

Price Data

Original Dataset (Local only, Haiti removed)

Data Points: 263452

Date range: 2002-01-31 - 2017-12-31

Data Points for 3 Commodities in 3 Countries in abridged date ranges (Sorghum, Millet, Maize. Chad, Mauritania, Nigeria) : 31,315

Note: These are the *deflated* prices (def_value)

Country	Type	Min Price	Max Price	Mean Price	Min Date	Max Date
Chad	Maize	92.035124	270.28656	200.84216	2012-05-01	2017-11-01
Chad	Millet	100.798723	383.47968	207.41094	2011-02-01	2017-11-01
Chad	Sorghum	67.352403	267.10515	143.79524	2009-03-01	2017-09-01
Mauritania	Maize	5.809351	19.60656	11.29252	2012-05-01	2017-12-01
Mauritania	Millet	4.699543	26.11826	11.38352	2011-04-01	2017-12-01
Mauritania	Sorghum	5.377839	31.53937	13.17781	2009-04-01	2017-09-01
Nigeria	Maize	18.182416	579.95596	61.28171	2012-06-01	2017-11-01
Nigeria	Millet	18.329048	180.70759	72.19422	2011-02-01	2017-12-01
Nigeria	Sorghum	5.889729	273.06924	69.9122	2009-04-01	2017-09-01

FEWS Reporting Bias:

Are the countries that only grow one type of commodity actually not growing the other three?

Djibouti only shows sorghum data in FEWS dataset, and FAO does not show either maize or millet data for this country.

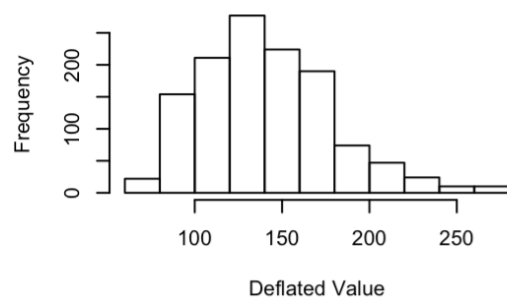
Angola & Malawi show Maize data in FEWS set, but no Sorghum or Millet. FAO numbers for 2017 state that they do produce the other two crops in smaller quantities:

Item Code	Domain	Area Code	Area	Element Code	Element	Item Code	Item	Year Code	Year	Unit	Value	Flag	Flag Description
	Crops	7	Angola	5419	Yield	56	Maize	2017	2017	hg/ha	10573	Fc	Calculated data
	Crops	7	Angola	5419	Yield	79	Millet	2017	2017	hg/ha	2593	Fc	Calculated data
	Crops	7	Angola	5419	Yield	83	Sorghum	2017	2017	hg/ha	2272	Fc	Calculated data
	Crops	72	Djibouti	5419	Yield	56	Maize	2017	2017	hg/ha	19350	Fc	Calculated data
	Crops	130	Malawi	5419	Yield	56	Maize	2017	2017	hg/ha	20078	Fc	Calculated data
	Crops	130	Malawi	5419	Yield	79	Millet	2017	2017	hg/ha	6340	Fc	Calculated data
	Crops	130	Malawi	5419	Yield	83	Sorghum	2017	2017	hg/ha	8696	Fc	Calculated data

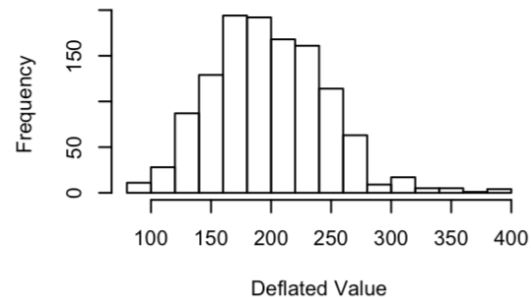
These countries were left out of the analysis for now.

