

**THE MARKET STRUCTURE, CONDUCT AND
PERFORMANCE OF HYBRID MAIZE SEED: A CASE STUDY
OF TRANS-NZOIA DISTRICT**

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fulfillment for the award of Masters of Science, Agriculture Economics in the Department
of Agriculture Economics, University of Nairobi**

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DECLARATION

THIS THESIS IS MY ORIGINAL WORK AND HAS NOT BEEN PRESENTED FOR ANY AWARD IN ANY OTHER UNIVERSITY.

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ABSTRACT

The study analyzed the market structure, conduct and performance of hybrid maize seed in Trans-Nzoia district in order to identify the problems affecting the seed industry. The problem affecting this industry in Trans-Nzoia district can be traced in marketing and distribution, especially market structure of hybrid maize seed among other factors. The maize market lacks competition due to low entry, which is attributed to both institutional and financial barriers. Another problem affecting the industry is lack of allocation of identification labels and seals for packets of less than 10kg, which has enabled unscrupulous traders to pack uncertified seed and sell to unsuspecting farmers. Pricing efficiency is yet another major problem that faces the industry.

The aim of the study was to assess the degree of competition in Trans-Nzoia hybrid maize seed retailing. The hypothesis of the study was that Trans-Nzoia hybrid maize seed market is competitive. The study was confined in Trans-Nzoia district, which is a major maize producing area.

The market structure was analyzed in four aspects, namely; market concentration, product differentiation, market integration, and barriers to entry. The market conduct was examined by use of hybrid maize seed prices and promotional activities. It was established from the survey that seed producing companies carried out promotional activities. None of the retail traders carried out any promotional activities. Performance was examined by use of pricing efficiency.

Primary data was obtained from a sample of 30 traders who were licensed to sell hybrid maize seed within the district and 30 farmers from the district. Secondary data was obtained from Kenya Plant Health Inspectorate Services (KEPHIS), Ministry of Agriculture, International Centre for Wheat and Maize Improvement (CIMMYT) and other publications. The data use in

the report was collected during the months of February to April 2000; a peak maize seed selling period. Random sampling technique was used in selecting the samples. Herfindal-Hirschman index, the Gini Coefficient, the Lorenz curve and descriptive statistics were used to analyze the market structure.

It was found that 96.7 percent of the hybrid maize seed sold in Trans-Nzoia district was from Kenya Seed Company (KSC) leaving only 3.3 percent of the market share to other maize seed companies. However 62 percent of the market share went to the largest 4 traders while 77 percent of market share went to the largest 8 traders. The Gini-Coefficient was found to be 0.6; implying that the market exhibits oligopolistic tendencies. The Lorenz curve showed that 50 percent of traders' control only 10 percent of sales volume while 15 percent of traders' control 60 percent of sales volume. The obtained Herfindal Index was 0.35; over a scale of 0 and 1 whereby 0 depicts equality while 1 depicts complete inequality of the market shares. All measures gave results that confirmed non-competitiveness in the maize seed market. The initial capital outlay of KSh.50000 before one could become a seed seller coupled with inaccessibility to credit due to the unfavorable conditions set by commercial banks hindered entry and expansion of small scale maize seed dealers. Clearance from the District Agricultural Committee (DAC), which sits once every quarter a year, delayed the process posing an institutional barrier. The delays in the committee meetings prevented would be seed sellers to enter the market given that the demand for seed is seasonal. The maize seed was available in packets of 2kg, 5kg, 10kg and 25kg for different varieties although only those packets weighing 10kg and above were sealed.

From the survey it was established that the pricing efficiency was very poor, and also there were no collusive tendencies in the hybrid maize seed market.

The farmers' view of the seed revealed that the most liked seed, which ranked highly in the District, was H614 among others namely: H622, H625, H626, H627, H628, H511, H512, and PHB3253. Complaints of farmers about the maize seed were varied including poor germination, impurity, infected materials, and undesirable plant characteristics.

The hypothesis that Trans-Nzoia hybrid maize seed market is competitive was rejected and instead the conclusion was that hybrid maize seed market is non-competitive.

The policy implication arising from this study is that in order to increase the number of seed maize sellers, the government, NGOs and other stakeholders should facilitate easy access to credit by aspiring stockists through micro-financing and speed up clearance process for those who apply for approval to become seed maize sellers.

CHAPTER 1:

INTRODUCTION

1.1 Origin of Maize

Zea mays L. are one of the oldest food grains. It belongs to the grass family Gramineae, tribe Maydeae and is the only cultivated species in this genus. The other species of *Zea*, commonly called teosinte, and the species of *Tripsacum*, commonly called gama grass are important world relatives of *Zea mays*. These are classified as the ‘New World’ Maydeae because their center of origin is in the Americas. Maize originated in North America 6000 to 7000 years ago (Smith, 1995). Domesticated maize was apparently developed by the inhabitants of present day Mexico from teosinte, an annual wild grass. From its Center of origin, maize spread gradually throughout the Americas and later, the European seamen carried it to Europe, Africa and Asia. Today maize is one of the largely grown cereals reflecting its ability to adapt to a wide range of production environments.

Maize is one of the world’s three cereals that dominate the world’s grain economy; the others being wheat and rice. Unlike wheat and rice, which are mainly consumed as human food, maize is a multipurpose crop that can be eaten by humans, fed to livestock or used as raw material in industry. Maize also remains an important staple food in many developing regions especially sub-Saharan Africa and Central America where it is frequently the mainstay of human diets.

Table 1 shows the maize production trends in Kenya and the area harvested since 1963 to the year 2000. The overall picture reflects that Kenya is finding it increasingly difficult to maintain an upward production trend, even as consumption continues to rise, driven by increasing population. Maize production trends and the area harvested are as shown in Figure 1. Since the

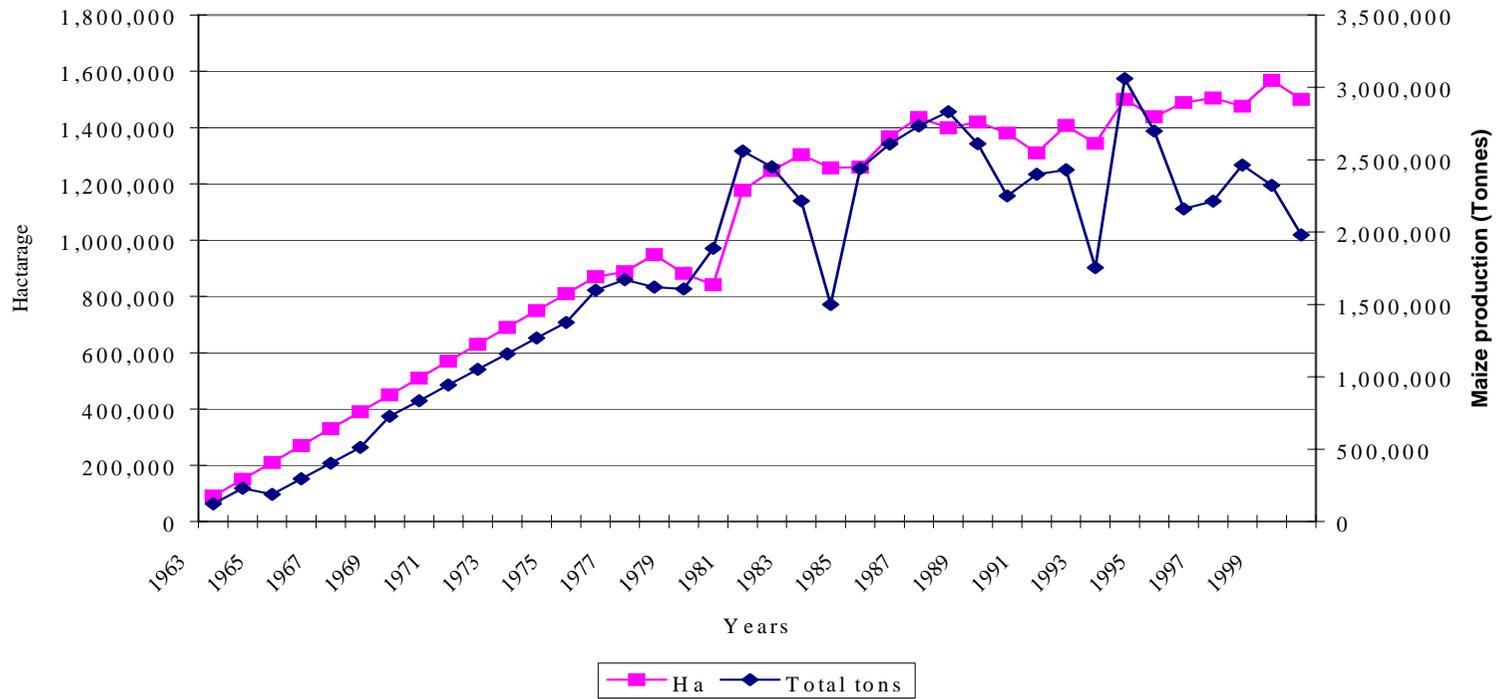
beginning of the 1990's, production has been on a downward trend reflecting among others, poor production practices in an environment where lack of credit limits farmers to low input use. The quality, quantity of seed and fertilizer, timeliness of land preparation and timing of sales are reflected in the generally reduced maize production.

Table 1: Maize production in Kenya (1963-2000):

YEAR	PRODUCTION (^000 MT).	AREA	HARVESTED
1963	90	121	
1964	150	229	
1965	210	187	
1966	270	295	
1967	330	403	
1968	390	511	
1969	450	727	
1970	510	835	
1971	570	943	
1972	630	1051	
1973	690	1159	
1974	750	1267	
1975	810	1375	
1976	870	1597	
1977	887	1671	
1978	948	1620	
1979	881	1606	
1980	841	1888	
1981	1176	2559	
1982	1247	2450	
1983	1303	2214	
1984	1256	1500	
1985	1259	2440	
1986	1367	2609	
1987	1435	2732	
1988	1399	2831	
1989	1420	2610	
1990	1380	2250	
1991	1310	2400	
1992	1407	2430	
1993	1343	1755	
1994	1500	3060	
1995	1438	2698	
1996	1489	2160	
1997	1504	2214	
1998	1475	2464	
1999	1567	2322	
2000	1500	1980	

Source: Central Bureau of statistics.

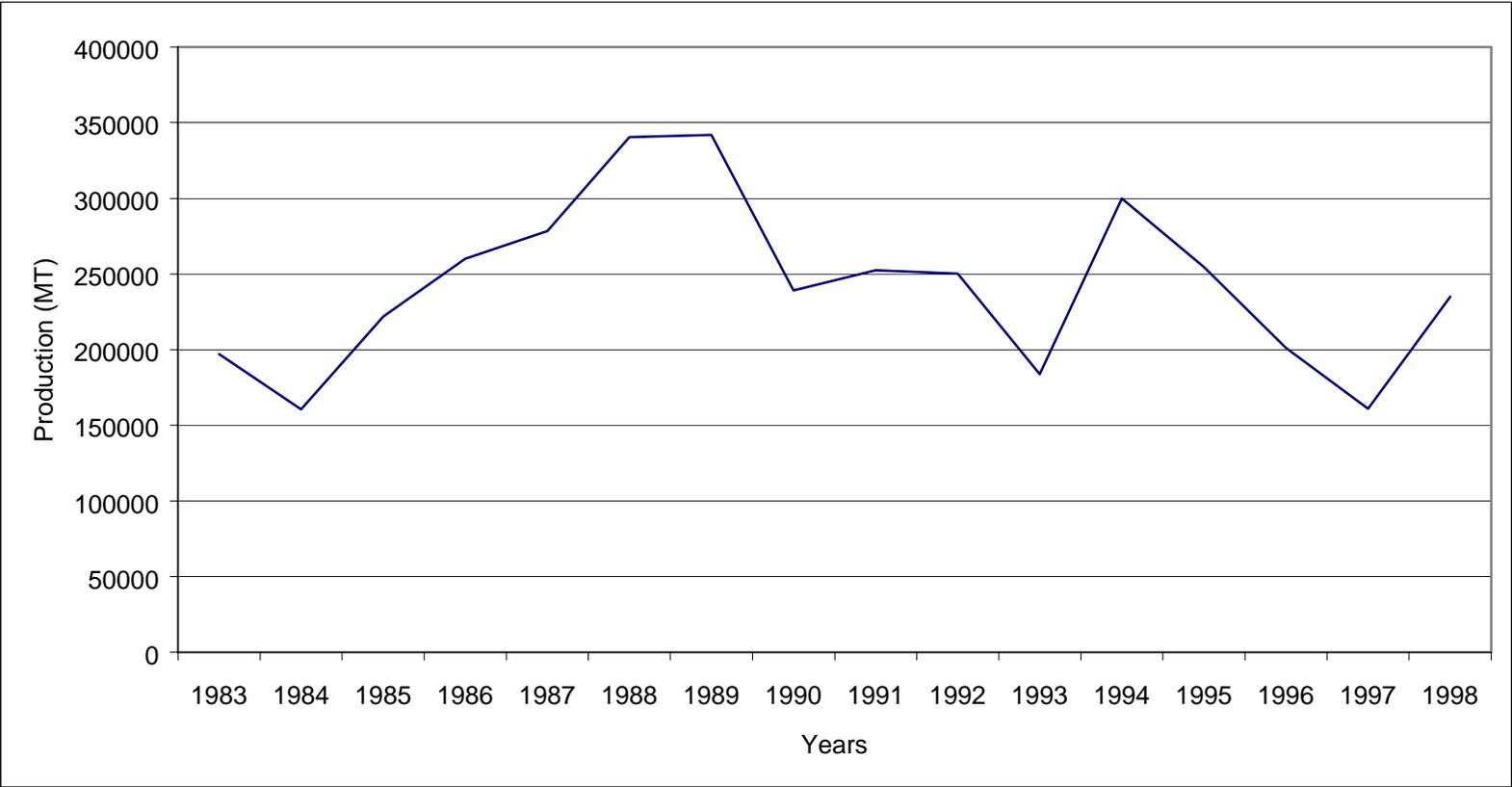
Figure1: Maize Production in Kenya (1963-2000).



Trends in maize production indicate that fluctuations exist in production thereby creating shortfalls in supply, in most years. The shortfalls make it difficult for the country to rely on self-sufficiency as the only strategy for addressing the problem of food availability since it cannot meet domestic demand. On the one hand, although Kenya has been self-sufficient in maize production in the past, since 1990 the net maize production has fallen short of consumption requirements – necessitating imports in every year. It has become increasingly difficult to maintain an upward trend in maize production as shown in figure 1, even as consumption continues to rise, driven mainly by increasing population especially the swelling urban numbers. Area under maize production has stagnated at about 1.4 million hectares and the annual production averages about 30 million bags (2.7 million metric tons). The output lags behind consumption, currently estimated at 3.3 million metric tons.¹ The national maize yield average is estimated at 8.5 (90-kg) bags or 0.8 metric tons per acre with a mean from 0.6 to 2.7 metric tons per acre.

¹ One has to be cautious with the consumption figures since they are derived from gross estimates based on the population. Consumption data in Kenya is mostly unreliable.

Figure 2: Maize production in Trans-Nzoia district (1983 to1998).

