



Food and Agriculture Organization
of the United Nations



NATIONAL BUREAU OF STATISTICS



Statistical analysis on the data collected from the PRICE survey 2022 implemented in Nigeria within the 50x2030 Program

In depth analysis of crops price data, NASS 2022/23

By TIOTSOP TSATSOP Armel Blaise

Statistical- Economist Engineer,

Statistician, ESS

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FOREWORD

This document has three objectives. It's intended to the following:

- 1) give an overview of the quality of crops price data collected through the 2022 price survey in Nigeria
- 2) inform on the homogeneity of prices between geographic area, and
- 3) suggest conversion factor to be use for missing units

I. Analysis of the quality of data on price

This section answers two main questions

- i) have we succeeded in improving the completeness and quality of our data, particularly reduce the influence of extreme values?
- ii) Are the rates of missing values reasonable?

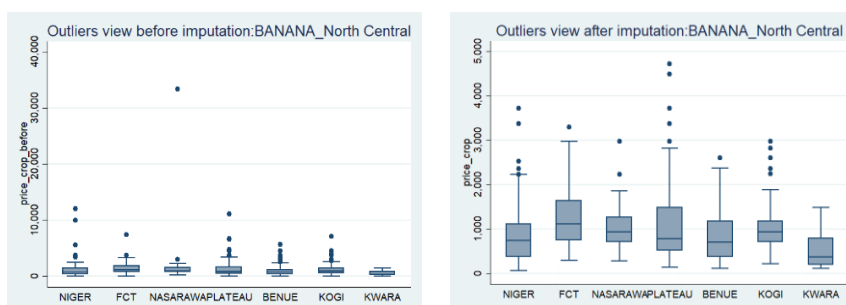
Regarding edition and imputation of outlier, as a reminder, price processing was carried out in five (5) stages:

- I) analysis of price consistency within the same combination of Condition x unit x Size prior to the conversion: that lead to some imputation: for example, (i) by dividing certain excessively large values by 10 or 100; (ii) sometimes by imputing units and size, to make them consistent with given prices. For example, we can't have a combination of (unit=piece & condition=shelled) for crops like maize and beans. Also, milk cup and cigarette cup are inconsistent for unshelled condition for maize. Probably, distinction between bunch, heap and bundle was not clear for surveyors.
- II) comparison of prices of fresh versus dry, separately for shelled and unshelled using box plot, prior to the conversion, to decide whether imputation of outliers should distinguish crops on different conditions or not;
- III) converting price into kilogram equivalents, using conversion factor available;
- IV) (micro) edition and imputation (*within STATE*) of outliers (using p05 lower threshold and $Q3/4 + 2*IQR$ upper threshold)
- V) (macro) edition and imputation to obtain estimates (median and mean) that are consistent between states in the same zone.

Main results: Through the various processes, about 15% of data on price had been imputed.

Regarding outliers: Box plots of prices before and after the data processing are presented side by side by zone and by item. It can be seen that the ranges of values are greatly reduced throughout the process. Outliers are treated, and the cleaned price data became fairly homogeneous and concentrated. Outliers were imputed using measures of central tendency (median and averages prices for states and zones).

Let consider for example the case of banana, in North Central zone. By comparing the left box plot (*before*), with the right (*after processing*) one can see that upper outliers' values were those greater than 5,000.



In the box plot on the right, we can still observe some outliers. Obviously, after one stage of imputation of outliers, news one appears. One can suggest to repeat the process. However, this would have led to a very large number of values identical to the central tendency, and we'd lose out in terms of dispersion. In addition, analysis of the first price estimates revealed significant differences between the median prices of states within the same zone.

Then to bring the median price spreads between states in the same zone down to a more reasonable scale, rather than systematically imputed a large number of all new extreme values, the solution was to proceed via macro editing, by identifying and progressively imputing outliers, while monitoring the effect on reducing price differentials between states.

All of the box plot (*before and after processing*) are presenting (in Appendix 1).

Regarding missing data, we can retain the following:

- i) There were no missing values on “condition” and none on prices.
- ii) Around 3,726 (2% of the sample) of unit of measurement were imputed using the information on the approximative weight in kilograms and other information obtained from the data about others units of measurement.

Based on the above two points, we can conclude that data was comprehensive, and the quality had been improved by the clearing process.

II. Comparative view of crops price by geographic area

The final stage of price data processing was about macro edition, consisted in a review of the estimates guided by the objective of having comparable (median) results between the states of the same zone. At the end of the process, therefore, it makes sense to verify if there are some inequalities between states of the same zone, and between different zones. To do this, the following tests are made:

- i) **To assess the similarity of prices between states within zone, we compare medians and means:** The “K-sample equality-of-medians test”: the null hypothesis that the K samples were drawn from populations with the same median. To say that the (median) prices of states are the same or comparable within zones implicitly refers to the null hypothesis. If not, the medians are statistically distinct between states of a zone (Table1).

The strategy for this test uses the procedure chi-squares test as follow: Firstly, for each crop, the sample of each zone is split into two groups: communities with price values greater than (or equal to) the median (the group “yes”), and the groups with price less than the median (the group “no”).

Then, the chi-squares test is performed by cross-tabulating the group variable with the states (within the zone). Since the chi-square test is an asymptotic test, there must be at least no (or few) expected values below five. We performed the test only when the size of a state is at least equal to ten.

Crops for which the medians are statistically equal between states and within zone are highlighted in table 1. We can see that in most cases, medians are statistically different from one state to another in the same zone.

For confirmation purposes, we also perform a comparison of means test. To the Fisher statistic, we add the (robust) Welch's test which corrects the Fisher statistic in the event of unequal variances between groups (see Table1).

- ii) **To assess the similarity of prices between zones**, we compare means, by performing the one-way ANOVA test. This compare means between zones. To identify zones with equal/different means, we use a multiple comparison test (see Table 2 for comments, and Appendix 2 for details).
- iii) **To assess the similarity of prices between sector (rural versus urban)**, we also performed t-test to compare means of prices by regions (see appendix 3).

For results to be consistent, a state is included in the test when at least ten of its communities grow the crop. Results are significant at the 5% level. All tests are obviously made by crop.

Tests of equality of medians / means between states within zones: Table1 contains results of the two tests (equality of medians and equality of means). The main finding is that, although the median values of the states of each zone seem to be close, the differences remain significant in almost all crops. The only crop for which medians are equals between states for all zones is iris potatoes (bold lines indicate equality of medians in Table1, at a 5% level). Some other crops have certain zones with equal values between states.

Table 1: By crop and by zone, K-sample equality-of-medians test and tests of equality of means

Crops	K-sample equality-of-medians test (H_0 : Prices of states came from a population with a same median)			Homoscedasticity test (H_0 : equal variance)				Tests of Equality of Means (H_0 : Equal means between state)			
	Zone	Pearson chi2	P-value	Statistic of Levene	ddl1	ddl2	P-value	ANOVA (Fisher test)		Welch Correction	
								F	P-value	Statistic of Welch	P-value
BEANS/COWPEA	North Central	243.4	<0.001	74.35	6	2 228	0.000	79.02	0.000	78.66	<0.001
BEANS/COWPEA	North East	210.9	<0.001	91.53	5	2 325	<0.001	68.55	<0.001	78.62	<0.001
BEANS/COWPEA	North West	473.4	<0.001	224.15	6	3 132	<0.001	176.09	<0.001	144.27	<0.001
BEANS/COWPEA	South East	11.3	0.01	2.86	3	251	0.037	4.10	0.007	3.86	0.012
BEANS/COWPEA	South South	13.1	0.011	23.88	4	182	<0.001	4.44	0.002	3.88	0.008
BEANS/COWPEA	South West	46.7	<0.001	2.25	4	322	0.064	13.18	<0.001	11.52	<0.001
CASSAVA	North Central	92.4	<0.001	35.34	6	1 964	<0.001	18.73	<0.001	18.47	<0.001
CASSAVA	North East	62.4	<0.001	6.54	5	806	<0.001	9.40	<0.001	5.98	<0.001
CASSAVA	North West	51.4	<0.001	26.56	6	978	<0.001	23.61	<0.001	14.46	<0.001
CASSAVA	South East	159.3	<0.001	31.95	4	1 354	<0.001	53.06	<0.001	72.51	<0.001
CASSAVA	South South	183.3	<0.001	17.66	5	1 558	<0.001	39.13	<0.001	32.99	<0.001
CASSAVA	South West	164.1	<0.001	37.38	5	1 792	<0.001	24.72	<0.001	28.49	<0.001
COCOYAM	North Central	60.3	<0.001	11.04	6	471	<0.001	6.72	<0.001	11.86	<0.001
COCOYAM	North East	42.9	<0.001	10.29	3	165	<0.001	15.22	<0.001	19.27	<0.001
COCOYAM	North West	24.1	<0.001	7.66	3	148	<0.001	3.43	0.019		
COCOYAM	South East	84.6	<0.001	51.64	4	1 175	<0.001	33.62	<0.001	24.85	<0.001
COCOYAM	South South	83.6	<0.001	60.76	5	1 093	<0.001	29.26	<0.001	30.77	<0.001
COCOYAM	South West	126.4	<0.001	28.89	5	962	<0.001	22.27	<0.001	52.11	<0.001
GROUND NUT/PEANUTS	North Central	356.4	<0.001	85.30	6	2 427	<0.001	58.69	<0.001	112.81	<0.001
GROUND NUT/PEANUTS	North East	182	<0.001	104.95	5	2 203	<0.001	43.66	<0.001	83.49	<0.001
GROUND NUT/PEANUTS	North West	556.4	<0.001	65.89	6	2 764	<0.001	82.29	<0.001	171.57	<0.001
GROUND NUT/PEANUTS	South East	44.9	<0.001	8.30	4	510	<0.001	12.37	<0.001	10.06	<0.001
GROUND NUT/PEANUTS	South South	32	<0.001	5.55	5	505	<0.001	0.82	0.536	1.07	0.380
GROUND NUT/PEANUTS	South West	18.2	0.001	10.94	4	301	<0.001	6.91	<0.001	5.90	<0.001
GUINEA CORN/SORGHUM	North Central	260.3	<0.001	106.26	6	2 323	<0.001	86.79	<0.001	82.47	<0.001
GUINEA CORN/SORGHUM	North East	159.2	<0.001	114.32	5	2 383	<0.001	58.66	<0.001	52.01	<0.001
GUINEA CORN/SORGHUM	North West	701.1	<0.001	261.59	6	3 260	<0.001	230.79	<0.001	278.87	<0.001
MAIZE	North Central	176.6	<0.001	44.78	6	3 539	<0.001	33.87	<0.001	28.51	<0.001
MAIZE	North East	373.1	<0.001	87.20	5	2 377	<0.001	53.62	<0.001	70.35	<0.001
MAIZE	North West	790.9	<0.001	173.36	6	3 460	<0.001	179.69	<0.001	227.43	<0.001
MAIZE	South East	154.8	<0.001	20.52	4	2 123	<0.001	23.32	<0.001	26.95	<0.001
MAIZE	South South	280.8	<0.001	31.81	5	2 271	<0.001	35.14	<0.001	73.48	<0.001
MAIZE	South West	203.5	<0.001	19.60	5	2 546	<0.001	38.91	<0.001	36.60	<0.001
MELON/EGUSI	North Central	104.6	<0.001	38.94	6	1 491	<0.001	28.57	<0.001	62.00	<0.001
MELON/EGUSI	North East	25.5	<0.001	12.24	2	238	<0.001	1.57	0.210	0.28	0.760
MELON/EGUSI	North West	25.8	<0.001	23.31	1	96	<0.001	16.46	<0.001	51.91	<0.001
MELON/EGUSI	South East	137.9	<0.001	9.24	4	1 016	<0.001	29.75	<0.001	27.55	<0.001
MELON/EGUSI	South South	50.9	<0.001	31.19	5	1 066	<0.001	9.70	<0.001	11.13	<0.001
MELON/EGUSI	South West	29.3	<0.001	2.70	4	561	0.030	9.29	<0.001	7.61	<0.001
MILLET/MAIWA	North Central	113.4	<0.001	97.64	6	1 465	<0.001	39.97	<0.001	37.47	<0.001
MILLET/MAIWA	North East	165.8	<0.001	86.85	5	1 813	<0.001	67.16	<0.001	75.39	<0.001
MILLET/MAIWA	North West	416.8	<0.001	230.80	6	2 965	<0.001	192.90	<0.001	183.19	<0.001
RICE	North Central	208.7	<0.001	26.17	6	2 364	<0.001	65.52	<0.001	65.07	<0.001
RICE	North East	311.6	<0.001	88.27	5	2 200	<0.001	76.49	<0.001	124.36	<0.001
RICE	North West	495.2	<0.001	79.45	6	3 446	<0.001	119.37	<0.001	95.81	<0.001
RICE	South East	26	<0.001	3.84	3	439	0.010	4.13	0.007	3.34	0.031
RICE	South South	30.4	<0.001	6.65	4	243	<0.001	14.29	<0.001	10.02	<0.001
RICE	South West	63	<0.001	9.03	4	199	<0.001	11.31	<0.001	37.24	<0.001

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Crops	K-sample equality-of-medians test (H ₀ : Prices of states came from a population with a same median)			Homoscedasticity test (H ₀ : equal variance)				Tests of Equality of Means (H ₀ : Equal means between state)			
	Zone	Pearson chi2	P-value	Statistic of Levene	ddl1	ddl2	P-value	ANOVA (Fisher test)		Welch Correction	
								F	P-value	Statistic of Welch	P-value
WHITE YAM	North Central	417.5	<0.001	165.62	6	2 062	<0.001	50.70	<0.001	53.12	<0.001
WHITE YAM	North East	2.3	0.128	6.23	1	267	0.013	1.75	0.186	4.22	0.042
WHITE YAM	North West	8.8	0.012	4.19	2	184	0.017	1.61	0.203	11.69	<0.001
WHITE YAM	South East	81.1	<0.001	41.81	4	1 274	<0.001	31.30	<0.001	30.95	<0.001
WHITE YAM	South South	231.8	<0.001	190.75	5	1 350	<0.001	79.58	<0.001	61.68	<0.001
WHITE YAM	South West	262.6	<0.001	242.43	5	1 289	<0.001	70.34	<0.001	68.14	<0.001
YELLOW YAM	North Central	36.7	<0.001	25.56	2	268	<0.001	21.76	<0.001	14.44	<0.001
YELLOW YAM	South East	72.8	<0.001	21.94	4	487	<0.001	11.25	<0.001	6.23	<0.001
YELLOW YAM	South South	116.6	<0.001	17.60	5	635	<0.001	20.41	<0.001	26.63	<0.001
YELLOW YAM	South West	72.4	<0.001	27.57	5	503	<0.001	13.48	<0.001	32.43	<0.001
WATER YAM	North Central	131.9	<0.001	14.99	6	661	<0.001	14.19	<0.001	10.71	<0.001
WATER YAM	South East	76.3	<0.001	24.40	4	699	<0.001	22.58	<0.001	10.27	<0.001
WATER YAM	South South	177.6	<0.001	196.93	5	970	<0.001	66.28	<0.001	39.03	<0.001
WATER YAM	South West	43	<0.001	11.77	5	545	<0.001	9.15	<0.001	17.91	<0.001
THREE LEAVE YAM	North Central	14.9	<0.001	16.51	1	116	<0.001	24.33	<0.001	25.27	<0.001
THREE LEAVE YAM	South East	93	<0.001	19.61	4	563	<0.001	30.14	<0.001	41.70	<0.001
THREE LEAVE YAM	South South	133	<0.001	39.04	3	523	<0.001	59.48	<0.001		
THREE LEAVE YAM	South West	41.4	<0.001	155.28	3	232	<0.001	23.83	<0.001	28.66	<0.001
BAMBARA NUT	North Central	17.2	0.002	8.15	4	305	<0.001	6.50	<0.001	6.13	<0.001
BAMBARA NUT	North East	34	<0.001	15.29	5	505	<0.001	11.55	<0.001	15.08	<0.001
BAMBARA NUT	North West	17.8	0.001	5.27	4	134	0.001	7.81	<0.001	7.50	<0.001
BAMBARA NUT	South East	0.9	0.348	2.38	1	18	0.140	8.39	0.010	8.39	0.010
BANANA	North Central	56.4	<0.001	9.18	6	669	<0.001	9.06	<0.001	12.57	<0.001
BANANA	North East	22.5	<0.001	8.42	4	297	<0.001	4.33	0.002	3.88	0.007
BANANA	North West	26.7	<0.001	3.40	3	139	0.020	3.94	0.010	8.11	<0.001
BANANA	South East	254.5	<0.001	15.70	4	1 047	<0.001	64.85	<0.001	102.29	<0.001
BANANA	South South	442.4	<0.001	73.91	5	1 218	<0.001	75.84	<0.001	53.85	<0.001
BANANA	South West	164.8	<0.001	22.77	5	1 112	<0.001	65.24	<0.001	57.67	<0.001
BEENI-SEED/SESAME	North Central	102.6	<0.001	15.50	5	930	<0.001	35.00	<0.001	29.51	<0.001
BEENI-SEED/SESAME	North East	142.1	<0.001	33.12	5	925	<0.001	37.05	<0.001	86.44	<0.001
BEENI-SEED/SESAME	North West	86.9	<0.001	6.99	5	677	<0.001	16.91	<0.001	28.65	<0.001
CARROT	North East	0.8	0.656	11.41	2	70	<0.001	5.05	0.009	3.35	0.045
CARROT	North West	70.8	<0.001	14.34	6	354	<0.001	15.08	<0.001	25.44	<0.001
GARDEN EGG	North Central	21.2	0.002	4.91	6	233	<0.001	4.83	<0.001	6.00	<0.001
GARDEN EGG	North East	25.2	<0.001	21.10	4	192	<0.001	18.41	<0.001	10.64	<0.001
GARDEN EGG	North West	51.9	<0.001	5.16	6	311	<0.001	10.56	<0.001	11.31	<0.001
GARDEN EGG	South East	0.7	0.694	0.83	2	76	0.442	1.56	0.216	1.12	0.344
GARDEN EGG	South South	13.1	0.004	11.25	3	80	<0.001	3.27	0.025	6.51	0.002
GARDEN EGG	South West	13	<0.001	16.11	1	31	<0.001	43.32	<0.001	25.98	<0.001
GINGER	North Central	10.8	0.001	7.29	1	28	0.012	21.81	<0.001	23.90	<0.001
OKRO	North Central	88.8	<0.001	16.65	6	1 376	<0.001	29.72	<0.001	25.50	<0.001
OKRO	North East	47.3	<0.001	27.52	5	905	<0.001	11.77	<0.001	18.19	<0.001
OKRO	North West	29.3	<0.001	15.08	6	1 172	<0.001	5.58	<0.001	5.14	<0.001
OKRO	South East	69.7	<0.001	64.68	4	1 040	<0.001	27.95	<0.001	36.13	<0.001
OKRO	South South	132	<0.001	53.22	5	1 177	<0.001	26.93	<0.001	33.10	<0.001
OKRO	South West	80.4	<0.001	9.48	5	877	<0.001	9.94	<0.001	8.79	<0.001
ONION	North Central	2.5	0.777	17.59	5	288	<0.001	3.26	0.007	1.57	0.186
ONION	North East	21.1	0.001	27.56	5	651	<0.001	13.72	<0.001	10.35	<0.001
ONION	North West	107.6	<0.001	13.77	6	1 561	<0.001	10.85	<0.001	10.85	<0.001
SWEET/BELL PEPPER (TATASHE)	North Central	49.1	<0.001	14.28	6	713	<0.001	11.69	<0.001	7.50	<0.001
SWEET/BELL PEPPER (TATASHE)	North East	100	<0.001	34.72	5	433	<0.001	10.91	<0.001	15.37	<0.001
SWEET/BELL PEPPER (TATASHE)	North West	113.4	<0.001	31.59	6	948	<0.001	16.29	<0.001	20.07	<0.001
SWEET/BELL PEPPER (TATASHE)	South South	42.5	<0.001	25.70	5	151	<0.001	5.74	<0.001		
SWEET/BELL PEPPER (TATASHE)	South West	28	<0.001	4.50	5	260	0.001	9.49	<0.001	13.85	<0.001

In depth analysis of Crops price data, NASS

Crops	K-sample equality-of-medians test (H ₀ : Prices of states came from a population with a same median)			Homoscedasticity test (H ₀ : equal variance)				Tests of Equality of Means (H ₀ : Equal means between state)			
	Zone	Pearson chi2	P-value	Statistic of Levene	ddl1	ddl2	P-value	ANOVA (Fisher test)		Welch Correction	
								F	P-value	Statistic of Welch	P-value
SMALL PEPPER (RODO)	North Central	47	<0.001	41.55	6	1 121	<0.001	15.59	<0.001	6.64	<0.001
SMALL PEPPER (RODO)	North East	83.9	<0.001	26.39	5	465	<0.001	12.53	<0.001	14.49	<0.001
SMALL PEPPER (RODO)	North West	101.1	<0.001	24.70	6	1 076	<0.001	24.00	<0.001	21.92	<0.001
SMALL PEPPER (RODO)	South East	75.3	<0.001	14.12	4	578	<0.001	10.90	<0.001	22.31	<0.001
SMALL PEPPER (RODO)	South South	73.4	<0.001	79.57	5	800	<0.001	18.79	<0.001	9.24	<0.001
SMALL PEPPER (RODO)	South West	156.2	<0.001	272.99	5	962	<0.001	56.75	<0.001	40.63	<0.001
PINEAPPLE	North Central	37.5	<0.001	16.42	2	188	<0.001	37.74	<0.001	34.98	<0.001
PINEAPPLE	North East	10.5	0.001	2.59	1	32	0.118	32.29	<0.001	27.36	<0.001
PINEAPPLE	South East	232.1	<0.001	31.91	4	630	<0.001	52.46	<0.001	118.37	<0.001
PINEAPPLE	South South	128.6	<0.001	146.80	5	877	<0.001	37.36	<0.001	33.56	<0.001
PINEAPPLE	South West	96.4	<0.001	10.49	5	621	<0.001	30.24	<0.001	39.71	<0.001
PLANTAIN	North Central	89.9	<0.001	14.50	6	497	<0.001	10.15	<0.001	20.75	<0.001
PLANTAIN	North East	1.3	0.251	0.13	1	99	0.717	3.99	0.048	3.55	0.079
PLANTAIN	South East	202.9	<0.001	28.30	4	1 126	<0.001	70.98	<0.001	82.03	<0.001
PLANTAIN	South South	355	<0.001	34.41	5	1 433	<0.001	75.27	<0.001	105.37	<0.001
PLANTAIN	South West	109	<0.001	54.30	5	1 339	<0.001	70.16	<0.001	92.85	<0.001
IRISH POTATO	North East	0	0.855	6.95	1	48	0.011	5.50	0.023	3.47	0.078
IRISH POTATO	North West	0.1	0.712	0.04	1	56	0.840	0.47	0.497	0.51	0.483
IRISH POTATO	South South	1.9	0.382	8.75	2	35	0.001	3.77	0.033	3.81	0.044
SWEET POTATO	North Central	152.4	<0.001	8.70	6	1 393	<0.001	12.25	<0.001	12.32	<0.001
SWEET POTATO	North East	30.3	<0.001	11.27	5	706	<0.001	5.22	<0.001	9.01	<0.001
SWEET POTATO	North West	62.8	<0.001	34.02	6	1 431	<0.001	21.57	<0.001	30.60	<0.001
SWEET POTATO	South East	57.4	<0.001	75.57	4	382	<0.001	21.87	<0.001	22.87	<0.001
SWEET POTATO	South South	77.9	<0.001	11.19	5	541	<0.001	19.36	<0.001	13.92	<0.001
SWEET POTATO	South West	19.3	0.002	35.93	5	536	<0.001	6.15	<0.001	4.33	0.001
PUMPKIN	North Central	69.8	<0.001	57.99	5	345	<0.001	14.29	<0.001		
PUMPKIN	North East	23	<0.001	30.76	4	266	<0.001	7.08	<0.001		
PUMPKIN	North West	22.7	<0.001	23.81	5	414	<0.001	8.02	<0.001	7.64	<0.001
PUMPKIN	South East	154.9	<0.001	84.26	4	1 870	<0.001	46.53	<0.001	58.36	<0.001
PUMPKIN	South South	248.9	<0.001	80.58	5	1 987	<0.001	29.60	<0.001	82.65	<0.001
PUMPKIN	South West	108.7	<0.001	79.60	5	346	<0.001	22.63	<0.001		
GREEN VEGETABLE	North Central	25.7	<0.001	74.53	6	895	<0.001	18.40	<0.001	34.33	<0.001
GREEN VEGETABLE	North East	27.5	<0.001	19.75	5	543	<0.001	1.25	0.283	2.16	0.060
GREEN VEGETABLE	North West	56.5	<0.001	11.27	6	597	<0.001	11.76	<0.001	20.60	<0.001
GREEN VEGETABLE	South East	64.8	<0.001	84.11	4	869	<0.001	39.85	<0.001	57.47	<0.001
GREEN VEGETABLE	South South	73.1	<0.001	45.03	5	890	<0.001	20.02	<0.001	33.94	<0.001
GREEN VEGETABLE	South West	111.7	<0.001	141.56	5	1 082	<0.001	60.11	<0.001	60.78	<0.001
SOYA BEANS	North Central	95.3	<0.001	47.54	6	1 779	<0.001	22.56	<0.001	20.74	<0.001
SOYA BEANS	North East	96	<0.001	26.47	5	1 161	<0.001	16.15	<0.001	59.12	<0.001
SOYA BEANS	North West	455.1	<0.001	176.05	6	2 050	<0.001	153.15	<0.001	139.08	<0.001
SOYA BEANS	South West	5.1	0.025	12.55	1	148	0.001	40.63	<0.001	11.44	0.008
SUGAR CANE	North Central	37.1	<0.001	4.15	6	301	0.001	9.04	<0.001	7.23	<0.001
SUGAR CANE	North East	19.1	<0.001	7.47	3	257	<0.001	3.84	0.010	6.06	0.001
SUGAR CANE	North West	15.8	0.015	13.03	6	538	<0.001	8.54	<0.001	10.63	<0.001
SUGAR CANE	South East	1.6	0.205	0.54	1	85	0.464	19.64	<0.001	12.70	0.004
SUGAR CANE	South South	55.9	<0.001	60.33	5	468	<0.001	24.95	<0.001	24.35	<0.001
SUGAR CANE	South West	23.9	<0.001	8.43	5	142	<0.001	8.28	<0.001	10.81	<0.001
TOMATO	North Central	88	<0.001	33.11	6	1 210	<0.001	24.94	<0.001	33.90	<0.001
TOMATO	North East	51	<0.001	21.76	5	816	<0.001	12.26	<0.001	19.72	<0.001
TOMATO	North West	99.5	<0.001	14.79	6	1 602	<0.001	16.53	<0.001	19.05	<0.001
TOMATO	South East	52.3	<0.001	15.47	4	268	<0.001	14.13	<0.001	19.67	<0.001
TOMATO	South South	15.9	0.007	9.24	5	363	<0.001	6.71	<0.001	7.30	<0.001
TOMATO	South West	132	<0.001	17.11	5	991	<0.001	27.40	<0.001	23.33	<0.001
WHEAT	North East	11.9	0.003	7.22	2	96	0.001	12.26	<0.001	13.62	<0.001
WHEAT	North West	65.2	<0.001	76.81	4	260	<0.001	16.53	<0.001	33.13	<0.001
CASHEW	North Central	82.6	<0.001	45.90	6	1 019	<0.001	15.61	<0.001	16.59	<0.001
CASHEW	North East	11.6	0.02	5.07	4	210	0.001	3.59	0.007	2.27	0.072
CASHEW	North West	15.4	0.009	7.15	5	127	<0.001	2.10	0.070		
CASHEW	South East	21.5	<0.001	19.52	4	463	<0.001	16.74	<0.001	12.00	<0.001
CASHEW	South South	13	0.011	7.85	4	241	<0.001	4.65	0.001	4.53	0.004
CASHEW	South West	21.6	<0.001	8.09	4	679	<0.001	5.57	<0.001	10.54	<0.001

Crops	K-sample equality-of-medians test (H ₀ : Prices of states came from a population with a same median)			Homoscedasticity test (H ₀ : equal variance)				Tests of Equality of Means (H ₀ : Equal means between state)			
	Zone	Pearson chi2	P-value	Statistic of Levene	ddl1	ddl2	P-value	ANOVA (Fisher test)		Welch Correction	
								F	P-value	Statistic of Welch	P-value
CHILLI PEPPER (SHOMBO)	North Central	42	<0.001	28.24	6	839	<0.001	14.51	<0.001	6.65	<0.001
CHILLI PEPPER (SHOMBO)	North East	91.7	<0.001	13.52	5	371	<0.001	11.89	<0.001	7.98	<0.001
CHILLI PEPPER (SHOMBO)	North West	113.2	<0.001	50.59	6	873	<0.001	33.39	<0.001	14.98	<0.001
CHILLI PEPPER (SHOMBO)	South East	42.5	<0.001	7.43	3	77	<0.001	4.53	0.006		
CHILLI PEPPER (SHOMBO)	South South	53	<0.001	11.21	5	148	<0.001	3.43	0.006		
CHILLI PEPPER (SHOMBO)	South West	63.7	<0.001	19.45	5	476	<0.001	13.60	<0.001	17.61	<0.001
COCOA	South South	32.5	<0.001	8.16	4	159	<0.001	4.17	0.003		
COCOA	South West	29.3	<0.001	0.39	4	659	0.818	0.96	0.429	4.65	0.002
COCONUT	North Central	29	<0.001	24.85	3	213	<0.001	24.18	<0.001	12.16	<0.001
COCONUT	South East	215.1	<0.001	50.70	4	826	<0.001	70.22	<0.001	101.88	<0.001
COCONUT	South South	19.1	0.002	3.44	5	883	0.004	15.38	<0.001	11.54	<0.001
COCONUT	South West	67.5	<0.001	9.44	5	430	<0.001	22.68	<0.001	30.19	<0.001
GUAVA	South South	0	0.934	17.69	1	23	<0.001	3.80	0.063	2.97	0.115
KOLANUT	North Central	5.2	0.023	3.17	1	39	0.083	1.52	0.225	2.93	0.096
KOLANUT	South East	33.8	<0.001	5.98	4	224	<0.001	4.08	0.003	6.26	<0.001
KOLANUT	South South	72.5	<0.001	21.40	5	237	<0.001	14.75	<0.001	15.99	<0.001
KOLANUT	South West	17.4	0.001	9.48	3	658	<0.001	2.30	0.076	4.58	0.004
MANGO	North Central	71	<0.001	54.30	6	840	<0.001	16.53	<0.001	25.67	<0.001
MANGO	North East	19.9	0.001	52.28	5	506	<0.001	23.08	<0.001	11.81	<0.001
MANGO	North West	27.8	<0.001	15.08	6	523	<0.001	4.91	<0.001	6.74	<0.001
MANGO	South East	124.1	<0.001	42.28	4	890	<0.001	31.66	<0.001	45.83	<0.001
MANGO	South South	88.4	<0.001	16.66	5	769	<0.001	17.18	<0.001	16.44	<0.001
MANGO	South West	57.3	<0.001	8.00	5	504	<0.001	7.33	<0.001	8.61	<0.001
ORANGE	North Central	79.4	<0.001	86.67	5	526	<0.001	51.58	<0.001	30.95	<0.001
ORANGE	North East	6.5	0.09	51.33	3	158	<0.001	13.03	<0.001	6.77	0.001
ORANGE	North West	2.8	0.248	2.94	2	48	0.063	0.15	0.858	0.13	0.881
ORANGE	South East	106.2	<0.001	40.05	4	870	<0.001	25.98	<0.001	53.23	<0.001
ORANGE	South South	76	<0.001	27.16	5	783	<0.001	25.76	<0.001	32.84	<0.001
ORANGE	South West	170.8	<0.001	36.28	5	689	<0.001	50.08	<0.001	36.79	<0.001
PALM FRUITS	North Central	26	<0.001	44.90	2	294	<0.001	18.27	<0.001	17.82	<0.001
PALM FRUITS	South East	89.8	<0.001	43.91	4	1 001	<0.001	31.63	<0.001	18.74	<0.001
PALM FRUITS	South South	155	<0.001	72.68	5	1 026	<0.001	29.19	<0.001	35.07	<0.001
PALM FRUITS	South West	134.2	<0.001	103.64	5	481	<0.001	26.70	<0.001	60.52	<0.001
PAWPAW	North Central	129.6	<0.001	25.06	6	457	<0.001	26.36	<0.001	34.95	<0.001
PAWPAW	North East	36.9	<0.001	4.32	4	143	0.003	19.58	<0.001	14.44	<0.001
PAWPAW	North West	7.7	0.052	5.92	3	87	0.001	4.19	0.008	2.26	0.100
PAWPAW	South East	278.9	<0.001	34.36	4	898	<0.001	118.75	<0.001	176.42	<0.001
PAWPAW	South South	95.7	<0.001	9.07	5	921	<0.001	15.61	<0.001	16.77	<0.001
PAWPAW	South West	173.9	<0.001	49.78	5	602	<0.001	62.10	<0.001	64.77	<0.001

Tests of equality of means between zones: Table2 contains comments about tests of equality of means, and multiple comparison test between pairs of zones. Details of results are given in Appendix 2.

