a few exceptions, an emphasis on technical solutions and productive goals with little regard to sustainability; training and capacity

building are mostly secondary goals or not a goal at all. For that matter these 16 projects seem to represent the majority of drinking water activities. Similar shortcomings are reported from all over the developing world. Recommendations to alleviate this problems call for improvement of and shifting emphasis towards planning, management, capacity building, training, appropriate technology, community participation and sustainability.
As a result an increased attention for wells and handpumps is noticeable especially when it concerns rural areas. It also has become clear that changing to another technology does not solve all problems. Presently, after a number of projects have been operational for some years, the problem of maintaining the facilities becomes evident. It is this problem which should generate a reassessment of the implementation of drinking water projects.

2.3. Maintenance of drinking water supply systems using handpumps.

2.3.1. Maintenance record.

Reports on the performance of handpumps almost unanimously state a percentage of about 60% of the pumps inoperative and an additional 20% in urgent need of repairs. Exceptions are recorded from projects which are still in their implementation phase and from projects where a strong and centralized organization conducts maintenance operations as in the case of Ghana /3/.
In general however, a centralized organization responsible for all aspects of maintaining handpumps and wells is considered too costly. Maintaining water supply systems, also when constructed with donor support, is considered the responsibility of the recipient country. The poor maintenance records are attributed to lack of funds, trained personnel and transport. But also the lack of commitment to maintenance both on the side of local governments and donors are important reasons for the disappointing results.
When it became clear that handpumps broke down at almost the same rate as new ones were installed the first reaction was to improve the construction of the handpumps; pumps were made more robust and overdimensioned

(e.g. the Shinyanga pump), high quality materials were introduced and new pumps were designed which did not possess intensive maintenance requiring parts such as hinge points (e.g. footpumps)(see appendix). Initially the upperstructure of the handpumps received most of the attention, later also the cylinder was improved. This tenor led to more expensive handpumps, but this was considered acceptable in expectation of reduced maintenance costs. By now most manufacturers advertise their handpumps stating that virtually no maintenance is required.
This development has unfortunately not led to an improvement of the overall performance of handpumps. The construction of a maintenance-free handpump has proved unattainable (as yet). When it was recognized that regular maintenance was a necessity, attention shifted toward the set-up of maintenance organizations.
Well projects usually cover relative large geographical areas, where wells are constructed at a relatively low density. Several wells may be constructed at or near places of a high population concentration, but the average distance between wells (or well concentrations) are large. For example the Shinyanga Shallow Wells Project covered an area of roughly 5 million hectares (± 1.7xNetherlands), over which 1000 wells are scattered /8/. From the Regional capital the average distance to a well is about 100 km. Such a situation is quite common in rural water supply projects utilizing wells and handpumps.
For centralized maintenance systems transport is estimated to consume 50-70% of the total maintenance costs. Decentralization is the obvious alternative. In order to reduce the costs of maintenance even further, a number of maintenance activities are delegated to the beneficiaries. This has led to the now popular "Three Tier Maintenance System", a system where three levels (sometimes four) can be distinguished, each with its specific tasks and responsibilities. The first level is usually village level where an appointed attendant is responsible for the daily care of the well(s) and pump(s). In most cases this is limited to cleaning and greasing. Several villages are covered by the regional level of the maintenance organization; usually a skilled mechanic who pays regular visits to check on the attendants, periodically overhauls the pump and attends to breakdowns. The central maintenance organization is the highest level, responsible for the supply (and sometimes production)

of spare parts, the training and checking the performance of pump mechanics and attend to major problems beyond the possibilities of the regional mechanics.

In India UNICEF has set up such a system, developed the India Mark II pump and has set up production of this pump by local manufacturers who are licensed to do so when they adhere to the high quality standards set and monitored by UNICEF. This set-up is claimed to be reasonably successful, however sustainability has still to be proven when UNICEF withdraws from the project. Apart from the pump production, similar maintenance systems are now encountered in most projects. Still, after the donor agency has withdrawn from the project, the maintenance performance has not notably improved.

Dissapointments as this have led to projects where the idea of handpumps has been abolished completely as in the water supply project in Zambia, implemented by An Foras Forbathen, the Irish National Institute for Physical Planning and Construction Research (/61/ issue of March 1983), arguing that the best problem is no problem. Also the Buba Tombali Project in Guinee Bissau offered this option /42/. Wells are provided with a winch and bucket. The fact that this increases the risk of contaminating the well is seen as a minor disadvantage considering that increasing only the quantity of available water is already a major health improvement and that practice shows that in many cases high quality well water is contaminated during transport and storage anyhow. This invalidates most reasons to construct covered wells with handpumps.

As an increasing number of rural water supply projects have passed the construction phase, the maintenance problem becomes more and more evident. A number of authors have already attempted to analyse the problem and it may be expected that during the second half of the Decade much of the attention will be centered on maintenance, as it has become clear from the experience of the first half that embarking on the construction of new projects is fruitless unless an adequate solution is found for the maintenance problems.

2.3.2. Analysis of the maintenance problems.

To keep a single handpump in operating condition is not so difficult if it is lavished with care and qualified maintenance attention, which is the case with pumps installed at mission posts and private wells constructed by progressive individuals for their own use. In contrast it is extremely difficult to keep a large number of handpumps continually operating, particulary when these pumps are widely distributed in difficult terrain in a country with a low level of development and having relatively few people with technical training and management experience. This is the case where such pumps are a public utility; the situation of almost all donor-supported water supply projects. The scope of the maintenance task may be illustrated by the definition given by Bastemeyer /5/:

> "A maintenance system for (rural) water supply is a semi-autonomous organizational structure, supported by an appropriate institutional and legal basis. It is created to ensure and monitor the performance of (rural) water supply systems in a clearly defined geographical area on a basis of agreed standards, with power to generate and to manage its own financial, material and human resources. Within the maintenance system the role and responsibilities of all concerned are clearly defined, but it is sufficiently flexible to follow economical, social and demographical developments."

Anyone familiar with the situation in developing countries, especially in sub-Saharan Africa, will agree that such a system is far from becoming reality. The major constraints being, as noted by Bastemeyer /5/:

- The ability of responsible agents to pay the annual costs.
- The limited amount of reliable information of costs.
- The establishment of the institutional and legal basis for maintenance, which requires a very strong political commitment and transfer of power.
- Availability of certain basic requirements to make a system work such as capable manpower.

This seems however, a lop-sided emphasis on shortcomings in the recipient countries. In his analysis of maintenance problems, Hofkes /22/ also

consideres the role of the donors when he lists the reasons for the generally poor maintenance situation:

- Organizational deficiencies.
  The organization constructing the system is usually not the organization responsible for maintaining the system. In most cases it is assumed that the community will maintain the well(s) and pump(s) somehow in one way or the other.
- There is a bias towards new construction and installation, both on the side of the donor agency and the recipient country.
- Financial constraints.
  Maintenance is considered the responsibility of the recipient country. Due to shortage of funds to sustain a centralized maintenance organization, the central sector agency is quick to pass this responsibility to the beneficiaries, without providing the means for implementation.
- Impact of poor quality handpumps.
  Each donor-aided project deems it necessary to design a new handpump, adapted to the specific local conditions of that particular project. Whether this leads to handpumps completely manufactured locally but of questionable quality, or to high quality pumps manufactured in the donor country, in both cases experiences at other projects are virtually ignored and the newly designed pumps have to go through a phase of development, fieldtests and adjustments which in many cases has not been completed by the time the project is handed over to the recipient country. As a result the project area is full with pumps out of different stages of development and..... malfunctioning.
- Absence of preventive maintenance.
  Despite all the maintenance schedules and task descriptions drawn up, maintenance, in most cases, comes down to repairing breakdowns. Lack of transport is mostly cited as the bottleneck to implement a proper preventive maintenance programme.

Based on 25 interviews with expatriates from Dutch-aided projects Bastemeyer /5/ concludes that the current problems are basically:

- The lack of maintenance due to institutional weaknesses, and limited managerial capacities within the administrative systems of developing countries.
- Maintenance problems as a result of increased investments, which call for additional funds and other resources for maintenance which are not available.

This illustrates once more the view of the donors that maintenance is the responsibility of the recipient country.

Pacey /40/ analyses the problem in the context of the community and concludes that designing new, more robust and reliable handpumps, which require only a minimum of maintenance will not solve the problem. Five points of importance are noted which require adequate attention:

- Communities using the wells and pumps.
  Why do some villages take care of their wells and pumps and others not? It might be that people have not come to appreciate the benefits of using well water, because the experience has been too short, or no effective health education has accompanied the implementation of the project. The well may be too far, give insufficient water or the taste or colour of the water may be disliked. It may also be that the people do not feel that the pump is theirs through a lack of involvement in planning and construction or there may be a lack of specific responsibilities for maintenance.
- Agencies administering well programmes.
  Often construction and maintenance are considered seperate operations conducted by different agencies. Construction is usually implemented by a specialist team from a sectoral agency as a crash programme, while operation and maintenance is delegated to some local authority. In many cases this results in one or more of the following shortcomings:
  - idea of **preventive** maintenance is lacking
  - maintenance is limited to repairing
  - regular visits are not recorded
  - no standardized pumps
  - shortages of spare parts, skilled manpower, transport facilities and funds

- Objectives for which the wells were provided.
  There should be a different approach for welfare wells and development wells. A crash programme to alleviate acute water problems during a severe drought or at refugee camps needs emphasis on providing water sources as fast as possible and as reliable as possible without the need of maintenance in the near future, because capacity building and setting up organizations in such situations is not feasible. Providing wells for established communities definitely bears a development aspect and such a programme should therefore comply with other development activities in such a community.
- Type of pump used.
  Many of the maintenance problems can be tracked back to defects and shortcomings of the pump. This may be faulty design or poor manufacturing such as:
  - poor quality steel or cast iron
  - roughly finished cylinders; cylinder bore uneven
  - cast iron cylinders instead of brass
  - no protection from rust
  - exessive wear on leathers, washers, bushes and bearings
  - poor screw threads
  - roughly drilled pivot holes
  - no provision for lubrication
  - no standardization of components to a sufficient degree of accuracy.
- The environment: climate, hydrology, geology.
  To guarantee sufficient supply pumptests are necessary.

In addition Pacey remarks that "... despite geohydrological reports the first attempt to make a well should be where the villagers want it."; a proposal which will be discarded by most implementers as being too costly, a waste of money, time and other resources in short supply.

Many projects install factory-made handpumps of which most are imported. The maintenance systems encountered in that case usually require some maintenance tasks to be carried out by the villagers; often a village-appointed pump attendant, who received some training.

The task description of a pump attendant usually comprises a daily, a weekly, a monthly and a yearly routine and duties which imply cleaning, tightening of nuts and bolts, painting, minor concrete repairs and checking for major problems. To carry out any major repair or overhaul, a district pumpmechanic has to be notified. Thus when skill is realy needed the attendant has to admit that he is not qualified or capable and an outsider has to be called in. However necessary his tasks and duties may be, pump attendant is hardly an appealing position. There are little or no possibilities to prove and improve himself. Furthermore it will soon become clear to the attendant that, when he does not follow the prescribed routine and omits one or more tasks, the pump will not break down; at least not immediately. Especially when the pumps are still pretty new, as most pumps in use nowadays, they will perform satisfactory for a period of about two years without any maintenance. This creates a feeling with the attendant of being kept busy with useless tasks and soon none of the required duties will be carried out and the appointee will look for employment possibilities elsewhere.
To circumvent this problem various approaches have been tried. To appoint and train women as pump attendants, because they are believed to have a greater interest in a proper functioning pump. Appointing young men, because they could be trained to take over all duties from district mechanics on the long run. Old men have been appointed because they would have little ambition to prove themselves or move out of the village and they are believed to have a greater authority to insist on changing of behavioural patterns.
Appart from a few success stories most projects have a disappointing maintenance record. Besides the fact that pumps do not provide water of a quantity and quality as intended, a failing maintenance system also results in an economic loss; a waste of financial, material and human resources. There is also the negative psychological impact of such failing; after a first negative experience villagers will be less co-operative and willing to contribute when another attempt is made to improve their water supply or when development activities in other fields e.g. agriculture, are initiated. Outsiders will be regarded with increasing suspicion and distrust.
From the analysis of the maintenance problems, proposals have been submitted to improve the poor maintenance situation and to guarantee sustainability of projects.

2.3.3. Approaches to improve maintenance.

It is generally agreed that maintenance is not an isolated activity for which a system can be designed irrespective of the history and nature of the project involved. It is also understood that a water supply project should be accompanied by other activities such as health education and sanitation, when lasting results are to be expected.
Out of economical considerations it is deemed necessary that at least the regular maintenance duties are carried out by the villagers or a village-appointed attendant.
When people have not come to appreciate the benefits of using well water or when they do not feel that the pump or the responsibility to take care of it is theirs, villagers will not perform the necessary tasks.
In order to create an awareness of the benefits of using well water and generate a sense of responsibility and ownership, it is proposed that communities be involved in the project at a much earlier stage. Preferably the project should be initiaited by the community and beneficiaries should be involved in planning, design and construction. At the same time a campaign should be launched to educate the future beneficiaries on the benefits of using well water. Some projects have put such a concept into practice, with varying success.
Appropriate technology, community participation and training are seen as vital elements for project success and proper functioning maintenance, but do not in itself guarantee success.
Disappointing performances of institutional agencies in fulfilling their obligations have led to an increased emphasis on planning and management training.
Developments in these fields have been discussed in the preceeding chapters.
Concerning operation and maintenance a seminar in Jakarta [54] agreed in 1980 on the following recommendations:

+ Proper operation and adequate maintenance of water supply systems have their beginnings in the appropriate design and proper construction of the system. The type of system designed should therefore be carefully selected with a view to easy operation and simple maintenance within the management capability of the local community.

