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PRODUCTIVITY AND "LIFE LINE" CONSIDERATIONS FOR RURAL WATER SUPPLY POLICY: AN AGRICULTURAL ECONOMIC VIEW POINT

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Water is both an economic input and a basic requirement to sustain life. Efficiency and equity considerations are therefore central to water supply and allocation. In South Africa the distribution of water resources is presently also under discussion. Eight principles are proposed in the White Paper on Water Supply and Sanitation Policy. These principles, although comprehensive, however lacks cohesiveness to guide the apparent conflict between efficiency and equity considerations. A policy framework to reconcile this conflict is developed in this paper.

PRODUKTIEWEITSE- EN OORLEWINGSOORWEGINGS VIR LANDELIKE WATER VOORSIENINGSBELEID : 'N LANDBOU-EKONOMIESE STANDPUNT

Water behoort as beide 'n ekonomiese produksie inset en 'n basiese lewensmiddel beskou te word. Doeltreffendheids- sowel as welvaart en billikheidsoorwegings staan dus sentraal tot water ontwikkelings- en voorsieningsbeleid. Waterbeleid is tans onder bespreking in Suid-Afrika. Agt beginsels word in die Witskrif oor Watervoorsiening en sanitasiebeleid voorgestel. Hierdie beginsels bied egter nie 'n basis om konflikte tussen doeltreffendheid en billikheid te bereedder nie. Hierdie saak word in die artikel aangespreek en 'n beleidsraamwerk word voorgestel om sodanige konflikte aan te spreek.

1. Introduction

In South Africa, access to water is considered a basic human right. It is estimated that two million households are presently without safe water supply. The RDP intends to provide clean water to every person in South Africa - at least 20 litres per person per day within 200 meters of where they live over the next 5 years (RDP, 1995). If water was not a scarce resource this policy objective could be achieved with relative ease through engineering effort. However, it is well known that water is one of the most critical scarce resources in the country. Water is also required for industry, farming, sport and recreation, environmental purposes, etc. Difficult choices will be necessary to supply and use this important resource in a "wise" manner to benefit society. A policy position on water supply should be supported by a clear set of objectives, criteria and water provision strategies, programmes and projects to ensure at least a reasonable degree of success in the implementation of the policy objectives.

2. In need for "agricultural economic logic"?

In the White Paper on Water Supply and Sanitation eight principles are proposed to direct water supply policy. These include: "demand driven" development, water - a basic human right, "some for all rather than all for some", equitable regional allocation, water has economic value, user payment, integrated development, and environmental integrity. Although these principles are comprehensive they lack cohesiveness and a solid foundation to address the potential conflict between equity and efficiency objectives of a water supply policy position. The Agricultural Economic discipline of applied economics is one (the only?) discipline which have a track record in addressing this apparent conflict (Maunder & Ohkawa, 1983). This paper will attempt to provide a fundamental argument and set of principles and criteria to address efficiency and equity considerations for water supply policy in South Africa. Objectives and criteria will be discussed from a macro viewpoint as well as to assist with the selection of water provision strategies and projects.

3. A policy framework: principles and criteria

3.1 Rural water supply - a productive and consumption investment

Water investment in rural areas may be considered as a productive investment adding to growth prospects and/or as a consumption good facilitating redistribution of income and uplifting levels of living. Investment in water supply, especially in South African context, can be considered to be in the interest of balanced and overall economic growth and social stability as the bulk of the population are located in rural areas.

Rural water development can add to growth prospects, especially when water is introduced as a complement to education, employment creation, agricultural and other production programmes, and health services. In this particular approach water is seen as a basic element and economic input in to an Integrated Rural Development process, where emphasis is placed on productive investments within rural communities.

Investment in rural water supply should also be considered as a consumption good where it is directed towards promoting the redistribution of income in favour of (rural) dwellers in order to improve their levels of subsistence. In this case rural water investment could be viewed as investment in future growth. Alternatively investment in water supply could be an element of a humanitarian or welfare approach, when water investment is not complemented with other production programmes but rather focused on short term relief.

Rural water supply clearly fits into a policy framework where efficiency considerations, due to productivity goals and growth objectives, as well as equity requirements due to redistribution and welfare goals, would have to be considered and reconciled.

3.2 Production and distribution objectives for water policy (equity and efficiency)

Water supply can be considered to be either a production input or a consumption item, depending upon the objectives, use and need. An analytical framework by Schickele, adapted by Carruthers (1973) to determine criteria of testing the efficiency of the objectives of water policy, prove to be applicable. Two major objectives of rural water policy are identified. These objectives are (a) maximum profitability and (b) optimum income and welfare distribution. Underlying these objectives are the so called utility function describing the needs of individuals, communities and nations.

