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Impact of Covid-19 on Staples and Food Markets in Tanzania

Policy Implications on Regional Trade for Cereals

ASPIRES Tanzania
Agricultural Sector Policy and Institutional Reforms Strengthening

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IMPACT OF COVID-19 ON STAPLES AND FOOD MARKETS IN TANZANIA
POLICY IMPLICATIONS ON REGIONAL TRADE FOR CEREALS

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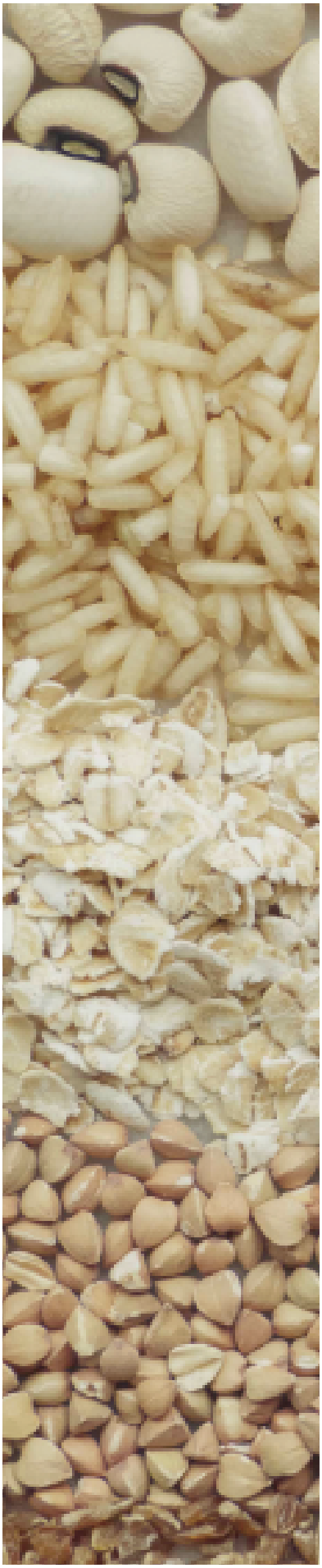
Key Messages:

- During the last 20 years, Tanzania on average has been self-sufficient in maize and rice production with a surplus of about 15-20 percent
- Three cereals dominate the domestic market (traded) volume of 4 million tons and their relative share include maize (50%), rice (25%) and wheat (25%)
- Export of the surplus cereals to regional markets is crucial in price stabilization and absence of trade could lead to depression of domestic prices
- Analysis of wholesale and retail prices for maize and rice indicates high market integration which implies regional factors need to be taken into consideration in assessing the national food security
- Rapid market survey indicates that outbreak of Covid-19 has disrupted regional trade leading to depression of domestic price for maize and rice in 2020 as compared to prices in the previous 5 years
- Empirical price analysis confirms that maize and rice markets are co-integrated and price change is transmitted across the borders. This finding strengthens the evidence that food security needs a regional approach as markets are interdependent
- Impact of Covid-19 in depressing domestic price is more prominent in rice than maize
- Moreover, price volatility for both maize and rice has increased in 2020 indicating increased market uncertainty and increased risk for producers and traders
- Tanzania needs to step up negotiation with its trading partner countries in the region to harmonize Covid-19 response policies and regulations for easy trading across the boarders

1. INTRODUCTION

Since the outbreak of Covid-19 in the beginning of 2020, a number of studies have been conducted in Tanzania to assess the effect and impact of Covid-19 in agriculture and food systems. ASPIRES with support from the International Fund for Agricultural Development (IFAD) took the initiative to review and summarize findings and recommendations from these various studies. The purpose of this review is to provide a summary of results and actionable policy recommendations to mitigate the impact of Covid-19 and build resilience against future pandemic outbreaks.



The synthesis of Covid-19 studies has also identified research and data gaps. The review of Covid-19 studies has shown that most of the studies are analyzing potential impact (ex-ante evaluation) based on literature and logical analysis. Few studies are assessing the actual impact (post-ante evaluation). Limited impact studies could be attributed to the short timeline since the outbreak of Covid-19, the risk of conducting face-to-face interviews, and delays in survey approval by the regulatory authority. Comprehensive surveys assessing Covid-19 awareness, agricultural production, value chain activities, livelihood and incomes, consumption, adaptation, vulnerability and other household information are still underway or in the approval process.

One of the research gaps identified in the Covid-19 studies review process is inadequate information on its impact in food markets. The Eastern Africa Grain Council (EAGC) has been collecting market prices for key cereals across the East Africa Region. The Ministry of Industry and Trade (MIT) has also been collecting food prices across markets in Tanzania. Both institutions have been producing monthly market bulletins; however, not much empirical analyses have been conducted.

