

ザンビアの小規模農家が建設した簡易堰の雨季と乾季における損傷評価

Diagnostic Assessment in Wet Season and Dry Season of Simple Weirs Constructed by Small-scale Farmers in Zambia

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1. Introduction

Hydraulic head works, including fixed-type weirs, gated weirs, combination-type weirs, and temporal weirs are typical and widely used as river diversion structures. This study focused on simple weirs because of their popularity in dry-season small-scale irrigation in Zambia. Simple weirs are means to develop small-scale irrigation widespread in the rural areas of Zambia. Simple weirs aid in making use of water and arable land to enhance livelihoods through dry-season irrigated agriculture of the rural population. This research describes and discusses the findings of the assessment conducted on existing 15 simple weirs constructed between May and June 2022. According to Food and Agriculture Organization (FAO, 2014), maintenance of simple weirs is essential since they are susceptible to flood damage and they need annual reconstructions and repairs. However, there is no specific period to carry out repair and reconstruction works on simple weirs. Therefore, the objective of the research was to assess the physical conditions of simple weirs across the dry and wet seasons and recommend timely corrective interventions. This research has emphasized studying the simple weirs during the dry and wet seasons. For this study, “excellent condition” refers to the weirs without defects, newly maintained or rehabilitated “partially” refer to the weir with damaged sections not exceeding 50%. leaking section, while “splashed weir” refers to the completely washed off by the floods.

2. Material and Methods

2.1. Study area

The study employed qualitative and quantitative methods in collecting the data. The study focused on weirs built using materials from the local forests. 15 simple weir sites were randomly selected from Luapula, Copperbelt and North-western provinces (Figure 1) five weir sites in each province. The study was conducted in two phases between 2022 November and January 2023. The first phase of the assessment was carried out in the dry season. It involved the collection of baseline information preceded by the repair and reconstruction of simple weirs identified as broken, damaged, or washed away. The second phase of the assessment was done during the rainy season. It involved observing and evaluating simple weirs after repairing and reconstructing some of the faulty simple weirs.

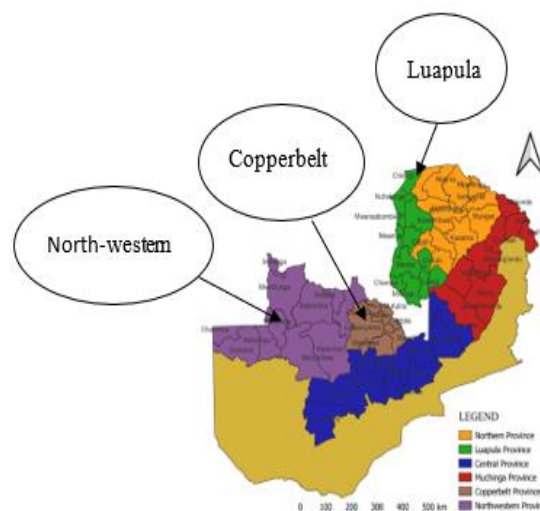


Fig. 1 Location of study area on Map of Zambia

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3. Results and Discussions

3.1. Situation Analysis and Measures

This study assessed simple weirs constructed between May and June 2022 irrigation season and found that out of the 15 weirs and sites selected in the northern provinces of Zambia, 10 were in excellent condition, Luapula 4 weirs, Copperbelt 3 weirs and North-wester 3 weirs. 4 sites had partly damaged weirs mainly to a lack of

Table 1 Overview of simple weir structures by province (Date of survey November 2022)

Province	Excellent condition weirs	Partially damaged weirs	Flushed off weirs
Luapula	4	1	0
Copperbelt	3	1	1
North-western	3	2	0

repair and maintenance observed on one site each in Luapula and Copperbelt while Northwestern had 2 sites. 1 site in the Copperbelt was observed with a washed-away weir likely caused by the increase in river inflows. The period when simple weirs were most vulnerable to damage was the wet season (November to March), but it was found that 33% (5/15) had some damage in the dry season (May to October).

3.2. Status of simple weirs in Wet season

To study the impact of flooding, Simple weirs were re-assessed in the rainy season between late December and early January. It was found that 47% of simple weirs constructed by experienced farmers and with the help of the agricultural extension officers were still intact and did not encounter structural problems. About 40% of simple weirs were sighted and constructed by the farmers on their own. Approximately 13% of simple weirs were reconstructed before the rainy season. A total of 33% of simple weirs constructed by farmers themselves were submerged (Figure 2) in water during the flash floods. The weirs affected by floods were observed in Luapula and Copperbelt provinces. While 33% of simple weirs were flushed entirely off, and this was observed in the North-western province. The river slopy section location of the simple weirs could be the likely contributing factor. According to (Dakpalah et al., 2018) simple weirs encounter such challenges often which affect their potential.



Fig.2 Simple weir submerged by the inflow of rainwater

4. Conclusion

The research reveals challenges for the implication of river floods on simple weirs. However, some of the challenges noted in the survey are exacerbated by the lack of maintenance of simple weirs. Solutions have not been developed to reduce disruptions arising from design, construction, and maintenance challenges. In order to reduce the design and implementation challenges highlighted by the research, there is a need to investigate weirs in the proposed sites.

References

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