

Socio-Economic Impact of Channelization on River Basin Utilisation in Eastern Uganda, The Case of Doho Rice Scheme, River Manafwa in Tororo District, Uganda

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Abstract

Whereas channelization helps to improve food production in view of the rapidly increasing population, it has environmental challenges since it interferes with the natural systems of the river basin. The study sought to establish the socio-economic impact of channelization on river basin utilization for flood rice cultivation. The specific objectives were: to determine the impact of channelization on the income level of the people around Doho rice scheme, find out the challenges faced by the people around the rice scheme resulting from channelization and to find out how the people are coping with these challenges. The study employed both quantitative and qualitative designs. The quantitative design was applied in establishing the economic benefits of channelization for example the quantity of rice produced over the years, the amount of money earned by the farmers and so on while the qualitative design was employed in characterizing the value judgments of the respondents regarding the challenges of channelization like flooding among others. The methods of data collection include; documentation, questionnaires, face to face interviews, focus group discussions and observation. It was established that there is a significant increase in the quantity of rice production and hence income to the people, extension of power to the otherwise remote areas, among others. However, there was also a significant challenge resulting from flooding due to channelization of the stream like displacement of people, outbreak of diseases like cholera, among others. It was also established that there are no clear mechanisms in place to foresee and cope with these challenges. There were no cases of bilharzia though. However, there is over concentration on the growing of rice at the expense of other crops which affects food security.

Keywords: *Channelization, River basin utilization, Socio-economic, Flooding, Coping Managed river reach, Doho rice scheme*

Introduction

EPA (2011) indicates that stream channelization describes any activity that moves, straightens, shortens, cuts off, diverts or fills a stream channel, whether natural or previously altered. Such activities include the widening, narrowing, straightening or lining a stream that alters the amount and speed of water flowing through the channel. Channelization alters the amount and speed of water flowing through a river channel.

From time immemorial, rivers and their valleys have held a high profile in the life of human beings. This is because they have been and continue to be used on several human applications for the livelihoods and the development, for example, irrigation for agriculture, as a source of drinking water, source of fish for food, the generation of hydroelectric power, disposal of wastes and so on (Calow & Petts 1994). All these applications have meant that humankind has constantly lived in touch with river valleys where they occur and ensured their exploitation. In most places where rivers occur, the communities have ensured that they have some basic knowledge of the characteristics of river flow, for example when the river floods, when it has the least amount of water, the deepest points, and the widest points and so on, so as to facilitate their safe and beneficial exploitation of the river water.

This knowledge is accompanied by having some methods of manipulating (channelizing) the river so as to gain maximum benefit from the utilization. This ability varies according to the level of skills and technology available to the community and the purpose of utilization of the river. Whatever the level of ability however, it all implies an interference with the natural flow of rivers and a change in the dynamics of these mechanics which in turn often lead to multiple adverse impacts.

One of the main purposes for the utilization of rivers worldwide has been irrigation for food production especially due to increasing human population. A casual look at the rivers across the world shows that along most

valleys, there is irrigation farming because of the need to supplement natural rain with river water through artificial irrigation or more vitally, in areas where rainfall is extremely scarce and crop growing entirely depends on irrigation.

Channelization has been carried out along most river valleys in Uganda and one such river valley is river Manafwa in Eastern Uganda. Along this river this river at Doho in Mazimasa sub county, Bunyole County, in Tororo district, commercial rice cultivation is being carried out. The project under the government of Uganda with support from the government of The Peoples' Republic of China started in 1975 with the aim of boosting food production in view of the increasing population. This involved the construction of major hydraulic works such as a diversion channel to divert water from the river into cultivated area hence channelization of the river. In addition, other channels and water control infrastructures were constructed at different points of the scheme.