Price is an important market signal and the impact of Covid-19 is expected to be reflected in food prices as the pandemic impacts supply and demand conditions. The recent rapid market survey by ASPIRES suggests effects of Covid-19 to include weakened demand for some products, increased demand for some, and disruption of supply chains including cross-border trade of food commodities such as maize and rice. For example, traders in Namanga think that the weakened demand for rice in Kenya is not only due to disruption of the supply chain but also due to the decrease in purchasing power of households arising from the lockdown in the economy imposed for many months by the Kenyan government. Interviews of farmers and traders in Ifakara (Morogoro), Magugu (Manyara), Mbeya and Kahama has shown that since Covid-19 outbreak, the number of rice buyers from Kenya and Rwanda has drastically decreased compared to previous years. As a result, rice prices have declined while paddy and rice stocks have stagnated in warehouses. Similar price trends and situations were expressed by maize farmers and traders in Kibaigwa (Dodoma), Namanga (Arusha), Horohoro (Tanga) and Tunduma (Songwe). Products whose demand has increased include spices, vegetables and fruit. The increase in demand of these products is attributed to increased health consciousness as consumers shift to immunity enhancing foods.

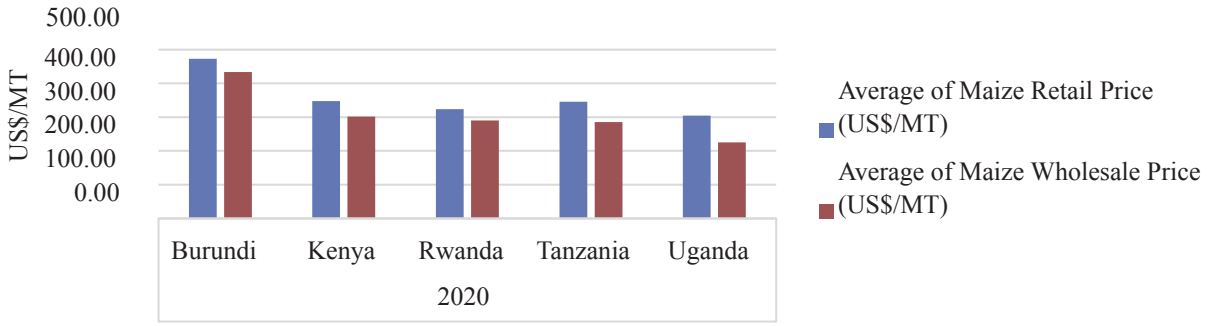
ASPIRES acquired monthly wholesale and retail market price data for rice and maize for Tanzania and other East African countries that share common borders with Tanzania. The monthly time series data covers several wholesale and retail markets across the region during the past six years (2015-2020). The price data is quoted in US dollars (USD) per tonne and hence eliminating the need to deflate the data. The analyses compare price levels, variations and transmission (spatial and temporal) before and after the outbreak of Covid-19 in 2020. Though the analysis is limited by the length of the price series after the outbreak of Covid-19 in 2020, the analysis sets the stage for continued surveillance and analyses as time unfolds.

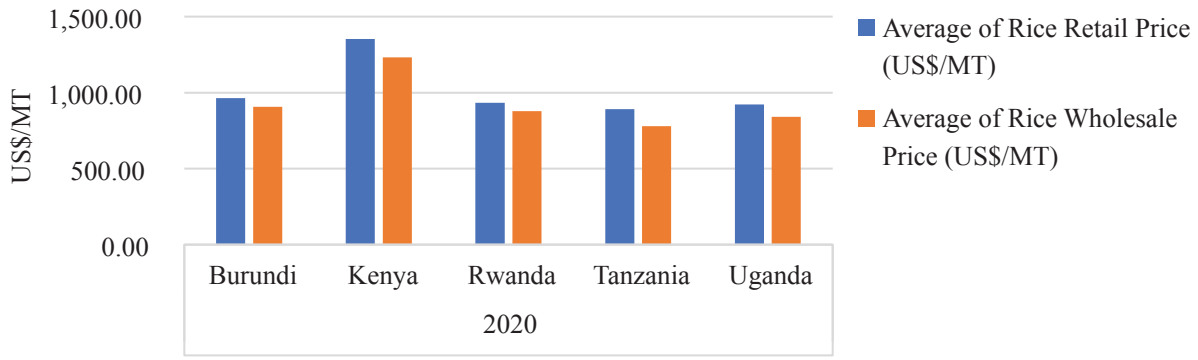
2. IMPORTANCE OF MAIZE AND RICE

Maize and rice are the most widely grown and consumed cereals in Tanzania. Based on the Agriculture Sample Census (NBS, 2012), about 4.5 million (75%) and 1.6 (26%) million farmers grow maize and rice respectively. Of the total maize (6 million tonnes) and rice (1.7 million tonnes) produced, 2 million tonnes of maize and 1.2 million tonnes of rice are traded in the market. Domestic cereal production is supplemented with 1 million tonnes of wheat imported, therefore, making the market share for popular cereals of 50% maize, 25% rice and 25% wheat.

