afrialliance socialinnovation

AfriAlliance MOOC#2 Final Assignment

Title: Nature-Based Water Storage Solutions in Seasonal Rivers -A case of Lusitu Stream in Zambia

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Abstract

Most of the population in Sub Africa relies on agriculture as the main source of livelihood endangered by water scarcity and climate change. Shallow alluvial aquifer represents an untouched potential (i). Nature-based water storage in seasonal rivers contribute to resilient livelihood, as water stored in the alluvial aquifers provide reliable and sustainable source of water for agriculture in arid and semi-arid regions in sub-Saharan Africa

It is against this background that the study aims at Improving the livelihood and resilience of smallholder farmers through effective access to and efficient utilization of alluvial water and storage. To achieve this objective, low-cost sand dams across of riverbed of the seasonal river is constructed using locally available basic material in conjunction with low-cost solar powered pump technology. The wall of the sand dam gradually increases so is the sediment deposition on the riverbed. This increases the water storage volume in the aquifers and thereby increasing water accessibility and utilization for agricultural purposes. The co-developed knowledge from this study will be tested, shared and compared with farmers and other relevant stakeholders and scaled up as a set of methodologies to create a reliable and sustainable source of water for agriculture for other rivers within the country and other countries within Africa.

DESCRIPTION AND BACKGROUND

The riverbeds of many seasonal (also known as ephemeral) rivers and streams that crisscross arid and semi-arid lands form shallow groundwater reservoirs, which are recharged every time the rivers flow (g). During the dry season, the stored water in the alluvial aquifers can be drawn by the communities and utilized for the purpose of agriculture, sanitation and coupled with other interventions can be made fit for use for human consumption. However, despite its high storage potential, this nature-based storage solution is currently under-utilized in many regions of Africa, in particular for productive purposes such as agriculture [(m); (l)] and Zambia is no exception to this description.

Zambia is endowed by many perennial rivers as well as the ephemeral ones. Lusitu, a seasonal River is located in the Southern Province of Zambia. The country has two seasons; April to August -Dry season and September to April is the rainy season. The land just like many African countries is mainly arid and semi-arid. Southern province is the drought prone area with high temperature and erratic rain season even in the wet season (o). With the current threat that climate change posed on the traditional sources of the water resources for agriculture in the arid and semi-arid land of Africa, that impacts negatively on food security, exploring nature-based solutions to improve resilience livelihood through alluvial water storage aquifers is key to climate change adaptation.

The sand dams, this is a very simple wall constructed in the bed of a seasonal river. The technology is low-cost and the material for construction is very simple material and usually built a by local communities. The height of this sand dam continues to go up, so does the sediment deposit behind the sand dam. This increases both the volume of water storage and its accessibility. The technology coupled with solar pumps allows farmers to access water for supplementary irrigation and mitigate the risks related to water availability. This social innovation solution can also enable farmers to extend the cropping season into the dry period and harvest a second (cash or staple) crop, providing opportunities for enhancing income and livelihoods for the rural poor (g). These sand dam these can increase the amount of land irrigated in Africa as much as 50%.

SOCIAL INNOVATION

TECHNOLOGICAL SOLUTIONS

Irrigation is a key component of food crop development in Africa closely linked to the agriculture sector and food security (h).

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Low cost technology, Sand dams (g)' (i.e. walls across the river in the sand) is used in Lusitu River, Zambia conjunction with low-cost, low-lift solar-powered pumps. The 'sand dams' gradually increase the thickness of the sediment layer in the river (through heightening the dam in stages), thus increasing both the volume of water stored and its accessibility. The technology allows farmers to access water for supplementary irrigation and mitigate the risks related to water availability

The sustainable use of this nature-based storage can be supported by the creation of a community monitoring device that ensures that all water users have correct and symmetrical information on actual groundwater levels – a critical element in sustainably managing such a common pool resource (k). The Software programs such as SAPWAT 4 (n), a low-cost solution, can estimate irrigation water requirements of crops, farms and drainage or administrative regions for planning purposes and can also help to resolve water allocation challenges

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It's also important to highlight that water quality monitoring not only needs to include water quality testing but also regular sanitary inspections of water supplies because potential contamination with pathogens or chemical, can occur at the source. or during treatment and distribution.

continuous alluvial aquifer water quality observations might be required near major settlements to monitor faecal contaminations (Hydrogen Sulphide testing kit could be used () and near large agricultural areas to assess contamination by nitrate, fertilizers or pesticides. Sensitization on conservation agricultural practices and hygiene practices is important.

