Factors Influencing the Awareness and Adoption of Borehole-Garden Permaculture in Malawi Lessons for the promotion of Sustainable Practices

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Background

Malawi

A largely agrarian state

80% of the population is reliant on rain-fed, small-holder agriculture (National Planning Commission Malawi, 2020)

High levels of poverty

50.7% of the population living below the poverty line (IMF 2017)

Heavily relaint on groundwater

Over 100,000 water-points such as boreholes, hand-dug wells, and surface water (Kalin et al., 2019)

Dysfunctional waterpoints

~50% of waterpoints are partially functional or non-functional (Kalin et al., 2019)

Challenges due to climate change

Climate change will only exacerbate the pressure on water supplies (Hall et al., 2021) Malawi loses ~1.7% of its GDP each year to losses from droughts and flooding

Borehole-garden permaculture

Borehole-garden permaculture proposes that stagnant water accumulating around boreholes is channelled into community-managed gardens providing a low cost and sustainable method of irrigation for community gardens.

Key benefits

Removal of stagnant water The removal of stagnant water provides public health benefits as stagnant water which acts as key breeding grounds for the malaria transmitting Anopheles

Generation of year-round food

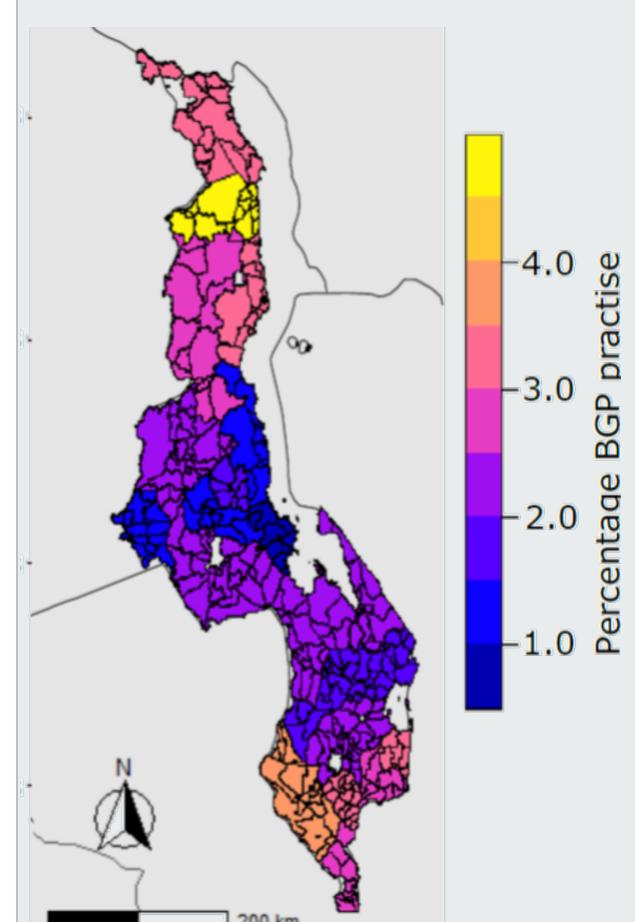
mosquitoes and other water-borne diseases

Enabling diets to be supplemented, thereby tackling food insecurity and increasing nutrition

Provide income to fund borehole maintainance

Rivett (2018) proposed that funds generated from BGP could sufficiently coverthe costs of borehole maintenance to prevent the waterpoint becoming dysfunctional.

Results



43.0% of surveyed water-points in Malawi were aware of borehole-garden permaculture (32,256) 2.4% of waterpoints were practising borehole-garden permaculture (1,800)

Communities in areas with reduced water availability had in an reduced knowledge of borehole-garden permaculture as did those in areas with increased malaria susceptibility. These are some of the communities that could most benefit from boreholegarden permaculture.

The proximity of a community to a borehole-garden permaculture practising waterpoint was a significant variable in where borehole-garden permaculture had been heard of.