3.IMPORTANCE OF REGIONAL TRADE FOR MAIZE AND RICE

Based on the national food balance sheet (MoA, FAO/WFP), on average, Tanzania is self-sufficient in food production with a surplus of from 15% to 20% during the last 20 years. The regional market is therefore important for Tanzania to trade its surplus otherwise it may lead to depression of domestic prices. For example, a study by IFPRI in 2013 demonstrated that during trade restrictions (export ban), farmers experienced depressed producer prices. Tanzania and Uganda are surplus producers of maize and rice in the region and their relatively lower market prices are incentives for trading with neighboring countries. The average represents several markets within a country and in 12 months of the year. The relatively lower prices of maize and rice in Tanzania and Uganda, opens up an opportunity for trading the cereals with other countries in the region (Figures 1&2).





4.TREND IN REGIONAL TRADE FOR MAIZE AND RICE

As previously noted, since Covid-19 outbreak, there have been challenges in regional trade due to disparity in policy and regulatory requirements for cross-border trade, as depicted in the EAGC/FEWSNET report (Table 1). Comparing years 2019 and 2020, volumes of maize exports from Tanzania to Kenya and of rice from Tanzania to Rwanda during the second quarter has decreased by over 50%. A similar pattern is observed when comparing 2020 exports with the average volume of trade during the previous 5 years. It is, therefore, evident that cross-border restrictions in response to Covid-19 may have negatively impacted regional trade for maize and rice. The negative effect could have been worsened by weakening demand in the destination markets due to long lockdown of the economies in Kenya and Rwanda which have contributed to income loss for households.

Table1: Cross-border trade for maize and rice during months of between April and June, 2020

	Commodity Trade Flow Corridors (source destination)	Trade Volumes in MT	% Change			Historical Comparison		
			Last Quarter	Last Year	5 Year Average	Last Quarter	Last Year	Average
Maize	Tanzania - Kenya	22,103	137%	-15%	-56%	▲	▲	▲
	Tanzania – Rwanda	1,764	-80%	48%	336%	▼	▼	▼
	Kenya - Tanzania	283	-92%	-91%	-86%	▼	▼	▼
Rice	Tanzania – Kenya	2,261	-60%	-86%	-89%	▼	▼	▼
	Tanzania - Rwanda	1,539	-53%	-87%	-95%	▼	▼	▼
	Tanzania - Burundi	1,183	33%	7%	43%	▲	▲	▲

Source: EAGC/FEWSNET, 2020

5. IMPACT OF COVID-1-9 IN PRICE-LEVEL AND STABILITY

In 2019 maize price was on a recovery trend after plummeting during the previous 3 years. The recovery trend was attributed to removal of trade restrictions and good weather. However, the recovery slowed down in 2020 due to trade disruption and weakening demand on the Kenyan side. Interviews of key informants at border markets of Namanga and Horohoro suggest that demand for maize on Kenya's side might have been affected by declining household incomes and weakening derived demand from the feed industry. Both Kenya and Rwanda have adopted strict lockdown measures to their economies to control Covid-19 including stringent cross-border regulations for truck drivers and traders including those involved in cereal trade. The deflection of price curves (Figures 3&4) depicts the slow-down in maize price recovery. A similar trend is observed in prices of rice between Tanzania and Rwanda. Prices of rice have been decreasing steadily over years probably due to increased production in the region. However, the decline in rice price accelerated in year 2020 (Figures 5&6); this reinforces the previous observation of the potential impact of trade disruption due policy and regulatory enforcement in response to the outbreak of Covid-19.