Table 2: By crop, interpretation of multiple comparison tests of average prices for zones

Crops	Results, multiple comparison of means prices for zones
BEANS/COWPEA	North Central, South East and South West have about the same average values The lowest difference (non-significant) is between North Central and South East Each of the other zones has very specific values, significantly different to others The biggest difference is between North West and South South
CASSAVA	North Central, North East and South East have about the same average values Each of the other zones has very specific values, significantly different to others The biggest difference is between North West and South East The lowest difference (non-significant) is between North East and South East, and between North Central and North East

COCOYAM	<p>North Central, North East and North West have about the same average values</p> <p>Each of the other zones has very specific values, significantly different to others</p> <p>The biggest difference is between North West and South South</p> <p>The lowest difference (non-significant) is between North East and North West</p>
GROUND NUT/PEANUTS	<p>North East and North West have about the same average values</p> <p>Ditto for zones South East, which have exactly the same average values</p> <p>Each of the other zones has very specific values, significantly and highly different to others</p> <p>The biggest difference is between North East and South South</p>
GUINEA CORN/SORGHUM	<p>North Central and South West have exactly the same average values</p> <p>Each of the other zones has very specific values, significantly and highly different to others</p>
MAIZE	<p>South East and South South have the lowest difference (non-significant)</p> <p>Each of the other zones has very specific values, significantly and highly different to others</p> <p>The biggest difference is between North East and South East</p>
MELON/EGUSI	<p>There are several pairs of zones with statistically similar values on average, such as (North Central and South West), or (North East and North West), or even (North East and South West) and the last (North West and South West)</p> <p>Each of the other pairs of zones has significantly and highly different values</p>
MILLET/MAIWA	<p>There are several pairs of zones with statistically similar values on average, like (North East and South West), or (South West and North West), or even (North East and South South)</p> <p>Each of the other pairs of zones has significantly and highly different values</p> <p>The biggest difference is between North East and South East</p>
RICE	<p>There are several pairs of zones with statistically similar values on average, such as (North Central and South West), or (South East and South South), or even (South East and South West)</p> <p>Each of the other pairs of zones has significantly and highly different values</p> <p>The biggest difference is between North West and South South</p>
WHITE YAM	<p>The group zones (North Central and North West and South West and South East) have similar values</p> <p>Each of the other pairs of zones has significantly and highly different values</p> <p>The biggest difference is between North East and South East</p>
YELLOW YAM	<p>Only South South has significant differences to others values of price in average.</p> <p>All others zones have statistically similar values on average</p>
WATER YAM	<p>Only South South and North West significant differences to others values of price in average.</p> <p>All others zones have statistically similar values on average</p>
THREE LEAVE YAM	<p>Only North West has significant differences to others values of price in average.</p> <p>All others zones have statistically similar values on average</p>
BANANA	<p>There are several pairs of zones with statistically similar values on average, such as (North Central and North East), or (North East and North West), or even (North West and South South)</p> <p>Each of the other pairs of zones has significantly and highly different values</p>
BEENI-SEED/SESAME	<p>There are many pairs of zones with statistically similar values on average (North Central and South West) or (North East and North West) or (North East and South West)</p> <p>The biggest difference is between North East and South South</p>
CARROT	<p>The three zones North East, North West and South South have statistically similar values on average</p> <p>Each of the other pairs of zones has significantly and highly different values</p> <p>The biggest difference is between South South and South West</p>
GARDEN EGG	<p>The three zones South East, South South and South West have statistically similar values on average</p> <p>There are several pairs of zones with statistically similar values on average, such as (North Central and North East) or (North East and North West)</p>

GINGER	The zones North Central, North West, South East, South South have statistically similar values on average Each of the other pairs of zones has significantly and highly different values
OKRO	The two pairs of zones (North Central and South West) and (North East and North West) have statistically similar values on average Each of the other pairs of zones has significantly and highly different values
SWEET/BELL PEPPER (TATASHE)	There are many pairs of zones with statistically similar values on average Only South South has significantly and highly different values to others zones
SMALL PEPPER (RODO)	Three pairs of zones (North Central and North East), (North Central and North West) and (North East and South West) have statistically similar values on average Each of the other pairs of zones has significantly and highly different values
PINEAPPLE	The zones North Central, North East, South West have statistically similar values on average There are several other pairs of zones with statistically similar values on average
PLANTAIN	There are many pairs of zones with statistically similar values on average No zone has values that always statistically different to all others zones
IRISH POTATO	Each zone has several other zones with which it has equivalent values
SWEET POTATO	Only the pair of zones North East and North West has statistically similar values on average Each of the other pairs of zones has significantly and highly different values
PUMPKIN	North East has the most different values with the other zones Each zone has several other zones with which it has equivalent values
GREEN VEGETABLE	The three zones North Central, North East and North West have statistically similar values on average Ditto for zones South East, South South and South West Each of the other pairs of zones has significantly and highly different values
SOYA BEANS	North Central has the most different values with the other zones Each zone has at least one other zone with which it has equivalent values
SUGAR CANE	Western zones have values different with eastern zones However, each zone has at least one other zone with which it has equivalent values
TOMATO	North East, South East and South South have different values with the other zones Each other zone has at least one other with which it has equivalent values
CASHEW	South South, North East and South West have similar values Each other zone has different values with others
CHILLI PEPPER (SHOMBO)	We have two pairs of zones with equal values: (North Central and South East) and (North East and North West) Each of the other pairs of zones has significantly and highly different values
COCONUT	Only North West has values significantly different to all others zones Each other zone has at least one other zone with which it has equivalent values
GUAVA	Prices are quite the same in average, no significant differences
KOLANUT	Prices are quite the same in average, no significant differences
MANGO	Three pair of zones have equal values: (North Central and North East), (North Central and North West) and (North East and South South) Each of the other pairs of zones has significantly and highly different values
ORANGE	There are many similarities and few significant differences between zones
PALM FRUITS	There are many similarities and few significant differences between zones
PAWPAW	Northern zones have values different with others zones

III. Searching for a strategy to Impute missing conversion factors

Without a conversion factor for a specific combination of condition, unit of measurement and size, the data cannot be used to estimate prices. This section presents the results of the strategies to impute the missing conversion factors.

a. View of combinations of units and sizes with missing conversion factors without and after data processing

Before processing, we had 9,918 representing 5.5% of records in the data, without conversion factors. After various imputations, using for example the information available in the variable related to the question about others units of measurement, about 3,726 of missing values (representing 2% of the sample) have been imputed. Then, it remains about 6,075 of cases (representing 3.37% of the sample) with missing conversion factor (see Table 3 for presentation by crops, and Table 4 for presentation by units of measurement). Data of these record had not been used for estimate median and means prices.

Table 3: By units, statistics on units on crops without conversion factor.

Unit of measurement	Number of communities that report the unit			Mains crops with no conversion factor for the unit (name and freq.)				
	Total	no conversion factor		1st crop	2nd crop	3rd crop	4th crop	5th Crop
		Freq.	% of total					
BASIN	6 999	538	7.7	GUAVA (206)	GARDEN EGG (133)	BAMBARA NUT (89)	COCOA (53)	CARROT (22)
BASKET	17 860	1 101	6.2	GUAVA (477)	GARDEN EGG (427)	COCOA (53)	GINGER (40) PUMPKIN (40)	CARROT (35)
BIN/ BASKET	3 910	307	7.9	GUAVA (144)	GARDEN EGG (123)	GINGER (18)	CARROT (10)	BAMBARA NUT (5)
BOWL	1 885	353	18.7	GARDEN EGG (159)	KOLANUT (89)	COCOA (57)	GINGER (42)	GARLIC (5)
CIGARETTE CUP	410	9	2.2	CASHEW (7)	BAMBARA NUT (2)			
CONGO	1 168	71	6.1	COCOA (50)	BAMBARA NUT (10)	GARDEN EGG (5)	GINGER (3) KOLANUT (3)	
DERICA/TIN	116	34	29.3	CASHEW (13)	MELON/EGUSI (7)	GARDEN EGG (6)	SMALL PEPPER (RODO) (4)	GROUND NUT/PEANUTS (2)
HEAP	10 490	815	7.8	GUAVA (387)	GARDEN EGG (223)	KOLANUT (88)	PAWPAW (56)	CARROT (34)
KOBIOWU	155	23	14.8	CASHEW (10)	SMALL PEPPER (RODO) (8)	COCOA (3)	MELON/EGUSI (1)	MAIZE (1)
MILK CUP	1 464	39	2.7	BAMBARA NUT (39)	-	-	-	-
MUDU	12 805	725	5.7	BAMBARA NUT (528)	WHEAT (63)	COCOA (37)	GINGER (35)	GARDEN EGG (30)
PAINT RUBBER	4 739	747	15.8	GARDEN EGG (238)	GUAVA (158)	KOLANUT (100)	ORANGE (89)	BAMBARA NUT (57)
PIECE	10 756	338	3.1	GUAVA (230)	KOLANUT (39)	PUMPKIN (27)	GARDEN EGG (19)	CARROT (12)
TIYA	4 221	199	4.7	BAMBARA NUT (103)	WHEAT (55)	CASHEW (13)	GARLIC (8)	MELON/EGUSI (7)
WHEEL BARROW	1 513	9	0.6	CARROT (7)	PUMPKIN (1)	GUAVA (1)		
Total	79 258	6 075	7.7	-	-	-	-	-

Table 4: By crops, statistics on units without conversion factor

Crop	Communities that reported the crop							
	Total (freq.)	No conversion factor		Main (°5) Unit of measurement (name and ##)				
		Freq	% of total ⁽¹⁾	1 st unit	2 nd unit	3 rd unit	4 th unit	5 th unit
GUAVA	1 771	1 612	91.0	BASKET (477)	HEAP (387)	PIECE (230)	BASIN (206)	PAINT RUBBER (158)
GARDEN EGG	2 378	1 376	57.9	BASKET (427)	PAINT RUBBER (238)	HEAP (223)	BOWL (159)	BASIN (133)
GINGER	421	218	51.8	BOWL (42)	BASKET (40)	MUDU (35)	BIN/BASKET (18)	CONGO (3)
BAMBARA NUT	1 866	858	46.0	MUDU (528)	TIYA (103)	BASIN (89)	PAINT RUBBER (57)	MILK CUP (39)
GARLIC	157	62	39.5	TIYA (8)	BOWL (5)	-	-	-
COCOA	1 154	312	27.0	BOWL (57)	BASKET (53)	BASIN (53)	CONGO (50)	MUDU (37)
WHEAT	552	125	22.6	MUDU (63)	TIYA (55)	-	-	-
KOLANUT	1 566	338	21.6	PAINT RUBBER (100)	BOWL (89)	HEAP (88)	PIECE (39)	CONGO (3)
CARROT	701	126	18.0	BASKET (35)	HEAP (34)	BASIN (22)	PIECE (12)	BIN/BASKET (10)
ORANGE	3 261	131	4.0	PAINT RUBBER (89)	-	-	-	-
CASHEW	2 879	95	3.3	DERICA/TIN (13)	TIYA (13)	KOBIOWU (10)	CIGARETTE CUP (7)-	-
PALM FRUITS	2 980	74	2.5	-	-	-	-	-
PAWPAW	3 215	60	1.9	HEAP (58)	-	-	-	-
PUMPKIN	5 372	102	1.9	BASKET (40)	PIECE (27)	WHEEL BARROW (1)	-	-
MANGO	4 113	44	1.1	-	-	-	-	-
MELON/EGUSI	4 597	50	1.1	DERICA/TIN (7)	TIYA (7)	KOBIOWU (1)	-	-
PINEAPPLE	2 433	25	1.0	-	-	-	-	-
THREE LEAVE YAM	1 502	13	0.9	-	-	-	-	-
SWEET/BELL PEPPER (TATASHE)	2 607	21	0.8	-	-	-	-	-
SUGAR CANE	1 858	13	0.7	-	-	-	-	-
YELLOW YAM	2 003	15	0.7	-	-	-	-	-
CASSAVA	8 536	47	0.6	-	-	-	-	-
ONION	2 570	15	0.6	-	-	-	-	-
PLANTAIN	4 584	29	0.6	-	-	-	-	-
WHITE YAM	6 512	37	0.6	-	-	-	-	-
BEANS/COWPEA	8 532	41	0.5	-	-	-	-	-
WATER YAM	2 973	16	0.5	-	-	-	-	-
COCONUT	2 415	9	0.4	-	-	-	-	-
GREEN VEGETABLE	4 931	18	0.4	-	-	-	-	-
MAIZE	16 415	62	0.4	KOBIOWU (1)	-	-	-	-
SMALL PEPPER (RODO)	5 059	20	0.4	KOBIOWU (8)	DERICA/TIN (4)	-	-	-
GROUND NUT/PEANUTS	8 778	24	0.3	DERICA/TIN (2)	-	-	-	-
RICE	8 963	28	0.3	-	-	-	-	-
BANANA	4 543	11	0.2	-	-	-	-	-
COCOYAM	4 070	10	0.2	-	-	-	-	-
IRISH POTATO	431	1	0.2	-	-	-	-	-
OKRO	6 595	11	0.2	-	-	-	-	-
SWEET POTATO	5 037	11	0.2	-	-	-	-	-
CHILLI PEPPER (SHOMBO)	2 824	4	0.1	-	-	-	-	-
TOMATO	5 293	6	0.1	-	-	-	-	-
BEENI-SEED/SESAME	2 717	1	0.0	-	-	-	-	-
GUINEA CORN/SORGHUM	8 114	2	0.0	-	-	-	-	-
MILLET/MAIWA	6 360	1	0.0	-	-	-	-	-
SOYA BEANS	5 202	2	0.0	-	-	-	-	-
Total	178 840	6 076	3.4					

Note: (1) Excluding "others units"

To impute the remaining missing values of conversion factor, we look for three approaches. The first obviously was to impute missing using the approximative weight in kilogram collected during the survey. The second approach was to find an econometric model for generating conversion factors. The third and most effective approach was to exploit a hand book published in 2004, containing conversion factors for a sample of crops and units.

b. Inability to use approximative weight in kilogram to impute conversion factors

During the survey, approximatively weight in kilograms of crops for each unit of measurement was collected. Unfortunately, only in 7.7% of cases, communities were able to give this approximation. However, the approximations given are highly inconsistent with the conversion factors available. Then, it's not possible to impute conversion factors using the approximation in kilogram collected during the survey.

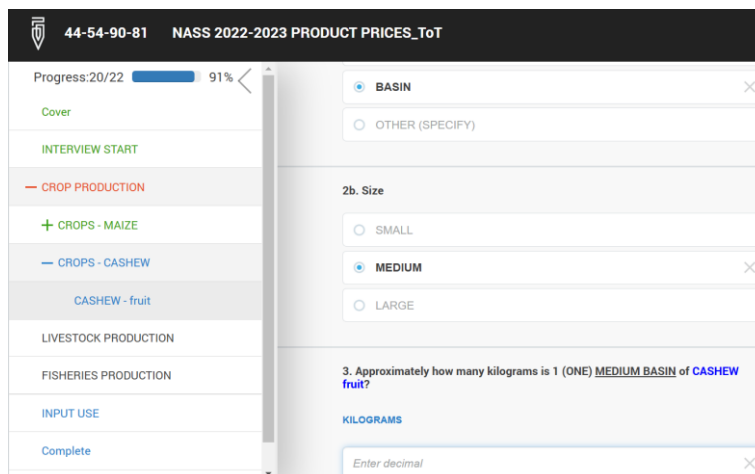


Table 5: For Beans, by Condition, unit and size, comparison of conversion factor with approximatively weight in kilograms collected

Condition	Unit	Size	Conversion factor	Approximative weight in kilo			
				Median	Mean	Max	Min
Shelled/ Unshelled (fresh)	MILK CUP		.14	1	1.2	2	.5
	BASKET	SMALL	7.16	1	13.65	400	.7
		MEDIUM	10.34	1	4.17	20	1
		LARGE	14.32	15	20.25	50	1
	BASIN	SMALL	9	2	2.98	10	.8
		MEDIUM	10.34	7.5	9.16	25	1
LARGE		37	10	11.25	15	10	
Shelled/ Unshelled (dry)	PAINT RUBBER		2.79	4	5.79	25	1
	MILK CUP		.11	1.5	2.5	5	1
	CIGARETTE CUP		.16	5	65.17	250	.7
	CONGO	SMALL	.73	2.5	2.5	3	2
		LARGE	1.09	2.5	2.53	4	1.13
	MUDU	SMALL	.78	2	2.04	5	1
		LARGE	.99	2.5	18.26	950	1
	DERICA/TIN	MEDIUM	.46	6	6	6	6
	TIYA	MEDIUM	1.25	2.6	3.03	5	1.5
		LARGE	1.91	2	14.65	650	1
	BASKET	SMALL	7.16	2.25	5.16	15	.05
		MEDIUM	10.34	4.5	47.27	350	2
		LARGE	37	50	50	50	50
	BASIN	SMALL	9	5	7.1	25	1.5
		MEDIUM	22	10	66.2	900	1
LARGE		37	17.5	30	100	10	

c. Testing a model for generating conversion factors

The theoretical model which suggests the idea of looking for a model is based on the following. According to the “Walrassian tatonnement” principle, prices will balance out in the different communities who sell the same crop. Then at the long run, unit of measurement with approximatively the same weight/quantity of goods/crop (so the same conversion factor) will be close.

Taking into account economies of scale, we can assume that the price per kilogram of small units will be higher than that of large units. However, because of competition, units that can contain the same quantities of a giving crop will have fairly similar prices. Consequently, if prices are consistent with conversion factors, then the price can be used to estimate the missing conversion factors.

Hence, if the conversion factor fitting model (by linear regression) is good, it should also be adapted to predict missing conversion factors.

In addition, using any auxiliary information common to both units with available conversion factors and units with missing conversion factors should improve the quality of the prediction. The only common auxiliary information is the condition (between the three variables conditions, units and size).

Note: For the time being, the predictive power of the model is not acceptable. However, this theoretical model is written to provoke thought.

The detailed model is shown in Appendix 5.

d. Exploiting a handbook of conversion factors to look for missing one obtained from National Agricultural Sample Survey (NASS)

The International Institute of Tropical Agriculture, Ibadan, had published a handbook of conversion factor in 2004 that contains local weights and measures in Nigeria. These conversion factors are mean given by (*three*) zones: the northern, the southeastern and the southwestern.

To estimate the quantity of crop in kilogram for each combination of unit and size, data were collected in a random sample of local markets, from sellers. During the survey, to measure the quantity of each product, surveyors collected samples of products sold by merchants selected according to their non-standard units. They then poured the product into a polyethylene bag. This was then weighed using a scale calibrated in the metric system. The weight was recorded in kg for each sampling point and the average was calculated for each product.

We looked up the missing conversion factor of the NASS. The size of units in the handbook are not always the same as in NASS. And many times, we had to make trade-offs. The following table gives us the conversion factors found in the handbook, by crop, unit of measurement, sizes and condition.

Table 6: Conversion factors getting from handbook published by the International Institute of tropical Agriculture, 2024

Crops	Unit	Size	Conversion factor published in Handbook (by zone / mean)			
			Northern	Southeastern	Southwestern	Mean
GARDEN EGG	HEAP		0.45	0.4	0.568	0.5
GARDEN EGG	BASKET	SMALL	17.5		4.467	11
GARDEN EGG	BASKET	MEDIUM	25.3		6.23	15.8
GARDEN EGG	BASKET	LARGE	49.7		12.167	30.9
CARROT	PIECE/ROOT/FRUIT		0.07			0.1
CARROT	HEAP		0.55			0.6
MELON/EGUSI (shelled)	MILK TIN	SMALL	0.11	0.11		0.1
MELON/EGUSI (shelled)	MILK TIN	BIG	0.23			0.2
MELON/EGUSI (shelled)	MILK TIN				0.11	0.1
MELON/EGUSI (shelled)	DERICA CUP				0.55	0.6
MELON/EGUSI (shelled)	KOBOWU (PLASTIC)				0.82	0.8
MELON/EGUSI (UNSHELLED)	KOBOWU (PLASTIC)				0.58	0.6
MELON/EGUSI (UNSHELLED)	CIGARETTE CUP			0.12		0.1
GREEN VEGETABLE	BUNDLE		0.36		0.29	0.3

For the following crops, we still have missing values of conversion factor:

GUAVA	CASHEW	SWEET/BELL PEPPER
GINGER	PALM FRUITS	(TATASHE)
BAMBARA NUT	PAWPAW	SUGAR CANE
GARLIC	PUMPKIN	COCONUT
COCOA	MANGO	SMALL PEPPER (RODO)
WHEAT	MELON/EGUSI (UNSHELLED)	BEENI-SEED/SESAME
KOLANUT	PINEAPPLE	MELON/EGUSI (UNSHELLED)
ORANGE	THREE LEAVE YAM	

It is also interesting to compare the values of the conversion factors used in the NASS with those available in that handbook (see Table 6). This is important to decide if we can recommend the use of conversions factor from hand book to impute missing values for upcoming survey. The comparison shows values very close most of the time. But three observations can be made (row with large gaps (>25%) are highlighted in bold in the table):

- i) Firstly, differences appear for few crops like banana;
- ii) Secondly, we have significant differences of conversion factors for units as heap and basket;
- iii) Thirdly, in NASS, for whenever the unit is a SAC/BAG, the size gives the conversion factor. For example, for a sag/bag of size 50kg, the conversion factor used in NASS is 50. However, in that handbook, the Sac/bag of 50kg does not necessarily have a conversion factor of 50. As reported, in the survey process that led to the handbook results, product quantities have been weighed.

Table 7: By crop and unit, comparison of some conversion factors: used in NASS versus found in the handbook

Crop	CropUnit	Size	Condition	Conv_factor (NASS)	Conversion factor published in Handbook (by zone / mean)				Gap
					Northern	South eastern	South western	Mean	
BANANA	BUNCH	LARGE		2.12	5.23	6.56	6.81	6.20	-192%
BANANA	PIECE	LARGE		0.07	0.10	0.13	0.11	0.11	-62%
BEANS/COWPEA	BASIN	LARGE	Shelled (dry)	37.00			42.37	42.37	-15%
BEANS/COWPEA	CIGARETTE CUP		Shelled (dry)	0.20		0.21		0.21	-7%
BEANS/COWPEA	DERICA/TIN	MEDIUM	Shelled (dry)	0.58			0.65	0.65	-12%
BEANS/COWPEA	KOBIOWU	LARGE	Shelled (dry)	1.21			1.18	1.18	2%
BEANS/COWPEA	MILK CUP		Shelled (dry)	0.14	0.15	0.15	0.14	0.15	-5%
BEANS/COWPEA	MUDU	LARGE	Shelled (dry)	1.24	1.75			1.75	-41%
BEANS/COWPEA	PAINTRUBBER		Shelled (dry)	3.51		3.83		3.83	-9%
BEANS/COWPEA	SACK/BAG	100 KG	Shelled (dry)	100.00	104.72		101.35	103.04	-3%
BEANS/COWPEA	SACK/BAG	50 KG	Shelled (dry)	50.00	62.63		50.24	56.44	-13%
BEANS/COWPEA	BASIN	LARGE	Shelled (fresh)	37.00			42.37	42.37	-15%
BEANS/COWPEA	CONGO	LARGE	Shelled (fresh)	1.37			1.45	1.45	-6%
CASSAVA	BASKET	MEDIUM		27.05			22.60	22.60	16%
CASSAVA	HEAP	LARGE		32.90			106.54	106.54	-224%
CASSAVA	HEAP	SMALL		10.13	11.64			11.64	-15%
CASSAVA	SACK/BAG	50 KG		50.00			47.98	47.98	4%
COCOYAM	BASKET	LARGE		17.58	11.97		25.17	18.57	-6%
COCOYAM	BASKET	MEDIUM		11.36	5.32		14.77	10.05	12%
COCOYAM	BASKET	SMALL		2.91	3.64		9.00	6.32	-117%
COCOYAM	HEAP	LARGE		1.86	1.72		2.27	2.00	-7%
COCOYAM	HEAP	MEDIUM		1.21			1.77	1.77	-47%
COCOYAM	HEAP	SMALL		0.46			0.09	0.09	80%
COCOYAM	PIECE	LARGE		0.37	0.22		0.20	0.21	43%
GREENVEGETABLE	BUNDLE	SMALL		0.48	0.36	0.29	0.29	0.31	35%
GROUNDNUT/PEANUTS	BASIN	LARGE	Shelled (dry)	20.73			35.90	35.90	-73%
GROUNDNUT/PEANUTS	BASIN	MEDIUM	Shelled (dry)	10.23		7.15		7.15	30%
GROUNDNUT/PEANUTS	CONGO	LARGE	Shelled (dry)	1.27			1.29	1.29	-2%
GROUNDNUT/PEANUTS	DERICA/TIN	MEDIUM	Shelled (dry)	0.51			0.65	0.65	-26%
GROUNDNUT/PEANUTS	KOBIOWU	LARGE	Shelled (dry)	0.93			1.05	1.05	-13%
GROUNDNUT/PEANUTS	MILK CUP		Shelled (dry)	0.13	0.13	0.14	0.09	0.12	6%
GROUNDNUT/PEANUTS	MUDU	LARGE	Shelled (dry)	1.08	1.54			1.54	-43%
GROUNDNUT/PEANUTS	PAINTRUBBER		Shelled (dry)	3.06		3.37		3.37	-10%
GROUNDNUT/PEANUTS	SACK/BAG	100 KG	Shelled (dry)	100.00	92.82	92.67	95.51	93.67	6%
GROUNDNUT/PEANUTS	SACK/BAG	50 KG	Shelled (dry)	50.00			48.76	48.76	2%
GROUNDNUT/PEANUTS	BASIN	LARGE	Unshelled (dry)	14.51			28.15	28.15	-94%
GROUNDNUT/PEANUTS	BASIN	MEDIUM	Unshelled (dry)	7.16		5.52		5.52	23%
GROUNDNUT/PEANUTS	CONGO	LARGE	Unshelled (dry)	0.54			0.86	0.86	-60%
GROUNDNUT/PEANUTS	KOBIOWU	LARGE	Unshelled (dry)	0.66			0.83	0.83	-26%
GROUNDNUT/PEANUTS	MILK CUP		Unshelled (dry)	0.05			0.13	0.13	-139%
GROUNDNUT/PEANUTS	MUDU	LARGE	Unshelled (dry)	0.45	0.93			0.93	-107%
GROUNDNUT/PEANUTS	SACK/BAG	100 KG	Unshelled (dry)	70.00	50.80		57.42	54.11	23%
GROUNDNUT/PEANUTS	SACK/BAG	50 KG	Unshelled (dry)	35.00	24.00		39.67	31.84	9%
GUINE ACORN/SORGHUM	BASIN	LARGE		17.12			41.75	41.75	-144%
GUINE ACORN/SORGHUM	BASIN	MEDIUM		6.34		6.90		6.90	-9%
GUINE ACORN/SORGHUM	CONGO	LARGE		1.98			1.50	1.50	24%
GUINE ACORN/SORGHUM	DERICA/TIN	MEDIUM		0.68			0.72	0.72	-6%
GUINE ACORN/SORGHUM	KOBIOWU	LARGE		1.21			1.24	1.24	-2%
GUINE ACORN/SORGHUM	MILK CUP			0.17	0.15		0.15	0.15	9%
GUINE ACORN/SORGHUM	PAINTRUBBER			3.57		4.15		4.15	-16%
GUINE ACORN/SORGHUM	SACK/BAG	100 KG		100.00	101.07	104.85	109.13	105.02	-5%
GUINE ACORN/SORGHUM	SACK/BAG	50 KG		50.00	46.25		56.26	51.26	-3%
IRISHPOTATO	BASKET	LARGE		7.02	13.47			13.47	-92%
IRISHPOTATO	BASKET	MEDIUM		4.22	6.99			6.99	-65%

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IRISHPOTATO	BASKET	SMALL		2.08	3.13			3.13	-51%
IRISHPOTATO	PIECE	MEDIUM		0.10	0.16			0.16	-52%
MAIZE	BASIN	LARGE	Shelled (dry)	57.40			41.10	41.10	28%
MAIZE	CIGARETTE CUP		Shelled (dry)	0.19		0.24		0.24	-27%
MAIZE	CONGO	LARGE	Shelled (dry)	1.48			1.59	1.59	-8%
MAIZE	DERICA/TIN	MEDIUM	Shelled (dry)	0.52			0.67	0.67	-30%
MAIZE	KOBIOWU	LARGE	Shelled (dry)	1.25			1.22	1.22	2%
MAIZE	MILK CUP		Shelled (dry)	0.17	0.15	0.16	0.17	0.16	5%
MAIZE	MUDU	LARGE	Shelled (dry)	1.32	1.78			1.78	-35%
MAIZE	PAINTRUBBER		Shelled (dry)	3.68		4.03		4.03	-10%
MAIZE	SACK/BAG	100 KG	Shelled (dry)	100.00	95.99	101.07	106.30	101.12	-1%
MAIZE	SACK/BAG	50 KG	Shelled (dry)	50.00	46.16		53.39	49.78	0%
MAIZE	BASIN	SMALL	Unshelled (fresh)	3.57		7.41		7.41	-107%
MAIZE	BASKET	LARGE	Unshelled (fresh)	4.97			21.33	21.33	-329%
MELON/EGUSI	CIGARETTE CUP		Shelled (dry)	0.14		0.12		0.12	14%
MELON/EGUSI	CONGO	LARGE	Shelled (dry)	1.12			1.07	1.07	4%
MELON/EGUSI	DERICA/TIN	LARGE	Shelled (dry)	0.49			0.55	0.55	-13%
MELON/EGUSI	KOBIOWU	LARGE	Shelled (dry)	0.55			0.82	0.82	-50%
MELON/EGUSI	MILK CUP		Shelled (dry)	0.11	0.11	0.11	0.11	0.11	0%
MELON/EGUSI	PAINTRUBBER		Shelled (dry)	2.46		3.00		3.00	-22%
MELON/EGUSI	SACK/BAG	100 KG	Shelled (dry)	100.00	67.60	87.39	73.71	76.23	24%
MELON/EGUSI	SACK/BAG	50 KG	Shelled (dry)	50.00			38.26	38.26	23%
MELON/EGUSI	BASIN	LARGE	Shelled (fresh)	19.91			27.00	27.00	-36%
MELON/EGUSI	BASIN	SMALL	Shelled (fresh)	10.11		4.88		4.88	52%
MELON/EGUSI	CIGARETTE CUP		Unshelled (dry)	0.12		0.18		0.18	-57%
MELON/EGUSI	CONGO	LARGE	Unshelled (dry)	0.92			0.70	0.70	24%
MELON/EGUSI	KOBIOWU	LARGE	Unshelled (dry)	0.45			0.58	0.58	-29%
MELON/EGUSI	MILK CUP		Unshelled (dry)	0.09			0.07	0.07	26%
MELON/EGUSI	PAINTRUBBER		Unshelled (dry)	2.11		2.18		2.18	-3%
MELON/EGUSI	SACK/BAG	100 KG	Unshelled (dry)	82.64		58.60	44.60	51.60	38%
MELON/EGUSI	SACK/BAG	50 KG	Unshelled (dry)	41.32			29.88	29.88	28%
MELON/EGUSI	BASIN	LARGE	Unshelled (fresh)	14.53			22.27	22.27	-53%
MELON/EGUSI	BASIN	SMALL	Unshelled (fresh)	7.33		4.41		4.41	40%
MILLET/MAIWA	BASIN	LARGE		18.34			47.64	47.64	-160%
MILLET/MAIWA	BASKET	SMALL		3.93		7.43		7.43	-89%
MILLET/MAIWA	CIGARETTE CUP			0.21		0.21		0.21	0%
MILLET/MAIWA	CONGO	LARGE		1.44			1.43	1.43	0%
MILLET/MAIWA	DERICA/TIN	MEDIUM		0.61			0.70	0.70	-15%
MILLET/MAIWA	KOBIOWU	LARGE		1.25			1.26	1.26	0%
MILLET/MAIWA	MILK CUP			0.15		0.16	0.14	0.15	2%
MILLET/MAIWA	MUDU	LARGE		1.25	1.82			1.82	-46%
MILLET/MAIWA	PAINTRUBBER			3.77		3.99		3.99	-6%
MILLET/MAIWA	SACK/BAG	100 KG		100.00	101.51	99.93	104.04	101.83	-2%
MILLET/MAIWA	SACK/BAG	50 KG		50.00			56.12	56.12	-12%
OKRO	BASKET	LARGE		21.79	21.85	21.50	21.50	21.62	1%
OKRO	BASKET	MEDIUM		9.27	6.57	6.27	6.27	6.37	31%
OKRO	BASKET	SMALL		3.13		2.78	2.38	2.58	18%
OKRO	HEAP	LARGE		0.56		0.62	0.62	0.62	-10%
OKRO	HEAP	MEDIUM		0.34	0.28			0.28	19%
OKRO	MUDU	SMALL		1.18	1.25			1.25	-6%
OKRO	SACK/BAG	25 KG		25.00		26.85	26.85	26.85	-7%
ONION	HEAP	SMALL		0.47		0.26	0.26	0.26	44%
ONION	PIECE	SMALL		0.09		0.10	0.10	0.10	-11%
PLANTAIN	BUNCH			1.06	8.35	7.29	7.75	7.80	-636%
PLANTAIN	PIECE	MEDIUM		0.23	0.29	0.23	0.25	0.26	-12%
RICE	CIGARETTE CUP		Shelled (dry)	0.22		0.26		0.26	-19%
RICE	CONGO	LARGE	Shelled (dry)	1.64			1.60	1.60	3%
RICE	DERICA/TIN	MEDIUM	Shelled (dry)	0.72			0.82	0.82	-13%
RICE	KOBIOWU	LARGE	Shelled (dry)	1.38			1.25	1.25	9%
RICE	MILK CUP		Shelled (dry)	0.16	0.19	0.17	0.16	0.17	-7%
RICE	MUDU	LARGE	Shelled (dry)	1.42	1.97			1.97	-39%
RICE	PAINTRUBBER		Shelled (dry)	3.99		3.57		3.57	11%
RICE	SACK/BAG	100 KG	Shelled (dry)	100.00	119.09		108.17	113.63	-14%
RICE	SACK/BAG	50 KG	Shelled (dry)	50.00	49.44	49.92	40.72	46.69	7%
RICE	BASIN	SMALL	Unshelled (dry)	7.90		8.03		8.03	-2%
SOYABEANS	BASIN	LARGE	Shelled (dry)	47.40			39.61	39.61	16%
SOYABEANS	BASIN	SMALL	Shelled (dry)	9.60		6.43		6.43	33%
SOYABEANS	CIGARETTE CUP		Shelled (dry)	0.20		0.23		0.23	-15%
SOYABEANS	CONGO	LARGE	Shelled (dry)	1.41			1.43	1.43	-1%

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SOYABEANS	DERICA/TIN	SMALL	Shelled (dry)	0.44			0.69	0.69	-57%
SOYABEANS	KOBIOWU	LARGE	Shelled (dry)	1.22			1.25	1.25	-3%
SOYABEANS	MILK CUP		Shelled (dry)	0.15	0.20	0.16	0.14	0.17	-14%
SOYABEANS	MUDU	LARGE	Shelled (dry)	1.23	1.73			1.73	-40%
SOYABEANS	PAINTRUBBER		Shelled (dry)	3.58		3.75		3.75	-5%
SOYABEANS	SACK/BAG	100 KG	Shelled (dry)	100.00	110.39	97.95	100.67	103.00	-3%
SOYABEANS	SACK/BAG	50 KG	Shelled (dry)	50.00			50.59	50.59	-1%
SWEETPOTATO	BASKET	LARGE		12.61	13.07		13.67	13.37	-6%
SWEETPOTATO	BASKET	MEDIUM		3.91	8.65		8.68	8.67	-122%
SWEETPOTATO	BASKET	SMALL		1.88	5.17		5.58	5.38	-186%
SWEETPOTATO	HEAP	LARGE		2.89	2.59	2.20	5.26	3.35	-16%
SWEETPOTATO	HEAP	MEDIUM		1.13			4.25	4.25	-274%
SWEETPOTATO	HEAP	SMALL		0.70			2.27	2.27	-222%
SWEETPOTATO	PIECE	MEDIUM		0.89			0.52	0.52	42%
SWEETPOTATO	PIECE	SMALL		0.23	0.32	0.37		0.35	-50%
SWEETPOTATO	SACK/BAG	50 KG		50.00			56.83	56.83	-14%
TOMATO	BASKET	LARGE		24.28	14.69	16.20	16.20	15.70	35%
TOMATO	BASKET	MEDIUM		8.26	6.68	9.18	9.18	8.35	-1%
TOMATO	BASKET	SMALL		3.65	2.85	4.31	4.31	3.82	-5%
TOMATO	HEAP	LARGE		1.00	1.15			1.15	-16%
TOMATO	HEAP	SMALL		0.29		0.36	0.36	0.36	-22%
TOMATO	PIECE	LARGE		0.06	0.06	0.07		0.07	0%
WATERYAM	HEAP	LARGE		21.89	17.08	16.00	18.22	17.10	22%
WATERYAM	HEAP	MEDIUM		12.79	9.91	9.90	10.64	10.15	21%
WATERYAM	HEAP	SMALL		8.81	7.54	6.37	6.23	6.71	24%
WATERYAM	TUBER	LARGE		5.88	3.56	3.55	4.49	3.87	34%
WATERYAM	TUBER	MEDIUM		2.95	2.26	2.03	2.48	2.26	24%
WATERYAM	TUBER	SMALL		2.09	2.03	1.37	1.25	1.55	26%
WHITEYAM	HEAP	LARGE		21.89	17.08	16.00	18.22	17.10	22%
WHITEYAM	HEAP	MEDIUM		12.79	9.91	9.90	10.64	10.15	21%
WHITEYAM	HEAP	SMALL		8.81	7.54	6.37	6.23	6.71	24%
WHITEYAM	TUBER	LARGE		5.88	3.56	3.55	4.49	3.87	34%
WHITEYAM	TUBER	MEDIUM		2.95	2.26	2.03	2.48	2.26	24%
WHITEYAM	TUBER	SMALL		2.09	2.03	1.37	1.25	1.55	26%
YELLOWYAM	HEAP	LARGE		21.89	17.08	16.00	18.22	17.10	22%
YELLOWYAM	HEAP	MEDIUM		12.79	9.91	9.90	10.64	10.15	21%
YELLOWYAM	HEAP	SMALL		8.81	7.54	6.37	6.23	6.71	24%
YELLOWYAM	TUBER	LARGE		5.88	3.56	3.55	4.49	3.87	34%
YELLOWYAM	TUBER	MEDIUM		2.95	2.26	2.03	2.48	2.26	24%
YELLOWYAM	TUBER	SMALL		2.09	2.03	1.37	1.25	1.55	26%

IV. Conclusion and recommendations

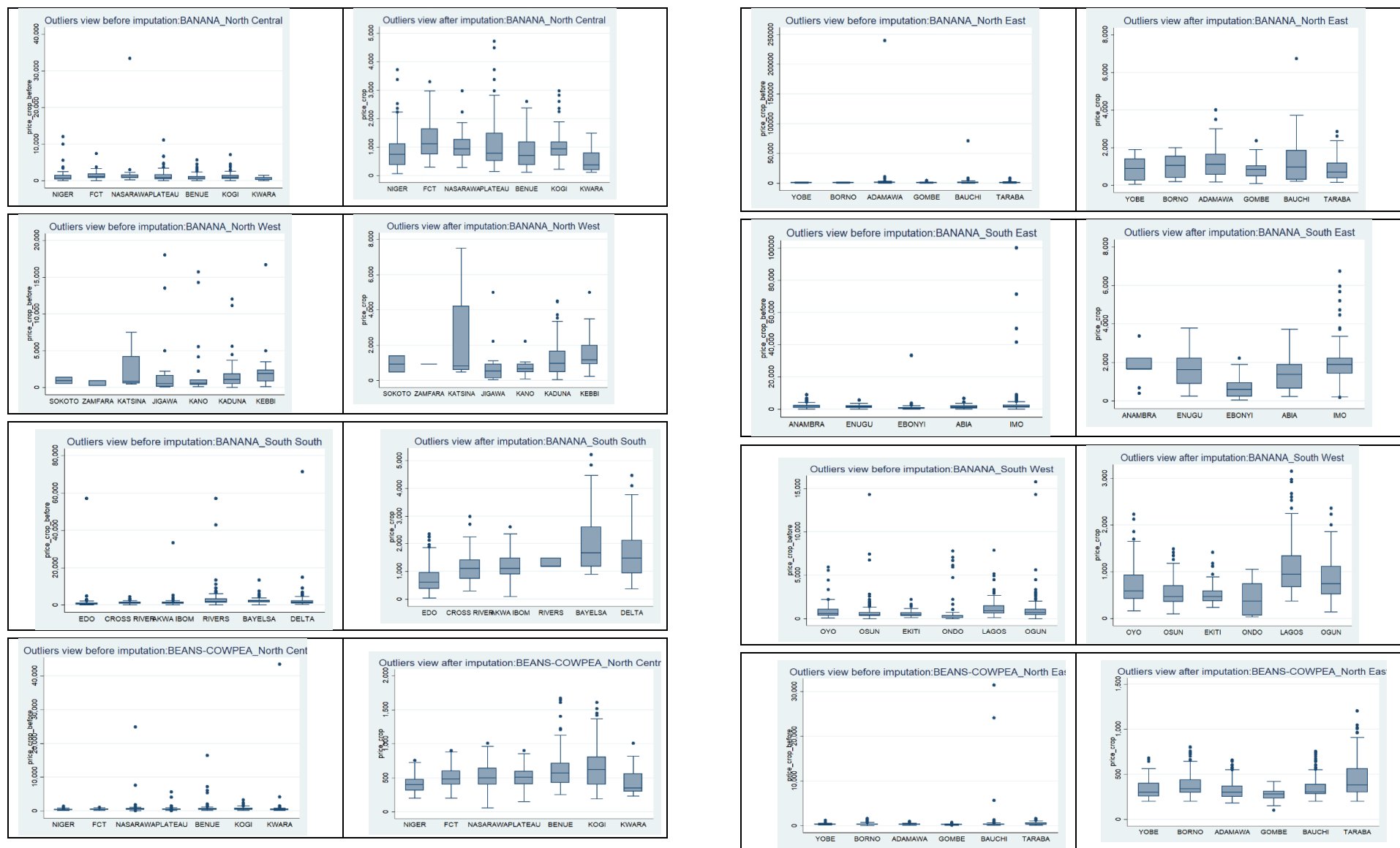
The data-processing process has improved the pertinence of the data on price, mainly by imputing extreme values and many missing values, and also by imputing some units and size to be consistent with the price recorded by the surveyor. Then, estimated median prices are fairly close between states in the same zone, but remain significantly different. There are therefore slight but significant price differences between states in the same zone, but significant differences between zones.

