



Effect of Hydraulic Ram Pump use in reducing hunger in Yatta Sub County in Machakos County

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ABSTRACT

More than two-thirds of the world's population produces about one-third of the world's food, and these people are suffering from a severe food crisis. This imbalance has severe economic and social repercussions and gravely jeopardizes the fundamental principles and values of the right to life and nutrition. This study assessed how hydraulic ram pumps in the Yatta Sub County of Machakos, Kenya, contributed to reduction of hunger cases. The researcher employed a descriptive survey on a sample of 43 farmers that was randomly selected and determined using Slovin's formula. Data was collected using questionnaires and analyzed in SPSS version 29. The independent variables' Cronbach's alpha values were = 0.712 for reduction of hunger. There was a significant positive relationship ($r = 0.891$, $p = 0.028 < 0.05$) between the reduction of hunger and improved living standards. Minimization of poverty correlated positively and significantly ($r = 0.999$, $p = 0.015 < 0.05$) with

improved living standards. The results showed a positive and significant correlation between the alleviation of water scarcity and improved living standards ($r = 0.834$, $p = 0.001 < 0.05$). It was recommended that national and county governments increase awareness of the benefits of using hydraulic ram pumps in arid and semi-arid areas while remaining determined to finance projects in ASAL that are tailored to improve the livelihoods of people in those areas. The study recommended increasing the number of hydraulic ram pumps in the location from 48 to having at least one hydraulic ram pump every two homesteads.

Key Terms:

Poverty: Water Scarcity: Living Standards: Hydraulic Rams:

1.0 BACKGROUND INFORMATION

The most fundamental human health and well-being needs are access to clean water, sanitation, and hygiene. If development

doesn't triple, billions will lack access to these essential services by 2030. Rapid population expansion, urbanization, and increased water requirements from the agricultural, industrial, and energy sectors all contribute to increased demand for water.

Water stress has worsened by years of abuse, lousy management, excessive groundwater exploitation, and tainted freshwater supplies. As a result of climate change, deteriorating water-related ecosystems, underinvestment in water and sanitation, and inadequate collaboration on transboundary waterways, countries are also confronting an increasing number of difficulties. The advancement rates would need to quadruple by 2030 to provide universal access to drinking water, sanitation, and hygiene. Achieving these goals would save the 829,000 yearly deaths from diseases directly linked to contaminated water, inadequate sanitation, and poor hygiene habits.

Increased sectoral investment and capacity building, promoting innovation and evidence-based action, improved cross-sectoral coordination and cooperation among all stakeholders, and adopting a more integrated and holistic approach to water management are key strategies to get Goal 6 back on track. Increased sectoral investment and capacity building, promoting innovation and evidence-based action, improved cross-sectoral coordination and cooperation among all stakeholders, and adopting a more integrated and holistic approach to water management are key strategies to get Goal 6 back on track.

Protect and restore water-related ecosystems by 2020, including wetlands, rivers, lakes, mountains, forests, and aquifers. By 2030, increase international collaboration and capacity-building assistance for projects and activities connected to water and sanitation, including technology for water harvesting, desalination, water efficiency, wastewater

treatment, recycling, and reuse. Encourage and boost community involvement in bettering water and sanitation management locally. Sanitation, cleanliness, and access to clean water are essential for human health and welfare. Safe water is important for livelihoods, school attendance, and dignity and is a requirement for good health. It also helps build strong communities with wholesome surroundings. Untreated excrement contaminates groundwater and surface waterways used for drinking water, irrigation, bathing, and domestic functions, leading to diarrhea and harm to health. Whether from artificial sources like nitrate or natural sources like arsenic and fluoride, chemical contamination of water continues to harm human health (Khanam, 2021). Numerous cases can be prevented with safe and adequate WASH, including trachoma, helminths spread through the soil, and schistosomiasis. During the Millennium Development Goal (MDG) period (1990–2015), diarrheal deaths due to insufficient water were cut in half, with significant advancements in water and sanitation services playing a crucial role. Increasing service levels for safely managed drinking water or sanitation, such as regulated piped water or connections to sewers with wastewater treatment, may significantly enhance health by lowering the number of fatalities from diarrheal disease, according to the evidence.

