IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed journal & Refereed journal ⁜ Vol. 12, Issue 11, November 2023

DOI: 10.17148/IJARCCE.2023.121104

Android based mobile application for estimation of tubewell discharge

Ram Naresh[1], Mukesh Kumar[2], Amandeep Singh[2], Sanjay Kumar[3]

Assistant Professor, Soil & Water Engineering, COAE&T, CCS HAU Hisar, Haryana INDIA[1]

Assistant Scientist, Soil & Water Engineering, COAE&T, CCS HAU Hisar, Haryana INDIA[2]

Professor, Soil & Water Engineering, COAE&T, CCS HAU Hisar, Haryana INDIA[3]

Abstract: Measurement of tubewell discharge plays a crucial role in sustainable water resource management. It enables informed decision-making, helps prevent over-extraction, and ensures the long-term availability of groundwater for various essential purposes. Developing applications for monitoring tubewell discharge can contribute to effective and efficient water resource management. Presently, Co-ordinate method is the most common method used to measure tubewell discharge but this method needs some calculations which are beyond the scope of a farmer or non technical person. therefore an attempt has been made to develop an application for the most common platform of android to help farmers and laymen to easily calculate discharge of their tubewell by simply putting the values of co-ordinates of the water jet. The application was developed on freely available MIT app developer web platform.

Keywords: Tube well discharge, water measurement, co-ordinate method, android application

I. INTRODUCTION

India constitutes 2% of the world's geographical area and has only 4% of the global freshwater resources. This disproportion between geographical area and freshwater availability poses challenges, especially given that the total population of India is around 17%, and there is a substantial cattle population exceeding 20%.As is common in many developing countries, more than 85% of water resources in India are used for agricultural purposes. This underscores the importance of managing water efficiently, especially in the agricultural sector. The state of Haryana, with only 1.4 % of the country's area, has been making a substantial 14 % contribution to the central pool. However, this intensive agriculture has put significant stress on the state's water resources, leading to an increased irrigation water requirement. While surface water resources are insufficient to meet the total irrigation needs, the state heavily relies on tube wells, with 70% of the irrigated area being served by them. The number of tube wells in Haryana has increased significantly over the years, contributing to a continuous rise in pressure on water resources. Given the escalating pressure on water resources, there is a pressing need to use water judiciously, especially in agriculture. The goal is to maximize production per unit of water, emphasizing careful and efficient use of every drop of water available.

The efficiency of water utilization on farmers' fields is poor attributed to water losses during the conveyance process and application at the field level. The situation is said to arise from a lack of awareness among farmers regarding the consequences of inefficient water application. Farmers may not fully understand the importance of using water efficiently and the impact it has on sustained production. The lack of appropriate tools and instruments for uniform water application is a contributing factor. Farmers may not have access to or be aware of the tools needed to ensure precise and efficient water usage on their fields. In coming decade, that water is expected to become a major limiting factor for sustained agricultural production. This underscores the urgency of addressing water management issues. The appropriate instrumentation is crucial for various aspects of water management, including water measurement, land leveling, water flow measurement, soil moisture measurement, and irrigation scheduling. Not many tools and instruments are currently available for farmers to undertake the necessary tasks related to water management. This implies a gap in the availability of resources needed for farmers to improve water use efficiency.

The absence of appropriate devices for farmers is mentioned, leads to the adoption of obsolete and inefficient alternatives. (Hamdy et al., 2003).This suggests that farmers may resort to outdated methods or tools for managing water on their fields. The absence of scientific water management is identified as a significant issue. This lack of scientific approach leads to the loss of valuable water resources, and the concept of applying a measured quantity of water based on crop water requirements is not widely practiced. (Rajput and Patel, 2002). The increasing number of tubewells in the state further emphasize the importance of accurately measuring the discharge of tubewells. Knowing the precise discharge is crucial for applying the required amount of water to the fields efficiently. (Kaur et al., 2010). The coordinate method is

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed journal & Refereed journal ⁜ Vol. 12, Issue 11, November 2023

