

INAUGURAL LECTURE

**The Kenyan Maize Sub-Sector Performance and Its
Implications for Food Security Policy Dialogue**

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Implications for Food Security Policy Dialogue**

Mark Ollunga Odhiambo

MOI UNIVERSITY
≡ PRESS 



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Finally I owe the achievements in my academic and scholarly pursuits to the invaluable support I have enjoyed from my family particularly to my wife Pamela and our children. Their support and encouragement during the writing of this document was a major driving force towards its successful completion. And to this I say “erokamano ahiinya,” that is, thank you very much indeed.

Abstract

Maize is the most important staple food crop in Kenya and is therefore widely grown in the country and features prominently in the diets of the majority of the people. Although the crop is believed to have been introduced at the Coast during the 16th or 17th century, it was not until the beginning of 1900s that it became adopted by the colonial white settlers as a cash crop. They found it an easy crop to grow since it required fewer skills and gave quick returns compared to other plantation crops which were being introduced at that time like tea, coffee, pyrethrum and sisal. The African labour force working on the European farms were fed on maize and soon began not only to admire it but also developed a high taste preference for it. The production of the crop then spread among the African population in many parts of the country and it soon got accepted as a major food crop in the country.

Maize soon became both a large scale and smallholder crop. Successive governments in Kenya starting from the colonial times and even after independence in 1963 have always maintained a policy of rigid control over the distribution, marketing and pricing of maize. During colonial times, the control was meant to safeguard the European large scale growers who produced the crop initially for export and later for the domestic market. After independence the control system was maintained by imposing maize movement restrictions and government price fixing resulting in pan-territorial and pan-seasonal pricing of maize and maize products in the country. During the control policy regime, the maize marketing was dominated by the National Cereals and Produce Board (NCPB) and its predecessor parastatal organizations which controlled the official or formal marketing system. A parallel informal marketing system also developed to cater for rural areas covering small scale farmers and consumers who had no access to the formal NCPB market.

During control, the formal NCPB dominated marketing system handled about 40% of marketed maize in the country or about 20% of total production. About 70% of NCPB maize came from the large scale farms while 30% came from smallholders. The informal marketing system handled about 50-60% of maize traded in the country and about 70% of smallholders sold their maize through the channel. Government control system though well intentioned to protect farmers during glut and the consumers in times of shortages, soon ran into criticism from policy analysts, donors and some industry stakeholders

for being inefficient. It impeded free trade and lacked transparency. Prices in the informal marketing system tended to vary spatially and seasonally unlike the pan-territorial and pan-seasonal prices maintained by government in the formal NCPB dominated marketing system. The question arose whether the controls were meant to only protect the urban and elite consumers who depended on the formal system for their maize and milled flour supply. The government of Kenya gave in to the critics and accepted to carry out maize market reforms, and after a series of partial liberalization and successive policy reversals, the maize market was liberalized in 1993 and both the formal and informal marketing systems merged into one marketing system. Traders, millers and other market participants were free to buy and sell maize of any quantity and move it to any part of the country and at any price. However, the NCPB was not privatized but was instead restructured to carry out commercial maize trade and also to remain the government agent carrying out the social functions of market stabilization and being the custodian of the country's maize Strategic Grain Reserve (SGR) of 6 million bags. In its market stabilization and commercial functions, the NCPB is expected to be the buyer and seller of last resort. In this respect it is expected to compete with other traders, run efficiently and make profits so as not to depend on Treasury subventions as used to be the case before liberalization. In its social functions, the NCPB is expected to stabilize the market by protecting farmers at harvest time by offering remunerative prices at the time when traders and millers tend to offer low prices. Secondly, NCPB is expected to protect consumers by selling maize from its stock and from SGR into the market when shortages occur and prices rise above normal. The NCPB has also the social function of sourcing, storing and allocating relief maize to be distributed in areas affected by drought or famine crisis as may be directed by the government. Despite many doubts about the government's commitment on the market liberalization, the system remained a free market from 1993 until the year 2011 when the Essential Commodities Prices Control Act of 2011 was introduced to include new control of other commodities including maize and maize meal. This new development has triggered new policy debate on the maize sector. Is the price control the right policy given that the domestic maize production in bad years cannot match consumption demand, and that the country has to resort to imports to meet demand? With production now oscillating between 20-36 million bags when the population is now standing at 41 million and growing fast, Kenya will soon become a permanent importer of maize unless drastic steps are taken to reverse this trend.

In the debate, policy analysts, donors and other stakeholders in the industry are wondering how and why the Control Syndrome has come back 18 years after it was regarded as dead and buried and therefore a non-issue. In concluding this lecture, it is recommended that price control is not the wise way to go. Rather, the government should embark on policies of strengthening the NCPB operations in its commercial trade and to act as the buyer and seller of last resort to protect both farmers and consumers in the market. In addition, the government should redirect its policies towards strategies for increasing maize production through investments in irrigation, promoting research, extension services and crop diversification. A proper incentive structure including provision of farm credit, fertilizer subsidy, certified seeds, infrastructure development, market access, good governance and legal environment for maize production and marketing is needed.

Citation

Professor Mark Ollunga Odhiambo is a professor of Agricultural Economics in the Department of Agricultural Economics and Resource Management at Moi University in Eldoret, Kenya. He was born on June 15, 1947 in the family of the late Mr. John Odhiambo and Mama Anjilina Opiyo Odhiambo of Kothidha Location, East Kanyada, Homa Bay District in Homa Bay County, Kenya. He got married in 1977 to Mrs. Pamela Akinyi Ollunga Odhiambo with whom they have been blessed with five children: Paul, Samuel, Joyce Awuor, James and Nathan.

Prof. Odhiambo attended Ligisa Primary School in Homa Bay District from 1954-1961 where in 1957 he sat for the Standard 4 Competitive Entrance Examination (CEE) and passed well. He then joined Standard 5 in the Intermediate section of the same school in 1958 and on reaching standard 8 he sat and passed the Kenya Preliminary Examination (K.P.E) in 1961. In 1962 Prof. Odhiambo joined Rapogi High School where he sat for the Cambridge School Certificate in 1965 and passed in First Division. At Rapogi, he was a Head Prefect, a great debater and football player. After passing so well, Prof. Odhiambo had a tough time making a choice of where to go next as he had several offers. He had the following invitations and offers: to go for A Levels; to go for S1 Teacher Training at Kenyatta College; to join the Army as an Officer Cadet at Lanet or go for Six month training as a Police Inspector or join Egerton College for Diploma training as an Agricultural Officer. While staying with his Uncle, the late Bernard Okello who was then the Post Master at Mau Narok, Prof. Odhiambo visited Egerton College with the uncle and was impressed by the academic environment, the facilities and the lifestyle of the students at the college. So in February, 1966, he attended the Egerton College Admission interview at the Nakuru Provincial Headquarters which had a very intimidating panel which included the late Dr. William Odongo Omamo (Kaliech). He passed the interview and when he received admission letter, he had no problem deciding to join Egerton College in preference to all other alternatives. The Diploma course at Egerton was very rigorous and demanding in terms of theoretical, applied and practical academic training. Indeed, he believes up to now that it was at Egerton during the Diploma course and later for his PhD at the University of California, Davis (UCD) where he met the greatest academic challenges in his student career.