Price Distribution: see next page

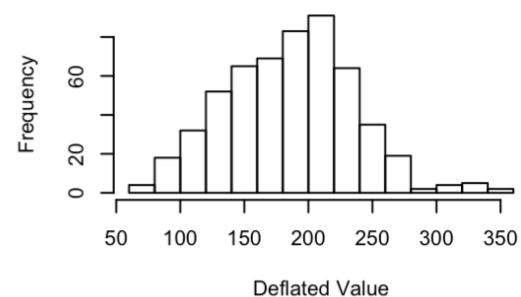
Chad : sorghum SD = 37.891



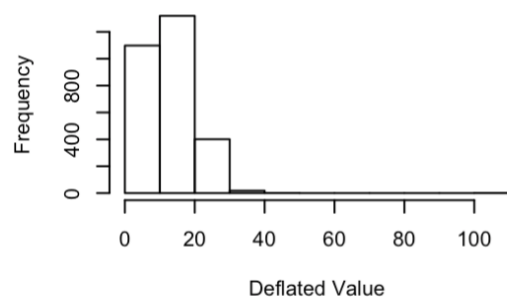
Chad : millet SD = 47.063



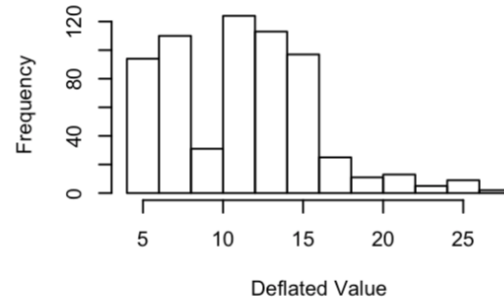
Chad : maize SD = 49.549



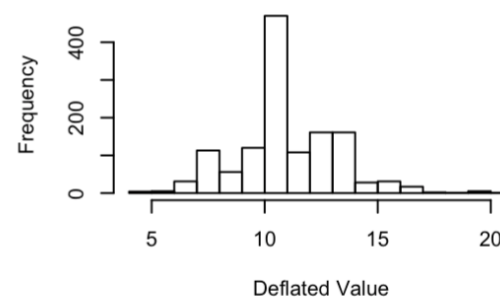
Mauritania : sorghum SD = 5.947



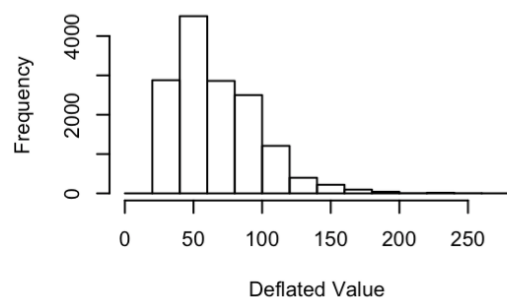
Mauritania : millet SD = 4.475



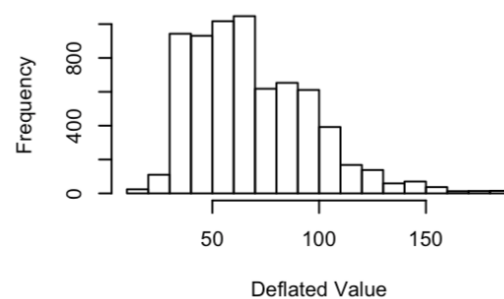
Mauritania : maize SD = 2.182



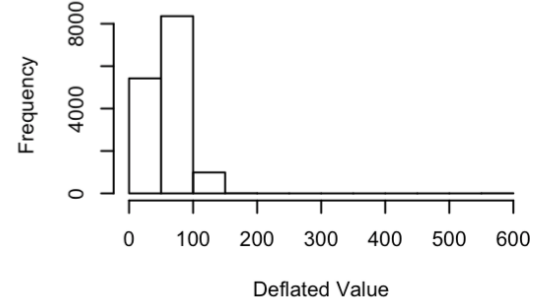
Nigeria : sorghum SD = 30.387



Nigeria : millet SD = 27.916



Nigeria : maize SD = 25.687

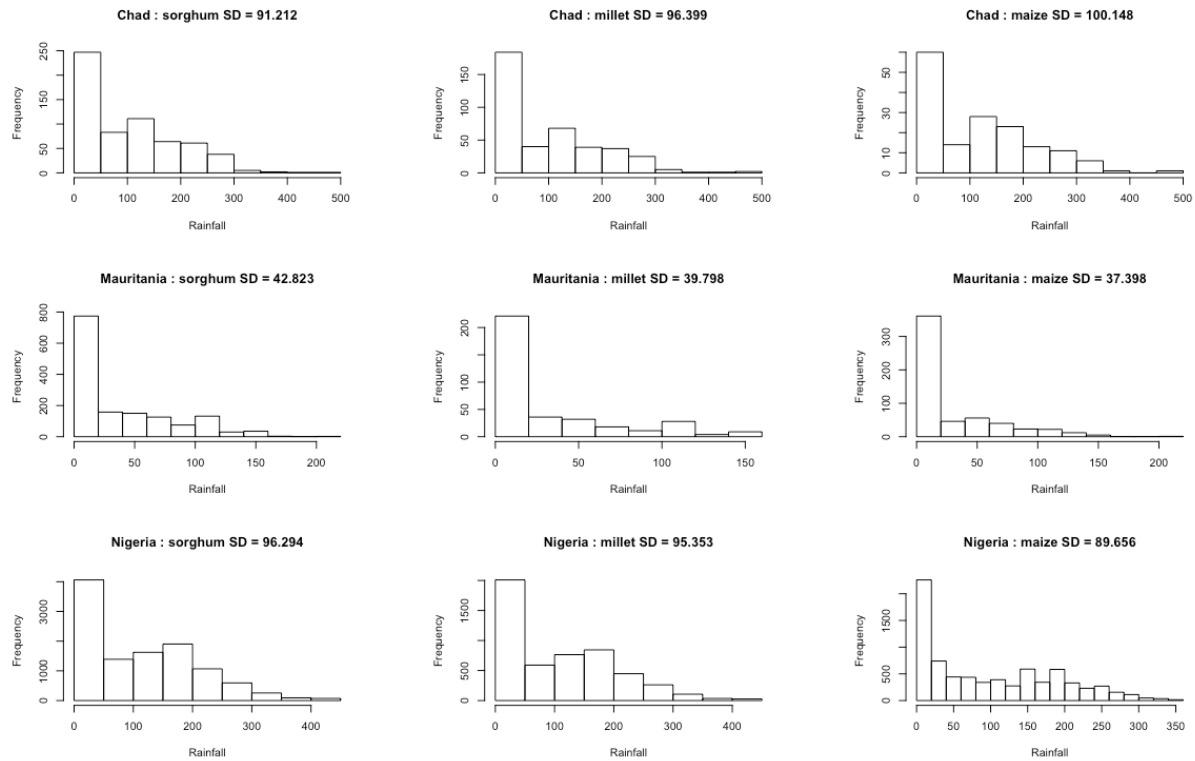


Precipitation Data

Average rainfall (in mm)

	country	grain	c(avg_rain = mean(avg_rainfall, na.rm = T))	avg_sowing	avg_growing	avg_harvest	avg_supplychain	avg_onemnth
1	Chad	maize	114.39243	175.83602	265.70754	146.580372	68.21325	126.02564
2	Chad	millet	97.00099	131.90891	238.17061	126.286574	58.93836	109.57079
3	Chad	sorghum	101.21167	156.96206	240.51326	79.562505	49.60849	111.08491
4	Mauritania	maize	28.83210	53.82766	52.73606	7.536003	16.21232	34.03406
5	Mauritania	millet	30.88194	63.86697	43.12779	8.535787	17.34374	32.65660
6	Mauritania	sorghum	38.85548	73.27830	60.73867	9.458809	20.92629	42.91855
7	Nigeria	maize	98.67709	87.89945	182.85070	207.985069	81.27185	114.56981
8	Nigeria	millet	107.84510	139.66426	216.83208	134.459777	67.02228	120.08424
9	Nigeria	sorghum	113.14835	149.99236	232.86682	105.263857	62.95715	122.36944