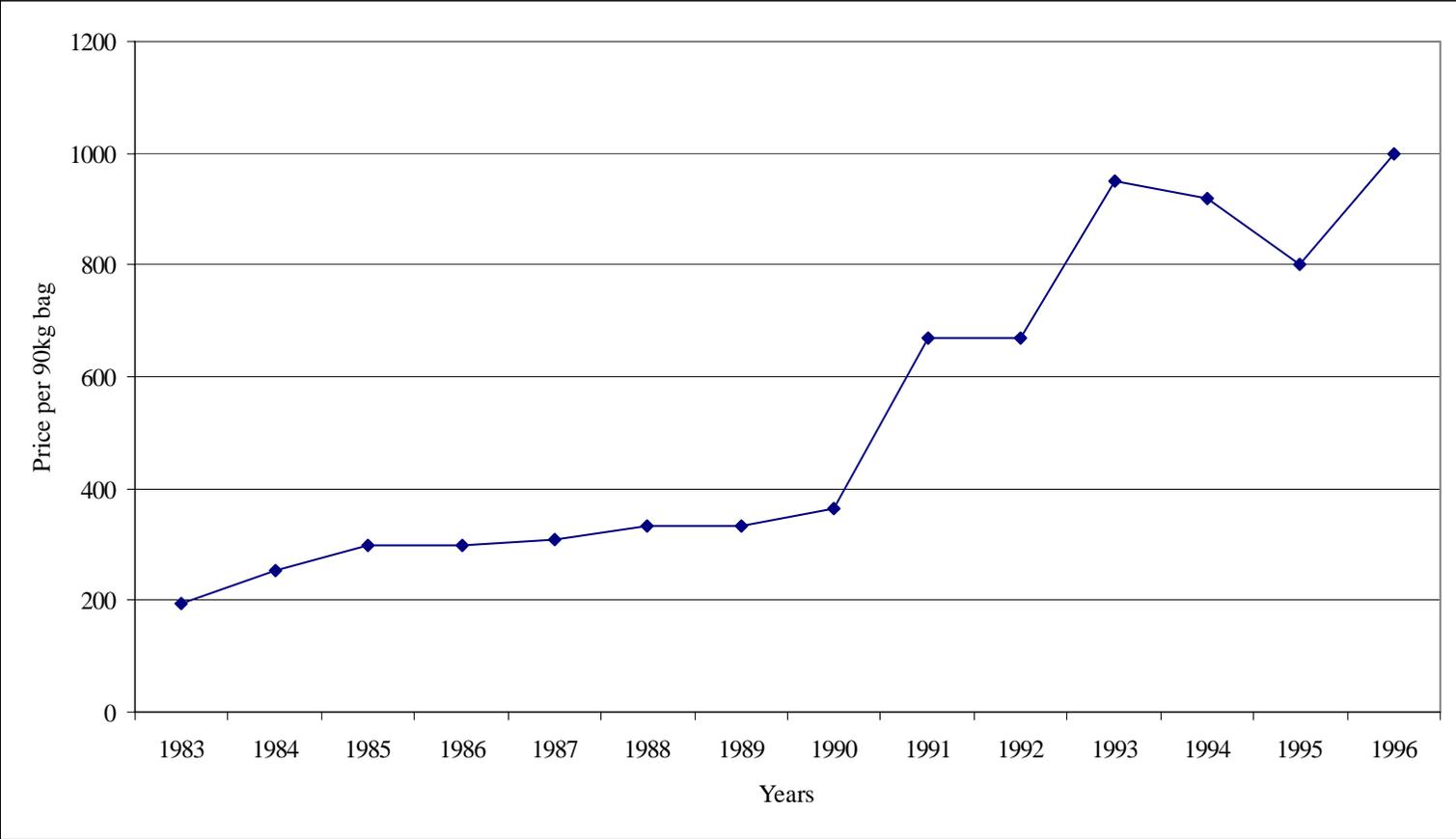


Source: Central Bureau of statistics.

Between 1984 and 1987 there was a gradual increase in production and a 90kg bag was sold for between KShs. 252 and 297. The production was almost constant between 1988 and 1989, with a 90kg bag costing KSh.333, before the major drop in production of 30% in 1990. The drop was attributed to the fact that the price offered of KShs. 333 was too low to meet the production cost then estimated at KShs. 500. As indicated in figure 3, the area under maize also reduced by 13%.

With the increase in price in 1991 to KShs. 670 for a 90-kg bag, production increased but gradually reduced in 1992 and drastically reduced in 1993. This drastic reduction in production in Trans-Nzoia district as shown in figure 2 was due to the inter-ethnic clashes that marred the country in general and Trans-Nzoia, which was a hotspot then. This is because many farmers were forced to flee from their farmlands for safety or in some instances crops were burned while still in the field. The drop in production as from 1992 to 1993 was 27% with a price of KShs. 950 for a 90 kg bag.

Figure 3: Price of Maize (1983-1996)

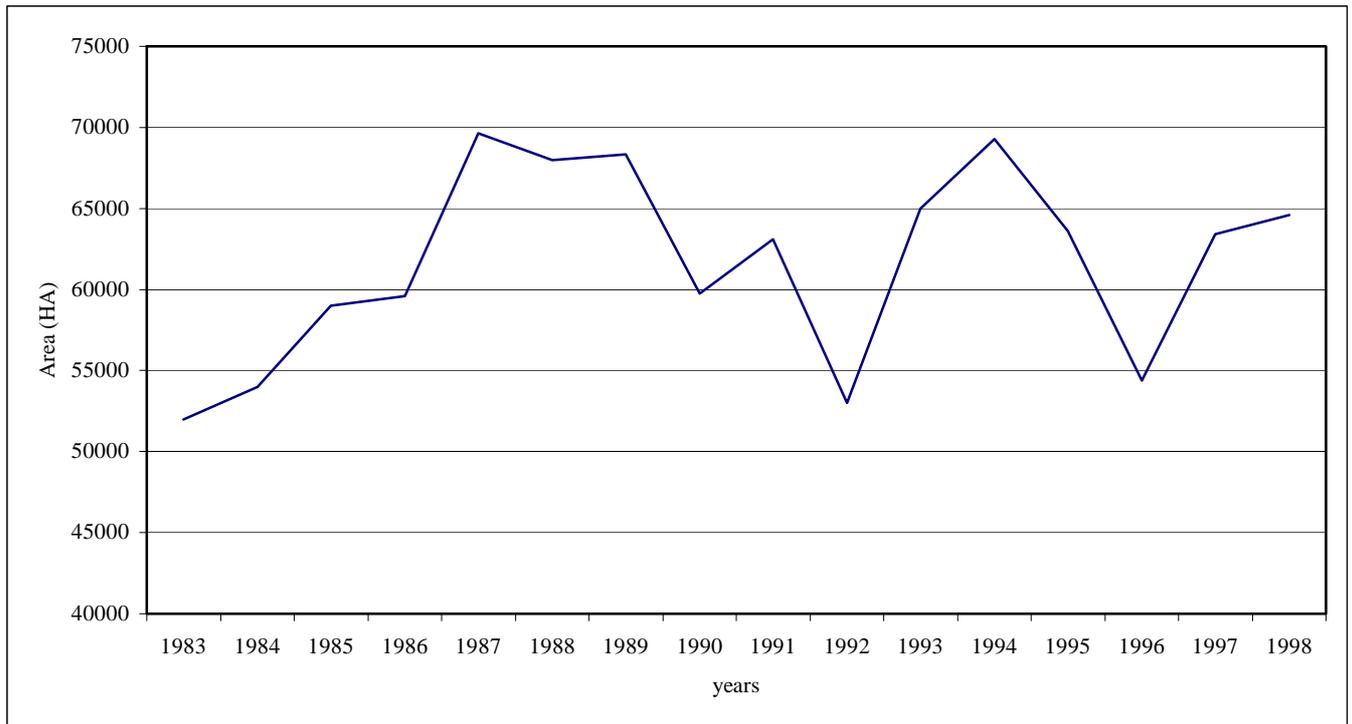


Source: Central Bureau of statistics.

From the figure 4, it is still appreciated that the area under maize was large between 1983 and 1996 and burning the crop could have contributed to the poor harvest. There was an increase in area of production by 39% in 1994 compared to 1993. The price also dropped to KSh.920 for a 90kg bag.

Recently experienced low output prices and inaccessible credit meant that more of the relatively large-scale maize farmers reduced the area under maize, leaving larger portions of their land fallow or under low intensity dairy, while others ventured into horticulture production. Other producers have tended to reduce the intensity of input use, which then increases the unit cost of production (Argwings, K. and Jayne T.S.1997).

Figure 4: Area under maize in Trans-Nzoia District (1983 to 1996)



Source: Central Bureau of statistics.

The growing size and increased commercialization of the global maize economy have been accompanied by an expansion in industries that provide inputs used in maize production, especially improved seed, chemical fertilizers, pesticides and machinery.

As the global maize seed industry has matured over time, it has undergone a series of restructuring and re-organizational changes. The nature and pace of these changes have varied among countries, reflecting differences in stages of development, variation in the structure of production and the differences in the prevailing economic, political and institutional climates. The net results have been a global maize seed industry comprising a conglomerate of different types of national seed industries that vary widely in their organization and performance (CIMMYT, 1992; 1994).

In most industrialized countries, the maize seed industry is now largely in the hands of the private sector. The roles of public institutions like the Universities, research institutions, and organizations offering services in extension, that once dominated maize research and technology transfer activities have diminished. Private companies have steadily expanded their sphere of influence to take advantage of profit opportunities offered by an increasingly commercialized and input dependent maize economy (Michael, 1998). Public organizations continue to play an important role in the technology development and transfer process, but they do so within an increasingly narrow and specialized realm. For instance the focus of publicly funded research has shifted more towards basic research. Very few publicly funded maize researchers now operate towards the applied end of research spectrum, for example developing and testing developed hybrids because private companies have assumed these functions. Many technology transfer activities have also been carried out by the private sector. For instance today, a maize farmer in Europe or the United States is likely to look first to their input dealer rather than the local government extension agent for technical advice on how to manage their crop (Michael, 1998).

If the steadily growing world maize economy has provided the impetus for the private sector seed industry to expand, economies of scale in research and seed production have contributed to its increasing concentration. The 1980s and 1990s have witnessed an unprecedented waves of mergers and consolidations during which the vast majority of the independent seed companies have been bought out or merged with larger competitors.

In the United States of America, for example, although the 7 largest companies currently control about 70% of the market for maize seed, 300 other companies also produce and sell maize seed. (Norskog, 1995). Experience from other countries has shown that deregulating the trade of inputs can lead to significant increases in the range and quality of inputs available to farmers, which in turn raises productivity and income (Gisselquist and Grether, 2000).

In developing countries, the maize seed industry is more variable in organization and performance. In countries where maize is produced mainly by small-scale, subsistence – oriented farmers, using low levels of purchased inputs, private firms have demonstrated an understandable reluctance to enter the market. In these countries, maize research, seed production and seed distributions are generally carried out by public organizations. (Michael, 1998).

1.2 Historical perspective of Kenya's maize seed industry.

Maize was introduced in East Africa in the sixteenth Century, by the Portuguese explorers. Several centuries passed before it was established as a major staple food in East Africa. In Kenya, the role of maize as a major food and cash crop was consolidated by the end of the First World War. The government, recognizing the potential importance of the crop initiated a maize improvement research program in 1955 at Kitale that focused on developing late maturing hybrids for highland areas. KSC was started by a group of farmers and was incorporated in July 1956 under the Company's Act, Chapter 486 of the laws of Kenya.

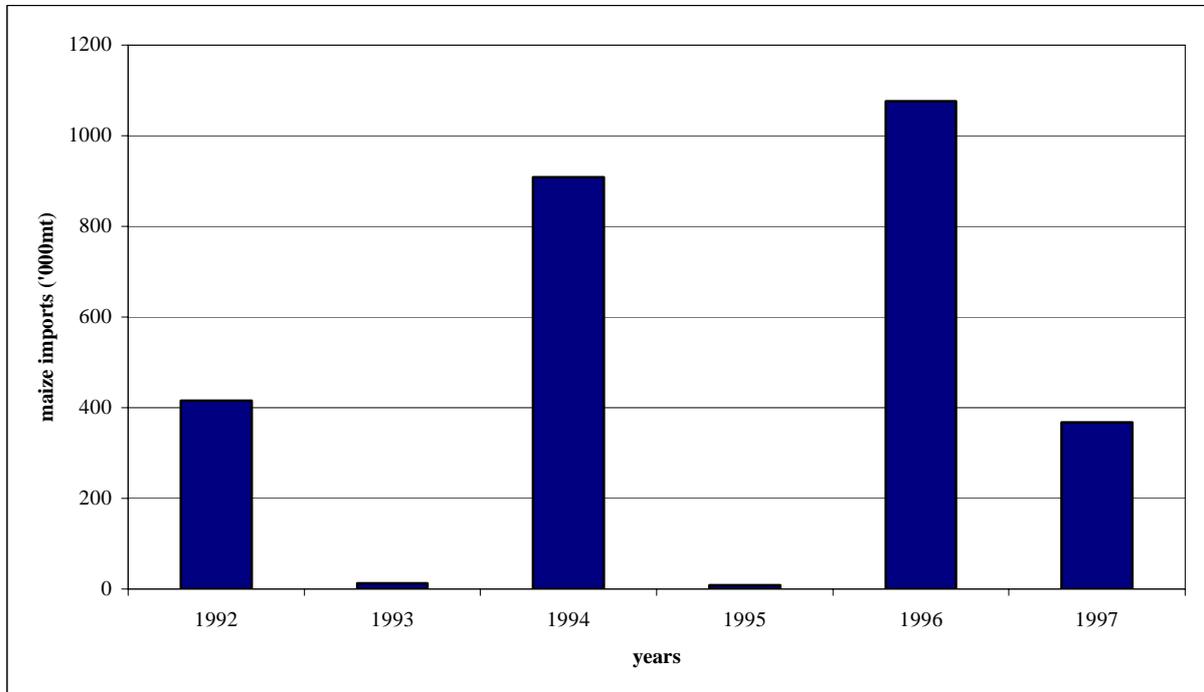
Although the Company was started to produce pasture seed for farmers, in 1958 it ventured into sunflower seed production that was planted for export to Europe as bird feed. Maize seed production program was initiated to increase turn over and reduce overhead costs. Since then, the Company diversified into other seed crops like maize seed, 1962; barley, 1972 and horticultural crops, in 1978.

Between 1957 and 1964, three additional maize research programs were established. The Katumani program concentrated on maize research for the semiarid and mid-altitude areas; the Embu program on moist mid- altitude areas and the Mtwapa program on the coastal lowlands.

By mid 1970s, ten hybrid maize varieties and three composites had been released. A decade after the first hybrid was released in 1964; all large-scale farmers and a significant proportion of the small holders in the medium to high potential zones of Kenya used hybrid seed (Gehart, 1975). In addition to the yield advantage of the released hybrids over farmers' local varieties, the establishment of an organized seed multiplication and distribution system and relatively good infrastructure and extension services played a key role in the spread and adoption of hybrid maize in the different regions. Adoption was much slower in the potential growing areas during the 1964 – 1974 period. Although the diffusion of improved seed and other production technologies continued among maize farmers, productivity gains have lagged behind the growth in demand over the past decade. This is attributed to the faster population growth of 3.5%. As a result of increased demand for maize, Kenya has recently experienced shortages in the domestic supply of its staple food leading to substantial imports of maize into the country. Over the past decade, this gap begun to show a systematic pattern of recurrence, particularly during poor rainfall years (Figure 5). This mitigates for measures to be put in place in order to achieve higher gains in maize

productivity if Kenya is to avoid a structural imbalance in its maize supply and demand equation and be able to reduce the increasing reliance on maize imports.

Figure 5: Maize imports to Kenya (1992-1997).



Source: Kenya Revenue Authority.

During the 1960s, the marketing of commercial seed targeted large-scale commercial farmers in Kenya. However, the KSC through the extension service and a wide network of small shopkeepers soon managed to interest small holders to purchase the seed. Initially, the seed policy in Kenya favored dominance of maize seed sector by the public sector. The government was involved in the development, multiplication, certification and marketing of maize seed through the Research Department then a branch in the Ministry of Agriculture, which was later, converted to Kenya Agricultural Research Institute (KARI) that is also a governmental research institution.

The KSC is a private organization in which the government owns a majority of shares. Maize seed multiplication and distribution by KSC was done under a monopoly status. KSC was also involved in the maintenance and production of the foundation seed developed by a government research agency, which it used for the production of hybrid seed. Together with its subsidiary company Simpson and Whitelaw Limited, KSC had the most elaborate seed processing and marketing facilities. The Kenya Farmers association (KFA), which was a shareholder of KSC, was the main seed-distributing agent.

Currently KSC has a Board of Directors comprising of nine members, four of who are appointed by the government including the chairman. The other directors represent KFA and private shareholders. The equity holding has altered with time but currently the 52% of Company's shares are owned by the Kenya Government under the Agricultural Development Corporation (ADC), the remaining shares are owned by KFA and public. Moreover, seed testing, inspection and certification at all levels of seed production and marketing was the responsibility of the public sector under the National Seed Quality Control Services (NSQCS) that was a unit within Research Department and later KARI.