Waterpoints in areas with reliable rainfall were more likely to adopt borehole-garden permaculture, highlighting the issue of competing water priorities

Waterpoints with more women on the water-point committee were morelikely to adopt boreholegarden permaculture, perhaps reflecting that these committees were more likely to be following best practise guidelines in borehole-management.

6 CLEAN WATER AND SANITATION Figure 1: Example borehole-permaculture garden. Stagnant water from the borehole is channelled to a community garden at the end of a soakaway. Photo supplied by Gift Wanangwa.

Research questions

What is the extent of borehole-garden permaculture awareness and adoption in Malawi?

Do the analysed variables influence boreholegarden permaculture awareness and adoption?

What lessons for the future promotion of borehole-garden permaculture can be learnt from where communities are aware of or adopt BGP?











Materials and methods



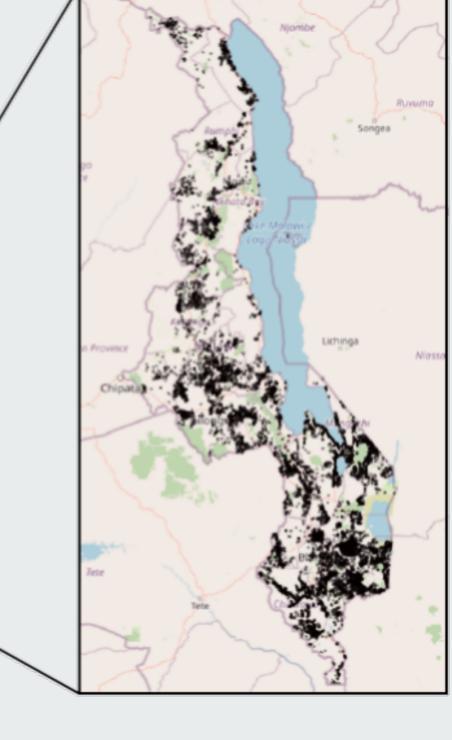


Figure 2: Map of Malawi with the point locations of waterpoints analysed in this study.

Data relating to over 100,000 water points across Malawi was collected between 2012-2021 by the Government of Malawi through the Climate Justice Fund.

Waterpoints were systematically visited by trained staff and surveys were conducted in Englishor Chichewa. Data was then quality controlled at the University of Strathclyde.

Variables for investigation were selected based on literature regarding sustainable technique adoption. 3 categories of variables were selected: socioeconomic, biophysical and waterpoint specific variables. Data regarding the values of variables across Malawi was accessed through from opensource databases including datasets from the Regional Centre For Mapping Of Resources For Development (RCMRD) and SERVIR-Eastern and Southern Africa.

Following data cleaning, 75,013 boreholes were analysed using generalised linear models (using the GLM function in base R) to identify factors influencing where borehole-garden permaculture had been heard of. Forward variable selection was used to provide a model with the simplest explanation.