+ The operation and management of these systems should be carried out by a competent agency until the communities are trained to take over and manage themselves.
+ Improvement of operational and management capabilities of local bodies should aim at operation, maintenance and improvement of the water supply systems and the revenue earned from water supply undertakings should be reserved for these purposes.
+ Relying simply on the community for operation and maintenance without a suitable institutional arrangement often precludes the efficient use of these systems. The development of a flexible institutional structure for operation and maintenance to suit the different types of systems such as handpumps, rainwater collection, and small piped systems are therefore stressed.
  The institutional structure should be flexible enough to encompass a modular or package approach towards operation and maintenance of water supply systems.
+ A standard set of financial, administrative and technical procedures appropriate to the system should be laid down for efficient management. Preventive maintenance in addition to breakdown/repair maintenance is strongly emphasized.
+ The absence of logistical control often delays the repairs and recommissioning of the systems. The standardization of units and equipment is strongly emphasized in order to reduce the number of types of equipment, thereby facilitating a more efficient system of procurement of spare parts, their storage and ease of repair by the operating staff.
+ The evaluation of the performance of the different pieces of equipment used should be made from time to time to continuously improve the performance or to drop the use of unefficient equipment and to reduce the need of keeping in stock large numbers and wide variety of spares.
+ Spare parts should be made readily available at convenient points in the logistic system and at a subsidized rate if not free so that the system can be repaired as soon as defects occur.
+ Contributions from the community by way of labour, local material, involvement in construction, and operation/maintenance are

emphasized. These are means to generate a sense of ownership of the system in the community which would ultimately lead to the financial viability of the system.

+ The level of community participation in operation and maintenance planned should depend on the complexity, type and size of the system.

These recommendations represent the present trend of thinking quite comprehensively.

The consulting engineering firm Dwars,Heedrik en Verhey (DHV) has been involved in well projects since 1974. At first the maintenance problems were attempted to be solved by improving the quality of the handpump, aiming at a maintenance free pump; the so-called 'golden pump'philosophy. This assumes that high quality and thus expensive pumps require very little and preferably no maintenance and will in the long run be cheaper than a simple and cheap pump, requiring regular maintenance, which, as practice has proven, is not carried out.
The result was the development of the Shinyanga pump, followed by the Kangaroo pump and the SWN-pump series (see appendix). The latest versions of the last two types are made of high quality and durable materials. Even this pieces of high technology still do require some maintenance and a maintenance free pump is by now considered unattainable. Therefore attention shifted towards a reliable maintenance set-up. DHV tries to find a solution for the problem by looking for incentives, which will activate certain individuals (appointed or chosen) to take up responsibility for the proper functioning of the pump. It is advocated to create an economical dependence on the pump and to use the pump for more than only drinking water supply. The pump attendant could be given a vegetable garden near the pump, which could be irrigated with waste water. Cattle watering facilities, facilities for washing clothes or a cattle dip could be constructed near and facilitated by the pump. Pumps could be installed specifically for such a purpose. Peletier /41/ shows several possibilities for productive use of spill and excess water. The advantage for pump maintenance in general to be expected is that in this way a number of people or groups of people will economically depend on the proper functioning of the pump. The pump will generate income and this

financial resource could stimulate a commercial supply of spares, which then also will benefit community water supplies.

Many projects require a financial or labour contribution from the beneficiaries for the construction. It is assumed that such a contribution generates a sense of ownership and an awareness of costs, which should result in taking better care of the pump. Such an approach however could effect the contrary as well. As White /51/ points out, the beneficiaries might feel they have done their share by contributing to the construction and the government should therefore ensure the proper functioning of the facility. Requiring a contribution from the beneficiaries is sometimes felt as some kind of government imposed taxation on the rural communities. Here the political slogan 'Water is free for everybody' backfires. Expectations have been raised and villagers feel they have facilitated the government enough already and the government should now keep its part of the bargain. For example, one of the reasons given for the villagation programme in Tanzania was that the government could only provide drinking water when the people moved to live in villages. After finally doing so the villagers expect the government to provide drinking water just as schools and dispensaries which were promised as well. Requiring again a contribution for such a facility before it can actually be realized leaves villagers with a feeling of betrayal and being cheated.

Comparing theirs with the urban situation, villagers feel that they are treated unfairly. In urban areas the government provides the facilities without contributions from the beneficiaries. Consumers paying a waterfee when they have a house connection is considered fair, because a house connection is a luxury which goes beyond the basic need. In many cases water from a public standpost in urban areas is free.

From the present author's survey of the maintenance situation of wells and pumps in the Shinyanga Region, Tanzania in 1982 (see /11/, first progress report), it showed that villagers demonstrated a greater concern for their pump and were taking much better care of it when the pump had functioned without trouble for about 1 1/2 to 2 years after installation; people had started to appreciate the facility. After a breakdown they were actively trying to get it repaired, or when the appropriate institution failed to do so, repaired the pump provisionally themselves. Unfortunately this development was frustrated

by the chronic incapability of the institutional maintenance organization to supply the required services.
The provisional repairs did not last very long and some repairs actually had a destructive effect on the pump. In this stage villagers may have been capable and willing to repair the pump properly when given the proper tools and spares. When asked about it, they stated to be willing to pay for it when necessary.
It may be concluded from this observations that installation of high quality pumps, which will operate trouble free for a period of about two years, will teach the users to appreciate the facility and create a desire to keep it working. In order not to frustrate such a development it is absolutely necessary that, when needed, the required services and spare parts can quickly be supplied.

Also the position of the pump attendant is under scrutiny. It is often proposed that, in order to improve the performance of this person, better incentives should be sought in the form of compensation in cash or exemption from communal duties. Such proposals are supported by experiences as in the Shinyanga Shallow Wells Programme, where a few years after the wells had been handed over to the villages and two attendants had been appointed in each village, all but a few of the attendants were neglecting their duties. The reasons stated were that in most cases they had expected to be employed by the government or the project. When this did not materialize they saw no reason to perform their duties any longer.
DHV has since long promoted the idea to allot a piece of land adjacent to the pump to the attendant, where waste water from the pump could be used to irrigate crops.
As stated before, the position of pump attendant is not a very appealing one. In order to give more status to the job, attendants are sometimes given more training and means to enable them to carry out major repairs and overhauls as well. This also reduces the reliance on the institutional maintenance organizations. It is in this light that the promotion of VLOM-pumps has gained much support.
Instead of training an unskilled person for such a job it is sometimes thought better to select persons who already possess basic mechanical skills,

as there are bicycle and oxcart repairmen. An approach which was reasonably successful in the FAO-supported drinking water project of the "Comité de lutte contre la faim" in Togo, 1980 (G.J.Bom and E.Roek, personal communication) Another approach, which was proposed in Tanzania (as reported by White /51/), is to train the attendant in other mechanical skills as well, and assist him in opening a mechanical workshop, from which he could make a living.

The many failures and few successes of the various approaches make it clear that organizing proper maintenance is a very complicated matter. The performance of a maintenance set-up is greatly determined by the way the project was initiated, planned, designed and implemented, the community participation during this phases and the appropriateness of the technologies. Also former experiences with government or donor-supported projects seem to be an important factor. The institutional structure, local power structure and infrastructure are all factors of significance to be taken into account when setting up a maintenance system. The relative weight of each of all these factors make each community water supply unique, requiring a unique solution. The often followed blueprint approach is therefore doomed to fail. An approach very successful at one place may completely fail at another.

2.4. Summary and conclusions.

Looking back at the first five years of the International Water Supply and Sanitation Decade, it must be concluded that the progress towards the goal 'Water for all by 1990' has sofar been disappointing. During this first five years the number of people without access to potable water has not been significantly reduced. Proclamation of the Decade however has attracted the attention of the international community to the drinking water problem. From the projects, which have been implemented lessons are learned and the complexity of the problem is beginning to be understood. Although many developing countries see it as a temporary solution, for rural areas wells with handpumps, when possible, are generally seen as the most feasible way to supply water. However, this is a feasibility in the eyes of the decission makers, whose major concern is economical and technical feasibility.

Handpump and well construction technology have developed to acceptable standards. Construction crews are being trained and when funds are made available an efficient construction programme could very well increase the rate of production. But an increase in production alone is not enough to alleviate the drinking water problem. The first half of the Decade also brought to light the problem of maintenance. The number of productive wells rapidly declines after completion of a project. Maintenance proved to require much more financial input than anticipated, mainly on transport. For economical reasons maintenance tasks are delegated to the beneficiaries. The supporting institutional framework is in most cases inadequate. Solutions are sought in the fields of community participation and appropriate technology, which should reduce the reliance of the community on institutional organizations. Failing maintenance systems turn out to be the greatest obstacle towards the goals of the Decade. Unless this problem is solved the chances to improve the drinking water situation in the world are very slim. Not the construction or financing of water supply systems, but maintenance is **the** headache of the Decade.

The negative effects resulting from a failing maintenance system are crucial to an extent that implementation of any new water supply project without a sound and fundamental solution for the maintenance of the supply should be disallowed.

Solutions put forward sofar have been in the fields of incentives, community participation, planning and management, technology, training and education. Although some successes have been reported, it is the view of the present author that these approaches merely respond to symptoms of a more fundamental cause. In order to find the roots of the problem an analysis of the rural society is required.

3. Analysis of the rural society.

It would be presumptious even to attempt to capture 'rural society' in one universal definition or analysis. Every (rural) society is the product of its own history and environment in its broadest sense. A comprehensive analysis of rural societies in all its variations as they occur world wide or even restricted to the developing countries alone, is beyond the scope of this paper. Because of the affinity of the present author with East Africa this analysis is limited to sub-Saharan Africa, for it is found that history and environment of (rural) societies in sub-Saharan Africa show considerable similarity and differ only in details. Although such differences may be of importance for a particular solution in a particular situation, it is thought feasible to give a general analysis of the sub-Sahara-African rural society, keeping in mind that any given rural society may deviate from such a generalized analysis in some details, which even may be of crucial importance sometimes. However, the present author feels that ignoring nuances is legitimate when it contributes to a better understanding of the issues at stake.

3.1. Rural societies in sub-Saharan Africa.

There is a great diversity in rural societies in sub-Saharan Africa. Any attempt to give a general description of African societies can be argued with an example of a particular tribe or group, which contradicts that description. In anthropology this phenomenon is sometimes called 'Bongo-bongoïsm'; Bongo-bongo is the name of an imaginary tribe, representing the particular tribe that contradicts a particular hypothesis. The present author is aware that his generalization of rural societies in sub-Saharan Africa is subject to this Bongo-bongoïsm, but nevertheless feels that such a generalization is permitted in order to understand and appreciate the peculiar social forces, which are at play in Africa. The Dutch proverb "De uitzondering bevestigt de regel" (the exception confirms the rule) may be of use in this context.
Aware that it may need some refinements when adapted to one particular case, the following analysis should be helpful in the understanding of rural societies in sub-Saharan Africa.

Often the colonial occupation is taken as a starting point in the history of modern African nations. The post-colonial administrations of African nations; the constitution and legal system, the form of government and the civil service are quite similar to that of their colonizer. This phase in history may have had its effect on the form of administration of present day nations in Africa, it has hardly or not at all affected the rural societies. The same is true for the post-independence administrations. The fundamentals of rural societies have hardly been touched by colonial powers nor by post-independence governments. Colonial rule and independence have only been minor environmental factors in the evolution of rural societies as they are encountered today.

Rural societies in sub-Saharan Africa, to some extent, resemble what Stamhuis [49] terms a"closed society", which is a society in which traditional family and tribal values predominate in all aspects of life, such as social and economical behaviour, administration of justice, religion, art and architecture. These societies are characterized by the influence of a dominant group of senior members, a well defined set of norms and rules, and high valued traditions geared to preserve the cultural inheritage, which leaves little or no room for individual opinions or initiatives. Life is supported by agriculture for food and raw materials, and house industry for processing these raw materials. Wolf [55], in an anthropological approach, distinguishes three types of societies: primitive societies, peasant societies and societies of farmers; a distinction which also could be considered successive stages in an evolutionary process. In a primitive society producers control the means of production, including their own labour, and exchange their own labour and its products for culturally defined equivalent goods and services of others. Surpluses are exchanged directly among groups or members of groups. In a peasant society the surpluses of rural cultivators are transferred to a dominant group of rulers, that uses the surpluses both to underwrite its own standard of living and to distribute the remainder to groups in society that do not farm but must be fed for their specific goods and services in turn. Farmers are agricultural entrepreneurs, running a business enterprise, by combining factors of production purchased in a market to obtain a profit by selling

advantageously in a products market.
Many intermediate forms are possible. Rural societies may bear characteristics of more than one of the above mentioned types of society.
In the terminology of Stamhuis [49] a primitive society would be called "closed" and a society of farmers "open". A peasant society is then a society in the process of being opened.
The rural society in sub-Saharan Africa is best characterized as a peasant society. Some might still bear some features of a primitive society others will have moved ahead already and some characteristics of a society of farmers may be encountered. In general however, the population of rural Africa can be described as peasants.
As about 80-90% of the population in sub-Saharan Africa lives in the rural areas it seems sensible to get a better understanding of the peasantry in Africa.