The seed industry in Kenya is subject to the "Seeds and Plant Varieties Act" of 1991. Unfortunately, a clearly stated seed policy is still missing (Ochuodho J. O., Sigunga D. O. and W. A. Songa. (1999). According to Cortes, 1995, production of poor quality seed could arise from poor seed inspection and certification by the NSQCS. As a unit within KARI, which itself is involved in variety development, NSQCS could easily be compromised because conflict of interest between NSQCS and KARI could occur. To improve on seed quality control, a new body called Kenya Plant Health Inspectorate Services (KEPHIS) was formed to replace the NSQCS in 1997. KEPHIS is the quality control body for the seed industry in Kenya. Control of the seed industry appears to be confined at seed multiplication stage. Little control is effected at seed processing, marketing and distribution levels.

The maize seed market in Kenya is quite highly segmented. The high potential agroecological zones depend on hybrids, with other areas sown to different hybrids segmented by germplasm maturity class. The more semiarid areas depend on Open Pollinated Varieties (OPVS) and the coastal area on either OPVS or the recently developed hybrids. Kenya's maize breeding program has been relatively successful in developing first –generation (F1) varieties for most of these market niches depending on hybrid seed.

The monopolistic position of KSC in the seed market has in fact resulted in a slow deterioration of that company's ability to supply seed of the right type, in sufficient quantity and at the required time.

Deregulation of the seed industry to date has been based on KARI's ability to sell foundation seed on a royalty basis to any established seed organization, undercutting the monopoly position of KSC. There is the need therefore to open up the maize seed sector to multinational seed companies. It is doubtful however if the multinationals seed Companies would move into

the OPVS maize market, which is utilized a lot in the semiarid zone where this seed have a clear-cut advantage over the hybrids. It is probable that the multinationals would try to compete in those niches where existing varieties have some competitive potential.

What is clear is that while competitive pressure within the Kenya seed market is needed, the private sector would not meet the requirements of all the Kenyans' maize farmers, who would require a continuous research role played by the public sector. The eventual division of labor between the private and the public sector will depend to a large extent on the proprietary of germplasm to and from the multinationals.

Adoption of maize seed depends on demonstrated good economic returns to its use, good communication network including road infrastructure, appropriate distribution channels and motivated extension workers. The seed industry was liberalized in 1996 when the government announced various policy changes in seed production and marketing. The main objective of the liberalization was to encourage competition among seed companies that could improve the seed quality and enhance efficiency in seed production thus reducing production costs. This policy was intended to attract private investment in seed development, multiplication and distribution. Prior to liberalization in 1996, 4 private companies were in business of development of maize and sunflower varieties. These were: Oil Crop Development Company (OCD), Monsanto, Pioneer and Western Seed Company.

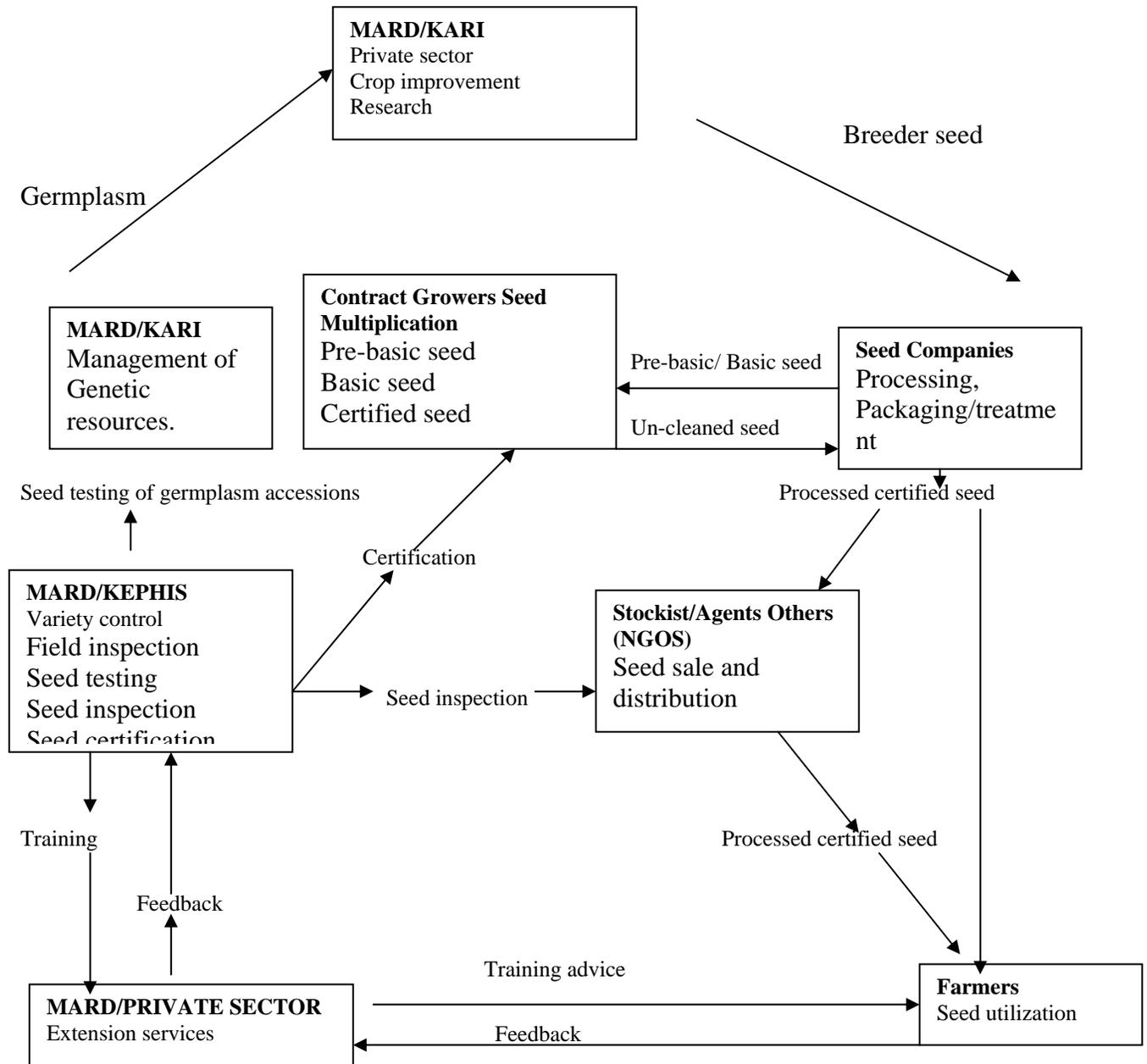
KARI traditionally passed on all the breeders' maize seed and inbred lines to KSC. Therefore, KSC enjoyed a monopoly in publicly developed varieties in seed multiplication until 1996. Initially, the newly formed seed companies could not have access to this publicly developed material for multiplication and distribution. Traditionally, these companies obtained the breeders seed or inbred lines from their sister companies operating in other countries like

Tanzania and Zimbabwe or from International research organizations like International Wheat and Maize Improvement Center (CIMMYT). In the policy pronouncement on liberalization of the seed industry, it was provided that KARI and other public funded research institutions would henceforth start providing breeders' seed to all registered seed companies without discrimination. Seed multiplication and distribution would therefore be open to competition among the registered seed companies.

1.2.1 Seed industry before Liberalization.

The formal and informal sub sectors of the seed industry have co-existed in the region for many years. In the formal seed sub-sector, there is an established legal framework for the movement of seed from research to the farmer, whereas in the informal seed sub sector there is no such defined process. Much of the seed of improved crop varieties has reached farmers through the formal sub-sector. The formal seed sector linkage is as shown in figure 6.

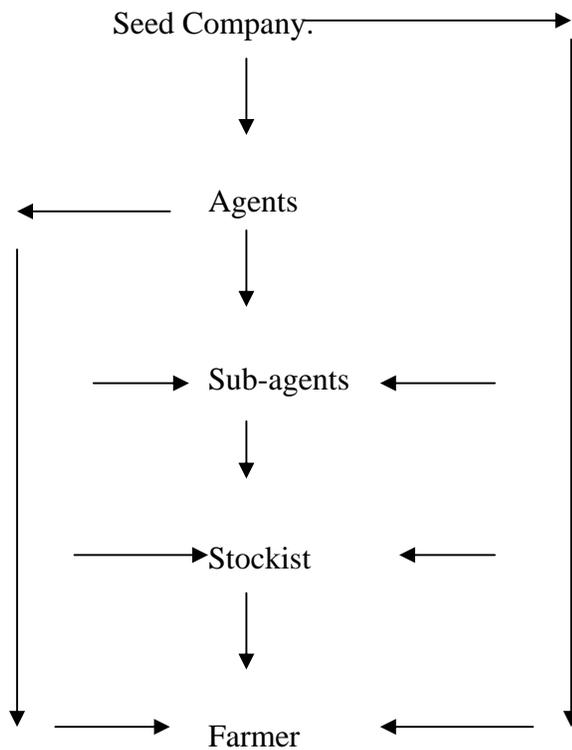
Figure 6: The formal seed sector linkages in Kenya.



Source: Ndegwa *et al* (1996)

Before liberalization in 1996, the formal sub-sector was dominated by public enterprises such as KSC, ADC, the Ministry of Agriculture, Ministry of Co-operative Development and Economic Planning through regional development agencies like KARI and large-scale farmers. In this era, seed distribution covered almost all farming regions in Kenya, penetrating even the small shopping centers in the rural areas. The distribution network was achieved through the efforts of the KFA that had a program to ensure that input distribution centers were opened in all major agricultural societies in the country. The Co-operative societies and a network of stockists numbering over 4000 countrywide supported the agents and sub-agents in the years before 1996. The marketing chain was as depicted in the figure 7:

Figure 7: Seed marketing Chain.



Source: Nyoro (1996).

The informal sub-sector dealt mostly in exchange of farmers' own saved local seed. Most farmers saved their own seed, bought seed from the local market or obtained seed from neighbors.

1.2.2 Seed industry after liberalization.

After liberalization both formal and informal seed sub-sectors still exist but the private sector has come onto the scene. The entry of the private² sector firms (Appendix 3) among them: East Africa Seed Company, Pioneer, Western Seed company and Monsanto has enhanced competition though this has introduced other problems such as doubtful quality in terms of viability and adulteration of the maize seed. On many occasions it has been alleged that other seed Companies use KSC packaging materials even when the seed has not originated from KSC, in order to sell their own seed. The farmers purchase seed expecting it to be from KSC when on the contrary it is not.

However, in the semi arid Eastern parts of Kenya the private sector has had minimal impact because private sector firms are reluctant to go into production of OPVS, which do not require a farmer to return to the market for the seed every other season.

In the post liberalization period most of the public sector institutions involved in the seed industry are being restructured. KARI has undergone metamorphosis and among the changes was the establishment of KEPHIS. KARI has also developed a seed unit whose main aim is to try and assist community based seed systems in managing the seed for enhanced productivity.

² See Appendix 3 for registered dealers in seed breeding and production.

1.3 Problem Statement

There is little information that has been documented on structure, conduct and performance of hybrid maize seed market in Kenya.

The problem affecting the seed industry can be traced partly to the seed marketing and distribution, mainly on the market structure of hybrid maize seed. For instance, the number of seed sellers in the market is small. Initially the KFA was the main seed distribution agent for KSC; with few sub-agents and stockists. Although the number of seed merchants has increased since 1996, it has not increased to desirable levels to foster competition in the market. As per the Seeds and Plants Varieties Act, CAP 326 laws of Kenya it states, Every seed merchant is supposed to appoint an agent, a sub-agent and a stockist who have knowledge, ability and appropriate facilities to maintain the quality and viability of the seed offered. In a way this affects the number of seed sellers because it is fully determined by the seed merchants. The above Act does not provide for the criteria the seed merchant uses to eliminate other interested parties who meet the above requirements and would like to sell seed. The law does not also provide for redress to those who would like to sell the seed and in one way or another are left out unfairly. Therefore the seed merchant would maintain a certain number of agents and stockists and can determine if the industry is monopolistic or competitive.

There has been a low entry in the hybrid maize seed market by private traders since the maize seed sector was liberalized. The low entry is attributed to both institutional and financial barriers. Under the institutional barriers it is found that after a seed merchant appoints seller, then the act stipulates that the seed seller applies to the director for a seed sellers' license by completing form SR12 with the required fee. The allocation of seed seller license is delegated to the District Agricultural Committee, which is a quarterly meeting. Also before a license is

issued the Divisional Agricultural Officer has to inspect the premises intended for use by the seed seller and due to lack of infrastructure in place for the officers, inspection may take several months or even years to be done. The Act further stipulates that, no person shall sell seed unless he holds a valid license issued under the Act. From this Act it is found that the bureaucracy involved in getting a seed seller license is unnecessarily time consuming. Given that the seed is a seasonal commodity then this confers undue protection to people already in the seed industry as many people give up before obtaining the license.

The Act also stipulates that every person who by way of trade or business produces, purchases or otherwise acquires, sells exposes, keeps, stores or advertises for sale any seed purported to be tested and certified by government shall apply to the secretary, Seed Regulation Committee for registration as a seed merchant. When it comes to integration and contractual arrangements of between seed merchants and the agents, the law does not give any provisions of the legal framework entailed. Given that a seed merchant can be a producer and seller of the seed, then he may have both horizontal and vertical integration and in the long run the industry becomes a monopoly with no favorable environment for competition. Also given that he has the right to appoint agents, sub-agents and stockists, then he could adversely influence free entry to the industry.

There is product differentiation in the hybrid seed market by varieties and within a variety through packaging using different packet sizes. Hybrid maize seed is in packets ranging from 2kg, 5kg, 10kg, 20kg, 25kg and 50kg. As per the seed and plant varieties act, stating that labeling and sealing shall not be conducted for seed packets less than 10kg in weight provided packets are sealed or closed, the phrase government certified is printed on the packet and the lot number, date of sampling, cultivars species and name is printed on the packet. The above Act has enabled unscrupulous traders to pack uncertified substandard hybrid maize seed and sell to

the unsuspecting farmers. This is made possible from the fact that KSC packets are easily available in the open-air market. However, not all farmers are literate to read the lot number to verify whether the seed is authentic provided the package is similar to that from KSC. Therefore the problem of appropriate seed packaging has made it difficult for the farmers to access good quality seed.

Pricing of the hybrid maize seed has been escalating over the years and that makes maize production a very expensive venture. The farmers who are the main consumers of the hybrid maize seed are forced to cope with the escalating prices of the seed making maize production costs to rise. This study therefore aimed at analyzing the market structure, conduct and performance of the hybrid maize seed by specifically considering Trans-Nzoia district.

1.4 Objectives of the study

The overall objective of this study was to examine the market structure, conduct and performance of hybrid maize seed for Trans-Nzoia district, one of the major maize producing areas in Kenya. To achieve this, the following specific objectives were pursued.

- a) To assess the degree of competition in Trans-Nzoia hybrid maize seed market at retail levels.
- b) To examine the trend of the price of hybrid maize seed at retail level over time.

The research question was: has the price of hybrid maize seed increased or decreased over time?

- c) To examine the market conduct of the hybrid maize seed market.

The research questions were: who determines the hybrid maize seed prices?

Who does promotional activities, the seed companies or the retailers?

- d) To analyze the market performance of hybrid maize seed.

1.5 Hypothesis to be tested

- 1) Trans-Nzoia hybrid maize seed market is competitive.
- 2) Trans-Nzoia hybrid maize seed pricing is efficient.

1.6 Area of study.

A case study of Trans Nzoia District (Kitale) was undertaken to assess the impact of the maize seed market reform on hybrid maize seed traders. Trans-Nzoia is one of the well-known Kenyan grain granaries and this is the reason why it was chosen as representative for high potential area for this research. The scope of this research is limited to Trans-Nzoia district. It is hoped however, that results of the study could be applicable in areas with similar cultures and conditions.