In 1968 Prof. Odhiambo graduated at Egerton College with a Diploma in Agriculture (with credit) and proceeded to do the East African Diploma in Agriculture at Makerere University, Uganda in 1969 graduating with a

University Diploma in Agriculture in the same year. Following his excellent performance in the two diplomas, he was recommended to go for a BSc. Degree course which then was only offered at Makerere in East Africa. However, while at Egerton College, Prof. Odhiambo was among a few students in his class who were persuaded by Prof. Robert Maxwell who was head of American pioneer Agricultural High School Teachers in Kenya to join them in the teaching of the subject in High School as the Americans were being phased out of the program with the coming to power of Richard Nixon as President of the United States of America (USA). So, Prof. Odhiambo and the others who agreed to take up the teaching challenge were put in a crash Teacher Training program course jointly offered by Kenyatta College and Egerton College and for which they earned S1 Secondary School Teaching Certificates and got registered by Teachers Service Commission (TSC) as Teachers. Armed with these qualifications Prof Odhiambo postponed his going to Makerere for his BSc. degree in Agriculture. Instead, he started working with the TSC in 1969 as an Agriculture and Biology Teacher and Head of Agricultural Department at Rapogi High School at Sare, in the then South Nyanza District now Migori County, Kenya. In that one year at Rapogi the School Agricultural Farm under his supervision managed to feed the whole school with most of its food requirements and sold the surplus to the extent that the school managed to buy a school Bus with the proceeds from the farm as in those days there were no provisions for Harambees or surcharging students as contributions toward acquiring a new school Bus. In recognition of this fete the then School Headmaster Brother Assisi bought Prof. Odhiambo a motorcycle as a present.

In 1970, Prof. Odhiambo was transferred from Rapogi to Kisii High School where he served as Agriculture and Biology Teacher and Head of the Agriculture Department up to 1971. In 1972, he was promoted as a Lecturer and transferred to Shanzu Teachers' College, Mombasa to teach Agriculture and Biology and Head of the Agricultural Department. Meanwhile between 1971 and 1975 Prof. Odhiambo was appointed by the Ministry of Education to serve as a member of the Kenya Institute of Education Agricultural Panel that was responsible for drawing up Curricula and Schemes for expanding Agricultural Education in Schools and Colleges in Kenya. Later in 1972 Prof. Odhiambo left Shanzu and proceeded for further studies at the University of Nairobi, Faculty of Agriculture where he earned a B.Sc. in Agriculture in 1975 coming top of his class and received the Gandhi Best Graduating Student Award and a cash prize of Kshs 2,500, not a small amount in those days.

Prof. Odhiambo was employed in 1975 as Graduate Assistant/Demonstrator in the Department of Agricultural Economics at the University of Nairobi after graduating with B.Sc in Agriculture. In 1976, he received DAAD scholarship and joined the M.Sc. program in the Department of Agricultural

Economics at the University of Nairobi which he completed in 1978, and after good performance he was identified for the staff development program and got appointed as a Tutorial Fellow/Graduate Teaching Assistant in the Department.

In October, 1978, Prof. Odhiambo was awarded a USAID scholarship to pursue a Ph.D program at the University of California, Davis (UCD) in the USA where he earned another Masters degree in Agriculture Economics in 1982 and Ph.D in 1983 specializing in Econometrics, Marketing, Production Economics, Resource Economics, Policy and Development Economics. The Ph.D program consisted of 3 years of course work followed by preliminary and comprehensive Examinations and Thesis Research. His Ph.D Dissertation was on "Production Risk and Decision Making: Testing Alternative Econometric Models With Evidence From Egyptian Cotton Production" in recognition of his Ph.D work Prof. Odhiambo was bestowed with the Grubb Scholar Shield Award by the Grubb Scholarship Foundation of Berkeley and Oakland, California, USA. While in the USA Prof. Odhiambo attended the American Economic Institute Postgraduate Diploma course in Economics at the University of Colorado, Boulder where he received the Diploma in 1979.

During his studies at University of California, Davis (UCD), USA, Prof. Odhiambo was appointed as a Reader in Economics in 1980 at the Department of Economics where he taught and carried out Tutorials in Micro Economics to Senior Undergraduate Students in Departments of Economics and Agriculture Economics. In 1982 to 1983 he was appointed an Associate in Teaching after his Ph.D course work in the stage known in the USA as 'All But Dissertation' (ABD), to teach in the Department of Agricultural Economics, University of California, Davis (UCD).

Upon his return to Kenya after his Ph.D studies in the USA, Prof. Odhiambo was promoted to position of Lecturer in 1984 and in 1987 he earned another promotion to Senior Lecturer position in the Department of Agricultural Economics at the University of Nairobi where he carried out teaching at undergraduate and post graduate levels and carrying out research, supervising post graduate students' theses and carrying out consultancy assignments. While at University of Nairobi, he was appointed the Secretary and later the

Chairman of the Farm Practice and Industrial Attachment Committee for undergraduate degree programs in the Faculty of Agriculture, University of Nairobi, Kabete Campus.

In 1992 Prof. Odhiambo was appointed Associate Professor by Moi University on promotion. Upon joining Moi University, he was appointed Head of Department (HoD) in the Faculty of Agriculture as Founder Chairman of the Department of Agricultural and Resource Economics to write up and start Post Graduate Programmes in Agricultural Economics. He drew up a good M.Phil degree program which was launched in 1993 has since proved very popular with students in Kenya and the Region. Later he started D.Phil in the Department consisting of course work and Thesis and which has also proved to be very popular with students in terms of the rigor and relevance of the courses offered. In 1998, Prof. Odhiambo was appointed Dean of the Faculty of Agriculture, Moi University, Chepkoilel Campus where he was tasked with starting undergraduate programmes in the Faculty offering B.Sc degrees in Agricultural Economics, Horticulture, Seed Technology, Animal Production and General Agriculture. In 1999, Prof. Odhiambo was one of the three economists from Africa (Kenya, Nigeria and South Africa) invited by the World Bank to travel to Washington to contribute to the Millennium Development Report and to give African development perspectives for incorporation into the report.

In 2003 Prof. Odhiambo was appointed to serve as Deputy Principal in Charge of Administration and Finance at the then newly established Western University College of Science and Technology (WEUCO); and later in 2006 he was appointed Ag Deputy Vice- Chancellor (DVC) when the College became a full University and renamed Masinde Muliro University of Science and Technology (MMUST). While there and despite his busy work schedule he still managed to spare some time for research, MSc. and Ph.D thesis supervision at Masinde Muliro University of Science and Technology and at Moi University. He also volunteered to teach some of the Ph.D courses back at Moi University despite his heavy workload at MMUST. During 2003-2006 as Deputy Principal in charge of Administration and Finance, Western University College and in (2006-2007) as the Acting Deputy Vice- Chancellor (A&F) he was part of a Management team that literally built the new University from scratch to the point that it now stands out as the seventh Public University in Kenya.

In 2006 Prof. Odhiambo was promoted to Full Professor at Moi University while still serving as Ag Deputy Vice Chancellor of Masinde Muliro University of Science & Technology. At the end of his contract assignment as DVC at

MMUST he returned to Moi University, School of Business and Economics where his Department of Agricultural Economics & Resource Management had been transferred from the School of Agriculture, while he was away in MMUST.

In 2007 Academic year he took a Sabbatical Leave and was appointed as Visiting Senior Research Fellow and Professorial Research Mentor at the Kenya Institute for Public Policy Research Analysis (KIPPRA) where he did a Study on Kenyan Agricultural Productivity and Competitiveness. While at KIPPRA Prof. Odhiambo he edited a book on Productivity and Competitiveness of Kenyan Agriculture. After completing his sabbatical leave at KIPPRA, Prof. Odhiambo resumed teaching, research and thesis supervision in his Department in the School of Business and Economics, at Moi University.