The analyses also revealed that the variable giving the approximate weights of the quantities corresponding to the units shows very strong variability from one community to another, and also very strong inconsistencies with the available conversion factors. These approximations are unusable. For future surveys, the data collected for this question can be improved by two strategies

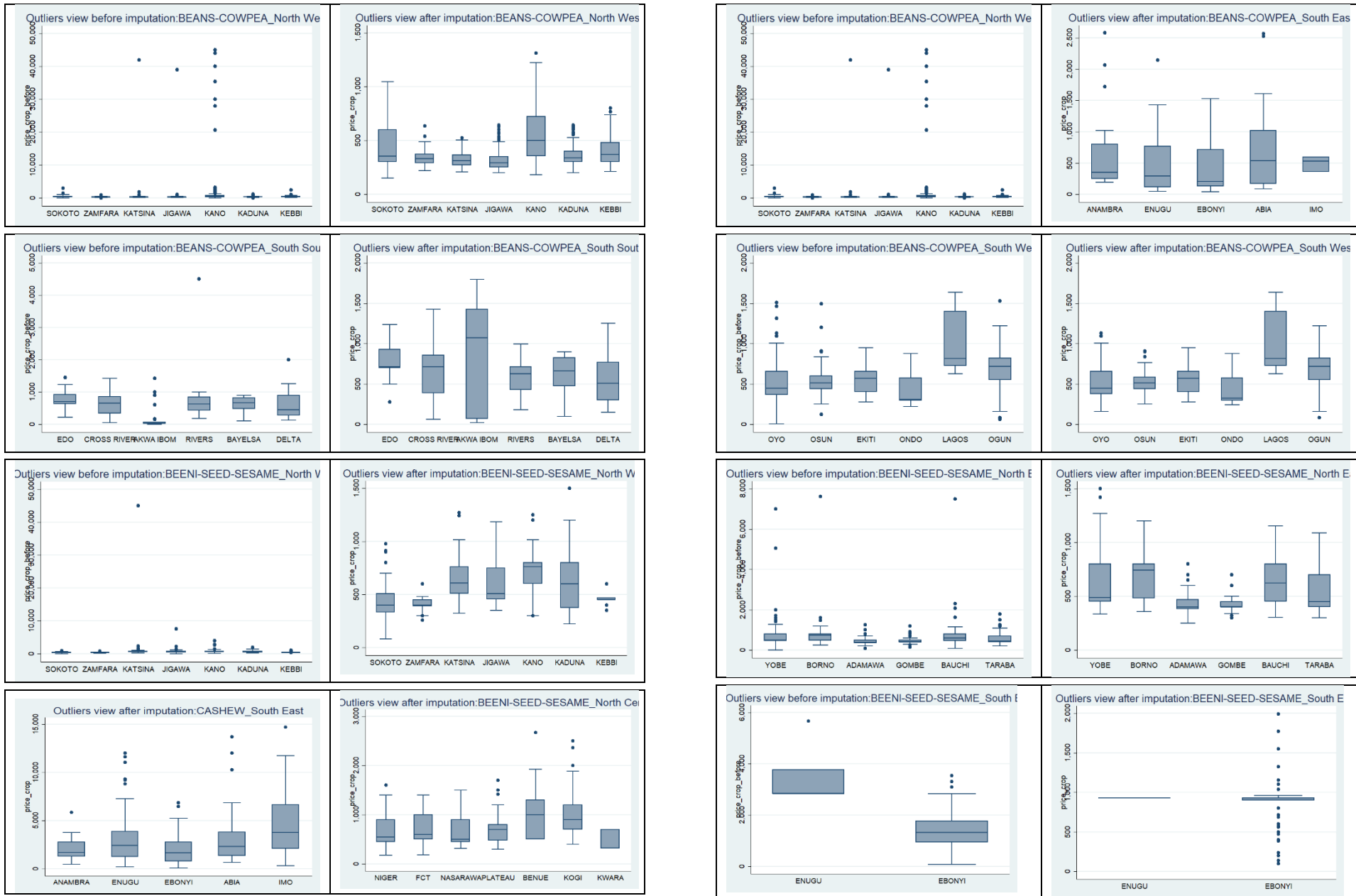
- By introducing controls in question input masks, such as range;
- By giving possibility to record values in grams instead of kilogram, because some incongruous values suggest that they represent measures in grams.

Finally, some missing conversion factor had been found in a handbook of local weight and measure, published by the International Institute of Tropical Agriculture in 2004. We suggest to use these measures to impute conversion factor in upcoming survey. We've also identified some units and crops for which the measurements given in this handbook present significant gap with conversions factor using in NASS. It would be useful to carry out a more depth analysis of units and crops with large gaps.

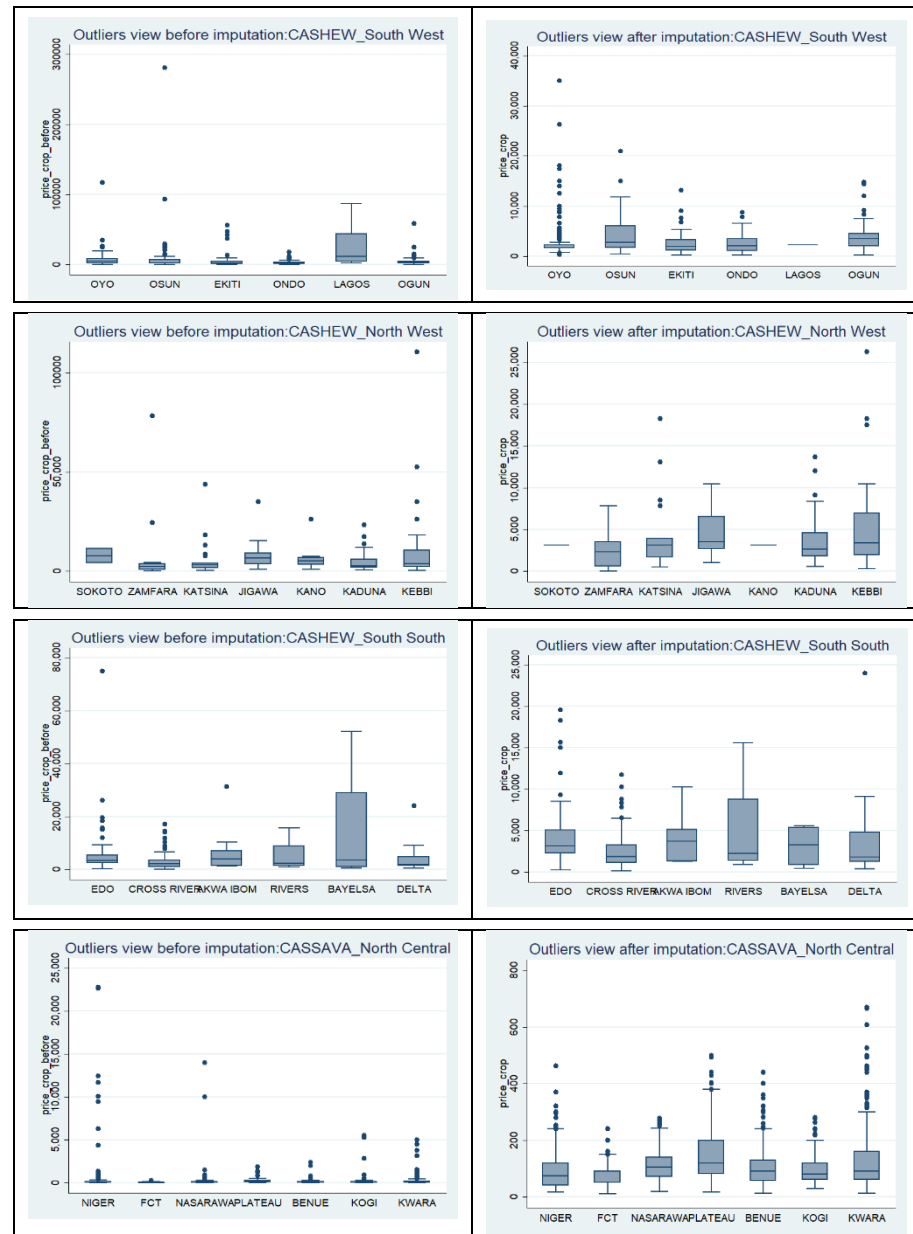
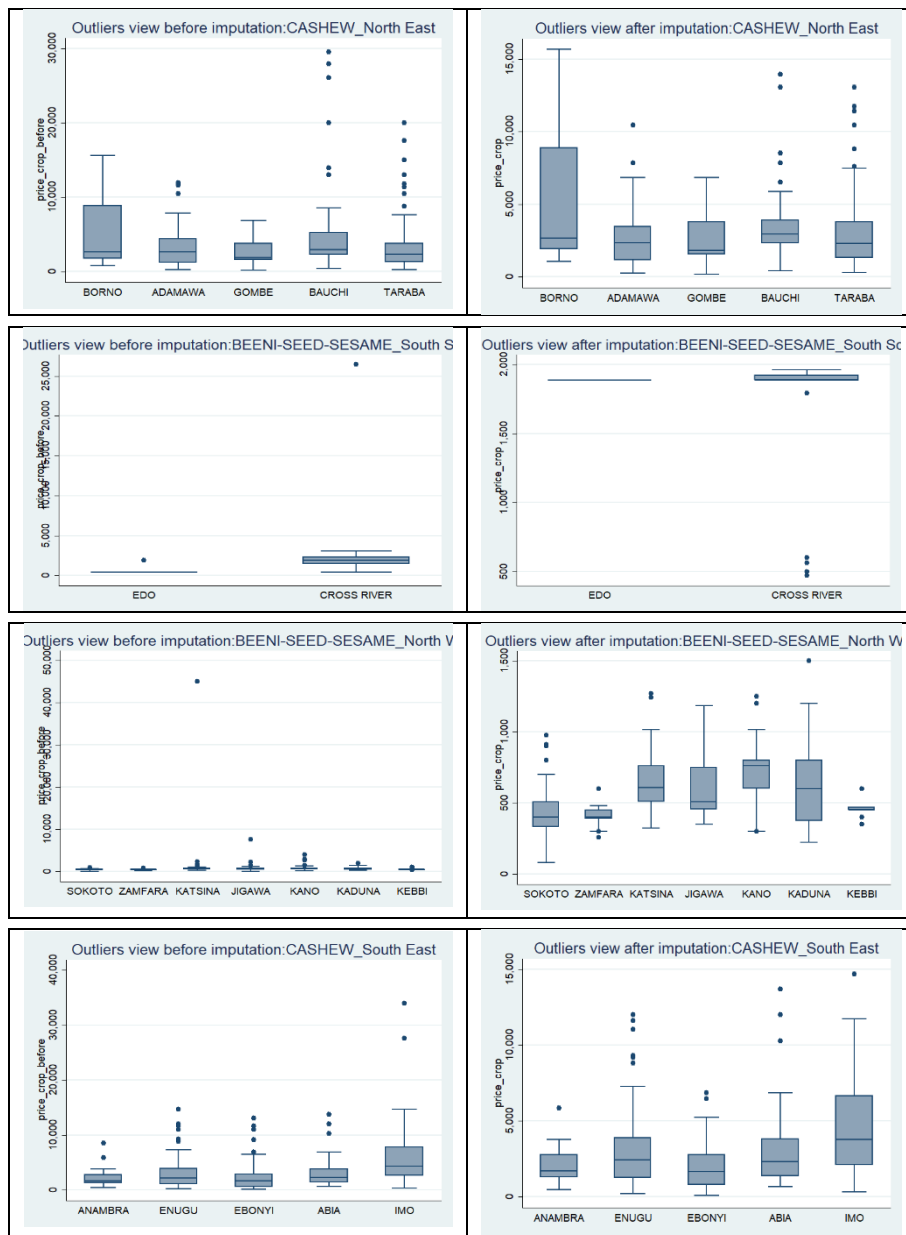
Appendix 1. : By crop and by zone, box plots of price in states comparison before versus after data processing



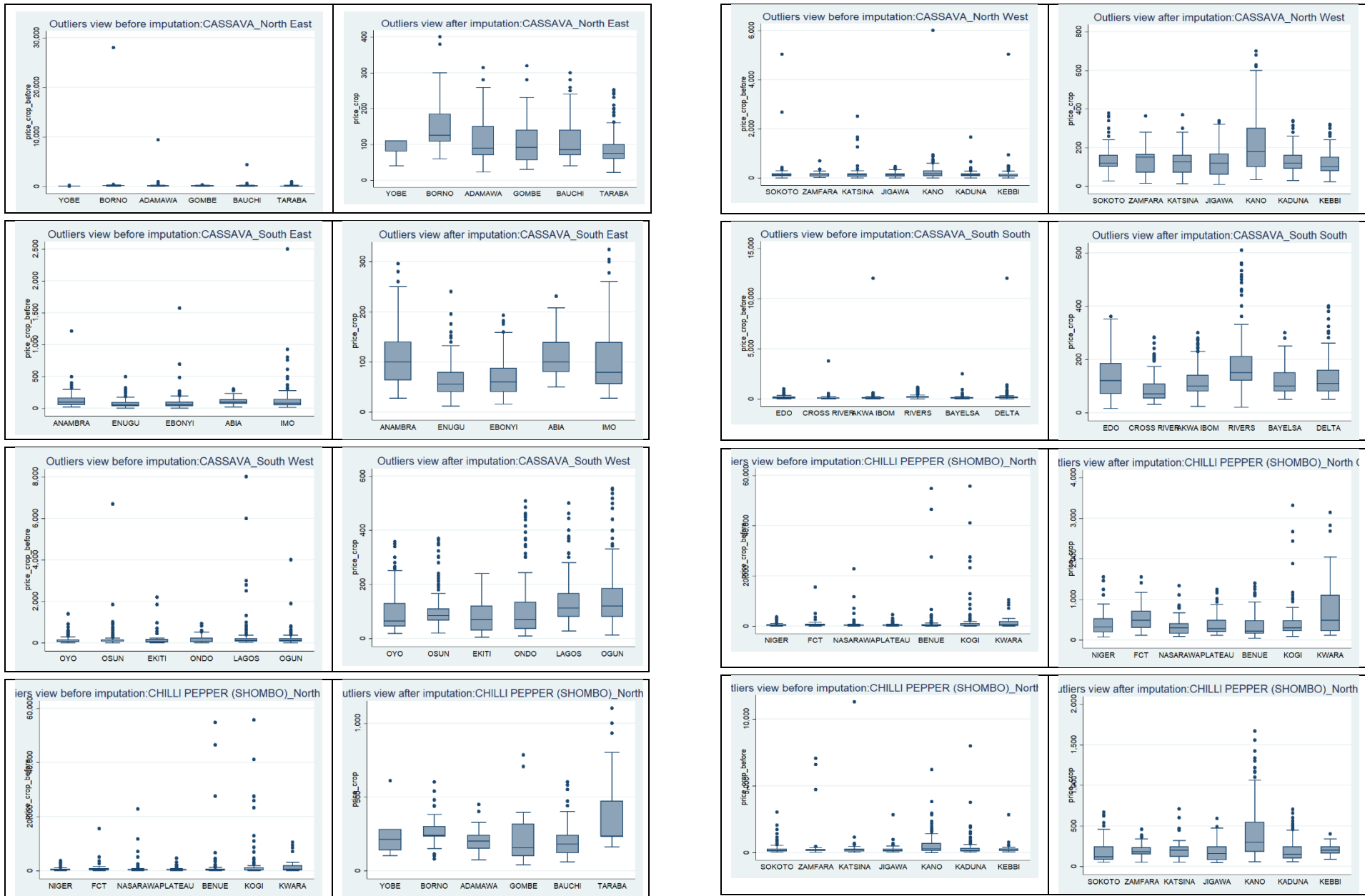
In depth analysis of Crops price data, NASS



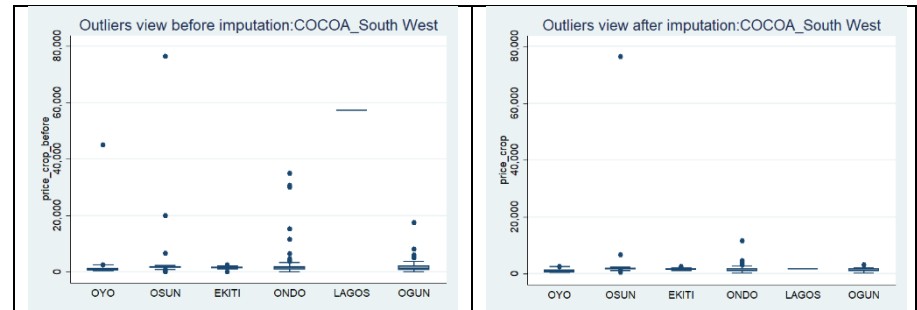
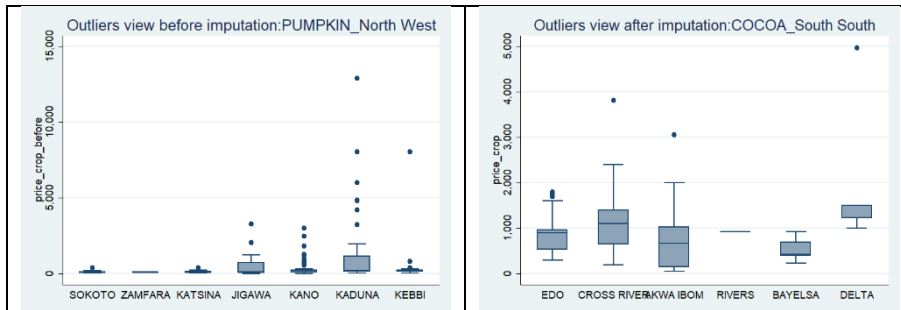
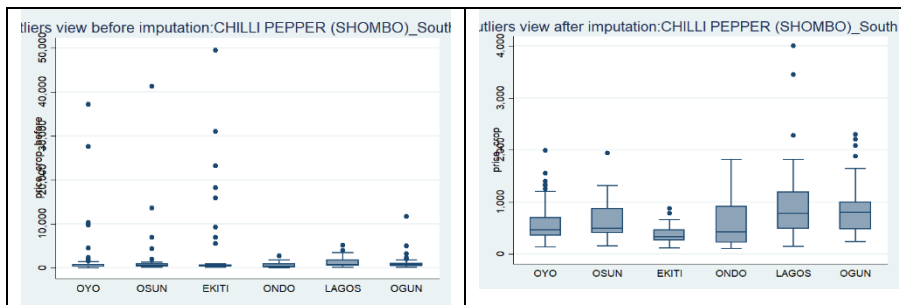
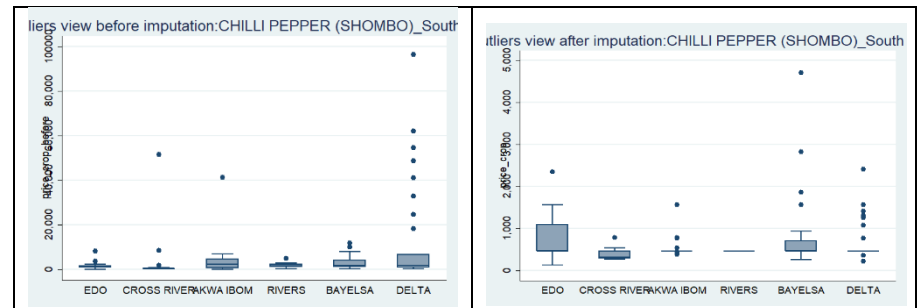
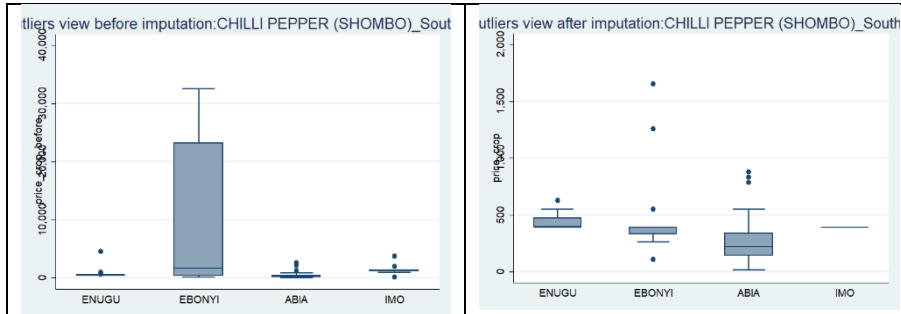
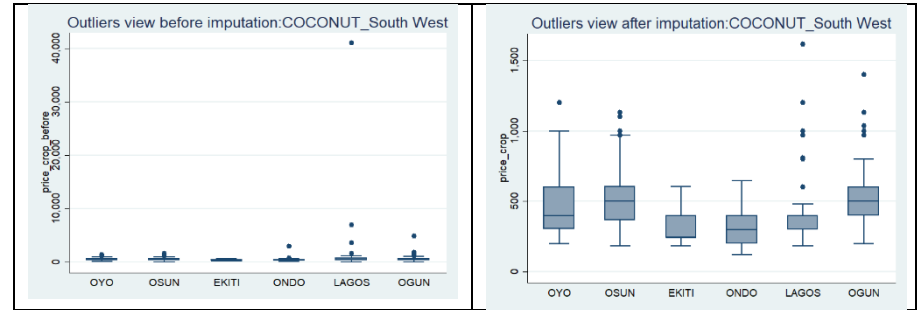
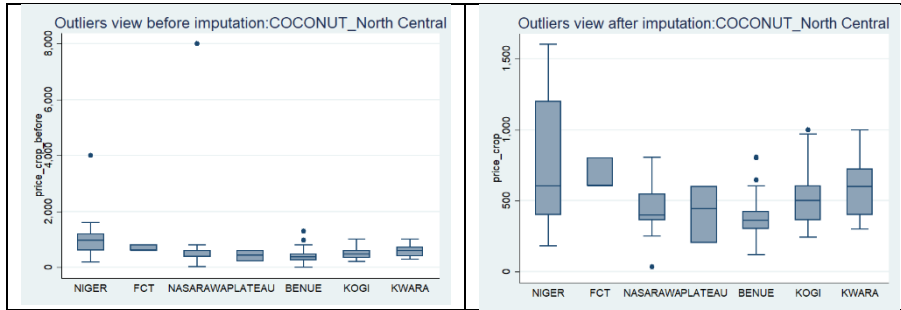
In depth analysis of Crops price data, NASS



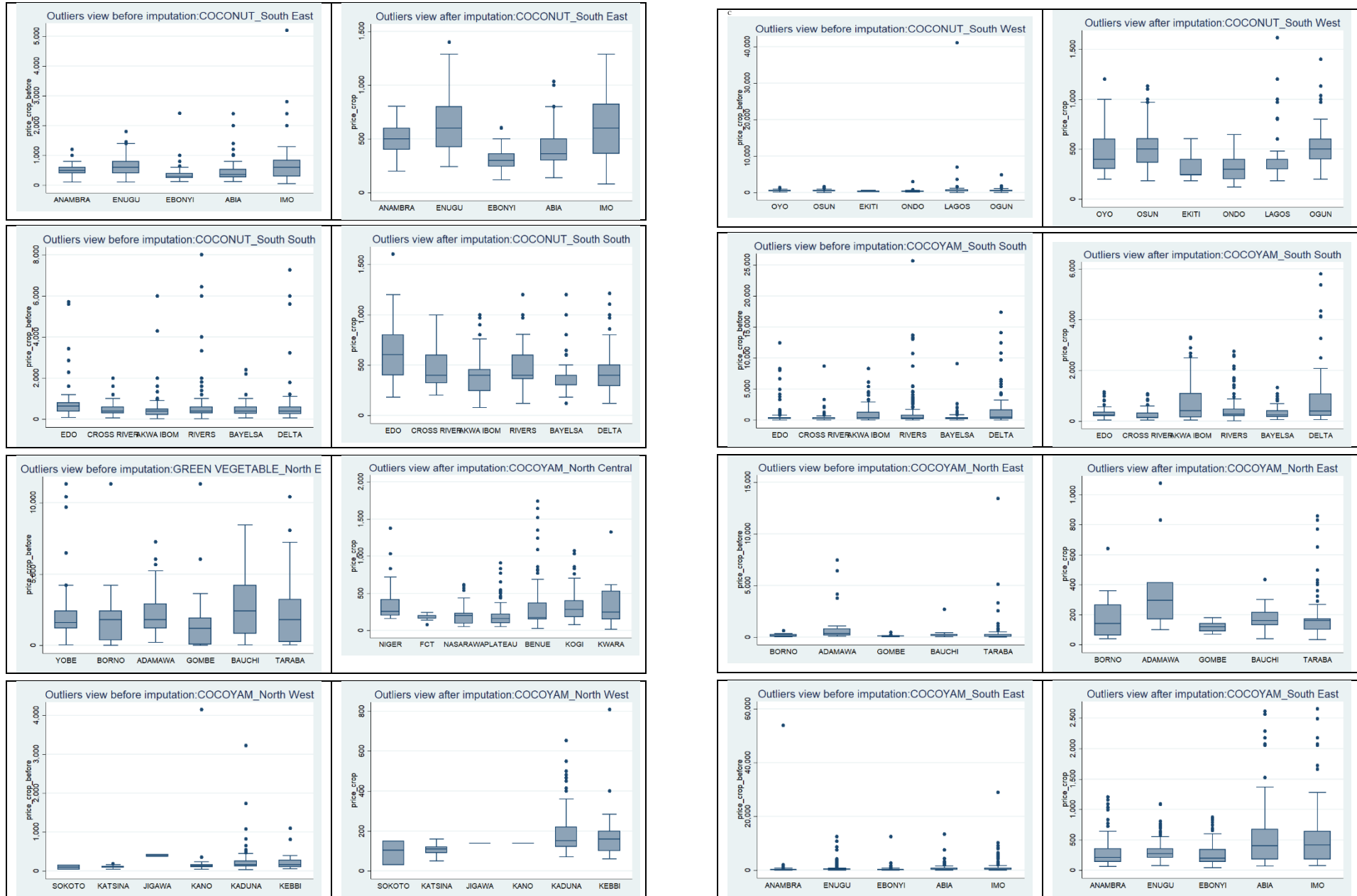
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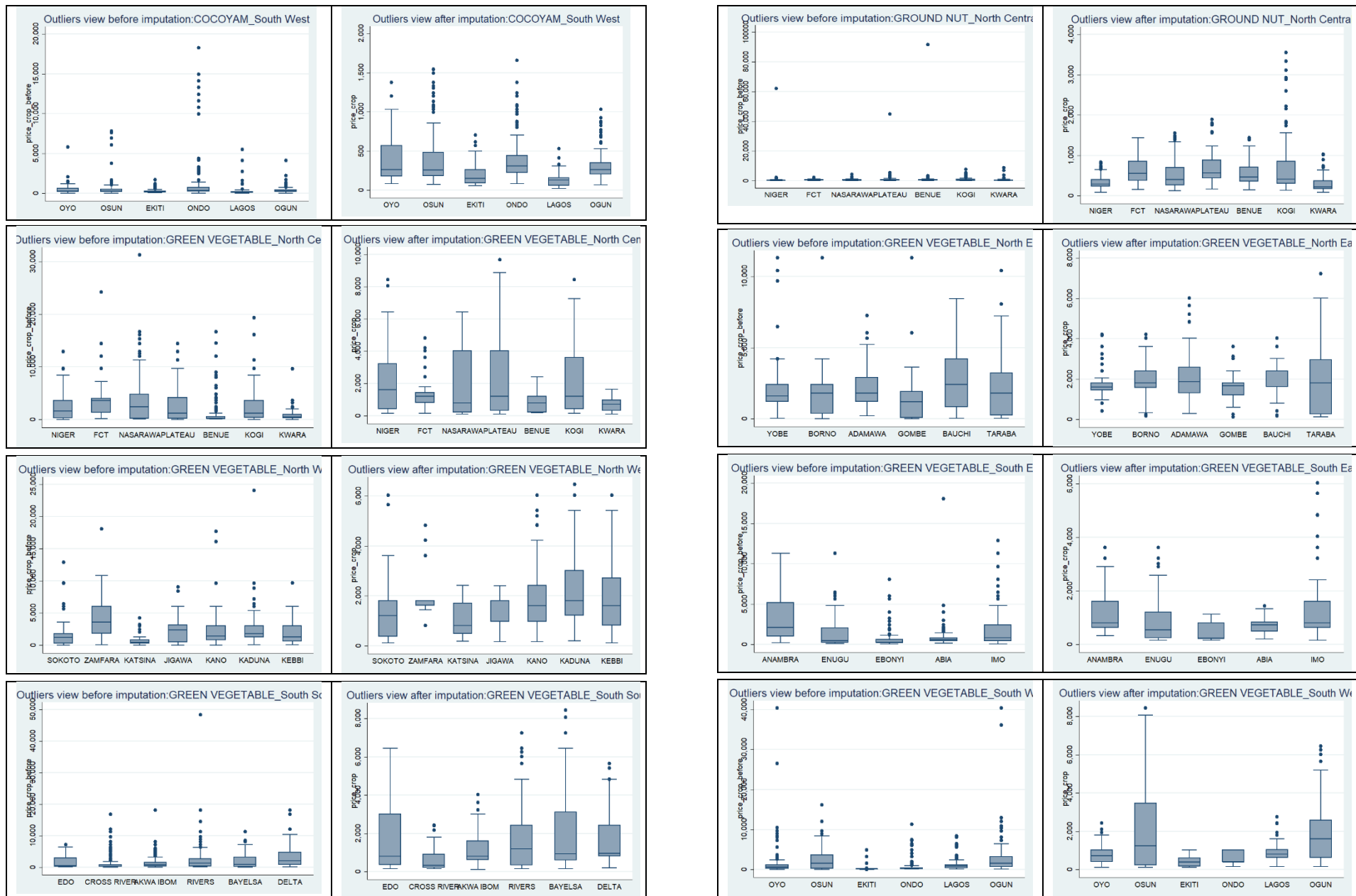
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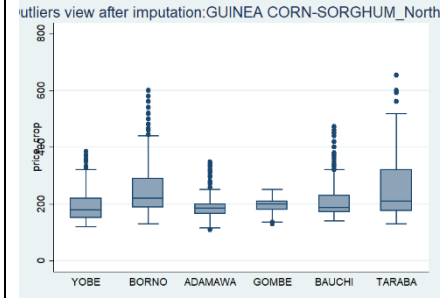
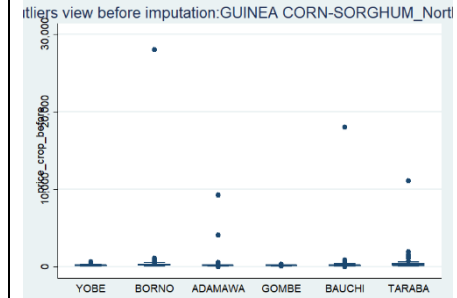
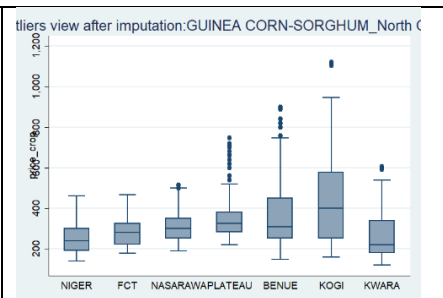
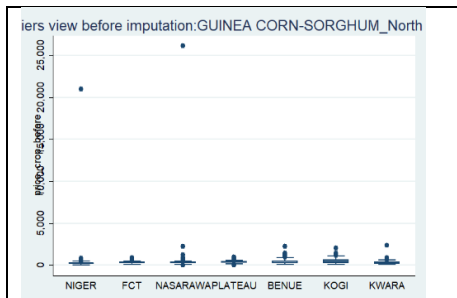
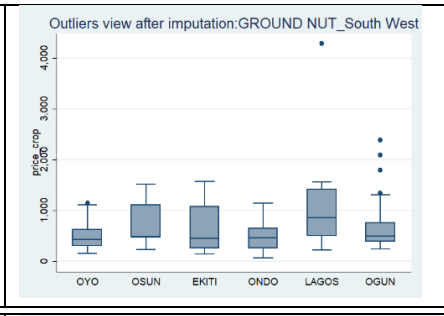
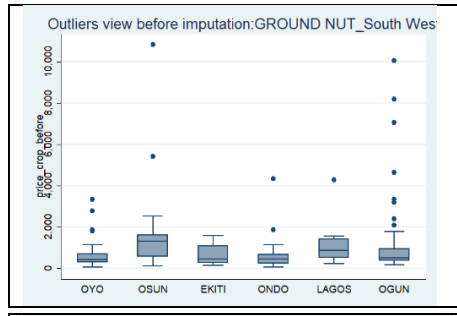
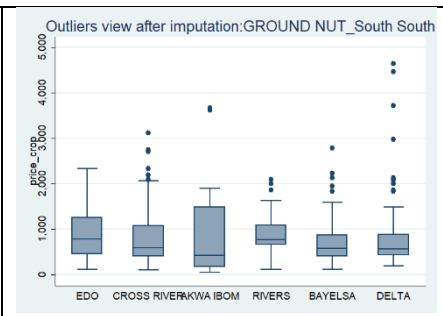
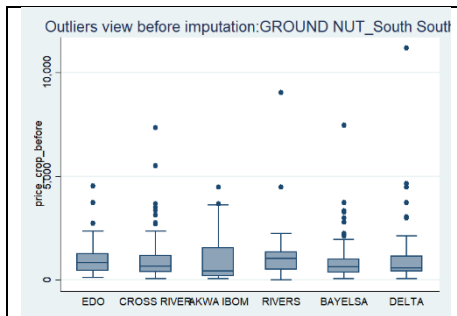
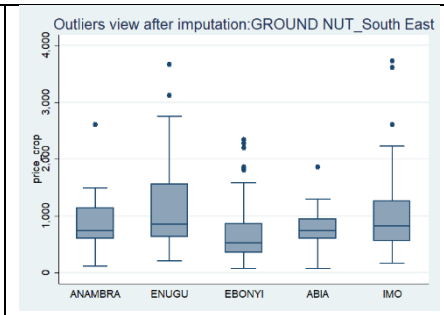
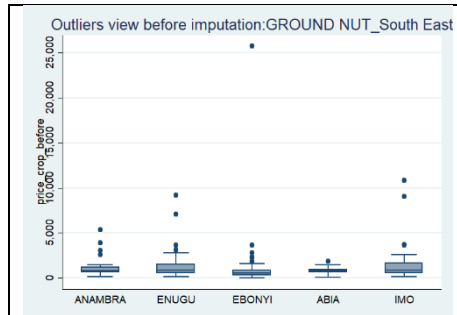
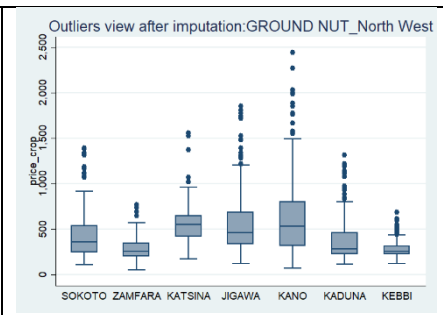
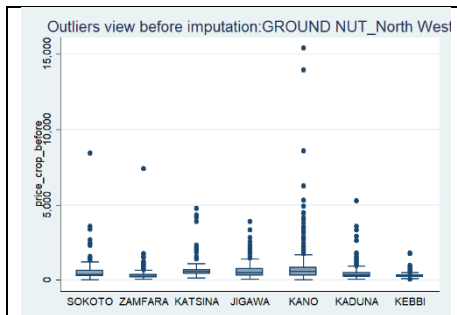
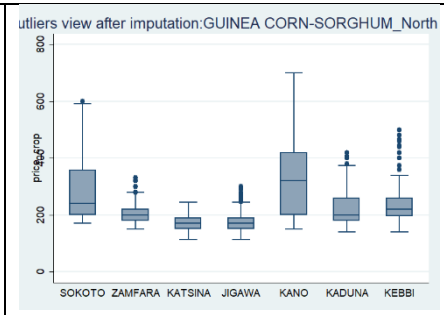
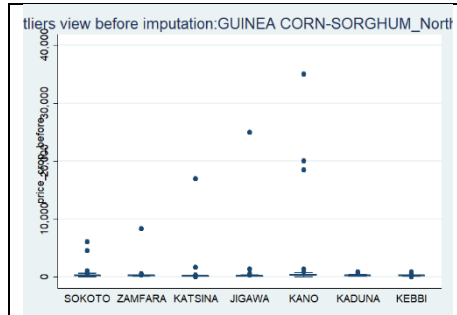
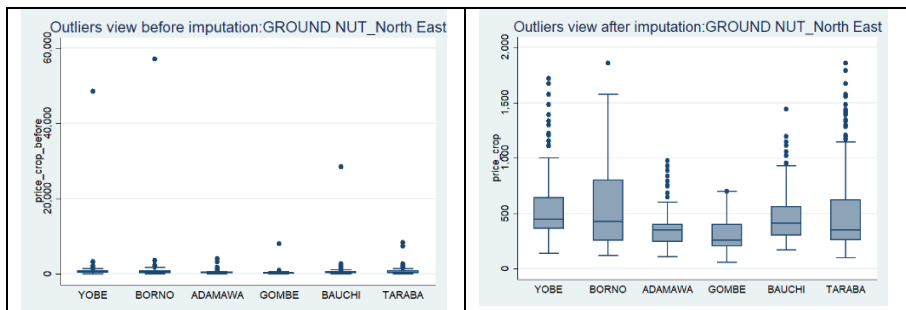
In depth analysis of Crops price data, NASS