1.7 Justification of the study.

The government is carrying out reforms in the economy to enhance growth of the various sectors. Liberalization of the seed sector was initiated in 1996 to improve the services in the seed industry. Liberalization of this industry was executed to encourage private companies to develop, multiply and distribute seed. In his case study on KSC activities and organization, Ndambuki (1996) indicated that there were three aspects closely associated in seed marketing mainly; products, customer and the competitor within the seed industry. However he did not elaborate further on the market structure and this study intends to fill this gap.

As is evident in the following chapter, published studies on hybrid maize seed marketing system in Kenya are scanty. In spite of these previous efforts a more contemporary study of the same was considered necessary, taking into account the deficiencies of the previous studies and changes that have occurred between then and now. It is likely that the hybrid maize seed

marketing structure, conduct and performance has changed over time and thus need to be examined. Competition would change seed market structure, conduct and performance. The study was set to assess the market structure, conduct and performance of the hybrid maize seed.

1.8 Scope of thesis.

The study has five chapters. Chapter one provides the background information on the development the maize seed industry in Kenya describing the status before and after liberalization. It outlines the problems within the industry and provides goals for the study and the hypothesis to be tested.

Chapter 2 reviews work on maize seed marketing in Kenya. Theories on use of marketing structure, conduct and performance model in marketing analysis are discussed and studies using this approach to analyze other commodity markets are presented.

Chapter three describes the methodology for data collection, discusses the types of data used, sources of the data and the techniques used in sampling respondents, and finally data collection and analysis.

Chapter 4 contains the observation on market structure, conduct and performance analysis. The hypothesis posed in the study is tested.

Finally chapter 5 gives conclusions of the study and presents recommendations for improving the maize seed trade.

CHAPTER 2.

2.0 LITERATURE REVIEW

2.1 Theoretical Aspects

2.1.1 Concept of competition.

Much of the confusion over what is meant by the term "competitiveness" is derived from the level at which competition is considered. Considerations may be at national or at firm level. Those interested in the competitiveness of a nation focus on trade deficit or on national productivity growth and the sectorial composition of output and their determinants (Mc.Corrison and Sheldon 1994). Those interested in a country industrial sector stress levels, changes in the balance of trade or the performance of the firm in the sector. Those concerned with the competitiveness of an individual firm or of groups of firms in an industry for example, the position of small and medium enterprise relative to large firms stress market share and its growth. The most common features in the analysis of competitiveness are that it should be assessed relative to some yardstick and that the emphasis should be put on growth or dynamic performance.

Competitiveness is the ability of a firm or a country to produce a commodity at an average variable cost below its cost price. Should any product fail to meet the test, its market position cannot be sustained and it would eventually cease to produce for the market. Competitiveness is distinct from the ability to produce. A producer or a country may be able to sell or export by incurring a net social loss. As Krugman (1994) observed, it is also distinct from welfare. From a normative standpoint, policy intervention aimed at enhancing competitiveness must be conditional upon improving welfare as well. The competitiveness of a nation is its ability to produce goods and services that meet the test of international competition while its citizens

enjoy a standard of living that is both rising and sustainable. Otherwise competitiveness can be achieved by squeezing welfare, for instance by instituting a head tax, reducing credit availability, increasing transaction cost and price risk for net buyers. Policies that enhance the competitiveness and welfare of all producers alike include the promotion of technological change, the reduction in transaction costs for purchased inputs, lower credit costs and lesser credit constraints in buying the inputs. Policies that reduce transaction costs on output markets may improve the welfare of all producers, but they may hurt the competitiveness of net buyers. Such policies fall in two broad categories for instance, those that reduce the spread between market price and the farm gate price and those that reduce the transaction directly incurred by the producers and consumers.

The first category is composed of infrastructure, marketing services, private and public transport, regional availability of marketing organization and agro-industries and the efficiency in trade intermediation system. The second are comprised of general education information service and contract enforcement institutions that enable producers to police with traders and agro-industries. Focusing on transaction costs as a determinant of competitiveness and welfare thus opens up a vast array of instruments for policy intervention. It also raises the issue of institutions in fostering competitiveness.

Marketing research is more useful when oriented with reference to a concept of an ideal or perfect market (Bressler and King, 1970). Conditions satisfying a perfectly competitive market include: homogeneity of product from the firm among consumers and the sellers point of view in that there are no advantages or disadvantages associated with selling to a particular consumer; two, that both firms and consumers are numerous and the sales or purchases of each individual unit is small in relation to the aggregate volume of a transaction; three, both firms and consumers have perfect information about the prevailing prices and the current bids and

they take advantage of every opportunity to increase profits and utility respectively; and four entry into and exit from the market is free to all firms and consumers in the long run (Handerson and Quandt, 1971). However in reality these attributes of perfect market structure do not exist.

The perfectly competitive model is idealistic, as the global economy today indicates that the model may be impossible to attain. This is due to the fact that there is welfare consideration that modifies the distribution of income and possible advantages of limited number of firms in those areas whose economies of large-scale operations are vital. Bressler and King (1970), in their competitive market model however, argued that attempts to improve marketing by approximating competitive conditions could be appropriate in many instances. They cite several advantages of the perfectly competitive model; for example they state that while welfare conditions would sometime define other results, the model makes it possible to judge the existing systems by standards of socially desirable results. These in most cases are consistent with general welfare. The above principle stresses the importance of theorizing and of logical analysis in the planning phases of research. By suggesting the general form for particular studies, it will help to insure that findings could be used in succeeding and more advanced studies. The principle further stresses the vital interrelationship and interdependence in the working of economic systems, hence can encourage researchers to go beyond superficial and gross relationships. Finally the competitive market model provides a "goal" that frequently differs significantly from the "status quo" and therefore it encourages the exploring and developing of new ideas and knowledge.

According to the neoclassical theory, the most efficient form of industrial organization is the competitive market, made up of large numbers of economic agents as individuals or firms. The economic agents seek to maximize their welfare by engaging in production, consumption, and

exchange of activities. Voluntary transactions serve to equilibrate supply and demand for goods and services at market-clearing prices that lie close to the low points on the industries long-term average cost curve. Market participants have full and free access to information and are able to adjust their bid and offer prices instantly and at no cost. Guided by an invisible hand the goods and services are cleared from the market. The most efficient technology always prevails and excess profits are always eliminated. Any divergence from this idealized scenario is explained in terms of market failure. However, the usefulness of applied analysis of the neoclassical theory is limited by the fact that it fails to account adequately for the transaction costs. The depiction of fully informed, completely rational economic agents working within well functioning, frictionless institution is often misleading. The problem lies in the assumption that information flow is perfect and transactions are costless. When the above assumption is violated, as is normally the case, then numerous institutional problems arise that the market forces in themselves cannot supersede (Klitgard, 1995).

2.2. Relevant empirical studies

Several studies on hybrid maize seed production and adoption in Kenya have been undertaken. Few however have focussed on the marketing channel and distribution of the hybrid maize seed marketing systems. For instance Ndegwa *et al* ; (1996) studied hybrid maize seed channel, and found out that there was a system of appointed agencies in which KFA depots acted as reservoirs of seed from which sub-agents such as co-operative unions could draw their hybrid maize seed supply from. In addition more than 3000 appointed stockists were able to draw from any of these points in minimum quantities at a lower price, which provided an incentive for the stockist to take seed to the farmers in farmers' area. A countrywide price for seed was set which was same whether purchased in Trans-Nzoia or anywhere else within the country.

The maximum hybrid maize seed quantity for purchases by retailers was set at 200 kg at a time. This was put in place in order to ensure that only seed required was purchased and to reduce the problem of excess stocks resulting in seed deterioration at the end of the planting season. Given that currently KSC is no longer the monopoly in the hybrid maize seed market there is need to establish the current marketing channels of the hybrid maize seed.

In his case study on KSC activities and organization, Ndambuki (1996) indicated that there are three aspects closely associated in seed marketing mainly products, customer and the competitor within the seed industry. However he did not elaborate further on the market structure and this study intends to fill this gap.

The studies mentioned above represent some of the previous efforts that have been made to investigate the hybrid maize seed market in Kenya. In spite of these previous efforts a more contemporary study of the same was considered necessary, taking into account the deficiencies of the previous studies and changes that have occurred between then and now. It is likely that the hybrid maize seed marketing structure has changed. Evidence of cost structure over time needs to be presented. As is evident in the foregoing, published studies on hybrid maize seed marketing system in Kenya are scanty. In the rest of this chapter, some studies that cover other areas of marketing are reviewed. These studies are considered relevant, especially because they offer good examples of the various approaches to studies of market competition.

The hybrid maize seed market like other markets is influenced by a set of social, political, economic and physical conditions under which it operates. This would explain the strategies adopted by the participants and consequently the outcome of the market objectives. Clodius and Mueller, (1961) defined structural variables as those characteristics that influence the organization of the market and which strategically influence the nature of pricing competition

within the market. Tomek and Robinson (1972) highlighted four-market structure variables commonly used to assess competition in a marketing system. They include: the degree of seller concentration³, inequality in market share, the extent of product differentiation, the level of market integration in the horizontal and vertical directions and the barriers to entry in the market.

Bain (1968) explained that high concentration of the market and inequality in a marketing system indicate oligopoly while low concentration imply tendencies towards competitiveness provided no major barrier to entry exists at the major marketing channel levels that are present. Rosenbluth (1955) stated that among the market structure variables, concentration is the most vital factor that influences the market conduct and performance. Miller (1984) associated competition in marketing systems with efficiency. He argued that competitive pressure is the best way to ensure that people in business organization perform efficiently. However, Scitovsky (1955) further pointed out that market concentration might affect income distribution in an industry; which could arise in different ways for example, through the influence of concentration on profit margins, on price attached to a product and on factor markets by barring the potential entrants into the industry. He concluded that this would likely enhance inequality in income distribution and cause poor market performance.

Various authors have also attempted to categorize competition in marketing based on level of concentration.

Concentration refers to the proportion of the transactions accounted for by a given number of participants in the market. Economic theory states that the presence of a few sellers with each having a big market share leaves decisions on markets, and profits in the hands of only a few

participants. Such markets are therefore associated with non-competitive pricing arrangements (Staatz, 1980).

A market concentration ratio is a measure of the percentage share of the market controlled by a specified percentage of firms ranked in order of market share from the largest to smallest; (Karugia, 1990; Ackello, 1978). High concentration and inequality indicate oligopolistic tendencies while in converse; low concentration suggests tendencies towards competition provided there are no serious barriers to entry into the market (Bain, 1951; 1968).

Parker and Connor (1979), used a Gini coefficient of 40% and below for an industry as indicative of effective competition or otherwise as non-competition or oligopoly tendencies.

United States of America (1966) defined high concentration as a situation in which the 4 largest firms control 50% or more of the sales. Both Bain (1951), and Mann (1968) were in agreement that a critical level of concentration occurs when the eight largest firms control 70% or more of the market share. Keyesen and Turner (1965) proposed that substantial oligopoly exists where the top 8 firms handle 50% of the sales. Bain (1968) (Table 2) gave the most detailed classification, displayed in Table 2 of a marketing industry based on shares of sales of the largest four and eight firms.

The Herfindal index is a summary measure of concentration for any number of firms in the market (Samuelson and Nordhaus, 1989). Its advantage over the other conventional market concentration measures is that it reflects the impact of firm size on market power.

Product differentiation, real or imagined, leads to non-random purchases by buyers unlike where there is perfect competition when the product is homogenous (Tomek and Robinson, 1972). Markets with highly differentiated products show high propensity towards oligopoly than toward perfect competition. Product differentiation takes different forms for example form

of packaging, quality difference and after sales services. This makes the consumer perceive one form of a product to be different from another form though the product is the same.

Integration involves the relationship leading to mergers between sellers at the same market. In vertically integrated system, producers, wholesalers and retailers act as a unified system. Either one-channel member owns the others or franchises them or has enormous power that forces all of them to cooperate (Kotler, 1989). Using the market conduct approach, it is possible for one to describe if the market is competitive or not Clodius and Mueller; (1961).

The forms of integration are horizontal and vertical integration. Such systems achieve economies of scale through size, bargaining power and elimination of duplicated services. Tomek and Robinson (1972) assert that integration occurs mainly because of the inefficiencies or inadequacy of the market exchange mechanism to control the flow of products in the correct time and with the desired attributes. This integration has effect on the smooth transfer of commodity from producer to consumer. In addition integration can reduce marketing costs especially transfer costs between market stages, purchase price and procurement risks. The degree of integration also shows the power of participants in making price decisions. Thus vertical integration may eliminate price as a coordinator between market levels, especially when the market is informal or weak.

Barriers to entry will always limit the number of potential market participants and thus directly influences competition in the trade. Barriers to entry are the source of all monopoly powers. The two types of barriers are technical and legal barriers. A technological barrier occurs when production is such that relatively large-scale firms are low cost producers. In this situation one firm may find it profitable to drive others out by price cutting, and when a monopoly has been established entry will be difficult because any new firm must produce at relatively low levels of

output, and thus at relatively high average costs. However the declining costs need only be “large” relative to the market in question. Another basis of technical monopoly is special knowledge of a low cost productive technique, which the monopoly keeps to itself.

Many pure monopolies are created as a matter of law and not economic conditions. This is the legal barrier whereby productive technique is legally protected by a patent. Another example of legal barrier is created when a monopoly is given exclusive franchise to serve a market. Aspects of barriers that were examined were the size of capital and financial requirements at the start of business and if a credit facility was accessible to traders. The institutional factors that included the policy aspect and how policy affects entry into the market were also examined.

Table 2. Bain industrial classification of industry based on sales of the largest 4 and 8 firms.

Firm type	% Share of the first 4 firms	% share of the First 8 firms	Number of Firms	Description
1	>90	>90	Very few	Oligopoly
2	65-90	85-90	Few	Highly concentrated.
3	50-65	70-85	Few to large	Highly to moderately concentrated.
4	35-50	45-70	Large	Low-moderately concentrated.
5	<35	<45	Very large	Moderate conc. with high competitive fringe.

Source: Bain (1968)

Market conduct refers to the patterns of behavior that enterprises follow in adjusting to the markets in which they buy and sell. Pricing mechanisms and sells promotions are the major aspects of market conduct (Bains, 1968).

Marketing systems have multiple and often conflicting goals. Compromises and trade-off are necessary if all participants are to be satisfied. For instance consumers are likely to evaluate a marketing system in terms of its performance in avoiding high and fluctuating prices, shortages in supplies and consistency in delivering products or produce of acceptable quality. Farmers' criteria could be the capacity of intermediaries to exert undue influences on the prices, the extent of competition in the sector supplying inputs and accessibility of marketing infrastructure like transportation at reasonable costs. Efficiency is the main variable used to determine performance. The two forms of marketing efficiency are operational and pricing efficiency. In this study pricing efficiency was assessed.

Pricing efficiency is based on three assumptions that competitive markets are efficient. It is concerned with the ability of the market to allocate resources and coordinate the entire agriculture production and marketing process in accordance with consumer directives. Evidence of pricing efficiency is the efficient resource allocation and maximizing economic output. Possibly, a measure of satisfaction of output of the marketing system is the price that consumers are willing to pay in the market place for the products. Pricing efficiency is concern with the exchange functions. It is achieved if the marketing institutions operate such that:

- ❖ Price differences between two areas reflect only the transport and handling costs of spatial transfer.
- ❖ Price differences between two periods for storable commodity reflect only the storage costs.
- ❖ The price of a processed product exceeds that of the unprocessed equivalent by the cost of processing.

Pricing efficiency measures are useful in evaluating marketing systems and depend upon four conditions:

- ❖ That customer has alternatives from which to choose in the market place. Therefore, price efficiency measure is irrelevant to monopolistic situations.
- ❖ The prices of alternatives adequately reflect the costs of providing them. That is no subsidies hidden for competitive products.
- ❖ Organizations and individuals must be free to enter or leave the market.

Assessment of pricing efficiency virtually entails an assessment of marketing profits. Marketing profits per production unit form the marketing margin, thus the difference between the average consumer and producer prices is generally the first step towards investigating pricing efficiency. (Schubert, 1973)

Equilibrium theory show that excess profits lead to higher consumer prices and lower producer prices as well as to lower turn over, i.e. a worse supply and sells situation (Bains, 1968). This is consistent with monopoly profits and it is an indication of pricing inefficiency.

