Climate Information for Planning & Decision Making for Smallholder Farmers in Northern Ghana

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Historical climate information, as opposed to seasonal forecast, can be greater used to guide farmers into the future.

This study aimed to transform historical climate data into useful information for planning and decision making by smallholder farmers way ahead of farming season.

Information with alternative livelihood activities that was shared with farmers in Northern Ghana using the Participatory Integrated Climate Services for Agriculture (PICSA) approach has encouraged change in decision making.

Introduction

Historical climate data is a rich source of agriculturally relevant information useful for planning & decision making by farmers. Farmers in Ghana are rainfall dependent and climate change & variability has worsened their plight. Northern Ghana is affected by frequent climate extreme events like drought, flood etc. and the rate of poverty in Northern Ghana is very high. Climate variability poses risk to smallholder farmers in the area. Farmers are faced with varied changing context which makes decision making a difficult task and requires the combination of simultaneous and staged decisions about several issues regarding crop and seed selection, planting date, crop insurance etc. All these decisions are dependent on climate and weather information. Timely and tailor made climate information if shared with smallholder farmers have a high probability of building their adaptive capacity and resilience.

Data, method and study area

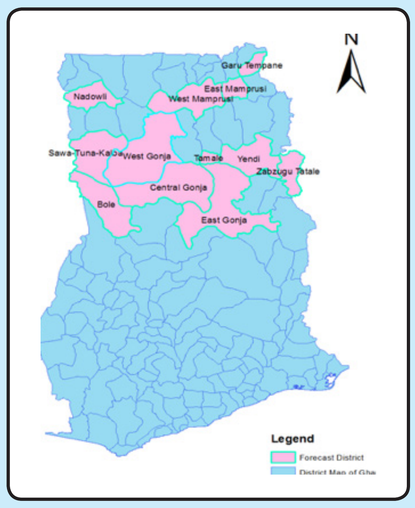
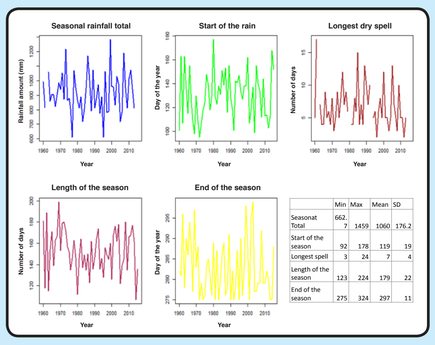


Figure: 1 Study area

Northern Ghana which includes the Northern Region, the Upper East and Upper West region covers close to about 50% of the total land area of Ghana. The area lies mainly in the guinea savannah eco-region of Sub-Saharan Africa, the remaining portion, which is just about a third of the Upper East region lie in the Sudan Savannah eco-region.

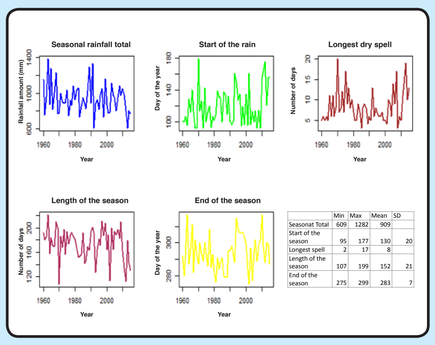
The station data used for the analysis was obtained from the Ghana Meteorological Agency. Daily rainfall and temperature data from 1960 to 2014 were analysed for six stations in Northern Ghana. The stations were Yendi, Tamale, Navrongo, Bole, Zuarungu and Babile. The gauge data was quality controlled and seven agriculturally relevant analysis (seasonal total, onset, cessation, length of the season, longest dry spell, SPI at 3-month time scale, temperature and ENSO) were produced and plotted in a time series for the purposes of planning and decision making by smallholder farmers.