Whereas these channelization practices serve our human purposes like improved food production as in the case of Manafwa, they inevitably interfere with the natural dynamics of river flow, which usually leads to several negative consequences before, at and after the point of channelization. Nakamura *et al.*, (1997) for instance note that the impact of channelization was confirmed not only by sediment budgets but also by river aggradation /degradation and the resultant vegetation changes observing further that the aggradation reduces the carrying capacity of the channel and causes sediment laden water to flood over the wetland as the original vegetation, *Alnus japonica* disappear from the adjacent area of the channelized river valley and are replaced by willo trees (*salix spp*)The other challenges associated with channelization include agricultural encroachment of river valleys and biodiversity loss Zsuffa *et al.*, (2013) and over exploitation of wetlands (Kansiime & Nalubega 1999),; Rongloei (2013); and Thenya (2006) as cited by (Zsuuffa 2013)

There is therefore controversy as regards the merits and demerits of channelization, that is, it is important in the improvement of agriculture especially in view of the rapidly increasing population but has challenges pertaining to its impact on the environment and society which calls for a balance between increased food production and environmental conservation.

The need for site specific knowledge and information on the socio-ecological impact of channelization on river basin utilization thus exists, especially in Tororo district and the Manafwa basin in particular which experiences a growing population and hence need for increased food production which results in high environmental stress (NEMA2009), which was the focus of the study.

The study therefore sought to establish the socio-economic impacts of channelization in Doho rice scheme along river Manafwa, Tororo district. The specific objectives were;

1. To determine the impact of channelization on the income level of the people around Doho rice scheme resulting from channelization.
2. To establish the challenges faced by people around the rice scheme resulting from channelization.
3. To find out how the people are coping with these challenges.

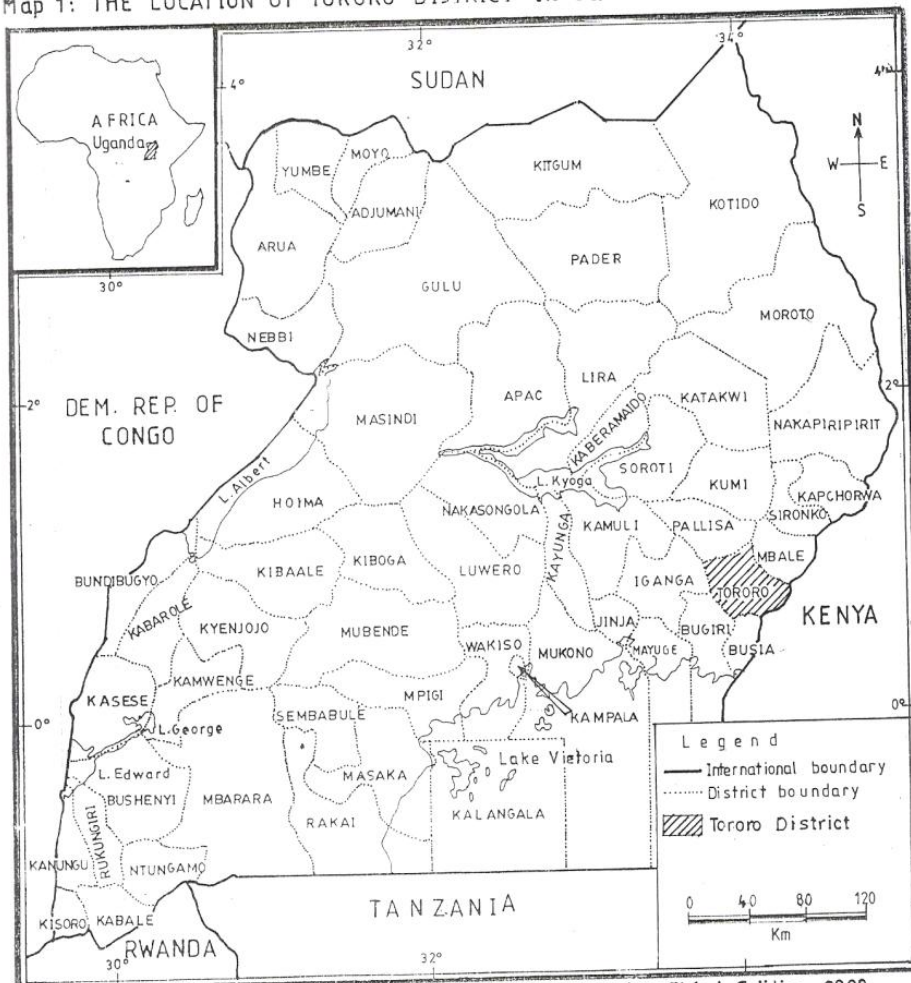
Substantial literature coverage converges on the notion that channelization from the lightest to the heaviest has various impacts on rivers (Allan 1995), Baker et al 1995), (Calow and Pets 1994). Whereas channelization practices like dam construction are important in agriculture and economic development, they lead to negative impacts such as unusual natural sedimentation, erosion from unplanned clearing of vegetation, loss of wild life habitat, change in water shade hydrology and so on (Degroove 1995), and (Gleick 1993). Channelization equally leads to accelerated flow velocity and deepening of the main channel leading to continued lowering of the water table with detrimental effect on wetlands on the flood plain, that is, prevents water from being discharged on the flood plain during spates hence preventing the natural dissipation of kinetic energy Malt and Morgan (1997), Petts (1983) and Durie (1983). Channelization is also associated with socio-economic challenges like the threat to human safety through increased dangers such as flooding, damage to infrastructure like pipe lines, increased cost of treatment for drinking water and so on (EPA 2013), (Galant et al 1996).

