# Assessment of Bertrand Model: A Case Study of Kenya Seed and Western Seed Company in Maize Seed Production in Trans-Nzoia County

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## ABSTRACT

This study examines how the Bertrand competition model operates in the maize seed market segment of Trans-Nzoia County in Kenya through an examination of Kenya Seed Company and Western Seed Company. It investigates pricing strategies while studying market conditions and consumer response within an oligopoly environment that uses price competition. Price serves as a leading market competition factor for maize seeds yet farmers decide their purchases based primarily on quality perceptions and brand loyalty along with distribution networks. Research findings reveal that price competition within the maize market operates according to expected consumer conduct from Bertrand models featuring homogeneous products. The research study demonstrates strategies for businesses to withstand competition stresses as it underlines service quality and product differentiation standards for long-term viability in this active market. The study leveraged secondary data collected from company publications as it presents crucial recommendations to policy makers who aim to develop sustainable competitive conditions within Kenya's agricultural market.

**Keywords:** Bertrand Model, Price Competition, Maize Seed, Trans-Nzoia County, Market Structure, Kenya Seed Company, Western Seed Company

## INTRODUCTION

The Bertrand model serves as a vital theoretical framework which explains market competition dynamics within differentiated product markets. In the late 19th century Joseph Bertrand developed this model to show how businesses would stop lowering prices at production cost levels which would result in economic loss (Bertrand, 1883). These pricing strategies together with market behavior and consumer decisions and industrial operations experienced this effect (Tirole, 1988).

The maize seed market of Kenya's agricultural sector provides an ideal opportunity to examine the practical application of the Bertrand model. The main agricultural area of Trans-Nzoia County (Kenya National Bureau of Statistics [KNBS], 2020) hosts operations for the leading seed producers KSC and WSC. The favorable climate of Trans-Nzoia County makes it stand out as a leading agricultural region where exceptional maize farming occurs leading to an active seed production and distribution hub (Ouma, 2018). The Bertrand model enables firms to understand how market competition affects their pricing strategies and market positioning and competitive dynamics.

The Bertrand model requires firms to match or reduce their prices because market competition occurs through price offers rather than through quantity adjustments. A firm that sets lower prices will capture the entire market. The final prices reach marginal cost levels because firms continuously participate in price matching competitions (Dixit & Stiglitz, 1977). The market for differentiated products presents multiple complexities during the selling process. Firms maintain limited price flexibility above marginal costs but must track their competitors' price strategies.

KSC and WSC have historically conducted price competitions for maize seed products while using distinct product features to balance these price battles. Seed production companies provide products which have different pest resistance capabilities and drought tolerance levels and yield strength characteristics and other agricultural properties. The firms use unique product qualities to create separate market values which supports market competition that meets Bertrand model requirements (Munyiri, 2020). The introduction of hybrid maize seeds with improved yield capabilities and disease resistance features and performance characteristics by KSC can establish a valid premium price. The price reduction from WSC forces KSC to reassess their pricing strategy because these competitive moves reveal their behavioral interdependence.

This study of the Bertrand model for maize seed production in Trans-Nzoia County reveals crucial information about agricultural markets of Kenya which is an economy significantly driven by agricultural activities. The research findings demonstrate how maize seed campanies achieve market dominance through their pricing decisions and consumer response in the industry. The research analyzes the marketplace activities of Kenya Seed Company and Western Seed Company to understand the Bertrand model's operational dynamics in Kenyan agricultural settings as described by Ouma (2018).

## LITERATURE REVIEW

The Bertrand model of price competition establishes a fundamental model for analyzing oligopolistic market competition that is characterised with dominance of two firms . A review of Bertrand model implementation analyzes its application within the Kenyan maize seed marketplace where it specifically studies Kenya Seed Company and Western Seed Company operations in Trans-Nzoia County. An assessment of key Bertrand model concepts alongside relevant research exploring maize seed market implications for the specific case study area of Kenya Seed Company and Western Seed Company in Trans-Nzoia County, Kenya.