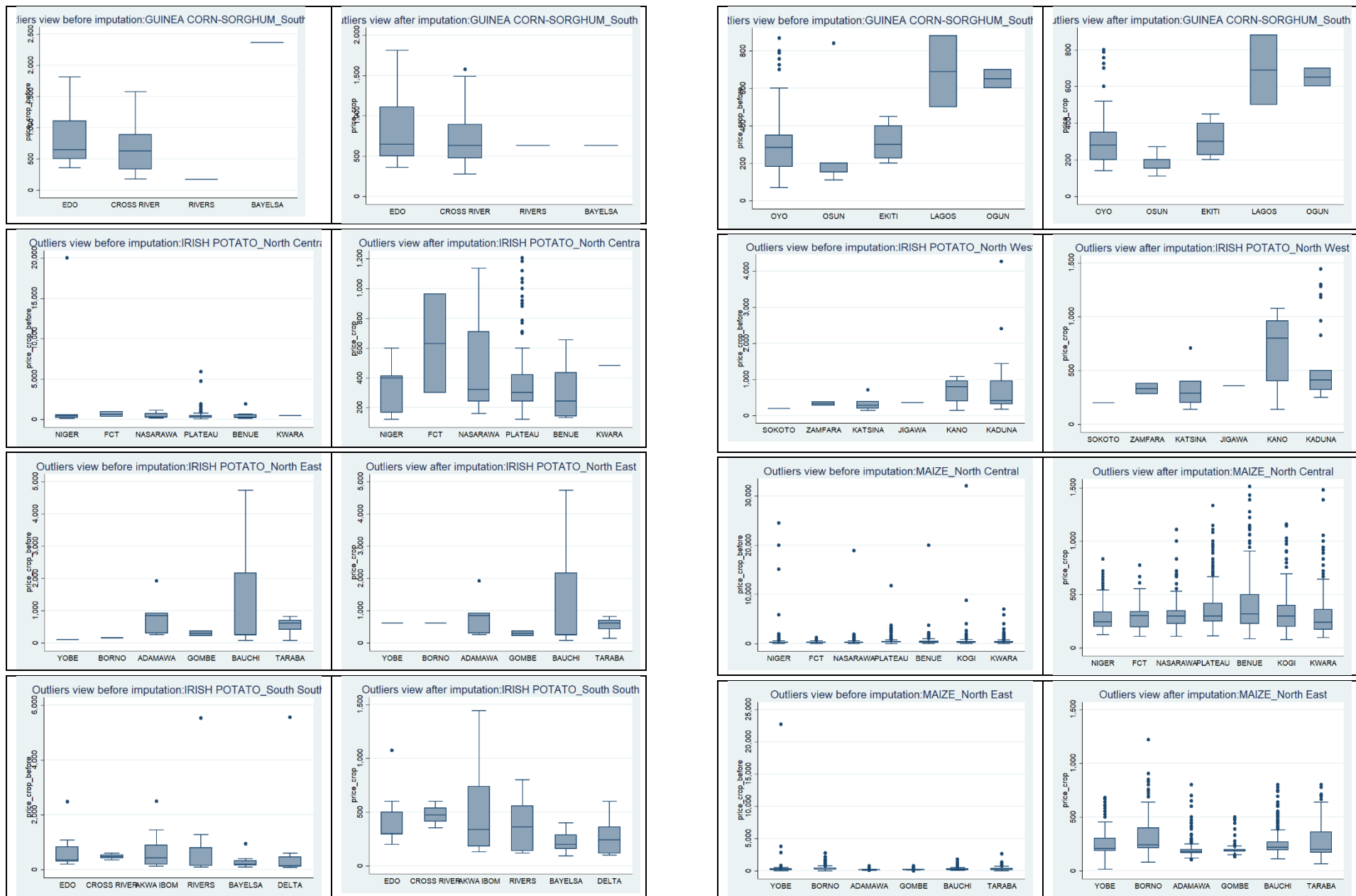
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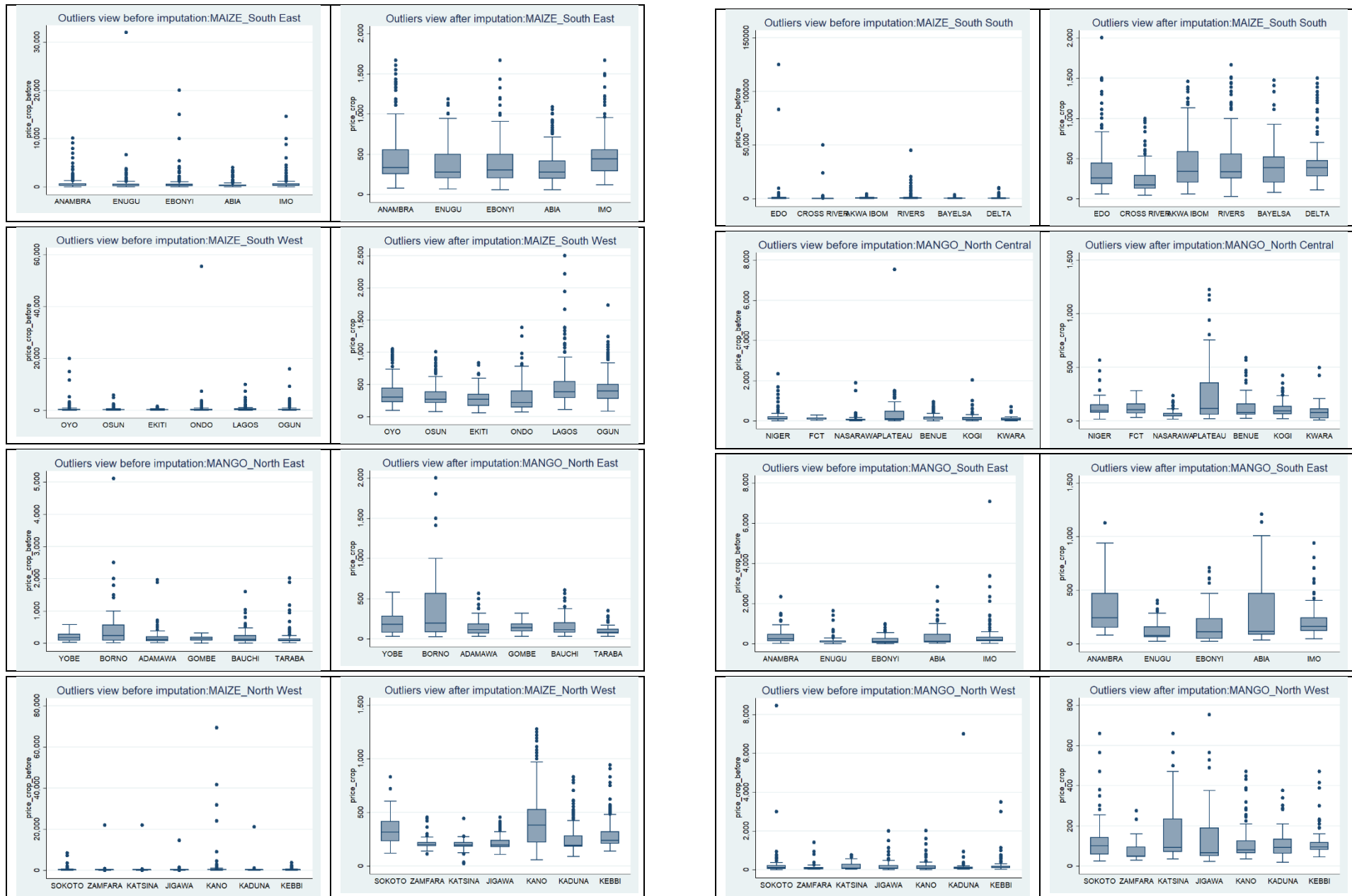
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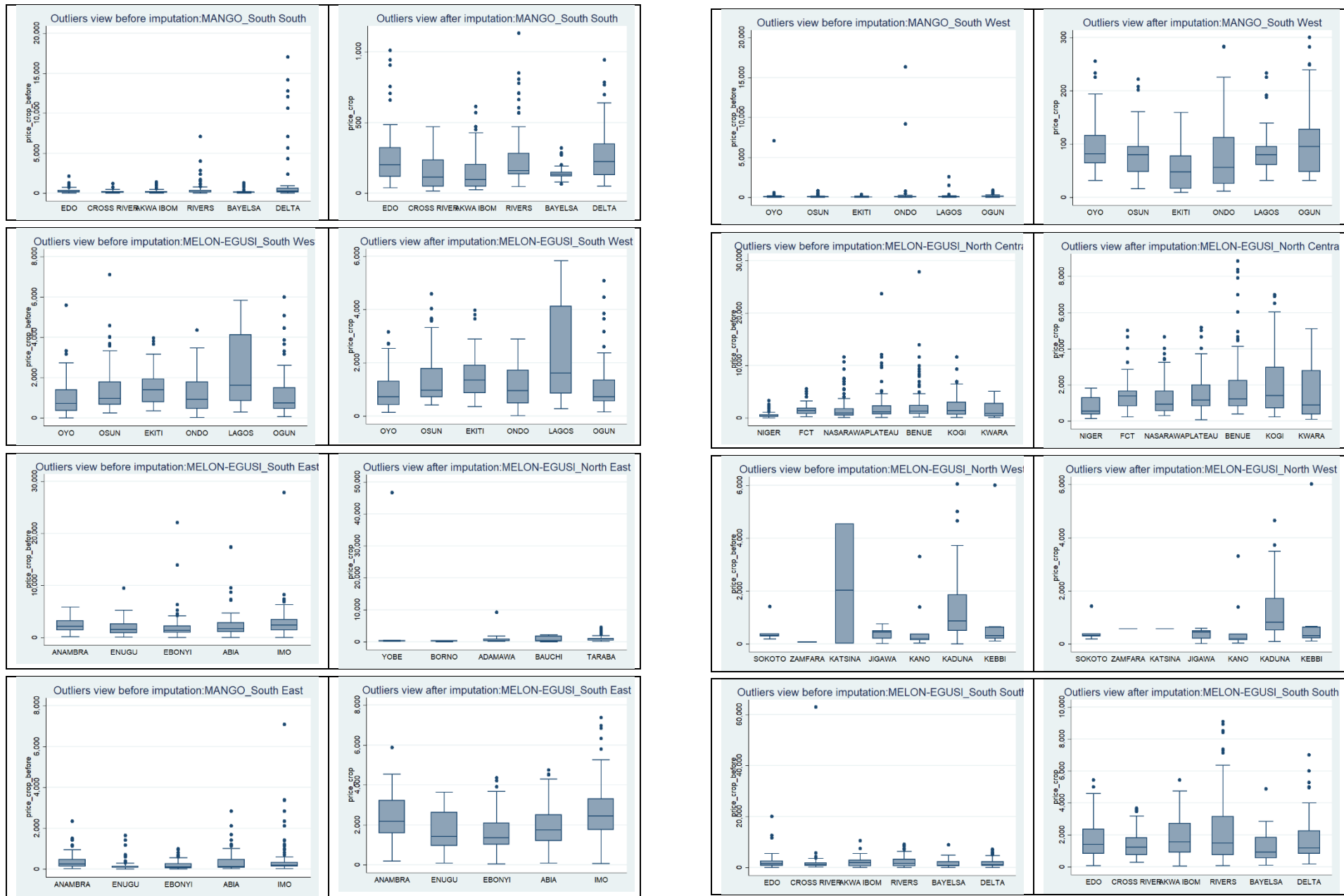
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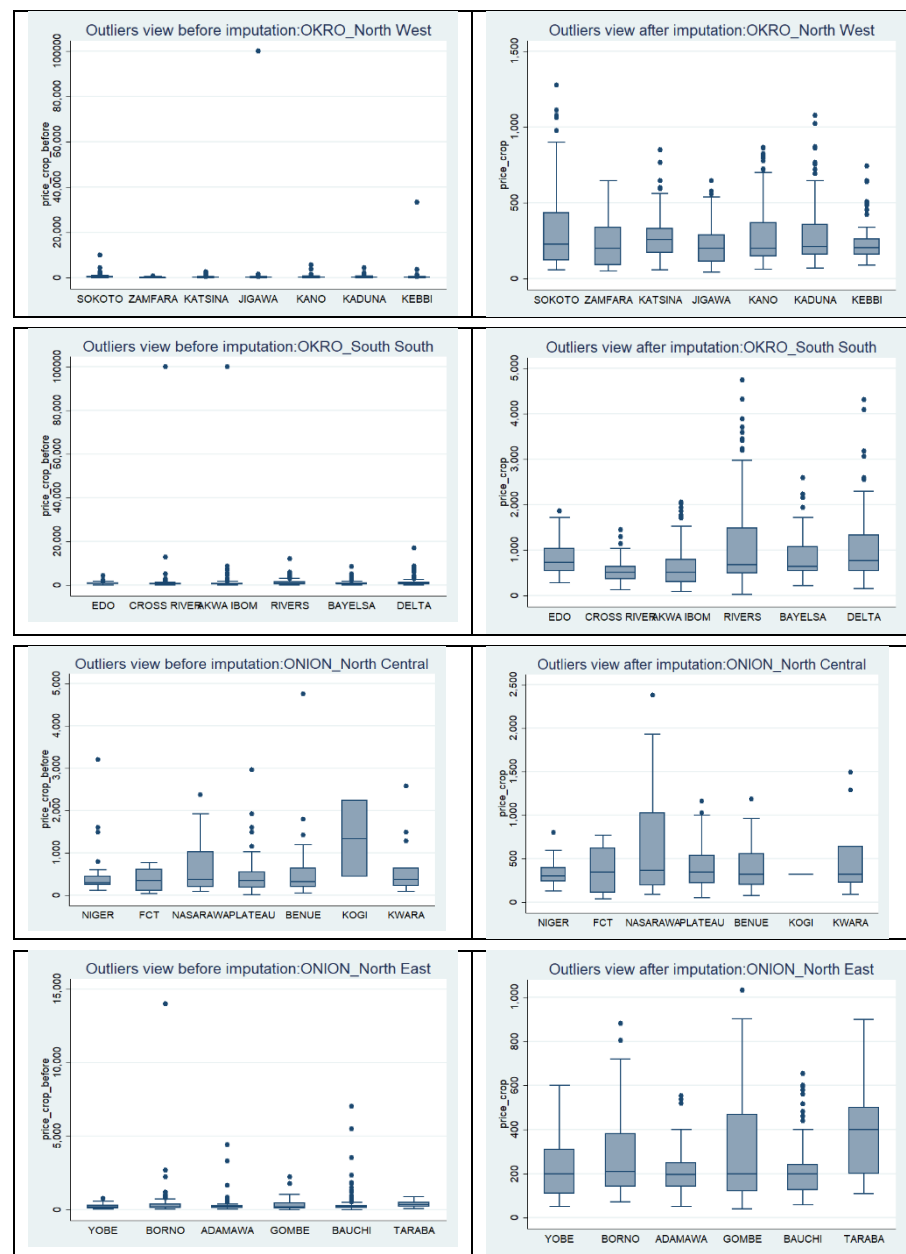
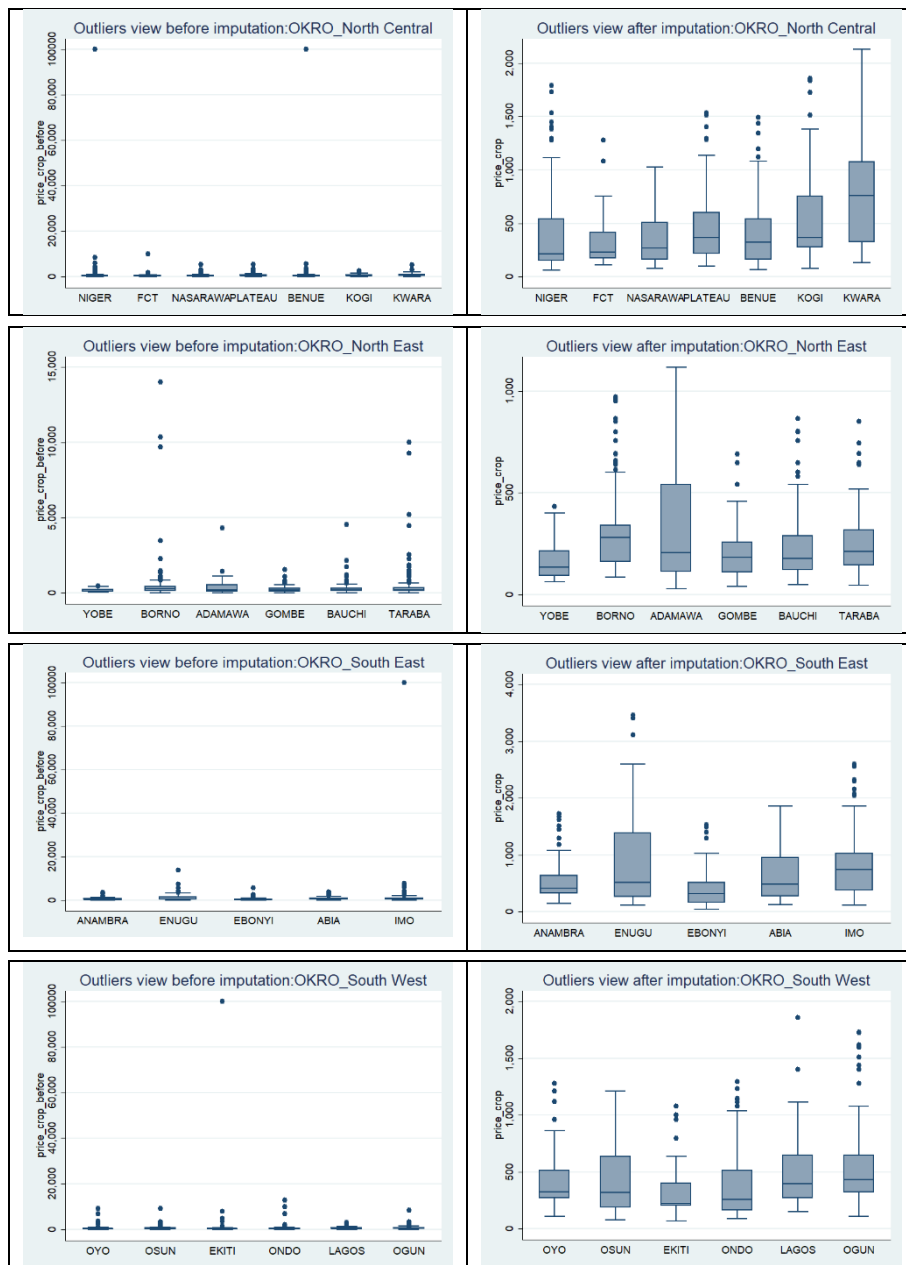


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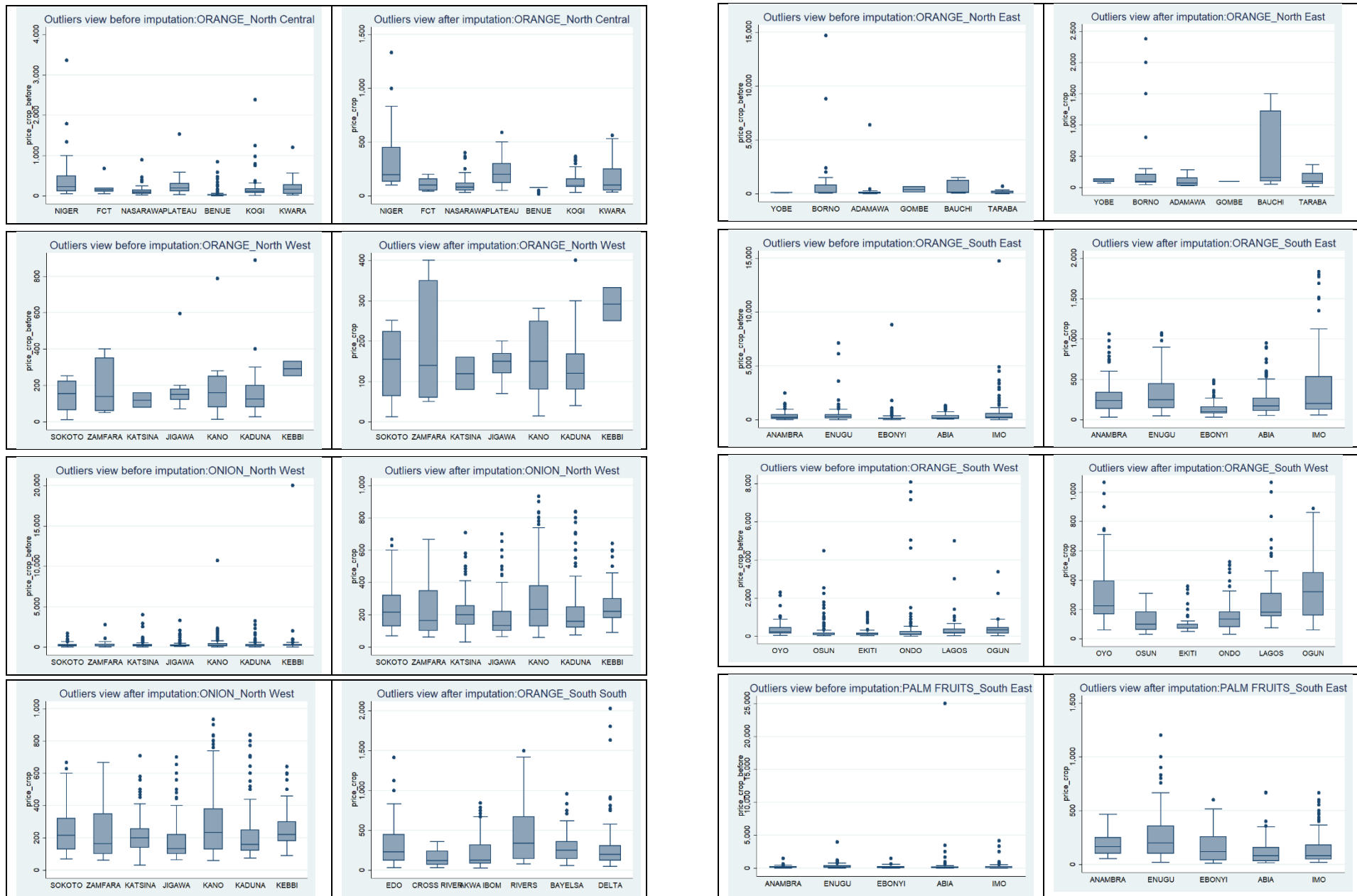


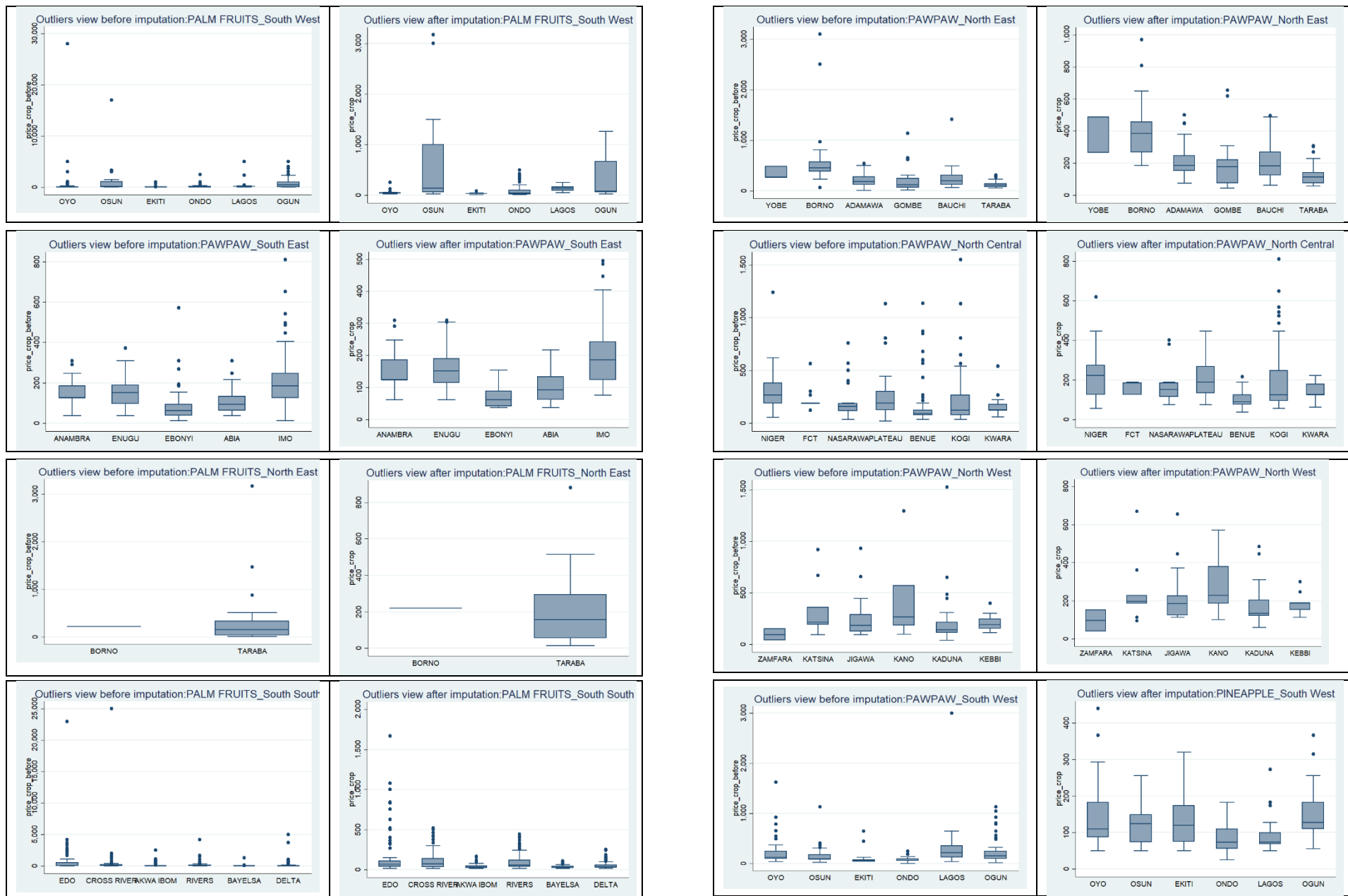
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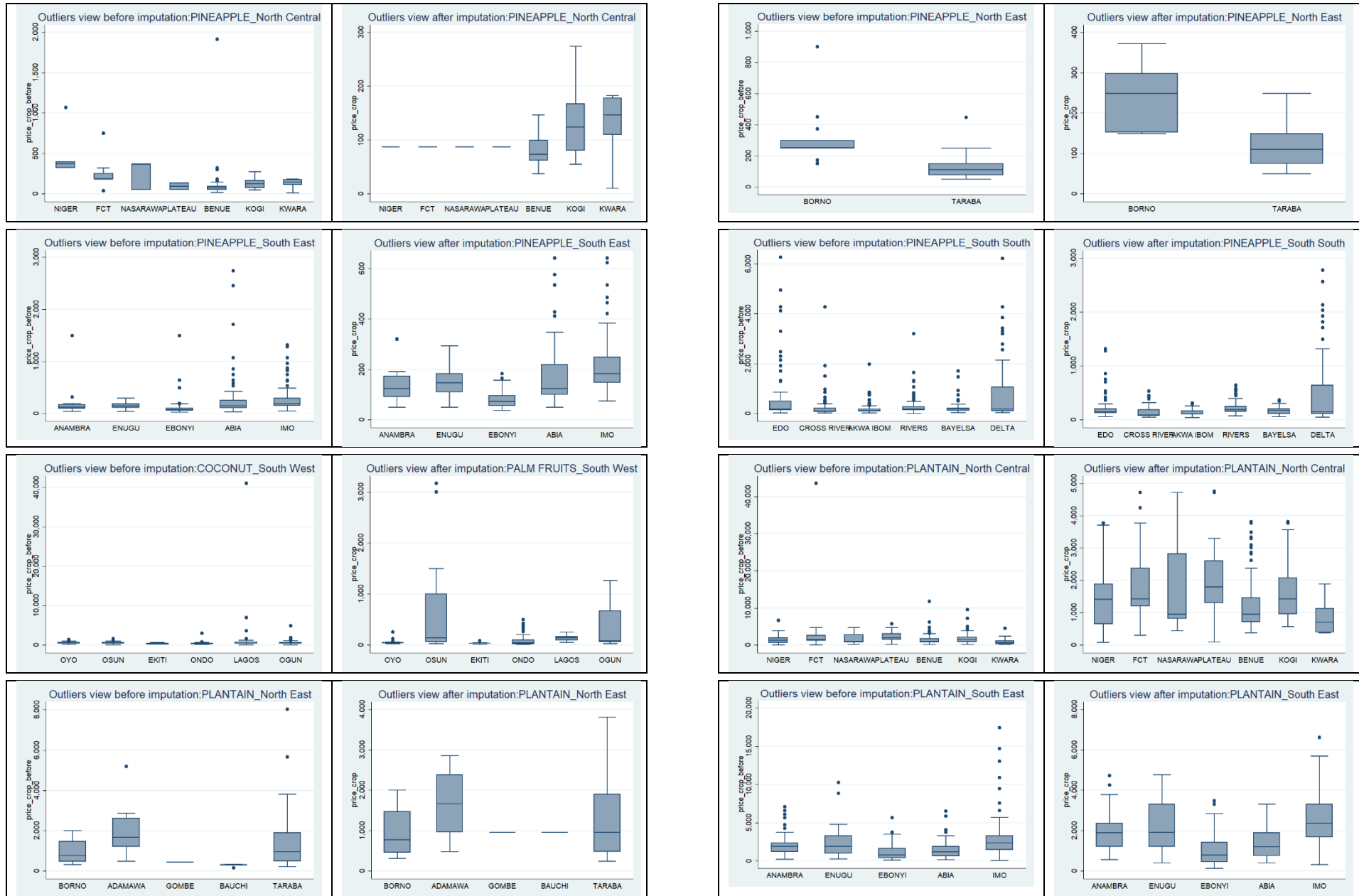