Since 2002 Prof. Odhiambo has served as a Member of Eastern, Central and Southern African Agricultural Economics Education Board (AEEB) and its Academic Board which run the Regional Collaborative Masters Program in Agricultural Economics. He was appointed by the Collaborative Masters in Agricultural and Applied Economics (CMAAE) and later by African Economic Research Consortium (AERC) to head and Chair the Academic Board Sub-Committee for Accreditation and Quality Assurance for the Regional Collaborative Masters in Agricultural and Applied Economics (CMAAE) for the Regional Postgraduate Training Program covering 16 Universities in Eastern, Central and Southern Africa (covering Kenya, Uganda, Tanzania, Rwanda, Zimbabwe, Malawi, Mozambique, Ethiopia and South Africa) in 2002-2011 period.

Prof. Odhiambo was appointed and served full terms as external examiner for Department of Agricultural Economics at the University of Nairobi; University of Lesotho; Egerton University, Njoro, Kenya; and Jomo Kenyatta University of Agriculture & Technology (JKUAT); and he is an External Examiner in similar Departments at the University of Zambia, the South Eastern University College, Kenya and University of Zimbabwe.

Prof. Odhiambo has successfully supervised over 30 M.Sc. Theses and 10 D. Phil theses besides examining several 20 M.Sc. Theses. Besides teaching, research and thesis supervision he also undertaken many Consultancy assignments for International Organizations such as World Bank, United Nation Education and Science Council (UNESCO), East African Development Bank (EADB), United States Agency for International Development (USAID), Swedish International Development Agency (SIDA), Finnish International

Development Agency (FINNIDA), Government of Kenya, Government of Uganda, Government of Sierra Leone and Government of Mozambique in collaboration with their donor agencies and National Governments agencies like Lake Basin Development Authority (LBDA), Kenya Sugar Board (KSB), Ministry of Agriculture (MoA), Kenya Agriculture Research Institute (KARI), United States International University (USIU) and Commission for Higher Education (CHE) to mention, but a few. Prof. Odhiambo has published seven (7) books as author, co-author and or editor. He has 28 publications in refereed journals and 60 other publications and project reports.

Professionally, Prof. Odhiambo is a member of several professional organizations including: African Association of Agricultural Economist (AAAE); American Agricultural Economics Association (AAEA); Western Agricultural Economics Association (WAEA), USA, Eastern Africa Agricultural Economics Association (EAAEA), Kenya Agricultural Teachers' Association (KATE), Kenya Economic Association (KEA), International Association of Agricultural Economists (IAAE), Member of Kenya Institute of Management (KIM), and Kenya Institute of Directors and Corporate Governance (KIDCG). He has widely travelled all over the World presenting papers or attending conferences or carrying out consultancy assignments or visiting other Universities in the World to share ideas.

Prof. Odhiambo is active in community service through involvement as a Committee Member of the Kenya Economic Association, Chairman of Kopyo Primary School Committee, East Kanyada, Kothidha Location, South Nyanza, Homa Bay and District Education Board Member - Homa Bay. He has also served as member of Board of Governors of Homa Bay High School, Ligisa High School and past member of the Parents Teachers Association (PTA) at Friends' School Kamusinga (FSK), Alliance High School (AHS), Mary Hill School and Makini High School



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January 26, 2012

Chapter One

Background on Maize as a Staple Food in Kenya Introduction

Maize (*Zea mays*) has its origin somewhere in Southern and Central America and was introduced into Kenya at the Coast by Portuguese traders in the 16th and 17th centuries, but only started becoming an important crop with the European Settlement from early 1900s (Ackland, 1971 and Chiodo-Juve, 1980). However, any analysis of the maize subsector in Kenya in terms of its production and marketing must of necessity be done within the context of the country's agriculture. The story of the history of modern agriculture as we know it today can be traced back to 1895 when the colonial government agricultural policy was prescribed for the Kenyan territory (Nelson et. al, 2008). The subsector has had a checkered and at times controversial development history starting with biased colonial policy (1895-1963) favoring the European settlers and discriminating against the indigenous Africans. Large tracts of land were alienated from African areas and distributed to European settlers who were encouraged to develop commercial agriculture that would use the then newly constructed Uganda Railways to transport imported farm inputs and farm exports passing via the Mombasa port thereby making the railway line economically viable. Many cash crops like coffee, tea, pyrethrum, sisal, wheat and maize were therefore introduced and grown on large plantations and estate farms. By 1906 the colonial government had divided the country into the "scheduled areas" or the "white highlands" and the "native reserves" where the bulk of African population was confined by legislation. However, it was not until 1938/39 that the Carter Commission drew up the boundaries delimiting these areas by law thereby halting African land expansion even as their reserve areas came under population pressure (Van Zwanenberg, 1972 and Leys, 1975).

However, at the beginning of European Settlement, it was soon realized that crops like tea, coffee, sisal and pyrethrum required heavy initial financial outlay to establish and maintain before they could start giving back returns to the settlers' farmers. Most of these crops also required high level of technical skills for their establishment and subsequent management. Maize

farming on the other hand, became more popular among the settlers as it required less skills and limited financial outlay to produce. It also offered quick returns, just within one season. So, by 1929 about half of all the estates were growing maize as their main crop (Zwanenberg, 1972). The colonial government also encouraged the European maize farmers by heavily subsidizing them by giving them special railway transport rebates to enable them export their maize cheaply through Mombasa port. During the Great Depression in the 1930s, the maize farmers were given further subsidy on export maize that was sold in the depressed world market at prices below a set local price level. The colonial government reckoned that European maize growers were so important to the maintenance of white settlement farming structure in the country that they had to be helped to thrive. As such, they could not be left to directly depend on the low prevailing world prices over which they had no control.

In the late 1920s, the European settlers started to form cooperatives to help market their farm produce and also act as a means for having bargaining power and fronting their course as pressure group. One such organization was the Kenya Farmers' Association (KFA) which was set up to market European crops and to lobby for their interest with the colonial government.

By 1920s African farmers had taken to growing maize for subsistence and with some substantial surplus which they sold to the domestic market while European maize all went for export as the world market prices were higher than the domestic prices. However, as the depression of the 1930s depressed world prices, the white settlers through KFA lobbied for their maize to be given preference in the local market where prices remained higher than the world market price. They in turn pushed for the African maize to be exported to face the low world prices and thereby leave room for their maize in the domestic market. In 1936, a marketing law was passed forcing African farmers to sell their maize to government and KFA agents at set prices and with specified grading system that would ensure that the export market was maintained even at the low world prices. This marked the beginning of maize price control in Kenya which later took various forms even after independence and only getting repealed in 1993. Throughout colonial history, European farmers pushed for maintaining discriminatory policies against Africans not only in maize, but also in the other cash crop sectors in terms of production and marketing. The Africans were left to grow maize and their traditional crops mainly for subsistence with occasional surplus for sale.

Several commodity Control and Marketing boards were later established to support and regulate the production and marketing systems of the European farmers' produce from vagaries of the world market and ensure they could make profits (Van Zwanenberg, 1972).

In the mid-1950s, as it became apparent that Kenya would soon gain independence, the colonial agricultural policies were reformed under the Sywnnerton (1955) plan to embrace strategies for bringing African smallholders into commercial farming of cash crops like tea and coffee. When Kenyans gained independence in 1963, the new government maintained the dual agricultural production system of the large scale and the smallholder systems. However, with the help of the new government, the large European farms were acquired by elite African farmers who were encouraged and supported to keep up the production systems in such farms to help develop the new economy. Other large farms were bought by the government and subdivided and then sold as small-scale farms to the poor and the landless Africans who were also encouraged to step up production for their food requirements and with surplus for sale. Maize production has remained up to now a large scale and smallholder crop even among these former white settler farming areas.