CAPACITY DEVELOPMENT

Multi-sectoral governance structure at different levels, is adopted. The proposed social innovation often cut cross many sectoral areas of interest (for example between those working with water management, agriculture, forestry, urban planning, ecological protection, etc.) and stakeholders have different perspectives and priorities for any proposed solution (d), therefore, integrated water resources approach is the holistic approach that would reduce conflicts and safeguard the resource under threat by the changing climate. This is also an opportunity to bring together different sectors with different perspectives/ideas under one common agenda. Decision makers, at local and national level in the agricultural sector must be aware of cross cutting issues with other sectors and therefore, increase awareness on climate change impacts on the water resource, impacts of agricultural activities on water quality and quality and the ecosystem etc to sustainably manage the resource. For water availability is affected by its quality (g)

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Training local farmers in water monitoring and on how to use monitoring data to plan water use for irrigation empowers them to participate in water management and in the allocation and understanding of the trade-offs that increasing food production may involve (e). The training should aim at instilling competencies and skills in conservative agricultural practices and reduce water pollution through proper use of chemical fertilizers, herbicides and pesticides and on alternatives to reduce their use (h). In addition, knowledge or experience sharing ventures via workshops, site visits, conferences with local and international stakeholders is very important

GOVERNANCE STRUCTURES

« Governance is essentially the processes and institutions through which decisions are made » (f).

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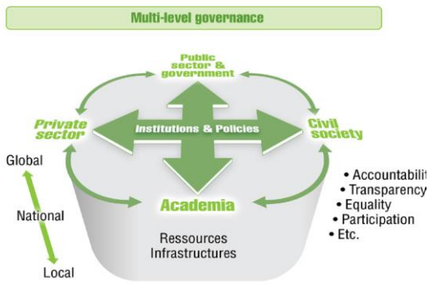
Given the importance of water to food security, sustainable agriculture and nutrition (c), the challenge of feeding growing populations will increasingly become a central issue in most national development policies (g).
The proposed social innovation often cut cross many sectoral areas of interest (for example between those working with water management, agriculture, forestry, urban planning, ecological protection, etc.) and stakeholders have different perspectives and priorities for any proposed solution (d), therefore, strong institutions and greater stakeholder involvement are required to improve and ensure sustainable and efficient water use for food production. This requires monitoring water quantity and quantity to inform water users and authorities about the water that is available for irrigation in the alluvial aquifer or rainfall.

Monitoring data is needed to inform about water consumption for agriculture and the impacts that aquaculture and agricultural practices, fertilizers, pesticides and agricultural waste have on water quality. Therefore, the need for stakeholders to agree on goals to reduce water pollution from agriculture, to increase water productivity, etc.

In many countries, the policy landscape remains highly fragmented. Better harmonization of policies across economic, environment and social dimentions /agendas ensures sustainability of the project. This also is key in promoting intersectoral collaboration through the development of consensus on policy objectives in a particular situation. Alignment of laws and policies also would create an enabling environment for the uptake of alluvial water storage for agricultural and other purposes and upscaling the co-created knowledge to other areas within the country.



Source: Adopted and adapted (i)

BUSINESS ROAD MAP

As stated in literature (i), social innovation relies on means other than market mechanisms in order to link the demand and supply sides.

All the stakeholders must be involved and interact interact during the different stages of the innovation process to create a common ground for the co-production of the required knowledge: from the comprehension of the need to the design, implementation and use of innovative solutions.
The business model and key business opportunities that exist at the different stages,

Source: Adopted and adapted (h)

Summary

Nature-based water storage in seasonal rivers contribute to resilient livelihood, as water stored in the alluvial aquifers provide reliable and sustainable source of water for agriculture in arid and semi-arid regions in sub-Saharan Africa. The success of social innovation is reliant on the involvement of all key stakeholders where all the technological and non-technological solutions of the social innovations dimensions are applied. In general, the poorest people may have the most to gain from the nature-based water storage in alluvial aquifers for improved water quantity and quality, especially where they lack access to improved water sources and are at risk of food insecurity.