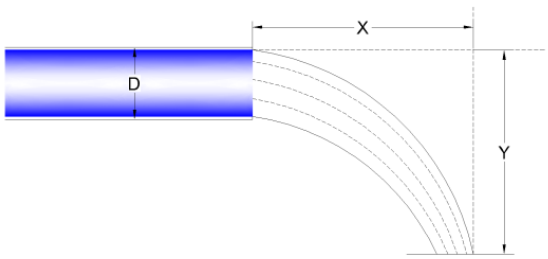
DOI: 10.17148/IJARCCE.2023.121104

the most common and frequently used method at present for measuring tubewell discharge. However, the calculations are may not be very easy and is beyond the scope of a farmer or layman, therefore an attempt has been made to provide farmers with a tool which can do all the background calculations and can provide the direct results. The Mobile app, provides a simple, inexpensive and practical means of estimating water flow rate of a tubewell. This methodology can help the farmers to apply the required quantity of water to their fields, based on the tubewell discharge, thereby avoiding over-irrigation. (Jain , 2019).

II. METHODOLOGY

Basically, trajectory methods consist of measuring the horizontal and vertical coordinates of a point in the jet issuing from the end of a pipe (Stock, 1955).

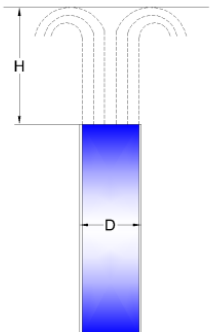
For horizontal pipe the flow is measured as:



$$Q = 0.00174 * X * D^{2} / Y^{0.5}$$

where:
Q = rate of flow, lps
D= inside diameter of the pipe , cm
X = horizontal distance of jet, cm
Y = vertical distance of jet, cm

For vertical pipe the flow is measured as:



$$Q = 0.0348 * D^{2} * H^{0.5}$$

where:
Q = rate of flow, lps
D= inside diameter of the pipe , cm
H= hight of jet, cm

Similar online software tools for discharge measurements has been developed on web based platforms. (Engineering ToolBox , 2009)

III. THE CODE

The programme for this app was written with the help of MIT App Inventorwhich is an easy-to-use drag-and-drop visual programming tool for designing and building mobile apps for android. The App Inventor was first introduced as an open source tool by Google in 2010, and now being maintained by the Massachusetts Institute of Technology (MIT).

The App Inventor provides a graphical user interface with all the necessary components required to build mobile apps and enables anyone to build a mobile phone application to meet their needs. The apps developed using this tool can easily be ported to the phone, shared with others, or even sent to the Google Play Store for distribution Worldwide [Pokress & Veiga, 2013].

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed journal & Refereed journal ⁜ Vol. 12, Issue 11, November 2023