During the first two decades of independence the agricultural sector including the maize subsector and the economy in general performed well. The agricultural growth during this period was mainly as a result of: (Odhiambo, 1998, and World Bank, 2004)

- i) Policies favoring new African farmers on large farms and the smallholder counterparts who had benefitted from land redistribution from the former European large farms.
- ii) Availability or ready access to subsidized credit.
- iii) Access to affordable purchased inputs such as fertilizers, certified high yielding seed varieties or seedlings and planting materials.
- iv) Efficient though regulated marketing services provided by subsidized parastatal agricultural boards. The culture of corruption and fraudulent practices had not infiltrated such government sponsored public agencies as was to happen later in 1970 and 1980s.

- v) Government policies of protecting products meant for local markets from imports and subsidizing or giving incentives to local products destined for exports to world markets.
- vi) Availing extension services to the farmers in both large scale and smallholder sectors. The extension inherited from the colonial government was expanded, well-funded and well trained.
- vii) In the maize subsectors, a Kenyan green revolution took place when maize research breeders came up with several high yielding maize varieties in form of hybrid and composite varieties suited to various altitudes and agro-ecological zones.

In the 1980s and 1990s, the Kenyan economy, and by implication the agricultural sector including the maize sub-sector, ran out of steam and started to slow down and eventually declining in growth and general performance. Thus after two decades of sustained growth, the Kenyan agriculture sector performed poorly in the 1990s. Both land and labor productivities in agriculture declined until the overall economic growth and that of the agricultural sector became negative by 2000-2002. Maize production and yields also grew but peaked in the 1970s and thereafter either stagnated or fluctuated around an average of about 2.0 tons per hectare.

Several reasons have been advanced as explanations for the poor performance of the economy and that of the agricultural sector in that period. These include a combination of exogenous and policy factors (Odhambo, 1998):

Exogenous factors:

- Poor weather particularly droughts leading to crop failures thus compromising the country's food security and reducing earnings from cash crops in both domestic and world markets. Also related to poor weather is the phenomenon of recurrent floods in some parts of the country that also affected crop performance.
- Declining World Commodity Prices: The decline in world prices of Kenya's export commodities especially for tea and coffee affected agricultural foreign exchange earnings
- Increases in prices of agricultural inputs particularly those imported from the world market like fuel, fertilizers, machinery, and other essential

agrochemical inputs. Indeed profitability in the agricultural sector plummeted significantly as both export terms of trade and domestic terms of trade deteriorated. It is reckoned that seed and fertilizer prices rose by about 80% while those of fuel and animal feeds rose by 50% and 40% respectively in the intervening period.

Declining fertility of land and poor management of water resources

The increasing population pressure has not only contributed to declining arable land per capita, but has also led to expansion of agriculture to fragile marginal land and to exhaustion or depletion of soil fertility. The result has been the decline in land productivity, poor water and land resource management leading to land degradation resulting in low yields and low carrying capacity.

Poor seed and reduced use of hybrid maize

There are times when farmers face shortages of certified or hybrid seeds, and at times the seeds come late. Unscrupulous traders sometimes fraudulently take advantage of such shortages and sell fake seeds to the unsuspecting farmers who in the final analysis fail to realize good germination and eventually end up with poor crop yields. The maize sub-sector is the most affected in this type of seed supply problem.

Lack of credit

By 1995 the Agricultural Finance Corporation (AFC) which hitherto had been giving farmers government subsidized credit had collapsed. Most farmers, particularly smallholders could not afford the credits from commercial banks, which at that time charged high interest rates.

Declining health status of the people

During the 1990s, HIV/AIDS, malaria and other infectious diseases had devastating impacts on the health of farmers and the general population of Kenya and as a result labor availability, quality of labor and labor productivity declined.

Poor infrastructure

Poor infrastructure, especially the road network resulted in high transportation, marketing and other transaction costs for farm produce and high acquisition cost for purchased inputs.

Lack of a coherent land policy

Kenya has just recently published a comprehensive land policy in 2009, but before that time there was no policy guideline on land use, land tenure and land delivery systems.

Inadequate extension services

The extension services during the 1990s declined in terms of quality, intensity of coverage and general impact on farmers. The government had frozen hiring of new public servants including those joining the agricultural extension services. Public expenditure also declined during that period resulting in reduced funding for extension activities. The poor extension services have impacted negatively on the production of most of the crops like maize and some cash crops.

Lack of access to efficient and remunerative markets

Many farmers, particularly smallholders have invariably suffered from poor market access or have had to deal with inefficient marketing systems. Maize farmers in the remote areas for instance, do not have easy access to the NCPB and have had to rely on the inefficient informal marketing system.

Maize popularity as stable crop in Kenya

Maize is by far the most important cereal crop in Kenya today as it has established itself as the main staple food among the various ethnic communities throughout the country (Odhiambo, 1994). It is believed that it was first introduced in Kenya and East Africa in the 16th and 17th century by the Portuguese traders who brought in some varieties originating from the Caribbean countries (Ackland, 1971 and Chiodo-Juve, 1980). These earlier varieties were more suited to the coastal regions than to the medium and high altitude hinterlands. The spread of the crop to the hinterlands and its subsequent adoption and popularity over the indigenous cereals like sorghum and millet is a comparatively more recent phenomenon brought about by the European settlers in the early part of the last century.

The European settlers encouraged by the colonial agricultural policy in Kenya (1895-1963) adopted maize as a cash crop and brought in new varieties from South Africa which could out-perform the old Portuguese introductions and the traditional grain crops like sorghum and millet. The other white settlers with large estate farms especially of coffee, tea and sisal also lobbied for

colonial policy support and regulation of the maize subsector in terms of production and marketing, not only to boost export, but also to ensure that they could get enough affordable maize in the local market to feed their growing African labour force. A symbiotic relationship therefore developed and was encouraged whereby the plantations became the major market for the settler maize growers, who in turn would provide the estates with local maize supplies to feed the African farm labour force thereby cushioning the plantations from over reliance on expensive maize imports that would raise their labor costs. It should be pointed out at this juncture that plantation owners during these times used to provide food rations, especially maize flour to its workers as an incentive and to ensure they were kept well-fed and healthy to cope with the demanding and arduous physical work on the open farm fields. During the First and Second World Wars, the maize farmers were encouraged and supported even more by the colonial government to step up production in support of the British colonial war efforts.

The plantation workers and the demobilized World War veterans on returning to their rural homes came back with changed tastes preferring maize to the then traditional staple cereals like sorghum and millet. These returnees idealized maize '*ugali*' in the rural villages as the modern '*mzungu*' type of food that was far much superior to the indigenous '*ugali*' made from traditional cereals like sorghum and millet. Stories are told in Nyanza among the Luos of young people who eagerly offered to go and work on the European plantations not only to earn money but also to go and enjoy the free rations of *ugali* maize meal offered to laborers during those days (Wanda-Nyabola and Orondo, 2011). This in short is the story of the history of maize and how it came to the extent of establishing itself as the most important staple cereal crop in Kenya today. The rest is now history, and herein then lies the complex dilemma of maize and its implications for food security in the country. Unlike in neighboring Uganda where sorghum and millet are still preferred to maize in the Northern part of the country while bananas are also preferred to maize in the South, Kenya is now literally a maize-based food system economy. All regions and by extension all ethnic groups including those who historically did not rely on maize have now adopted maize as their staple food crop. It is therefore grown by farming households in all parts of the country where arable agriculture is practiced in both high and medium areas (RMPA) and the arid and semi-arid lands (ASALs). A recent survey revealed that maize is the leading crop on most farms and that about 93% of farm households including

even those in Nairobi, North Eastern and other provinces grow maize (Kenya Integrated Household Budget Surveys, 2007). It is also estimated that maize is the leading single food item in the Kenyan households and accounts for about 24% of the food consumption share in a typical household (KIPPRA, 2010). Tables 1.1 and 1.2 give these statistics.