Many scientists define drylands as ecosystems comprising grasslands, woodlands, and rangelands, which comprise more than 40% of the planet's surface (IUCN, 2019). 41% of the Earth's surface is made up of drylands, of which 45% is used for agriculture, according to Burrell et al. (2020). Worldwide, 2 billion people live in drylands, which can be found on all continents (IUCN, 2019; FAO, 2016).

1.1 Statement of the problem

Hydraulic ram is one of the oldest mechanical devices for water lifting. Technological progress also improved the RAM, but electric and fuel-powered pumps superseded it. Today, the ram constitutes a reliable, low-maintenance, sustainable alternative to motor-driven pumps. Since introducing hydraulic ram pumps in Kenya, there has not been evidence on whether the pumps have significantly contributed to curbing hunger cases among people living in ASALs. In addition, there is no record of any study conducted in Yatta Sub County in Machakos concerning the effects of hydraulic ram pump use to human living standards. Since building up communities has become one of Kenya's primary methods of alleviating poverty, partaking in construction and building infrastructure has become one of the most booming businesses in the country, generally helping the economy and allowing newer and safer ASALs to arise all around the country. In this view, the current study sought to investigate how hydraulic ram pumps have contributed to curbing hunger issues in Yatta Sub County in Machakos County, Kenya.

1.2cObjective of the study

The main objective of this study was to investigate the effect of Hydraulic Ram Pump use in reducing hunger in Yatta Sub County in Machakos County.

1.3 Hypotheses

H₀: Hydraulic Ram Pump use does not have significant effect on reduction hunger in Yatta Sub County in Machakos County.

H₁: Hydraulic Ram Pump use has significant effect on reduction hunger in Yatta Sub County in Machakos County.

2.0 LITERATURE REVIEW

2.1 Reduction of Hunger

More than two-thirds of the world's population produces about one-third of the

world's food, and these people are suffering from a severe food crisis (Gundogdu, 2019). This imbalance, which threatens to worsen over the next ten years, has severe economic and social repercussions and gravely jeopardizes the fundamental principles and values of the right to life and nutrition. Eliminating hunger and malnutrition, one of the goals outlined in the UN Declaration on Social Progress and Development, and eradicating the factors contributing to this condition are shared goals among all countries (Singleton et al. 2021). The historical circumstances of the people who suffer from hunger and malnutrition, particularly social inequalities, which continue to be among the most significant barriers to the complete emancipation and advancement of the developing countries and all of the peoples involved, include alien and colonial domination, foreign occupation, racial discrimination, apartheid, and neo-colonialism in all its forms (Singleton et al. 2021).

This situation has gotten worse recently as a result of many crises that the global economy has experienced, including the decline of the international monetary system, inflationary increases in import costs, heavy burdens of external debt on the balance of payments of many developing countries, an increase in food demand partly due to population pressure, speculation, a shortage of and increased prices for essential agricultural inputs, and a rise in food prices; The Charter of Economic Rights and Duties of States should be taken into consideration in the context of ongoing negotiations, and the General Assembly of the United Nations should be urged to unanimously adopt a Charter that will serve as a valuable tool for the development of new international economic relations based on justice and equity principles (Niyobuhungiro, 2019).

A comprehensive informational strategy that adequately accounts for the various interdependences is required for the economic study of hunger. The interdependences between income and food consumption, the operations of different economic sectors, production and trade in multiple countries, macroeconomic stability and food security, intra-family distributional rules and the sharing of food and health care, women's power and fertility behavior, military expenditure and economic deprivation, early undernourishment and its effects on health and skills, political instability, and macroeconomic stability are all examined by Amartya (2018). These linkages' implications are briefly discussed by Amartya (2018).