Maximum profitability (efficiency) objective and criteria: Maximum economic profitability is reached -when "factors of production are allocated among various lines of production in such a way that their marginal product values are equal throughout the economy" (Carruthers, 1973: 18). Based on this **equi-marginal** condition the following set of **policy criteria** can be derived to ensure maximum profitability in water supply investment: (i) is a particular policy likely to increase or decrease the economic product (GDP) in a country or region? (ii) will it better or worsen resource allocation by equalising or widening marginal returns in various production fields and enterprises?; and (iii) does policy measures for water supply complement or conflict with other sectoral policies and objectives?

Equity and distribution objectives: With regard to the equity related objective of the distribution of welfare and income, two aspects are relevant, viz "subsistence" or "life line" considerations and "contributive" considerations (Carruthers, 1973). The subsistence or "life line" considerations require that policy be directed at reducing to a practical minimum the number of people or communities whose level of living falls below an acceptable standard of living concerning certain aspects such as nutrition, clothes, shelter, medical care, basic education and also water for drinking and sanitation purposes (20 litre per person per day according to RDP). The **policy criteria** for "life line" considerations should address the following issues: (i) is a particular policy likely to reduce the number of (rural) families living below the set minimum living standards? and (ii) are the maximum number of (rural) families reached by such proposed programmes and projects?

Concerning the "contributive" consideration, Carruthers (1973) states that in principle it requires that policy be directed at increasing the contribution to the social and economic product of persons who earn inadequate incomes.

The contributive principle suggests that when the basic minimum standard of services, as set by the State, is achieved, people should contribute to the economic product by paying for water and services, and utilising services in accordance to productivity considerations.

Applying the contributive norm to rural water supply development, the following **policy criteria** for contributive redistribution can be suggested: (i) is the water supply programme/project expanding the individual's or community's opportunity to contribute more to the national economic product? and (ii) is the water supply programme/project helping the individual to secure a labour reward commensurate of her potential productivity.

3.3 Towards a water supply policy position

This approach argues that distributional considerations require a departure from "first best" or optimal efficiency solutions and resource allocations. A "second best" position¹ is suggested where all needs in access of the stipulated subsistence or "life line" requirements is guided by a process where efficiency criteria, such as marginal value product of a service (drinking water) equal the marginal cost of supply, are applied to determine the allocation of water resources. This policy position stipulates: (i) the provision of water related to a minimum standard living level to the rural population at a "token" fee or even free; while (ii) water used in quantities above this minimum standard be directed to productive purposes and charged for against the marginal cost of supply. This provision includes water used for personal as well as economic productive use; (iii) a rural water supply policy that is linked to the national policy so that water supply is as far as possible internally viable or moving in that direction in terms of the allocation of resources such as finances, trained manpower and administrative and managerial capacity. Life line programmes should therefore not be funded through cross subsidisation by productive users, but by a fund created for the process. The RDP fund should be used for such purposes; and (iv) that beneficiary communities are involved in decision making on various alternatives as to the supply of water and their responsibilities *inter alia* the utilising of water and financing of services. Elements of this approach is presently contained in South Africa's water policy.

4. Rural water investment strategies

In the next section, strategies which could influence or determine investment priorities for rural water supply are discussed:

- (i) **Economies of scale and per capita cost strategies:** Economies of scale are highly visible in water supply development. If the objective of rural water supply programmes is simply to maximise the number of people served on such a basis that per capita costs of the system is reduced then water supply systems should firstly be constructed in the largest concentration of population. Towns and villages could simply be ranked by population size and provided with water supplies as resources become available. According to this strategy, rural water investment would be concentrated in high population density areas, while cost effective methods would enable ranking of projects in per capita cost and per capita water supply categories. One of the assumptions of such a strategy is that it may be cheaper to move communities, than to pipe water to them. In Tanzania a major motivation for the Ujamaa village settlement was that it would provide the opportunity for low per capita cost of services such as water and health care. Evidence however, indicates that the supply of water alone will seldom have any significant influence on the movement and settlement of people.
- (ii) **Growth point strategies:** Rural communities are generally not among those participating in rapid

economic growth. Urban areas are attracting people and businesses and investment flows because of greater demand and higher rates of return. In view of equity oriented considerations and balance growth objectives, it is however argued that the creation of points or centres of rapid growth in rural areas is a viable and desirable means of coping with the problem of rural poverty and migration from rural to urban areas. The premise that water supply is a necessary but not sufficient element for economic growth, supports the view that rural water supply investment spread randomly among villages, will not directly or even indirectly generate significant economic returns. A strong point can therefore be argued that water supply above subsistence or life line levels should be direct to growth points as a complimentary input of an economic development strategy. The clustering of water supply projects around growth points would also generally be consistent with economies of scale considerations.