CHAPTER 3

3.0 METHODOLOGY

This chapter provides information and methodologies used in data collection and analysis for this study. It also provides information on sources and sampling procedures adopted.

3.1 Conceptual framework.

One important approach to the study of market performance, namely, Structure- Conduct-performance framework, suggests that relationship exist between structural characteristics of a market and the behavior of market participants and that their behavior in turn influences the performance of the market (Scaborough and Kydd 1992; Scott1995). The perfect competition market model is often used in economics as a standard by which structure of the market can be evaluated. Large number of buyers and sellers, low barrier to entry, product homogeneity and complete knowledge of alternative choices on the part of producer and consumer characterize the competitive market model. It also pre-supposes and entails an economically efficient allocation of resources. Since each trading firm maximizes its profits by equating the given price to it's marginal cost, competitive prices correctly reflect both consumer demand and the cost of resources employed (Scheid and Sutenan, 1979). In this study the structure, conduct and performance of hybrid maize seed marketing system was examined.

Typical Structure- Conduct- performance (SCP) analysis tends to assess market performance largely in terms of:

- (1) Whether marketing margins charged by various actors in the marketing system are consistent with costs; and

- (2) Whether the degree of market concentration is low enough (and the number of firms operating in a market is large enough) to ensure competition, which is in turn assumed to drive down costs to their lowest level.

The Structure- Conduct- performance (SCP) approach postulates that as market structure deviates away from the paradigm of perfect competition as characterized above, the extent of competitiveness of the market will decrease; and consequently a decline in market efficiency will take place (Scaborough and Kydd 1992; Scott1995).

3.2 Market structure

Market structure refers to the organizational characteristics of the market, which determine the interrelationship among sellers, between buyers and sellers, and among sellers to the actual and potential suppliers. Structure influences market performance and conduct. Knowledge regarding structure can give indications about competitiveness. The latter in turn has considerable influence on prices.

The variables used to explain market structure are the degree of market concentration, vertical and horizontal integration, condition of entry in the market and magnitude of product differentiation.

In this study the seed sellers were referred to as retailers as there was no clear cut between a wholesaler and a retailer. Almost all retailers got the hybrid maize seed supply from the KSC seed shop and those whom had registered as wholesalers sold more seed as retailers. For the above reason all the shops sold as retailers and the name given to different seed sellers was considered at retailer level.

3.2.1 Concentration.

Concentration refers to the percentage of total transactions accounted for by a given number of participants in the market. Consequently it may be assumed that high concentration and inequality indicate oligopolistic tendencies while in converse, low concentration suggests tendencies towards competition provided there are no serious barriers to entry into the market. Information from the retailers was obtained through interviews by use of questionnaire (Appendix 4), and the data was recorded. The monthly turnover (in kg of maize seed) of each of the 30 retailers⁴ was recorded. The market concentration was obtained by retailers being classified into 18 groups according to their sale volume with a class interval of KSh.100,000. The eighteen-class stratification aimed at giving a clear picture of the sales value of majority of the retailers. For easier manipulation of the data the eighteen groups were further divided into six groups with a class interval of KSh.500,000. From this later stratification, it would be possible to establish which class controls the greatest proportion of transactions. From the obtained turnover, Lorenz curves would be constructed and other indicators of market power including Herfindal- Hirschman index (H.I), and Gini coefficient.

$$H.I = \sum_{i=1}^n S_i^2 = S_1^2 + S_2^2 + S_3^2 \dots \dots \dots (i)$$

Where S_i = percentage market share of i^{th} firm

$H = 0 < H < 1$ and monopoly power increase as H tends to 1.

The retail traders were also classified into small, medium and large scales with arbitrary cut-off levels of hybrid maize seed.

Also, to assess retailer concentration, the sales share of the first four and eight largest retailers in the sample would be obtained. Viewed as a structural determination of competition, the

⁴ Retailer is a registered hybrid maize seed seller in Trans-Nzoia District.

degree of concentration is of strategic influence, this would give an indication of existence of potential monopoly power. The average monthly seed sales of retailers were recorded during the survey. The data were used to calculate sales shares of the first four and eight largest retailer in the sample.

Lorenz curves and Gini coefficients derived would be used to demonstrate the levels of inequality in the market. The Lorenz curve would display the distribution of shares of sales or income among the traders in the market. It would therefore show how the actual distribution of market shares differs from the hypothetical situation of equal distribution.

The Gini coefficient a statistical measure based on the Lorenz curve would be used to measure the dispersion of concentration in the total market as used by Ritson, 1988. It would give a summary of the deviations in percentage shares of sales among the traders. The surface of the area between the Lorenz curve and the diagonal of the graph (A), divided by the area under the diagonal (A+B) represents the Gini coefficient.

Gini Coefficient as a comparative measure of inequality in share distribution is the most commonly used in income distribution studies. It has the range zero to one and oligopolistic behavior increases as the coefficient approaches 1 while the market becomes most competitive as the Gini Coefficient, tends to zero (Scheid and Sutenan, 1979).

Gini Coefficient, (R) was obtained using Andic and Peacock (1961) formula:

$$R = \sum_{k=2}^i (P_{K-1} q_k - P_k q_{k-1}) * 1/10000 \text{ -----} 2$$

P = Cumulative % of traders by classes.

Q = Cumulative % of volume or values of commodity sold by each group of traders.

K = social order of the cumulative % for each group of traders.

3.2.2 Product differentiation

Markets with highly differentiated products show high propensity towards oligopoly than to pure competition.

Data was obtained to detect product differentiation in the market. The packages offered for sale were listed. Traders were interviewed to reveal different after sales services they received from wholesalers or the supplier (Appendix 4). The services that the traders provided to farmers were also recorded. The packaging amount of the hybrid maize seed that was sold was obtained from the retailers. The retailers were asked if the farmers preferred specific packages of hybrid maize seed or if they preferred specific variety of hybrid maize seed. The above questions were aimed at finding out the farmer's awareness of the differentiated products in the market.

3.2.3 Integration and contractual agreements

Retailers were asked reasons for contracts with the specific source of supply they mentioned. They were asked the modes of payment they had with the supplier (Appendix 4). Probing was carried out in conjunction with the above two questions in an attempt to reveal the existence of contracts.

Integration in the hybrid maize seed market was examined by determining if there were contracts on quantity of seed delivered by seed companies to wholesalers or by wholesalers to retailers. Other forms of integration such as extension of credit to traders was assessed. Results were expressed in cross-tabular form and inferences made on basis of frequencies. Data was analyzed using SPSS a statistical computer package and descriptive statistics were presented.

3.2.4 Barriers to entry

Barriers limit the number of potential market participants and thus directly influences competition in the trade. In the current study, two impediments to entry in the hybrid maize seed market retailing system were investigated. These were institutional restrictions and high initial capital requirements. Aspects of the variables that were investigated in the study were size of capital, financial requirements at the start of business and whether credit facilities are accessible to retailers (Appendix 4). Barriers to entry were determined by establishing the threshold capital required for starting the hybrid maize seed business. At the same time sources of the funds, the current operational costs were analyzed to determine both the diversity and ease of access to credit to facilitate entry. Information on the role of Government in licensing, checking on quality standards and enacting regulatory laws were considered as part of possible barriers to entry.

Barriers to entry were also analyzed using descriptive statistics and statistical computer program. Participatory rural appraisal was conducted to find out the most popular maize seed variety and the problems encountered by farmers using hybrid seed. Descriptive statistics, SPSS and excel were used to analyze the data from the farmers.

The questionnaire used to interview the farmers is as shown in Appendix 5.

3.3 Market conduct

Market Conduct explains the behavioral characteristics of firms or the strategy they use with respect to pricing, buying and selling at the market place. Price and promotions are the two variables, which were used to determine the market conduct.

Pricing mechanisms considers methods employed by a firm in determining prices and quantities to be sold. Some of the factors that were considered included whether prices were determined independently or through collusion.

Traders were asked whether they set prices of hybrid maize seed individually or by colluding with each other, and also if they jointly restricted the amount of seed for sale to raise the market price (Appendix 4). The answers given were used to describe the level of collusion in the seed market among the traders and stakeholders.

Sales promotion policy considered the budget set-aside for sales promotion by traders. Traders were asked the type of promotions they carried out to advertise for the hybrid maize seed, and how much it costs was incurred. Bain, 1968 asserts that the amount of money spent on sales and promotions is an indication of the competition a firm may be facing and hence the need to promote its' product in order to increase its' sales. Firms thus use sales promotions in order to avoid competition.

3.4 Market performance

Market performance is an end result, which firms in any market arrive at by pursuing the line of conduct they have deemed best for themselves. KSC determined the hybrid maize seed price and for that reason the pricing efficiency of KSC was assessed.

The performance dimensions used in the study included: Prices paid by the consumers; have these costs risen or fallen since the transition to liberalization, the profits made by KSC from sell of hybrid maize seed.

To determine the price over time, secondary data was used. Real prices of hybrid maize seed since 1985 to 2000 were determined. The price data was obtained from KSC and the consumer price indexes were used to determine the real price of hybrid maize seed. The consumer price

index was obtained from central bureau of statistics. However, pricing efficiency becomes irrelevant in cases where monopolistic tendencies exist.

3.4.1 Pricing efficiency

Ruttan (1969) describes a procedure of investigating whether the average marketing margins contain appreciable monopoly profits. The procedure involves investigation of whether the marketing margins are statistically dependent on consumer prices. Ruttan (1969) presupposes that changes in the consumer prices have only a slight effect upon the marketing costs of a product. Eventual changes in marketing margins resulting from changes in retail prices are accordingly based upon changes in the profit margins. If the margin remains relatively stable during changing retail prices, this indicates that the dealers' pass on consumer price changes fully to the producer, i.e. they are not in a position to use increases in demand to expand their profit margins. The independence of marketing margins in respect to consumer prices is empirically tested by regression analysis upon producer and consumer prices. Schubert has used such a test in the case of Jinja/Uganda. (1972), when analyzing the efficiency of the marketing of maize flour by large processing mills. A regression analysis of the quarterly buying prices of posho (un sifted maize flour produced by Hammer mills) by the retailers in Jinja from 1961-1965 gave a regression line of the form:

$$Y = -57.3 + 0.69x$$

Where: Y = selling price of posho

X = buying price of maize

β was found to be significantly different from one at 20% level. Accordingly, the trading margin was dependant on price and hence changes in consumer prices were not passed on to the producer in full. This was an indication of price inefficiency.

This study followed a similar approach in analyzing whether there exists price efficiency in the marketing of hybrid maize seed by KSC.

To determine whether there was unmet demand of hybrid maize seed, the retailers were asked if they met the demand of their customers or if shortages existed. A checklist of questions was used. The farmers were also asked if they had access to quality hybrid maize seed at all time.

3.5. Selection of the sample and data collection

The sampling frame was a list of all 46-hybrid maize seed retailers obtained from the licensing department of Trans Nzoia district. The primary data in the study was collected by use of structured questionnaire (Appendix 4) and by single visit, personal interviews. The data included sales volumes for February–April 2000, by variety. The study of Trans-Nzoia district hybrid maize seed marketing system was undertaken at the peak season of seed buying in preparation for planting in February to April 2000. Usually planting in this district is done in March and April.

A sample of 30 farmers were randomly selected from a list of farmers in the district; obtained at the District Agricultural Office, of the Ministry of agriculture. Data was collected through use of structured questionnaire (Appendix 5), by single visit personal interviews in April 2000.

Secondary data was obtained from various seed companies. Published and unpublished reports, public libraries, KARI and past studies carried out.

CHAPTER 4:

RESULTS AND DISCUSSIONS:

The distribution of the retailers' population in the District is as shown in Table 3. Of this group, a random sample of 35 retailers was chosen from the sample and is presented in Table 4.

Table 3: Distribution of Retailers population.

Name of market	Number of traders of each seed		
	H6 series (H614, H622, H625, H627, H628, H626)	H5 Series (H511, H512)	Pioneer (PHB3253)
Kitale town	19	15	4
Maili saba	2	1	1
Moi's Bridge	10	10	0
Kiminini	5	1	0
Kibagenge	1	0	0
Bikeke	2	2	0
Sikhendu	4	5	0
Ndal	3	2	0
TOTAL	46	36	5

Table 4: Distribution of sample Retailers Traders.

Name of market	Number of traders of each seed		
	H6 series (H614,H622,H625,H627,H628,)	H5 Series (H511,H512)	PioneerPHB3253
Kitale town	12	10	4
Maili saba	2	1	1
Moi's Bridge	7	7	0
Kiminini	4	1	0
Kibagenge	1	0	0
Bikeke	2	2	0
Sikhendu	4	1	0
Ndal	3	2	0
TOTAL	35	24	5

4.1 Source of supply

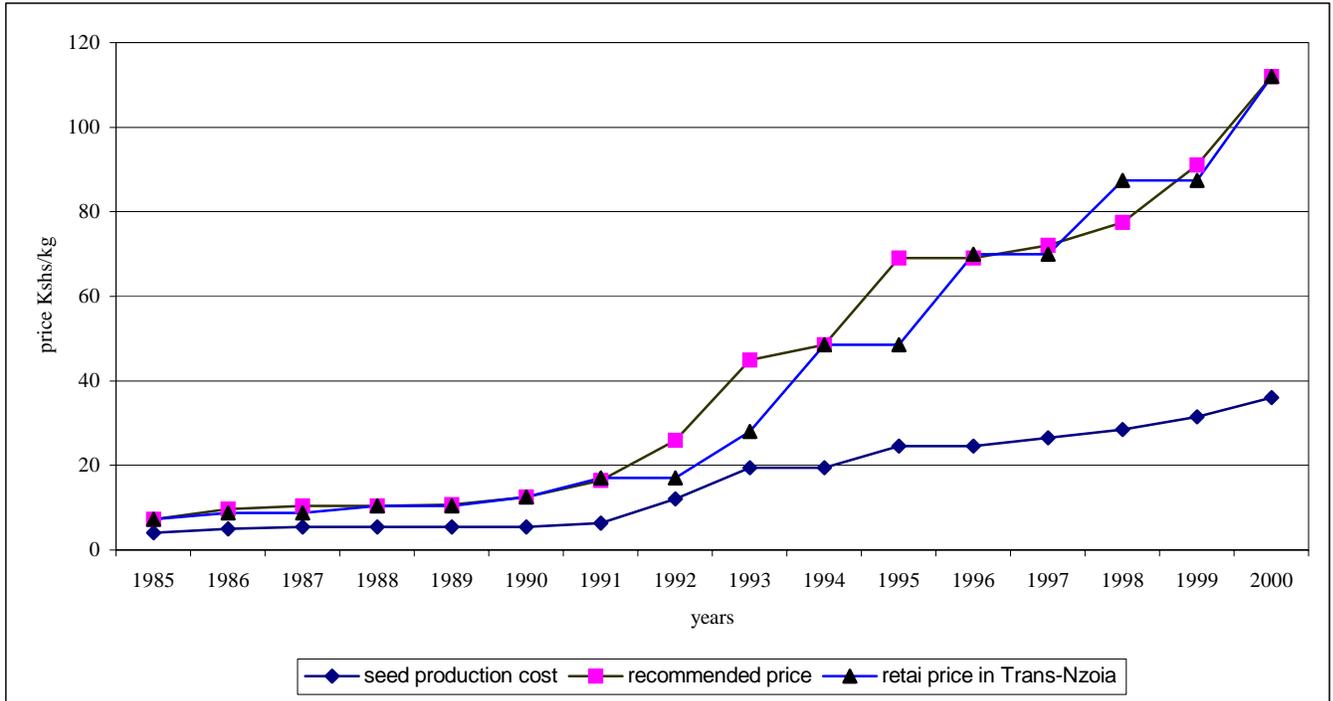
The survey revealed that 96.7 percent hybrid maize seed used by farmers in Trans-Nzoia comes from KSC. Farmers could buy the seed directly from the KSC at any time. All these prices are set by KSC for the different market channels. Seed pricing is a big problem that farmers face. The recommended prices are expected to be the ones farmers have to pay. The KSC hybrid maize seed production costs have also gone up over time. The retail prices (Appendix 1) recommended by KSC and have changed over the years is as shown in Figure 8.