3.2. The African peasantry.

The following typification of peasantry is for its greatest part based on the book 'Peasants' by E.R.Wolf [55]. This anthropological work presents a clearly written description of peasant life in all its manifestations. Its avoidance of anthropological jargon makes it accessible to laymen in the field of anthropology.
In the preceeding chapter peasants have been described in terms of agricultural production and the transfer of its resulting surpluses. It should be understood however, that peasantry is not an economical motivated mode of production, but rather a way of life.
The agricultural activities of peasants have to furnish them with: a caloric minimum; a daily intake of food calories, required to balance the expenditures of energy a man incurs in his daily output of labour as well as for non-productive family members for whom he is responsible, and surpluses for: seed for next years crop, food for their livestock, replacement funds, ceremonial funds and funds of rent.
The replacement fund is the amount required to replace equipment for both production and consumption, such as repair or renewal of tools, storage facilities, fencing, pottery, utensils, clothing, etc.
The ceremonial fund is the amount required to entertain social relations

with their fellows, such as marriages, funerals and religious celebrations. Within the prevailing power structure someone will exercise a superior power resulting in some claim on the labour of a peasant. Such a claim may be paid in labour, produce or money and is called a rent.
It is this production of a fund of rent which critically distinguishes the peasant from the primitive.
Till recently land was not scarce and landownership was unknown in Africa. Therefore landrent, such as found in South America, Europe and Asia and fuedalism are unknown in Africa (apart from Bongo-bongo land of course).
The rent which has to be paid can be seen as a sort of taxation, which some superior power can claim and for which only very little is received in return. In modern Africa the government is such a power, but also within the social unit of which the peasant is a part, superior powers exist,such as chiefs, witch-doctors and others. The peasant then is subjected to (asymetrical) power relations, which make a permanent charge on his production. The peasant is forced to maintain a balance between his own demands and the demands of the superior power.
The African peasant is, as compared to his fellows in Asia, Europe and South America, in a position where the claims on his products of labour are relatively small.
Peasants are inclined to limit their payments of rent to a social acceptable minimum; just enough to keep him out of trouble and avoid repercussions from the claimant; an attitude comparable to tax evasion practices by individuals and corporations in developed countries.
The African peasant is relatively free to dispose of his surpluses. The superior powers do claim some of it, but are not in a position to claim all of it, let alone to force the peasant to produce surpluses for them.
The peasant unit - the peasant and his family - is not engaged in agriculture only. Besides the calories they need, they also have to dress themselves, build houses, manufacture tools and utensils, process the agricultural products, etc. All these activities may be undertaken by the unit itself, but more frequently they are carried out by specialists, usually members of the same community as the peasant unit.
Goods and services not produced by the peasantry, but complementary to peasant production are obtained from outside and here the peasant is

linked to what could be called a market. Some communities might specialize in the production of specific commodities and periodically exchange them with items from other communities, but basically an African community, consisting of several peasant units is self-reliant for their basic needs. Surpluses may be utilized to purchase goods or services from outside in order to increase the status, level of comfort or just because it is easier to buy than to make.

In order to preserve their existence peasants are engaged in a complicated structure of social relations. When they can afford, favors are extended and help is given to (temporary) less fortunate members of the community, thus creating a right to call upon them in times his own unit encounters a set-back. Relations with powerful and successful members of the community are cultivated by offering services for the same reasons. Mostly this relations are temporary, flexible, latent for long periods and they are many.

Ceremonies play an important role in peasant societies. They underwrite and uphold social relations and the interdependence of the individual members, they reaffirm the prevailing power structure.

Religion provides the common framework of rules and norms, which make actions somehow predictable. It also disciplines the individual to adhere to prevailing rules and norms or otherwise risk supernatural sanctions.

Peasant communities are therefore very conservative. The complicated set of obligations and rights, the mode of production, the power structure, the religion and the economical relations are all geared to preserve the existence of the community and its independence.

The lack of landowners, who can claim rent, and powerful individuals, who can claim tribute from large groups of peasants make the African peasantry as a whole difficult to control. Colonial conquerers have experienced this. There was no ruling gentry, which could simply be replaced, but virtually every community had to be taken control of separately. The supply of agricultural products or labour to the conquerer was only possible through the use of force.

In contemporary Africa peasant communities are part of a larger social structure, the state. The next chapter will address the relation of the peasant community with the state.

3.3. The peasant and the state.

The western perception of 'state' is an organized political community **with** its apparatus of government; the community and its government apparatus are two complementary elements, which are inseparable.
In this sense the word 'state' does not apply to the African situation. When speaking of 'state' in Africa one only refers to the government apparatus, which is a governing structure instituted by the colonizers and imposed on the society. After independence the structure remained virtually unchanged; colonial administrators were simply replaced by nationals. There are no historical grown ties between the society and the state. Hyden [24] bluntly asserts that African countries are societies without a state. The relation or better the non-relation between the state and the day-to-day productive activities of the society is, according to Hyden, the key issue of the problems in present day Africa.
The following analysis is, to a large extent, a reflection of the views of Hyden [24,25], complemented with the views of the present author.
Keywords in Hyden's work [24,25] are: 'peasant mode of production', 'uncaptured peasantry', 'economy of affection' and 'exit option'.
The peasant mode of production is characterized by a rudimentary division of labour, virtually no product specialization and thus very little exchange between various units of production. A peasant household does not realy depend for its own productive and reproductive needs on the contribution by members of another social class. There is no seperation of production factors.
Uncaptured peasantry stands for the lack of structural interdependence between the various units of production and between the peasants and other social classes. This makes that the relation between those who rule and those who till the land are not firmly rooted in the productive system as such.
Interactions between the peasant unit and other production units or social classes follow the lines of what Hyden calls the economy of affection. The economy of affection has nothing to do with fond emotions per se. Rather, it denotes a network of support, communications and interactions among structurally defined groups connected by blood, kin, community or other affinities such as religion. It links together in

a systematic fashion a variety of discrete economic and social units, which in other regards may be autonomous. It tends to be ad hoc and informal rather than regular and formalized. The economy of affection thus constitutes more than just customary functions or what has been described as informal circuits such as Rotating Saving and Credit Associations (ROSCA s) as described by Bouwman [7]. The peasant mode of production and its economy of affection functions side by side with the economy institutionalized by the state, whether socialistic or capitalistic. The economy of affection interacts with the state economy and even influences it. The influence of the institutional economy on the peasantry is limited to some forms of taxation and/or subsidies. Because the institutional economy is not rooted in the productive system it has no power to control the productive system. The peasant is in a position to cut ties with the formal economy at will and retreat into his self-reliant mode of production and depend on his economy of affection: the exit option. He will do so whenever he feels that the costs of his engagement in the formal economy exceed the benefits. His decisions on this are logic and totally rational within the confines of affection criteria, although it may be a form of rationallity different from the western concept of 'homo economicus'.

From the peasant's point of view the state is structurally superfluous. Any public policy aimed at improving, controling, directing or changing his agricultural output is experienced as a foreign intervention. For that matter there is no difference between the colonial administration and the post-independence governments. Attempts from either one to submit the peasant's production to macro-economical goals are experienced as attacks on his way of life, which also is his means of survival. His defence is the exit option; retreat into the economy of affection.

The economy of affection is a strong force. Colonial powers were only able to overcome it by using military force, but they could not eradicate it. In contemporary Africa it is very much present again and it may be one of the major forces derailing the institutional economies of the African countries.

The functional purposes of the economy of affection are basic survival, social maintenance and development. Its effectiveness in achieving this is limited to community level. Besides providing a safety net for the

peasants, the economy of affection is, on the other hand an obstacle to national development. The economy of affection is geared to preserve or to improve the status of the locallity, which often comes into conflict with the principles on which national development is based. It imposes social obligations on individuals that limit their interest and capacity to support public concerns outside their own community. Tribalism and nepotism in hiring practices are manifestations of this negative side of the economy of affection.

The state also has fallen victim to this economy of affection. Policy making and policy implementation are hampered by the strong forces of the economy of affection. Officials are continueously exposed to the demands from their 'clan', which are often in conflict with the development of the national economy. A 'clan' is in this context the group of people who can put a claim on the individual through the economy of affection, e.g. bloodrelatives, electoral constituency, religious groups, people who have put the individual through school, people to whom the individual owes his/her present position, etc. For the individual official this moral obligations tend to be much stronger than the public interest. As a result public resources are diverted to satisfy demands of the economy of affection instead of being used for the intended purposes. Hyden puts it as follows:

> "The economy of affection tends to swamp the public realm, limiting the scope for decisions aimed at defending the foundation on which its existence rests."

and continues:

> "... the post colonial state, in spite of a superficial structural resemblance with its colonial predecessor, is very different. It has created one of the most problematic paradoxes in contemporary Africa: the existence of a state with no structural roots in society which, as a balloon suspended in mid-air, is being punctured by excessive demands and unable to function without an indiscriminate and wasteful consumption of scarce societal resources." (Hyden, /24/, p. 19).

Eager to distinguish itself from the colonizer the post independence governments in sub-Saharan Africa embraced the socialistic approach: comprehensive planning, state control, equality, people's power and

participation. Social welfare was given priority over growth irrespective of its costs to the economy. The public sector grew rapidly and statal and parastatal organizations were created to regulate the national economy. This way the economy of affection was given the opportunity to get a strong foothold in the state apparatus, incapacitating it to function as a framework for a national economy and development.
The individual peasant experiences great discrepancies between political rhetoric and practice; Government promises hardly ever materialize.
The only way open to the peasant to share in the vast resources controlled by the state is through his relations - through the economy of affection - with individual officials controlling (part of) those resources. Attempts by the state to control and direct national development are thus continueously undermined by demands from what Hyden calls 'clan'politics.
Despite the differences of the post-independence state compared to the colonial state, it has remained an alien body in contemporary Africa. It has no roots in the society and does not realy control the production factors in a way that it can put claims on the producers. The latter can escape demands from the state by retreating into the peasant mode of production and relying on the safety net supplied by the economy of affection. On the other hand the producers are not a strong united social force, which can effectively put claims on the state and demand state actions to their benefit.
Peasants have an effective means - the economy of affection - to repel any attempt from the state to submit their productive potential to national development goals and secondly to siphon resources away from the state and away from national development.
Instead of steering the ship of state, African governments are struggling to keep the ship of state afloat.

3.4. Summary.

In sub-Sahara African nations 80 percent or more of the population lives in rural areas. When discussing rural development, of which rural water supply is only one aspect, an understanding of rural societies in Africa is a prerequisite. The great diversity of rural societies in Africa render it delicate to describe African rural societies in general terms. In spite of that, a generalization is felt to be

justified for clearness' sake as long as an awareness remains that many nuances do exist and when applied to a particular society adaption may be required.

In this light rural societies south of the Sahara can be described as peasant societies, which are characterized by a peasant mode of production and an interaction between various production units, which is guided by the rules of the economy of affection. Rural societies are economically and socially virtually autonomous. If there are links with the greater society, the national economy, they are not of vital importance and rural societies can, at will, withdraw their involvement in the greater society - the exit option.

As a result the state in African nations, which actually is no more than an artificial structure imposed on a conglomerate of virtually autonomous units, has no control over the economic forces of the society. It is therefore also incapable to efficiently and effectively direct national development, because national policy is predominated by 'clan'-politics, i.e. individuals involved in national politics are exposed to demands from the economy of affection, which they, as individuals, cannot ignore.

When these peculiar forces, which seem to be at play in Africa are appreciated one must conclude that the prevailing perceptions of development and the current practices of development assistance need to be reassessed and put in line with historical, social, political and economical realities.

4. Reassessing development.

Although development is usually indicated in terms of economical parameters, development definitely means more than just economic growth. As Stamhuis /49/ puts it, total development implies development of education, health and health care, jurisdiction, a sensible use of resources and environment, moral values, etc, etc, as well (p. 343). However, economic growth is a precondition for developments in the field of social welfare in order to sustain the achievements; it is the horse pulling the wagon.

Whether socialistic or capitalistic, the state does have to create conditions favourable to economic growth in order to finance social welfare. Sofar the socialistic approach has failed to create such conditions in sub-Saharan Africa, instead there is reason to believe that it has reinforced the economy of affection.

The establishment of states in a socialist fashion, after independence as reaction to the exploitive governments of the colonial era in African countries, may seem logical, but is historically premature. Marx /4/ saw socialism as the final result of a (long) capitalistic process of exploitation of one class by another. For a peasant society to become a socialist society is, as acknowledged by Lenin, only possible with the support of a strong and determined military apparatus, loyal to the socialist cause; an approach few would advocate for African countries at present.

The historical process of development, though not necessarily a law of nature, does not foresee the creation of socialist states without allowing a process of social stratification first; for proletarians to unite there have to be proletarians first. Turning the pre-capitalistic peasant societies into socialistic states is, in the terminology of Hyden, an historical shortcut.

The huge state apparatus, which goes along with a socialistic ideology, has proved to be an ineffective tool to initiate and sustain development. Every attempt to get control over the productive forces in the society - the creation of marketing boards, development authorities and parastatal organizations - has effectively been repelled by the producers through their economy of affection and exit option. The state has become a money consuming mastodon, incapable to trigger economic growth necessary

to support its extensive apparatus and sustain social welfare. Also nations, which are considered capitalistic, as compared to other African nations, tend to put social welfare above development of a national economy. A catching example to illustrate this happened in 1979 in Kenya. In order to curb unemployment in the country, all employers were ordered by presidential decree to increase their number of employees with ten percent. The government with tens of thousand employees was not exempted, on the contrary, it was to give the good example, and employed thousands of additional people. Almost all the new employees were unskilled and,because of the lack of appropriate vacancies, were given makeshift tasks as a time passing activity; parking lots and offices were swept several times a day. Within a couple of months private enterprises had managed to lay off some employees and had reduced their workforce to roughly the original strength. The new government employees however, enjoyed the protection as any other civil servant and government was saddled with an additional unproductive workforce of several thousand new employees, who had to be paid regular salaries. The net effect of this measure was that it reduced the working morale of both the new and the original employees; the former because they quickly experienced that their presence was only burdensome to their superiors and the tasks they were given were actually useless. The latter, because seeing the new employees earning a salary with doing nothing, they were demoralized. The raise of government expenditure for this case, which may have increased the purchasing-power of a couple of thousand individuals, which might as a result, indirectly, have a positive effect on the national economy, actually had to be diverted from more pronounced and more direct development activities, which could have had a much more positive effect on national development in the long run.