Why the popularity of maize?

So far then, maize has over-shadowed most of the traditional cereal crops in virtually all parts of Kenya where cultivation agriculture is carried out. Despite becoming important as a staple food just less than a century ago, its widespread acceptance and subsequent popularity over other traditional cereals have been attributed to some of the following peculiar characteristics of the crop (Ackland, 1971, Odhiambo, 1994):

- a) It has higher yielding potential which has enabled it to outperform the indigenous cereals especially in agro-ecological zones with satisfactory rainfall and suitable soils (see Table 2.1).
- b) As a crop, maize can grow at different altitudes in Kenya where arable agriculture is practiced.
- c) It has fewer pests and diseases than other cereals.
- d) It suffers from less bird attacks and damage as compared to sorghum, millet and other cereal crops with exposed grain on open pinnacles.
- e) Compared to other cereals like sorghum and millet, maize is less labor intensive especially where manual labour is the major production technology in terms of land preparation, planting, weeding, harvesting, threshing, winnowing and other post harvest handling.
- f) As far as production and consumption are concerned most Kenyans have developed superior taste for maize and believe it is superior and more palatable than the traditional cereals. This aspect has resulted in great pressure on local production to the extent that it is now being grown even in unsuitable or marginal agro-ecological zones where the yields are unreliable. Maize has become not only the leading crop among the major crops grown by farm households in Kenya, but also the leading food item in the Kenyan households and with many end-users in various parts of the country (see Tables 1.1 to 1.5).

- g) Because of people's preference for maize over other cereals, the demand for it is quite high and has therefore a ready market.
- h) There are several varieties of maize including local land race varieties, hybrids and composites available as seed that can be grown in different agro-ecological zones. Indeed as the crop gained popularity some farmers throughout Kenya have selected and developed suitable local varieties through random selection and by trial and error.

Table 1.1: Proportions of Farming Households Growing Maize and Various Major Crops

Crop	Kenya	Rural	Urban	Nairobi	Central	Coast	Eastern	Nyanza	North Eastern	Rift Valley	Western
Maize	927	930	859	976	868	933	943	957	947	929	932
Finger Millet	58	60	10	00	00	14	63	96	00	65	82
Other millet	16	16	01	00	04	07	64	04	00	01	03
Sorghum	107	108	83	00	01	05	120	323	00	31	104
Cassava	90	90	89	126	23	332	82	105	00	07	185
Sweet Potatoes	75	75	81	00	27	06	29	120	00	22	249
Irish Potatoes	138	140	113	00	467	00	84	06	00	166	20
Sukuma Wiki	74	73	112	24	128	24	82	44	00	70	70
Field Peas	18	18	24	00	44	15	30	02		13	02
Beans	611	622	576	812	700	174	788	467	366	613	612
Green/Black Grams	55	57	29	00	00	178	179	31	00	05	04
Cow Peas	144	147	90	14	09	496	434	56	00	12	62
Pigeon Peas	87	90	21	00	02	14	408	00	00	06	02
Bananas	84	85	76	00	145	28	99	123	00	24	63
Tea	85	88	18	00	118	00	66	158	00	29	28
Other Crops	493	494	466	664	616	588	502	482	435	351	523

Source: Kenya, 2007; Kenya Integrated Household Budget Surveys (KIHBS)

Table 1.2: Food Consumption Shares in Rural Households in Kenya

Food Item	Shares (%)
Maize	23.6
Milk	14.4
Meat	9.8
Beans	8.9
Sugar	7.1
Vegetables	6.3
Root crops	5.4
Cooking Oils	4.8
Other cereals	4.1
Other Food Items	15.6
Total	100

Source: KIPPRA, 2011

End-uses of maize

Maize as a staple food in Kenyan is consumed in virtually all parts of the country with the per capita utilization put by various sources at between 1-1.5 bags or 100-150kg per year (Odhiambo, et. al 1994, Odhiambo, 1994 and World Bank, 2010). As far as the country is concerned maize remains basically a food crop which features more in domestic market than in the international trade. Maize has many end uses and is eaten in a variety of forms and is largely used flour form for cooking *ugali* (a kind of thick porridge) and *uji* (thin porridge). It is estimated that about 75% of the maize consumed in Kenya is milled into flour or maize meal and used in this form (Mukumbu, 1992 and Odhiambo et al, 1994). The maize is usually milled in pure form to obtain the flour, but in rural areas where *posho* milling is done, some farmers and consumers grind their maize mixed with sorghum, millet or cassava.

As discussed under the section on maize milling, some by-products mainly, bran and germ are also obtained and used for manufacturing animal feeds and cooking oil. Other maize based food-stuffs in Kenya vary from one region of

the country to the other and also among the various ethnic groups (see Tables 1.3 to 1.5). Odhiambo et al (1994) have estimated that about 80% of maize consumed in the western part of the country is eaten in the form of *ugali* and *uji*. This region is inhabited by the Luo, Luhya, Kisii, Teso and Kuria ethnic groups who are good eaters of maize in the form of *ugali* and *uji*. They also eat other maize-based foodstuffs usually in mixtures with beans, peas and other grain legumes (see Table 1.3).

The per capita consumption of maize in the rural households in this region is higher than other regions and it is estimated to be about 1.25-1.50 bags per year (Odhiambo et al, 1994). Apart from its major use in *ugali* and *uji* preparation, about 20% of maize consumed in the western region is eaten in the form of (a) Boiled green maize on the cob; (b) Roasted green maize also on the cob and (c) Boiled green or dry maize mixed with common grain legumes or pulses like beans, peas, green grams or groundnuts. The maize mixtures prepared this way go by different names from region to region and from one ethnic group to the other (see Tables 1.3 to 1.5). For example it is known as *nyoyo* in Luo, *githeri* in Kikuyu, *isiyo* in Kikamba, *amaenjera* in Luhya, *mbororo* in Kitaita, *muthere* in Kimeru, *magendek* in Tugen and *akande* in Rural Tanzania just to mention but a few. Again, the ratio at which the maize and grain legume mixtures for this kind of meal preparation vary from one region of the country to the other and range from 1 to 1 to 1 to 3 with maize being less expensive than the legumes tending to be on the higher side. A rich mixture with more legumes would be the preferred choice by consumers, however the high cost of legumes tend to moderate the preparation of the mixture to some psychic optimal level where its economic cost just strikes a balance with the taste preference.

In Central and Eastern provinces, among the Kikuyu, Embu, Meru and Kamba communities only about 70% of the maize is eaten as flour in form of *ugali* and *uji* as compared to 80% eaten in this form in western Kenya. However, a substantial quantity of maize (about 30%); is eaten in other forms including *githeri*, in Kikuyu, Embu and Meru, *isiyo* and *mutokoi* (soft *githeri* made from polished maize) by Kambas. Another form of dish made from maize is the *irio* or *mukimo* (Kikuyu word for mashed *githeri* and potatoes). The Luhya also have a similar word for it known as *omushenye* which is *githeri* mashed with sweet potatoes instead of Irish potatoes.