Climate information for Navrongo & Tamale



	Min	Max	Mean	SD
Seasonal Total	662.7	1459	1060	176.2
Start of the season	92	178	119	19
Longest spell	3	24	7	4
Length of the season	123	224	179	22
End of the season	275	324	297	11

Figure: 2 Navrongo



	Min	Max	Mean	SD
Seasonal Total	609	1282	909	
Start of the season	95	177	130	20
Longest spell	2	17	8	
Length of the season	107	199	152	21
End of the season	275	299	283	7

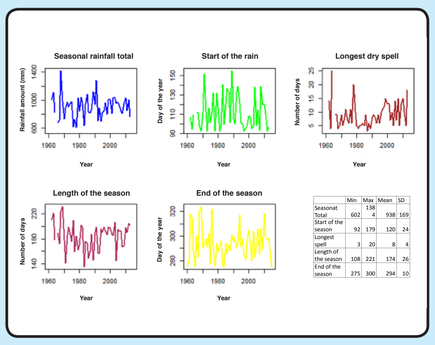
Figure 3: Tamale

The agriculturally relevant analysis conducted for this work forplanningand decision making by farmers are seasonal rainfall totals, the start of rains, the length of season, end of the season, longest dry spell, standard precipitation index and the probability of the season being wet or dry with respect to particular ENSO phase.

All these useful information were extracted from historical climate information mainly from rainfall and temperature data.

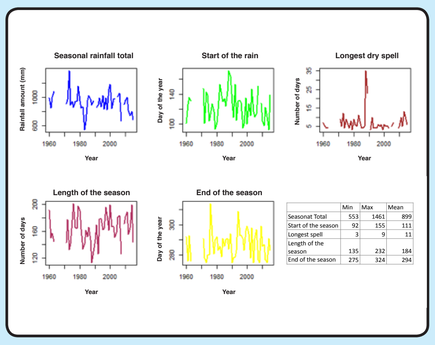
The seasonal rainfall amount for all the stations analyzed showed inter annual variability and did not show any visible trend.

Climate information for Bole & Babile



	Min	Max	Mean	SD
Seasonal Total	602.4	938	138	169
Start of the season	92	179	120	24
Longest spell	3	20	8	4
Length of the season	108	221	174	26
End of the season	275	300	294	10

Figure 4: Bole



	Min	Max	Mean
Seasonal Total	553	1461	899
Start of the season	92	155	111
Longest spell	3	9	11
Length of the season	135	232	184
End of the season	275	324	294

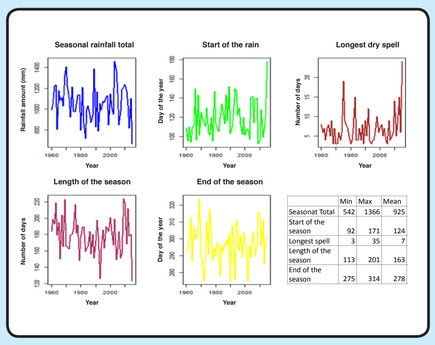
Figure 5: Babile

Seasonal rainfall total is directly linked to the types of crops grown in a particular area. Crops have water requirement at the various stages of development until harvest. Farmers need this information to consider crops to be planted and at what time of the season in order to meet the water requirement of the crop.

Farming in the area is generally small holding with little or no investment in irrigation so a reduction in seasonal rainfall total is a threat to crop yield.

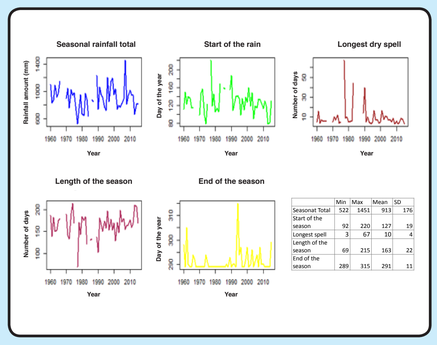
The mean seasonal rainfall amount is 940.6mm. Zuarungu has the highest variability with Navrongo having the least.

Climate information for Yendi & Zuarungu



	Min	Max	Mean
Seasonal Total	542	1366	925
Start of the season	92	171	124
Longest spell	3	35	7
Length of the season	113	201	163
End of the season	275	314	278

Figure 6: Yendi



	Min	Max	Mean	SD
Seasonal Total	522	1451	913	176
Start of the season	92	220	127	19
Longest spell	3	67	10	4
Length of the season	69	215	163	22
End of the season	289	315	291	11

Figure 7: Zuarungu

The onset of the season date helps the farmer to plan ahead of time regarding investment for the season, budget, land preparation, crop choice and variety among others. The onset of the season has remained variable for the study area over the period analyzed.

Evidence from the data reveals variability across the region. The mean onset date for the area is May 1st. Zuarungu has the highest variation with Bole having the least.

The earliest start of the season for the area has been April 1st and the most delayed onset has been August 7th. The growing season over Northern Ghana spans a little over six months.