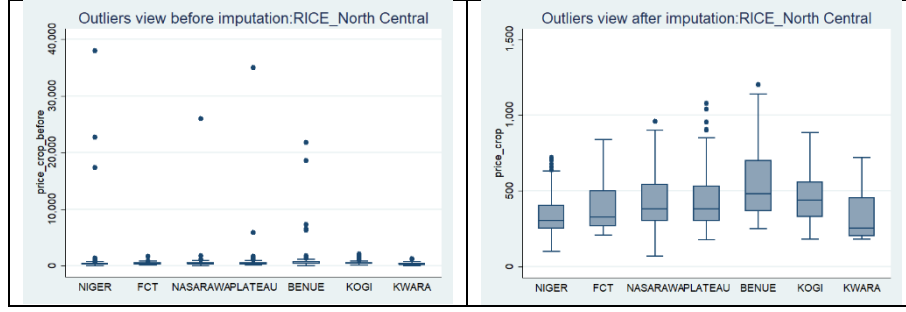
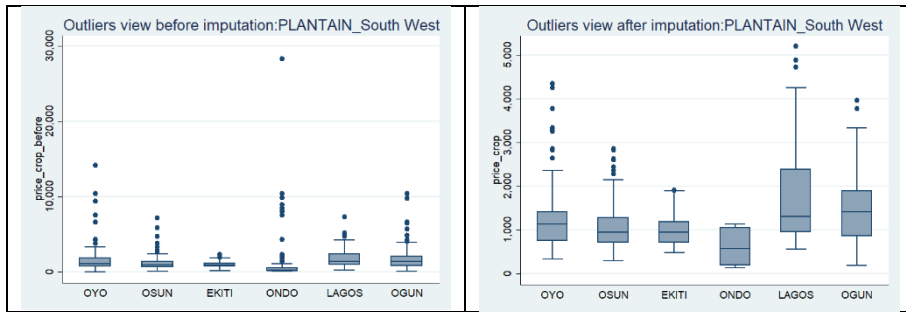
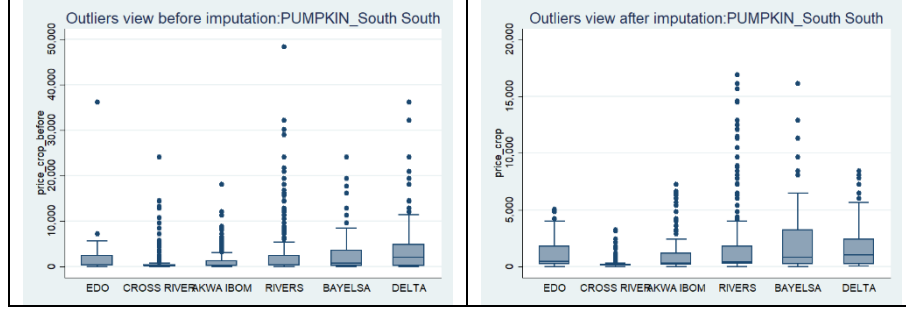
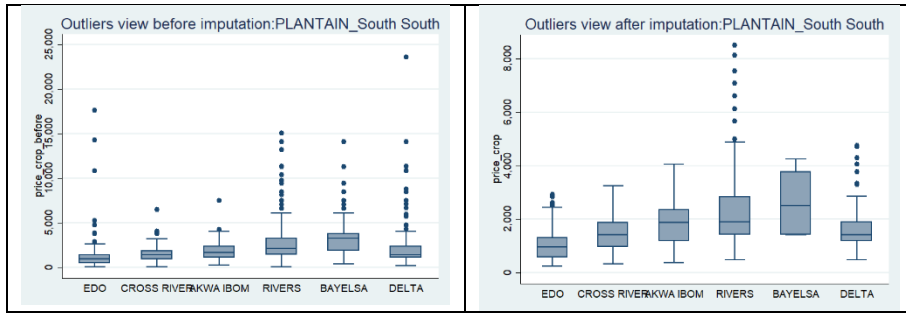
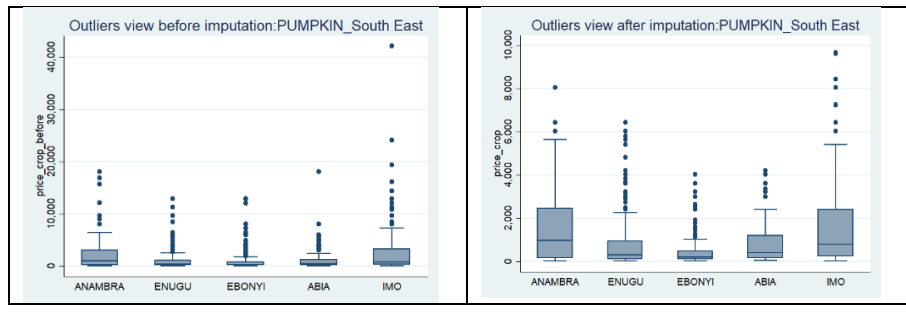
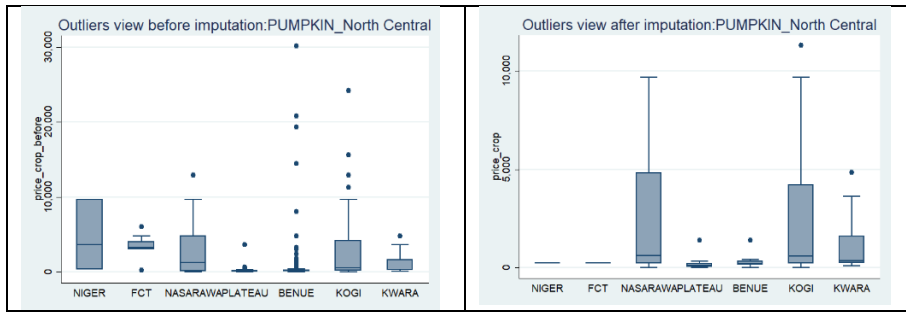
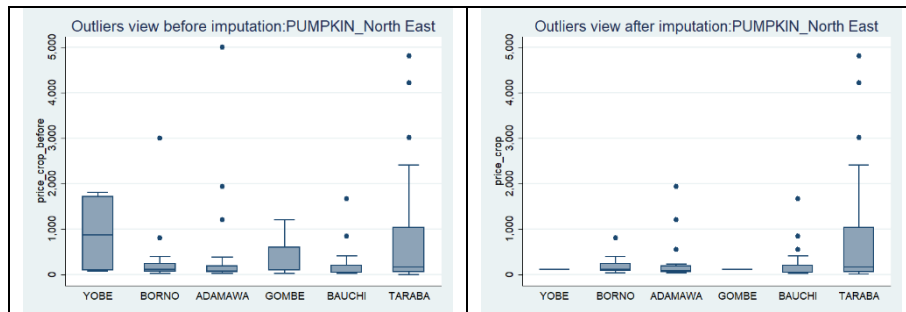
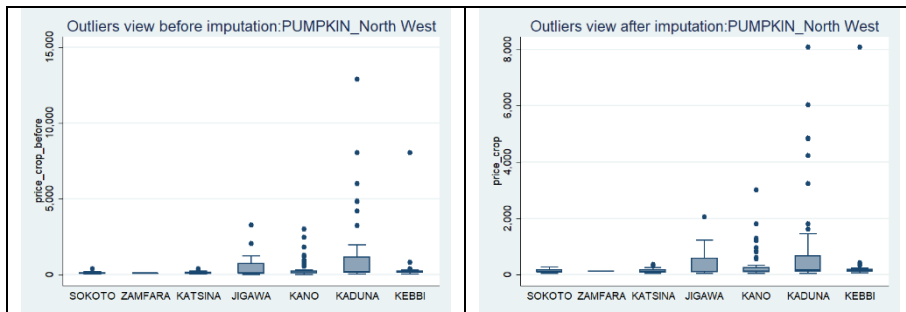
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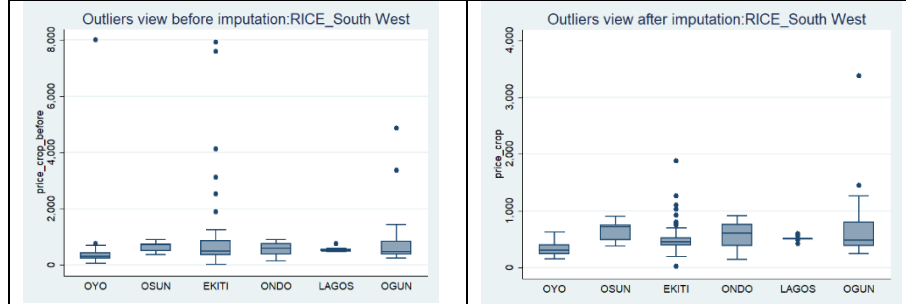
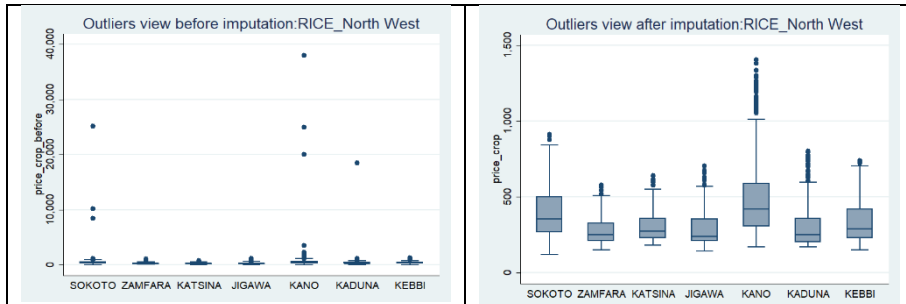
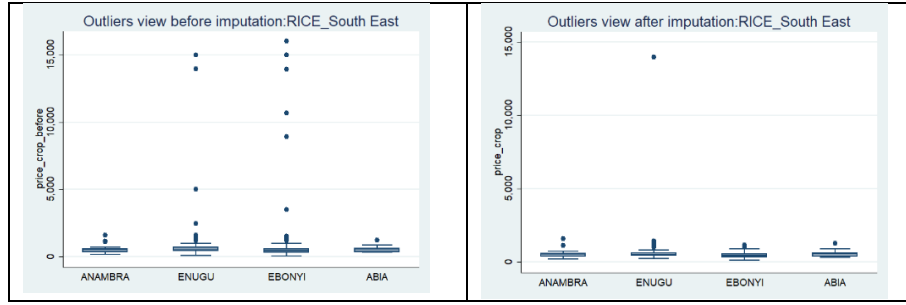
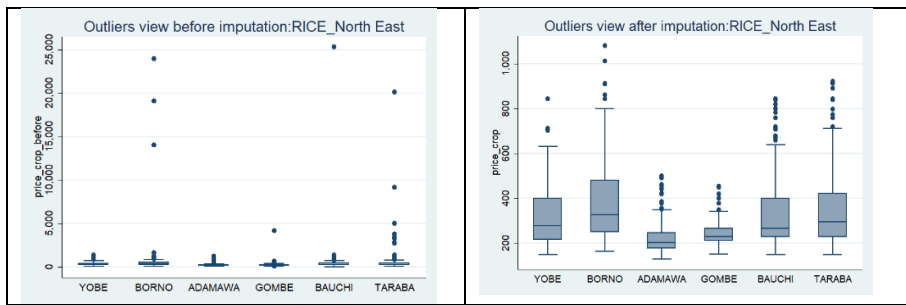
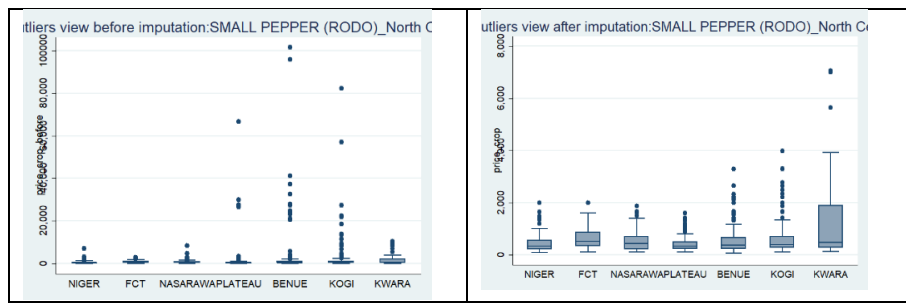
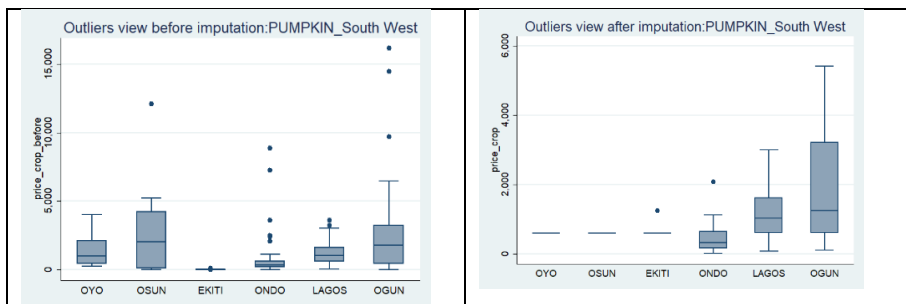
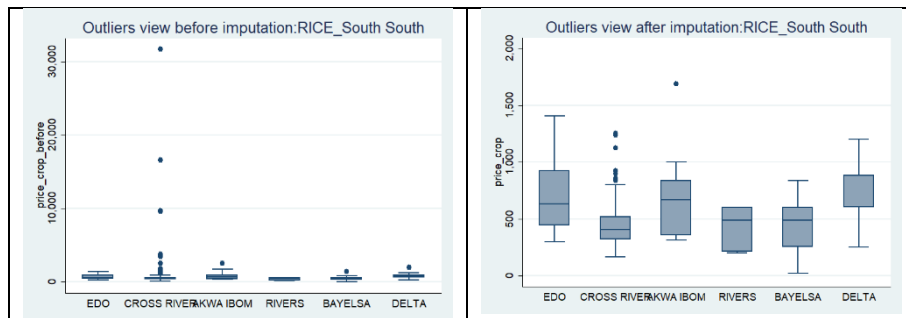
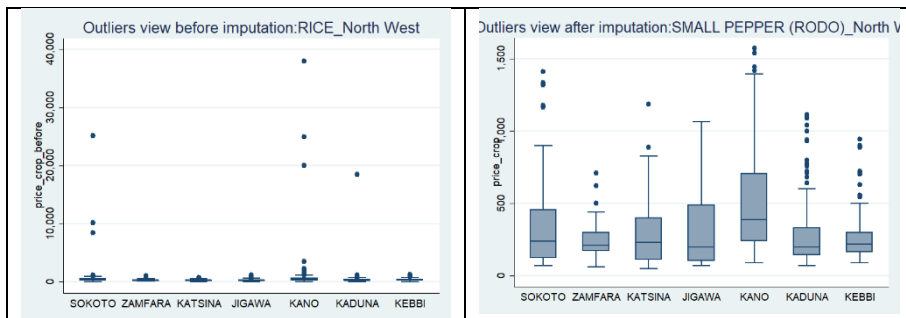


In depth analysis of Crops price data, NASS

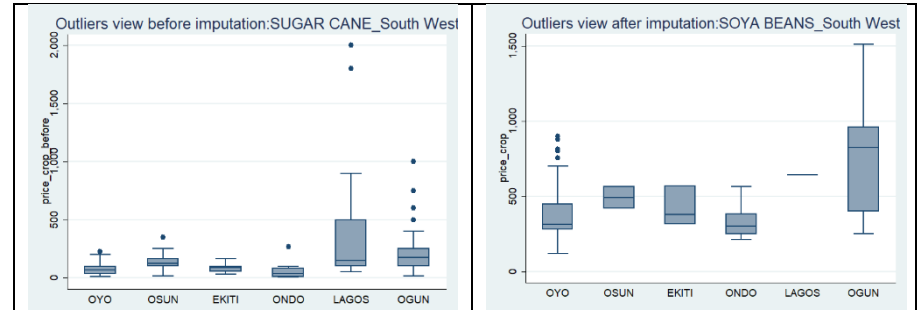
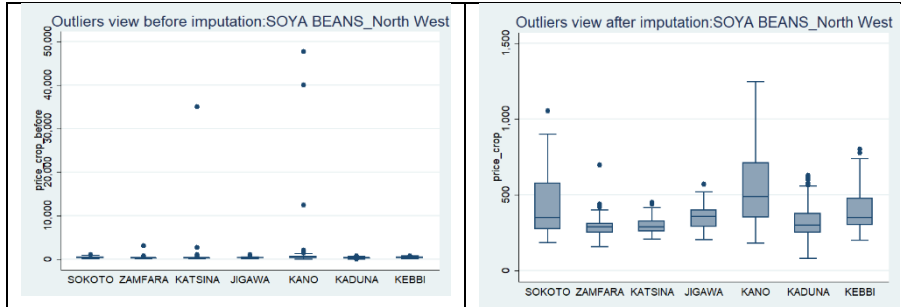
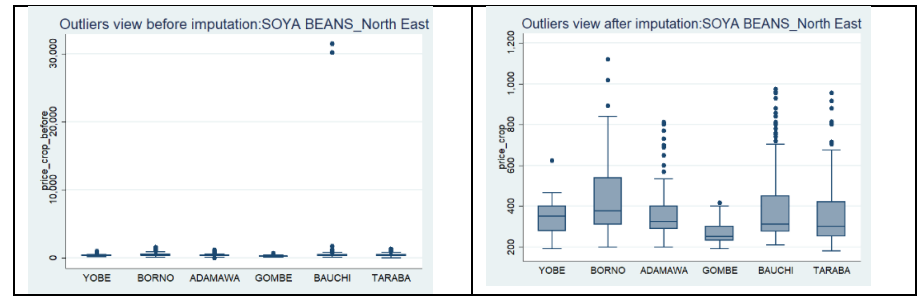
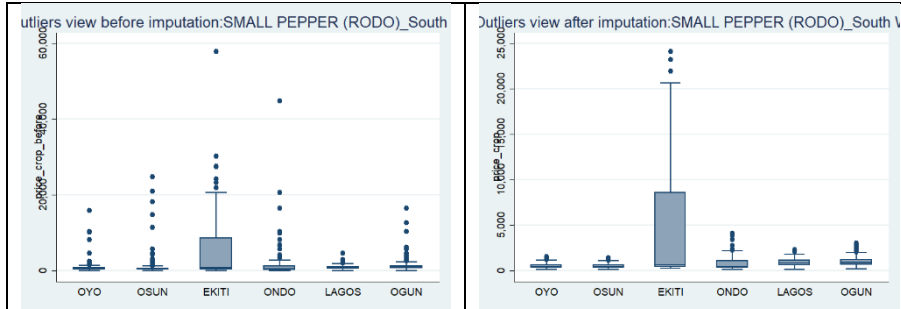
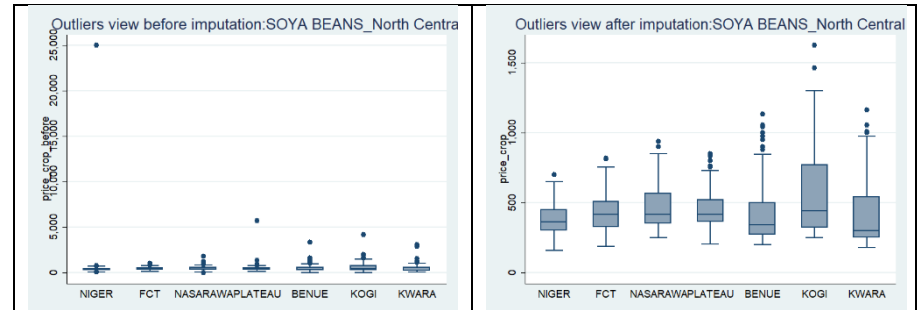
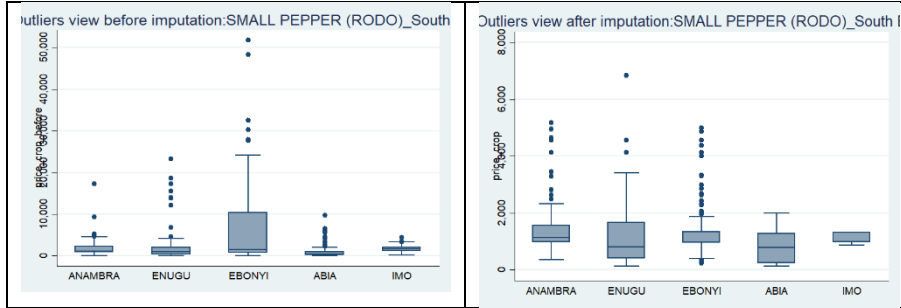
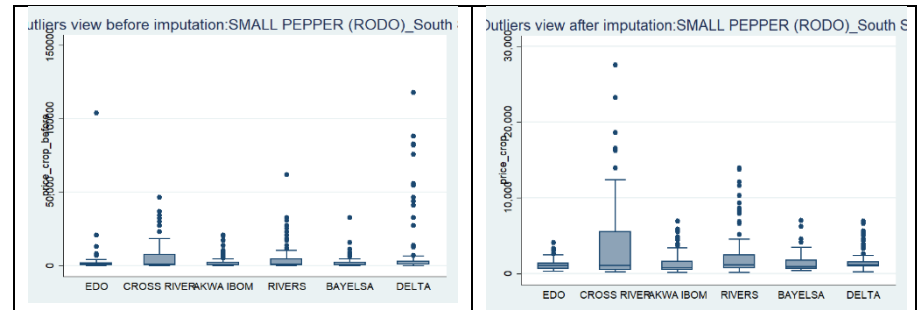
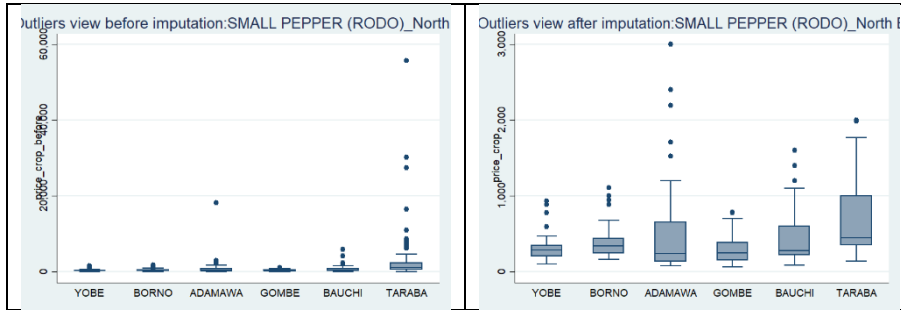




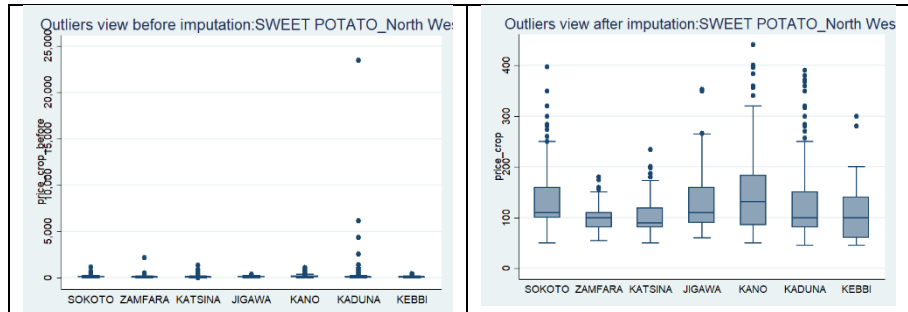
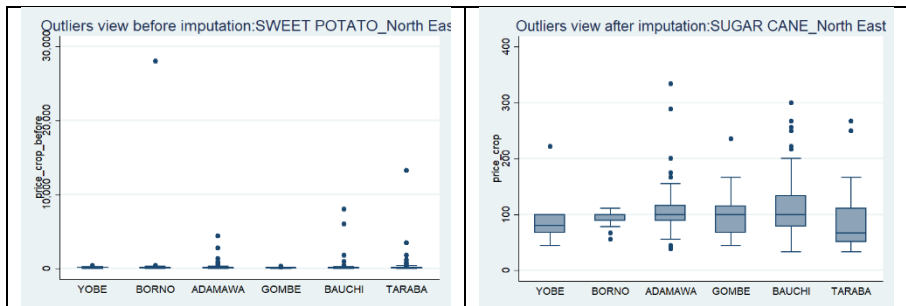
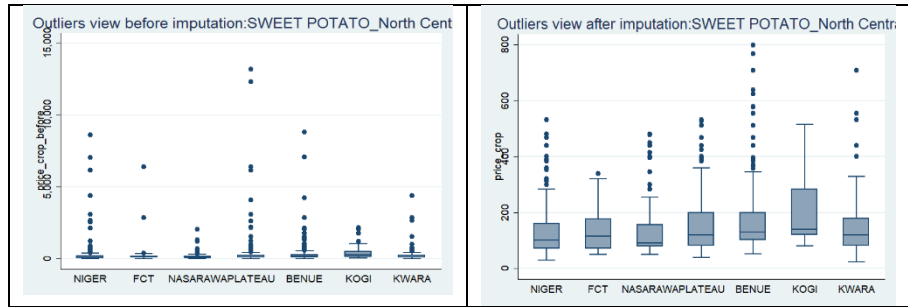
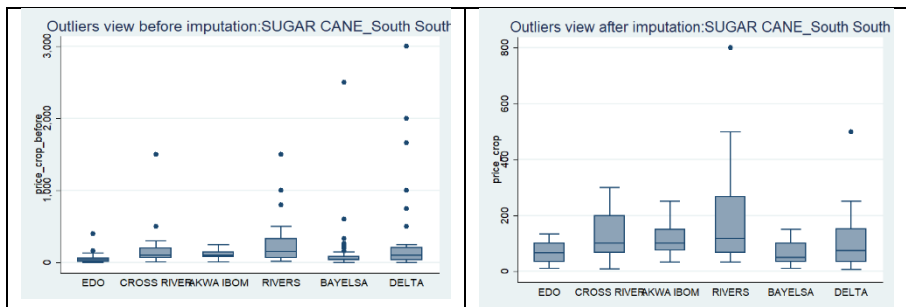
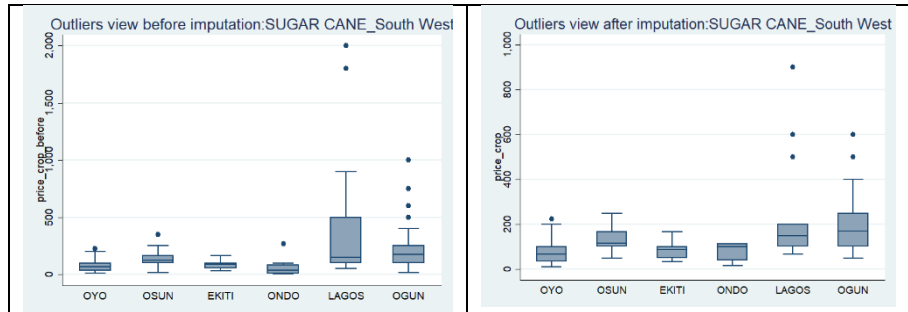
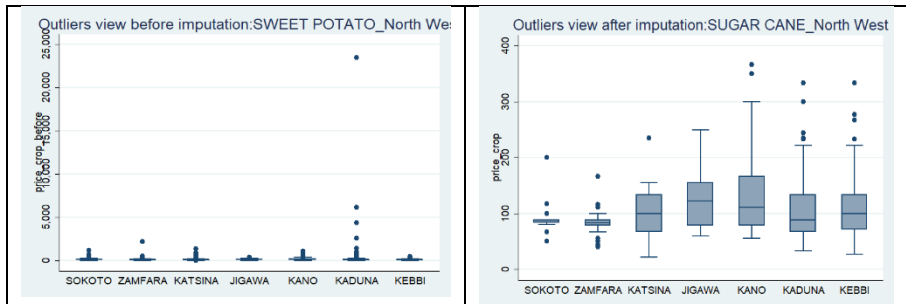
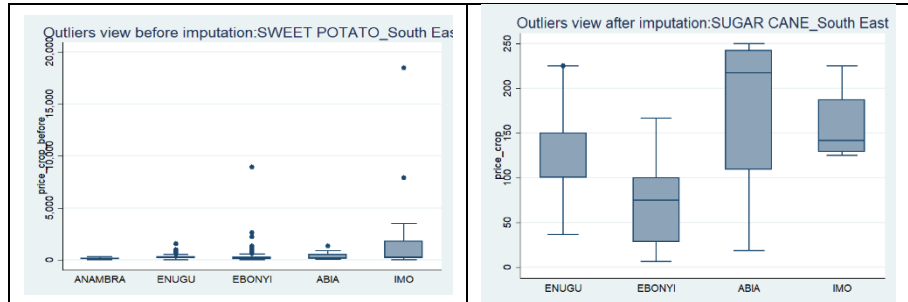
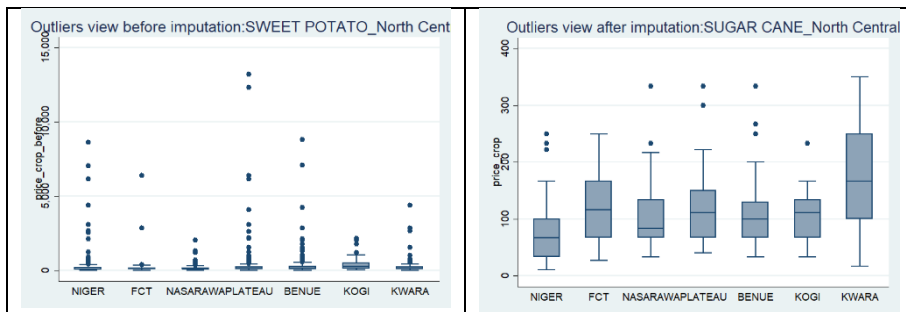
In depth analysis of Crops price data, NASS