In the Rift Valley province, the patterns of maize consumption are relatively similar to those of western Kenya. Maize is consumed mainly in flour form with about 80% being used for *ugali* and *uji*. This leaves about 20% for other forms of meal preparations like *githeri*, *irio* and other mixtures of maize and beans. The per capita maize consumption in Rift Valley is also very high, especially in maize surplus districts in the counties of Trans-Nzoia, Nandi and Uasin Gishu. The drier and maize deficit counties in the province have relatively lower per capita consumption mostly due to lack of adequate supply and non-availability rather than as a reflection of the tastes and preferences of the people in these areas. Most of the drier counties and districts depend largely on livestock and livestock products for their livelihood and most of the maize consumed is either purchased or received as famine relief.

The Coast and North Eastern provinces as we have noted already and as discussed further in Chapter 2 are all made up of maize deficit counties and districts. However, the consumption of maize in this region is also high and mainly in flour form for cooking *ugali* and *uji*. The consumption of maize in major towns and urban centres follow the same patterns as formed in the rural areas. Most of the urban household virtually produce no maize of their own and fully depend on the marketing system for their supply of maize and maize flour consumed. The maize flour used in the major urban centres as will be discussed later in Chapter 4 come from the large, medium and small maize millers. The *posho* mills are also found in some parts of the urban centres particularly in the low income areas of the major towns or in smaller towns and trading centers. The urban consumers use maize in form of flour for the cooking of *ugali* and *uji*. A lesser but significant proportion of the maize is also consumed in form of *githeri*, *nyoyo*, *irio* and other maize beans mixture meals.

In concluding this section, it is worth pointing out that given the widespread consumption of maize in its various forms throughout the country and given the fast growth in the Kenyan population, maize is coming under great pressure as a staple food. The government rather than resorting to price control will have to devise strategies to boost maize production and to promote diversification to other food crop production and consumption.

Table 1.3: Maize and Beans Mixtures Used as Meals and Ratio of Maize-to-Beans by Some Ethnic Communities and Selected Counties

Meal	Local name	Language	County	Ratio
Boiled dry/ green Maize and dry Beans	Githeri	Kikuyu	Nyeri, Kirinyaga, Kiambu, Nyandarua	2 to 1
			Laikipia	2 to 1
			Nakuru	1 to 2
			Kajiado, Narok	1 to 2
		Kiambu	Embu	2 to 1
	Muthere	Kimeru	Meru	2 to 1
	Isiyo	Kikamba	Machakos, Kitui, & Makueni	2 to 3
	Nyoyo	Luo	Kisumu, Homa Bay, Migori & Siaya	1 to 1
	Chiyoyo	Kisii	Kisii & Nyamira	1 to 1
	Magendek	Tugen	Nakuru	1 to 2
	Amaenjera	Luhya	Kakamega, Busia, Vihiga & Bungoma	1 to 1
	Mbororo	Kitaita	Taita-Taveta	2 to 3
	Kisumba	Kitaveta	Taita-Taveta	2 to 3
Mahengere	Kisuba	Homa Bay & Migori	2 to 3	
Mashed githeri and potatoes (Kienyeji)	Irio, Mataha (Mokimo)	Kikuyu	Nyeri, Kirinyaga, Laikipia, Nyandarua & Nakuru	
	Mataha	Kiambu	Embu	
	Mataha	Kimeru	Meru	
	Akande	Tanzania	Tanzania	2 to 1

Source: Adapted and modified from Ouedraogo, et al, 1994; African Agricultural Technology Foundation (AATF), 2009

Table 1.4: Estimated Per Capita Maize Consumption Per Annum for Selected Counties in Kenya

Province	Counties	Per Capita Consumption (Bags)	Comments/uses
Nyanza	Kisumu, Migori, Homa Bay & Siaya	1.5	Eaten in flour form as ugali, <i>uji</i> or as <i>nyoyo</i> Substitutes are sorghum, millet and cassava
Western	Kakamega, Vihiga Busia Bungoma	1.5	Used in flour as ugali and <i>uji</i> or <i>maenjere</i> used in flour form as ugali or <i>uji</i> , Cassava and millet highly substitute for maize Maize eaten in flour form as ugali or <i>uji</i> and <i>nyoyo</i> .
		1.0	
		1.0	
Rift Valley	Trans Nzoia	2.0	Use pure maize or mixtures with other cereals, Used mainly as ugali or <i>uji</i> Use maize as in Trans-Nzoia for Ugali or <i>Uji</i> Use Maize for Ugali or <i>Uji</i>
	Uasin Gishu	1.5	
	Nandi	2.0	
Central	Nyeri	1.0	Ugali becoming important, but not regular dish Other forms are <i>Irio</i> , <i>Githeri</i> , <i>Mutokoi</i> and <i>Mataha</i>
Eastern	Machakos	1.5	Ugali, <i>Uji</i> , <i>Isiyo</i> , <i>Mutokoi</i> and <i>Githeri</i>
	Kitui	1.5	
	Mwingi	1.5	
	Makueni	1.5	

Source: Odhiambo, et al, 1994 and Updated, 2011

Table 1.5: Estimated Urban Per Capita Maize Consumption Per Annum for Selected Urban Areas

Towns	Per Capita (Bags)	Comments on Use
Nairobi	1.0	
Nakuru	1.0	Mainly Eaten in form of <i>Ugali, Uji, Nyoyo, Githeri, Irio</i>
Eldoret	1.5	
Kitale	1.5	
Kisumu	1.5	
		<i>Ugali, Uji, Nyoyo, Githeri</i>
Kakamega	1.25	
		<i>More Ugali, Uji, Nyoyo, Githeri</i>
Bungoma	1.25	
Thika	1.0	
Nyeri	0.75	<i>Ugali, Uji, Githeri, Irio, Mutokoi.</i>
Kitui	1.5	<i>Ugali, Mutokoi</i>
Machakos	1.5	<i>Ugali, Mutokoi</i>
Mwingi	1.5	<i>Ugali, Mutokoi</i>
Busia	1.0	
		<i>Ugali, Uji, Nyoyo</i>
Mombasa	1.0	<i>Ugali, Uji</i>

Source: Odhiambo, 1994 and updated in Field Survey, (2011)

Maize and food security situation in Kenya

Kenya like most countries in Africa, is facing a food security crisis although as a country, it has strived to maintain self-sufficiency in food since independence in 1963. In the last two decades or so, the country has slowly moved from being a net food exporter to a persistent net importer (Karanja, et. al, 1998) mainly due to its fast growing population, adverse weather conditions and poor macroeconomic performance. Kenya currently imports such food items like Wheat, Rice, Sugar, Cooking fats and oils and maize in increasing amounts and the trend is worrying to the extent that most analysts now feel that the struggle for food self-sufficiency has already been lost.

More worrying now is the fact that maize demand now outstrips domestic production in Six out of Ten years (Karanja, et. al, 1998) and projections for the future (Kenya, 2011) indicate that with the rapidly growing population, this phenomenon may become a regular or permanent feature in the future. Therefore unless drastic policies and strategies are instituted to increase maize productivity and total production and to diversify into the production of other alternative crops that can supplement or substitute maize as staple foods, Kenya will increasingly depend on maize imports. Table 1.1 shows the relative dominance of maize as an enterprise among farm households in Kenya vis-à-vis other food crops and low farm diversification in food production.

