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A Comparison of GPS and Manual Calculations for Measuring Watershed Area of College of Agriculture, Dapoli

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ABSTRACT
This study aims to compare the accuracy, time efficiency, and practicality of using GPS technology versus manual calculations for measuring agricultural land.The research methodology involves the measurement of agricultural land parcels using both GPS devices and manual methods. Accurate measurement of agricultural land for proper and efficient land management, decision-making, and resource allocation in the agricultural sector.Traditionally, manual methods have been employed to measure land areas, relying on physicalmeasurements and calculations. However, with the advent of Global Positioning System (GPS) technology, a new approach has been introduced to land measurement, offering the potential for improved accuracy, efficiency, and data integration. A sample of agricultural plots will be selected, and their dimensions will be recorded using traditional manual techniques, such as tape measures and compasses. Simultaneously, the same plots will be measured using GPS devices capable of capturing precise location data. The collected measurementsbetween the two methods will be compared to evaluate the discrepancies, if any.The analysis will consider factors such as measurement accuracy, ease of use, time required for data collection, and potential sources of error for each approach. Additionally, the study will explore the compatibility of GPS data with existing Geographic Information Systems (GIS) for seamless integration and analysis. This comparison will provide insights into the strengths and limitations of both GPS and manual calculations, helping farmers, land surveyors, and agricultural professionals to make informed decisions regarding land measurement techniques.

I. INTRODUCTION

Google Earth is a unique geo-mapping program that uses aerial imagery to form an interactive and comprehensive map of the Earth's surface. This application provides a versatile tool that allows users to discover unknown geographic and ecological features, to track climate change and record our history.Google Earth continues to be a useful resource for individuals, governments and private organizations who want to track and tag geographic data for research and other purposes. By collecting enormous amounts of data, Google has made it possible for governments to observe the growth of cities worldwide, for researchers and scientists to observe the shifting patterns of flora and fauna on a global scale, and for individuals to tell their personal stories in a more convenient and accurate way. Google Earth's imagery is displayed on the computer or laptop screen as a digital globe as seen from a far distance. The imagery is retrieved from aircrafts or space satellites where the data and imagery is collected through partnerships with the National Aeronautics and Space Administration (NASA), National Geographic etc.

II. REVIEW OF LITERATURE

The Global Positioning System (GPS) and Geographic Information System (Civilians) are two distinct but nearly combined technologies that allow for the collection, storage, operation, analyses, and display of spatial data. The two technologies should not be confused — a GPS is a system for collecting spatial data, a Civilians is a system for managing and penetrating spatial data and a Civilians may or may not involve GPS data. The GPS consists of 24 satellites which takes 12 hours to circle the globe once to provide worldwide time, position and velocity information. GPS makes it possible to identify specific locations on the earth by measuring distance from the space satellites. GPS data provide accurate spatiotemporal information of vehicular or personal movements. Many scientists and researches focus on the machine learning technology, concerning the study and construction of systems which can learn from training data set and use the learned knowledge to automatically deal with other data set which share the same characteristics as the former. A lot of studies have been conducted using different methods including Multi-Layer Perceptron Neural Network (Byon et al., 2007; Gonzalez et al., 2010), Decision Tree (Pattterson et al., 2003; Zheng et al., 2008; Reddy et al., 2008), Bayesian Network (Zheng et al., 2008; Moiseeva and Timmermans, 2010).

III. MATERIALS ANDMETHODOLOGY

A. Materials

Accoutrements for measuring the distance manually, plastic tape recording is used having length of 100 bases. Chaining the check line for measuring the distance, ranging rods are used to make the chain line straight. Optic forecourt is used to assure the perpendicular position of equipoises-measured on both side of chain line. Global Positioning System (GPS) of interpretation German GPS was used for measuring the equals at each station point. Base camp software installed in computer for bridging the GPS with computer, to transfer the measured equals. Google Earth software is used to detect the observed equals on specified ground and measure the distance and area of chosen ground.