Materials and Methods

The study was conducted at Doho Rice Scheme in Mazimasa Sub County, Bunyole County, Tororo district in eastern Uganda (Map 1). However, part of the scheme farmland stretches to the neighboring Kachonga sub county (Map 3). Doho Rice scheme was purposely chosen because it is a typical channelized area, very significant for Rice production, and yet it is also vulnerable to environmental degradation.

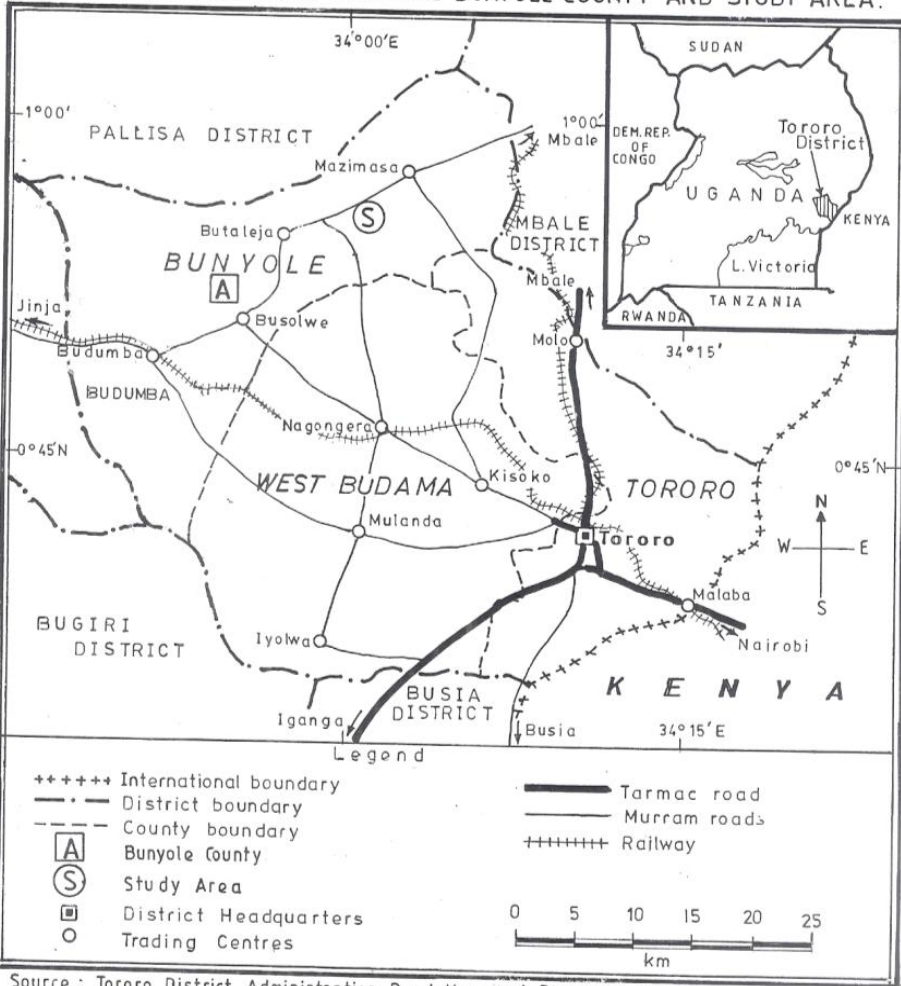
The area is part of the extensive Kyoga basin which experiences tropical type of climate (wet and dry) (NEMA 1997). The total annual rainfall is about 1000-1200 with a double rainfall maxima, that is, the first rain season runs from March to June, while the second between October and November. There is a considerable dry spell between the two rain seasons. The mean annual temperature is 27.7°C and minimum temperature is 16.2°C. The soils are of Mazimasa complex of catena characterized mainly by sandy and loamy soils (NEMA 1997). The swampy soils occur at the swamp edges and these get lighter and sandier as the topography gets higher.