Enso Phase & 3-Month SPI

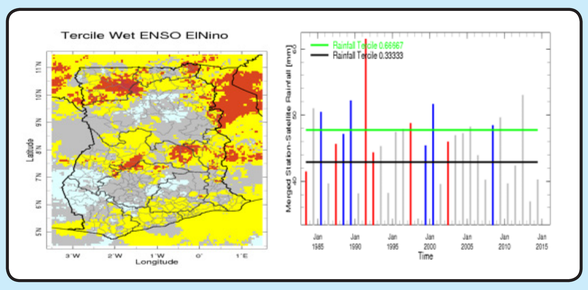


Figure 8: Enso phase

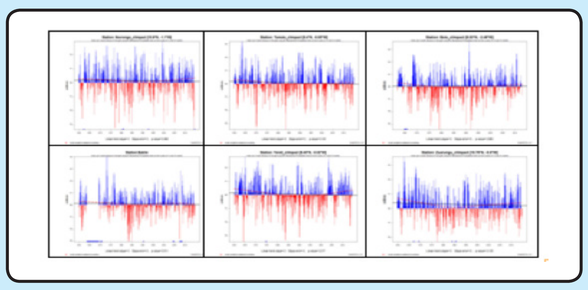


Figure 9: 3-Month SPI

The earliest start of the season for the area has been April 1st and the most delayed onset has been August 7th. The growing season over Northern Ghana spans a little over six months. The crops grow in this area should be able to mature within a six month period. The mean length of the season is 169 days equaling approximately six months.

Annual Mean Temperature

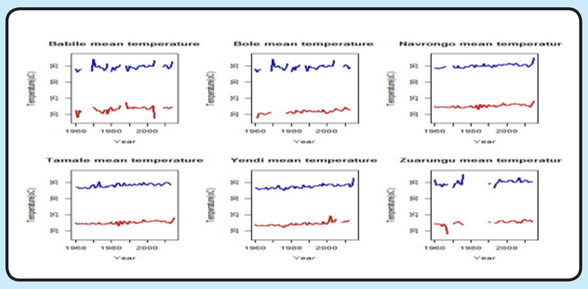


Figure 10: Annual mean temperature

Farmers determine when to plant in the season knowing potential cessation date, crop water requirement and number of days needed for maturity. The mean end of the season for Northern Ghana is day 290 (October, 16th). All the stations have shown variability in the end of the season date. The area is characterized by high frequency and less persistency of drought over a long timescale and less frequent but persistent over short period of time (Figure 9).The probability of having a wet condition over Northern Ghana ranges between 20% to 80% for an Elnino phase. (Figure 10)

The temperature plot depicts an upward trend in both minimum and maximum temperature for all the stations. Careful look at the minimum temperature time series shows a higher increasing trend compared to the maximum temperature. This means that diurnal temperature will be increasing which also has implication for agriculture.

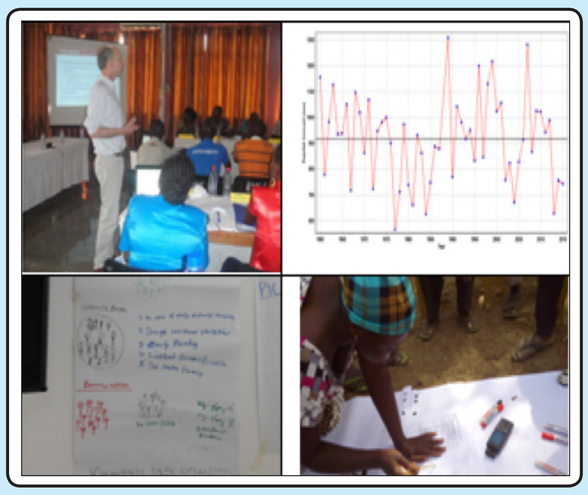


Figure 11: Sharing climate information

Sharing Climate Information

PICSA is an example of an approach that has used this historical climate information in Ghana to support agriculture. Together with participatory decision making tools, information on options and practices and forecasts the historical climate information is used by farmers to plan and make decisions on what practical crop, livestock and other livelihood management practices are best suited to local conditions. Ninety three percent of farmers found the climate information useful with 97% percent of farmers making changes in their crop, livestock or livelihood options.

Conclusions

The seasonal rainfall pattern for Northern Ghana still remains variable. The agriculturally relevant climate information analyzed from the historical data also depicts variability than any established trend. The high variability over the area makes it more compelling to share climate information with farmers for planning and decision-making. This will help build their adaptive capacity and resilience.

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