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Climate Information

For

The Health Sector

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Foreword

This "Climate Information for the Health Sector" Bulletin has been designed to convey essential information regarding the monitoring of human comfort conditions based on the analysis of temperature and humidity data and also for the monitoring of Malaria outbreak areas based on the analysis of temperature and precipitation data.

Since the monitoring of temperature and rainfall over a given area can be used to assess the likelihood of outbreak of Malaria with a lag of two months, this information can be an important for early warning tool if used judiciously.

The major objective of this bulletin is in line with the National Meteorological Agency's strategy of diversifying climate application products to the basic developmental sectors (such as the Health, the water, the agricultural sector etc...). This bulletin can be a very important source of information to Health professionals engaged in the monitoring of Public Health, to Tourism Agents and institutions who advise tourists regarding the comfort conditions of the places to be visited by the tourists and to the researcher who is interested in the field of Bio-Climatology.

We have the opinion that careful and continuous use of this bulletin can benefit to the improvement of early warning and preparedness in the Health sector.

Meanwhile, your comments and constructive suggestions are highly appreciated to make the objective of this bulletin a success,

This same bulletin can be accessed online at:

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1. Rainfall, Temperature and Humidity Conditions during September 2017.

Based on the national meteorological data of September 2017; above 80 mm amount of monthly total rainfall and 80% relative humidity were recorded over most parts of the country (fig.1a). As a result, favorable climate condition for the existence and distribution of malaria was observed over most western half lowland and the rift valley areas of the country during the month of September 2017 (fig.1a). Correspondingly the rainfall deciles map of September 2017 shows normal to highest in the record rainfall distribution over most parts of the country. On the other hand, below normal to much below normal rainfall distribution was recorded over a few southeastern pocket areas of the country during the month of September 2017 (fig. 1b).

As per Grover-Kopek et al. 2006, the suitable climatic conditions for transmission of malaria in Africa are; when the monthly precipitation accumulation is at least 80 mm, the monthly mean temperature is between 18°C and 32°C and the monthly mean relative humidity is 60% and above.

The same method was applied on Temperature, Rainfall and Humidity using meteorological data of September 2017 collected from some representative meteorological stations of the Ethiopia in order to *demarcate all the possible malaria expected areas of the country* (fig. 4).

According to assessments of September 2017 rainfall, temperature and humidity with respect to the distribution of malaria, values of monthly mean temperature 18⁰C to 32°C was observed over most lowland areas except the central and eastern highland parts of the country, accordingly the central and eastern highland portion of the country were shaded in deep blue color (fig. 2a). At the same time some meteorological stations over most western half parts of the country were recorded above 80 mm amount of monthly total rainfall (fig. 1a); in addition to this 60% and above monthly mean relative humidity was recorded over most similar western half and the adjoining areas of the country (fig. 2b). Regarding the above all information output of monthly rainfall, humidity and temperature assessments; the climatic condition was favorable for the survival and distribution of malaria over most western half lowland parts of southeastern SNNPR, Gambell, western Oromiya, Benishangulguz, western Amhara, western Tigray and northeastern Afar regional states during the month of September (fig.4).

For more and detailed information with respect malaria, the monthly mean minimum and maximum temperatures summary maps of September 2017 were posted on page four, figures 3 (a) and 3(b).

Based on the climate assessment of September 2017, favorable climate condition for the existence and distribution of malaria was observed over most western lowland portion of the country during the month of September 2017.

In principle, areas of favorable climate conditions for the existence and distribution of malaria can be summarized as follows; if there is an area which satisfies the above three significant conditions with respect to the current monthly rainfall, temperature and humidity data; that specific portion of the area will be clearly marked in light yellowish background and superimposed with red square pattern (fig.4).

Rainfall, Temperature and Humidity Assessment during the month of September 2017.