The believe in the socialistic alternative for African countries is waning, even in leftist circles.

As long as the state remains a largely oversized government apparatus, incapable to effectively govern the association of virtually autonomous production units, little progress towards a strong national economy can be expected. Therefore, development activities should bring about an interdependence of state and producers. This implies breaking down the economy of affection, cutting off the exit option and allow for a process

of social stratification. In Hyden's words: "the peasantry should be captured by the state". On the other hand the state should be captured by social classes.
Development, as Stamhuis correctly puts it, is characterized by a process of differentiation going hand in hand with a process of integration. Such a process enhances a seperation of production factors, a pre-condition for either capitalistic or socialistic societies.
Despite its shortcomings, capitalism is likely to be the most effective force to initiate and sustain such a process. To be sure, capitalism in this context is not what the IMF promotes as a system of free international trade, rather it denotes a national policy stimulating and supporting private initiatives and alow those initiatives to develop without government interference, so that it reaches a balance between the capabilities and the requirements of society based on economic considerations of costs and benefits. This way capitalism tends to bring out and stimulate qualities and capabilities of individuals, it tickles the creativity and inventivity of people, it rewards private initiatives, it initiates and sustains specialisation and differentiation and thus integration. As a result it brings about a seperation of production factors and social stratification. This qualities of capitalism will appeal most to progressive, talented and individualistic minded people. Successful individuals emerging from such a process will experience the demands of the economy of affection as cumbersome and obstructive and will try to avoid or circumvent the moral obligations to their 'clan'. To a person, who worked himself up to a privilaged position, the economy of affection only means surrendering part of his welfare, acquired through personal initiatives, to less fortunate, less productive and less risk-taking clanmembers, without expecting that the positions will ever be reversed. The original mutual reliance and support relation of socially more or less equal clanmembers changes into a relation between a (small) permanent group of providers and another (large) permanent group of receivers. The providers - the economical successful - will try to evade the demands from the economy of affection and eventually establish a social class of independent, economical successful individuals; a bourgeoisie. Besides the immediate impulse such people give to the national economy, they initiate the historical important process of social stratification.

Socialism on the other hand, in its quest of egalitarianism, tends to suppress private initiatives, smother creativity and inventivity of people, it denounces private ambition, but demands a loyalty to less talented and less fortunate society members. As a result the speed of progress of the society as a whole is decided by what the weakest members of the society can manage. All the others have to restrain themselves and a lot of the available local capacity is left unused.

The resemblance between socialism and the economy of affection has led to the believe that socialism is the logic choice for African nations. Most pronounced is the Tanzanian experiment with Ujamaa, also known as African Socialism. However, the strength of the economy of affection - the person to person relation - is lost when the system is applied nationwide. Loyalties which exist at community level cannot be extrapolated to loyalties between different communities or tribes or other anonymous groups at the national level.

National development requires a loyalty to the national system, a loyalty which is often in conflict with the loyalty to the community. Therefore an individual has to choose either for the community or for the nation. A socialist system, unlike capitalism, offers little incentive to choose for the latter.

Advocates of socialism, e.g. Nyerere [38], tend to focus on the unattractive aspects of capitalism, for example personal greed, exploitation of one group by another and deadly competition between groups or nations. Discarding capitalism for those reasons, they ignore the historical function of capitalism in breaking down the hold that the economy of affection still has over African societies. Besides that, capitalism possesses a great deal of flexibility to remedy its own shortcomings; afterall the proletarian revolution, predicted by Marx to result from capitalism, never materialized. With history as a guide, measures might be taken to limit undesireable manifestations of capitalism.

Appreciating this, what then should development imply?

Development definitions such as:

> "Development is everything that frees and emancipates underlying and repressed individuals, races, peoples and nations." (Stamhuis [49]; translation by the present author).

E R R A T U M

page 50: To the quotation from Stamhuis [49] should be added:

N.B. Stamhuis continues with rejecting this quotation as a definition for development, but considers it a major development objective instead. (p. 344).

and

> "Development is the process, which provides people with control over their own situation in a way that enables them to improve it by collective action (if necessary with assistance from outside). This means that development has to aim at increasing the independence and welfare of underlying groups." (Penning et al [42]; translation by the present author).

presuppose an already existing social stratification accompanied by an exploitive relation between the different classes. This may be applicable to South and Central America or Asia, but do not appreciate the peculiar situation in Africa. Both definitions focus exclusively on social welfare of individuals and groups, disregarding the role they have to play in the greater society.

There is no universal definition of development. There might be an ultimate goal which is universal, but a definition of development should apply to a particular situation at a particular time, appreciating the prevailing conditions and the next step to be taken towards the ultimate goal.

The ultimate goal might be a philosophical perception of a 'perfect world order'. More often, in the context of developed and developing nations, it comes down to raising the developing nations to a political, economical and social level equal to that of the developed nations and erasing lop-sided dependencies, exploitation and oppression.

Efforts, which bring about political, economical and social independence and increase the possibilities for self determination of developing countries are contributions towards development. It is the opinion of the present author that, regarding the peculiar situation in Africa as described above, development in sub-Saharan Africa comprises all those activities which promote, initiate and sustain the transition of the pre-capitalist society to a capitalist society. In practice this means that a development strategy should aim at restricting government influence in the national economy to providing the proper environment for economic growth, promoting and supporting entrepreneurialism and thus differentiation and integration. As a result social classes will emerge and demand government actions to their benefit. Once these social forces can effectively put claims on the state, either by representation

or by their economic relevance, the state will be rooted firmly in the society and will be able to effectively steer the national economy. It should be realized that such a process cannot be accomplished overnight, it will be a long and painful route. Development is intrinsically disruptive; groups of people will be marginalized by the process, and measures should be taken to limit the hardship for such groups. This should be the second objective of a development strategy.

4.1. Consequences for development activities.

When it comes to discussing specific development activities, such as water supply, two approaches are most distinct. The first is known as the blueprint approach, which implies rigid planning and design and a top-down decission process aimed at efficiently realizing physical project goals, with little regard for sustainability and for the wishes, knowledge and involvement of the people likely to be affected by the project. The second could be labelled the romantic approach, which requires that projects be initiated, formulated and implemented by the beneficiaries, if necessary with outside help. Technology and management should fit in the capabilities already present. The efforts are aimed at uplifting the social, political and economical deprived and breaking down prevailing power structures in order to create an egalitarian society. This approach puts its emphasis on social welfare of individuals and groups who are presently less privileged than others.
Both approaches tend to reinforce the economy of affection. The first as a reaction to blunt interference from outside, the second because no integration with and dependence on the greater society is created and the autonomy of the community is reinforced. Therefore both approaches are anti-development.
Development means change, development means renewal, as stated before development is intrinsically disruptive. However, not every change, renewal or disruption leads to development, on the contrary, most changes, renewals and disruptions are anti-development. Development projects face a constant dilemma. On the one hand development efforts should introduce changes and new technologies, behaviour and attitudes, which lead to a greater interdependence of individuals and communities with the greater society and on the other hand they should not be

disruptive or alien to a degree that beneficiaries do not accept them and ignite their defence. In that case the project reinforces the economy of affection and is therefore definitely anti-development.
For that matter development efforts should include enough aspects, which link up with the technology, behaviour and capabilities of the beneficiaries in order to have the project accepted and on the other hand the project should possess enough elements new to the beneficiaries, which bring them a step further on the long road of development.
To find the balance between these two types of aspects is the constant dilemma facing, especially, project implementers. It is a matter of estimating unpredictable consequences of possible actions.
Critics are quick to denounce the course of action decided upon, when the results come to light. If the project is quickly accepted and taken up by the beneficiaries, because it is in good agreement with prevailing technology and behavioural patterns, it is asserted that an important opportunity has been missed to effect positive changes and instead the project has strengthened the status quo. If, on the other hand, the project is for some reason not taken up by the beneficiaries, planners, designers and especially implementers are accused of ignoring local circumstances, traditions and socio-political structures.
The introduction of new elements definitely needs time to get accepted; an appreciation period. This may be illustrated by the introduction of the Kangaroo pump (see appendix) in a shallow wells project in Tanzania.
In 1976 the Kangaroo pump, a spring loaded footpump, was developed by the Shinyanga Shallow Wells Project in Tanzania (see /8/ and /9/) as a possible solution for the problems encountered with the pumps in use at that time, which suffered from heavy wear and tear at the hinge points. It took several years to overcome the growing pains of the new design.
In 1981 Harderwijk /21/ wrote a fierce article denouncing the self-serving practices of consultants in pushing inappropriate technologies, using the development of the Kangaroo pump in 1976 as an exemplary case to illustrate his assertions. The consultant concerned was accused of ignoring the wishes and preferences of the users of the pumps. Women experienced the required pumping motion as unelegant and indecent and children were unable to work the pump alone. When given the choice the users would prefer hand operated pumps. In spite of this grievences the

consultant continued to install Kangaroo pumps. In 1978 the project moved to Morogoro Region also in Tanzania and one out of every four pumps installed there was a Kangaroo pump. When in 1982 wells and pumps installed in the Morogoro Region were rehabilitated prior to handing the project over to local authorities, villagers expressed their strong preference for the Kangaroo pump, because of its high yield per stroke and its dependability. Without appraising the approach of the consultant nor the general critisism of Harderwijk, the latter definitely has lost credibility by selecting an exemplary case, which later turned out to be a great success in practice.

As noted before, development means change, renewal and disruption and also that peasant societies are of a conservative nature. Therefore peasant societies will experience any development initiative as threatening to their way of life and thus defend themselves against it or at the least will be very reluctant to co-operate.
When the state undertakes development implementation it runs the risk to fail to penetrate the defences set up and as a result loses credit and authority. Irrespective of commendable national objectives, peasants will judge any policy only on how it affects their own personal life according to their own perception of good and bad. When judged positive it may be taken up sometimes. Not always, because coming from the state it is experienced as an outside intervention and that in itself poses a threat. When the outcome is negative, peasants will defend themselves against such a policy and resort to the dependable machinery of the economy of affection. If this is the case the state has achieved the opposite of what was intended. Instead of taking a step forward on the path of development, the outcome is a step back by reinforcing the economy of affection.
In order to get a better hold over society, states tend to increase the bureaucratic machinery, making itself even more vulnarable to infiltration and undermining by the economy of affection. In fact engaging actively in project implementation is in most cases a self destructive act for a state under the prevailing circumstances in sub-Saharan Africa.

4.2. Consequences for water supply projects.

In the field of water supply a distinction should be made between welfare programmes and development programmes. The first, in this context, captures projects, which aim to alleviate severe water shortage problems, which threaten the very life of people as encountered in disaster areas or refugee camps. In such cases quick and effective actions are of paramount importance and everything else will be secondary to that objective. Water supply as a development project has quite a different set of goals. It is this type of projects that will be discussed here.
A water supply project within the framework of a national development programme is directed at areas where there is a supply of water, but the supply may be of bad quality, too far away from the users, of available quantities considered too low or unreliable during dry spells. The very existence of the people though is not at stake.
If not dealing with disaster areas or emergencies, water supply projects should definitely contribute to national development and thus imply more than only improving the welfare of the beneficiaries; it should be a tool to weaken the hold of the economy of affection over society and to cut off the exit option open to individuals in society.
No author elaborating on the subject of water supply neglects to point out the possitive effects, which may result from an improved water supply as there are the improvement of the general health situation and economic benefits (less loss of labour through sickness, reduction of time needed for water collection, etc.), often some indirect benefits are added as well. However, for these benefits to materialize the project has to be accepted by the beneficiaries-to-be and be used as envisaged by the project designers. This is where most projects fall short. Reasons for this, which are often cited are (adapted from White /51/ pp 29-30):

Institutional:

- Lack of a rural water supply policy forming part of a national water supply policy.
- Existence of several government agencies whose lines of responsibilities overlap or are ill defined.
- Lack of institutions capable of project development.
- Lack of water organizations at the local level.
- Lack of trained manpower at every level.
- Lack of criteria for project evaluation and priority selection.

Financial:

- Per capita costs which, for a given level of service, increase as village size decreases.
- Relatively low income of villagers and limited village financial resources.
- Lack of a policy to obtain maximum financial support from areas to be served.
- Lack of local government infrastructure, inability to collect and retain locally collected taxes for local use, and difficulty in collecting fees from water users.
- Lack of village motivation and of public health education, so that villagers are unaware of potential benefits of improved water systems and are not willing to pay for them.
- Seasonal availability of water from ponds, streams, and other sources of questionable quality to which the rural population may return if high charges for improved water supply are imposed.

Technological:

- A record of short operating life for equipment, poor maintenance, and many project failures.
- Lack of local capacity to fabricate simple, reliable equipment for which spare parts and service would be available locally.
- Severe communication problems between remote rural systems and their support organizations in areas with poor or non-existent telephone service, so that system breakdowns are not reported promptly.
- Difficulty in obtaining spares due to lack of money, scarcety of foreign exchange, cumbersome procurement procedures, problems of logistics and absence of a support agency which maintains an inventory of needed parts.
- Difficulty in providing sufficient repair staff and transport to attend promptly to breakdowns in widely dispersed rural systems with very poor road links.