Figure 3: Nominal maize price trend in Kenya

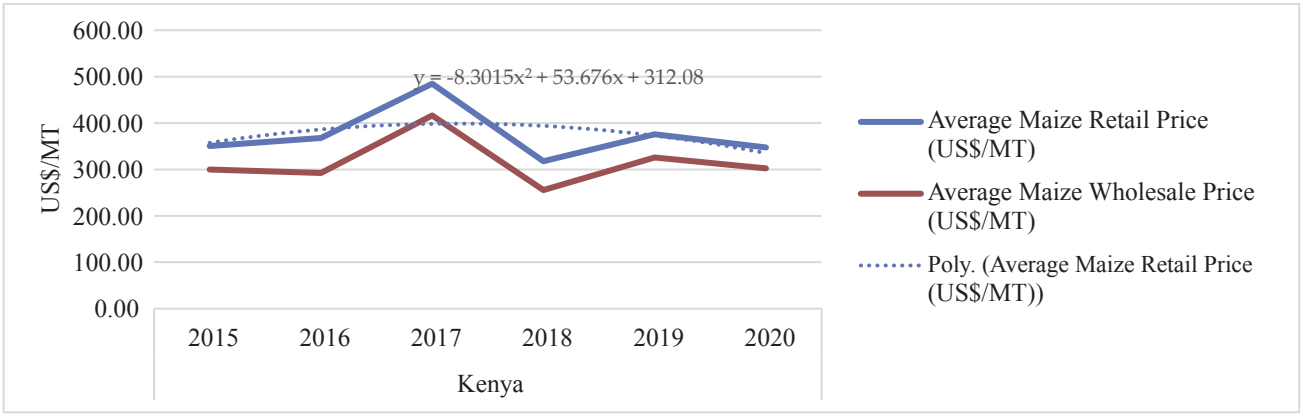


Figure4: Nominal maize price trend in Tanzania

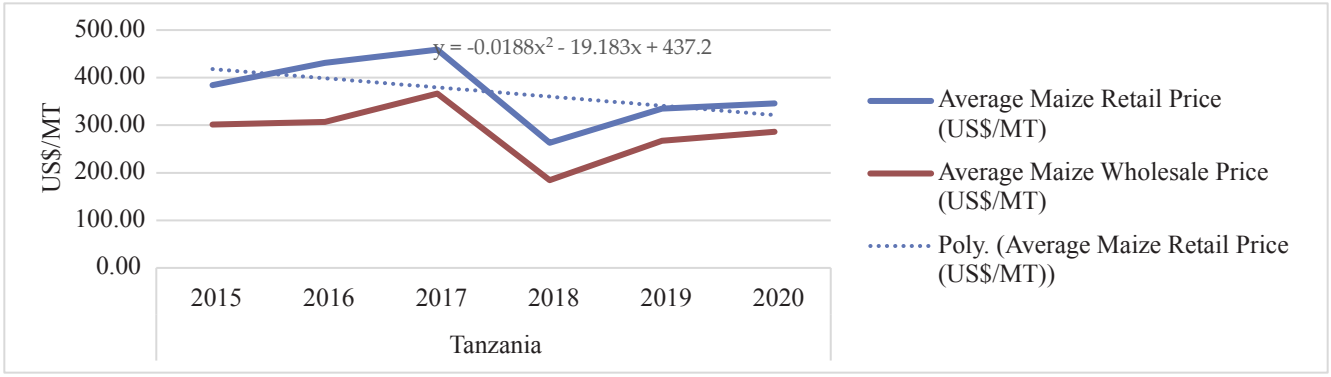


Figure5: Nominal Rice price trend in Tanzania

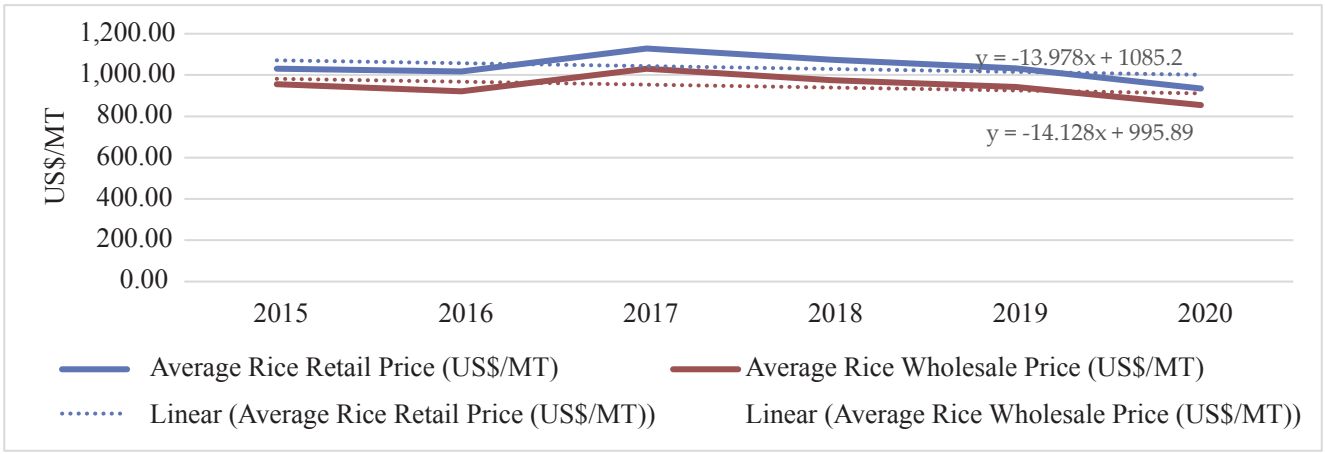
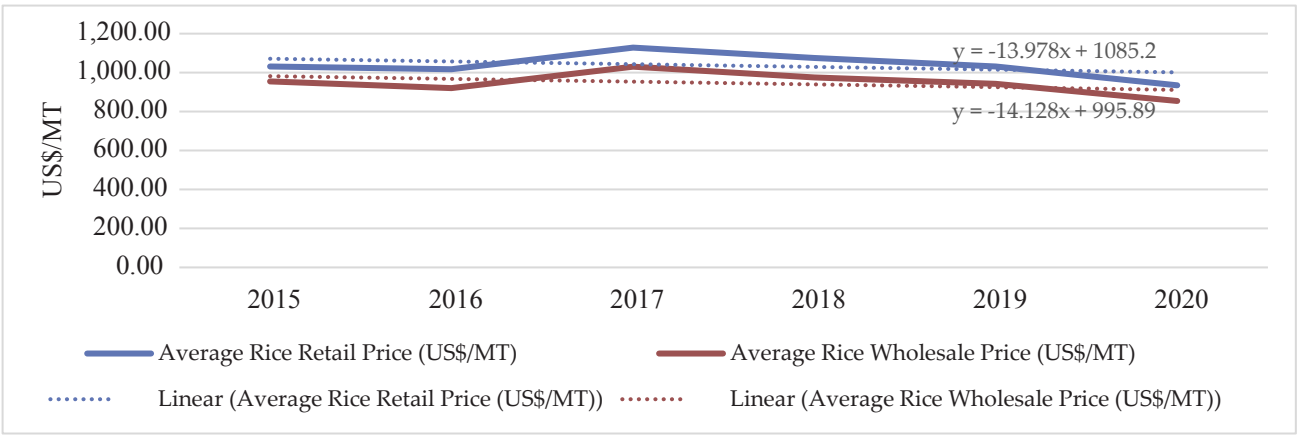


Figure6: Rice price trend in Rwanda



6. MARKET MARGINS

The analysis also estimated price differences between wholesale and retail for both maize and rice across markets in Tanzania (Figures 7&8). Changes in market margins (or price spread) imply changes in market efficiency or changes in equity. In both maize and rice price margins have been declining during the past six years but stagnated for maize and accelerated for rice in 2020. Most likely the changes in 2020 reflect declining profits as prices are stagnant or declining.

