CHAPTER V
SUMMARY & CONCLUSION

Soil erosion by water is the result of interplay between catchment environmental factors such as soil topography, drainage, rainfall and land use pattern. The concurrence of drought, water shortage and soil and water loss is the greatest limiting factor for socially and economically sustainable development in arid-semiarid regions of Gujarat. These soil losses are continually leading to critical degradation of soil characteristics, decreased soil productivity and crop production, causing agro-ecological, environmental and watershed-function problems. Therefore more effective soil and water conservation measures are essential for sustainable increases in productivity on cultivated highland slopes. Knowledge of the volume and rates of runoff generated in response to rainfall is very important. Rainfall is purely a natural phenomenon almost beyond the scope of human intervention until now, whereas runoff is largely the product of the interaction of rainfall with many factors over the land surface. The runoff is not only the greatest source of soil and water loss but also important water for crop production.

Estimation of peak runoff rate is very important for design of hydrological structure. Estimation of runoff volume or runoff depth is one of the design parameters for irrigation storage structure. Runoff plot is used for estimation of runoff volume and to find out peak runoff rate from hydrograph. Various experiments also conducted to find out effect of soil type, cropping pattern and slope on runoff. Sometimes this runoff plot is structured at a remote location. So, It is very difficult to measure runoff depth in adverse weather conditions and at night time. The runoff measurement system is very useful in this type of condition.

Soil erosion and water loss hazards in rainfed areas are very severe. Saurashtra region of Gujarat has an uneven topography and is directly or indirectly dependent on rainfall. Knowledge of rainfall-runoff and runoff-soil loss relationships in these areas is very important to develop appropriate technology for soil and water conservation for increased crop production. Keeping in view the long term sustainability and productivity of eroded lands, measurement of runoff is essential.

This chapter deals with the summary of the experiment conducted and the conclusion drawn from it.

In order to measure runoff, an IoT based smart runoff measurement system was developed in this study. Ultrasonic sensors used for measurement and microcontroller used for control sensors and to send data to the website for cloud storage and data visualization. Stored data can be downloaded and it can be used for analysis and generation of hydrograph.

The following conclusions were derived from the outcomes obtained through the development and evaluation of smart runoff measurement system.

(1) The total cost of the developed smart runoff measurement system is Rs. 10040/-. Considering the CRF approach, the annual cost of the system can be Rs. 2744 /- per year which is very less as compared to the annual cost of Rs. 40000 for paying a salary of one person during the probable 5 rainy months of the monsoon season.

(2) The IoT based developed smart runoff measurement system can be very cost-effective and efficient system for the monitoring of runoff inflow for the various topographic conditions, land use, soil types, etc.

(3) The runoff data can be directly stored in cloud storage and obtained at our place for further processes.

(4) The mean absolute error of distance measured using NewPing Library is 4.5 mm and the relative error is 0.71%.

(5) The mean absolute error of distance measured using NewPing Library with iteration method is 5.25 mm and the relative error is 0.97%.

(6) The mean absolute error of distance measured using NewPing Library with temperature effect equation method is 3 mm and the relative error is 0.63%

So, From the above conclusion, it is recommended to use NewPing Library with temperature effect equation method to measure distance using ultrasonic sensor.

Future Work

Web application will develop for visualization of sensor data, data storage and data downloading as per the required time of period. From the stored data hydrograph will be also generated and will visualize on the web application.