The frequency of the word 'lack' or synonyms in this list is striking. This indicates that appropriateness of the projects concerned is questionable, that projects are implemented without a proper inventarization

of local capabilities, capacities and resources.
Secondly it can be noted from this list that implicitely rural water supply systems are considered public utilities. It is this unquestioned acceptation of rural water supply systems as public utilities with the state responsible for overall performance, which is, in the opinion of the present author, the fundamental problem underlying most of the symptoms mentioned in the above list. It is true of course that politicians have committed themselves to the cause of water supply; the slogan "Water is free for everybody" is commonplace in African countries, but at present, when African societies are in a transition phase from pre-capitalist to capitalist societies (some societies have proceeded further in this process than others), the state is not yet in a position to take up such a task. The state is not yet rooted in society to an extent that it can command society and control social forces working in and on the society. On the other hand society has not produced social forces powerful enough to put demands on the state. This implies that conditions necessary to implement a water supply policy in the form of public utilities are absent in African nations. The rural dweller is as yet not concerned with national policies and strategies; the scope of his interest is still limited to his locality.
Sufficient manpower, funds, capabilities and a proper infrastructure and set of incentives will not fundamentally alter the situation.
The state implementing water supply systems and consequently failing to maintain them over and again, undermines its own authority and credibility, if there still is any left.
Water supply projects also have to contribute to the process of differentiation and integration; to the demolishing of the economy of affection.
The state should be in a position that it cannot directly be held accountable for failure of a project. The state should provide conditions favourable to projects, but the implementation should be left to non-government organizations or private enterprises. In fact small scale rural water supply systems offer an excellent opportunity to promote entrepreneurialism.
The effectivity and efficiency of a maintenance organization, after the implementation phase of a project is completed, is an indication of the successfulness of a water supply project. It will be clear that

a maintenance programme can only become successful when a proper foundation has been laid during the planning, design and implementation phases of the project. Maintenance is not a problem which can be seperated from planning, design and implementation.
Too often donor and state involvement in a water supply project stops after construction activities have been completed, apparently assuming that long term goals will somehow be realized without further assistance. Although project objectives may state long term goals such as:

- to provide safe water to as many people as possible
- to reduce water-related diseases
- to improve living conditions for the rural poor
- to encourage rural development

the terms of reference (and thus points for evaluation) of a project are usually limited to production goals such as:

- number of wells to be constructed or
- number of villages or people to be served during a given period of time.

After production is completed the facilities are handed over to a (unprepared) local organization, to take responsibility for maintenance. Such a distinct seperation of responsibilities and activities is fundamentally wrong and is inviting project failure. The reader will agree that maintenance should be included in decisions from the very start of the project. In fact maintenance should be the guide for any decision to be taken during all phases of the project. Hence it seems appropriate to take a closer look at the various aspects of water supply projects with regard to maintenance and the part water supply projects should or could play in national development, as envisaged in the previous chapters.

It should be clear that a project which fails is definitely not contributing to development, on the contrary, in most cases it will be anti-development; it is a waste of resources and has negative psychological effects on the would-be beneficiaries. Extra efforts are required to activate them again for other development projects after a negative experience. The question is what makes projects fail and what can be done about it.

The following procedure is most common for donor-aided water supply projects. First a project is identified with, but usually without a request from the beneficiaries-to-be. The geographical area, the number of people to be served and project objectives are established. Then the planners and designers move in in order to establish costs and time involved. When this phase is completed to the satisfaction of the parties involved sofar, the project is implemented to be handed over to a local organization responsible for maintenance at the end. Often different donor agencies and local organizations are involved in the various stages of the project. This seperation in time and of people and organizations exacerbates the problem of differing agendas already mentioned in chapter 2. To a large extent this problem is the result of the incentive structures in effect; most of the persons and institutions involved (especially in the early stages of the project such as identification, planning and design) are usually not accountable for the final result of the project. Within the scope of this paper the final result should be seen as the proper functioning of a maintenance organization years after donor support has been withdrawn.
In practice the implementers of a water supply project are often the first to touch the problem of maintenance. Though they are not realy accountable for the proper functioning of the maintenance organization years after their departure either, being confronted with the problem they at least tend to attempt to find a solution, but at that stage the possibilities are often limited by the rigid planning and design. The only way all players in the game will make project success a high priority is to be accountable for it.
A strategy which may come close to realizing this is in the first place defining project goals and objectives in terms of creating water supply systems and organizations in a manner that it guarantees the proper functioning for tens of years after withdrawal of donor support. This being the one and only objective planning, design, type of construction, technology, etc. are no longer goals in itself, but become more like tools to assist in reaching the objective. It then will soon become apparent that it is impossible to plan and design prior to implementation. Planning presupposes a predictability of a problem situation and of the reaction to outside intervention. Western planning techniques do not appreciate the peculiarities of the pre-capitalist rural African societies

and are therefore destined to fail in that situation. Wrong conclusions during the planning phase lead to wrong designs, which eventually come to light in the form of malfunctioning maintenance.
The only way to limit such adverse effects is a project approach at which identification, planning, design and implementation are undertaken simultaneously by a group of specialists all dedicated to the same project goal. Failure of any plan or design in the field provides valuable feed-back information and should not be regarded as a failure to be covered up or for which a scapegoat should be found. A project should start at a small scale (pilot) and gradually expand when experience of all involved increases. An approach as this also has been advocated by Korten /31/ for rural development programmes in Asia. In such a project approach, which Korten has denoted a Learning Process Approach, three stages may be distinguished before reaching maturity (see fig. a.).

Stage 1: Learning to be effective.

One or more teams of highly qualified personnel are sent to one or more villages, which constitute their learning laboratory or pilot site. Here they develop a familiarity with the problem in question from the beneficiary's perspective and try out some promising approaches to addressing jointly identified needs. They may be supported by a variety of external resource persons with expertise in various fields. Errors will be common and resource imputs required will be high relative to results. It is assumed that rapid adaptive action will be taken as errors in initial assumptions are identified.

Stage 2: Learning to be efficient.

As insights are gained into what to do, attention is redirected to learning how to do it more efficiently, eliminating activities which are relatively non-productive and working out simplified problem-solving routines for handling critical activities within the grasp of less skilled persons. New learning laboratory sites may be selectively established to test and further refine such methods - simultaneously giving additional personnel experience in their application.

Stage 3: Learning to expand.

Then attention is again redirected, this time to the phased development of a supporting organisation geared to the require-

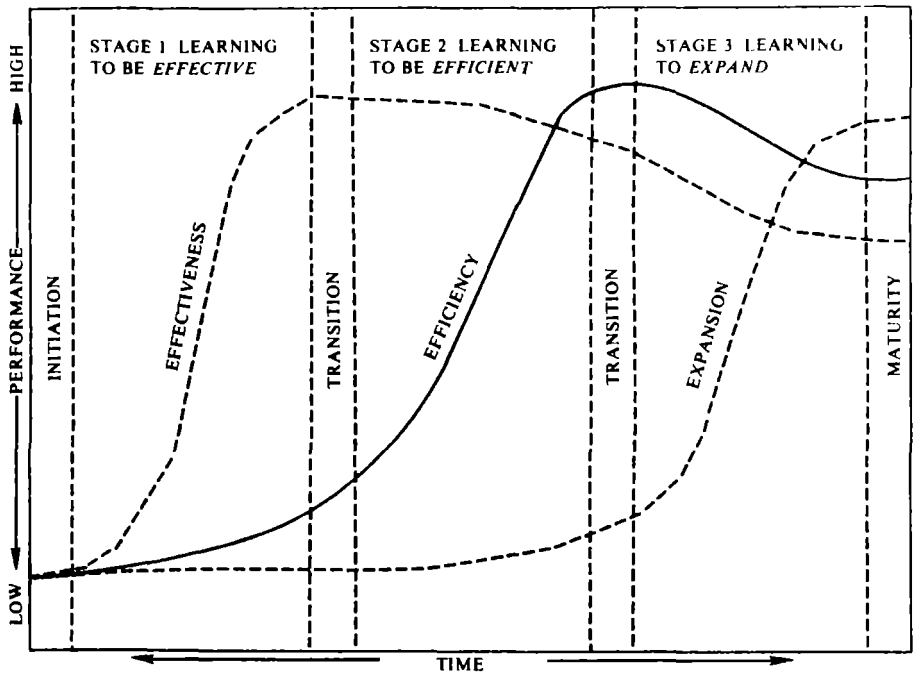

Fig. a. Programme learning curves (adapted from Korten /31/)

ments of carrying out the prescribed activities on a larger scale. It requires building into the organization the supporting skills, management systems, structures and values.

Some distinct features of this approach are:

- a substantial continuity of personnel
- self-defining character
- errors are treated as essential sources of information
- gradual expansion from pilot scale
- undefined time period of specialists' involvement
- participation from the beneficiaries from the very start.

Given a chance such an approach will soon uncover another shortcoming of present day programmes. When identifying needs from the beneficiary's perspective it will soon become apparent that much of the supposed benefits of an improved water supply system can only be realized when actions in other fields are undertaken simultaneously. For a positive

effect on health, water supply has to be complemented with sanitation and health education programmes. When the water supply is also supposed to provide water for cattle watering, cattle dipping or watering gardens, technology and skills should be made available to realize such objectives. Improving the general health situation being the most important motive for improving the water supply system, health care organizations would be the most logic implementers. In fact the water supply projects, which actually have been implemented by health care organizations show a considerable higher degree of success than those implemented by organizations in the water sector. The most important reason for this is probably the fact that health care organizations have much more and prolonged experience in working with beneficiaries at grass root level (bare foot doctors, etc.) and a second reason might be that water sector workers trying to win beneficiaries for their case by using arguments from the field of health care is regarded as an improper attempt of "sales' promotion". Their infamiliarity with details of health and health care reduces their educative task to uttering slogans only. Credibility is lost and little response can be expected.

Water supply projects definitely should not be implemented in isolation. It should go hand in hand with sanitation, health care, nutrition and maybe other activities. In most cases water supply is only a means to achieve goals in the other fields. For sure a very crucial means, but it remains a means and not a goal in itself. It is therefore subordinate to the goal(s) in the other field(s).

Besides the structural shortcomings, analysed in the previous chapters, this is another reason why sectoral institutions (ministries and parastatals) are unfit to implement such programmes. Rivalries, competition for funds, power and status and the differing agendas, motives and objectives of several sectoral agencies make it almost impossible to co-operate successfully. Non-governmental organizations (NGOs) are much better equiped to undertake such tasks, because most of the limiting factors of institutional organizations do not apply to NGOs, but more important, whether volunteer organizations, private organizations or private enterprises, all have sprouted from the society or at least are rooted in the society.

The strength, authority and possibilities of NGOs are often underestimated. It comprises more than informal money circuits as described

by Bouman /7/, who concentrated mainly on saving and credit organizations. Very important NGOs for example are churches and church organizations, but also organizations as Rotating Saving and Credit Associations (ROSCAs), selfhelp organizations for school building, hospital building, etc., may be very useful, especially when they cover several communities or even districts. Sometimes such organizations may be (temporary) latent, but the organizational capacity can quickly be activated and can be of great use.

The Learning Process Approach does not require institutional national structures prior to the start of field activities. Umbrella structures will be established when the need arises and will grow while the project progresses.

The involvement of the community is of paramount importance to success. At the very start it are the beneficiaries who identify the needs. It may then appear that water supply has a much lower priority to the beneficiaries than was assumed. As long as there are unsatisfied needs of a higher priority it is unlikely that a water supply project will be successful, because a major incentive for beneficiaries to participate is the fact that a realy felt need is involved. Maslow /33/ introduced a hierarchy of needs and contended that a need is only addressed when needs of lower order are satisfied. He distinguishes several levels, which are, starting with the lowest level:

1. physiological needs (food, drink and sleep)
2. safety needs
3. belongingness and love needs
4. esteem needs
5. need for self-actualization
6. desires to know and to understand
7. the aesthetic needs.

For a hungry person (a physiological need has not been satisfied) the possibility to earn a higher status (esteem need is addressed) offers no incentive to undertake activities. However, when the needs of the first three levels are all satified the prospect of a higher status will become the major motive for such a person to embark on activities. Although Maslow claims a general applicability of his theories, critics assert that he neglects the effects of the social and cultural environ-

ments of the people in his analysis. Therefore this ideas should be handled carefully when applied to the African situation, but the basic idea, the very existence of some hierarchy of needs and its consequences, will also be true for the African rural dweller. Thus the need of the highest priority as identified by the beneficiaries should be satisfied first. If not it will remain an obstacle when attempting to satisfy a need of lower priority. Too often it is taken for granted that water supply (and sanitation) is recognized as the major problem by the people themselves. When this appears to be not the case, intensive education programmes are introduced to make the people aware of their problems. The relation between diseases and contaminated water may be made understood, but ignoring the priorities of the beneficiaries and putting much effort in trying to get water supply on top of their priority list will soon be regarded as an undesirable outside intervention and result in the loss of credibility and confidence. Much better would be first (or simultaneously) to tackle the problems of higher priority as identified by the beneficiaries. A problem, however, is that priorities may be many and differing for each individual in the community, which might well go far beyond the capabilities and expertise of the development team. Additional expertise could be sought, but appreciating the realities of present day development assistance, which is rather sector orientated and not likely to change in the near future, the forementioned suggestion may prove wishful thinking. It should therefore be accepted that many or most individuals of a community view water supply as a problem of low priority. When not completely ignored, this problem is usually tackled by the introduction of intensive education and information programmes, actually telling the people that the problems they see as important are in fact less important than water supply, implying that they are unable to analyse their own situation. No wonder the effects of such a programme are usually disappointing.