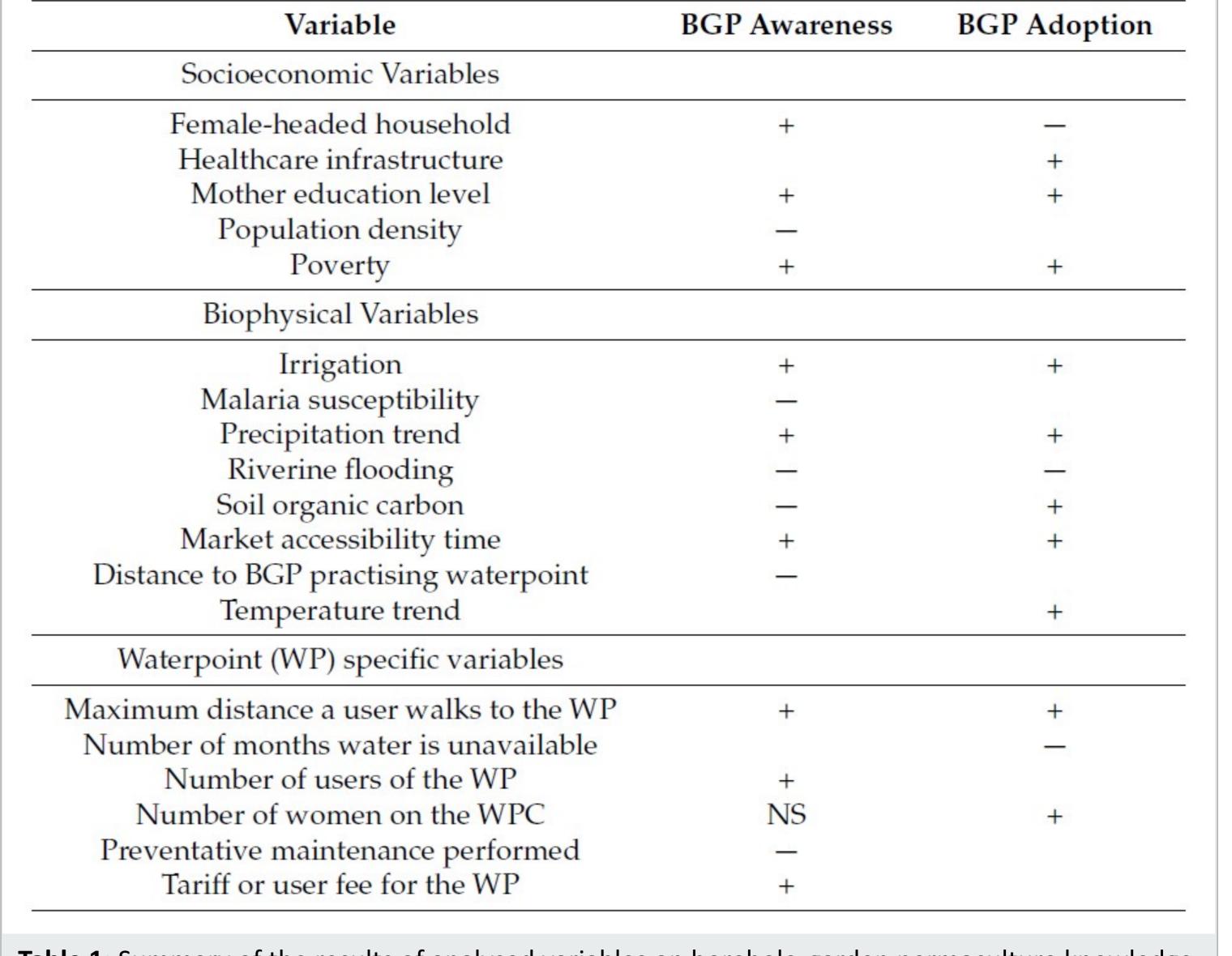


Table 1: Summary of the results of analysed variables on borehole-garden permaculture knowledge and adoption in a the minimal-variable GLMs in which variables were selected by positive variable selection. (+) denotes a significant positive variable estimate, (-) denotes a significant negative variable estimate and 'NS' (not significant) is written for any variable estimate with a p-value of >0.05

Key policy recommendations

A new focal area for borehole-garden promotion

Areas where communities could benefit most from borehole-garden permaculture due to unreliable rainfall and high malaria susceptibility, were less likely to be aware of borehole-garden permaculture. This research proposes that stakeholders, including the Government of Malawi and NGOs should focus on expanding the awareness of borehole-garden permaculture to communities in areas that could benefit most from the technique.

Increase collaboration

Capitalising upon social contacts both between neighbouring communities and external service providers could provide an efficient mechanism of expandingthe awareness of borehole -garden permaculture in Malawi. Furthermore, the encouragement of borehole-garden permaculture provides a mechanism to promote other good practices in waterpoint management such as the development of a waterpoint committee and ensuring maintenance of water-points.

Context is key

Borehole-garden permaculture adoption must also be considered in the context of the specific community and waterpoint, accounting for limitations in the context such as land ownership challenges or conflicting priorities for land and water usage such as livestock. However, the context of communities may also present an invaluable asset through pre-established social capital.

