Agricultural Products Price Forecasting

Relevance and Significance:

According to a Business Daily article, Kenyan farmers earn less even though consumers pay more for food products as there is a huge disparity between farmers' price and consumer prices. Kenyan Farmers commodities prices are influenced by the inefficient market structure and the intermediaries between producers and consumers. It is noted that the market dynamics are dictated by the middlemen contributing to divergent wholesale and retail prices in the Kenyan Markets. However, there are external factors that have affected farmers' commodities prices such as subsidy schemes, currency fluctuation but farmers continue to earn less than the market price set in Kenyan stores and marketplaces.

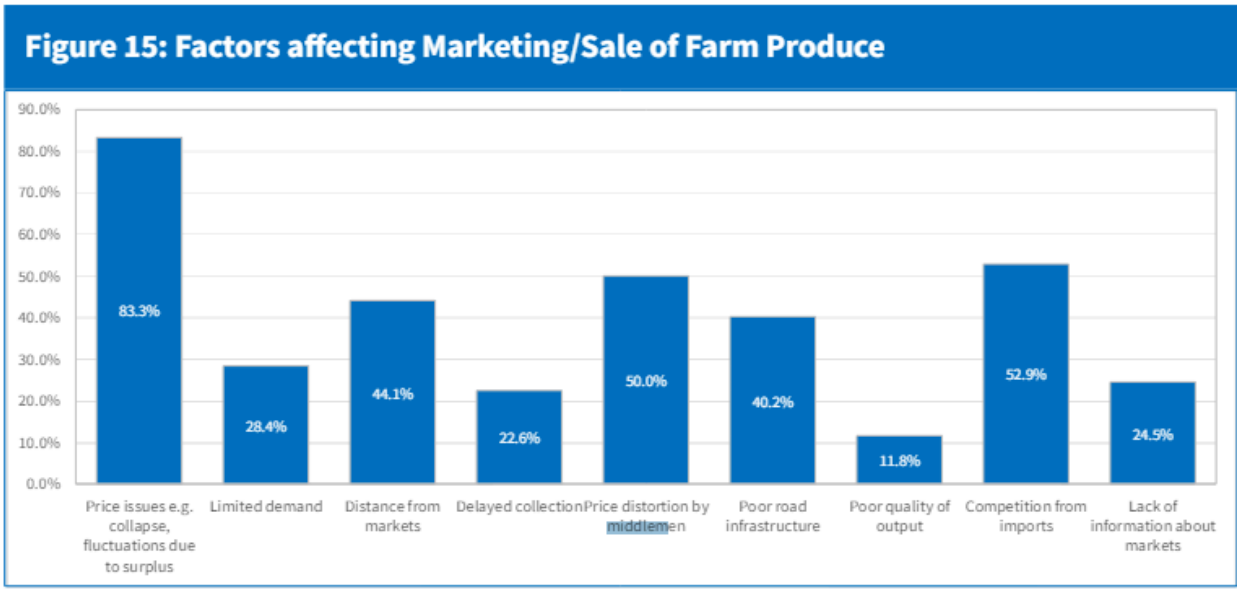
According to the KARI report, the supply side factors, there is a decline in agricultural productivity, due to poor market access and market exploitation. for small-scale farmers Agriculture is a key contributor to the Kenyan GDP and provides livelihoods to a large part of the Kenyan Population.
CBK Survey 2023 shows that the food commodities prices are down.In addition, the survey shows that foreign currency performance could be a factor in downward adjustment of the food prices.

Problem
Farmers face crop yield price disparities, market inefficiencies, and lack protection from exploitative practices by middlemen

Solution
Implement a robust price forecasting system using historical and real-time data with support of machine learning models to empower farmers with predictive pricing updates, enhance market transparency, and improve decision-making for all stakeholders in the agricultural value chain eg Middlement

Rationale
Farmers have the challenge of setting their crop produce prices due middlemen exploitative negotiation skills
Unike Forex traders,the Kenya Farmers Association doesn’t have a system that predicts real time crop prices across all Kenyan food markets based on real time and historical data..
Predictive analytics will assist farmers predict crop prices to protect themselves from exploitative middlemen in the food supply chain with real-time predictive price updates of crop prices in all Kenyan Food Markets

Project seeks to assist Kenya Farmers Association, and other stakeholders in the agriculture industry with informative, predictive crop prices based on the market locations, supply volume, products and external factors like the fluctuations of the Foreign currencies - dollar.