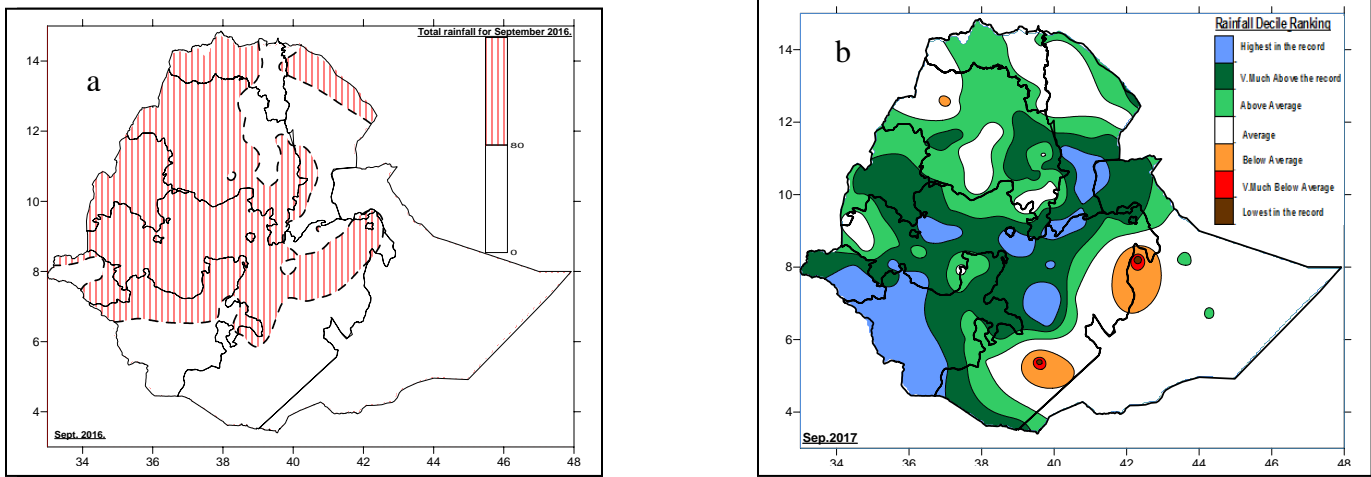


Fig. 1:- Rainfall assessment of September 2017.

- (a) Monthly total rainfall amount of September 2017 in mm. Hatched areas had monthly rainfall amount of 80mm and above
- (b) Rainfall deciles of September 2017. Areas shaded in green color indicate wetter than normal condition, while areas shaded in red color indicate rainfall deficiency.