Extreme weather and drought have a negative impact on rural populations' ability to sustain their way of life (Maione, 2020). They contribute significantly to the food shortage in Northern Kenya (Maione, 2020). Because of their high susceptibility within the population, children and the elderly are particularly affected by hunger- and malnutrition-related diseases because of their inability to adjust to varied and changing local climate conditions and low levels of resilience (Maione, 2020). The Kenyan government developed the Hunger Safety Net Programme (HSNP), which is currently in its third phase of operation in 2009 in response to these circumstances (Maione, 2020). One of the main elements of Kenya Vision 2030, the country's development plan, is the HSNP (Maione, 2020). Its primary goals are to ensure food security for everyone and to advance financial inclusion through cash transfers (Maione, 2020). International agencies provide the majority of the funding for these initiatives (Maione, 2020). Expanding access to cash transfers helps disadvantaged households who have lost access to agricultural and natural resources as a result of harsh weather events as well as

shifting socioeconomic pressures (Maione, 2020). In this situation, those who depend on natural resources cannot secure their present and future welfare (Maione, 2020). The HSNP has supported 69,000 households while covering 31% of the population in the poorest areas since its implementation started in 2009 (Maione, 2020). Its growth through increased financial resources will allow more highly susceptible households to increase their resilience, better manage climate threats, and secure their future well-being (Maione, 2020). Future domestic and foreign investment efforts should concentrate on insurance programs, technical support, regulations reducing disaster risk, protection of natural capital, and compensation programs (Maione, 2020).

The goal of Song and Imai (2019) was to assess Kenya's Hunger Safety Net Programme's (HSNP) immediate effects and long-term viability. The impact of program participation on the household Multidimensional Poverty Index (MPI) is estimated using difference-in-difference and propensity score matching methods (Song and Imai, 2019). Song and Imai (2019) discovered that program participation considerably decreased the MPI, which is primarily driven by the food insecurity component, and that the decrease in poverty is attributable to the reduction in the incidence and severity of poverty, particularly the latter, among the ultra-poor households (Song and Imai, 2019). Weaknesses in the program's implementation and financing, as well as the short-term focus of impact evaluation, may undermine the program's ability to contribute to the development of a powerful state that is responsible for the eradication of poverty, even though the government of Kenya is making strides in the institutionalization of social protection, according to our analysis of the country's political economy (Song and Imai, 2019).

3.0 RESEARCH METHODOLOGY

This research project employed a descriptive survey method to collect data from a sample of the targeted population. The descriptive survey was an appropriate choice since the researcher aimed to identify socioeconomic characteristics, frequencies, trends, and categories. The research targeted farmers and owners of hydraulic ram pumps in Yatta Sub County in Machakos County. According to Ministry of Agriculture data in Yatta Sub County, there were 156 registered farmers in the Sub County out of which 48 farmers owned hydraulic ram pumps. Primary data was collected using the questionnaire. Content validity and a pre-test survey were conducted to test the instrument's validity. The reliability of the pilot's study data was tested using the Cronbach alpha coefficient. An alpha coefficient of 0.70 or higher was considered acceptable (Cooper & Schindler,

2009). Therefore, the researcher strove for reliability values of 0.70 or higher.

4.0 DATA ANALYSIS, RESULTS AND INTERPRETATION

4.1 Demographics

Occupation of the Population

The table below demonstrates that 88.4% of the population in the study area were farmers. Less than 12% of the population had other occupations than farming. Therefore, the study concluded that farming was the primary economic activity of the population in the study area.

Table 1: Occupation of the Population

	N	%
Yes	38	88.4%
No	5	11.6%

4.3.5 Use of Hydraulic Ram Pump

The study established that all (100%) of the respondents had used hydraulic ram pumps at some point in their lives (Table 3).

Table 2: Use of Hydraulic Ram Pump

	N	%
Yes	43	100.0%

4.3.6 Ownership of Hydraulic Ram Pump

The study further established that 60.5% of the population owned the hydraulic ram pumps they used, while 39.5% of the population leased the hydraulic ram pump (Table 4).