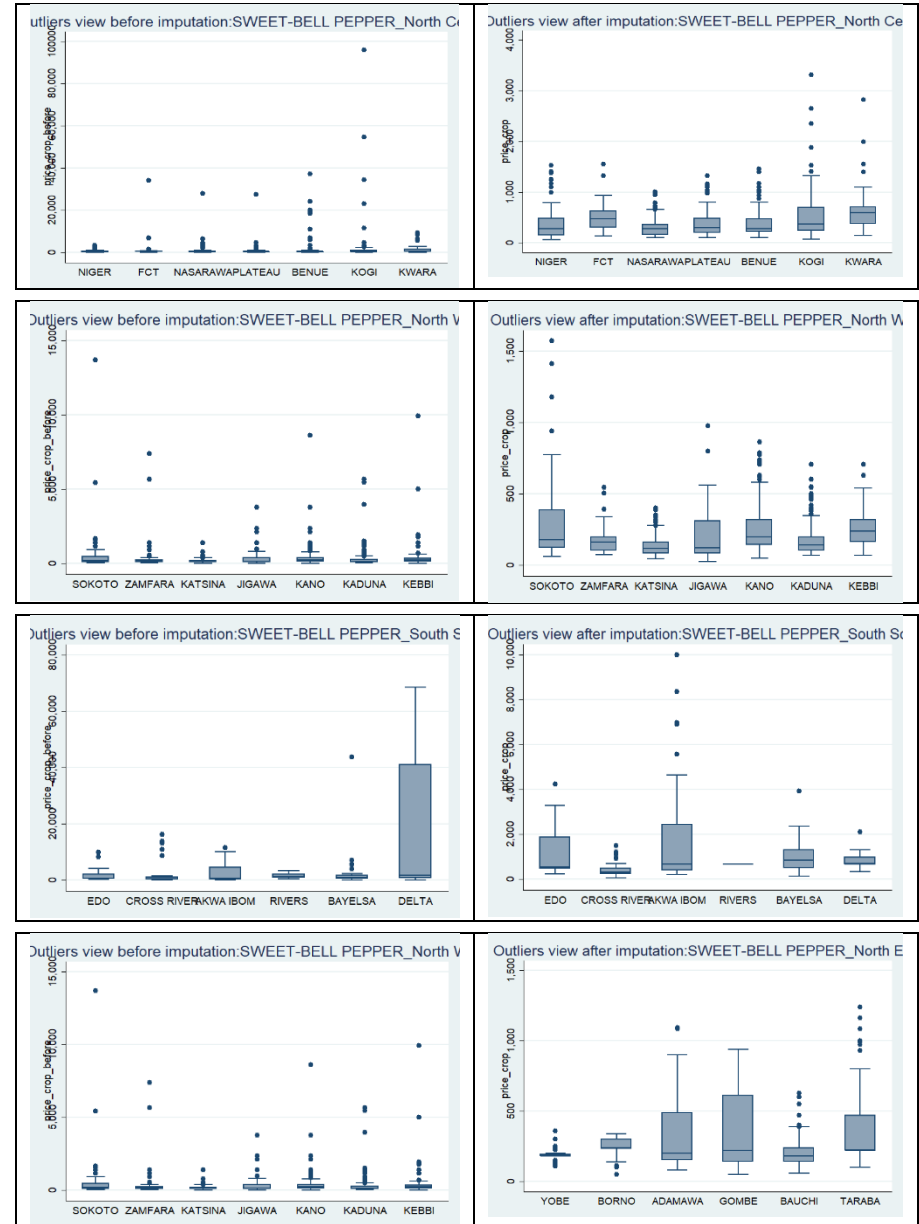
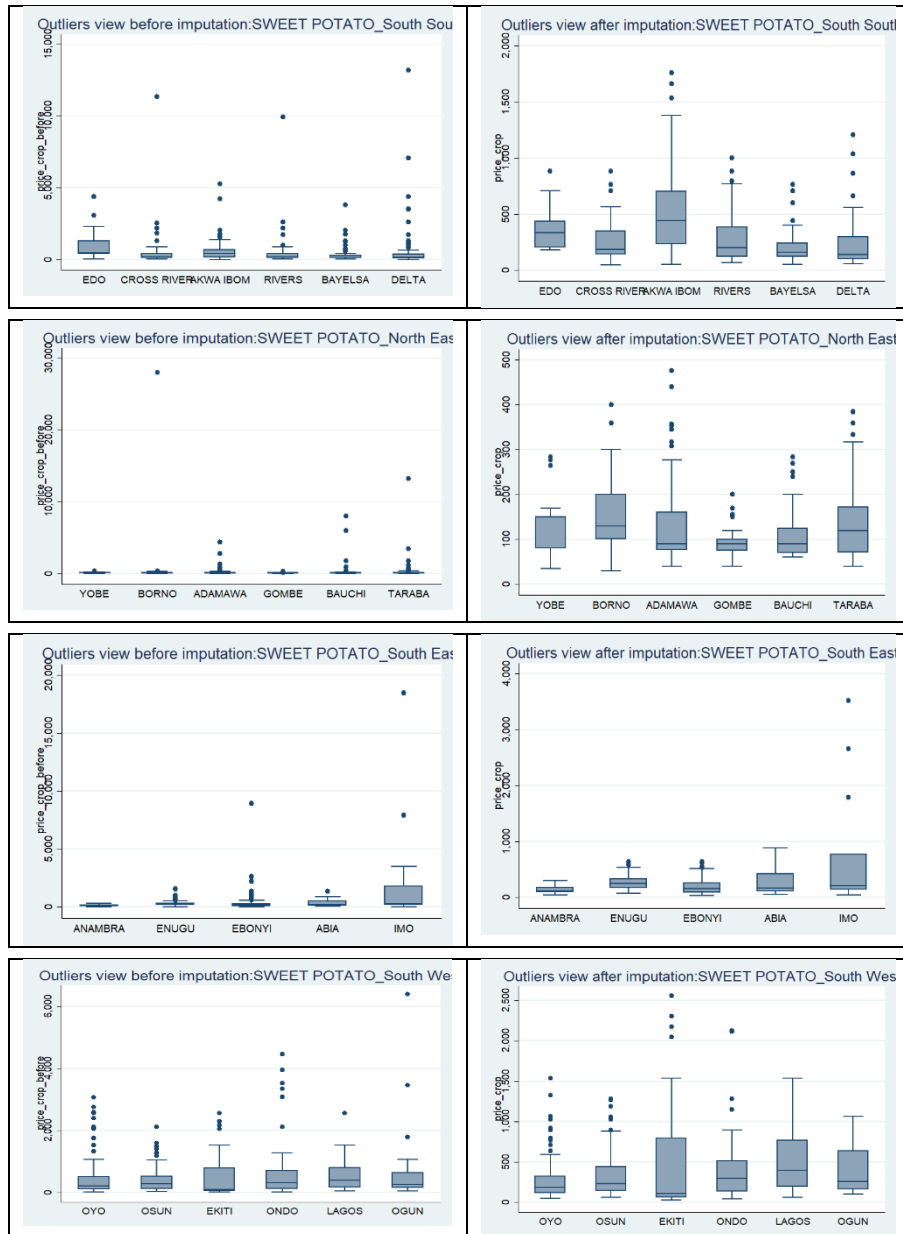
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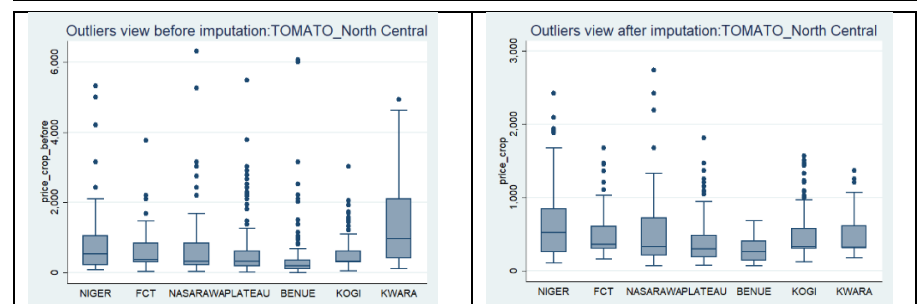
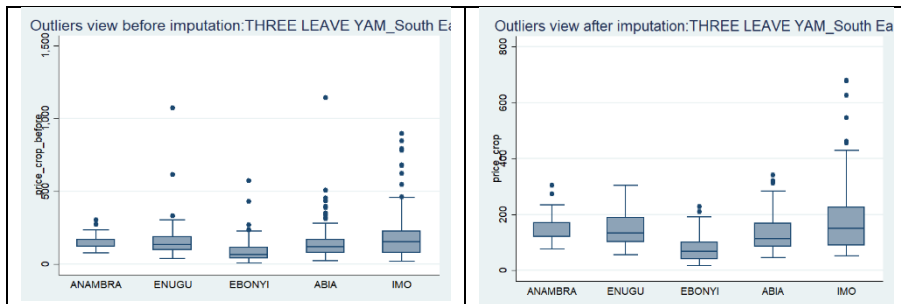
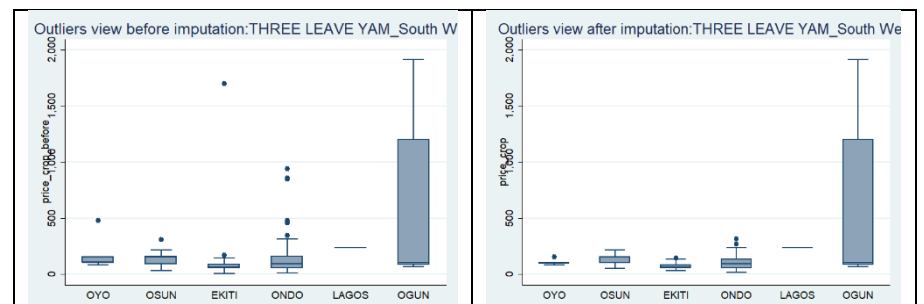
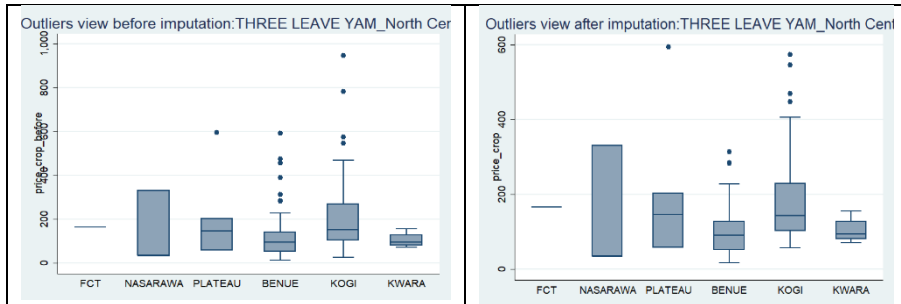
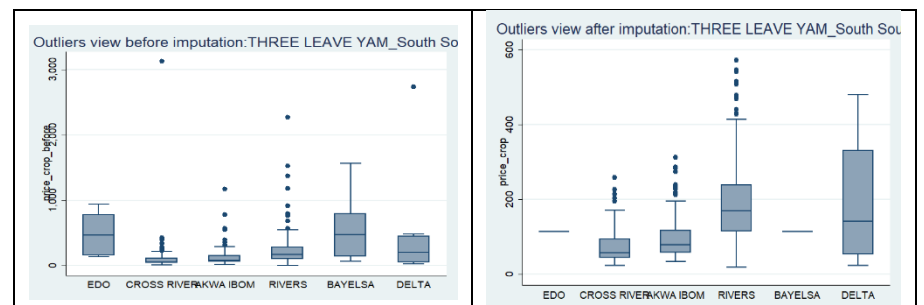
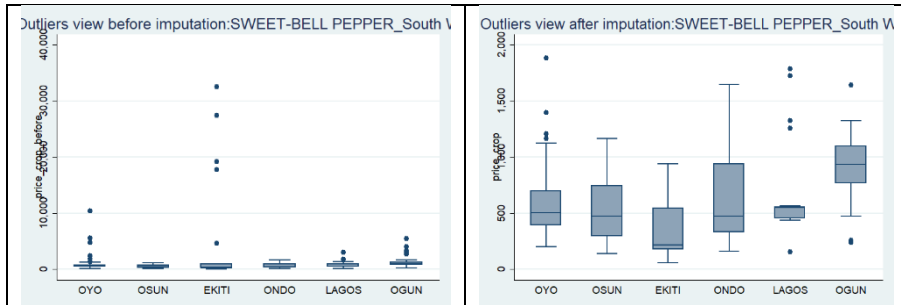
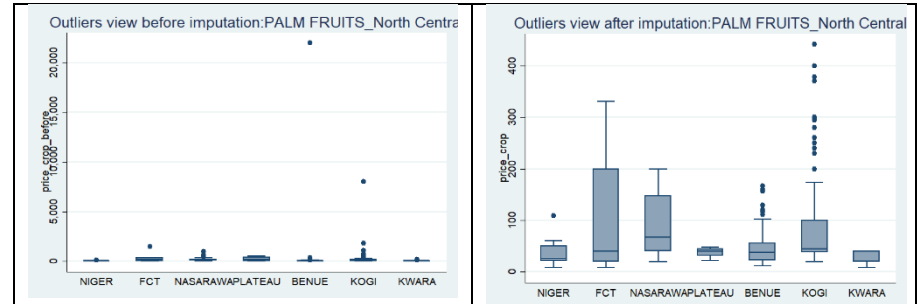
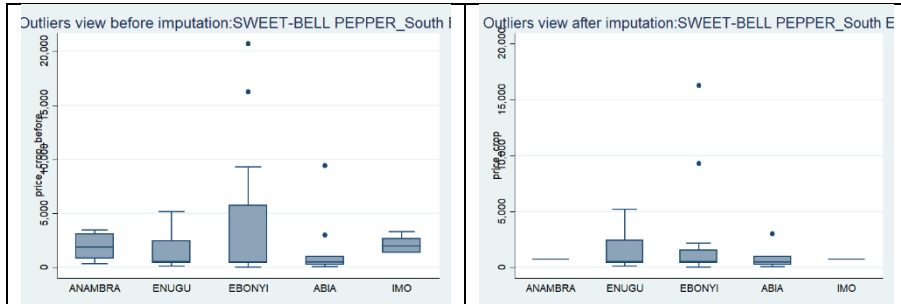
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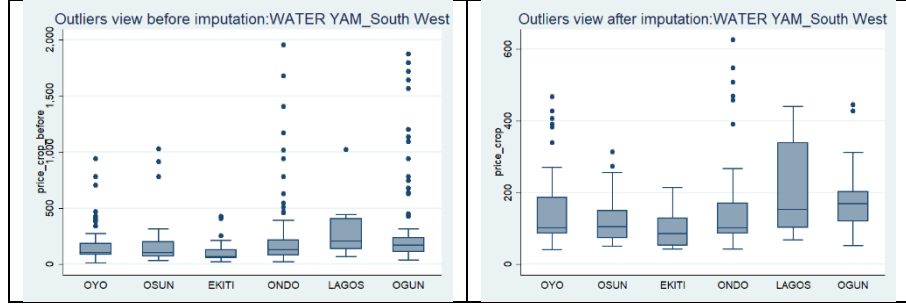
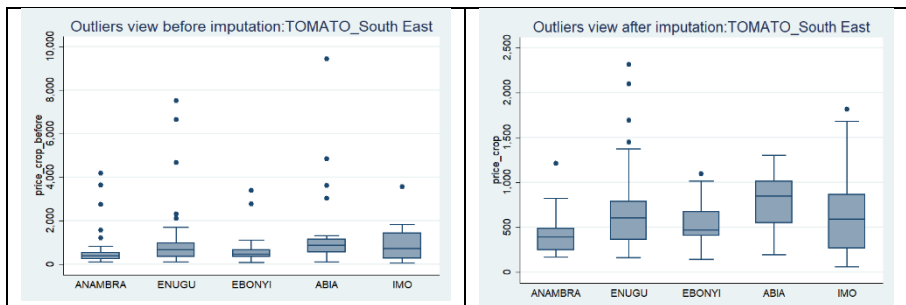
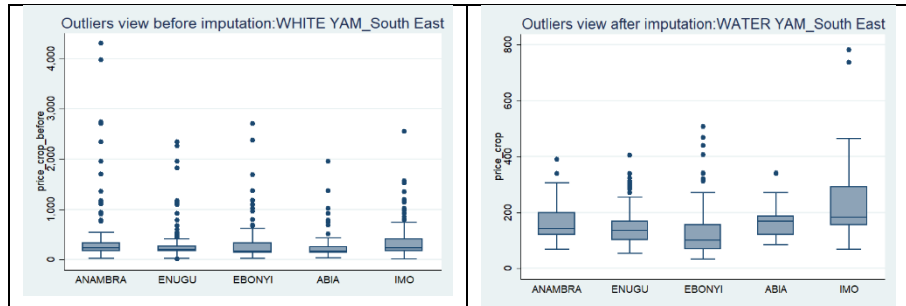
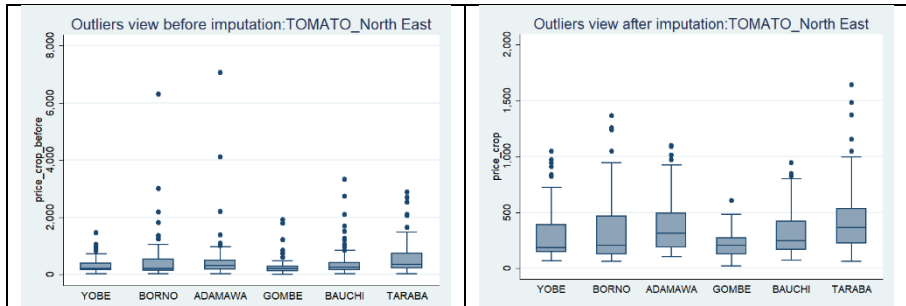
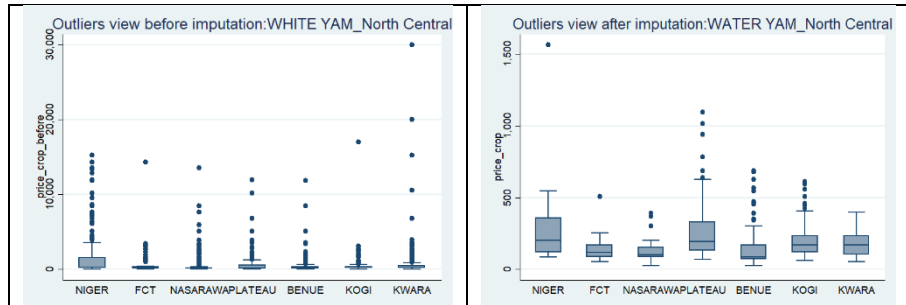
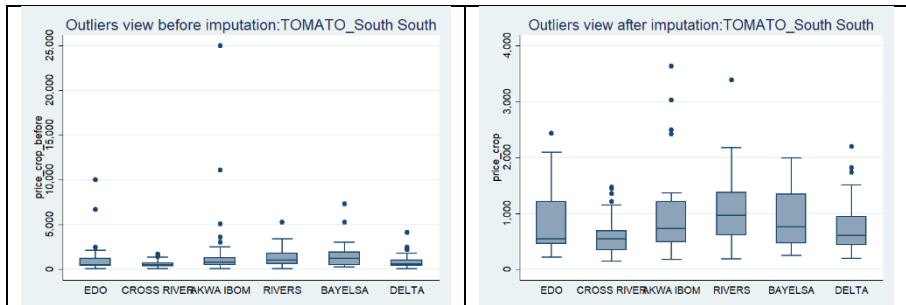
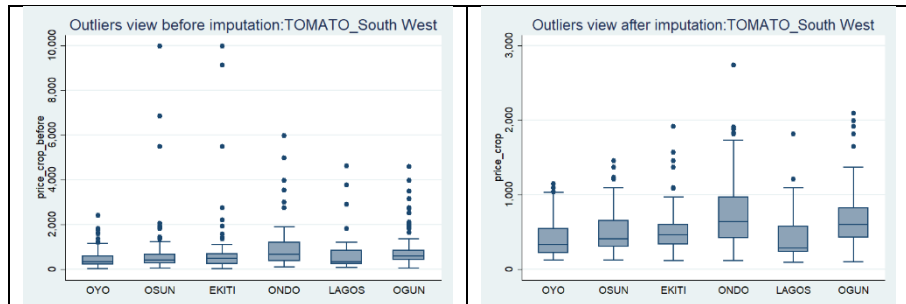
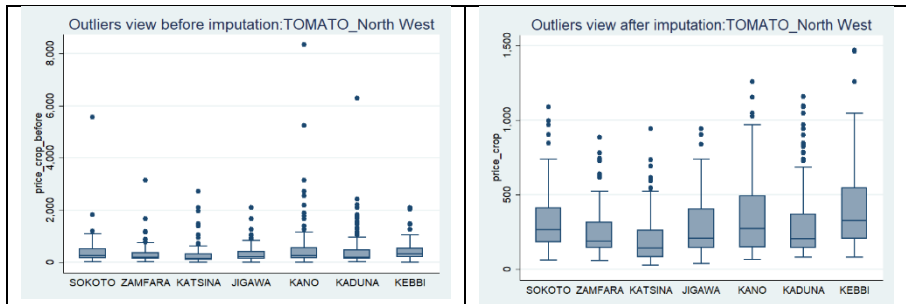
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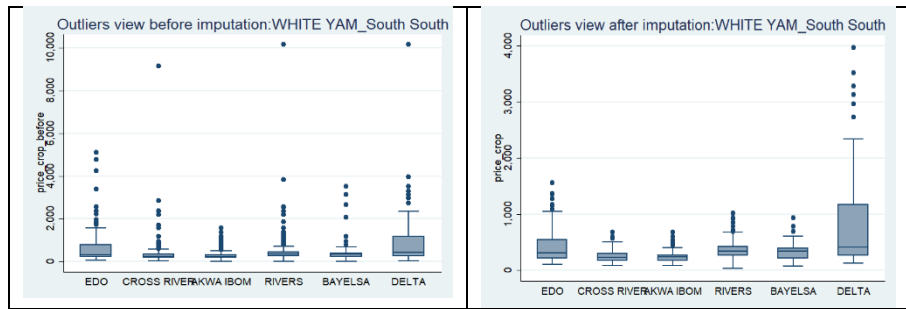
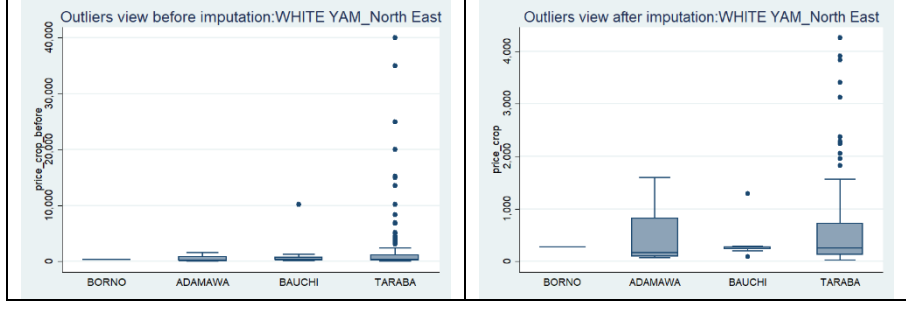
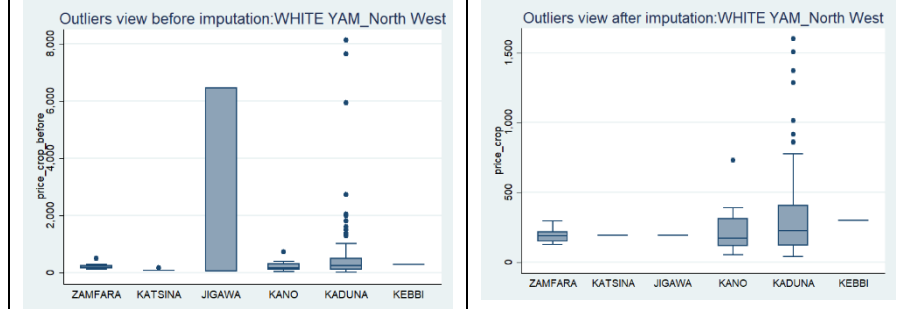
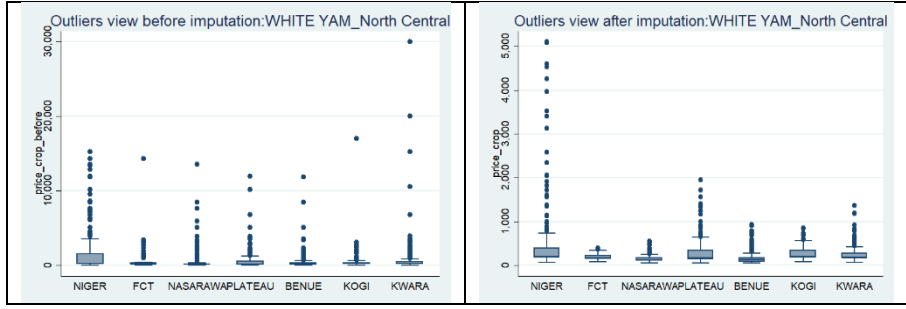
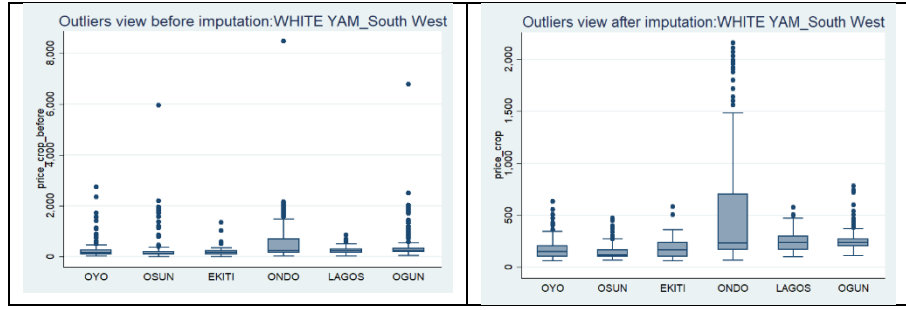
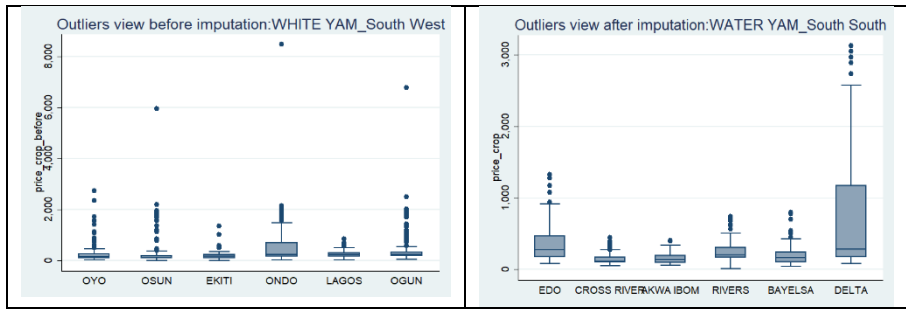
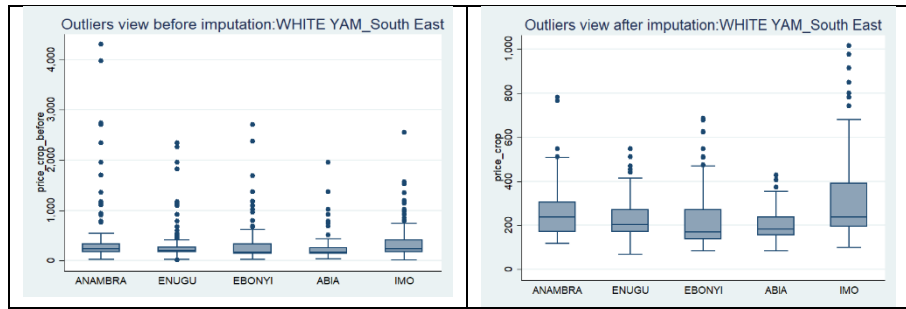
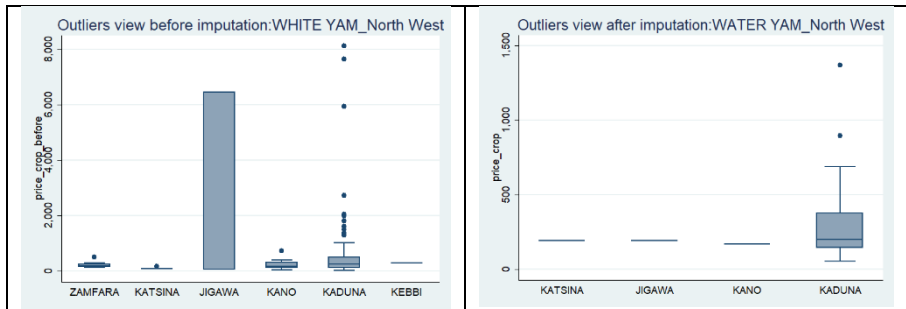
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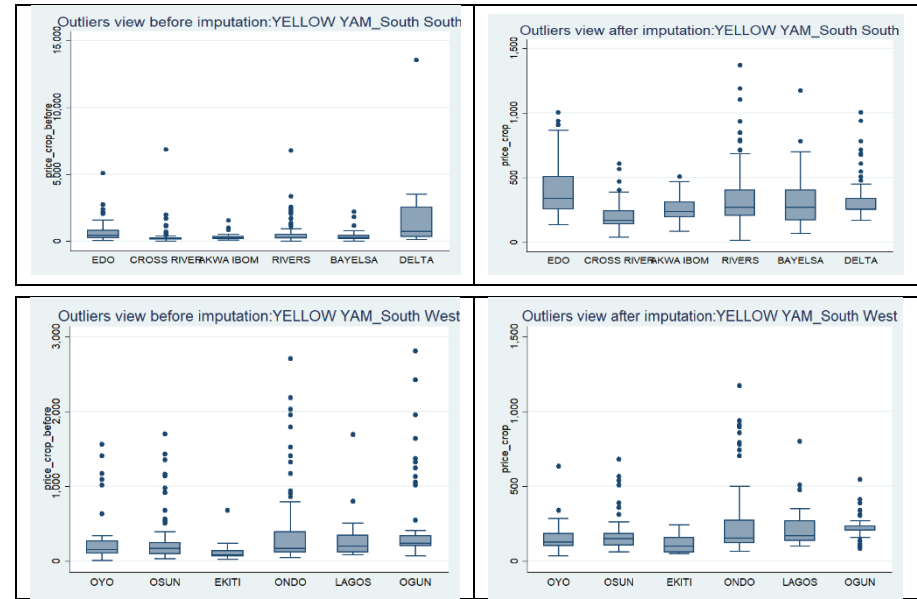
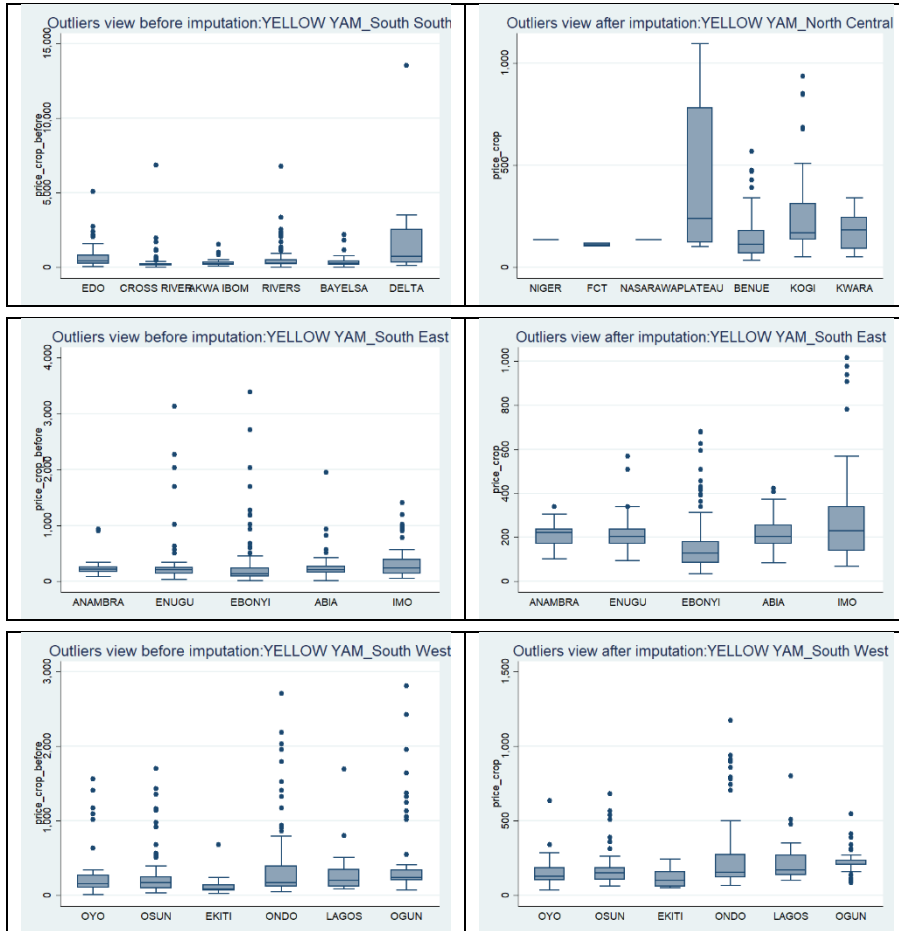
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Appendix 2. By crop, multiple comparison test of mean prices between zones

Crops	Reference zone	Zone for comparison	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
BEANS/COWPE A	North Central	North East	162.18667 ^a	6.19096	0.000	144.0098	180.3635
	North Central	North West	107.99611 ^a	5.78781	0.000	91.0029	124.9893
	North Central	South East	9.82593	13.75030	1.000	-30.5454	50.1972
	North Central	South South	-185.26519 ^b	15.61517	0.000	-231.1118	-139.4186
	North Central	South West	-35.16872 ^a	12.28390	0.063	-71.2346	0.8972
	North East	North West	-54.19056 ^b	5.71777	0.000	-70.9781	-37.4030
	North East	South East	-152.36074 ^b	13.72097	0.000	-192.6459	-112.0756
	North East	South South	-347.45185 ^c	15.58935	0.000	-393.2227	-301.6810
	North East	South West	-197.35538 ^b	12.25106	0.000	-233.3249	-161.3859
	North West	South East	-98.17018 ^a	13.54384	0.000	-137.9353	-58.4050
	North West	South South	-293.26130 ^b	15.43368	0.000	-338.5751	-247.9475
	North West	South West	-143.16483 ^a	12.05235	0.000	-178.5509	-107.7788
	South East	South South	-195.09112 ^b	19.84365	0.000	-253.3527	-136.8295
	South East	South West	-44.99465	17.34449	0.142	-95.9186	5.9293
South South	South West	150.09647 ^a	18.85720	0.000	94.7311	205.4618	
CASSAVA	North Central	North East	9.95790	3.51090	0.069	-0.3502	20.2660
	North Central	North West	-38.39673 ^b	3.28523	0.000	-48.0423	-28.7512
	North Central	South East	18.16292 ^a	2.96843	0.000	9.4475	26.8783
	North Central	South South	-26.19729 ^b	2.85091	0.000	-34.5676	-17.8269
	North Central	South West	-9.94264 ^a	2.74548	0.004	-18.0034	-1.8818
	North East	North West	-48.35463 ^b	3.99140	0.000	-60.0735	-36.6357
	North East	South East	8.20503	3.73499	0.421	-2.7610	19.1711
	North East	South South	-36.15518 ^b	3.64229	0.000	-46.8491	-25.4613
	North East	South West	-19.90054 ^a	3.56037	0.000	-30.3539	-9.4472
	North West	South East	56.55965 ^a	3.52370	0.000	46.2140	66.9053
	North West	South South	12.19944 ^a	3.42528	0.006	2.1427	22.2562
	North West	South West	28.45409 ^a	3.33804	0.000	18.6535	38.2547
	South East	South South	-44.36021 ^b	3.12273	0.000	-53.5286	-35.1918
	South East	South West	-28.10556 ^a	3.02678	0.000	-36.9923	-19.2188
South South	South West	16.25465 ^a	2.91161	0.000	7.7061	24.8032	
COCOYAM	North Central	North East	50.70323	37.52479	1.000	-59.5048	160.9113
	North Central	North West	94.78988	39.31093	0.239	-20.6640	210.2438
	North Central	South East	-126.61277 ^b	23.17008	0.000	-194.6619	-58.5636
	North Central	South South	-254.70991 ^c	23.41495	0.000	-323.4782	-185.9416
	North Central	South West	-62.52262	23.89037	0.134	-132.6872	7.6420
	North East	North West	44.08664	46.78998	1.000	-93.3328	181.5060
	North East	South East	-177.31600 ^b	34.36285	0.000	-278.2377	-76.3943
	North East	South South	-305.41314 ^c	34.52843	0.000	-406.8211	-204.0052
	North East	South West	-113.22585 ^b	34.85258	0.018	-215.5858	-10.8659
	North West	South East	-221.40264 ^b	36.30489	0.000	-328.0280	-114.7773
	North West	South South	-349.49978 ^c	36.46166	0.000	-456.5855	-242.4140
	North West	South West	-157.31249 ^b	36.76876	0.000	-265.3002	-49.3248
	South East	South South	-128.09714 ^b	17.91524	0.000	-180.7131	-75.4811
	South East	South West	64.09015	18.53227	0.008	9.6620	118.5183
South South	South West	192.18729 ^a	18.83753	0.000	136.8626	247.5120	
GROUND NUT/PEANUTS	North Central	North East	50.09147 ^a	11.45472	0.000	16.4604	83.7226
	North Central	North West	37.02352 ^a	10.82867	0.009	5.2305	68.8165
	North Central	South East	-326.48263 ^b	18.90674	0.000	-381.9929	-270.9723
	North Central	South South	-327.21291 ^b	18.96772	0.000	-382.9022	-271.5236
	North Central	South West	-97.57387 ^a	23.37364	0.000	-166.1990	-28.9487
	North East	North West	-13.06795	11.11838	1.000	-45.7116	19.5757
	North East	South East	-376.57410 ^b	19.07415	0.000	-432.5759	-320.5723
	North East	South South	-377.30438 ^b	19.13459	0.000	-433.4837	-321.1251
	North East	South West	-147.66534 ^b	23.50927	0.000	-216.6887	-78.6420
	North West	South East	-363.50615 ^b	18.70488	0.000	-418.4238	-308.5885
	North West	South South	-364.23643 ^b	18.76652	0.000	-419.3350	-309.1378
	North West	South West	-134.59739 ^a	23.21067	0.000	-202.7441	-66.4507
	South East	South South	-0.73028	24.33900	1.000	-72.1897	70.7292
	South East	South West	228.90875 ^a	27.90949	0.000	146.9663	310.8512
South South	South West	229.63903 ^a	27.95084	0.000	147.5752	311.7029	
GUINEA CORN/SORGHU M	North Central	North East	96.82323 ^a	3.43214	0.000	86.7462	106.9002
	North Central	North West	74.14353 ^a	3.19633	0.000	64.7589	83.5282
	North Central	South East	-810.87375 ^b	41.74699	0.000	-933.4458	-688.3017
	North Central	South South	-514.07364 ^b	20.98035	0.000	-575.6734	-452.4738
	North Central	South West	-5.26676	12.94336	1.000	-43.2694	32.7359
	North East	North West	-22.67969 ^a	3.17320	0.000	-31.9964	-13.3629
	North East	South East	-907.69698 ^b	41.74522	0.000	-1030.2639	-785.1301
	North East	South South	-610.89686 ^b	20.97684	0.000	-672.4864	-549.3074
	North East	South West	-102.08999 ^a	12.93767	0.000	-140.0759	-64.1041
	North West	South East	-885.01728 ^b	41.72650	0.000	-1007.5292	-762.5054