Due to transportation costs, farmers in remote areas complained of the high cost of the purchased seed, forcing them to use seeds selected from their harvests. This technically leads to lower production as a result of inbreeding and segregation.

Price of seed plays a major role in seed sales and market expansion. The KSC has over the years operated on a very thin profit margin, due to government price control as shown in figure 8, but the profit margin seemed to have increased enormously since 1993.

The retail price in the year 2000, which was uniform countrywide, was KSh.112.50 for a kilogram. The large change in price from KSh. 50.00 per kilogram in 1992/1995 to KSh. 70.00 per kilogram in 1996/1997 was partly due to structural adjustment after liberalization. Further, the survey revealed that despite Pioneer seeds' introduction in Trans-Nzoia it has hardly penetrated the market leaving 96.7 percent of the market share to the Kenya Seed Company. Only 3.3 percent of the Trans-Nzoia market is left for other seed like Pioneers' PHB3253.

Figure 8: Cost of seed production, recommended retail prices and actual prices for KSC hybrid maize seed in Trans-Nzoia District.



Source: KSC Records, Trans-Nzoia District Agriculture office Annual Reports.

The retailers gave different reasons as to why they opted to sell seeds from the KSC as follows: 50 percent of the traders sold seed from this company due to the its reliability; 26.7 percent due to the its' popularity; 13.3 percent due to good seed quality; 6.7 percent due to company's efficiency and 3.3 percent sold the seed due to its purity as shown in Table 5. Problems cited for non-preference for hybrid maize seed from Pioneer Company (PHB3253) were that it is seed for mid altitude zones and so cannot give high yields in the highlands areas like the H6 series produced by the KSC. It should be noted that PHB3253 was imported from United States of America; therefore import duty was imposed on it, which further reflected in the high retail prices and so becomes more expensive than the locally produced seed from KSC. This led to farmers shunning this seed altogether and opted for the H6 series from KSC, which was cheaper, and thought to be higher yielding.

Table 5: Categories of reasons for preference of seed from KSC.

	Frequency	Percent	Cumulative Percent
Reliability	15	50.0	50.0
Popularity	8	26.7	76.7
Quality	4	13.3	90.0
Efficiency	2	6.7	96.7
Purity	1	3.3	100.0
Total	30	100.0	

4.2. Market structure

The structure of a market influences its performance and conduct. Knowledge about structure can give suggestions about competitiveness of the market. The four variables investigated in this study are concentration, product differentiation, integration and barriers to entry.

4.2.1 Market concentration.

The smallest transaction by a retail trader was KSh. 11200 per month while the retail trader with the largest transaction sold hybrid maize seed worth KSh. 12096000 per month during the peak planting seasons. Due to this wide range, the retail traders were divided into 18 groups with a class interval of KSh.100000 of the sales as shown in Table 6. The 18 groups were further subdivided into six groups as shown in Table 7 to enable easier manipulation of data and calculation of the Gini Coefficient with a class interval of KSh 500000 of total sales.

The retail traders were also classified into small, medium and large scales with arbitrary cut-off levels of hybrid maize seed values as shown in Table 8. Retailers who were categorized fell under the small group with sales of less or equal to one million per month were 59.9 percent of the total number of traders sampled and had a small market share of only 13.40 percent of the total sales. The medium size that had sales above one million but below KSh. 3 million per month comprised of 26.60 percent of the total traders and had a market share of only 24.67 percent of the total sales. The large group had a turnover greater than KSh. three million per month and comprised only 13.30 percent of the total number of retailers and had an enormous market share of 61.67 percent of the total transactions.

Table 6: Average value (KSh.) of hybrid maize seed transacted by sample 18 groups of retail traders (February-April 2000).

Average value of seed sales per month.	Number of retailers	Class frequency	Monthly value of seed sale (Million)	Class % of total sales.
<100,000	5	17.0	0.2	0.4
100001-200000	1	3.3	0.1	0.2
200001-300000	2	6.7	0.4	0.9
300001-400000	2	6.7	0.7	1.5
400001-500000	1	3.3	0.4	0.9
500001-600000	3	10.0	1.6	3.5
600001-700000	3	10.0	2.0	1.7
700001-800000	0	0.0	0.0	0.0
800001-900000	1	3.3	0.8	1.7
900001-1000000	0	0.0	0.0	0.0
1000001-1100000	0	0.0	0.0	0.0
1100001-1200000	4	13.3	4.4	9.3
1200001-1300000	0	0.0	0.0	0.0
1300001-1400000	1	3.3	1.3	8.0
1400001-1500000	0	0.0	0.0	0.0
1500001-2000000	2	6.7	3.8	8.0
2000001-2500000	1	3.3	2.2	4.6
> 2500001	4	13.3	29.5	61.3
TOTAL	30	100.	47.9	100.0

Table 7: Average value (KSh.) of hybrid maize seed transacted by six groups of sample retail traders (February-April 2000).

Average value of seed sales per month.	Number of retailers	Class frequency	Total monthly value of seed sale (Million)	Class % of total sales.
<500,000	11	36.60	1.92	4.00
500,001-1,000,000	7	23.30	4.50	9.40
1,000,001-1,500,000	5	16.60	5.82	12.10
1,500,001-2,000,000	2	6.60	3.90	8.05
2,000,001-2,500,000	1	3.30	2.24	4.67
> 2,500,000	4	13.30	29.57	61.67
Total	30	100.00	47.95	100.00

Table 8: Categories and value (KSh.) of Hybrid maize seed traders in Trans-Nzoia District.

Size.	Sales per month	No. Traders.	Class frequenc	Value of seed sale by class per month	Class % of total sales.
Small	<1M	18	59.90	6.50M	13.40
Medium	1-3M	8	26.60	11.93M	24.67
Large	>3M	4	13.30	29.6M	61.67
Total		30	99.8	48.03M	99.74

The questions normally posed concerning concentration are firstly: whether number of sellers in an industry is small or large, secondly whether the market share controlled by some or all sellers are large enough so that an oligopolistic interdependence of their price, output and related policies in the market may be presumed to exist or whether oligopolistic interdependence does exist, how strong is it as determined by the sizes of the market shares of some or all sellers (Bain, 1968)

When considered from three perspectives the Trans-Nzoia hybrid maize seed-retailing system was judged to be highly to moderately concentrated. The criterion used in this study to judge the degree of competition is shown in Table 2. The classification is based on the first 4 and 8 largest firms as well as the total number of sellers in the market. The number of retailers in Trans-Nzoia was large. There were 46 licensed functional retailers' seed shops in the district in the year 2000, out of which 35 were sampled and only 30 seed shops filled the questionnaires (Appendix 4) appropriately.

The market shares controlled by the first 4 and 8 largest retailers in the sample were not found to be large enough to foster oligopolistic interdependence by Bains criterion in Table 2 below.

Following Bains classification, in Table 2, the Trans-Nzoia hybrid maize seed retailing system was judged as being highly to moderately concentrated.

The output of the sample of 30 retailers (Table 9) indicates that, the largest 4 firms and the largest 8 firms controlled 61.67 percent and 77.20percent of the sales respectively.

Firms with high turnover had been in existence for long and had earned consumer loyalty over time. However, as per the survey results, no specific shop did any advertising as KSC mainly carried out all advertising; save for a poster placed at the shop entrance to show consumers that hybrid maize seed from KSC was sold in the shop.

Table 9: Market share of the first 4 and 8 largest retailers in Trans-Nzoia.

% Share of 4 largest retailers.	% Share of 8 largest retailers	Total number of sellers.	Industry description.
61.67	77.20	46	Highly to moderately concentrated.

Using cumulative percentage to estimate values (Table 10), the Gini coefficient for the retailers is calculated as follows:

$$(36.6*13.4)-(4*59.9)=250$$

$$(59.9*25.5)-(13.4*76.5)=502$$

$$(76.5*33.6)-(25.5*83.1)=451$$

$$(83.1*38.3)-(33.6*86.4)=280$$

$$(86.4*100)-(38.3*99.7)=4821$$

$$6304*1/10000=0.63$$

The degree of relative inequality in market shares was 0.63 for retailers on scale zero to one where zero depicts absolute equality and one displays complete inequality of distribution.

Table 10: Cumulative frequency of transaction by class percentages of retail hybrid maize seed dealers in Trans-Nzoia district.

Serial order of class (K)	Cumulative frequency of traders in class. (P)	Cumulative frequency of transactions by traders in class.
1	36.6	4.0
2	59.9	13.4
3	76.5	25.5
4	83.1	33.6
5	86.4	38.3
6	99.7	100.0

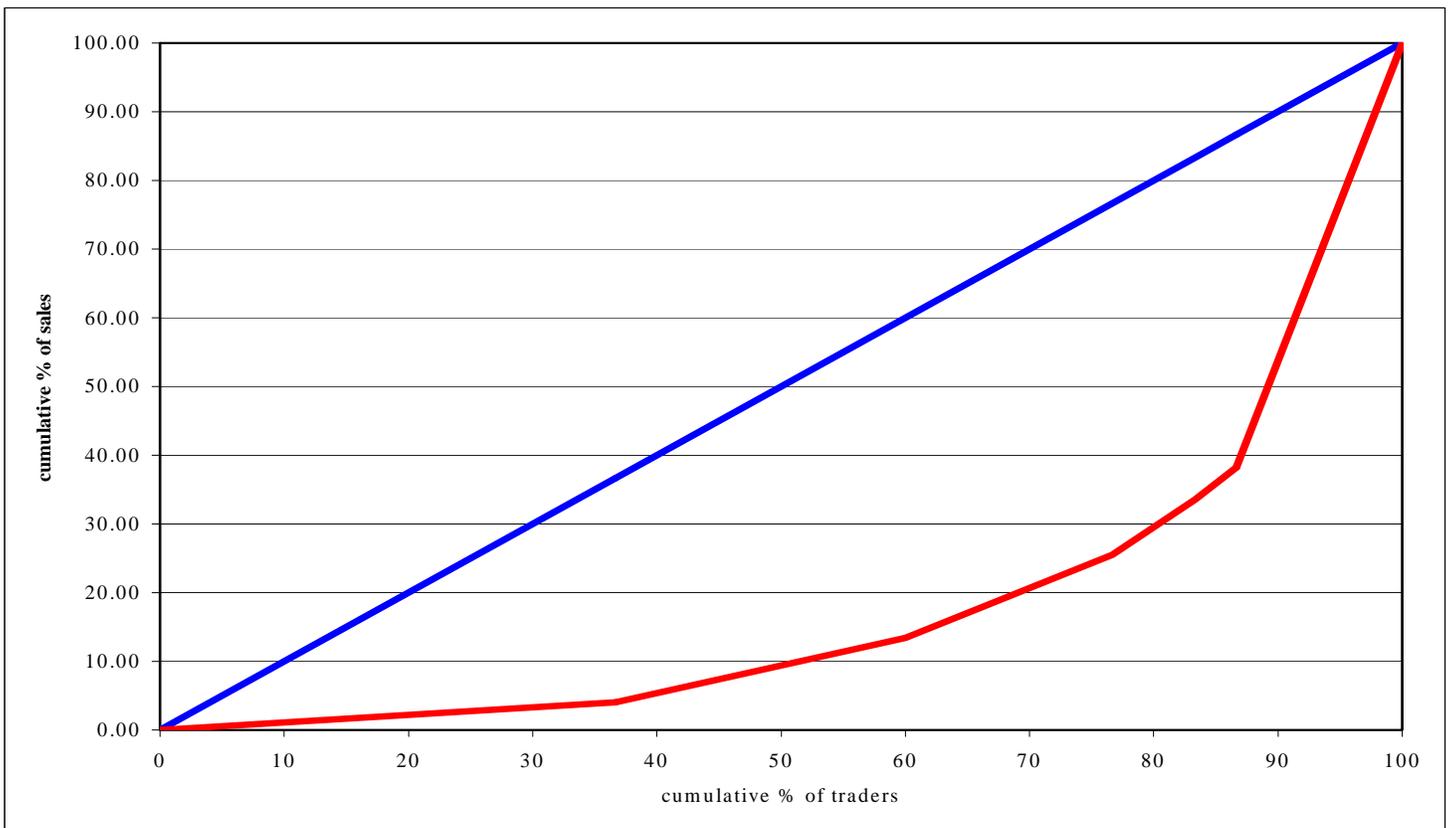
An alternative way of studying the degree of market concentration is by drawing the Lorenz curve as shown in figure 9, which depicts the cumulative distribution of sales against cumulative distribution of traders as shown in Table 11.

The Gini coefficient for inequality in market shares was found to be 0.6. A Gini Coefficient higher than 0.4 can be considered as oligopolistic (Parker and Connor, 1979) so the retail market for hybrid maize seed in Trans-Nzoia exhibits clear oligopolistic tendencies. This is further illustrated by the Lorenz curve, (figure 9) which shows that 50 percent of traders' control only 10 percent of sales volume while 15 percent of traders' control 60 percent of sales volume.

Table 11: Cumulative frequency of transaction by class percentages of retail hybrid maize seed traders in Trans-Nzoia District.

Serial order of class (k)	Average value sales in KSh. per month.	Cumulative frequency of traders in class	Cumulative frequency of transactions by traders in class. (Q)
1	<100,000	17.0	0.4
2	101000-200000	20.3	0.6
3	201000-300000	27.0	1.5
4	301000-400000	33.7	3.0
5	401000-500000	37.0	3.9
6	501000-600000	47.0	7.4
7	601000-700000	57.0	9.1
8	701000-800000	57.0	9.1
9	801000-900000	60.3	10.8
10	901000-1000000	60.3	10.8
11	1000001-1100000	60.3	10.8
12	1100001-1200000	73.6	20.1
13	1200001-1300000	73.6	20.1
14	1300001-1400000	76.9	28.1
15	1400001-1500000	76.9	28.1
16	1500001-2000000	83.6	36.1
17	2000001-2500000	86.9	40.7
18	> 2500001	100.2	100

Figure 9. Lorenz curves for the traders of hybrid maize seed in Trans-Nzoia district.t.



The Herfindal Index was calculated using the values in Table 12 and a value of 0.35 was obtained. Under an index of zero and one whereby zero depicts equality while one depicts complete inequality of the market shares. The H.I. results confirmed non-competitiveness in the seed market.

Table 12: Market share and amount in kg of seed sold per month during peak planting season.

	Company name	Kilograms sold/month	Proportion of market share (S)	S*S	Sales value/mont
1	Kenya Farmers	76000	0.1775	0.031516409	8512000
2	Big tree investment	10000	0.0233	0.000545644	1120000
3	Bachee stores	6000	0.0140	0.000196432	672000
4	Kamwana shop	5000	0.0116	0.000136411	560000
5	Lulu stores	6000	0.0140	0.000196432	672000
6	Tony shop	200	0.0004	2.18258E-07	22400
7	Seed shop	10000	0.0233	0.000545644	1120000
8	Uncle stores	2000	0.0046	2.18258E-05	224000
9	Gadher enterprice	20000	0.0467	0.002182577	2240000
10	Loviin holdings	40000	0.0934	0.008730307	4480000
11	Onke distributors	2000	0.0046	2.18258E-05	224000
12	Mumela shop	1000	0.0023	5.45644E-06	112000
13	Mea Ltd	108000	0.2522	0.06364394	12096000
14	Wamu Drapers	40000	0.0934	0.008730307	4480000
15	Koluu agro products	6000	0.0140	0.000196432	672000
16	Heptagon agro input	12000	0.0280	0.000785728	1344000
17	TNT Teachers	10000	0.0233	0.000545644	1120000
18	Kwik Kall Limited	5000	0.0116	0.000136411	560000
19	Kiplongoni shop	7400	0.0172	0.000298795	828800
20	Kaburu stores	3200	0.0074	5.5874E-05	358400
21	Wamumbi stores	500	0.0011	1.36411E-06	56000
22	Pakawa shop	17000	0.0397	0.001576912	1904000
23	Tolai shop	800	0.0018	3.49212E-06	89600
24	Tinganga Kapkoi	5000	0.0116	0.000136411	560000
25	Kamur agro sstores	10000	0.0233	0.000545644	1120000
26	Kensam and Patts	17500	0.0408	0.001671035	1960000
27	Farmers Hardware	4000	0.0093	8.73031E-05	448000
28	Ritho shop	3200	0.0074	5.5874E-05	358400
29	Patty stores	100	0.0002	5.45644E-08	11200
	Chanddivip stores	200	0.0004	2.18258E-07	22400
Total		428100	1.0000	0.35	47947200

4.2.2 Product differentiation.

According to the survey results there were nine main hybrid maize seed varieties sold in Trans-Nzoia District namely H614, H622, H625, H626, H627, H628, H511, H512, and PHB3253. Other seed varieties sold in Kenya with their respective adopted growing climatic agro-ecological zones are as shown in Table 13. All the varieties were from Kenya Seed Company apart from pioneer seed, which was from Farm-chem Company, a marketing agent of Pioneer Seed Company.