Table 3: Ownership of Hydraulic Ram Pump

	N	%
Own	26	60.5%
Lease	17	39.5%

4.3.7 Years of Use of Hydraulic Ram Pump

The researcher wanted to know how long the respondents had used the hydraulic ram pumps. The respondents were asked to show the years they had been using the hydraulic ram pumps. The statistics in Table 5 below

showed that 20.9% of the respondents indicated that they had used the ram pumps for 1-2 years, 11.6% for 3-4 years, 18.6% for 5 years, and 48/8% for over 5 years.

Table 4: Years of Use of Hydraulic Ram Pump

	N	%
1-2	9	20.9%
3-4	5	11.6%
5	8	18.6%
Above 5	21	48.8%

4.2 Contribution of Hydraulic Ram Pumps to the Reduction of Hunger

4.4.1 Hunger Reduction before acquiring Hydraulic Ram Pumps

The respondents were asked to state how they managed hunger before they obtained hydraulic ram pumps. The results are illustrated by the statistics in Figure 4 below.

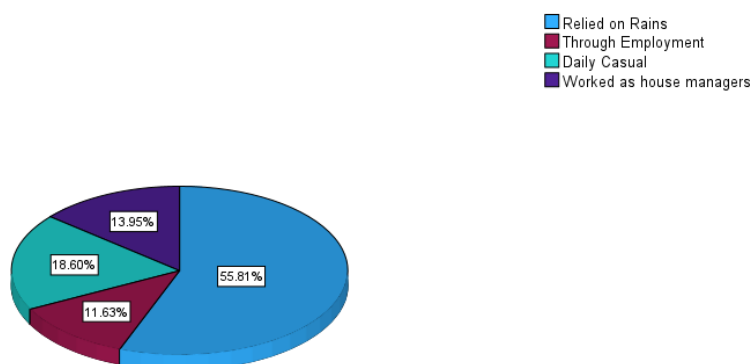


Figure 1: Ways of Managing Hunger before acquiring Hydraulic Ram Pump

The results demonstrated that most (55.81%) of the farmers relied on sporadic rains to

grow food crops that helped them manage or reduce hunger in their households. 11.63%

were employed to earn income that enabled them to buy food to reduce hunger. A proportion of 18.60% lived –hand-to-mouth by working as daily casuals to be able to feed their families, while 13.95% reduced hunger by working as house managers, a job that enabled them to earn income to buy food.

4.4.2 Contributions of Hydraulic Ram Pumps

The researcher provided the respondents with five five-point Likert questions for the respondents to show the degree to which they agreed with given statements. On the scale, the respondents were required to choose one value between 1 and 5, where 1 represented strongly disagree while 5 strongly agreed.

The first question asked the respondents to show the extent to which they agreed with the statement, “I use a hydraulic ram pump to pump water to irrigate food crops.” The data collected was analyzed, and the results are illustrated in Table 6 below. All the farmers stated that they used hydraulic ram pumps to pump water that was used for irrigation. According to the statistics, 83.7% agreed with the statement, while 16.3% strongly agreed with the statement. Therefore, it was established that hydraulic ram pumps have contributed to hunger reduction by enabling farmers to pump water for irrigating food crops in the study area.

Table 5: HRP to Pump Irrigation Water

	N	%
3	17	39.5%
4	19	44.2%
5	7	16.3%

The second question required the respondents to show the degree to which they agreed that HRP was a sustainable and low-cost alternative for crop production. As demonstrated in Table 6, all the respondents agreed that hydraulic ram pumps provided a sustainable and cost-effective alternative for crop production. Following the statistics,

55.8% agreed, and 44.2% strongly agreed that hydraulic ram pumps provided them with a sustainable and cost-effective alternative for the production of food crops. Therefore, the study found HRPs sustainable and cost-effective alternatives for the production of food crops.

Table 6: HRP is a sustainable and Cost-effective alternative for Crop Production

	N	%
4	24	55.8%
5	19	44.2%

Thirdly, the respondents were asked to indicate their degree of agreement with the statement that “HRP is cheap, simple to use,

and environmentally friendly.” The results are shown in Figure 7.