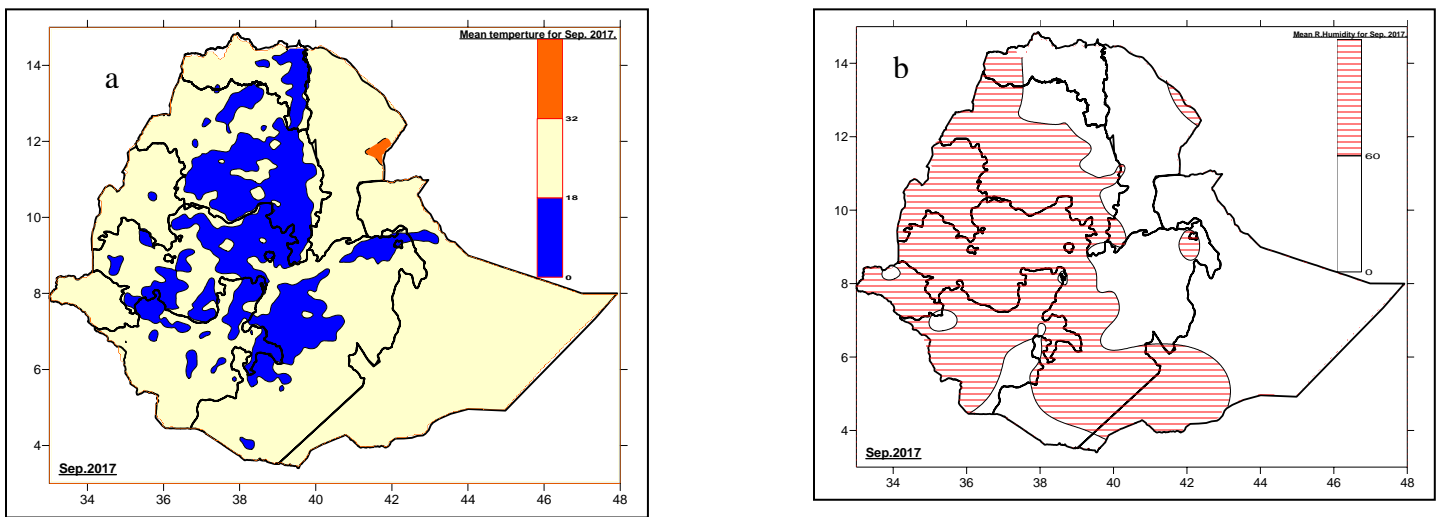


Fig. 2:- Temperature and relative humidity assessment of September 2017.

- (a) Monthly mean temperature in degree centigrade of September 2017. Areas shaded in light yellowish color had monthly mean temperature of 18 to 32 oC and areas with temperature greater than 32oC shaded in red color while areas shaded in deep blue color had monthly mean temperature less than 18 oC
- (b) Monthly average relative humidity in % of September 2017. Hatched areas had monthly average Relative humidity of 60% and above.

Average temperatures for the month of September 2017.

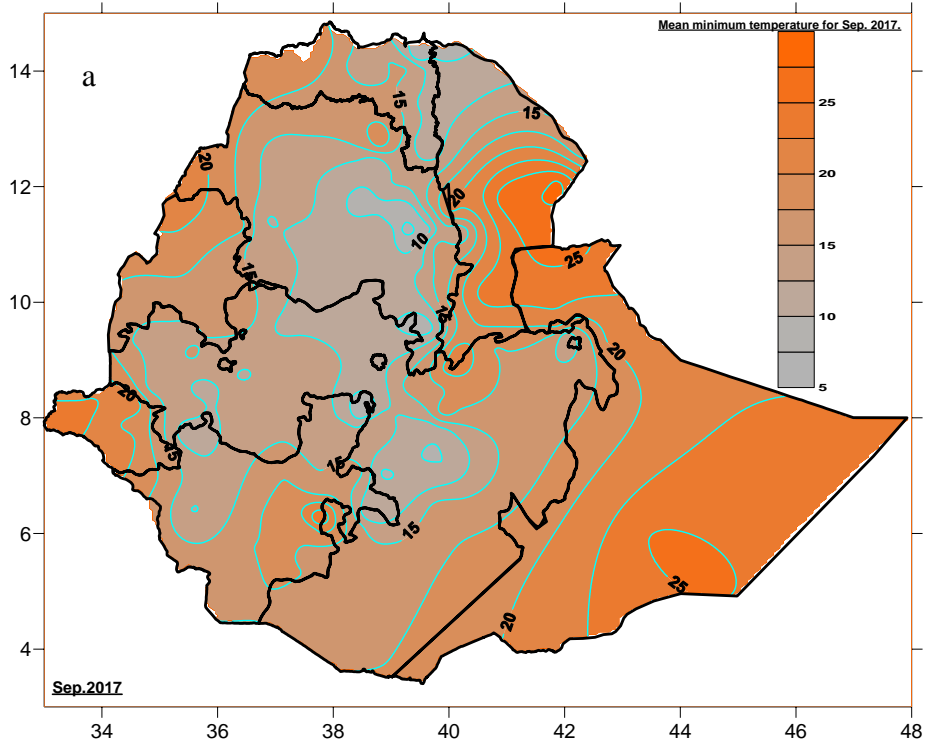


Fig 3:- (a). Mean minimum temperature in degree Celsius during September 2017.