The co-developed knowledge from this study will be tested, and scaled up for other rivers within the country and other countries within Africa.

References

(a) [k] Vallejo B. and Wehn U. (2016) Capacity Development Evaluation: The Challenge of the Results Agenda and Measuring Return on Investment in Capacity Development in the Global South, World Development, Vol. 79, pp.1-13, doi:10.1016/j.worlddev.2015.10.044.

(b) [l] Wehn U. (2015) The Global Content: National Capacity Development Strategies, Tailor Made Training for contact points of Uganda's National Water and Environment Capacity Development Strategy, in collaboration with the Ministry for Water and Environment (Uganda), Kampala, Uganda, 10-11 November.

(c) HLPE (High-Level Panel of Experts on Food Security and Nutrition Committee on World Food Security). 2015. *Water for Food Security and Nutrition: A Report by the High-Level Panel of Experts on Food Security and Nutrition*. Rome, HLPE. www.fao.org/3/a-av045e.pdf

(d) Nesshöver, C., Assmuth, T., Irvine, K. N., Rusch, G. M., Waylen, K. A., Delbaere, B., Haase, D., Jones-Walters, L., Keune, H., Kovacs, E., Krauze, K., Külvik, M., Rey, F., Van Dijk, J., Vistad, O. I., Wilkinson, M. E. and Wittmer, H. 2017. The science, policy and practice of nature-based solutions: An interdisciplinary perspective. *Science of The Total Environment*, Vol. 579, pp. 1215–1227. doi.org/10.1016/j.scitotenv.2016.11.106.

(e) [m] FAO [2013], Investing in smallholder agriculture for food security, HLPE reports series #6, www.fao.org/cfs/cfs-hlpe

(f) [e] Lautze J., de Silva S., Giordano M., Sanford L., (2011), Putting the cart before the horse: Water governance and IWRM, Natural Resources Forum, 35, 1-8

(g) WWAP (United Nations World Water Assessment Programme)/UN-Water. 2018. The United Nations World Water Development Report 2018: Nature-Based Solutions for Water. Paris, UNESCO. Chapter 4 "Nature Based Solutions for managing water-related risks, variability and change" in The United Nations World Water Development Report 2018

(h) https://afrialliance.org/knowledge-hub/afrialliance-social-innovation-factsheets/social-innovation-factsheet-12-monitoring

(i) https://afrialliance.org/knowledge-hub/afrialliance-social-innovation-factsheets/social-innovation-factsheet-32-innovation

(j) You, L., Ringler, C., Nelson, G. C., Wood-Sichra, U., Robertson, R. D., Wood, S., Guo, Z., Zhu, T. and Sun, Y. 2010. What is the Irrigation Potential for Africa? A Combined Biophysical and Socioeconomic Approach. IFPRI Discussion Paper. Washington DC, International Food Policy Research Institute (IFPRI). www.ifpri.org/publication/what-irrigation-potential-africa.

(k) Ostrom, E. 2008. The challenge of common-pool resources. Environment: Science and Policy for Sustainable Development, Vol. 50, No. 4, pp. 8–21. doi.org/10.3200/ENVT.50.4.8-21.

(l) Love, D., Van der Zaag, P., Uhlenbrook, S. and Owen, R. 2011. A water balance modelling approach to optimising the use of water resources in ephemeral sand rivers. River Research and Applications, Vol. 27, No. 7, pp. 908–925. doi.org/10.1002/rra.1408.

(m) Lasage, R., Aerts, J., Mutiso, G.-C. M. and De Vries, A. 2008. Potential for community-based adaptation to droughts: Sand dams in Kitui, Kenya. Physics and Chemistry of the Earth, Vol. 33, No. 1–2, pp. 67–73. doi.org/10.1016/j.pce.2007.04.009.

(n) SAPWAT4, http://www.wrc.org.za/Knowledge%20Hub%20Documents/Conference%20proceedings/van%20Heerden.pdf

(o) Bäumle, R., C. Neukum, J. Nkhoma and O. Silembo (2007). The Groundwater Resources of Southern Province, Zambia (Phase) Volume1-Technical Report. www.deutscher-rohstoffeffizienz-preis.de

















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