ABSTRACT: HEALTH ISSUES DUE TO NEW IRRIGATION PRACTICES IN THE VOLTA BASIN

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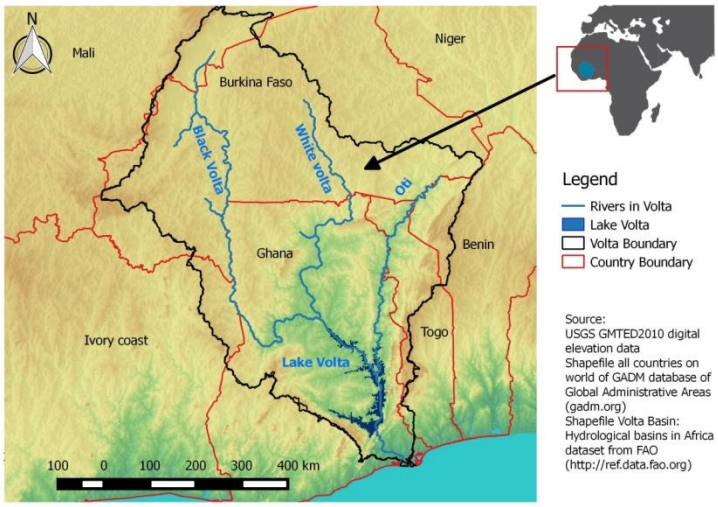

Figure 1 overview of the Volta Basin

Water is one of the most critical elements in agriculture. In dry, sub-humid and semi-arid regions the issue of water scarcity is becoming more urgent, this is especially the case in the Volta Basin (Andreini, Vlek & van de Giesen, 2002). Since 1980 small reservoirs are being promoted in Burkina Faso to establish agricultural growth in rural areas (Boelee, Cecchi and Koné, 2010). Small reservoirs are used to store water in areas susceptible to drought for irrigation of vegetables, watering livestock and domestic use (Venot, Andreini, and Pinkstaff, 2011).

Burkina Faso is a relative poor country, its potential to increase its food supply by irrigating with small reservoirs is high (Andah et al., 2003). Around 1700 small reservoirs are currently available in Burkina Faso, and the policies of the government aim to increase the number of small reservoirs (Boelee et al., 2010). In many cases the installation of small reservoirs has led to an increase in household income (Boelee et al., 2010). Besides the positive aspects as increasing the water storage, negative side effects can be found as well, as schistosomiasis instances.

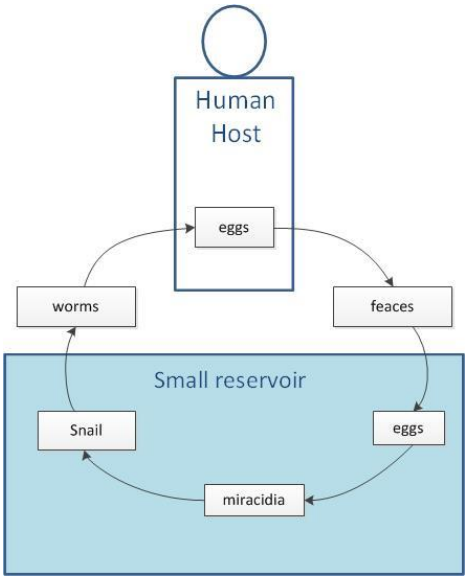

Figure 2 Spread of schistosomiasis

Schistosomiasis (also known as bilharzia) is a disease caused by snails in the small reservoirs that release parasitic worms (cercariae) (Colley, Bustinduy, Secor, & King, 2014). The cycle is presented in figure 1.

Schistosomiasis has a high frequency of occurrence in Burkina Faso, especially in the upper region. The prevalence of the disease is approximately 30%, with local variations (Boelee et al., 2010). The environment of a small reservoir offers ideal conditions for the growth of the snails that can be the host for a disease. Main locations for small reservoirs are savannas and forests, these are perfect growth places for algae. Algae are food for the snails. Furthermore, the small reservoirs enhance conditions for contact between humans and the snails, such as during bathing, sanitation, getting water and washing of clothes (Boelee et al., 2010). The most common form of schistosomiasis found in Burkina Faso is

urinary schistosomiasis, caused by the species Schistosoma heamatobium (Boelee et al., 2010). The symptoms of the disease will lead to inflammatory and obstructive disease in the urinary system, possibly leading to death (Clerinx et al., 2006). Often the disease is not taken serious enough by patients, meaning that they are not seeking the appropriate medical care. Several policies could be implemented to reduce the spread of schistosomiasis, such as the use of soap (soap is toxic for larvae), improved sanitation facilities, preventive use of medication, cleaning of the small reservoirs and education (Boelee et al., 2010).

The aim of the article is to study the spread of schistosomiasis cases at small reservoir locations in Burkina Faso, by using a previously developed basin model. Governmental and basin agencies in Burkina Faso could benefit from this study to understand the side effects of an increase of the amount of small reservoirs.

In order to study the Volta basin, the main rivers are modelled: Black and White Volta and Oti. Since Oti has the smallest influence it is schematized as a constant inflow. The other two rivers are simulated as stock flow structures. The water balance consists of an inflow (rain, and the inflow of the upper river segment) and outflow (evaporation, losses, extraction by humans for example irrigation and outflow to the next river segment). The river is divided in three parts, since these areas have the highest climate differences. To model irrigation, the most common reservoir type (small reservoir) in Burkina Faso has been created for each segment. The small reservoir is also schematized as a stock since inflow from the river, rainfall and evaporation may occur. The modelling of the disease is applied to one sub-basin, the Upper Black Volta, since this has area has the highest prevalence of schistosomiasis. Since the spread of schistosomiasis is very local, between two to five kilometers, the disease will not spread via the rivers in the basin (Colley et al, 2014). The population is divided in three groups (Healthy Population, Population with Schistosomiasis and the Very Sick Population). The population is split in these groups in order to model the spread of the disease of the society.

The effectiveness of the two most common policies for schistosomiasis is compared: Praziquantel distribution and education. Mass distribution of the drugs Praziquantel is advised as a precautionary mean. With this drug no immunity can be given, but the person can be protected for a first infection. For this reason, Praziquantel should be given to the people living close to small reservoirs on a regular basis. This policy is currently already implemented, on smaller scale by the WHO. Also, ittt iiis proven that after infection the drugs Praziquantel can help to cure infected people (Boelee et al., 2010). Zida et al. (2016) show the need for education of the population. In this way the population can be made more aware. People can follow more safe hygienic practices and know when they should be treated.

When analyzing the modelling results, the increase in the amount of small reservoirs turned out to have a major impact on the infectivity ratio of schistosomiasis, having a negative effect on population growth. An increase in the capacity of small reservoirs turned out to affect the high infected populations more than the low infected populations. Regarding policy effectiveness, it could be seen that for the population with low infectivity ratio, the spread of schistosomiasis can mostly be encountered by using praziquantel. However, in order to combat high infectivity ratio, the combination of both the praziquantel policy and the spreading awareness of disease by education is needed to keep a stable population.

Therefore, it is advised to the government of Burkina Faso government to reduce their small reservoirs in the high infected regions, or use the policies mentioned above.

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