A unanimous decision of all members of a community to do something about their water supply situation after a long period of education and information should be regarded with some sceptism. Repeatedly pressing the topic of water supply, the disadvantages of the present supply and the improvements to be expected from the new one to be build, comes close to indoctrination tactics, which may achieve that community members bravely voice the desired wishes, which definitely does not

mean that that is what is in their hearts. Project implementers then may feel confident to continue the project with the consent of and desired by the beneficiaries, especially when a communal approach is chosen, the final result is often far below expectations.
It is the view of the present author that education and information should be introduced with utmost restraint and only when the need is there. The aim should definitely not be to try to convince people that their biggest problem is another than they themselves think. It only should explain facts such as the relation between contaminated water and diseases and possible solutions to improve the situation. Because practice and experience is a far more effective teacher than a person explaining abstract subjects, the project should move quickly to establish one or more solutions in the field. Instead of fooling oneselves by making the community members say they want the project by using indoctrination tactics, it is much better to just accept that a (greater) part of the community is indifferent to the project; an attitude which may change when they **see** what the project actually has to offer.
As noted in chapter 2.3.3. (p. 31) and 4.1. (p. 51) a period of about 1 1/2 to 2 years is required for people to start to appreciate a water supply facility. During that period the functioning should not be hampered by frequent breakdowns and any breakdown should be quickly repaired in order to prevent that people temporary have to resort to other sources of water and thus offsetting the positive effects the facility already might have had on the general health situation.
When it is accepted that initially there will be a general indifference to a water supply project, the problem arises whether a communal approach still is the most desirable to set up an organization which effectively can manage and maintain the water supply facility, especially through the first critical appreciation period.
Two motives to promote communal ownership and responsibility for maintenance of a water supply facility can be distinguished. First there are the projects implemented by institutional sectoral agencies following the blueprint approach. It soon becomes evident that maintenance of the constructed facilities demands too great a share of the available funds, manpower and transport facilities. Mostly such agencies feel that the requirements for maintenance are obstructive in their pursuit to construct

new facilities. Their solution is to hand the facility and the responsibility to maintain it over to the beneficiaries; the best way to solve your problem is to put it into someone else's lap, seems to be the underlying philosophy here. Obviously such an approach lacks any sound basis to lead to success.

The second motive arose from a dissatisfaction with the forementioned approach. It is argued that a water supply facility is for the benefit of all members of the community and therefore should be owned by all beneficiaries, who also should equally share the responsibility for it. As the institutional structures have proven to be unable and not capable to maintain the facilities the community itself should take up that task and should get organized in a way that ensures that all community members equally share in the benefits of the facility and equally share the burden of maintaining the facility. However commendable, such an approach presupposes a substantial awareness and willingness from all community members. As stated before, that should not be taken for granted nor can it be expected to be obtained through an intensive education and information campaign. A structure of responsibilities and accountabilities requires organizational and management capabilities and capacities and a loyalty to the system, which are not present in pre-capitalistic communities. To think these requirements can be satisfied through training, education and information is rather presumptuous and equally short-sighted as the blueprint approach; the blueprint approach believing in the power of technology, money and management, the communal approach believing in the power of an ideology.

Qualities as mentioned above need to be developed, which is only possible in a favourable environment; an environment of a genuine belief that a communal approach is the only and best way to achieve the desired goals. This believe arises from negative experiences with other approaches, especially approaches which expose large groups within the community to exploitation and oppression. Pre-capitalist communities in sub-Saharan Africa lack such experiences, which makes the step to a communal approach a shortcut in an historical process, with no real chance for success. Instead of being led by ideological and romantic motives one should pursue an approach appreciating historical, social and economical realities. Besides the possible solution of communal ownership

and responsibility the alternative possibilities of ownership by a small group of people or an individual, who can buy the facility and run it as a commercial enterprise, should be proposed as well. Such a solution will appeal to progressive members of the community and offers possibilities for people to use their capabilities to their own advantage. The economic dependence on the facility will make the owner(s) of a water supply facility much more dedicated to maintenance than a communal organization can ever be. Besides that, such a solution does not require a loyalty to the system from the people who do not (yet) consider water supply as a priority and secondly it stimulates development as defined in the previous chapter.

Especially wells with handpumps have promising possibilities for such an approach. The technology is rather simple, the facilities are relatively cheap and required management capacity is limited.

Unfortunately this solution is often quickly discarded, arguing that the assistance is aimed at a group of people who already are in a better position and increases the gap between the poorest of the poor and the better-offs and secondly it puts the water users at the mercy of the owner(s) of the water supply facility, opening the way for exploitive relations. Within the scope of the perception of development as described in the previous chapter these can not be regarded as disadvantages. Assisting prospective entrepreneurs not only offers them a possibility to improve their personal circumstances, but after all brings a water supply to the community as was the intention. Besides that it creates conditions much more favourable to maintenance - economical dependency - and thus to sustainability than does communal ownership.

The second argument against private ownership underestimates the leveling powers of social and economical forces. The owner(s) of a facility cannot discard the wishes (water prices, opening hours, etc.) from the customers completely otherwise he/she will soon be out of business. If, afterall, the community feels being exploited the approach has fulfilled its historical task and conditions are ripening for communal approaches.

Politically there may remain some problems. In the first place water is generally regarded as a matter of public interest and no individual can claim ownership of water resources. This does not imply that someone

cannot deal in water; usually it is put in a way that water itself is indeed free of charge, but the use of the facility is levied. Water peddlers and also public utilities operate that way.
Secondly, extensive legislation in most countries in Africa is very restrictive regarding water undertakers. Usually the state is assigned the task to provide water, but often it is, within the law, possible to license water undertaker committees, although it does not forsee in licensing private enterprises. A major task of water supply project staff will be to find ways to circumvent the restrictive legislation or to get it changed. Especially when communities themselves opt for the solution of privately owned wells, there is reason to adapt legislation.
Whatever obstacles there are, private ownership as proposed here deserves serious consideration, because of the great number of advantages it has over communal ownership, especially with respect to maintenance and sustainability in general:

- it does not require all community members to be equally committed to the system.
- It does not require extensive managerial and organizational capacities. One person possessing such qualities is enough.
- Responsibilities and accountabilities are clear and simple.
- Flexibility and speed of action in case of breakdowns is much greater. Decission-making is not delayed by time consuming procedures.
- It offers powerful incentives to maintain the facility; breakdowns reduce the income of the owner.
- For consumers there is a clear link between payment and service offered; pay down the nail.
- It enhances a process of differentiation within the community and integration with the greater society.
- It creates economical interdependencies.
- An individual owning a well is not as easy falling a prey to the economy of affection as a committee.
- The system does not depend on social control, an in practice ineffective guard against misuse.
- It is depending much less, or not at all on state structures and institutions and is thus not affected by the general inefficiency

of the bureaucratic machinery.

- Project assistance and resources can be put to use much more efficiently and effectively.
- The realization of a reliable water supply for the community and sustained reliability is much better ensured.
- It makes a much more efficient use of local capacities.

In case the legal obstacles for private ownership are unsurmountable intermediate solutions may be considered as there are:

- Ownership by the community, represented by a water undertaker committee, and running of the facility is let out for hire to an individual, who also is responsible for maintenance.
- The facility is installed, owned and maintained by a private enterprise (contractor or individual), the community rents the facility from the private enterprise. No rent is due for the period the facility is out of order.

Whatever solution is opted for it should provide clear-cut accountabilities and responsibilities, effective sanctions, incentives to guarantee sustainability and a structure which can operate independent from the bureaucratic government machinery.

For a better maintenance a private interest in the proper functioning of a facility only is not enough. It also requires an appropriateness of the facility and well functioning supply lines for spare parts. Regarding appropriateness, much of what has been said in chapter 2.2.3. applies to the solution proposed in this chapter. Only, within the scope of this paper, the phrase "appropriate to development" gives another dimension to appropriateness. In fact it is this appropriateness to development which leads to the solution as proposed here.
Also for the presented solutions Village Level Operation and Maintenance (VLOM) qualities are important selection criteria. Pump owners will probably have an even more keen eye for this than conventional project implementers, because easy and simple maintenance is to their own advantage.
With regard to the availability of spares the Learning Process Approach provides ample opportunity to gradually develop a system of supply and manufacturing simultaneously with the introduction of improved

water supply to the community. Both activities are complementary and reinforce each other.

Instead of the project developing again another handpump, serious consideration should be given to existing pumps and for the sake of standardization, especially to pump types already installed in the country. When handpumps of the required quality and capacity are not manufactured locally, but can be obtained abroad, the project should establish a manufacturing plant locally, which eventually will manufacture the desired pump under licence. Initially complete handpumps may be imported, when capabilities increase pumps may be imported in parts and be assembled locally. In a later stage more and more parts may be manufactured locally and only few or no parts are imported in the end. Possibilities to import and the local availability of raw materials will have to be major considerations in the selection of the handpump. In co-operation with the mother company of the handpump it may be possible to adapt the design of the handpump to local circumstances.

As a starting point for a pump manufacturing plant existing industries should be considered. Technical know how and trade relations are then already present and such experience is of great use. The project should assist interested companies in obtaining import licences, put the companies in contact with the foreign manufacturer and negotiate an agreement for the local manufacture of the handpump in question under licence. An approach as this has proven quite successful in Upper Volta, where now the India Mark II pump is manufactured locally (/61/, issue of Jan. 1983)

Regarding the supply and distribution system for spares, existing wholesale and retail outlets should be considered. At the community level shopkeepers, bicycle or oxcart repairmen may prove valuable. Shopkeepers are familiar with supply lines and have a proven practical knowledge of economics. Repairmen possess basic technical skills and can easily be instructed in the repair of handpumps. Through his own system of supply lines he will be able to procure spares. Taking up pumprepair and maintenance as an additional activity provides a repairman with a broader foundation for his enterprise, but on the other hand he is not solely depending on income from pumprepair and maintenance, which may be too little to live on, especially in the beginning when pumps are still new and few. This is a major advantage over setting up special

pump maintenance and repair enterprises. Also the suggestion from Tanzania (White [51]) to train pumpmechanics and assisting them to set up a mechanical workshop of their own in order to employ their newly obtained skills for other purposes as well so that a regular income can be ensured, is a solution only to be considered when the forementioned solution - relying on existing enterprises - cannot be realized because they simply are not there.

The implementation of a water supply project thus takes the form of intermediating between beneficiaries, prospective entrepreneurs, suppliers, manufacturers, etc. It is not possible to present a blueprint on how and what has to be done. The Learning Process Approach is an important tool to reach a satisfactory solution. When a specialised team has made an inventory of all the wishes of the community, for the problem of water supply (which will be only one of the fields of action) the various solutions as proposed in this paper should be discussed; advantages and disadvantages should be carefully weighed. Whether the community decides for a community owned or a privately owned facility or one that is owned by an association of a number of community members, the question arises how much of the capital investment should be borne by the owners. One is inclined to demand the full recovery of costs from private owners and in the case of communal ownership feel for subsidizing the water supply facility. Another possibility, favoured by the present author, is to insist on recovery of the whole investment in all cases, but providing credit facilities in the form of a sort of revolving fund. For every community a credit for the costs of one facility is made available. The first facility is constructed from this amount and additional facilities can be constructed when the loan is repaid.
The actual construction may be carried out with selfhelp, by a contractor, a combination of both, but should, in line with the rest of this paper, not be undertaken by the project itself. The project should negotiate costs and reductions in costs for selfhelp, conditions for quality guarantee and guarantee periods etc. Sometimes a contractor will have to construct the complete facility, at other places the role of the contractor may be reduced to the supply of construction materials.

Within the scope of such a project it may be necessary that contractors are assisted for some time to become familiar with well construction and its problems and for the procurement of the required machinery. Site exploration may pose a major problem. Few contractors might be willing to agree to a contract, which implies finding water and guaranteeing the yield. Only large companies with much experience in the field of water exploration agree to such a contract. When there is no alternative the project may have to take up the task of exploration and finding prospective sites and take the risk for it, by a special clause in the credit arrangement with the owners.
The role of the state in this approach is very limited. That is, the state is not involved in the actual implementation, operation or maintenance. It should however, create a favourable environment for such a process to take place. Private enterprising should be stimulated. The state also has a task in enforcing quality regulations, this concerns the quality of water as well as construction materials and industrial products used in water supply systems. The reduction of the involvement of the state being a major aspect of the development perception in this paper besides the creation of interdependencies between communities among each other and between communities and the greater society, the proposed approach definitely contributes to national development.

4.3. Implications for donor assistance.

When discussing development in Africa one cannot ignore foreign aid. While initially foreign aid was considered complementary to domestic efforts, it has now become a major source of income - for many countries foreign aid makes up for more than 70 percent of the national budget - and it is now a prerequisite to the sustenance of any significant public investment in several countries. Much can and already has been said about the negative consequences of this heavy reliance on foreign aid and the disadvantages of the present forms of foreign aid in general (see for example Hyden [24]). This chapter will only indicate in which way the present forms of foreign aid work against development as envisaged in this paper and will further be limited to the way foreign aid could contribute to development in the particular area of water supply and maintenance.

Foreign aid in its present form comprises one major obstacle towards development in Africa, i.e. the handling of donor assistance on a government-to-government basis. Over 90 percent of donor funds is channelled through governments. Although this way of handling affairs is beneficial to both the donor and the recipient government - it is mainly serving their informal motives - it is definitely not serving development as envisaged in this paper. Foreign aid from government to government, to support development, presupposes that the state and a macro economy in the recipient countries are in place and at work. As analysed in chapter 3. this is not the case in sub-Saharan Africa. This system of foreign aid not only tends to disguise the real issues of development in Africa, but in fact also tends to reinforce the very structural constraints that impede progress.

The meagre results of the present system of donor assistance are embarrassing to both the donor and the recipient governments, but because pressure from political constituencies are likely to be more effective in donor countries than in recipient countries, changes should be expected first from the side of donor countries. The strong dependence of developing nations in Africa on donor assistance also provides the donors with plenty of leverage to press alternative approaches to development; a strategy which already is successfully applied by international organizations as the IMF and World Bank, although the motives behind it and the goals pursued are at the least disputable in those cases.