- **Income redistribution strategies:** The goal of redistribution of real income from higher to lower income groups could be an important consideration in establishing water supply priorities, i.e. selecting which villages and areas should have a high priority for receiving a water supply system. Investment in the poorest rural communities will result in a high-to-low-income distribution, because these rural communities are seldom, if ever, in a position to finance, or even partly finance, a water supply system. The subsidisation of rural village schemes is therefore an important element of this strategy. Various approaches are currently internationally in use for selecting areas/villages which should have a high priority for water supply investment. A few of these approaches will briefly be described.
- **The "worst first" approach** - In this approach villages are ranked according to their need for water, and those villages with "very extreme needs" or "extreme needs" are given highest priority. In Thailand this strategy is followed with a high degree of success and in their case "worst first" villages means those which are deemed to be most affected by disease, poor quality water and also sub-minimal availability. Other criteria that can be used are per capita water available for drinking, per capita income levels, distance to existing water sources during dry seasons, the amount of energy required to fetch drinking water, and so on.

A "worst first" policy in water supply requires high rates of subsidisation. This is therefore usually a high social cost method. It is also important to remember that "worst first" situations may often be encountered in informal urban settlement areas. Certain poor rural villages may therefore compete for investment funds with urban areas. The "worst first" approach can also be seen as an important manifestation of minimum standards considerations in economic policy. Contributive considerations are not generally accounted for by this approach. In certain circumstances it may be more economically to induce "worse off" communities to physically move to growth points.

- **Lobby and Political influence** - In countries where the criteria for selecting villages for rural water investment are loosely defined, those groups and villages that agitate, petition, lobby and frequently demand assistance are those that receive assistance first. Where this type of approach is apparent, it is often not the poorest villages which agitates for improved services but those villages populated by relatively better educated and higher income people that are first to recognise the value of improved water supply. Political favouritism could also play a role. In this case the redistribution of income is promoted by the strength of political influence and the power of a community or group.
- **Financial contribution** - In many countries villages must contribute some portion of the cost of the construction and/or maintenance and operation of the water supply system. This contribution can be made in terms of money, labour and/or administration. This approach of selecting villages may however work against the very poorest villages and areas. In several countries villages are expected to contribute between 10 and 30 per cent of construction cost and to pay a water user fee which at minimum covers operation and maintenance cost. According to World Bank studies, this strategy of providing villages with water supply systems is viable and applicable if the projects are on a financially acceptable footing. This provision increases the probability that the villagers will accept, use and maintain the water system.

The condition that a financial contribution, covering some portion of capital and operation and maintenance expenses is required, is often not consistent with the redistribution of income required by a "worst first" strategy. On the other hand, it could be consistent with a growth point approach, and if the government partially subsidises the investment, it could tend to redistribute real income in favour of poorer rural inhabitants. This particular strategy of priority establishment is clearly in line with the contribution principle.

- (iv) **Priority index formula:** The Inter-American Development Bank (IDB) and the Pan American Health Organisation (PAHO) have proposed a formula for choosing which villages in a country or region should be supplied with water first. This formula is based on physical, social, demographic and economic variables as well as technical and cost specifications. It is also consistent with the economies of scale strategy of maximising the number of villages (people) served by the system. One version of this formula as used by the IDB is described briefly:

$$I = 100 \frac{P}{(C-A)} \cdot r \cdot k$$

Where I = the index of village (or project) selection; P = the expected population to be served in twenty years time; C = total cost of project, excluding distribution network costs, but including operational costs; A = capital contribution by the village or community; r = ratio between existing water flow at source or point of capture and the requirements foreseen in the twentieth year or operation; k = the concentration

of houses in the community to be served measured as the proportion of the total number that are located within 50 meters of the proposed main conduit. The index I₁ tends to assign a higher priority to sustainable villages which require the lowest per capita capital contribution from the national budget or agency. The exclusions of distribution network costs could be questioned, unless a marginal concept is applied e.g. the costs to link a village with the main distribution system (a public responsibility).

- (v) **Community involvement strategies:** The strategy of providing needy villages with water supply systems if projects are on a financially acceptable footing increases the probability that the population will accept, use, and maintain the system. It is frequently noted in rural water supply literature that the probability of project failure is much greater in cases where the recipient village is not enthusiastic about the water project. "No matter how badly a village 'needs' a better water supply system, if the population itself does not perceive the value of the system, the usage rate will be wasteful (or low), system maintenance and local administration will be inadequate and vandalism could be a problem" (Saunders & Warford, 1976: 109), according to DBSA (1985).