DOI: 10.17148/IJARCCE.2023.121104

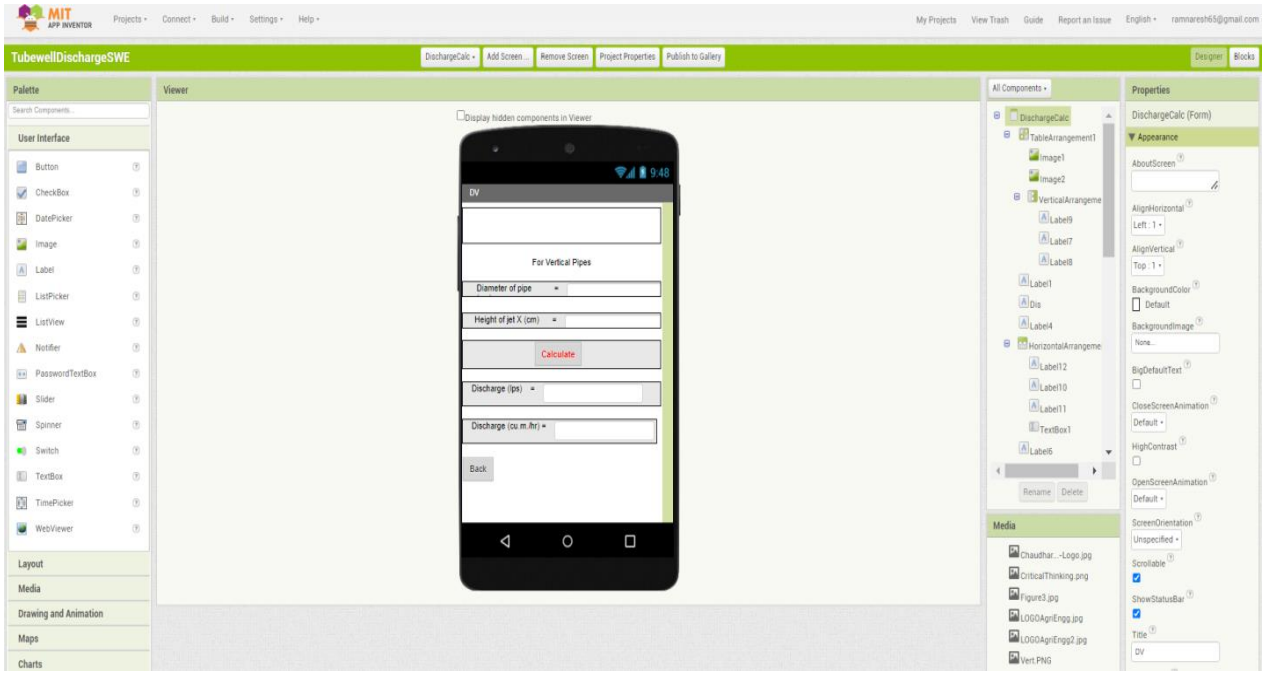


Fig. 1 MIT app developer interface

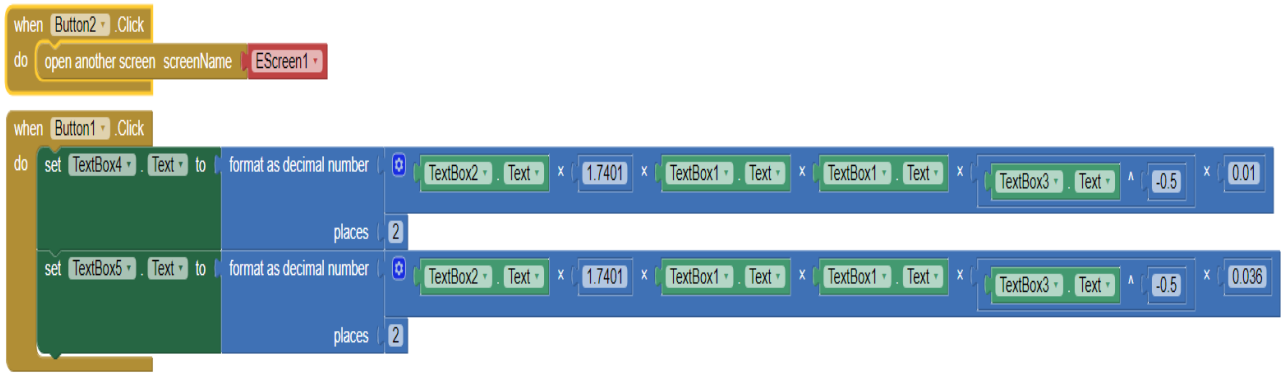


Fig. 2 Blocks for calculation of discharge from horizontal pipe

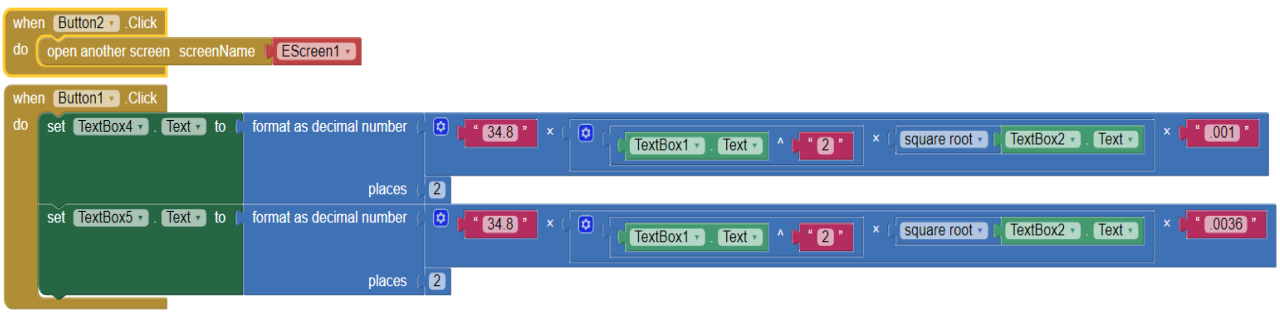


Fig. 3 Blocks for calculation of discharge from vertical pipe

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed journal & Refereed journal ⁜ Vol. 12, Issue 11, November 2023