Despite the increasing cognition, also in donor circles, that 'more of the same thing' is not the answer to the problems of contemporary Africa, it is not likely that the current system of donor assistance will radically change in the near future, because of the many vested interests in this small world of aid business. Without disparaging the need to reassess donor assistance as a whole, it is, at least for the time being, more realistic to aim at improving the performance of individual donor supported projects.

For a project approach as described in the previous chapter and especially for projects in the field of water supply, donor assistance, in order to be supportive, should feature characteristics as described in the remainder of this chapter.

Preparation and formulation of a water supply project in a fashion as proposed in this paper, emphasizes long term objectives such as establishing a water supply system that will perform satisfactory till years after withdrawal of donor support; it abstains from elaborate pre-planning and prescribing the ways to achieve the long term objectives; it does not restrict project activities to the water supply sector only, but features the flexibility to include and support activities in other fields as well whenever deemed necessary.

The magnitude and type of donor assistance is only decided upon after a thorrough inventarization of local needs and capacities, especially the capacity of non-governmental organizations and private enterprises, with regard to the long term objectives.

Financial assistance for the project is not channelled through conventional institutional structures, but directly to the project.

With regard to manpower a policy of continuity is pursued, accompanied by a flexibility to assign additional expertise to and withdraw unneeded personnel from the project according to requirements.

The duration of donor involvement is not decided prior to implementation, but the donor agency is committed to the project till the objectives have been achieved. Even when the donor agency has physically withdrawn from the project it remains committed to, accountable and responsible for its future performance.

The speed at which the project progresses is not decided upon by the wishes of the recipient government or of the donor agency, but is adapted to the capacity of the project environment to absorb the changes and developments initiated by the project.

Evaluation criteria no longer emphasize productive goals, but appropriate guidelines and procedures are developed to monitor progress with regard to achieving sustainability.

It would be naïve to expect that institutional donor agencies quickly adopt such an approach. Non-governmental donor organizations however, offer a promising substitute. Hyden [24] emphasizes the importance of ' the warm temperature of funds'. The depersonalized conventional manner to transfer foreign aid funds from Treasury to Treasury along with the professional and bureaucratic strings attached, tend to make the money

cold. A more direct relation between beneficiaries and donors (individuals, groups or movements in the donor country) together with an involvement by persons or groups committed to the objective for which the money is supplied, tend to warm the temperature of the funds. This way the warm temperature of the funds has a potentially possitive effect at both ends of the transaction and, as long as the aid business has not produced better results, should not just be discarded as being an oldfashioned missionary philosophy.
The potential of involving smaller groups more directly in development assistance, especially on the side of donor nations, is illustrated by the number of bilateral relations between individual municipalities in The Netherlands and a municipality in one or the other developing country. The number of such relations has increased enormously in recent years (see [50]). Also church congregations adopting a project in the Third World is exemplary to this. Professionals in the aid business view this development with sceptisism and criticize it for being unco-ordinated, ad hoc, without any relation to broader goals, etc. Maybe true, but it definitely 'warms the money' and that compensates to a large extent the negative sides as cited, which afterall can be improved significantly when the professional aid business(wo)men are willing to assist and accept the concept as another valuable approach. Non-government development assistance organizations have a history and experience of working along such lines and have the potential to effectuate the process advocated above. The institutional donor agencies may not be in a position to drastically change their own policies in order to implement projects along the lines indicated in this paper, it only requires a minor adjustment in the policy of governments in donor countries to divert a more substantial percentage of the total aid allocation to non-governmental organizations, who are then left to implement the desired policy.

4.4. Summary.

Turning the pre-capitalistic peasant societies of contemporary Africa into socialistic states ignores the realities of rural Africa. Emphasizing social welfare in itself is not progressive, rather it impedes development.

Development, seen in terms of the next step to be taken in an historical process, implies initiating a process of differentiation and integration, and creating an interdependency of production units among each other and with the greater society. A development policy promotes, stimulates and supports such a process. In practice that means breaking down the hold of the economy of affection over African societies and cutting off the exit option, open to production units. A capitalistic approach is likely to be the most effective force to bring about the desired transition.

Development activities and donor assistance should not just focus on improving social welfare alone, but should contribute to development as perceived in this paper as well. If not, it confirms or even reinforces the status quo and thus should be labelled an anti-development activity. A rural water supply project, in this context, can only be considered successful when it eventually results in a well functioning maintenance system and on the other hand has initiated or contributed to a process of differentiation and integration. The implementation of a water supply project with such objectives is a delicate problem of finding a compromise between elements linking up with the social, technological, economical, political and physical environment of a community and elements supporting development, which often infringe the established situation and relations. However, because of its relative simplicity, wells with handpumps offer promising possibilities, but it does require a modified approach for the practice of project implementation and for donor assistance.

Project objectives should emphasize the contrivance of a well functioning maintenance system and abstain from production goals. Project identification, planning, design and implementation should be carried out in a fashion of a Learning Process Approach, making maximum use of local capacities and limiting the role of the state to an absolute minimum. Conventional donor assistance on a government-to-government basis creates too many obstacles for success, instead donor funds and expertise should be channelled through non-governmental organizations, both on the side of the donor and the recipient country.

5. Conclusions.

The major problem confronting implementers of rural water supply projects in sub-Saharan Africa is the failing of maintenance systems. When analysing this problem within the confines of the water supply sector, failing maintenance is often contributed to causes as lack of funds, lack of management capacity, manpower, transport, infrastructure, etc. Solutions are then sought to alleviate or circumvent each one of these problems.

In this paper it has been attempted to demonstrate that failing maintenance is not an isolated technical problem nor an organizational problem, but rather a manifestation of an erroneous development perception.

Too often development projects, especially water supply projects, have no other goal than to improve the welfare of a rather small group of beneficiaries.

The analysis of rural societies in sub-Saharan Africa, in order to find the roots of the maintenance problem, brought to light a much more fundamental problem, which is the structural non-relation between the state and the society. The implications of this conclusion are enormous. To a large extent it explains why, with the current project implementation practices, maintenance systems fail. It also implies that, if development is pursued, projects should contribute to a process improving the relation between the state and its society.

Rural water supply projects must not shirk the responsibility to contribute to this process. Although it is much easier to concentrate only on welfare aspects, also water supply must be regarded a tool to stimulate development as percieved in this paper. The consequence on the short run will be that the intention of the International Drinking Water Supply and Sanitation Decade namely "Safe water and adequate sanitation for all by 1990" is definitely far too optimistic and probably unrealistic. An approach as proposed in this paper, not only restricted to water supply projects, on the long run will lead to the realization of economical, social and political independent nations in sub-Saharan Africa.

With regard to maintenance of wells and handpumps the proposed approach much better assures that the selected solution is geared to the carrying capacity of the local economy and of the local management capacity and thus stands a much better chance to overcome or pre-empt maintenance problems than the prevalent approaches.

Failing maintenance systems may be the headache of the Decade, compared to the immense problems facing contemporary Africa, it is only a mild ailment and more accurately only a symptom of a much more serious malady. The curing of the patient will take a long time and the medicines required will not be sweet. All treatments applied should aim at the source of the disease and not be limited to fighting symptoms.
It is likely that some treatments cause some undesired side-effects, e.g. the marginalization of particular groups in the society, but this should not be a reason to soften the treatment. Development assistance should therefore, in the first place, aim at strengthening the local market, the process of social stratification and the role of local capital and entrepreneurs. Secondly it should take measures to soothe the pain of those groups who are in danger of being marginalized by this process.
To dismiss this approach, just because not all people concerned equally share in the benefits of a project, is proof of a shortsightedness and a lack of understanding of the realities in contemporary Africa.

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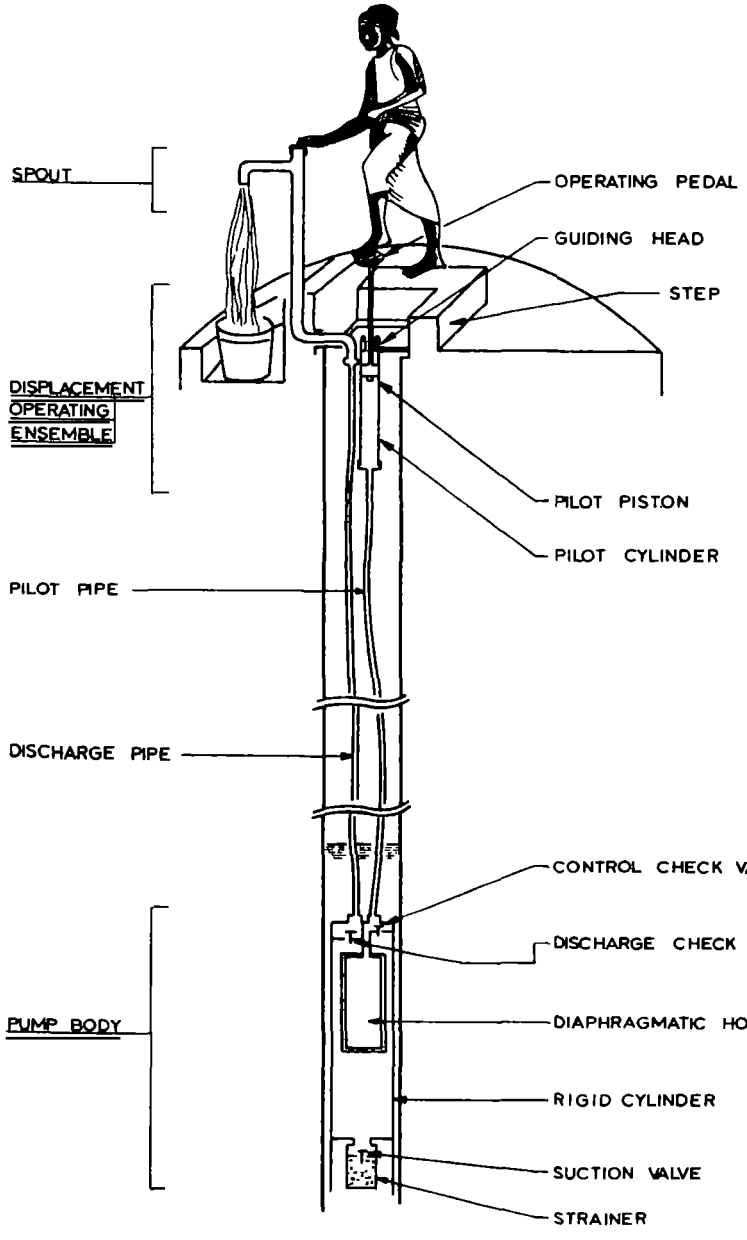
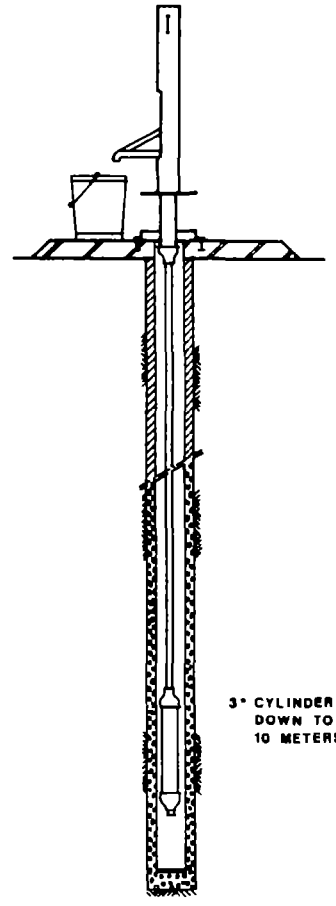
Appendix. Pumptypes referred to. Footpumps.

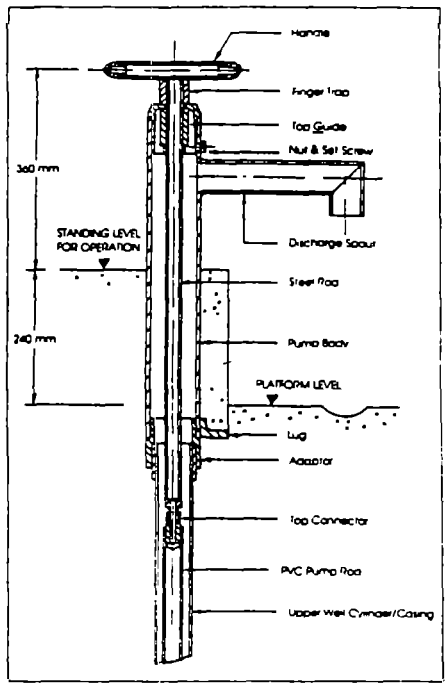


HYDRO - POMPE VERGNET
SCHEMATIC ARRANGEMENT



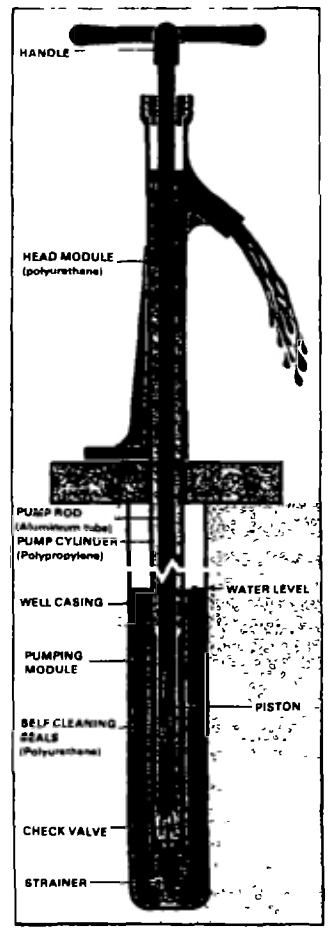
THE "KANGAROO" PUMP

Appendix. Pumptypes referred to (continued). Direct action pumps.