Analysis of recent trends in maize production consumption, exports and imports (see Table 1.6) confirms our fears that the country is slowly but is surely slipping into maize import dependency unless drastic strategies are taken to reverse the trend. Some of these policy issues are raised and discussed in this lecture against the backdrop of the pressure from the government and some of the people advocating for price control in the country including the maize industry.

Table 1.6: Recent Trends of Maize Production, Imports, Exports, and Assumed Consumption (Million Bags); Year 2000 to 2010

Year	Production	Export	Import	Net Available	Population	Assumed consumption	Per Capita Consumption (Kg)
2000	25.00	0.01	4.55	29.54	30.2	31.54	88.04
2001	30.60	0.00	3.43	34.02	30.9	32.27	99.10
2002	26.00	1.76	0.18	24.42	31.5	32.90	69.76
2003	28.00	0.03	1.29	29.25	32.2	33.63	81.76
2004	23.40	0.27	2.69	25.82	32.8	34.26	70.84
2005	32.30	0.12	0.55	32.73	35.1	36.66	83.92
2006	34.60	0.25	0.81	35.16	36.1	37.70	87.66
2007	32.50	0.31	1.12	33.31	37.2	38.85	80.58
2008	26.00	0.21	2.71	28.50	38.3	40.00	66.96
2009	27.10	0.05	16.76	43.81	38.6	40.32	102.16
2010	46.58	0.03	2.55	49.10	39.4	40.32	102.16

Source: Kenya, 2011

Chapter Two

Maize Production Patterns

Maize production in Kenya as earlier pointed out is widespread and takes place in virtually all parts of the country where arable agriculture is practiced. Its popularity as staple food crop is already reviewed in Chapter 1 and as shown in Table 1.1, it is the leading crop in most farm households in the various parts of the country including those in Nairobi County. Because of variation in altitude and the bimodal rainfall patterns in some parts of Kenya, maize at different stages of growth can be seen as one traverses the various agro-ecological zones in the country. The crop is grown at attitudes ranging from sea-level to over 2,500 metres above sea-level. Several maize varieties suitable for various altitudes and agro-ecological zones have been developed for farmers by government maize research stations at Kitale, Embu, Katumani and Mtwapa all falling under the Kenya Agricultural Research Institute (KARI). About 71% of farmers in Kenya have adopted and are growing the high yielding hybrids and composite maize varieties produced by these research stations. Virtually all (100%) of the large-scale farmers in the maize surplus counties of Trans-Nzoia, Uasin Gishu grow the hybrid varieties (Kenya, 2011). The adoption of hybrids is also high among smallholders in the maize surplus counties of Kericho, Bomet, Nandi, Bungoma, Kakamega, Kisii and Nyamira.

Following the historical dichotomous nature of Kenyan agriculture of large scale and smallholder production, maize is grown both by small scale and large scale farms under varying technologies with different yield levels. In most parts of the country, particularly among the small scale producers, maize is grown twice a year to take advantage of the long and the short rainy seasons of the bimodal rainfall pattern in the country. However, in the high altitude areas with unimodal rainfall patterns and where maize usually takes long to reach maturity, the crop is grown only once a year. Indeed as discussed later, the majority of large scale producers fall in this category.

Most of the maize produced in Kenya by both smallholders and large scale farms is planted in the long rainy season starting during February or early March period. However, due to variation in altitude and agro-ecological conditions such maize mature at different times of the year with peak harvesting being July to September for the lower altitude and October to December/January for the medium and high altitude areas. The section that follows analyses the production of the crop under smallholder and large scale systems. In general, the Rift Valley region, on average accounts for over 50% of the national maize production in the country. Nyanza and Western regions contribute on average about 14% each towards the national maize production (Kenya, 2011). According to these recent estimates, Central, Eastern and Coastal regions account for just about 22% of maize in the country.

Smallholder maize production system

As would be expected, maize being a staple crop is grown virtually by most if not all smallholder farmers. As a rule of thumb smallholders are regarded as those with farms below 8 hectares in size, but the majority are much smaller. About 95 percent of small scale farmers grow their maize during the long rainy season while only about 65 percent of this category of farmers grows the crop during the short rains (Ackello-Ogutu and Odhiambo, 1986; Odhiambo, et al 1994 and, Kenya, 2011). On the basis of annual national production, it is further estimated that smallholders as a category, account for about 70-80% of the total maize in the country, thus implying that the large-scale farms account for only 20-30% of the total production (Odhiambo, et al, 1994 and Kenya 2002 and 2011). In terms of regional analysis, about 60% of smallholder maize is produced in the Western Region of Kenya consisting of the Nyanza, Western and Rift Valley Provinces. The areas east of the Rift Valley therefore account for about 40% of smallholder maize production. In terms of Provinces, Central Province is a high potential area for maize but most of the smallholder farmers in the various counties of Nyeri, Muranga, Kiambu, Kirinyaga and Nyandarua concentrate more on high valued cash crops like tea, coffee and horticulture, thereby producing maize in small quantities with less or no surplus for sale.

North Eastern and Coast Provinces and most of their respective counties are regarded as maize deficit regions where smallholders' production is low and sometimes even below subsistence level. These regions experience frequent crop failure and famine. Eastern Province, with the exception of the

counties of Meru, Tharaka Nithi and Embu are largely maize deficit regions and the situation is worse in its Southern counties of Kitui, Makueni and Machakos.

Indeed, Meru and Embu counties account for the bulk of smallholder maize production from Eastern province. Most of the smallholders are subsistence farmers who mostly produce for home consumption with occasional surplus for sale in good years. Some of the smallholders, especially those in the maize surplus areas tend to produce significant commercial surplus just as their large-scale counterparts. Maize yields in small smallholder farms are relatively lower than those realized on the large farms and range between 8-20 bags or 0.7-2.2 tons per hectare depending on the region, agroecological zone and the level of technology used. In general, yields are higher in the medium and high potential areas in the high and medium altitude zones. Smallholders in low altitude areas and marginal agro-ecological zones invariably get lower yields.

Large scale maize production system

As we have seen historically, the European settlers who were given large tracts of land by the colonial government took up maize as a cash crop as they found it less expensive to grow in terms of skills, machinery and labor requirements and because it gave quick returns. Thus large scale maize production up to the present day (2012) is mainly in the Rift Valley Province (in the counties of Trans Nzoia, Uasin Gishu and Nakuru) and in Western Province, Lugari District in the county of Kakamega. Indeed the North Rift counties of Trans Nzoia and Uasin Gishu are regarded as the granary or the bread basket of Kenya. The large farms as noted already account for about 20-30% of maize production in the country. They grow maize as a commercial cash crop and sell about 90% of their harvest to the open market traders, millers or to the NCPB. While the small-scale farms produce maize for home consumptions, the large farms are on the other hand operated as commercial business with some of them employing professional farm managers with degrees or diplomas in Agriculture or Farm Business Management. Some of the farms use sophisticated technologies including use of farm machinery to mechanize such farm operations like ploughing, harrowing, planting, weeding, harvesting, shelling, bagging and transportation. Still, some other large scale maize producers use herbicides instead of or to complement hand weeding. Some of the farms have own machinery for most of these farm

operations, while some may hire from fellow farmers or commercial firms providing farm machinery services at specified fees. Virtually all (100%) of the large scale farms use certified hybrid seed and commercial fertilizers for planting and top dressing (Mose, 2011 and Kenya, 2011). These farms therefore employ most of the recommended crop husbandry practices and usually get relatively higher yields than those in the smallholder sector. Depending on level of technology used and crop husbandry practices, the maize yields in large farms range from about 2-4 tons per hectare. Most of the large scale farms in the maize surplus counties strive to use best practice in their production, but are sometimes let down by poor distribution, or lack of or late arrival of some essential inputs like certified seed, fertilizers or hired machinery.