The Bertrand model bases its application on several vital assumptions:

### Homogeneous Products

According to this model firms produce products that are exactly the same so consumers decide what to buy exclusively based on price. Buyers view hybrid maize seeds from Kenya Seed Company and Western Seed Company as interchangeable products thus upholding the conditions of the model.

Table 1.1: From Kenya Seed Campany & Western Seed Campany show variety of seeds produced.

| *Kenya Seed Hybrid Varieties* | *Western Seed Hybrid Varieties* |
|---|---|
| *H513* | *WH401* |
| *H515* | *WH403* |
| *H517* | *WH504* |
| *H518* | *WH507* |
| *H519* | *WH508* |
| *H520* | *WH509* |
| *H624* | *WH301* |
| *H525* | *WH101* |
| *H526* | *WH605* |
| *H521* | *WH505* |
| *H522* | *WH400* |

### Price Competition

Price stands as the main competitive instrument making it the central focus of the Bertrand model rather than quantity as in Cournot competition. Both firms actively change their prices to attract farmers in the maize seed market resulting in a permanently competitive price war.

Here is a table showing prices for different seed varieties produced by the two firms.

Table 1.2: From Kenya Seed Campany & Western Seed Campany shows price tag for various seed varieties.

| *Kenya Seed Campany* | | *Western Seed Campany* | |
|---|---|---|---|
| *Hybrid Seed Variety* | *Price(Ksh) / 2KG* | *Hybrid Seed Variety* | *Price(Ksh) / 2KG* |
| *H513* | *460* | *WH401* | *820* |
| *H515* | *460* | *WH403* | *820* |
| *H517* | *460* | *WH504* | *820* |
| *H518* | *460* | *WH507* | *820* |
| *H519* | *460* | *WH508* | *820* |
| *H520* | *460* | *WH509* | *820* |
| *H626* | *460* | *WH301* | *820* |
| *H6218* | *460* | *WH101* | *820* |
| *H6213* | *460* | *WH605* | *820* |
| *H629* | *460* | *WH505* | *820* |
| *H614* | *460* | *WH400* | *820* |

**Rational Consumer Behavior**

This pricing strategy depends on consumers making logical decisions by selecting the most affordable option. The occurrence of agricultural challenges such as drought and pest problems has made Trans-Nzoia County farmers intensely focus on seed prices because seeds are price-tangible products.

The dominance of Kenya Seed Company in this region occurs because farmers in this area prefer to buy seeds based on price alone. Farmers tend to purchase seed maize from Kenya Seed due to its affordable price which reduces their production expenses. On the other hand some farmers choose Western Seed campany seeds for their own preference and choice.

**Perfect Information**

Steps under the Bertrand model allow customers to obtain full price information while making their purchasing decisions. Mobile technology combined with information dissemination channels allows Kenyan farmers to obtain pricing information thus making farmers in this region highly aware of seed firm prices.

**Limited Capacity**

According to the model's assumptions businesses possess enough operational capacity to fulfill all customer demands at current market rates. The maize seed production and distribution network of Kenya Seed and Western Seed Companies operates efficiently throughout the regional area.

The maize seed market in Trans-Nzoia County is characterized by a competitive dynamic that reflects the Bertrand model's principles. Key observations include:

**Dynamic Pricing Strategies**

The Kenya Seed Company and Western Seed Company maintain continuous strategic pricing approaches intended to achieve market control. The price battle triggered by price reductions from one company makes the other firm lower its prices while affecting profitability negatively. The price competition observed between firms resembles Bertrand competition since continuous price reduction ultimately results in zero profit margins.