Figure7: Maize price spread (marg in) between wholesale and retail price

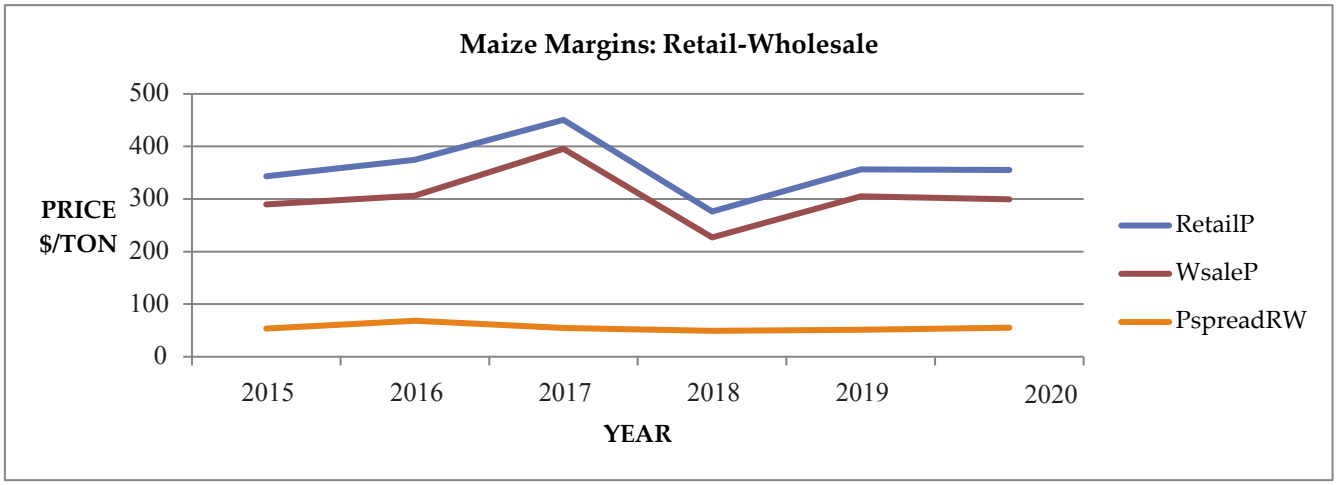
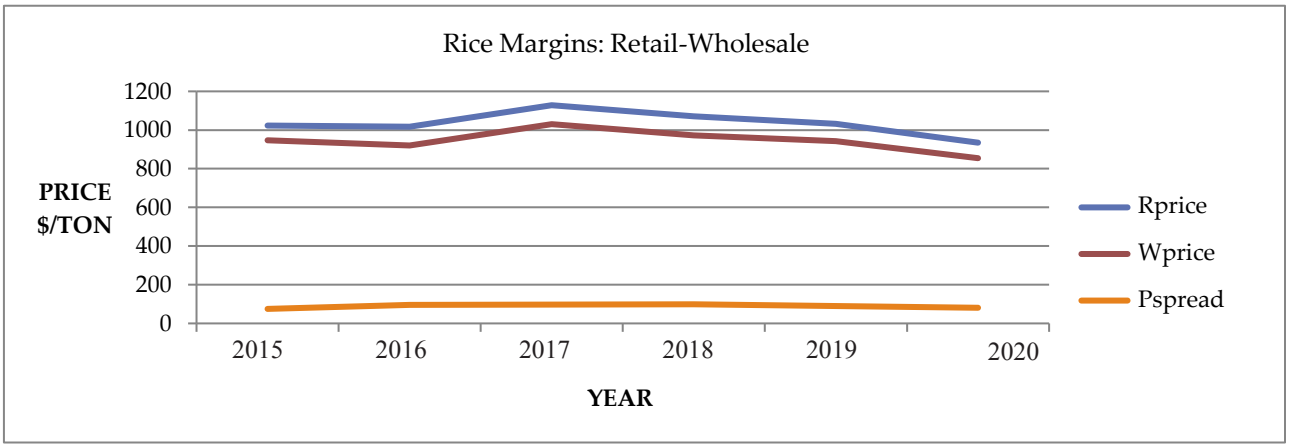


Figure 8: Rice price spread (margin) between wholesale and retail price



7. MARKET INTEGRATION AND PRICE TRANSMISSION

The theory of market integration and approaches is used to examine price transmission across markets (spatial), overtime and across various stages of the value chain e.g. retail and wholesale. For example, if regional markets are integrated it implies there is interdependency in food markets and hence coherent policies are necessary for trade sustainability. Conversely, factors impeding trade such as Covid-19 need to be addressed to avoid consequences of trade failure. The study uses monthly price series to test market integration in selected pairs of markets for maize (in Tanzania and Kenya) and rice (Tanzania and Rwanda). The study employed the two stage Co-integration and Error Correction Method (CEC) to analyze factors affecting wholesale price of maize in Tanzania. The factors considered include maize retail and wholesale prices in Tanzania and Kenya. A Covid-19 dummy variable was introduced for year 2020 prices to represent changes in cross-border trade that could have risen due to newly imposed policies and regulations in response to the outbreak of Covid-19. The dummy could also take into account any changes in demand and supply due to Covid-19 outbreak. The purpose of introducing the Covid-19 factor was added to assess if it had an impact on the observed price relationship between markets in Kenya and Tanzania. The procedure was then repeated to examine price relationships across rice markets in Tanzania and Rwanda.

The analysis confirms that there is a long-term spatial price relationship for maize and rice between markets in Tanzania and its neighbors (Kenya and Rwanda) and that price changes are transmitted across the border. The implication of this finding is that there is interdependency in price formation between Tanzania and its neighbors. It is therefore imperative to consider food security from both national and regional perspectives. The results also show that market integration weakened in 2020 especially for rice which might be the result of Covid-19 outbreak. The theoretical background and the analytical results are presented in Appendix 1.