Map 1: THE LOCATION OF TORORO DISTRICT IN UGANDA.



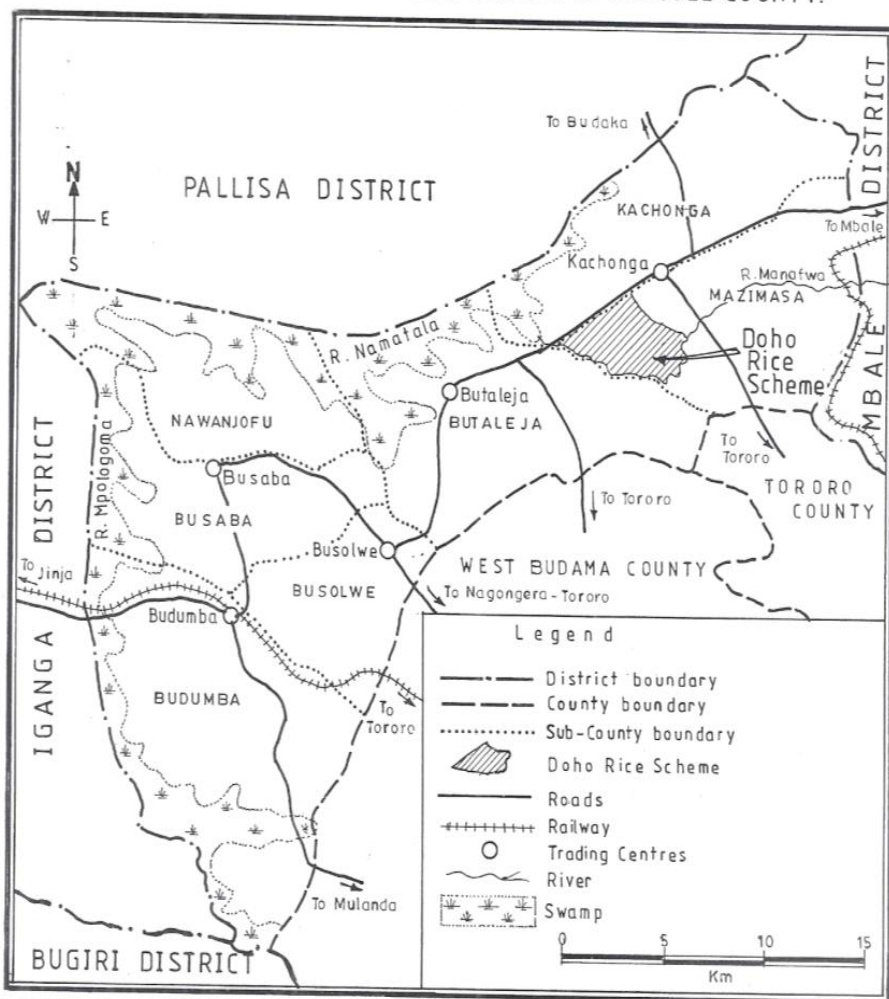
Source : Macmillan Social Studies Atlas for Uganda .Third Edition 1998.

Map 2. TORORO DISTRICT SHOWING BUNYOLE COUNTY AND STUDY AREA.



Source : Tororo District Administration Population and Planning Office, 2003.

Map 3: THE LOCATION OF DOHO RICE SCHEME IN BUNYOLE COUNTY.



Source: Tororo District Administration Population and Planning Office, 2003.