Table 1.3: From Kenya Seed Campany & Western Seed Campany shows price tag for various seed varieties.

| *Kenya Seed Campany* | | *Western Seed Campany* | |
|---|---|---|---|
| *Seed Variety* | *Price /2KG* | *Seed Variety* | *Price/2KG* |
| *H513* | *460* | *WH401* | *820* |
| *H515* | *460* | *WH403* | *820* |
| *H517* | *460* | *WH504* | *820* |

| | | | |
|---|---|---|---|
| *H518* | *460* | *WH507* | *820* |
| *H519* | *460* | *WH508* | *820* |
| *H520* | *460* | *WH509* | *820* |
| *H626* | *460* | *WH301* | *820* |
| *H6218* | *460* | *WH101* | *820* |
| *H6213* | *460* | *WH605* | *820* |
| *H629* | *460* | *WH505* | *820* |
| *H614* | *460* | *WH400* | *820* |

**Market Share and Consumer Behavior**

According to Yamoah et al. (2020) farmers select their seeds based on three criteria: quality perception, brand reputation and price considerations. Price plays an essential role in determining consumer choices thus both companies implement pricing strategies that match the Bertrand model. Price differences serve as the main factor for farming communities to change brands while demonstrating the Bertrand model's practical significance.

Table 1.4: Maize seed market share in 2004 (based on market plan 2007)

| Company Market Share | Amount (MT) |
|---|---|
| *Kenya Seeds* | *5.10% 900* |
| *Western Seed* | *3.7% 650* |
| *Other Campanies* | *1.2% 200* |
| *TOTAL* | *8.35% 1750* |

**Price Elasticity**

According to Yamoah et al. (2020) farmers select their seeds based on three criteria: quality perception, brand reputation and price considerations. Price plays an essential role in determining consumer choices thus both companies implement pricing strategies that match the Bertrand model. Price differences serve as the main factor for farming communities to change brands while demonstrating the Bertrand model's practical significance.

Several studies,however have provided insights into the dynamics of the maize seed market, showing how effective the Bertrand model is:

**Competitive Landscape and Oligopolistic Behavior**

Mukumba et al. (2021) analyzed the different competitive strategies that dominant seed producers use in the Kenyan agricultural market. The study demonstrates that companies modify their product pricing to prevent losing marketplace position to competitors while exhibiting Bertrand competition characteristics. This model demonstrates its worth by verifying its ability to examine advanced market behaviors within seed companies operating in maize seed markets.

**Consumer Decision-Making**

A study by Ochieng et al. (2022) analyzed the factors influencing farmers' purchasing decisions in the Trans-Nzoia County maize seed market. Their research revealed that price remains the most critical factor for farmers, validating the primary assumption of the Bertrand model regarding consumer behavior. The findings align with the model's premise that firms must remain vigilant in their pricing strategies to attract price-sensitive farmers.

**Market Information Dissemination**

Njuguna et al. (2021) examined the role of information technology in influencing market dynamics among seed suppliers and consumers. The study found that farmers with better access to pricing information tend to

make more strategic purchasing decisions, highlighting how the perfect information assumption in the Bertrand model could manifest in practice.

Bertrand economic model offers a valuable lens through which we can confirm the competitive dynamics of the maize seed market in Trans-Nzoia County, particularly concerning the pricing strategies of Kenya Seed Company and Western Seed Company. The model's assumptions—including homogeneous products, price competition, rational consumer behavior, and perfect information—are reflected in the realities of this market. Previous studies provide substantial empirical evidence supporting the relevance of the Bertrand model in understanding market behavior, consumer decision-making, and competitive strategies. As the maize seed industry continues to evolve, further research exploring the nuances of this competitive landscape will be vital for stakeholders in the agricultural sector to navigate pricing strategies effectively.

## METHODOLOGY

This study assess the application of the Bertrand model in the context of the maize seed production industry in Trans-Nzoia County, focusing on two major companies: Kenya Seed Company and Western Seed Company. Secondary data analysis was used to derive insights regarding pricing strategies, market dynamics, and consumer behavior in the maize seed sector.