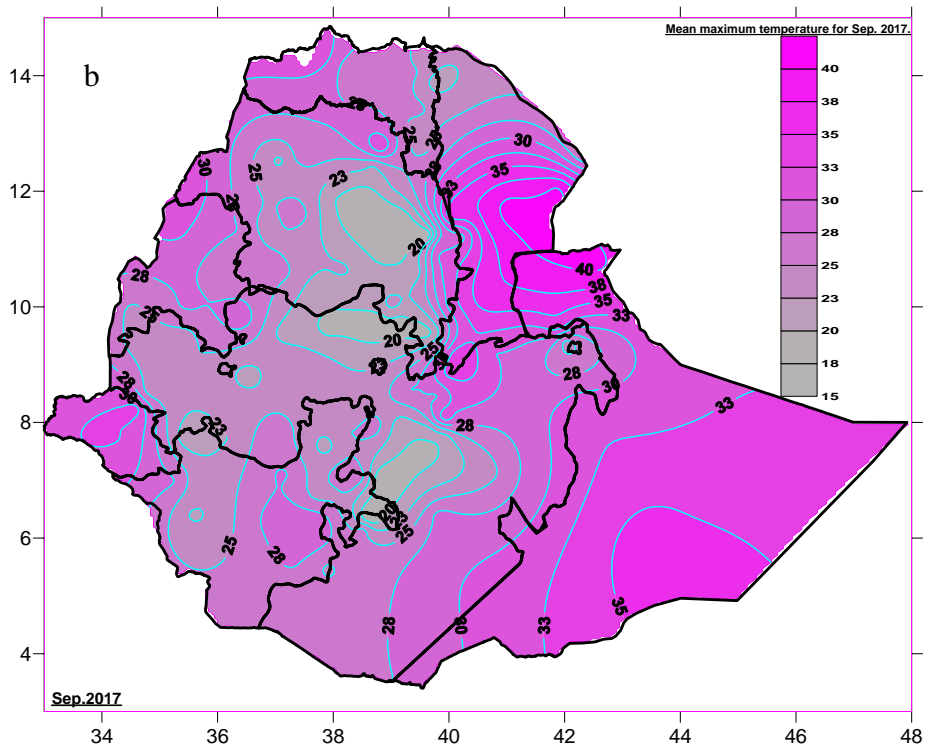


Fig 3:- (b). Mean maximum Temperature in degree Celsius for the month of September 2017.

Malaria prone areas during the month of September 2017.

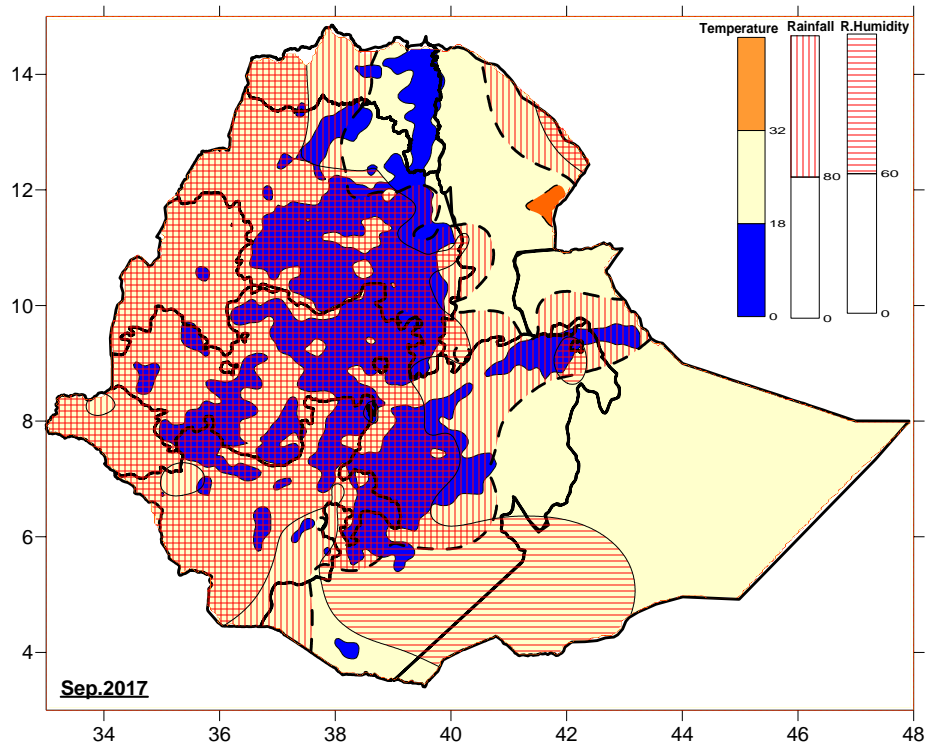


Fig 4:- Combined temperature, rainfall and relative humidity analysis for September 2017. Areas under square patterns with yellowish background color are assumed to satisfy favorable climatic conditions for malaria.