The sandy soils are unproductive and susceptible to erosion which explains why people concentrate on swamp cultivation. The major land use type in the area is agriculture and significantly swamp rice cultivation. However, other crops were also grown e.g. millet, maize, bananas, cassava etc. Rice is the major crop that contributes to the household income and others were mainly for subsistence consumption. The study employed both quantitative and qualitative designs. The quantitative design involved mainly the use of questionnaires and documentation while qualitative design involved the use of face to face interviews, focus group discussions and observation.

A total of one hundred respondents participated in the study including officials from the rice scheme administration, farmers of the scheme and local leaders from the two sub counties where the scheme is located. The farmers were chosen by simple random sampling from the list of farmers in the scheme records. Seventy five (75/75%) of the farmers were deemed sufficient to give a representative view of the over two thousand farmers in the scheme in view of the limited time and other resources during the study. The scheme officials were ten (10/10%) and these were purposively picked because they were considered as key informants. The local leaders were fifteen (15/15%) and were also purposively picked because they were also considered key informants. The local leaders consisted both politicians and civil servants especially those in line of production and disaster management departments.

For the data on impact of channelization on the income levels of the people, the amount of rice produced per plot in the scheme and the price of rice per kilogram in the market was sought. This was done by looking through the scheme records over the years. In addition, the respondents who are farmers in the scheme were asked give the amount of rice that they harvest per plot per season and a computation was done. Here, questionnaires were used for the literate farmers and oral interviews for the illiterate ones. A focus group discussion was also held with farmers to gauge their perceptual view of this. A part from this, observation was also carried out to take note of some of the developments that the farmers said they had done out of the income from rice for example house constructed, house hold items acquired, among others

As regards the challenges faced by the people around the scheme due to channelization, the different categories of respondents were asked using the different tools to give their experiences on these issues. In addition, focus group interviews were conducted with the respondents to gauge their view. The local leaders were particularly engaged in this especially from the point of view of the disaster management resulting from the effects of floods. Regarding the way people cope with the challenges, focus group discussions were held with the farmers while the scheme officials answered questionnaires and some technical staff from the disaster management department were engaged in in-depth interviews so as to get their views.

Results

Impact of channelization on income levels of the people:

Results of the farmer perception survey indicated that the majority of the farmers said that channelization has had a very positive impact on them. Almost 98% indicated that they had derived various socio economic benefits from the scheme.

Rice production

All the farmers indicated that rice growing has increased very significantly since channelization began as indicated below:

Table 1: Average Rice Production per acre

Year	Number of kilograms
1999	800
2000	6500
2001	600
2002	700
2003	700

Source: Field Data.

The table shows a declining trend in production probably due to the gradual decline in soil fertility as a result of monoculture which is usually associated with channelization. In this area, rice is grown without intercropping and yet there is no use of fertilizers. However, despite this trend, the farmers indicated that their income had been boosted by the increased amount of rice produced and this has helped to enhance their socio-economic status for instance they have been to; build permanent houses for themselves, take their children to “good schools” other than the usual Universal Primary and Secondary schools, acquire land elsewhere outside the scheme, acquire improved transport means like motor cycles and occasionally motor vehicles, among others.

Channelization has also led improved infrastructures in the area for instance electricity has been extended to this otherwise remote area which has facilitated other economic activities for example establishing rice mills, welding plants, entertainment centres, among others. The other aspect of infrastructure is the opening and improvement of the Mbale- Busolwe road which has improved transportation of goods and people hence improved business, higher income and better socio-economic status.

The other positive impact of channelization is the development of trading centres within this area. Two major trading centres have grown around the scheme namely, Nabiganda and Doho and these have further helped to raise the level of economic activities and bring services nearer to the people. Nabiganda trading centre is in fact on the verge of being upgraded to a Town Council status which will make it become a full urban centre.

Challenges faced by the people around the rice scheme resulting from channelization

Whereas the farmers were excited about the positive impacts of channelization, a number of challenges were discovered to be inflicting the people around the scheme namely; flooding which occurs every year. Flooding triggers several other challenges for instance the outbreak of waterborne diseases like cholera, dysentery, among others that causes distress and occasionally death to the people. It also leads to the destruction of infrastructure such as roads, bridges as well as other property and crops hence famine and poverty.