DOI: 10.17148/IJARCCE.2023.121104

IV. THE APP

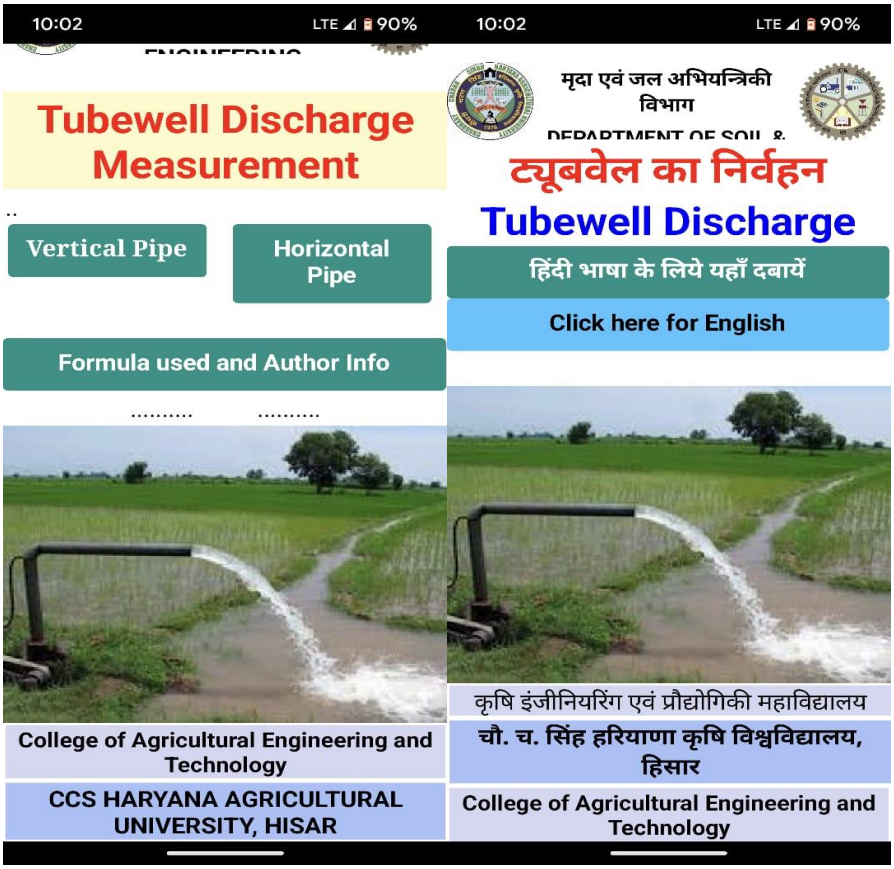


Fig. 4 Screenshot of app for tubewell discharge calculations

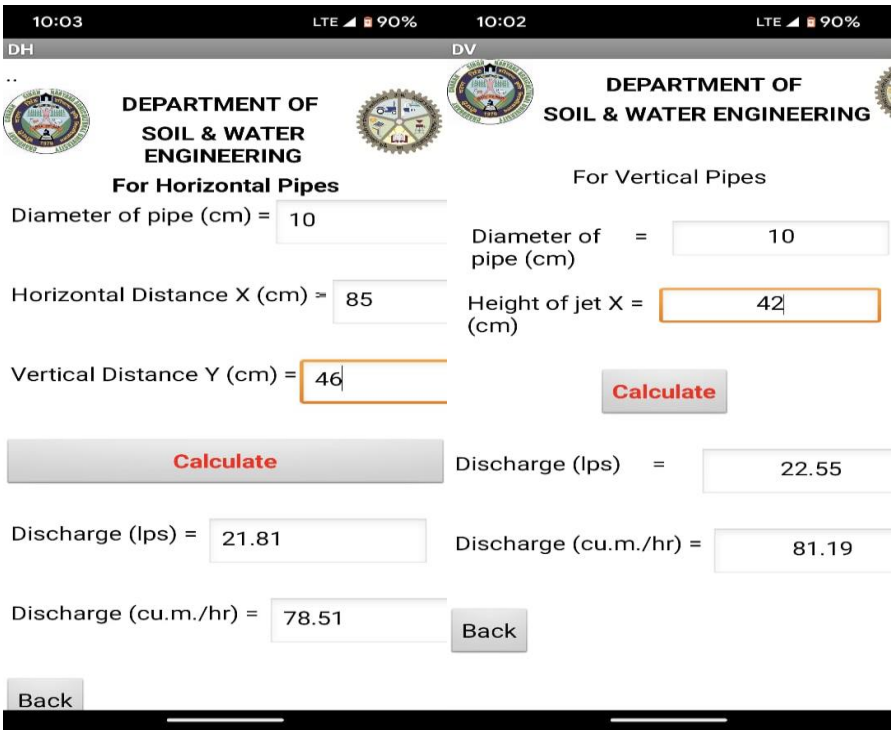


Fig. 5 Screenshot of calculation of discharge for horizontal and vertical pipes

International Journal of Advanced Research in Computer and Communication Engineering
Impact Factor 8.102 ⁜ Peer-reviewed journal & Refereed journal ⁜ Vol. 12, Issue 11, November 2023
DOI: 10.17148/IJARCCE.2023.121104

V. CONCLUSION

Under ordinary field conditions, with reasonable care, measurements can be made in which the error seldom exceeds 10 percent. The most accurate estimated discharge will be obtained when the pipe is truly horizontal.

REFERENCES

[1]. Hamdy A, Ragab R, Scarascia-Mugnozza E (2003). Coping with water scarcity: water saving and increasing water productivity. *Irrigation and Drainage*, ICID 52(1): 3–20.
[2]. Jain, A K. (2022). Measurement of Tubewell Discharge.[Mobile app]. *Google Play Store*. https://play.google.com/store/apps/details?id=com.agritechnology.tubewell&pcampaignid=web_share
[3]. Kaur, S. & Aggarwal, R. & Singh, S. & Gulati, H. (2010). A simple mechanical device for the measurement of discharge in a tubewell. *Journal of Engineering and Technology Research*. 2. 111-117.
[4]. Pokress & Veiga (2013) MIT App Inventor, arXiv:1310.2830v2[cs.CY]
[5]. Rajput TBS, Patel N (2002). Determination of status of use of irrigation equipments on farmers' field through participatory rural appraisal techniques. *In Proceedings of 2nd International Agronomy Congress*, Nov. 26–30, 2002, New Delhi, 2: 1470–1471.
[6]. Stock, E.M., "Measuring of Irrigation Water," Bulletin No. 5, *Utah State Engineering Experiment Station and Utah Cooperative Extension Service*, 1955.
[7]. The Engineering Tool Box (2009). Vertical Pipes - Discharge Height vs. Volume Flow. [*online*] Available at: https://www.engineeringtoolbox.com/discharge-height-vertical-pipe-d_1529.html