The above combined map was planned to demonstrate the effect of monthly temperature, rainfall and relative humidity with respect to the distribution of malaria during the month of September 2017. Regarding to this point; Areas under red squared patterns with light yellowish background colors are assumed to satisfy suitable climatological condition for the existence and distribution of malaria whereas areas whose monthly average temperature below 18°C and lowland areas whose monthly average temperature greater than 32°C are marked in deep blue and red color respectively and those portion of the country were not favorable for the distribution of malaria.

Based on the above principle; areas whose average temperature between 18 and 32 degree Celsius, total rainfall 80 mm and above together with a monthly average relative humidity of 60% and above was observed over most western half lowland areas of the country. As a result climatic condition was favorable for the survival and distribution of malaria over most western half lowland portion of southeastern SNNPR, Gambela, western Oromiya, Benishanguluz, western Amhara, western Tigray and northeastern Afar regional states during the month of September 2017.

In general the rainfall, temperature and humidity (RTH) values with respect to distribution of malaria; if the current monthly assessment of temperature, rainfall and humidity satisfy the above conditions, the climate condition over that specific area automatically considered to be favorable for the survival and distribution of malaria and that portion of the region will be marked in light yellowish background color superimposed with red square pattern.

2. Temperature Humidity Index (THI) Conditions during September 2017.

The Temperature Humidity Index (THI) condition for human being was developed by the US weather Bureau in 1959; it is applied to the temperature and humidity data over representative stations of the country; to review the weather condition which was comfort, moderate and discomfort during the month of September 2017. According to this approach, if the ‘THI’ calculated values exceed 26 almost all the population feel uncomfortable (here we refer to it as "uncomfortable"), if the ‘THI’ calculated values between 21 to 26 half of the population feel uncomfortable (here we refer to it as "moderate") and if the THI calculated values are less than 21 almost all the population feel comfortable (here we refer to it as "comfortable") with respect to heat stress.

According to the “THI” calculated values of the above table, the level of human comfort with respect heat stress; uncomfortable condition was still observed over the rift-valley and the adjoining low land areas of the country; as a result uncomfortable condition was recorded over Metehara 19 out of 30 days and Diredawa 18 out of 30 days during the month of September 2017. On the other hand high land areas like, Gore, Adisababa, Balerobe, Debremarkos, Mekele and Nekemte were stayed comfortable for more than 96% of the observation days; moreover the rest parts of the country were remained moderate for more than 70% of the observation days. In most cases, both comfortable and moderate conditions with respect to heat stress were recorded for more than 83 which were dominating over most parts of the country during the month of September 2017 (table 1).

Frequency of temperature-humidity Index (THI) during the month of September 2017.

No	Stations / Sep._2017	Number of Days with THI Values of			Total number of Days
		< 21 (Comfortable)	21-26 (Moderate)	>26 (Uncomfortable)	
1	Gore	31	0	0	31
2	Addisababa	31	0	0	31
3	Balerobe	31	0	0	31
4	Debremarkos	31	0	0	31
5	Mekele	29	1	0	30
6	Nekemte	26	4	0	30
7	Negele	5	25	0	30
8	Arbminch	3	24	2	29
9	Combolcha	8	22	0	30
10	Jimma	9	21	0	30
11	Gondar	9	21	0	30
12	Bahirdar	10	20	0	30
13	Awassa	12	18	0	30
14	Debrezeit A.F	12	16	0	28
15	Metehara	1	10	19	30
16	Diredawa	1	11	18	30

Table 1:- Temperature Humidity Index (THI) values for some selected stations during the month of September 2017.

Reference: - Grover-Kopec et al. 2006 - Web-based climate information resources for malaria control in Africa, Malar J. 2006; 5: 38. Published online 2006 September 11. doi: 10.1186/1475-2875-5