The other challenges voiced by the respondents include; high prevalence of malaria and occasional cholera, heavy siltation due to inability to dredge the channels, gradual decrease in soil fertility due to monoculture and lack of fertilizers, pests and diseases, biting muddy water insects like millipedes that affect the farmers as they work, Overgrowth of water tolerant weeds, high rate of school dropouts coupled with the use of child labor for scaring birds from the rice fields, over concentrating on rice production at the expense of other crops.

How the people cope with these challenges.

The study found out there are no established procedures being followed in coping with the challenges outlined above for instance; Both the scheme officials and the local government leadership have no mechanism for early detection and warning against floods and neither are there specific institutionalized plans within the scheme and the local governments for emergency response during such disasters.

As regards the outbreak of diseases, the usual national health infrastructure is relied on for the management of such cases and in case of an epidemic; the National Disaster Management Program is called in. Unfortunately, this has not worked effectively in most of the previous cases of epidemic outbreaks. Similarly, there are no specific coping strategies for all the other challenges. Each case is handled by the respective individuals as they come up.

Discussion

Results here indicate that channelization has enabled farmers to realize several socio-economic benefits but also some challenges. However, these findings may not be very authentic since there were no concrete statistics to validate them. Both the benefits and challenges were based on the perception of the farmers rather than any verified institutional reports with exception to the records of the rice scheme.

Conclusion

The findings of the study show that the channels are poorly maintained, heavily silted and clogged by weeds hence do not carry much water as they should have. This eventually affects the volume of irrigation water available to the rice fields, especially those distant from the main irrigation channel hence low rice yields.

There was no visible sign of soil erosion and even the respondents did not raise it. This could perhaps have been due to the fact that the channels are clogged hence carrying water below their usual capacity and at lower velocity. Whereas it was beyond the scope of this study to assess the impact of channelization on the aquatic species, it is probable that there has not been as much damage, as it would be if erosion were very high. The study also revealed that most of the irrigation structures were poorly maintained. The sluice gates that regulate the flow of water were in a poor state most were rusted, some did not have steering wheels while others were clogged with silt and refuse.

There was no mechanism for detecting whether or not diversion of water causes impact on flow characteristics of the river. Therefore both the scheme administration and the farmers were not aware of the likely occurrence of floods.

The management of the scheme was incapacitated due to lack of equipment, funds and even human resources. The farmers therefore would not get enough technical attention and this would compromise their skills of handling the rice crop. The farmers were not organized well enough. Whereas there was a farmers' association that was running the scheme, many of the farmers seemed detached from it. This would perhaps explain their reluctance to pay irrigation fees.

Whereas the farmers were growing other crops elsewhere, rice growing was a clear monopoly at the scheme. This coupled with the deposition of sediments within the channels and not the fields as was the case before reduced the fertility level of the soil gradually. The invasion of water tolerant weeds especially algae and Nile cabbage was a concern to the farmers because they destroyed crops and were difficult to control. This, added to the spraying with pesticides against the rice diseases and the constant deposition of silt, may indicate an environmental danger to the area. Note however that the scope of the study did not include this.

However, despite all the above observations, the study revealed that the scheme had positive socio-economic impact on the people of the area. In summary, there were good indicators of development for example the coming up of trading centers such as Doho, Nabiganda and others in addition to the fact that people had constructed milling machines, permanent and semi-permanent houses plus other household items. Initially, famine was almost a permanent feature in this area but this reduced and people were by and large able to have an improved diet from the income of the rice.

Recommendations

- There is need for an early detection, warning and rescue mechanism against floods and other disasters. This can be done by establishing a system of constantly monitoring the water level in the river and diversion channels and communicating it the people accordingly.
- Need to organize the farmers more effectively to manage the scheme better for instance continuously cleaning up the channels around their plots so as to have water flowing to all plots for better yields.
- There is need for strict enforcement of laws to ensure the avoidance of school dropouts and the use of child labour in the scheme.
- Sensitization of farmers to plant some leguminous crops alongside rice to ensure sustainable fertility of the land.
- Farmers need to be sensitized to balance the growing of rice with the growing of other crops so as to ensure sustainable socio-economic development.

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