ESTIMATION OF AREAL RAINFALL IN SOME CATCHMENTS OF THE UPPER TANA RIVER

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ABSTRACT

Accurate assessment of areal rainfall is important in many areas of study like water balance studies and flood forecasting where the accuracy of the final result depends largely on the ability to estimate the mean areal rainfall over a catchment area. Many workers have formulated methods of estimating this important parameter from individual raingauge catches. Most of the work has been directed towards improving the sampling technique so that more precise estimates of the rainfall over the area of interest can be obtained without necessarily increasing the labour input or the numbers of raingauges.

Early workers recognized the use of the simple average, that is, the unweighted arithmetic mean, but as early as 1911, Thiessen showed the ureliability of the simple average when uneven distribution of rainfall was considered, and proposed the Thiessen Polygon technique.

Many workers have since tried to devise
methods which could take into account uneven
distribution of rainfall and have developed
the Isohyetal map method, integration schemes
between raingauge stations, fitting surfaces
to the observed rainfall and several modifi-
cations to the simple arithmetic mean.

The Isohyetal method is very suitable to use
in determining areal rainfall as factors like
orography, variation of rainfall etc. can be
taken into account. It is, however, time
consuming and done manually requires a lot of
skilled labour, which is often absent.

Several Meteorological Offices, like the
UK Meteorological Office (1975) have therefore
developed ways of arriving at areal rainfall
results, comparable to those expected with
the Isohyetal method in their areas. In
East Africa, however, no such policy has been
formulated.

This study therefore aims at finding
the best method or methods to use in deter-
mining areal rainfall in the upper Tana river
area, using fast methods of calculation which
can be computerised as an alternative to the
conventional Isohyetal Map method.

The study entails the comparison of five
methods:

(a)   The Isohyetal method

(b)   The Iso-percentile method (as
       used by the British Meteoro-
       logical office)

(c)   The Chidley and Keys method

(d)   The Thiessen polygon method based
       on the Monte Carlo procedure

(e)   The (unweighted) Arithmetic mean method.

These methods are tested in four catch-
ments of the Upper Tana river. These catch-
ments are 4AC3, 4BE2, TRDA and 4ED3 according
to the Ministry of Water Development nomen-
clature. The testing is done using 20 year
rainfall data for the period 1957 to 1976
inclusive for the dry months of January and
July, the wet months of April and November
and the yearly total rainfall.

The results of the methods (b) to (e) are
compared to the Isohyetal method assumed to be
the least biased. The results show that The
Isopercentile method as used by the British
Meteorological Office does give reliable
results similar to the Isohyetal map method
in these catchments and can therefore be used
as a computarised alternative to the Isohyetal
map method in these catchments in obtaining
areal rainfall.