8. CONCLUSION AND POLICY IMPLICATIONS

Policies and regulations in response to the outbreak of Covid-19 may have negatively affected the performance of maize and rice markets through disruption of regional trade which is necessary for offloading production from surplus to deficit areas. There are signs of weakening consumer demand as a result of lost livelihoods. Price analyses indicate dampening or stagnation of wholesale and retail prices despite strong market integration. The negative effects of policies and changes in demand in response to Covid-19 are more pronounced in rice than in maize prices. Results call for Tanzania to address issues impeding regional trade such as disparity in policies and regulations in response to Covid-19. Moreover, an outward looking food security policy would be more effective than inward looking policies. Results suggest a need to address food security issues more regionally than nationally.

Appendix 1: Summary Results from Co-integration and Error Correction Method

The Error Correction Model - Engle-Granger (ECM-EG) method is used to analyze market integration between Tanzania (Arusha) and Kenya (Nairobi) for maize and between Tanzania (Iringa) and Rwanda (Ruhengeri) for rice. The Engle-Granger two-step method involves first estimating the cointegration relationship and test for cointegration (Greene 2000, Minot 2011 and Mgale 2020). The Augmented Dickey Fuller (ADF) test is then performed to test whether there is a long-term relationship between variables used in the model. The second stage involves forming the error correction model (ECM) where the error correction is the residual from the cointegration relationship, lagged once. ECM is estimating both short-term and long-term effects of one time series on another. Thus ECMs directly estimate the speed at which a dependent variable returns to equilibrium after a change in other variables.

Estimated Equation:

$$ARWP_t = \propto_0 + \propto_1 AARP_t + \propto_2 NBWP_t + \propto_3 NBRP_t + \propto_4 COVID_t - \gamma_2 ECT(-1)_t + \varepsilon_t$$

Where:

$\alpha_t = Constant$

$ARWP_t = Wholesale\ price\ in\ Arusha$

$AARP_t = Retail\ price\ in\ Arusha$

$NBWP_t = Wholesale\ price\ in\ Nairobi$

$NBRP_t = Retail\ price\ in\ Nairobi$

$COVID_t = Dummy\ for\ Covid, = 1\ if\ 2020$

$ECT = Error\ Correction\ Term$

Table 2: Unit root test for maize price

Null Hypothesis: ECT is non-stationary and has unit root			At Level		At First-difference	
			t-Statistic	Prob.*	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-3.981804	0.0030	-7.250803	0.0000
Test critical values (Significance % level):	1		-3.565430		-3.565430	
	5		-2.919952		-2.919952	
	10		-2.597905		-2.597905	
*MacKinnon (1996) one-sided p-values.						

Null hypothesis: The time series variable ECT in non-stationary and has a unit root. Since the t-statistic is statistically significant we reject the null hypothesis and conclude that when all variables are stationary at first difference I(1) the error term is stationary at level I(0). Therefore, there is cointegration or long-run relationship among variables used in the model..

Table 3: Estimated results of the ECM-EG Model Dependent variable=Wholesale maize price in Arusha

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	-2.233962	5.870318	-0.380552	0.7052
Retail price - Arusha	0.537235	0.075149	7.148924	0.0000
Wholesale price - Nairobi	0.848603	0.270736	3.134427	0.0029
Retail price - Nairobi	-0.084752	0.201454	-0.420700	0.6758
Covid-19 dummy	-0.144993	16.49492	-0.008790	0.9930
ECT	-0.518624	0.115268	-4.499277	0.0000
R^2	0.6526			
$R^2 - adj$	0.6172			
F-statistics	18.4147			
DW-Stat	1.5222			

Null hypothesis: The time series variable ECT in non-stationary and has a unit root. Since the t-statistic is statistically significant we reject the null hypothesis and conclude that when all variables are stationary at first difference I(1) the error term is stationary at level I(0). Therefore, there is cointegration or long-run relationship among variables used in the model..

Table 4: Granger Causality Test(Lag=1)

Null Hypothesis:	Obs.	F-Statistic	Prob.
Retail price in Arusha VS Wholesale price in Arusha	55	0.62889	0.4309
Wholesale price in Arusha VS Retail price in Arusha		0.06796	0.7952
Wholesale price in Nairobi VS Wholesale price in Arusha	55	0.21778	0.6427
Wholesale price in Arusha VS Wholesale price in Nairobi		7.74115**	0.0075
Retail price in Nairobi VS Wholesale price in Arusha	55	0.01699	0.8968
Wholesale price in Arusha VS Retail price in Nairobi		13.9747**	0.0005
Wholesale price in Nairobi VS Retail price in Arusha	55	1.82793	0.1822
Retail price in Arusha VS Wholesale price in Nairobi		1.90960	0.1729
Retail price in Nairobi VS Retail price in Arusha	55	4.11243*	0.0477
Retail price in Arusha VS Retail price in Nairobi		8.54278**	0.0051
Retail price in Nairobi VS Wholesale price in Nairobi	55	0.07998	0.7784
Wholesale price in Nairobi VS Retail price in Nairobi		0.95665	0.3326

The granger causality tests show that there is a two-way relationship between wholesale and retail prices and between prices in Arusha and Nairobi. However, the influence of prices in Arusha on Nairobi prices is much stronger than the vice versa relationship.