Precipitation distributions

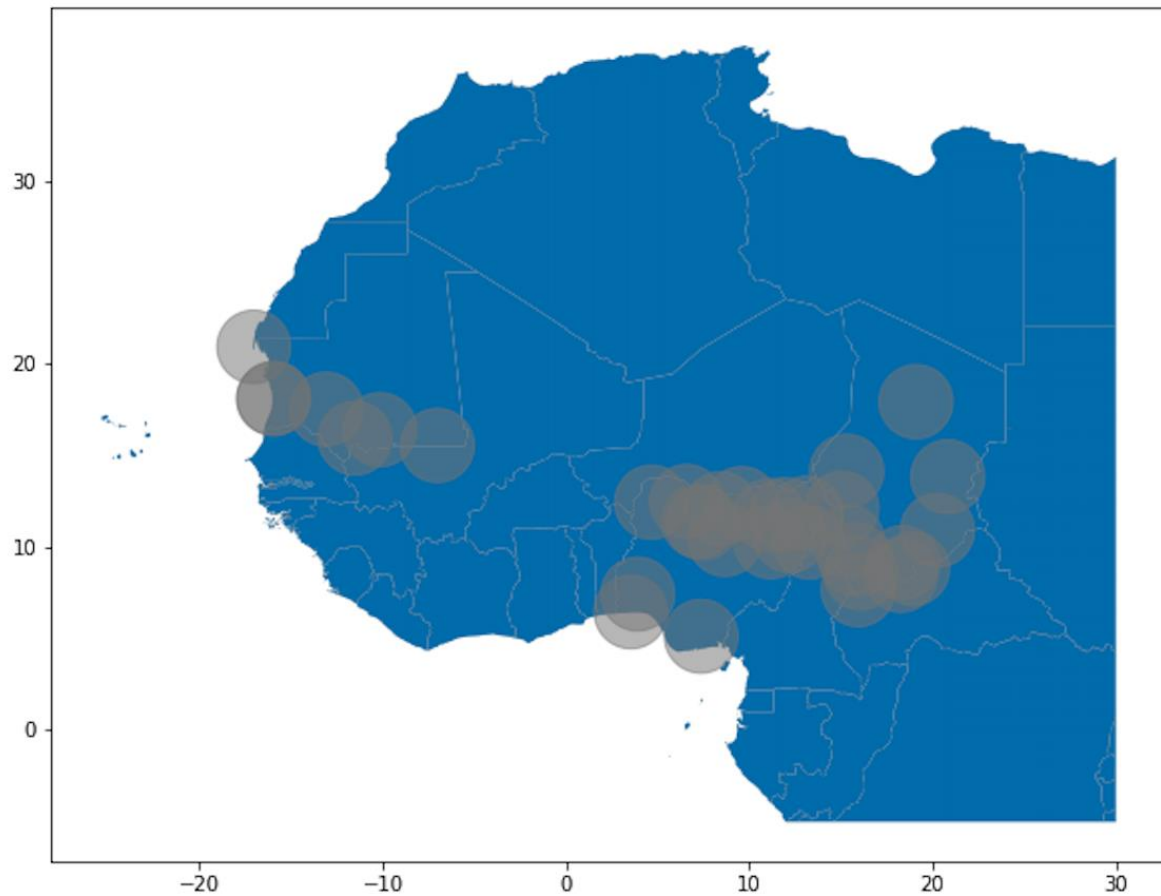


Markets

Full list of markets is on the next page

	country	market
1	Mauritania	Nouadhibou
2	Mauritania	Tintane
3	Mauritania	Aoujeft
4	Mauritania	Magta-lahjar
5	Chad	Amtiman
6	Chad	Bongor
7	Chad	Kelo
8	Chad	Mongo
9	Chad	Moundou
10	Chad	Sarh
11	Nigeria	Dandume
12	Nigeria	Giwa
13	Nigeria	Ibadan, Bodija
14	Nigeria	Kano, Dawanau
15	Nigeria	Kaura Namoda
16	Nigeria	Saminaka
17	Chad	Abeche
18	Chad	N'Djamena
19	Nigeria	Lagos, Mile 12
20	Nigeria	Aba
21	Nigeria	Gwandu, Dodoru
22	Nigeria	Gombe
23	Nigeria	Maiduguri
24	Mauritania	Nouakchott, March<8e> SCIM
25	Mauritania	Kankossa
26	Nigeria	Gujungu
27	Mauritania	Adel Bagrou
28	Nigeria	Biu
29	Nigeria	Damaturu
30	Nigeria	Mubi
31	Nigeria	Potiskum
32	Chad	Faya
33	Chad	Moussoro
34	Chad	Bol

Spatial distribution of markets analyzed



Analysis

Regressions were run based on 5 variables: Commodity, Buffer, Time Window, Aggregation, and Zero/No Zeros.

Commodities

- Sorghum
- Millet
- Maize

Buffers (radial distance from city center):

- 25km **Note that I also ran the analysis for 50km and 75km but the results were identical to the 25km buffer.**
- 100km
- 200km

Time Windows

- P_sow: sowing season (varies for each country)
- P_grow: growing season (varies for each country)
- P_harv: harvest season (varies for each country)
- P_sup: supply chain period (all time from harvest season to the date of sale)
- P_onemonth: one month of precipitation (one month before the date of sale)

Aggregation

- Average: average rainfall for the window of time
- Accumulated: accumulated rainfall for the given window

Zero/No Zeros

- Zero: includes data points where rainfall was 0
- No Zero: does not include data points with less than 1mm of rainfall

Model Selection + Plots

Each set of data was fit with a log_linear, log_log, quadratic, and cubic function.

The best model was selected based on a few criteria:

- All coefficients must be significant (pvalue less than 0.05) therefore likely to be a meaningful addition to the model
- All model AIC values were compared. The lowest value was selected *unless...*
- If the difference between the lowest and second lowest AIC value was less than 4, the simplest model of the two was selected. (Method taken from Burnham and Anderson, 2004)

The data was then bootstrapped with the ideal model. Plotted is the median estimate across bootstraps, and the errors are the estimates at the 95th and 5th percentile.

Color of plot coordinates to the buffer size.

Red = 25km

Yellow = 100km

Blue = 200km