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	North West	South South	-588.21717'	20.93955	0.000	-649.6972	-526.7372
	North West	South West	-79.41030'	12.87712	0.000	-117.2184	-41.6022
	South East	South South	296.80011'	46.59463	0.000	159.9950	433.6052
	South East	South West	805.60699'	43.57080	0.000	677.6801	933.5339
	South South	South West	508.80688'	24.40859	0.000	437.1416	580.4722
MAIZE	North Central	North East	78.17185'	5.76449	0.000	61.2494	95.0943
	North Central	North West	31.93555'	5.19765	0.000	16.6772	47.1939
	North Central	South East	-82.55315'	5.96748	0.000	-100.0715	-65.0348
	North Central	South South	-67.07471'	5.84419	0.000	-84.2311	-49.9183
	North Central	South West	-30.48986'	5.64918	0.000	-47.0738	-13.9059
	North East	North West	-46.23630'	5.79083	0.000	-63.2360	-29.2366
	North East	South East	-160.72500'	6.49068	0.000	-179.7792	-141.6708
	North East	South South	-145.24656'	6.37751	0.000	-163.9686	-126.5245
	North East	South West	-108.66171'	6.19930	0.000	-126.8606	-90.4628
	North West	South East	-114.48870'	5.99293	0.000	-132.0817	-96.8957
	North West	South South	-99.01026'	5.87017	0.000	-116.2429	-81.7776
	North West	South West	-62.42541'	5.67605	0.000	-79.0882	-45.7626
	South East	South South	15.47844	6.56156	0.275	-3.7839	34.7408
South East	South West	52.06329	6.38849	0.000	33.3090	70.8175	
South South	South West	36.58485'	6.27348	0.000	18.1682	55.0015	
MELON/EGUSI	North Central	North East	314.14718'	96.84425	0.018	29.7394	598.5549
	North Central	North West	399.45651'	131.20377	0.035	14.1433	784.7697
	North Central	South East	-615.94140'	57.82188	0.000	-785.7500	-446.1328
	North Central	South South	-412.45030'	56.99807	0.000	-579.8396	-245.0610
	North Central	South West	146.84202	69.89671	0.536	-58.4274	352.1115
	North East	North West	85.30933	154.54116	1.000	-368.5400	539.1587
	North East	South East	-930.08858'	100.05954	0.000	-1223.9388	-636.2383
	North East	South South	-726.59748'	99.58575	0.000	-1019.0563	-434.1386
	North East	South West	-167.30516	107.48996	1.000	-482.9767	148.3664
	North West	South East	-1015.39791'	133.59465	0.000	-1407.7325	-623.0633
	North West	South South	-811.90681'	133.24017	0.000	-1203.2004	-420.6132
	North West	South West	-252.61449	139.24694	1.000	-661.5485	156.3195
	South East	South South	203.49110'	62.30477	0.016	20.5173	386.4649
South East	South West	762.78342'	74.28764	0.000	544.6189	980.9479	
South South	South West	559.29232'	73.64825	0.000	343.0055	775.5791	
MILLET/MAIWA	North Central	North East	84.07824'	4.21442	0.000	71.7034	96.4531
	North Central	North West	57.22682'	3.83136	0.000	45.9768	68.4769
	North Central	South East	-498.92797'	40.19260	0.000	-616.9459	-380.9100
	North Central	South South	-388.99342'	49.17580	0.000	-533.3888	-244.5980
	North Central	South West	68.71770'	13.71933	0.000	28.4335	109.0019
	North East	North West	-26.85142'	3.57862	0.000	-37.3594	-16.3435
	North East	South East	-583.00621'	40.16930	0.000	-700.9557	-465.0567
	North East	South South	-473.07166'	49.15675	0.000	-617.4111	-328.7322
	North East	South West	-15.36054	13.65091	1.000	-55.4439	24.7228
	North West	South East	-556.15479'	40.13091	0.000	-673.9916	-438.3180
	North West	South South	-446.22024'	49.12539	0.000	-590.4676	-301.9728
	North West	South West	11.49088	13.53755	1.000	-28.2596	51.2413
	South East	South South	109.93455	63.35669	1.000	-76.1004	295.9695
South East	South West	567.64567'	42.23779	0.000	443.6224	691.6689	
South South	South West	457.71112'	50.86104	0.000	308.3673	607.0549	
RICE	North Central	North East	106.48484'	6.98196	0.000	85.9859	126.9838
	North Central	North West	48.36817'	6.29509	0.000	29.8858	66.8505
	North Central	South East	-92.47885'	12.21659	0.000	-128.3466	-56.6111
	North Central	South South	-112.64568'	15.58251	0.000	-158.3958	-66.8956
	North Central	South West	-47.59925	17.06804	0.080	-97.7108	2.5124
	North East	North West	-58.11667'	6.43316	0.000	-77.0044	-39.2290
	North East	South East	-198.96369'	12.28830	0.000	-235.0420	-162.8854
	North East	South South	-219.13052'	15.63880	0.000	-265.0459	-173.2152
	North East	South West	-154.08409'	17.11945	0.000	-204.3466	-103.8216
	North West	South East	-140.84702'	11.91145	0.000	-175.8189	-105.8751
	North West	South South	-161.01385'	15.34446	0.000	-206.0650	-115.9627
	North West	South West	-95.96741'	16.85099	0.000	-145.4417	-46.4931
	South East	South South	-20.16683	18.57604	1.000	-74.7059	34.3722
South East	South West	44.87960	19.83866	0.356	-13.3665	103.1257	
South South	South West	65.04644'	22.07130	0.048	0.2453	129.8476	
WHITE YAM	North Central	North East	-344.23823'	27.66346	0.000	-425.4662	-263.0103
	North Central	North West	-66.66565	32.21555	0.578	-161.2599	27.9286
	North Central	South East	39.22034	15.40387	0.164	-6.0099	84.4506
	North Central	South South	-130.82346'	15.13118	0.000	-175.2530	-86.3939
	North Central	South West	25.68810	15.34495	1.000	-19.3691	70.7453
	North East	North West	277.57258'	40.27181	0.000	159.3229	395.8223
	North East	South East	383.45857'	28.65756	0.000	299.3116	467.6055
North East	South South	213.41477'	28.51192	0.000	129.6955	297.1340	

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	North East	South West	369.92633'	28.62594	0.000	285.8723	453.9804
	North West	South East	105.88599'	33.07311	0.021	8.7737	202.9982
	North West	South South	-64.15781	32.94699	0.773	-160.8997	32.5841
	North West	South West	92.35375	33.04571	0.078	-4.6780	189.3855
	South East	South South	-170.04380'	16.88021	0.000	-219.6090	-120.4786
	South East	South West	-13.53225	17.07209	1.000	-63.6609	36.5964
	South South	South West	156.51156'	16.82646	0.000	107.1042	205.9189
YELLOW YAM	North Central	North East	89.28524	88.52887	1.000	-170.8802	349.4507
	North Central	North West	-52.75720	78.80596	1.000	-284.3493	178.8349
	North Central	South East	43.10713	28.78261	1.000	-41.4782	127.6924
	North Central	South South	-182.48615'	27.49179	0.000	-263.2780	-101.6943
	North Central	South West	56.59701	28.60073	0.720	-27.4538	140.6478
	North East	North West	-142.04245	114.08708	1.000	-477.3174	193.2325
	North East	South East	-46.17811	87.37232	1.000	-302.9447	210.5885
	North East	South South	-271.77140'	86.95563	0.027	-527.3134	-16.2294
	North East	South West	-32.68823	87.31257	1.000	-289.2792	223.9027
	North West	South East	95.86433	77.50445	1.000	-131.9029	323.6316
	North West	South South	-129.72895	77.03440	1.000	-356.1148	96.6569
	North West	South West	109.35421	77.43708	1.000	-118.2151	336.9235
	South East	South South	-225.59328'	23.50232	0.000	-294.6610	-156.5255
	South East	South West	13.48988	24.79037	1.000	-59.3631	86.3429
South South	South West	239.08316'	23.27922	0.000	170.6711	307.4953	
WATER YAM	North Central	North East	-6.33248	57.83734	1.000	-176.2350	163.5700
	North Central	North West	-140.09547'	42.50496	0.015	-264.9577	-15.2332
	North Central	South East	15.25825	13.76638	1.000	-25.1818	55.6983
	North Central	South South	-114.77206'	12.79838	0.000	-152.3685	-77.1756
	North Central	South West	26.68297	14.66747	1.000	-16.4041	69.7700
	North East	North West	-133.76298	70.40841	0.863	-340.5942	73.0682
	North East	South East	21.59074	57.79433	1.000	-148.1855	191.3669
	North East	South South	-108.43957	57.57144	0.896	-277.5610	60.6818
	North East	South West	33.01545	58.01557	1.000	-137.4106	203.4415
	North West	South East	155.35372'	42.44643	0.004	30.6634	280.0440
	North West	South South	25.32341	42.14243	1.000	-98.4739	149.1207
	North West	South West	166.77844'	42.74717	0.001	41.2047	292.3522
	South East	South South	-130.03031'	12.60262	0.000	-167.0517	-93.0090
	South East	South West	11.42472	14.49696	1.000	-31.1615	54.0109
South South	South West	141.45503'	13.58114	0.000	101.5592	181.3509	
THREE LEAVE YAM	North Central	North East	123.15670	103.77009	1.000	-181.9237	428.2371
	North Central	North West	-253.28008'	85.04348	0.044	-503.3049	-3.2553
	North Central	South East	15.85101	14.07374	1.000	-25.5253	57.2273
	North Central	South South	-6.62762	14.13725	1.000	-48.1906	34.9354
	North Central	South West	12.70719	15.76024	1.000	-33.6274	59.0417
	North East	North West	-376.43678	132.96310	0.071	-767.3435	14.4700
	North East	South East	-107.30569	103.17394	1.000	-410.6334	196.0220
	North East	South South	-129.78432	103.18262	1.000	-433.1375	173.5689
	North East	South West	-110.44951'	103.41749	1.000	-414.4932	193.5942
	North West	South East	269.13109'	84.31503	0.022	21.2479	517.0143
	North West	South South	246.65246	84.32566	0.052	-1.2620	494.5669
	North West	South West	265.98727'	84.61288	0.026	17.2284	514.7461
	South East	South South	-22.47863	8.74600	0.154	-48.1916	3.2343
	South East	South West	-3.14382	11.18105	1.000	-36.0157	29.7281
South South	South West	19.33481	11.26088	1.000	-13.7718	52.4414	
BANANA	North Central	North East	-63.54875	50.03722	1.000	-210.4960	83.3985
	North Central	North West	-253.90996'	65.48306	0.002	-446.2179	-61.6020
	North Central	South East	-485.30980'	35.95833	0.000	-590.9108	-379.7088
	North Central	South South	-324.38884'	34.95599	0.000	-427.0462	-221.7315
	North Central	South West	315.34443'	35.54069	0.000	210.9700	419.7189
	North East	North West	-190.36121	72.23161	0.126	-402.4880	21.7656
	North East	South East	-421.76105'	47.14208	0.000	-560.2060	-283.3161
	North East	South South	-260.84009'	46.38206	0.000	-397.0530	-124.6271
	North East	South West	378.89318'	46.82430	0.000	241.3815	516.4049
	North West	South East	-231.39984'	63.29837	0.004	-417.2919	-45.5078
	North West	South South	-70.47888	62.73438	1.000	-254.7147	113.7569
	North West	South West	569.25439'	63.06205	0.000	384.0563	754.4524
	South East	South South	160.92096'	30.66878	0.000	70.8541	250.9878
	South East	South West	800.65423'	31.33358	0.000	708.6351	892.6734
South South	South West	639.73327'	30.17802	0.000	551.1077	728.3589	
BEENI-SEED/SESAME	North Central	North East	246.89719'	14.62277	0.000	203.9383	289.8560
	North Central	North West	206.00676'	15.84009	0.000	159.4717	252.5419
	North Central	South East	-101.24260'	33.56295	0.039	-199.8440	-2.6412
	North Central	South South	-929.02790'	44.63769	0.000	-1060.1647	-797.8911
	North Central	South West	-255.57225	182.83050	1.000	-792.6926	281.5482
North East	North West	-40.89042	15.86894	0.150	-87.5103	5.7294	

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	North East	South East	-348.13978'	33.57658	0.000	-446.7812	-249.4983
	North East	South South	-1175.92509'	44.64794	0.000	-1307.0920	-1044.7581
	North East	South West	-502.46943'	182.83300	0.090	-1039.5972	34.6583
	North West	South East	-307.24936'	34.12433	0.000	-407.5000	-206.9987
	North West	South South	-1135.03466'	45.06131	0.000	-1267.4160	-1002.6533
	North West	South West	-461.57901'	182.93439	0.175	-999.0046	75.8466
	South East	South South	-827.78530'	53.90811	0.000	-986.1568	-669.4138
	South East	South West	-154.32965'	185.31204	1.000	-698.7403	390.0810
	South South	South West	673.45565'	187.63423	0.005	122.2228	1224.6885
CARROT	North Central	North East	66.23980'	17.61336	0.002	16.6052	115.8743
	North Central	North West	99.52309'	13.75502	0.000	60.7614	138.2848
	North Central	South South	138.38419'	35.07395	0.001	39.5456	237.2228
	North Central	South West	-557.33010'	62.75056	0.000	-734.1615	-380.4987
	North East	North West	33.28329	14.31882	0.205	-7.0672	73.6338
	North East	South South	72.14439	35.29886	0.414	-27.3280	171.6168
	North East	South West	-623.56989'	62.87655	0.000	-800.7564	-446.3834
	North West	South South	38.86110	33.54072	1.000	-55.6568	133.3790
	North West	South West	-656.85319'	61.90663	0.000	-831.3064	-482.4000
	South South	South West	-695.71429	69.80983	0.000	-892.4388	-498.9898
GARDEN EGG	North Central	North East	13.21343	7.24387	1.000	-8.1002	34.5271
	North Central	North West	29.31336'	6.50426	0.000	10.1759	48.4508
	North Central	South East	-32.29274'	9.29127	0.008	-59.6304	-4.9550
	North Central	South South	-56.47652'	9.08608	0.000	-83.2105	-29.7425
	North Central	South West	-37.76250'	12.02735	0.026	-73.1506	-2.3744
	North East	North West	16.09993	6.82349	0.277	-3.9768	36.1767
	North East	South East	-45.50617'	9.51747	0.000	-73.5094	-17.5029
	North East	South South	-69.68995'	9.31727	0.000	-97.1041	-42.2757
	North East	South West	-50.97593'	12.20294	0.000	-86.8806	-15.0712
	North West	South East	-61.60611'	8.96739	0.000	-87.9908	-35.2214
	North West	South South	-85.78988'	8.75461	0.000	-111.5486	-60.0312
	North West	South West	-67.07586'	11.77895	0.000	-101.7331	-32.4187
	South East	South South	-24.18377	10.98479	0.419	-56.5043	8.1368
	South East	South West	-5.46976	13.51909	1.000	-45.2470	34.3075
South South	South West	18.71402	13.37890	1.000	-20.6507	58.0788	
GINGER	North Central	North East	-790.28455'	245.25516	0.022	-1519.0412	-61.5279
	North Central	North West	125.80388	72.42236	1.000	-89.3936	341.0013
	North Central	South East	253.04878	296.94203	1.000	-629.2914	1135.3890
	North Central	South South	-64.09408	167.69651	1.000	-562.3913	434.2031
	North Central	South West	-1233.61789'	245.25516	0.000	-1962.3746	-504.8612
	North East	North West	916.08844'	239.15017	0.003	205.4722	1626.7046
	North East	South East	1043.33333	374.32923	0.088	-68.9569	2155.6236
	North East	South South	726.19048	282.96630	0.165	-114.6219	1567.0029
	North East	South West	-443.33333	334.81024	1.000	-1438.1960	551.5293
	North West	South East	127.24490	291.91999	1.000	-740.1727	994.6625
	North West	South South	-189.89796	158.63428	1.000	-661.2674	281.4715
	North West	South West	-1359.42177'	239.15017	0.000	-2070.0380	-648.8056
	South East	South South	-317.14286	328.77713	1.000	-1294.0786	659.7929
	South East	South West	-1486.66667'	374.32923	0.002	-2598.9569	-374.3764
South South	South West	-1169.52381'	282.96630	0.001	-2010.3362	-328.7114	
OKRO	North Central	North East	180.45078'	19.00149	0.000	124.6572	236.2443
	North Central	North West	173.71938'	17.65155	0.000	121.8896	225.5491
	North Central	South East	-232.57641'	18.25225	0.000	-286.1700	-178.9828
	North Central	South South	-388.95882'	17.63543	0.000	-440.7413	-337.1764
	North Central	South West	15.36372	19.18226	1.000	-40.9606	71.6881
	North East	North West	-6.73140	19.64347	1.000	-64.4100	50.9472
	North East	South East	-413.02720'	20.18498	0.000	-472.2958	-353.7586
	North East	South South	-569.40961'	19.62899	0.000	-627.0457	-511.7735
	North East	South West	-165.08707'	21.02969	0.000	-226.8360	-103.3382
	North West	South East	-406.29579'	18.91967	0.000	-461.8491	-350.7425
	North West	South South	-562.67821'	18.32533	0.000	-616.4864	-508.8700
	North West	South West	-158.35566'	19.81839	0.000	-216.5478	-100.1635
	South East	South South	-156.38241'	18.90464	0.000	-211.8916	-100.8732
	South East	South West	247.94013'	20.35524	0.000	188.1716	307.7087
South South	South West	404.32254'	19.80403	0.000	346.1725	462.4726	
SWEET/BELL PEPPER (TATASHE)	North Central	North East	-739.15937'	189.27715	0.001	-1295.2437	-183.0751
	North Central	North West	208.67648	154.27461	1.000	-244.5725	661.9255
	North Central	South East	-1256.01368	461.48104	0.098	-2611.8157	99.7884
	North Central	South South	-3648.58684'	275.32060	0.000	-4457.4613	-2839.7124
	North Central	South West	-197.88096	224.27785	1.000	-856.7951	461.0331
	North East	North West	947.83585'	180.24052	0.000	418.3006	1477.3711
	North East	South East	-516.85431	470.79799	1.000	-1900.0290	866.3203
	North East	South South	-2909.42747'	290.66720	0.000	-3763.3893	-2055.4657
	North East	South West	541.27841	242.87145	0.389	-172.2625	1254.8193

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	North West	South East	-1464.69016'	457.84884	0.021	-2809.8210	-119.5593
	North West	South South	-3857.26332'	269.18811	0.000	-4648.1209	-3066.4057
	North West	South West	-406.55744	216.70569	0.911	-1043.2250	230.1101
	South East	South South	-2392.57316'	511.49422	0.000	-3895.3108	-889.8356
	South East	South West	1058.13272	485.92742	0.443	-369.9412	2485.7567
	South South	South West	3450.70588'	314.58247	0.000	2526.4825	4374.9293
SMALL PEPPER (RODO)	North Central	North East	-215.10906	129.27822	1.000	-594.7477	164.5296
	North Central	North West	226.66987	100.25169	0.357	-67.7295	521.0692
	North Central	South East	-1914.15110'	120.19940	0.000	-2267.1289	-1561.1733
	North Central	South South	-1423.74502'	108.68567	0.000	-1742.9116	-1104.5785
	North Central	South West	-524.83849'	103.24512	0.000	-828.0283	-221.6487
	North East	North West	441.77893'	130.06695	0.010	59.8241	823.7338
	North East	South East	-1699.04204'	145.99625	0.000	-2127.7749	-1270.3092
	North East	South South	-1208.63597'	136.67327	0.000	-1609.9910	-807.2810
	North East	South West	-309.72944	132.38793	0.290	-698.5001	79.0412
	North West	South East	-2140.82097'	121.04730	0.000	-2496.2887	-1785.3532
	North West	South South	-1650.41489'	109.62267	0.000	-1972.3330	-1328.4968
	North West	South West	-751.50836'	104.23103	0.000	-1057.5934	-445.4233
	South East	South South	490.40607'	128.11956	0.002	114.1699	866.6422
	South East	South West	1389.31260'	123.53786	0.000	1026.5311	1752.0941
South South	South West	898.90653'	112.36673	0.000	568.9302	1228.8829	
PINEAPPLE	North Central	North East	-48.57635	35.51762	1.000	-152.9321	55.7794
	North Central	North West	-189.45895'	44.95551	0.000	-321.5445	-57.3734
	North Central	South East	-45.85016'	15.31668	0.042	-90.8527	-0.8476
	North Central	South South	-98.44948'	14.77444	0.000	-141.8589	-55.0401
	North Central	South West	-6.21742	15.34085	1.000	-51.2910	38.8562
	North East	North West	-140.88260	54.12473	0.140	-299.9086	18.1434
	North East	South East	2.72619	33.80960	1.000	-96.6111	102.0635
	North East	South South	-49.87313	33.56744	1.000	-148.4989	48.7527
	North East	South West	42.35893	33.82056	1.000	-57.0106	141.7285
	North West	South East	143.60879'	43.61864	0.015	15.4511	271.7664
	North West	South South	91.00947	43.43120	0.543	-36.5975	218.6164
	North West	South West	183.24153'	43.62713	0.000	55.0589	311.4241
	South East	South South	-52.59932'	9.99360	0.000	-81.9619	-23.2367
	South East	South West	39.63274'	10.81340	0.004	7.8615	71.4040
South South	South West	92.23206'	10.03062	0.000	62.7607	121.7034	
PLANTAIN	North Central	North East	255.11744	114.51888	0.389	-81.1960	591.4309
	North Central	North West	-828.55009	223.79937	0.003	-1485.7932	-171.3070
	North Central	South East	-434.18880'	58.49633	0.000	-605.9780	-262.3996
	North Central	South South	-466.08964'	56.53365	0.000	-632.1149	-300.0644
	North Central	South West	265.41346'	57.04379	0.000	97.8900	432.9369
	North East	North West	-1083.66753'	241.79887	0.000	-1793.7707	-373.5644
	North East	South East	-689.30624'	108.63864	0.000	-1008.3509	-370.2616
	North East	South South	-721.20709'	107.59455	0.000	-1037.1855	-405.2287
	North East	South West	10.29602	107.86346	1.000	-306.4721	327.0642
	North West	South East	394.36129	220.84822	1.000	-254.2150	1042.9376
	North West	South South	362.46044	220.33650	1.000	-284.6130	1009.5339
	North West	South West	1093.96355'	220.46794	0.000	446.5040	1741.4230
	South East	South South	-31.90084	43.40314	1.000	-159.3651	95.5634
	South East	South West	699.60226'	44.06555	0.000	570.1927	829.0118
South South	South West	731.50310'	41.42470	0.000	609.8491	853.1571	
IRISH POTATO	North Central	North East	-286.77086'	64.25431	0.000	-476.4449	-97.0968
	North Central	North West	-173.30968	60.94176	0.070	-353.2054	6.5860
	North Central	South East	-309.39665	110.32182	0.079	-635.0587	16.2654
	North Central	South South	18.32401	65.10188	1.000	-173.8520	210.5001
	North Central	South West	-326.74219'	92.62791	0.007	-600.1731	-53.3113
	North East	North West	113.46117	77.09929	1.000	-114.1304	341.0527
	North East	South East	-22.62579	120.00545	1.000	-376.8732	331.6216
	North East	South South	305.09486'	80.42796	0.003	67.6773	542.5124
	North East	South West	-39.97133	103.97274	1.000	-346.8914	266.9487
	North West	South East	-136.08696	118.26491	1.000	-485.1964	213.0225
	North West	South South	191.63369	77.80706	0.213	-38.0471	421.3145
	North West	South West	-153.43251	101.95888	1.000	-454.4078	147.5428
	South East	South South	327.72065	120.46138	0.102	-27.8727	683.3140
	South East	South West	-17.34554	137.30484	1.000	-422.6595	387.9684
South South	South West	-345.06620'	104.49866	0.016	-653.5387	-36.5937	
SWEET POTATO	North Central	North East	52.06038'	10.03119	0.000	22.6027	81.5180
	North Central	North West	51.21828'	8.18224	0.000	27.1903	75.2463
	North Central	South East	-65.89640'	12.51562	0.000	-102.6499	-29.1430
	North Central	South South	-142.22806'	10.98841	0.000	-174.4967	-109.9594
	North Central	South West	-212.13736'	11.02480	0.000	-244.5128	-179.7619
	North East	North West	-0.84210	9.98641	1.000	-30.1683	28.4841
North East	South East	-117.95678'	13.76300	0.000	-158.3733	-77.5403	

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	North East	South South	-194.28843	12.39050	0.000	-230.6745	-157.9024
	North East	South West	-264.19773	12.42278	0.000	-300.6785	-227.7169
	North West	South East	-117.11468	12.47976	0.000	-153.7628	-80.4665
	North West	South South	-193.44634	10.94755	0.000	-225.5950	-161.2977
	North West	South West	-263.35564	10.98407	0.000	-295.6115	-231.0998
	South East	South South	-76.33165	14.47551	0.000	-118.8405	-33.8228
	South East	South West	-146.24095	14.50315	0.000	-188.8310	-103.6509
	South South	South West	-69.90930	13.20780	0.000	-108.6954	-31.1232
PUMPKIN	North Central	North East	741.01312	155.28979	0.000	284.9984	1197.0279
	North Central	North West	930.61408	139.09548	0.000	522.1546	1339.0736
	North Central	South East	159.28719	111.83887	1.000	-169.1322	487.7066
	North Central	South South	-216.35275	111.31182	0.780	-543.2244	110.5189
	North Central	South West	-12.40269	145.26781	1.000	-438.9875	414.1821
	North East	North West	189.60096	149.73148	1.000	-250.0916	629.2935
	North East	South East	-581.72592	124.81946	0.000	-948.2633	-215.1885
	North East	South South	-957.36587	124.34744	0.000	-1322.5171	-592.2146
	North East	South West	-753.41581	155.48216	0.000	-1209.9954	-296.8362
	North West	South East	-771.32688	103.98331	0.000	-1076.6781	-465.9757
	North West	South South	-1146.96683	103.41623	0.000	-1450.6528	-843.2809
	North West	South West	-943.01677	139.31020	0.000	-1352.1068	-533.9267
	South East	South South	-375.63994	62.09104	0.000	-557.9728	-193.3071
	South East	South West	-171.68989	112.10582	1.000	-500.8931	157.5134
South South	South West	203.95006	111.58002	1.000	-123.7092	531.6093	
GREEN VEGETABLE	North Central	North East	-187.05252	88.29577	0.513	-446.3448	72.2397
	North Central	North West	-125.18312	85.80460	1.000	-377.1597	126.7935
	North Central	South East	479.46525	77.44526	0.000	252.0370	706.8935
	North Central	South South	284.56355	76.70369	0.003	59.3130	509.8141
	North Central	South West	635.23939	73.45106	0.000	419.5406	850.9382
	North East	North West	61.86940	96.27372	1.000	-220.8512	344.5900
	North East	South East	666.51777	88.90426	0.000	405.4386	927.5969
	North East	South South	471.61607	88.25903	0.000	212.4317	730.8004
	North East	South West	822.29191	85.44740	0.000	571.3643	1073.2195
	North West	South East	604.64837	86.43063	0.000	350.8333	858.4634
	North West	South South	409.74667	85.76679	0.000	157.8811	661.6122
	North West	South West	760.42251	82.87065	0.000	517.0618	1003.7832
	South East	South South	-194.90170	77.40337	0.178	-422.2070	32.4036
	South East	South West	155.77414	74.18142	0.537	-62.0695	373.6177
South South	South West	350.67584	73.40689	0.000	135.1068	566.2449	
SOYA BEANS	North Central	North East	51.68047	6.98179	0.000	31.1780	72.1829
	North Central	North West	34.79025	5.99913	0.000	17.1734	52.4070
	North Central	South East	-313.26880	53.72475	0.000	-471.0347	-155.5029
	North Central	South South	-232.93523	49.76711	0.000	-379.0793	-86.7912
	North Central	South West	20.57782	15.13441	1.000	-23.8653	65.0209
	North East	North West	-16.89022	6.79760	0.195	-36.8518	3.0713
	North East	South East	-364.94926	53.81976	0.000	-522.9942	-206.9044
	North East	South South	-284.61570	49.86966	0.000	-431.0609	-138.1705
	North East	South West	-31.10265	15.46830	0.666	-76.5262	14.3209
	North West	South East	-348.05904	53.70113	0.000	-505.7555	-190.3625
	North West	South South	-267.72547	49.74161	0.000	-413.7946	-121.6563
	North West	South West	-14.21242	15.05033	1.000	-58.4086	29.9838
	South East	South South	80.33357	72.96977	1.000	-133.9464	294.6136
	South East	South West	333.84662	55.46956	0.000	170.9570	496.7362
South South	South West	253.51305	51.64580	0.000	101.8521	405.1740	
SUGAR CANE	North Central	North East	-2.26922	9.54280	1.000	-30.3159	25.7775
	North Central	North West	-29.82490	8.19944	0.004	-53.9234	-5.7264
	North Central	South East	14.60833	13.49891	1.000	-25.0655	54.2822
	North Central	South South	-15.32725	8.41826	1.000	-40.0689	9.4144
	North Central	South West	-28.86110	11.50428	0.183	-62.6727	4.9505
	North East	North West	-27.55568	8.50797	0.018	-52.5609	-2.5504
	North East	South East	16.87755	13.68851	1.000	-23.3535	57.1086
	North East	South South	-13.05803	8.71904	1.000	-38.6836	12.5676
	North East	South West	-26.59188	11.72617	0.352	-61.0556	7.8718
	North West	South East	44.43323	12.78831	0.008	6.8479	82.0186
	North West	South South	14.49765	7.22409	0.674	-6.7342	35.7295
	North West	South West	0.96380	10.66156	1.000	-30.3710	32.2986
	South East	South South	-29.93558	12.92970	0.311	-67.9365	8.0653
	South East	South West	-43.46943	15.12146	0.061	-87.9120	0.9732
South South	South West	-13.53385	10.83075	1.000	-45.3659	18.2982	
TOMATO	North Central	North East	179.64414	18.35015	0.000	125.7583	233.5300
	North Central	North West	187.39158	15.44098	0.000	142.0486	232.7346
	North Central	South East	-77.49994	27.21941	0.066	-157.4307	2.4308
	North Central	South South	-330.67211	24.15490	0.000	-401.6038	-259.7404
	North Central	South West	-50.81689	17.36233	0.052	-101.8020	0.1682

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	North East	North West	7.74744	17.42572	1.000	-43.4238	58.9187
	North East	South East	-257.14408	28.39239	0.000	-340.5194	-173.7688
	North East	South South	-510.31625	25.46941	0.000	-585.1081	-435.5244
	North East	South West	-230.46103	19.14895	0.000	-286.6926	-174.2294
	North West	South East	-264.89152	26.60496	0.000	-343.0179	-186.7651
	North West	South South	-518.06369	23.46033	0.000	-586.9558	-449.1716
	North West	South West	-238.20847	16.38226	0.000	-286.3156	-190.1014
	South East	South South	-253.17217	32.44779	0.000	-348.4563	-157.8881
	South East	South West	26.68305	27.76420	1.000	-54.8475	108.2136
	South South	South West	279.85522	24.76719	0.000	207.1255	352.5850
CASHEW	North Central	North East	-920.14649	229.30719	0.001	-1593.7915	-246.5015
	North Central	North West	-1807.92009	279.89829	0.000	-2630.1886	-985.6516
	North Central	South East	-37.92270	170.53102	1.000	-538.8986	463.0532
	North Central	South South	-872.53987	215.62859	0.001	-1506.0007	-239.0790
	North Central	South West	-805.51046	150.45171	0.000	-1247.4985	-363.5224
	North East	North West	-887.77360	335.71643	0.123	-1874.0214	98.4742
	North East	South East	882.22379	251.87954	0.007	142.2671	1622.1805
	North East	South South	47.60662	284.35570	1.000	-787.7566	882.9699
	North East	South West	114.63603	238.74294	1.000	-586.7288	816.0008
	North West	South East	1769.99739	298.67133	0.000	892.5785	2647.4163
	North West	South South	935.38023	326.52630	0.063	-23.8693	1894.6298
	North West	South West	1002.40963	287.67943	0.008	157.2821	1847.5371
	South East	South South	-834.61717	239.49364	0.007	-1538.1873	-131.0470
South East	South West	-767.58776	183.02249	0.000	-1305.2603	-229.9152	
South South	South West	67.02941	225.63708	1.000	-595.8338	729.8926	
CHILLI PEPPER (SHOMBO)	North Central	North East	157.89004	20.87056	0.000	96.5784	219.2017
	North Central	North West	163.74207	16.22821	0.000	116.0683	211.4158
	North Central	South East	35.96504	39.20025	1.000	-79.1939	151.1240
	North Central	South South	-205.00667	29.52780	0.000	-291.7508	-118.2626
	North Central	South West	-219.58812	19.23388	0.000	-276.0917	-163.0846
	North East	North West	5.85203	20.74590	1.000	-55.0934	66.7975
	North East	South East	-121.92500	41.27587	0.047	-243.1815	-0.6685
	North East	South South	-362.89671	32.23242	0.000	-457.5862	-268.2072
	North East	South West	-377.47816	23.17283	0.000	-445.5532	-309.4031
	North West	South East	-127.77704	39.13403	0.017	-242.7414	-12.8127
	North West	South South	-368.74875	29.43983	0.000	-455.2344	-282.2631
	North West	South West	-383.33019	19.09855	0.000	-439.4362	-327.2242
	South East	South South	-240.97171	46.26022	0.000	-376.8708	-105.0726
South East	South West	-255.55316	40.47295	0.000	-374.4509	-136.6554	
South South	South West	-14.58145	31.19761	1.000	-106.2310	77.0681	
COCOA	North Central	North East	1095.17928	1720.71736	1.000	-3747.4886	5937.8471
	North Central	South East	421.61691	1227.54651	1.000	-3033.1050	3876.3389
	North Central	South South	440.53327	821.32944	1.000	-1870.9595	2752.0260
	North Central	South West	-205.99467	803.09824	1.000	-2466.1788	2054.1894
	North East	South East	-673.56236	1788.51758	1.000	-5707.0425	4359.9178
	North East	South South	-654.64600	1538.34546	1.000	-4984.0590	3674.7670
	North East	South West	-1301.17394	1528.68947	1.000	-5603.4118	3001.0639
	South East	South South	18.91636	955.25335	1.000	-2669.4826	2707.3153
South East	South West	-627.61158	939.62423	1.000	-3272.0250	2016.8018	
South South	South West	-646.52794	224.95623	0.042	-1279.6292	-13.4267	
COCONUT	North Central	North East	79.18822	86.50860	1.000	-174.9863	333.3628
	North Central	North West	-310.77677	77.69737	0.001	-539.0627	-82.4909
	North Central	South East	-32.99059	17.86343	0.973	-85.4759	19.4947
	North Central	South South	5.17560	17.73579	1.000	-46.9347	57.2859
	North Central	South West	24.76444	19.54986	1.000	-32.6758	82.2047
	North East	North West	-389.96499	114.11268	0.010	-725.2442	-54.6857
	North East	South East	-112.17881	85.46299	1.000	-363.2812	138.9236
	North East	South South	-74.01261	85.43641	1.000	-325.0369	177.0117
	North East	South West	-54.42378	85.83134	1.000	-306.6084	197.7609
	North West	South East	277.78618	76.53148	0.004	52.9258	502.6465
	North West	South South	315.95237	76.50179	0.001	91.1792	540.7255
	North West	South West	335.54121	76.94259	0.000	109.4729	561.6095
	South East	South South	38.16620	11.60795	0.015	4.0604	72.2720
South East	South West	57.75503	14.22614	0.001	15.9566	99.5535	
South South	South West	19.58883	14.06554	1.000	-21.7377	60.9154	
GUAVA	North Central	North East	78.43056	269.16871	1.000	-724.2283	881.0894
	North Central	North West	-709.07407	277.99625	0.176	-1538.0566	119.9084
	North Central	South East	323.44086	273.47568	1.000	-492.0614	1138.9431
	North Central	South South	277.23810	265.29557	1.000	-513.8711	1068.3473
	North Central	South West	-23.33333	308.58120	1.000	-943.5199	896.8533
	North East	North West	-787.50463	183.87723	0.000	-1335.8250	-239.1842
	North East	South East	245.01030	176.96856	1.000	-282.7085	772.7291
North East	South South	198.80754	164.04471	1.000	-290.3724	687.9875	

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	North East	South West	-101.76389	227.48908	1.000	-780.1345	576.6067
	North West	South East	1032.51493	190.12625	0.000	465.5600	1599.4699
	North West	South South	986.31217	178.15944	0.000	455.0422	1517.5822
	North West	South West	685.74074	237.86845	0.068	-23.5810	1395.0625
	South East	South South	-46.20276	171.01994	1.000	-556.1828	463.7773
	South East	South West	-346.77419	232.56921	1.000	-1040.2937	346.7453
	South South	South West	-300.57143	222.89287	1.000	-965.2361	364.0933
KOLANUT	North Central	North East	2272.22076	1323.72252	1.000	-1620.8259	6165.2674
	North Central	North West	1669.77703	3112.89343	1.000	-7485.1925	10824.7466
	North Central	South East	-1007.40046	957.07497	1.000	-3822.1426	1807.3417
	North Central	South South	-768.01514	952.36850	1.000	-3568.9156	2032.8853
	North Central	South West	4977.52314	901.88801	0.000	2325.0850	7629.9613
	North East	North West	-602.44373	3149.97306	1.000	-9866.4638	8661.5764
	North East	South East	-3279.62121	1071.54900	0.034	-6431.0296	-128.2128
	North East	South South	-3040.23589	1067.34742	0.067	-6179.2875	98.8157
	North East	South West	2705.30238	1022.55891	0.124	-302.0269	5712.6317
	North West	South East	-2677.17748	3014.31277	1.000	-11542.2229	6187.8679
	North West	South South	-2437.79216	3012.82172	1.000	-11298.4524	6422.8681
	North West	South West	3307.74611	2997.24723	1.000	-5507.1098	12122.6020
	South East	South South	239.38532	550.43775	1.000	-1379.4433	1858.2139
	South East	South West	5984.92359	457.57834	0.000	4639.1931	7330.6541
South South	South West	5745.53827	447.65075	0.000	4429.0046	7062.0719	
MANGO	North Central	North East	-26.23851	9.32990	0.074	-53.6398	1.1628
	North Central	North West	14.52206	9.23063	1.000	-12.5877	41.6318
	North Central	South East	-76.35312	7.98941	0.000	-99.8175	-52.8887
	North Central	South South	-47.23970	8.28470	0.000	-71.5713	-22.9081
	North Central	South West	59.65651	9.34130	0.000	32.2217	87.0913
	North East	North West	40.76057	10.32773	0.001	10.4287	71.0925
	North East	South East	-50.11461	9.23516	0.000	-77.2377	-22.9915
	North East	South South	-21.00119	9.49178	0.405	-48.8779	6.8756
	North East	South West	85.89502	10.42676	0.000	55.2723	116.5178
	North West	South East	-90.87518	9.13486	0.000	-117.7037	-64.0467
	North West	South South	-61.76176	9.39422	0.000	-89.3520	-34.1715
	North West	South West	45.13445	10.33803	0.000	14.7723	75.4966
	South East	South South	29.11342	8.17786	0.006	5.0956	53.1313
	South East	South West	136.00963	9.24667	0.000	108.8527	163.1665
South South	South West	106.89621	9.50298	0.000	78.9866	134.8059	
ORANGE	North Central	North East	-133.83314	21.09279	0.000	-195.7923	-71.8739
	North Central	North West	-58.56296	31.69538	0.971	-151.6669	34.5409
	North Central	South East	-174.50414	13.13899	0.000	-213.0994	-135.9089
	North Central	South South	-169.03582	13.40855	0.000	-208.4229	-129.6487
	North Central	South West	-95.80617	13.77088	0.000	-136.2576	-55.3548
	North East	North West	75.27018	35.15032	0.485	-27.9825	178.5228
	North East	South East	-40.67100	20.08933	0.645	-99.6826	18.3406
	North East	South South	-35.20268	20.26666	1.000	-94.7352	24.3298
	North East	South West	38.02696	20.50818	0.957	-22.2150	98.2689
	North West	South East	-115.94118	31.03663	0.003	-207.1100	-24.7723
	North West	South South	-110.47286	31.15171	0.006	-201.9797	-18.9660
	North West	South West	-37.24321	31.30937	1.000	-129.2132	54.7268
	South East	South South	5.46832	11.76711	1.000	-29.0971	40.0337
	South East	South West	78.69796	12.17837	0.000	42.9245	114.4714
South South	South West	73.22964	12.46872	0.000	36.6033	109.8560	
PALM FRUITS	North Central	North East	-128.03496	38.82818	0.015	-242.0979	-13.9720
	North Central	North West	-112.54619	65.96161	1.000	-306.3173	81.2249
	North Central	South East	-101.12073	15.45268	0.000	-146.5151	-55.7264
	North Central	South South	-8.13496	15.40530	1.000	-53.3901	37.1202
	North Central	South West	-233.92967	17.33877	0.000	-284.8646	-182.9947
	North East	North West	15.48877	74.14216	1.000	-202.3138	233.2913
	North East	South East	26.91423	37.21439	1.000	-82.4080	136.2365
	North East	South South	119.90000	37.19474	0.019	10.6355	229.1645
	North East	South West	-105.89471	38.03628	0.081	-217.6314	5.8420
	North West	South East	11.42546	65.02474	1.000	-179.5935	202.4444
	North West	South South	104.41123	65.01350	1.000	-86.5747	295.3971
	North West	South West	-121.38348	65.49859	0.959	-313.7944	71.0274
	South East	South South	92.98577	10.70545	0.000	61.5371	124.4345
	South East	South West	-132.80894	13.33853	0.000	-171.9927	-93.6252
South South	South West	-225.79471	13.28361	0.000	-264.8171	-186.7723	
PAWPAW	North Central	North East	-71.94965	8.91245	0.000	-98.1294	-45.7699
	North Central	North West	-54.87485	10.40294	0.000	-85.4329	-24.3168
	North Central	South East	11.57014	5.43361	0.500	-4.3908	27.5310
	North Central	South South	9.46421	5.40968	1.000	-6.4264	25.3548
	North Central	South West	17.79310	5.86399	0.036	0.5680	35.0182
	North East	North West	17.07480	12.19210	1.000	-18.7388	52.8884

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	North East	South East	83.51979	8.36363	0.000	58.9521	108.0875
	North East	South South	81.41387	8.34810	0.000	56.8918	105.9359
	North East	South West	89.74276	8.64943	0.000	64.3356	115.1500
	North West	South East	66.44499	9.93679	0.000	37.2563	95.6337
	North West	South South	64.33906	9.92372	0.000	35.1887	93.4894
	North West	South West	72.66795	10.17851	0.000	42.7692	102.5667
	South East	South South	-2.10593	4.44783	1.000	-15.1712	10.9593
	South East	South West	6.22296	4.99049	1.000	-8.4363	20.8822
	South South	South West	8.32889	4.96443	1.000	-6.2538	22.9116
OTHER. PERMANENT CROP (SPECIFY)	North Central	North East	145.00000	318.13958	1.000	-824.3486	1114.3486
	North Central	North West	160.41667	224.95865	1.000	-525.0163	845.8497
	North Central	South South	6.92308	223.22150	1.000	-673.2169	687.0631
	North Central	South West	-720.00000	284.55269	0.173	-1587.0118	147.0118
	North East	North West	15.41667	266.17467	1.000	-795.5986	826.4319
	North East	South South	-138.07692	264.70813	1.000	-944.6237	668.4699
	North East	South West	-865.00000	318.13958	0.111	-1834.3486	104.3486
	North West	South South	-153.49359	139.51344	1.000	-578.5811	271.5939
	North West	South West	-880.41667	224.95865	0.005	-1565.8497	-194.9837
	South South	South West	-726.92308	223.22150	0.030	-1407.0631	-46.7831

*. The mean difference is significant at the 0.05 level.