### Research Design

This study adopts a descriptive research design that shows a comprehensive assessment of the pricing strategies of Kenya Seed Company and Western Seed Company. By utilizing secondary data, the research analysis existing literature, market reports and other data sources.

### Data Collection

The research derived its data from secondary sources which included:

### Market Research Reports

The maize seed market data was explored through publications from agricultural research institutions and reports from the Kenya Ministry of Agriculture.

### Scholarly Articles

Academic databases JSTOR and Google Scholar hosted peer-reviewed articles and research papers enabled the investigation into empirical evidence regarding agricultural markets implementing the Bertrand Model.

### Industry Associations

Information from the Kenya Seed Traders Association added understanding about market competition together with firm pricing behavior in the industry sector.

### Data Analysis

In our study we dealing with two companies, Kenya Seed and Western Seed Company, in Trans-Nzoia County.

In a basic Bertrand model, the prices set by the two firms can be expressed as follows:

Let:

(Pk)= Price set by Kenya Seed for H513 = Ksh 460

( PW )= Price set by Western Seed Company for WH401= Ksh 820

( Q) = Quantity sold

( QD) = Quantity demanded, which is a function of the price

In a simple form, we can express the demand function as:

QD = D(460, 820)

Where:

- Maize seeds from Kenya Seed holds a lower price than Seed maize from Western Seed Campany example:

Reference to (Table 1.2 ), Seed Maize H513 market price is Ksh 460 from Kenya Seed while WH401 market price is Ksh 820 from Western Seed Campany.

-Seeds from Kenya Seed will be on high demand and high sales will be made than seeds from Western Seed Campany.

**Profit Maximazation**

With high demand for Kenya Seed seeds in the market, it results into Kenya Seed Campany making higher sales which result into higher profit than Western Seed Campany.

Profit Functions:

Kenya Seeed Campany _pi_K = (PK – CK) QK

Western Seed Campany_pi_W = (PW – CW) QW

Where CK and CW are the costs of production for Kenya Seed and Western Seed, respectively.

From the analysis above, pricing of Kenya Seed Campany seeds has largely contributed to dominance of Kenya Seed Campany in seed maize market.

**Limitations of the Study**

-Use of Secondarly Data

The analysis focused on secondary data, which may not capture the most recent market developments post-2023.

This data presents a dependency on accurancy to the primarly collection source.

## CONCLUSION

This research has thoroughly evaluated how the Bertrand model operates through market analysis of maize seed production in Trans-Nzoia County between Kenya Seed Company and Western Seed Company. The data analysis demonstrates the competitive price strategies deployed by each seed company and their influence on industry competition.

Which through the market share report of 2007 clearly show that Kenya Seed Campany has a bigger stake in the market as compared to Western Seed Campany. Kenya Seed’s market dominance is evidently powered by lower prices of their seed maize varieties in the market, hence affirming the betrand model.

## RECOMMENDATIONS

The research reveals findings that allow us to advance several recommendations which will improve both the study results and their practical use.

**Diversification of Product Lines**

Companies should extensively develop different seed varieties to serve specific agricultural requirements across distinct regions. By supplying specific-area products this method will reduce price competition because customers get products that match their exact needs.

**Consumer Education**

A program to teach consumers about premium seed benefits might redirect market pricing from cost-focused competition into benefits-focused competition. Hence enahancing understanding among customers about high-quality seed's long-term value reduces their emphasis on immediate price.

**Data-Driven Decision Making**

Competing seed companies need to enhance their data collection analytics to monitor market transformations and customer conduct patterns. Better pricing strategies will emerge through response-based actions that follow market patterns and competitive pricing levels

The recommendations will improve Kenya Seed Company's and Western Seed Company's market position in maize seed to achieve mutual business growth and sector enhancement in agriculture. The findings obtained from this research provide essential information to stakeholders who want to grasp competitive pricing practices in agribusiness markets within the framework of Bertrand Economic Model.

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