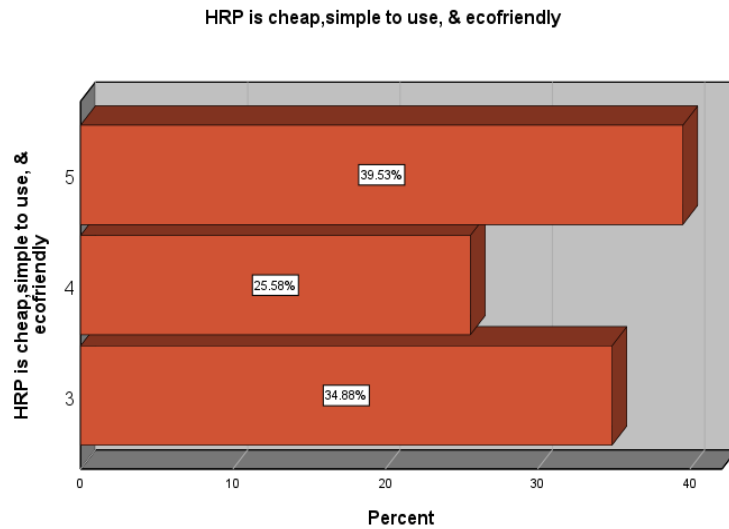


Figure 2: HRP is cheap, simple, and environmentally friendly

All of the farmers agreed, with 39.54% strongly agreeing, that hydraulic ram pump was cheap to acquire, simple to use, and ecofriendly. The study, therefore, concluded that hydraulic ram pumps were cheap to acquire, simple to use, and environmentally friendly. Likert questions, with 1 denoting strongly disagree and 5 strongly agree, were used to get the findings shown above.

4.4.3 HRP Maintenance Cost

The study found that the maintenance cost for hydraulic ram pumps to be low, as indicated

by the farmers. According to the statistics, 44.2% of the population argued that the maintenance cost for the pump was comparatively low, while most of them (55.8%) stated that they found the maintenance cost for the hydraulic ram pump low (see Table 8). The answers to the Likert questions that produced the findings above were 1 for strongly disagree and 5 for strongly agree.

Table 7: HRP Maintenance Cost

	N	%
3	19	44.2%
4	24	55.8%

4.4.4 Reliability of Hydraulic Ram Pump

Hydraulic ram pump as a means of pumping water for irrigation was found to be a reliable means for crop production. All the farmers stated that their hydraulic ram pumps were reliable for crop production. The statistics showed that 62.79% and 37.21% agreed and

strongly agreed that hydraulic ram pump was reliable for crop production. The results above were obtained from Likert questions in which 1 represented strongly disagree and 5 strongly agree.



Figure 3: Reliability of Hydraulic Ram Pump

The research went further to examine how the hydraulic ram pumps helped the farmers to reduce hunger. The respondents were asked to answer the question, “After acquiring/leasing hydraulic ram pumps, how

has it helped you to manage or reduce hunger?” The results are shown in Figure 7 below. Likert questions, with 1 denoting strongly disagree and 5 strongly agree, were used to get the findings shown above.