Table 1: Descriptive results of the nominal wholesale and retail maize price

Statistic	Arusha Wholesale Price	Arusha Retail Price	Nairobi Wholesale Price	Nairobi Retail Price
Mean	281.7813	411.8906	338.4068	425.3729
Median	244.5000	439.0000	319.0000	419.0000
Maximum	554.0000	679.0000	523.0000	662.0000
Minimum	154.0000	208.0000	221.0000	331.0000
Std. Dev.	98.40513	116.3552	64.04151	69.08588
Skewness	1.216293	0.195052	0.931860	1.229365
Kurtosis	3.667392	2.544493	3.850599	4.932205
Observations	59	59	59	59

B. Rice price estimates

Table 5: Descriptive results of the nominal wholesale and retail rice price **Please insert units of measurement**

Statistic	Iringa Wholesale Price	Iringa Retail Price	Ruhengeri Wholesale Price	Ruhengeri Retail Price
Mean	742.3478	840.3478	1006.309	1097.088
Median	738.0000	848.0000	1031.500	1108.500
Maximum	888.0000	954.0000	1137.000	1352.000
Minimum	520.0000	712.0000	661.0000	703.0000
Std. Dev.	80.79146	70.09696	93.75966	123.1974
Skewness	-0.422421	-0.076523	-0.877667	-0.372746
Kurtosis	2.895540	1.691041	3.916047	3.160110
Observations	68	68	68	68

Table 6: Unit root test for rice price

			At Level		At First-difference	
			t-Statistic	Prob.*	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-3.621000	0.0078	-5.824004	0.0000
Test critical values (Significance level 5%)	1		-3.533204		-3.533204	
	5		-2.906210		-2.906210	
	10		-2.590628		-2.590628	
*MacKinnon (1996) one-sided p-values.						

Since the t-statistic is significant we reject the null hypothesis and conclude that when all variables are stationary at first difference I(1) the error term is stationary at level I(0). Therefore, there is cointegration or long-run relationship among variables used in the model.

Table 7: Estimated results of the ECM-EG Model: Dependent variable=Wholesale rice price in Iringa(lag length=1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	1.644043	2.949917	0.557318	0.5793
Retail price - Iringa	0.997769	0.056642	17.61534	0.0000
Wholesale price - Ruhengeri	0.650389	0.165993	3.918182	0.0002
Retail price - Ruhengeri	-0.338100	0.126748	-2.667494	0.0098
Covid -19 dummy	-28.15869	7.615603	-3.697499	0.0005
ECT	-0.297909	0.059861	4.976656	0.0000
R^2	0.8670			
$R^2 - adj$	0.8561			
F-statistics	79.5844			
DW-Stat	1.5521			

The short-run model (first-difference of lagged variables and lagged ECT) results indicate the ECT coefficient is negative and significant. The coefficient indicates speed of adjustment toward long-run equilibrium. The cointegration indicates that price changes at upstream level are transmitted to the level above.

Table 8: Granger Causality Test (Lag=1)

	Observations	F-Statistic	Prob.
Retail price in Iringa VS wholesale price in Iringa	67	0.22568	0.6363
Wholesale price in Iringa VS retail price in Iringa		0.15217	0.6977
Wholesale price in Ruhengeri VS wholesale price in Iringa	67	4.68319*	0.0342
Wholesale price in Iringa VS wholesale price in Ruhengeri		2.25906	0.1378
Retail price in Ruhengeri VS wholesale price in Iringa	67	3.55073*	0.0641
Wholesale price in Iringa VS retail price in Ruhengeri		1.19146	0.2791
Wholesale price in Ruhengeri VS retail price in Iringa	67	0.00662	0.9354
Retail price in Iringa VS wholesale price in Ruhengeri		0.01507	0.9027
Retail price in Ruhengeri VS retail price in Iringa	67	0.00091	0.9760
Retail price in Iringa VS retail price in Ruhengeri		0.00014	0.9906
Retail price in Ruhengeri VS wholesale price in Ruhengeri	67	0.00190	0.9653
Wholesale price in Ruhengeri VS retail price in Ruhengeri		0.04212	0.8380

The granger causality tests show that both wholesale and retail prices in Rwanda influence wholesale and retail prices in Tanzania, respectively.

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