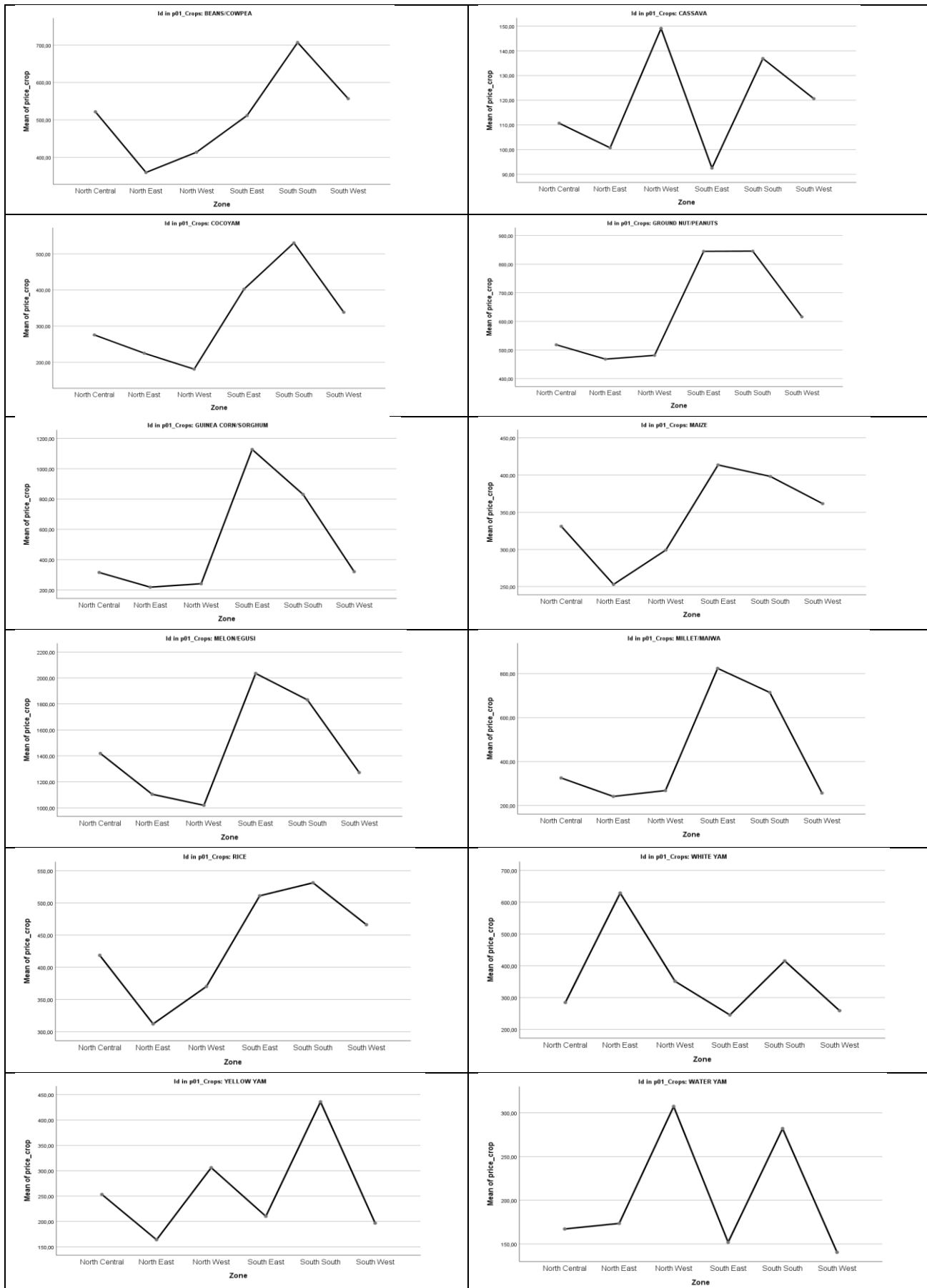
Appendix 3. : T-test made by crop to compare mean of price by region

Crops	Means	Equal variance s assumed?	Levene's Test for Equality of Variances		t-test for Equality of Means					95% IC	
			F	Sig.	t	df	Sig. (2-tailed)	Mean	Std. Error	Lower	Upper
BEANS/COWPEA	URBAN = 461	YES	58,527	<0.001	4.924	8489	<0.001	25.9	5.3	15.6	36.2
	RURAL = 435				4.532	4122.906	<0.001	25.9	5.7	14.7	37.1
CASSAVA	URBAN = 121	YES	12,272	<0.001	2.754	8489	0.006	5.1	1.9	1.5	8.8
	RURAL = 116				2.746	8305.021	0.006	5.1	1.9	1.5	8.8
COCOYAM	URBAN = 419	YES	15,986	<0.001	4.983	4058	<0.001	69.9	14	42.4	97.4
	RURAL = 349				5.195	3917.484	<0.001	69.9	13.4	43.5	96.2
GROUND NUT/PEANUTS	URBAN = 588	YES	87,958	<0.001	7.984	8752	<0.001	75	9.4	56.6	93.5
	RURAL = 513				7.373	4309.471	<0.001	75	10.2	55.1	95
GUINEA CORN/SORGHUM	URBAN = 264	NON	2,934	0,087	1.181	8110	0.238	3.9	3.3	-2.6	10.4
	RURAL = 260				1.058	3160.973	0.29	3.9	3.7	-3.4	11.2
MAIZE	URBAN = 362	YES	190,442	<0.001	12.457	16351	<0.001	43.6	3.5	36.7	50.4
	RURAL = 318				12.231	14289.079	<0.001	43.6	3.6	36.6	50.5
MELON/EGUSI	URBAN = 1649	YES	10,195	0,001	1.832	4545	0.067	79.3	43.3	-5.6	164.3
	RURAL = 1569				1.856	4330.118	0.064	79.3	42.7	-4.5	163.2
MILLET/MAIWA	URBAN = 281	YES	5,385	0,02	2.202	6357	0.028	7.9	3.6	0.9	15
	RURAL = 273				2.071	2647.816	0.038	7.9	3.8	0.4	15.4
RICE	URBAN = 408	YES	26,25	<0.001	6.634	8933	<0.001	36.7	5.5	25.9	47.5
	RURAL = 372				5.431	3591.459	<0.001	36.7	6.8	23.4	49.9
WHITE YAM	URBAN = 311	YES	18,362	<0.001	-0.961	6473	0.337	-10.6	11	-32.1	11
	RURAL = 322				-0.953	6030.093	0.34	-10.6	11.1	-32.3	11.2
YELLOW YAM	URBAN = 301	NO	3,264	0,071	1.81	1986	0.07	33.7	18.6	-2.8	70.1
	RURAL = 267				1.787	1604.995	0.074	33.7	18.8	-3.3	70.6
WATER YAM	URBAN = 216	YES	19,713	<0.001	4.101	2955	<0.001	39.7	9.7	20.7	58.7
	RURAL = 177				4.317	2835.336	<0.001	39.7	9.2	21.7	57.7
THREE LEAVE YAM	URBAN = 150	NON	0,999	0,318	1.927	1487	0.054	14.9	7.8	-0.3	30.1
	RURAL = 135				2.03	1438.43	0.043	14.9	7.4	0.5	29.4
BAMBARA NUT	URBAN = 399	NON	0,001	0,973	-0.423	1006	0.673	-5.8	13.8	-32.9	21.3
	RURAL = 405				-0.425	549.562	0.671	-5.8	13.7	-32.8	21.1
BANANA	URBAN = 1184	YES	10,887	0,001	6.521	4530	<0.001	153.3	23.5	107.2	199.3
	RURAL = 1031				6.571	4412.631	<0.001	153.3	23.3	107.5	199
BEENI-SEED/SESAME	URBAN = 769	YES	20,127	<0.001	5.489	2714	<0.001	88.1	16	56.6	119.5
	RURAL = 681				5.058	1070.952	<0.001	88.1	17.4	53.9	122.2
CARROT	URBAN = 184	YES	4,661	0,031	2.246	573	0.025	27.8	12.4	3.5	52.1
	RURAL = 157				1.961	265.736	0.051	27.8	14.2	-0.1	55.7
GARDEN EGG	URBAN = 141	YES	11,762	0,001	5.026	1000	<0.001	26.5	5.3	16.2	36.9
	RURAL = 115				4.742	615.675	<0.001	26.5	5.6	15.5	37.5
GARLIC	URBAN = 473	NON	2,19	0,142	1.268	93	0.208	75.9	59.9	-42.9	194.8
	RURAL = 397				1.152	26.736	0.259	75.9	65.9	-59.3	211.2
GINGER	URBAN = 466	NON	1,898	0,17	0.725	201	0.469	49.4	68.1	-84.9	183.6
	RURAL = 416				0.687	109.956	0.494	49.4	71.9	-93.1	191.9
OKRO	URBAN = 567	YES	82,977	<0.001	10.624	6582	<0.001	127.9	12	104.3	151.5
	RURAL = 439				10.532	6159.22	<0.001	127.9	12.1	104.1	151.7
ONION	URBAN = 281	NON	0,6	0,439	1.65	2553	0.099	15	9.1	-2.8	32.9
	RURAL = 266				1.505	1084.921	0.133	15	10	-4.6	34.6
		YES	66,656	<0.001	5.295	2584	<0.001	727	137.3	457.7	996.2

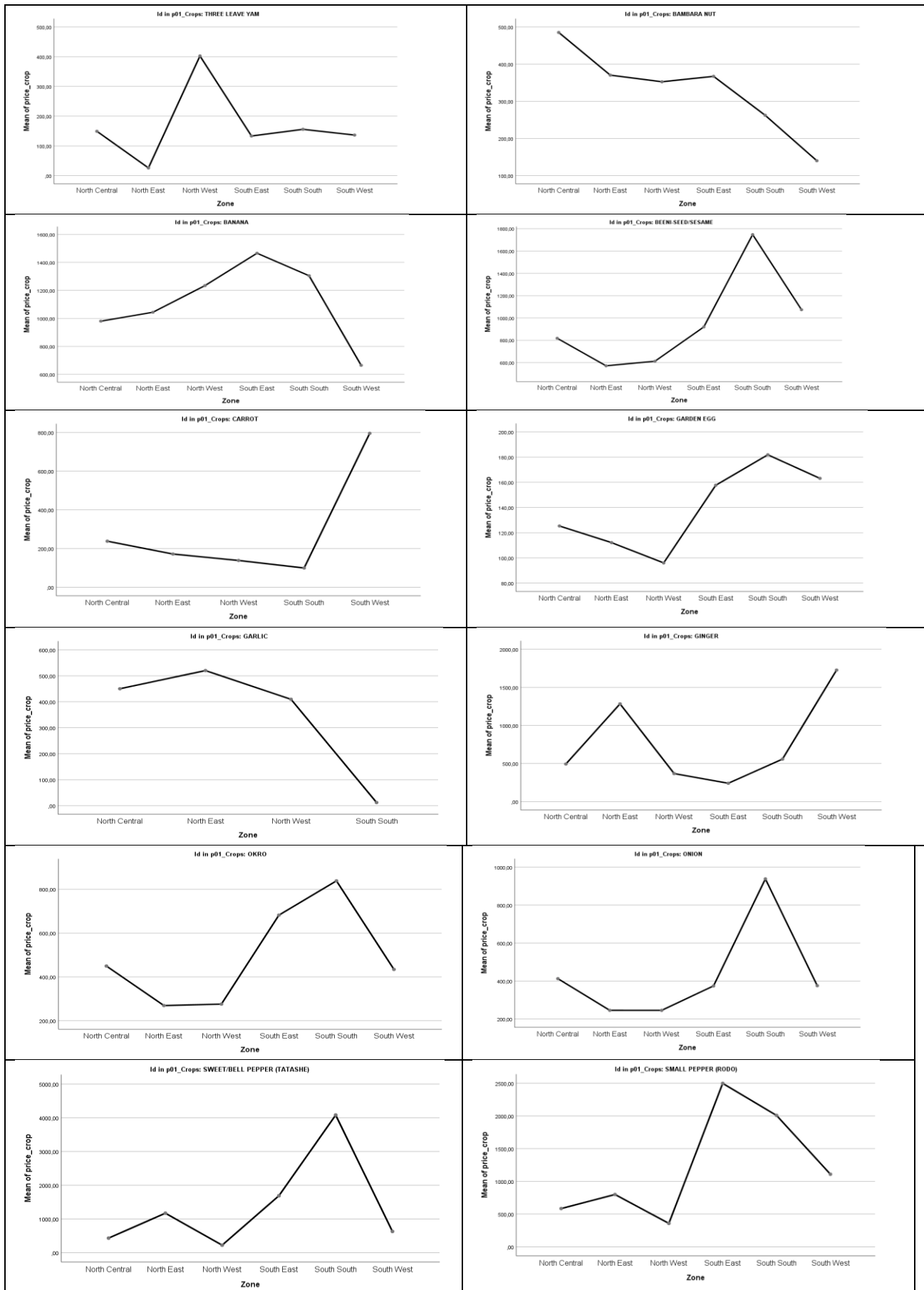
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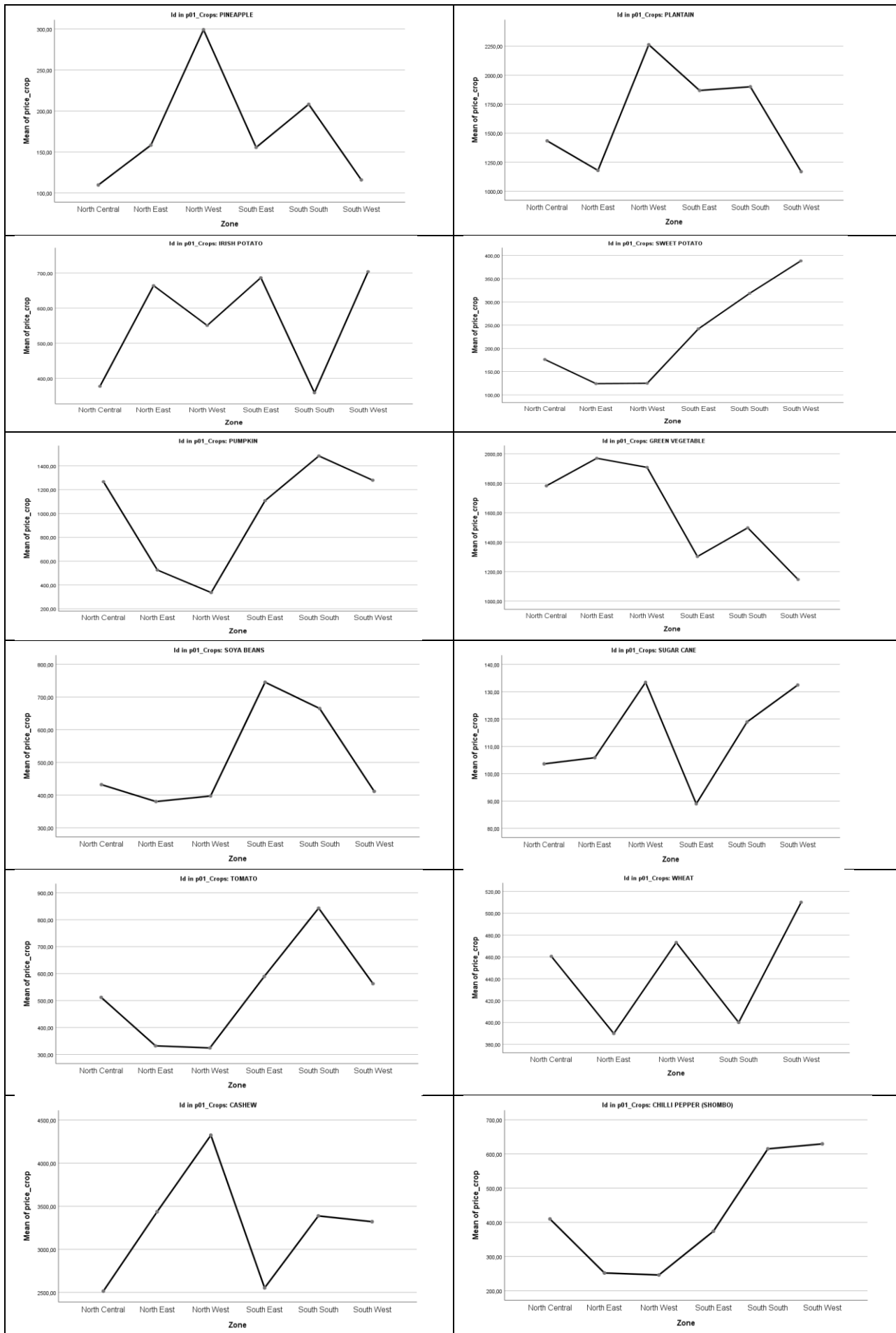
SWEET/BELL PEPPER (TATASHE)	URBAN = 1243 RURAL = 516				3.804	868.158	<0.001	727	191.1	351.9	1102
SMALL PEPPER (RODO)	URBAN = 1355 RURAL = 928	YES	35,211	<0.001	6.08	5037	<0.001	427.3	70.3	289.5	565.1
					5.809	3716.463	<0.001	427.3	73.6	283.1	571.5
PINEAPPLE	URBAN = 173 RURAL = 147	YES	8,389	0,004	3.2	2406	0.001	26	8.1	10.1	42
					3.435	2405.988	0.001	26	7.6	11.2	40.9
PLANTAIN	URBAN = 1641 RURAL = 1563	NON	1,543	0,214	2.27	4553	0.023	78.3	34.5	10.7	145.8
					2.231	3690.717	0.026	78.3	35.1	9.5	147
IRISH POTATO	URBAN = 536 RURAL = 440	YES	10,086	0,002	2.114	428	0.035	95.9	45.4	6.7	185
					1.969	258.506	0.05	95.9	48.7	0	191.7
SWEET POTATO	URBAN = 237 RURAL = 173	YES	129,594	<0.001	9.444	5024	<0.001	63.9	6.8	50.7	77.2
					8.751	3150.654	<0.001	63.9	7.3	49.6	78.3
PUMPKIN	URBAN = 1307 RURAL = 990	YES	26,911	<0.001	5.774	5268	<0.001	317.1	54.9	209.5	424.8
					5.873	4767.43	<0.001	317.1	54	211.3	423
GREEN VEGETABLE	URBAN = 1537 RURAL = 1545	YES	10,239	0,001	-0.159	4929	0.874	-7.5	47.3	-100.3	85.3
					-0.16	4928.996	0.873	-7.5	47.2	-100	85
SOYA BEANS	URBAN = 414 RURAL = 405	YES	6,863	0,009	1.595	5198	0.111	9.3	5.8	-2.1	20.7
					1.533	2423.511	0.125	9.3	6	-2.6	21.1
SUGAR CANE	URBAN = 113 RURAL = 123	NON	2,66	0,103	-1.749	1843	0.08	-9.5	5.4	-20.2	1.2
					-1.819	1842.312	0.069	-9.5	5.2	-19.8	0.7
TOMATO	URBAN = 533 RURAL = 421	YES	22,51	<0.001	9.294	5285	<0.001	112.6	12.1	88.8	136.3
					9.208	4211.085	<0.001	112.6	12.2	88.6	136.5
WHEAT	URBAN = 418 RURAL = 471	YES	6,187	0,013	-2.778	425	0.006	-52.7	19	-90	-15.4
					-2.849	382.916	0.005	-52.7	18.5	-89.1	-16.3
CASHEW	URBAN = 3153 RURAL = 2775	YES	11,158	0,001	3.231	2783	0.001	378.6	117.2	148.8	608.4
					3.221	2707.452	0.001	378.6	117.6	148.1	609.1
CHILLI PEPPER (SHOMBO)	URBAN = 465 RURAL = 342	YES	27,555	<0.001	8.59	2818	<0.001	122.9	14.3	94.8	150.9
					8.062	1700.566	<0.001	122.9	15.2	93	152.7
COCOA	URBAN = 1668 RURAL = 1244	NON	0,168	0,682	2.341	859	0.019	424.6	181.4	68.6	780.6
					2.616	515.516	0.009	424.6	162.3	105.7	743.4
COCONUT	URBAN = 491 RURAL = 422	YES	19,292	<0.001	6.869	2404	<0.001	68.5	10	48.9	88
					7.018	2224.645	<0.001	68.5	9.8	49.3	87.6
GUAVA	URBAN = 377 RURAL = 418	NON	1,778	0,184	-0.326	157	0.745	-41.5	127.1	-292.4	209.5
					-0.322	141.338	0.748	-41.5	128.8	-296.1	213.2
KOLANUT	URBAN = 3494 RURAL = 3770	NON	0,031	0,861	-0.726	1226	0.468	-275.2	379.3	-1019.4	468.9
					-0.725	1161.747	0.468	-275.2	379.5	-1019.9	469.4
MANGO	URBAN = 182 RURAL = 145	YES	65,577	<0.001	6.931	4067	<0.001	37.2	5.4	26.7	47.7
					6.877	3751.941	<0.001	37.2	5.4	26.6	47.8
ORANGE	URBAN = 252 RURAL = 171	YES	40,069	<0.001	9.119	3128	<0.001	80.6	8.8	63.3	98
					9.393	3106.394	<0.001	80.6	8.6	63.8	97.5
PALM FRUITS	URBAN = 156 RURAL = 147	YES	5,485	0,019	0.916	2904	0.36	8.8	9.6	-10	27.5
					0.884	2277.523	0.377	8.8	9.9	-10.7	28.2
PAWPAW	URBAN = 146 RURAL = 145	YES	8,428	0,004	0.232	3153	0.817	0.8	3.5	-6.1	7.7
					0.228	2710.368	0.82	0.8	3.6	-6.2	7.8
OTHER, PERMANENT CROP (SPECIFY)	URBAN = 225 RURAL = 368	YES	6,332	0,017	-0.965	31	0.342	-142.4	147.5	-443.3	158.5
					-1.241	24.115	0.227	-142.4	114.7	-379.1	94.3

Appendix 4. : Graph of evolution of means of price by zone and by crop

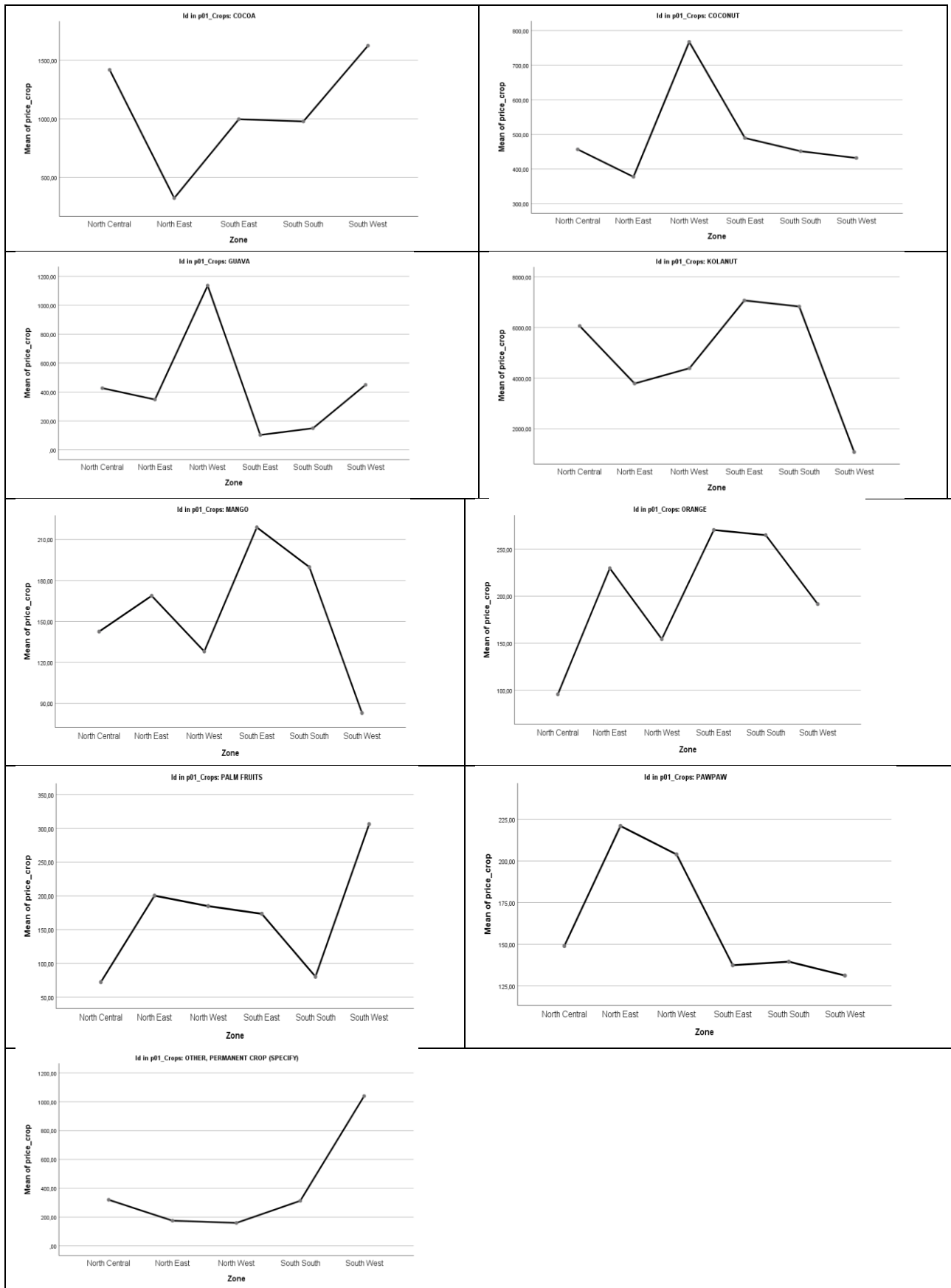


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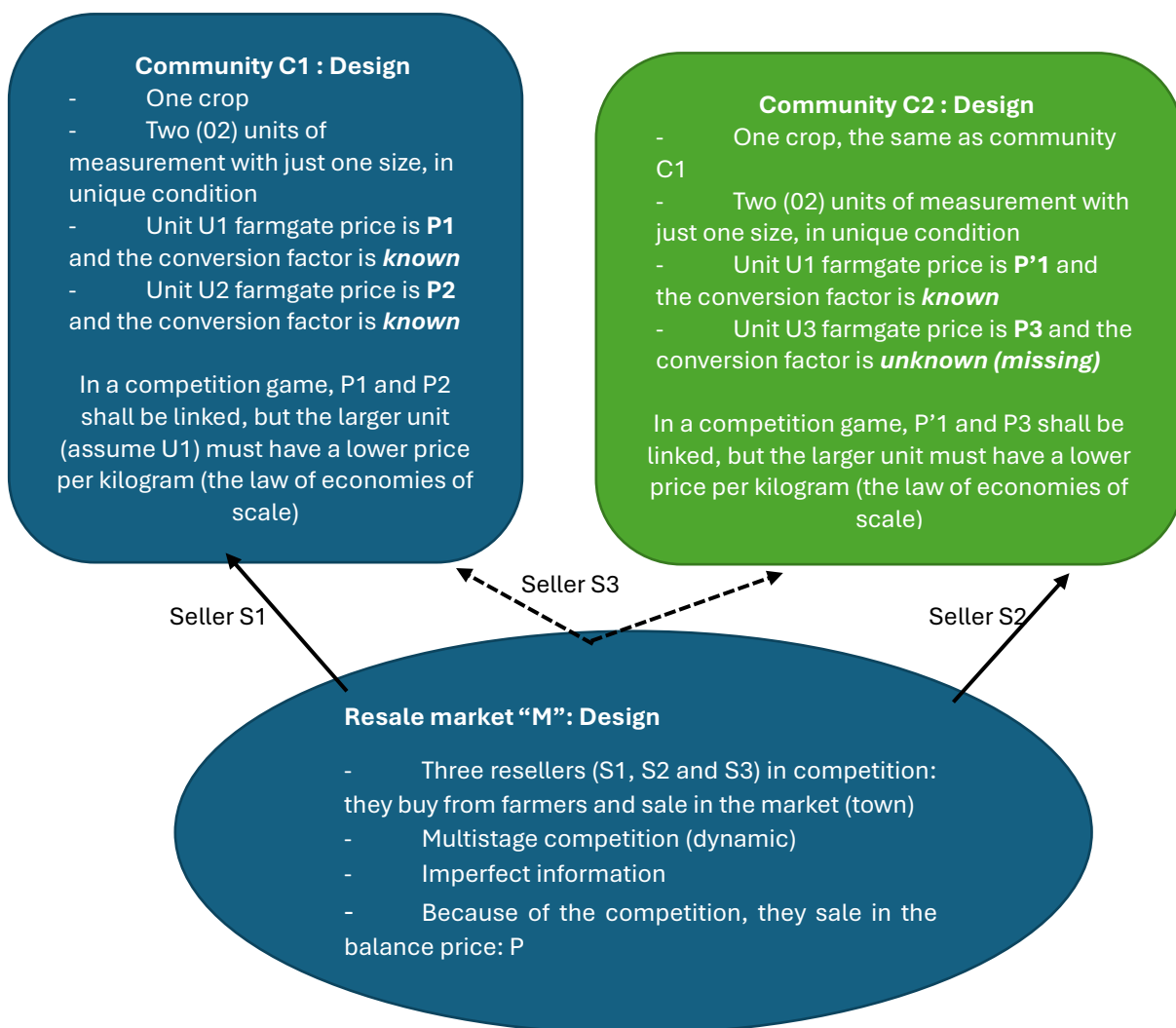


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Appendix 5. : Theoretical model for estimating conversion factors.

This is present for discussion purposes. Let suppose two communities C1 and C2 who grown the same crop.



The question is: using information on price, conversion factor and units of measurement in communities, is it possible to predict the unknown conversion factor of the unit "U3"?

We assume an imperfect information of the market to say that Seller 3 only, knows the two farmgate prices (communities) and he arbitrates on them. Then, the two communities are also in competition and will adjust their price to attract Sellers.

when seller 3 goes to a community, he creates an increase in demand and prices in that community rise. At the same time, prices in the other community fall. According to the "Walrassian tatonnement" principle, prices will balance out in both communities: Unit of measurement with approximatively the same weight/quantity of goods/crop (so the same conversion factor) will be close at the long run.

Taking into account economies of scale, we can assume that the price per kilogram of small units will be higher than that of large units. However, because of competition, units that can contain the same quantities of a giving crop will have fairly similar prices. Consequently, if prices are consistent with conversion factors, then the price can be used to estimate the missing conversion factors.

Hence, if the conversion factor fitting model (by linear regression) is good, it should also be adapted to predict missing conversion factors. In addition, using any auxiliary information common to both units with available conversion factors and units with missing conversion factors should improve the quality of the prediction. The only common auxiliary information is the condition (between the three variables conditions, units and size).

Note: For the time being, the predictive power of the model is not acceptable. However, this theoretical model is written to provoke thought.