Table 13: Local and imported maize seed varieties for different agro-ecological zones in Kenya.

Company	Variety	Zone
Kenya seed company	H511	Medium altitude
Kenya seed company	H512	Medium altitude
Kenya seed company	H614D	High altitude
Kenya seed company	H625	High altitude
Kenya seed company	H626	High altitude
Kenya seed company	H627	High altitude
Kenya seed company	H628	High altitude
Kenya seed company	9401 (experimental)	High altitude
Kenya seed company	DCL	Low altitude
Kenya seed company	PH1	Low altitude
Kenya seed company	PH4	Low altitude
Kenya seed company	DH1	Low altitude
Kenya seed company	DH02	Low altitude
Kenya seed company	9202 (experimental)	High altitude
Kenya seed company	KCB (Carryovers)	Low altitude
Western seed Company	KCB	Low altitude
Imported varieties		
Monsanto (K) Ltd	CG4141	Medium altitude
Monsanto (K) Ltd	CG5051	Medium altitude
Farmchem (Pioneer)	PH32253	Medium altitude

Source: KEPHIS records.

It was established that packaging of KSC Varieties was in packets of 2kg, 5kg, 10kg, and 25kg packets. The KSC could occasionally package 50kg bags on order from individual farmers. Seed quality was sometimes affected by shortage of packing materials in KSC factory. Due to the shortage of small bags (2kg), seed was packed in the 25kg bags. The distributors then opened the 25kg bag and re-packed it in small paper bags without labels. This provided avenues for adulteration. Farmers have on many occasions reported seed of unknown origin packed in small paper bags with no labels. To make matters worse, cases of rejected or even uncertified seeds were sold as seed for planting to unsuspecting farmers. Within a variety, the different sizes of packets are therefore rightly regarded as differentiated product lines. Therefore, homogeneity in the industry is lacking.

The traders revealed that 100 percent of their customers were aware of the various variety types, packet size and range in the market so that buyers often based their choices on these factors.

Occasionally some traders provided different after sale services to the farmers as shown in Table 14. Transport services were provided by 36.7 percent of the traders while 3.3 percent of the traders provided extension services to their customers. About 60 percent of the traders did not offer any service to the customers apart from the actual sale of seed.

As indicated earlier, a competitive market has homogenous goods. The moment product differentiation sets in, product homogeneity is affected and so is market competition. From the above observation it may be inferred that the level of differentiation in the hybrid maize seed market is sufficient to affect competition.

Table 14: Other services offered to farmers by seed Retailers.

Services	Frequency	Percentage	Cumulative Percent
Non	18	60.0	60.0
Transport	11	36.7	96.7
Extension	1	3.3	100.0
Total	30	100.0	

4.2.3 Barriers to entry.

Bain (1968) describes the condition for entry as structural characteristics of an industry that refers to the advantage that the already established sellers in the industry have over the other potential additional sellers, who may wish to join it. The condition of entry is a measure of the hurdle to new competition in the industry or the “fence” which protects established sellers and which new sellers must surmount before they can enter into competition. Barriers could result from: limited know-how, capital requirements, institutional restrictions and non-competitive reactions of established stockists.

In the current study, two impediments to entry in the hybrid maize seed market retailing system were institutional restrictions and high initial capital requirements.

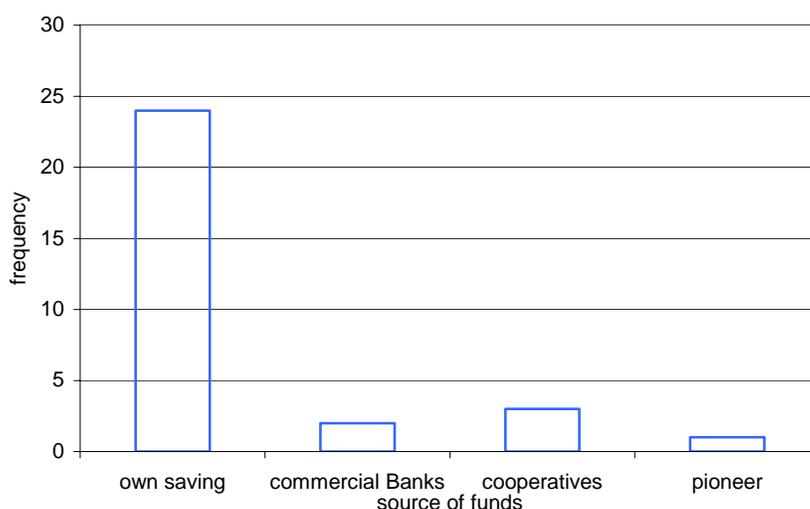
Access to working capital was found to be a major barrier to entry into the business and to expansion by the old traders. The initial capital requirement was at least KSh. 50,000. Given the wage rates in the country, this was fairly high. About 60 percent of the people interviewed indicated that it was fairly difficult to obtain the initial capital. Sources beyond own saving were often necessary. As shown in Table 15 and figure 10, only 6.7 percent of the retailers obtained loans from commercial banks, 10 percent got funding from the co-operative societies while 3.3 percent got their initial capital from Pioneer Seed Company. Therefore, 80 percent of

the retailers had initial capital from own saving. The source of credit for the traders included the commercial banks but the high interest rates and collateral issue were cited as major limitation in the acquisition of credit and made commercial borrowing risky. Of those who had access to the credit, they indicated that it was inadequate. Access to credit and ability to raise adequate funds was an implicit barrier to entry for seed sellers. This conferred undue protection upon those who were already established in the business. Seed companies gave a discount on purchase of set minimum amount of seed by the retailers, which in effect could not alleviate them of adequate funds to enter into hybrid maize seed business.

Table 15: Sources of funds to start business

Sources of funds	Frequency	Percent	Cumulative
Own Savings	24	80.0	80.0
Commercial Banks	2	6.7	86.7
Cooperative sacco	3	10.0	96.7
Pioneer	1	3.3	100.0
Total	30	100.0	

Figure 10: Sources of funds to start business.



As per the institutional restrictions, for one to sell seed the seed variety act stipulates that the aspiring merchant should consult an Agricultural Officer for recommendation to sell the seed obtainable from KSC. This was to ensure that known and only reputable retailers sell the seed. Most seed sellers alleged it took a long time before they could obtain recommendation letter from the Agricultural Officers, who issued letters after the District Agriculture Committee, which is a quarterly meeting. Also a license in form of a card from the KSC allowing one to sell the seed and thus become a subagent of KSC also took a long time to be obtained. Given that the seed is a seasonal commodity, if one fails in two subsequent years, then the probability of giving up the venture all together is very high.

The assessment also showed that obtaining trading licenses was not an impediment to entry into the seed selling system although the taxes were relatively high. The Government issued license to the traders, which varied considerably from among traders depending on other items the trader sold alongside the hybrid maize seed. None of the traders sold maize seed entirely as they indicated that seed selling was a seasonal business and so could not be relied upon entirely for the rest of the year. Some traders sold seed alongside agrochemical while others sold it in general merchant shops. However, the traders had no problem with the license and so was not a major barrier to entry.

In cases whereby barriers to entry in the market exist, it leads to market failures and hence leading to non-competitiveness in the market.

4.2.4 Integration and Contractual agreements.

Horizontal integration is the bringing together of firms under one-management that are at the same level of the marketing channel. It involves the merging of competitor firms. The survey of hybrid maize seed retailers in Trans-Nzoia revealed that some horizontal integration does exist.

Five of the hybrid maize seed retailers interviewed owned more than one outlet, and of these, only one had three outlets. Integration can be justified if it results in improvement in efficiency, which can be achieved if firms integrate so as to exploit economies of scale and reduce their operating costs. Integration would be undesirable if it diminishes competitive behavior of market participants. In Trans-Nzoia hybrid maize seed selling system, it would be difficult to accept the notion that retailers acquired more than one maize seed outlets so as to improve their efficiency. While horizontal integration could lead to reduced costs (hence improving technical efficiency) this was not reflected in the prices that the integrated hybrid maize seed shops charged their customers. The KSC set the prices and so the five integrated shops only wanted to increase their turnover and hence the profits.

Vertical integration however, is the merging of firms or enterprises at preceding levels of the marketing channel. KSC itself acted as a manufacturer; wholesaler and retailer as it had a retailing seed outlets, which sold seed to farmers at retail prices. This integration had nothing to do with increasing the efficiency but instead to increase the sales volume of the Company.

There were 23.3 percent of the retailers who had contracts with the KSC as their supplier and the contract was that they could get the seed on credit. About 76.6 percent had no credit contracts with the KSC, save for the agreement letter authorizing them to be seed sellers. Ten percent of the retailers had contracts with farmers and the contracts were to provide seed on credit to the farmers. This was mainly informal, as there were no drawn legal contracts to that effect apart from one shop, which was owned by a teachers' saving and credit cooperative (sacco) and gave credit to the teachers who were its' members.

Integration, by conventional definition, involves the ownership or control of operations on the vertical and horizontal directions of the marketing channel. The survey revealed that such

integration was not significantly present in the Trans-Nzoia hybrid maize seed marketing system. The contracts that existed were few and were mainly verbal and informal and could not fully have any impact on the market performance.

4.3 Market conduct.

Market conduct was explored by examining the level of collusion among traders on aspects of quantity of maize seed sold, price at which maize seed is sold and in the selection of customers. In addition to that the market conduct was greatly inferred based on the market structure.

It was not a common practice for traders to collude among themselves in setting the prices as the Seed producing Companies recommended all prices, which reflected actual retail prices. The price setting was therefore devoid of collusion.

The KSC prices are uniform all over the country and hardly consider transportation costs. Pricing in any one given year or season is fixed but is reviewed periodically and determined by seed producing companies. Traders on the outskirts of Kitale town made minimal profits as transportation costs were incurred, further reducing the profit margins. Due to lack of incentives by the traders outside Kitale town to sell seed, farmers were forced to travel to Kitale to purchase seed.

Survey results on farms indicated that the further you move from the Kitale town towards places like Sikhendu which is over 35 km from Kitale town, there is lot of crop failure and less yield per hectare. This was despite the fact that the soils and whether conditions are almost the same. Traders who were further from the depot made minimal profit on seed sale and only sold seed so that the other shop merchandise like agrochemical could be sold. Therefore the seed was always scarce in the market. With the seed scarcity some farmers opted to travel to Kitale to buy seed and would buy seed enough for two seasons to avoid traveling again. Due to use of

carryovers, the yields per hectare were lower compared to other areas near the seed depot. Some of the farmers even resorted to use uncertified seed.

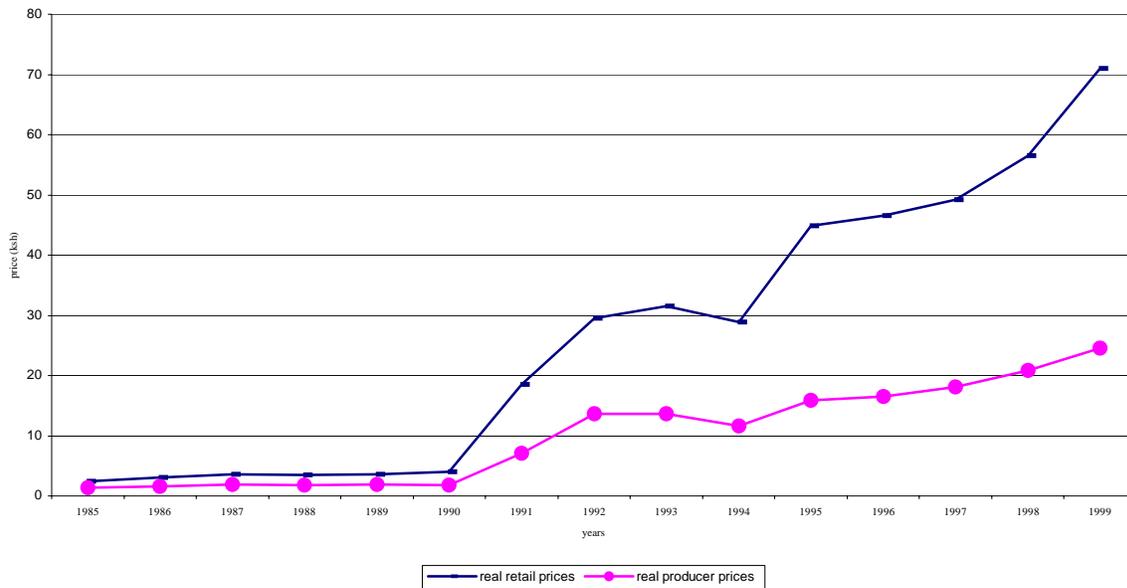
There were no incidences of collusion among traders on quantity of maize seed to sell. 100% of traders indicated that they had not done any consultation on how much to sell or to whom to sell to with their fellow traders. There was no collusion whatsoever on consumer area of coverage and any consumer was allowed to purchase hybrid maize seed from wherever place he wished to. Every seller decided alone on the amount of commodity to purchase and sell. Since traders derived income from the price differential of each unit sold there would be more returns from higher sales subject to the trader's financial position. Restricted sales arising from collusive deals would therefore not be in the interest of traders individually or even collectively.

Seed promotions were undertaken by KSC at places such as: Agriculture society of Kenya, Harambee shows and mass media. None of the retailers was involved in hybrid maize seed promotions

4.4 Market Performance.

Real prices of hybrid maize seed have increased considerably since the onset of liberalization as shown in Figure 11.

Figure 11: Real price of hybrid maize seed.



The price efficiency cannot apply in the case of Trans-Nzoia hybrid maize seed because of the monopolistic tendency determined in the study by KSC.

4.4.1 Pricing efficiency by KSC

The assessment of the pricing efficiency of hybrid maize seed was based on producer prices and prices paid by farmers who used hybrid maize seed for maize production. The prices used in the analysis were the ex-plant prices. The producer prices that were considered were the prices paid by KSC to its contracted farmers. KSC pays contracted seed farmers for the maize seed delivered to the plant. The consumer prices have also changed with time and were mainly decided upon by KSC. Table 16 shows the different prices paid to seed producers by KSC and those paid by farmers for its' hybrid maize seed.

Table 16: Average hybrid maize seed producer and consumer prices (KSh.) per kilogram and the percentage increase in each price.

Year	Producer price per kg	% increase or decrease	Retailer price per kg	% increase or decrease	Producer price as % of consumer price.
1985	4	25	7.2	34.7	56
1986	5	10	9.7	7.2	52
1987	5.5	00	10.4	00	53
1988	5.5	00	10.4	2.4	53
1989	5.5	00	10.6	17.4	52
1990	5.5	14.50	12.5	31.2	44
1991	6.3	90.5	16.4	57.9	38
1992	12.0	62.5	25.9	73.7	46
1993	19.0	00	45.0	7.8	43
1994	19.5	25.5	48.5	42.3	40
1995	24.5	00	69.0	00	36
1996	24.5	8.2	69.0	4.3	36
1997	26.5	7.5	72.0	7.6	37
1998	28.5	10.5	77.5	17.4	37
1999	31.5	14.3	91.0	23.1	35
2000	36.0	00	112.0	00	32

Source: Authors investigation

Consumer and producer prices have generally increased over the years. The consumer price shows an upward trend with their average increase being generally higher than the corresponding increase in producer prices. The consumer prices reported in this case were the KSC recommended price for hybrid maize seed.