Source : CBK Agricultural Survey 2023

Objective.

1. Provide farmers with crop price forecasts.vs the foreign exchange rate.over time

2. Enable farmer's and other stakeholders to anticipate the market trends of the crop produce, resource allocation, and market position

3. Enhance market transparency and price forecasting to farmers and industry policymakers.

4. Predict the price food products based on supply and demand of food products and market location

5. Market segmentation for the farmers based on the prices, supply volumes, and location.
   - Best Market Location Place and Product to sell

6. Support small- scale farmers in data-driven demand projections of the food commodities in the market

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Data Availability: Historical agricultural commodity prices, and CBK currency data- Ministry of Agriculture Website and CBK website - weekly, data is collected daily in all markets in the Country.

MOA- Ministry of Agriculture

CBK - CBK

Feasibility: Utilize machine learning models to analyze the relationship between location, product, prices, time & currency fluctuations in the CBK forex rates to develop accurate forecasting models of the food prices in Kenya.

Scope and Objectives:
According to KIPRA, 20% of the farmers have adopted farming marketing technologies that connect them to buyers.Unlike other technologies, this project seeks to empower farmers with predictive analytics of crop prices to weed out middlemen who exploit the farmers on the farm product prices.

Develop models to forecast crop yield prices based on location, time, supply dynamics, and external factors like fluctuations in CBK forex rates - dollar. With the interface the farmer can predict the commodities prices based on the market location, product, time and supply volume of the products.

Deployment

Product	Location	Supply Volume	USD/KES	Output (Price)

Ethical Consideration: Ensure that small-scale farmers in the agriculture industry benefit from the insights generated and to consider the potential external factors like forex rates on their food prices. The data collected by the Ministry of Agriculture in all food markets is updated every day by the field enumerators.

Methodology and Approach: Employ regression analysis and time series forecasting techniques to predict crop price trends. Use data visualization techniques to communicate findings effectively to communicate to the Kenya Farmers Association,farmers, Government policy makers, small scale farmers, county government, and Financial institutions as agriculture is a key GDP contributor in the Kenyan economy.

Impact and Contribution: Empower Kenya Farmers Association with actionable insights farm produce price performance, and inform farmers on what, where to sell their produce to maximize their profits. Enhance market transparency and stability by providing accurate price forecasts to farmers, traders, middlemen and policymakers based on the economic status of the Kenyan Economy. Lastly, contribute to informed decision-making and resource allocation based on the market dynamic of the agricultural sector products eg supply of subsidized fertilizer, and agricultural inputs to stabilize the food prices in the country

Benefits to the Farmers

1. Stable market price projections.
2. Increased profitability for farmers based on the supply and demand forces
3. Provides insights to farmers on buying prices of the food products from the traders in the market.
4. Assist farmers know where and what to sell the products - **Best Market Place and Price**

Sources

1. https://www.citizen.digital/business/cbk-survey-reveals-decline-in-food-prices-improved-access-to-subsidised-fertilizer-n340450
2. https://routetofood.org/small-scale-farmers-are-the-key-to-food-security-in-kenya/
3. https://www.centralbank.go.ke/uploads/market_perception_surveys/1508555824_REPORT%20ON%20THE%20AGRICULTURE%20PRICE%20SURVEY.pdf

Project Process

1. Business Understanding - Joyce Muthiani

Project objectives
Stakeholders
Problem Statement

2. Data Exploration and Understanding- Milton Kabute & Kenneth Karanja

Source data from Ministry of Agriculture & CBK
Explore the data, clean the data
Select relevant crops to focus on

3. Data Preprocessing & Exploration - Kenneth Karanja

Handle missing values, Outliers
Scale Features
Feature

4. Feature Engineering - Thorne Makau
5. Modeling - **Everyone**
6. Parameter Tuning - Joyce
7. Model Evaluation - Thorne Makau

8. Deployment Design - https://streamlit.io/ (**Everyone**) - Research on how deployment has been done on other prediction projects
9. Project Management- Collins Cheruiyot
10. PPT - Collins Cheruiyot
11. Data Report - Thorne
12. Readme - Joyce & Milton

Crops To Focus

1. Maize
2. Irish Potatoes
3. Tomatoes
4. Beans
5. Cabbages
6. Onions
7. Sorghum
8. Wheat
9. Rice
10. Capscicum
11. Green Grams