B. Methodology

Methodology used for measuring the vertical distance area of flat ground in both way-using software Google Earth and manually using chain check was done. Also comparison was made for both results. This research was carried out in the College of Agriculture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra. For measuring the distance 1000feet chain line was decided and also ranging of chain line was done for making the chain line straight. Total 20 intermediate stations (C00 to C1000; where ABC shows chainage and number represent distance in bases) were marked with the help of measuring tape recording and sword arrows at each 50feet distance throughout chain line. After establishing the stations on chain line, equals of each station was measured with the help of GPS with uniqueness. C00, C50, C100etc. In the same way, six vertical equipoises (three on left side OL00, OL600 and 1000); three on right side (OR00, OR600 and OR1000); where OL is neutralizing left side, OR is neutralize right side and number represent position of chain line where neutralize was taken. Equipoises were drawn manually by right angle tringle system and also ranging rods are drawn in to a ground at neutralize position. Cross check was done with the help of optic forecourt for assuring the perpendicular of equipoises and GPS equals are measured at these equipoises for having blockish type of enclosed boundary, to measure the area.

Google Earth was used to measure and calculate the distance and area of the College of Agriculture. The aerial imagery of the study area was then clipped and the calculations were done on Google Earth itself.

IV. RESULTS AND DISCUSSION

A. Total Area Measurement

The study area is measured on flat ground using “Add Polygon” tool of Google Earth. In first trial, the area is measured by specifying only four corner pointsas shown in Figure 1. This measured area, then compared with standard area of (30,748.36 m²).

Measured results are given in Table 1.

Figure 1. Location of College of Agriculture Watershed with space measurement on Google Earth

Table No. 1 Total Area

Sl. No	Description	Distance (m)	Error (m)
1	Standard area	30,748.36 m²	-
2	Perimeter using tape	732	0.3%
3	Perimeter of campus using aerial image	702.96 m²	30

When number of points are lower than there's advanced delicacy in area results is observed and vice versa, as number of points increases. Google Earth measured area is lower than standard area, when many points are specified. While, measured area is advanced than standard, when further points are specified.

Figure 2. College of Agriculture Building-1

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Table No. 2 Total Area of College of Agriculture Building-1

Sl. No	Description	Distance (m)	Error (m)
1	Standard area	12802.61m²	-
2	Perimeter using tape	472	0.2%
3	Perimeter of campus using aerial image	452	20
4	Remaining Space Excluding College of Agriculture Building-1	17945.75m²	

Figure 3. College of Agriculture Building-2

Table No. 3 College of Agriculture Building-2

Sl. No	Description	Distance (m)	Error (m)
1	Standard area	11601.76m²	-
2	Perimeter using tape	460 m	0.3%
3	Perimeter of campus using aerial image	430.80m	30
4	Remaining Space Excluding College of Agriculture Building-2	19146 m²	

Figure 4. College of Forestry Building-3

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Table No. 4 College of Forestry Building-3

Sl. No	Description	Distance(m)	Error(m)
1	Standard area	2452.99m²	-
2	Perimeter using tape	242m	0.2%
3	Perimeter of campus using aerial image	222.64m	20
4	Remaining Space Excluding College Building	28295.37 m²	

Figure 5. Hostel Building-4

Table No. 5 Hostel Building-4

Sl. No	Description	Distance(m)	Error(m)
1	Standard area	717.57 m²	-
2	Perimeter using tape	117 m	0.1%
3	Perimeter of campus using aerial image	107.11 m	10
4	Remaining Space Excluding College Building	30030.79 m²	

CONCLUSION

1. Why do this research? To calculate the error rate between satellite image and human calculation rate using meter tape. The area calculated using meter tape and the areal footage the hardly difference is approximately 10 to 30 m.
2. How was it done? Among all GIS and GPS Apps the reliable source of satellite images (real time) is google map/google earth.
3. What was the aim? To differentiate between the allocation of space in watershed using aerial view.
4. Where was this research done? DBSKKV Campus – College of Agriculture, Dapoli.
5. Who are the authors?YibeniShantioTsopoe, P.R. Kolhe, Nikita Dhondiba Patil, Sagar Bajirao Gavit.

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