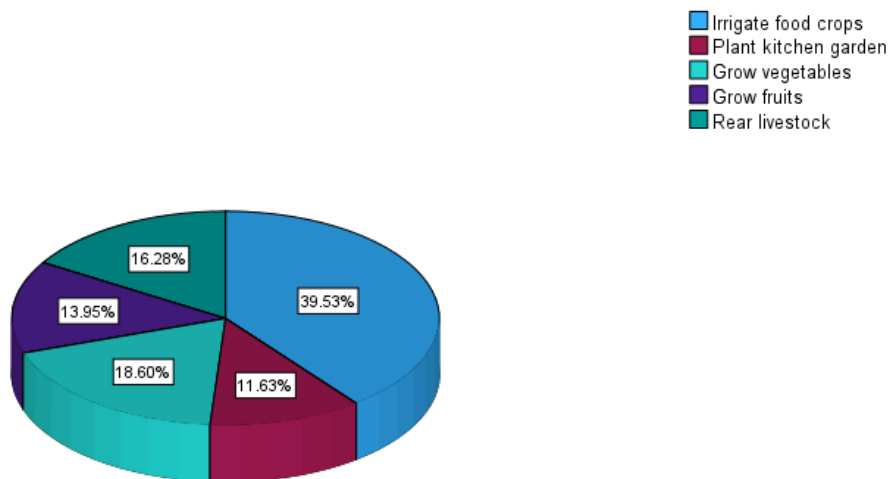


Figure 4: How has a hydraulic ram pump helped you to manage or reduce hunger?

The results illustrate that hydraulic ram pump has helped 39.53% of farmers to irrigate food crops, 11.63% to plant kitchen gardens, 18.60% to grow vegetables, 13.95% to grow fruits, and 16.28% to rear livestock. All these

measures were taken to help the farmers deal with hunger.

5.0 SUMMARY

As a reliable, low-maintenance, and environmentally friendly substitute for motor-driven pumps, rams are still used

today. There is no proof that the hydraulic ram pumps have considerably raised the living standards of those who reside in ASALs since their introduction in Kenya. Furthermore, no research on the benefits of hydraulic ram pumps for raising living conditions has been done in the Yatta Sub County of Machakos, according to the records. Construction and infrastructure development have grown to be two of Kenya's most lucrative industries, helping to boost the economy and enable the emergence of newer and safer ASALs across the nation. This is because improving communities has become one of Kenya's main strategies for reducing poverty. Accordingly, the current study chose Yatta Sub County in Machakos County, Kenya, as the study region in order to examine how hydraulic ram pumps have improved people's living standards in ASALs.

All of the responders, as shown in Table 2, concurred that hydraulic ram pumps offered a viable and affordable alternative for crop production. In accordance with the statistics, 55.8% of respondents agreed, and 44.2% strongly agreed, that the cultivation of food crops using a hydraulic ram pump offered them a viable and affordable alternative. The study discovered HRPs as a viable and affordable solution for growing food crops. Thirdly, the respondents were prompted to rate how much they agreed with the claim that HPP is affordable, user-friendly, and environmentally beneficial. The outcomes are displayed in Figure 4. All of the farmers believed that hydraulic ram pumps were inexpensive to buy, easy to use, and environmentally beneficial, with 39.54% strongly agreeing. Accordingly, the study concluded that hydraulic ram pumps were inexpensive to buy, easy to use, and environmentally beneficial. According to the farmers, the study discovered that hydraulic ram pumps require little maintenance. The majority of people (55.8%) said they thought

the maintenance cost for the hydraulic ram pump was low, whereas 44.2% of the public claimed that the maintenance cost for the pump was relatively cheap (see Table 5). The findings show that hydraulic ram pumps have aided 39.53% of farmers in the irrigation of food crops, 11.63% in the planting of kitchen gardens, 18.60% in the growth of vegetables and fruits, and 16.28% in the care of cattle. All of these steps were taken to assist the farmers in overcoming hunger. The respondents were questioned about their degree of poverty prior to purchasing the hydraulic ram pumps as part of a study looking at how much they reduced poverty. It was determined that the majority of respondents, who made up 55.8% of the population, were experiencing extreme poverty.

6.0 CONCLUSION

Based on the findings of this study, it was concluded that the application of hydraulic ram pumps by farmers had a strong positive and significant contribution to improving the living standards of people through the reduction of hunger. Farmers used hydraulic ram pumps to grow food crops, which increased their ability to reduce hunger. Their nutrition was found to have significantly improved when the farmers irrigated food crops on their farms.

7.0 RECOMMENDATION

Following the conclusions made in this study, it was recommended that national and county governments increase awareness of the benefits of using hydraulic ram pumps in ASAL (s) while remaining determined to finance projects in ASAL that are tailored to improve the livelihoods of people in those areas. The study recommended increasing the number of hydraulic ram pumps in the area from 48 to having at least one hydraulic ram pump every two homesteads.

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