Tara handpump

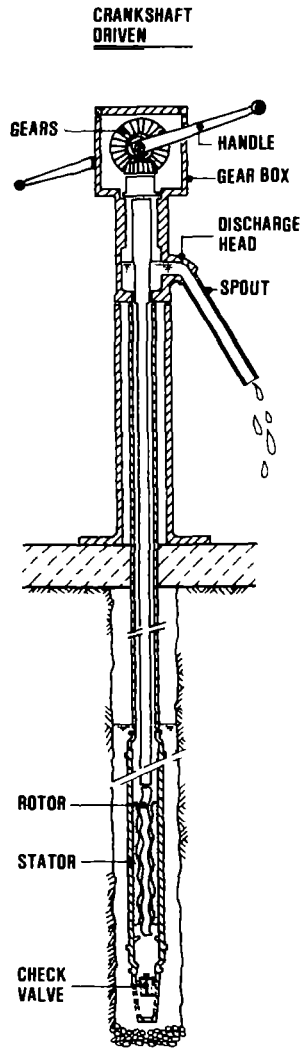
Bangladesh



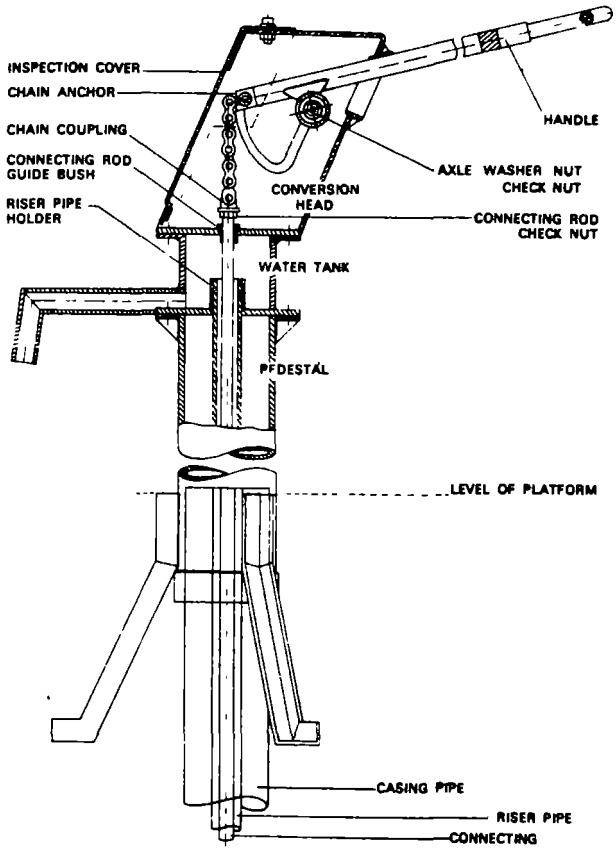
Plastic handpump uses buoyant pump rod

Appendix. Pumptypes referred to (continued). Mono pumps.

Mono Pumps



Appendix. Pumptypes referred to (continued). India Mark II pump.

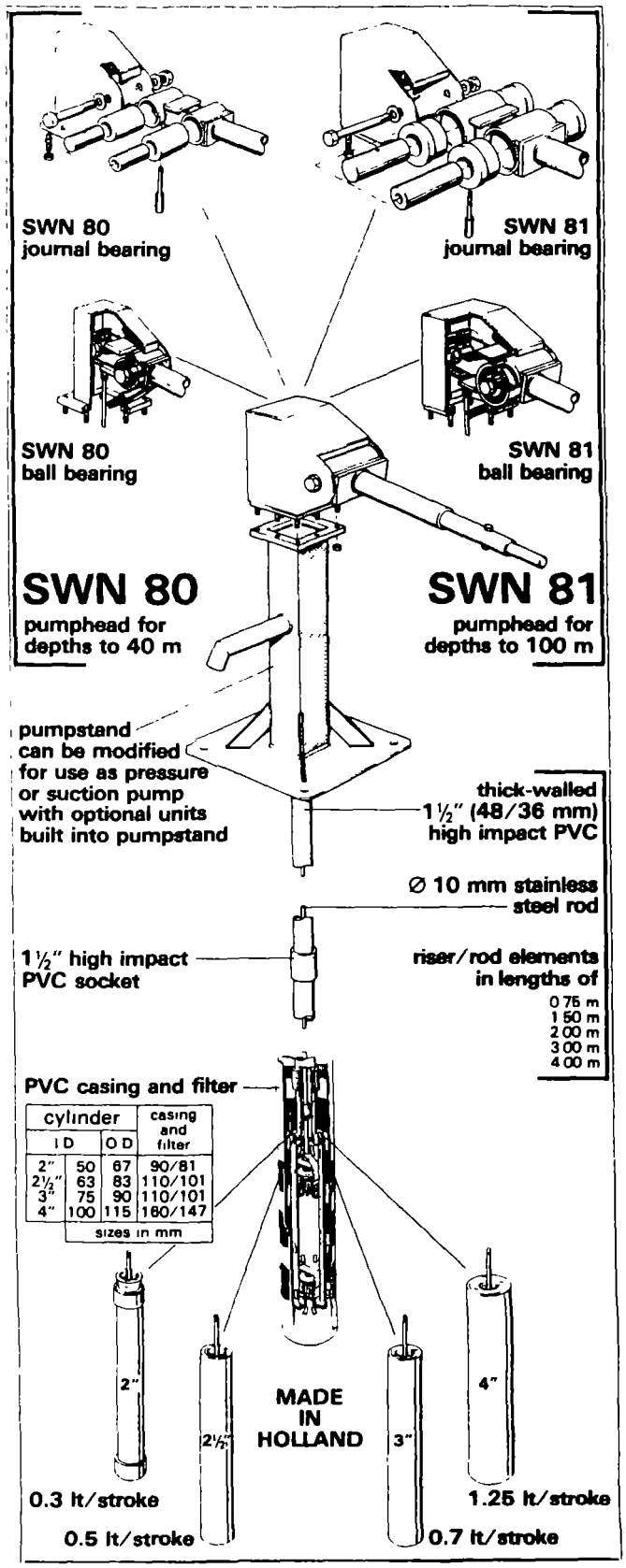


Mark II
Deep Well Handpump

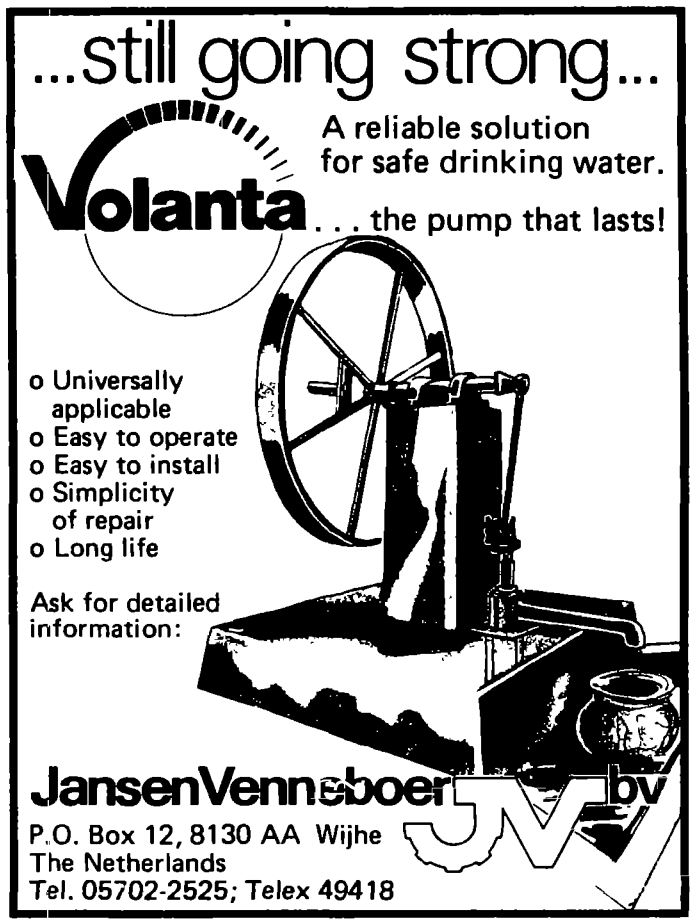
— capacity 1200 l/h
— operable to a level of 80m
— suitable for boreholes of 3 inch
— pump fully galvanised
— cylinder complete of brass
— flange or tripod execution
— easy to install
— easy to operate and to maintain
— delivery ex stock
— very competitive price
— excellent proven quality

Appendix. Pumptypes referred to (continued).

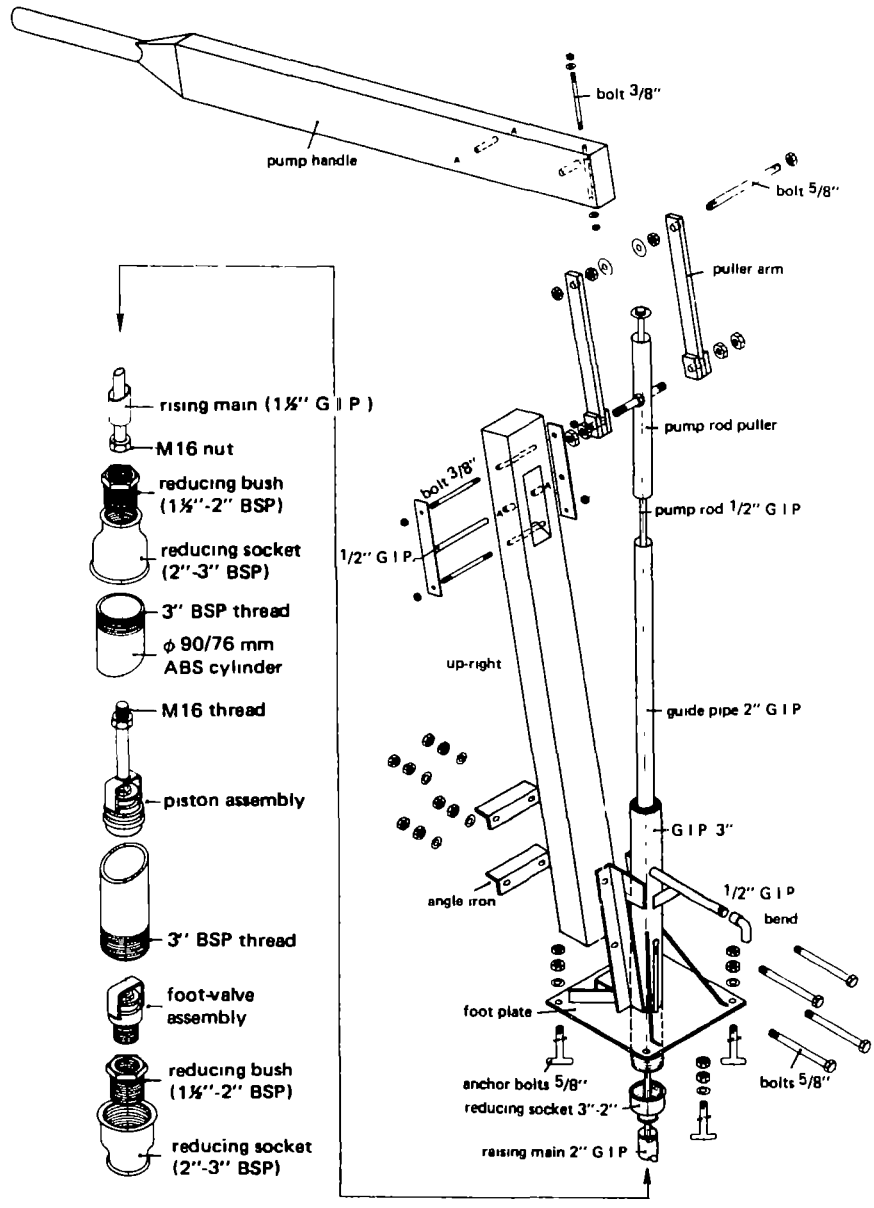
SWN-range.



Appendix. Pumptypes referred to (continued). Volanta handpump.



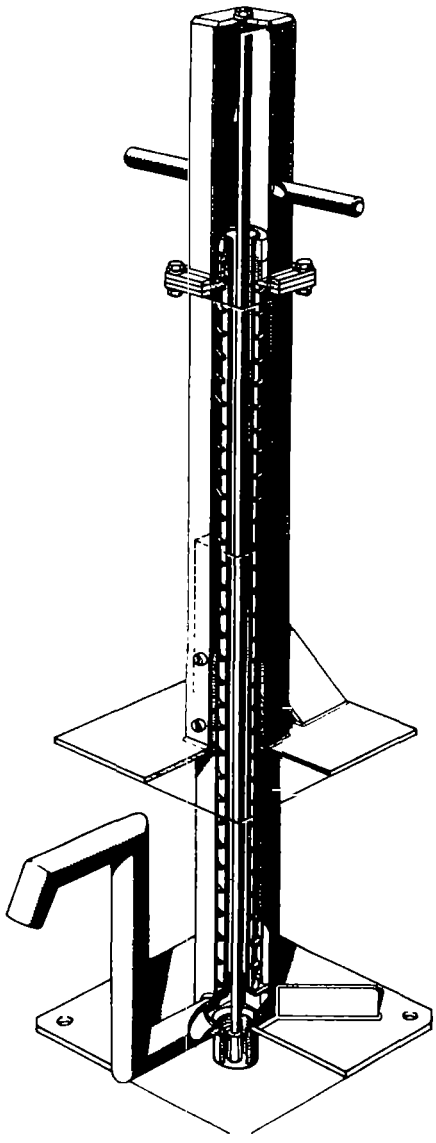
Appendix. Pumptypes referred to.(continued). Shinyanga pump.



The Shinyanga pump

Appendix. Pumptypes referred to (continued). Kangaroo pump.

KANGAROO MK 1



KANGAROO MK 2 PUMP