An enthusiastic community will be more likely to have its contributions completed and its payments submitted on time. The system will be utilised sensibly and will be well maintained. As a result, in several countries those villages which are actively enthusiastic about obtaining a water supply system and which are prepared to contribute to labour, capital and administration are given high priority. In Malawi community involvement is considered to be the cornerstone of the successful rural water supply programmes and an example of this approach is also found in Peru (Development Bank, 1985). Villages which expressed interest in improved water supplies, have requested a improved system, and have offered and committed themselves to assistance in construction operation and maintenance are regarded as high priority villages.

In this strategy education, training and the motivation of villagers play an important role and

such programmes could be introduced as complements to water supply development programmes.

5. A framework for decision making at project level

To allow for the application of water development investment in a consistent manner the following criteria should be addressed. The criteria will be applicable irrespective of the strategic approach followed: (i) Does the objectives of the project fit the water policy objectives? (ii) Does the project policy guidelines fit the macro policy guidelines. (iii) Does the project fit in to a wider (regional and local) development programme? (iv) Why is project intervention required? Do we have "market" failure or "government" failure? (v) Is an appropriate fund secured to support the project? (vi) Who "owns" the project? (vii) Who receives the benefits; Who is responsible for the costs? (viii) Is the project affordable (fiscally)? (ix) Does economic benefit exceed economic costs? (x) Will the project be sustainable? (xi) Is it the best alternative? (Development Bank, 1993).

The ranking of water supply projects has to rely ultimately and heavily upon that sometimes questionable tool, judgement. Choice of, or among, projects has to be made somehow and the strategies presented in this section, ranging from per capita cost considerations on the one end of the spectrum to community involvement on the other end, should be seen as a check list by which projects can be judged and selected.

In Table 1 a concise summary of the fields of application of the various strategies are given.

6. Conclusions

In this paper it is argued that an important distinction must be made between water as a productive input and water as a consumption item to provide minimum acceptable living levels. Both aspects should be accommodated in a water supply and distribution policy. Although it can be argued that a policy position supporting water supply in rural areas, tends to promote redistribution of income a "growth point" notion is strongly present in most of the mentioned strategies. Four important conclusions can be drawn from this orientation in water supply policy.

Firstly, a growth orientation in water supply development is

Table 1 : The relationship between water supply policy objectives and water development strategies

Strategies	Policy objectives		
	Minimum standards of living (life line)	Contributive redistribution	Profitability objectives
Economies of scale and per capita cost		*	*
Growth point		*	
Income redistribution:			
Worst first	*		
Political influence	*		
Financial contribution		*	*
Priority index formula		*	
Community involvement	*	*	

not necessarily bad. On the other hand a "worst first" strategy providing water to the villages and areas which generally are among the smallest, poorest and least educated, is a high-cost and low pay-off venture.

Furthermore, the poorest villages in a country are poor for many good reasons. These villages may not have a sufficient economic base to support the existing population at other than subsistence levels. As a result, a policy which provides non-viable villages with water services, encouraging the current subsistence level existence, is and will not be productive and may serve to the long run detriment of the national economy. An integrated policy to help relocate the population closer to growth centres, offering opportunities for increased earnings, employment and education may be more productive in the long run. However, minimum living requirements should clearly not be neglected, and accommodated at the lowest possible cost levels in low growth potential areas. There is however a trade-off.

A second conclusion of an economic growth orientation in water supply development refer to the absolute necessity not to view water supply as an input in isolation. Water supply should be an integral part of a development "package" including education, health, nutrition, employment, training and productive incentives, as well as a productive infrastructure. It would however, not be required that such a "development package" is exclusively directed to where financial and economic returns are optimised. Due to equity considerations, and by applying the "contributive" principle, such packages should also be employed in social and regional context to achieve redistribution objectives.

A third conclusion is that the link between community support and water supply development is important. The lack of capacity development and demand analysis which should have been done in villages before projects were instituted, are often the main reason for systems to fall apart.

Villagers must consider themselves to be involved in water supply development i.e. ownership and accountability at grass roots level.

Fourthly, to institute a "growth with equity" water policy, it is argued for a set of institutions to a) allow for productive and contributive redistribution water allocation; and b) ensure cost effective, and where possible contributive mechanisms for "life line" strategies.

Note:

1. Where it is "not possible to make one person better off without making someone else worse off, given the existence of certain immovable constraints upon resource allocation and product distribution within the economy" (Ritson, 1978 : 248).

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