The seed producer prices paid by KSC and the farmer/ consumer prices of hybrid maize seed were compared empirically using a regression model as discussed in 3.4.1. Result of the regression analysis between the two sets of analysis gave the following equation:

$$P_y = - 6.8 + 0.994P_x \text{ -----(3)}$$

Where: P_y = Consumer price in KSh. per Kilogram of hybrid maize seed.

P_x = Producer price of maize seed in KSh. Per kilogram

When statistically tested the regression coefficient of $\beta_1 = 0.994$ was found to be significantly different from one at 5% level of significant. This result implied that, the marketing margin was not independent of price, implying that changes in consumer prices are not passed on to producer in full so that the supply of marketing services does not approximate perfect elasticity. This was an indication of pricing inefficiency.

From the above result the excess profits were reaped by KSC and neither the producer nor the consumer were benefiting. However given that KSC also was a producer, it did not lose due to high profits. Only the farmer sub-contracted by KSC lost as a producer. The excess profit was as a result of higher consumer prices and lower producer prices, which is consistent with monopoly profits and is an indication of pricing inefficiency.

Monopolistic inefficiencies led to the monopoly firm (KSC) to pass over the infrastructure costs to someone else. In this case KSC passed the infrastructure and transport costs to the traders who had close proximity to the seed depot. Due to the fact that the price was the same irrespective of the transportation costs, those who were near the depot subsidized the retailers who were far from the seed depot. The economic theory dictates that when a market is operating efficiently then prices of a given product would be related over space and time and between forms. Prices should only differ between geographical areas of a country by transportation costs from one point to another. Similarly, the price of storable products at one point in time should not exceed the price in a previous period in time by more than the cost of storage. Again the price of processed products should not exceed the price of unprocessed equivalent by more than the cost of processing.

In pricing efficiency concepts, it was found that prices that do not reflect the cost of marketing services were clues to functional deficiencies. Prices in Trans-Nzoia hybrid maize seed market

did not reflect the cost of marketing as seed companies gave prices without considering marketing costs. For instance, The KSC prices were uniform all over the country and hardly considered transportation costs. Pricing in any one given year or season is fixed but is reviewed periodically and determined by seed producing companies. Traders on the outskirts of Kitale town made minimal profits as transportation costs were incurred, further reducing the profit margins.

Similarly the PHB3253 seed from pioneer was supplied at the retailers' door and price was also uniform. Transportation costs were incurred by the Company and so did not reflect the costs of marketing services. Prices were not related over time and space. Further this points out the pricing inefficiency in the industry.

Market oriented organization compete for customers by lowering marketing costs, increasing operational efficiency and at the same time adding more utility. This was not the case with the Trans-Nzoia hybrid maize seed market because the transportation costs kept on increasing.

There was evidence of unmet demand at market-based prices on the outskirts of Kitale town. This was because of lack of incentives by the traders outside Kitale town to sell seed to farmers. The effect was some farmers purchased enough seed for two seasons so as to lower costs of going back to Kitale to search for seed.

4.5. Farmers' perception of the hybrid maize seed

The study went ahead to establish the farmers' view on the hybrid maize seed using a Participatory Rural Appraisal method. The results showed that 70 percent of the farmers got Information pertaining seed from the Agricultural Extension Officers of the Ministry of Agriculture, 16.7 percent got information from both radio and the Agricultural Extension

Officers, 6.7 percent got the information from radio only while 3.3 percent heard information about the seed from friends as shown in Table 17.

Table 17: Farmers source of information on hybrid maize seed.

Information source	Frequency	Percentage	Cumulative %
Friend	1	3.3	3.3
Extension officer	21	70	73.6
Radio	2	6.7	80
Others	1	3.3	83.3
Extension and radio	5	16.7	100
Total	30	100	

At least 50 percent of the farmers agreed that they got some information pertaining seed mainly during the growing season on more than one occasion. It can be concluded therefore that the farmers had some access to information on hybrid maize seed matters.

H614 variety was given first preference by all the farmers followed by H625 and H628 in terms of high yields. The farmers gave the advantages of H614 mainly as being: high yielding, disease and insect resistant, usually has less rotting in fields and during storage, less lodging and having good taste. Most farmers disliked H627 because they indicated that it rots a great deal while still in the field.

Some farmers noted that seed from KSC was impure, as it was a mixture of different varieties. They indicated that they bought seed under one variety name but when the crop started tussling in the field they observe that, it was a mixture of different varieties of the seed. Professionally this may be due to ignorance since a hybrid involving H614, or any hybrid involves a seed stock where segregation occurs hence resulting in lack of uniformity. However, farmer indicated that they were very much aware of the tussling characteristics of different varieties and could easily point out the different varieties in the mixed crop in the field. Other problems

presented by farmers on the quality of the seed included poor germination, infected material and undesirable plant characteristics. In addition, farmers reported that seeds of unknown origin packed in bags without labels were also sold on the market. In some cases, it was reported that rejected uncertified seeds have been sold to unsuspecting farmers purporting that it originated from authentic sources.

4.6 Hypothesis.

The result on the hybrid maize seed market structure shows that the retailer had relatively high concentration ratio of 0.6. This indicates unequal distribution in the amounts of transaction between traders at the retail level.

The Herfindal- Index obtained was 0.3, which further proves the inequality in the market leading to rejection of the hypothesis that the Trans-Nzoia hybrid maize seed market was competitive.

In addition, the market was characterized by large incidences of product differentiation arising from the many different packaging varieties of the hybrid maize seed in the market. Differentiation of a product leads to non-random purchases by the buyers and it is in contrast to ideal perfect competition where the product is homogenous. Due to heterogeneity and the vast differentiation of the hybrid maize seed the market competition is affected.

In a competitive market there are no barriers to entry. However, the survey done in February to April 2000 revealed that hybrid maize seed market had two main barriers to entry namely the high initial capital to start the business and the institutional barriers.

The hypothesis that the Trans-Nzoia hybrid maize seed market is competitive was therefore rejected and instead the conclusion was that the hybrid maize seed market in Trans-Nzoia was not competitive.

The hybrid maize seed price has increased considerably over time. This has consequently resulted in high maize production costs.

It was not a common practice for traders to collude among themselves in setting the prices as the Seed producing Companies recommended all prices, which reflected actual retail prices. The price setting was therefore devoid of collusion.

The survey results revealed that the market performance was inefficient. The pricing was inefficient because it did not reflect the cost of marketing services, the difference in form and space and was fully determined by the seed producing Companies who made excess profits. Therefore the second hypothesis that the Trans-Nzoia hybrid maize seed price is efficient is also rejected.

CHAPTER 5:

CONCLUSIONS AND RECOMMENDATIONS.

The chapter presents a summary of the conclusions and gives recommendations on how to improve the hybrid maize seed marketing system based on data and information from Trans-Nzoia district.

5.1 Summary:

The study of Trans-Nzoia district hybrid maize seed marketing system was undertaken at the peak season of seed buying in preparation for planting in February to April 2000. Usually planting in this district is done in March and April. The study revealed that 96.7 percent of the hybrid maize seed sold in the district was from KSC. KSC is also based in the district while 3.3 percent was from Pioneer Company, mostly dealing in imported seed.

The Gini Coefficient of 0.6, illustrates unequal distribution in shares of transactions. The hybrid maize seed market system had a high degree of market concentration. This indicates that there was a low ability to entry in the hybrid maize seed market by private traders since liberalization and monopolistic tendencies still existed. Wholesalers rarely existed, as the traders preferred to buy seed directly from the KSC with the Companys national headquarter in Kitale town, and also Kitale is the commercial district headquarters. The KSC also sold seed directly to the farmers at retail prices.

There were nine types of hybrid maize seed sold in the district namely: H614, H622, H625, H626, H627, H628, H511, H512, and PHB5332. The seed was available in packets of 2kg, 5kg, 10kg, and 25kg for the different varieties. Different varieties and variations in packaging units suggests that there was product differentiation in the hybrid maize seed market because of the existence of different varieties and also within a variety, the different sizes of packets are

regarded as differentiated product lines. After sale services to farmers like transportation of the seed to the nearest bus terminus also existed for 36.7 percent of the retailers. There was very little integration in the conventional sense of ownership. The two major barriers to entry in the hybrid maize seed market were mainly high initial capital requirement and the institutional restrictions.

Traders did not collude with each other to set prices or restrict sales volumes. This is because the prices were mainly determined by the KSC in case of their seed and by Pioneer Company in case of the Pioneer seed.

Market performance was very poor given that price did not reflect the cost of marketing the product and neither did the price of the seed relate over space and time and these are clues to functional deficiencies.

Farmers indicated that they were unhappy with the seed from KSC due to seed adulteration but had no alternative sources. They also indicated H614 variety ranked highest and was preferred but was always insufficient to meet farmers' needs because KSC wanted to market other variety that was not preferred.

5.2 Conclusion.

The analysis of market structure, conduct performance reveals that there were factors that favor imperfect competition in Trans-Nzoia District hybrid maize seed retail marketing. There was unequally distributed shares of transactions among traders, the existence of product differentiation due to different qualities of seed in the market and barriers to entry. However, based on the Gini Coefficient the market is categorized as oligopolistic.

It is also concluded in this study that changes in consumer prices were not fully passed on to the seed producers and thus the product market of hybrid maize seed is relatively inefficient in pricing.

The monopoly of distribution of the seed initially done by KFA has diminished and now there are many traders in the seed retailing business. In spite the fact that the government allowed other companies in the seed industry, KSC still has the greatest share of the market in the district indicating that monopoly still exist in the seed industry.

5.3 Recommendations and policy implications

- ❖ In order to increase the number of seed sellers, the government should provide an enabling environment for those who qualify to be given a chance to sell the hybrid maize seed so that the market can be competitive.
- ❖ Barriers to entry in the seed industry due to institutional and financial barriers can be eliminated. For instance in order to reduce the financial barriers, the government could facilitate easier access to credit. One way is to encourage micro-finance organization to offer credit to traders so that they can expand their businesses. Streamlining the efficiency in licensing by serving the aspiring seed sellers more regularly throughout the year could reduce the institutional barriers. This would reduce the bureaucratic hustles and time one would wait before getting a license.
- ❖ Policy guidelines should be provided on labeling and sealing for seed packets especially those that weigh less than 10kg so that farmers may not buy hybrid maize seed which is not labeled or sealed. Many of the farmers were illiterate and are not able to read the lot number on the seed packet. They only relied on their seeing packets similar to the KSC ones. In addition KSC should put in place appropriate measures in order to bar the KSC packaging bags from the open market. By doing so, KSC will be exonerating itself from blame on quality and adulteration and to protect its image as a leading supplier of quality certified seed.
- ❖ The government should encourage the establishment of Seed Companies in Kenya. Establishment of such Companies would be a significant step in marketing development whose effects are likely to be realized in terms of greater socio-economic welfare and the overall economic development of the country.

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Appendix 1: Retail hybrid maize seed prices (KSh), 1985-2000.

Year	Producer price.	Recommended price by KSC.	retail	Retail price in Kitale
1985	4	7.2		7.2
1986	5	9.7		8.7
1987	5.5	10.4		8.7
1988	5.5	10.4		10.4
1989	5.5	10.6		10.4
1990	5.5	12.5		12.5
1991	6.3	16.4		17.0
1992	12.0	25.9		17.0
1993	19.5	45.0		28.0
1994	19.5	48.5		48.5
1995	24.5	69.0		48.5
1996	24.5	69.0		70.0
1997	26.5	72.0		70.0
1998	28.5	77.5		87.5
1999	31.5	91.0		87.5
2000	36.0	112.0		112.0

Source: Kenya Seed Company.

APPENDIX 2: Area, production and prices of maize in Trans-Nzoia

District (1983 to 1996).

Year	Area (Ha)	Production (MT)	Production (90kg	Price/90kgbag
1983	52000	197100	1971000	193
1984	54000	160440	1604400	252
1985	59000	222000	2220000	297
1986	59582	260000	2600000	297
1987	69631	278500	2785000	310
1988	68000	340400	3404000	333
1989	68350	341800	3418000	333
1990	59740	239000	2390000	363
1991	63090	252400	2524000	670
1992	53000	250200	2502000	670
1993	65000	183900	1839000	950
1994	69300	300000	3000000	920
1995	63600	254400	2544000	
1996	54396	201265	2012650	
1997	63400	160890	1608900	
1998	64600	234909	2349090	

Appendix 3: Registered seed dealers in Kenya.

Reg. No	Seed Enterprise	Activities	Crops	Comments
800	Kenya Seed Company	Breeding (KARI) Seed Production Seed Processing Seed Marketing	Cereals Sunflower Beans Pasture Vegetables	Active Active Active Active Active
801	East-Africa Seed Company	Breeding Seed production Seed Processing Seed Marketing	Cereals Beans Vegetables	Active Active Active Active
802	Oil Crop Development	Breeding Seed production Seed processing Seed Marketing	Oil crop Cereals Beans Vegetables	Active
803	Hortitec (Kenya) Limited	Breeding Seed production Seed processing Seed Marketing	Open pollinated Sunflower Sorghum beans Vegetables	Inactive Active Active Active
806	Kiplol seeds	Seed production Seed processing Seed Marketing	Horticultural Crops	Dormant-no noticeable activity
804	Western Seed & Grain Co. Ltd.	Breeding Seed production Seed processing Seed Marketing	Cereals Sunflower Beans Pasture	Active
815	Lake Basin Development Authority	Seed production Seed processing Seed Marketing	Cereals	Inactive
813	Regina Seeds	Breeding Seed production Seed processing Seed marketing	All seeds	Active
	Kenya Agricultural Research Institute	Breeding Seed production Seed processing Seed marketing	Various crops	Active
838	Monsanto (Cargill) Kenya Ltd	Breeding Seed production Seed processing Seed marketing	Various crops	Active

Appendix 4: Questionnaire for Retailer Maize Seed Traders

No.----

1.0 Name of company.....

2.0 Name of respondent.....Date

3.0 Location of business..... District -----

1.2 Position of the respondent in business

Owner/Partner/Employee/Other.....

1.3 When was the business started?.....

1.4 Where was the source of funds for starting business?

Own saving/Revenue from other business/Loan/Other.....

1.5 How much would one require to start a similar business currently?.....KShs.

1.6 Which maize seed company is the source of the maize seed you sell? -----

1.7 Why that particular company? -----

5.0 What different services do you provide to attract more farmers? -----

6.0 Are all your customers aware of such services? Yes/ no

7.0 When selling seed do you know the prices of other retailers? Yes/no

8.0 When selling seed do you know the quantities and varieties of maize seed sold by other
retailers?

9.0 How do you find out this information? Own observation/ from other traders/ other-----

Appendix 5: Questionnaire For Farmers.

No. -----

Date -----

1.0 Name of respondentLocation -----District-----

1.1 Position of respondent in the farm -----

1.2 Do you plant maize using hybrid maize seed? Yes or No

1.2.1 State the source of your information on seed: friend/ agriculture extension officer/ radio/
other-----

1.2.2 How many times do you access information on maize seed annually? None/ ones/ twice/
many times/all the time I need information.

1.2.2 Please list the variety you have grown in the past five years, ranking them in order of
importance:

Variety of maize seed	source of seed	frequency of seed purchasing	Quantity of seed purchased in kg.	Area under maize in hectares.	Kg of seed per hectare.

1.3 Where do you purchase the seed? Place ----- Distance from farm (km)-----

1.4 In the last 10 years have you changed your use of improved seed: reduced/ increased/
unchanged. -----

1.5 Has the use of other inputs changed? Increased/ decreased/ unchanged. -----

Reasons as to why you use that particular seed?

List the problems encountered when using the various seed varieties:

Name of variety	Problems encountered when using the seed variety.	Reasons as to why you prefer that particular seed variety.
1.	a)	
	b)	
	c)	
	d)	
2.	a)	
	b)	
	c)	
	d)	
3.	a)	
	b)	
	c)	
	d)	
4.	a)	
	b)	
	c)	
	d)	
5.	a)	
	b)	
	c)	
	d)	
6.	a)	
	b)	
	c)	