Table 2.1 Maize Production and Yields in Kenya 1964 -2010

Year	Area (Ha)	Production in tons	Production in bags	Yield (tons/Ha)	Yields (Bags/Ha)	Price Per bag (Kshs)
1964	701300	229500	2549745.00	0.33	4.0	30
1965	454000	187700	2085347.00	0.41	5.0	33
1966	346000	295700	3285227.00	0.85	9.4	32
1967	447700	403200	4479552.00	0.90	10.0	36
1968	829300	511200	5679432.00	0.62	7.0	32
1969	939400	619200	6879312.00	0.66	7.3	28
1970	943400	727200	8079192.00	0.77	9.0	28
1971	974700	835200	9279072.00	0.86	10.0	25
1972	1043000	943200	10478952.00	0.90	10.0	30
1973	1211600	1051200	11678832.00	0.87	10.0	35
1974	1151300	1159200	12878712.00	1.01	11.1	35
1975	1161800	1267200	14078592.00	1.09	12.1	42
1976	1190900	1375200	15278472.00	1.15	13.0	63
1977	1215800	1597100	17743781.00	1.31	15.0	69
1978	1246700	1671400	18569254.00	1.34	15.0	80
1979	1282100	1620000	17998200.00	1.26	14.0	70

1980	1322700	1606500	17848215.00	1.21	13.4	80
1981	1364900	1888300	20979013.00	1.38	15.3	86
1982	1120000	2560000	28441600.00	2.29	25.3	90
1983	1208000	2450100	27220611.00	2.03	23.0	96
1984	1236000	2214800	24606428.00	1.79	20.0	139
1985	1230000	1500000	16665000.00	1.22	14.0	158
1986	1370000	2440300	27111733.00	1.78	20.0	168
1987	1430000	2870000	31885700.00	2.01	22.2	178
1988	1440000	2400000	26664000.00	1.67	19.0	188
1989	1420000	3140000	34885400.00	2.21	25.0	193
1990	1300000	2890289	32111111.00	2.22	25.0	313
1991	1310000	2400240	26666667.00	1.83	20.3	351
1992	1407000	2430243	27000000.00	1.73	19.1	464
1993	1344000	1755176	19500000.00	1.31	15.0	950
1994	1500000	3060306	34000000.00	2.04	23.0	950
1995	1439000	2699270	29988889.00	1.88	21.0	650
1996	1489000	2160216	24000000.00	1.45	16.1	800
1997	1505000	2214221	24600000.00	1.47	16.3	1,280
1998	1476000	2464246	27377778.00	1.67	19.0	1,050
1999	1567000	2322232	25800000.00	1.48	16.4	1,050
2000	1500000	2160216	24000000.00	1.44	16.0	1,050
2001	1707403	2757896	30640222.00	1.62	18.0	792
2002	1592315	2411248	26788967.00	1.51	17.0	1,052
2003	1670914	2713832	30150678.00	1.62	18.0	1,358
2004	1819817	2455176	27277000.00	1.35	15.0	1,482
2005	1760618	2918449	32423967.00	1.66	18.4	1,363
2006	1888185	3248102	36086411.00	1.72	19.1	1,300
2007	1515304	2929086	32542144.00	1.93	21.4	1,200
2008	1793757	2369806	26328544.00	1.32	15.0	2,500
2009	1885071	2443067	27142478.00	1.30	14.3	2,614
2010	2008346	3464887	38494899.00	1.73	19.1	1,619

Source: Republic of Kenya, Price Control Act Cap 504 (prices 1964-1994); Gitu, K.W., 1992.

Maize production calendar

Depending on the region, altitude, and rainfall patterns, it is possible to grow one or two crops of maize per year in Kenya. Thus the climatic diversity and altitude variations allow some regions to have two planting and harvesting seasons in a given year. The length of time taken by maize to reach maturity and hence harvesting stage also varies with climate and altitude. With the exception of Rift Valley Province all other areas have at least two harvests in a year (Maritim, 1982; Odhiambo, 1994; Kenya, 2011 and EAGC, 2011). The planting and harvesting seasons follow the pattern of the rainy seasons. In general, the long rainy season in the country occurs from February to the end of July, while the short rainy season occurs around September to the end of November. In some parts of the country bi-modal rainfall patterns consisting of the two rainy seasons are quite distinct, while in other parts like Rift Valley, the two seasons merge into one prolonged unimodal pattern.

In a normal year, the long rainy season is more reliable and virtually all farmers in parts of Kenya where maize is grown start planting with the onset of rains between mid February up to early April. Harvesting of the long rains crop then occurs between July and December depending on the agro-ecological zone and as dictated by variations in altitude and climate. In the short rainy season, however, only about 65% of the farmers plant maize, and these are mainly small holders found in the lower and warmer agro-ecological zones of Nyanza, Western, Central, Eastern and Coast Provinces. Maize grown in these lower and warmer areas matures relatively fast such that the crop planted at the beginning of the long rains is harvested around July and August, to allow for another planting to be done in September with the short rains. The second crop of maize is then harvested in December and January, just around the time when other high altitude areas are also preparing to harvest their crop planted at the beginning of the long rains.

For example, in the high altitude areas in the Rift Valley and some parts of Central and Eastern provinces maize takes long to mature and the long rainy season crop planted in February or March is harvested around October, November and December. Thus the large scale farmers in the high altitude counties like Trans Nzoia, Uasin Gishu and Nakuru plant maize around March and April and harvest between October and December or up to January with no provision for the short rainy season crop.

Since maize production, like that of most crops in Kenya is virtually done under rainfed conditions, the performance of the crop heavily depends on the reliability and the actual amounts and distributions of the rains received during the crop season. However, since most of the crop in the country comes from the long rainy season, any failure or delayed on-set of the long rains will have a greater negative impact on the domestic maize supply than would be the case with the short rainy season. However, it should be noted in retrospect that, the two rainy seasons complement each other and it is always desirable that both the long and short rains never fail if Kenya is to have an assured adequate production and avoid importation. Regional shortages, especially in the maize deficit areas (counties and districts) can become so acute in years of poor rainfall that the government and other relief agencies have to step in to distribute maize and other foodstuff to those living in the affected areas. At times the shortages can be so widespread that many parts of the country face starvation and in such situation the government and the relief agencies resort to maize importation through purchases or through foreign food aid.

Regional maize surplus and deficit areas

Although maize can be seen growing in most parts of Kenya, the agro-climatic conditions and soil fertility variations in the country determine the maize yield and volume of production in the various regions or counties and districts. The agro-climatic diversity in the country as modified by variations in the altitude, rainfall and temperature, all combine to determine the maize varieties grown in a given region and the timing of farm operations like land preparation, planting, weeding, pest control and harvesting. Analysis of past national production data and district agricultural reports shows that on aggregate the larger Western Region of Kenya which covers Rift Valley, Nyanza and Western Provinces account for over 60% of maize production in the country. This implies that the remaining regions consisting of Central, Eastern, North eastern and Coast Provinces produce just about 40%, and this as noted already comes from smallholder farms. A recent analysis based on the 2010 maize crop production revealed however, more skewed statistics with Rift Valley estimated to account for above 50% while Nyanza and Western Provinces were each estimated to produce 14%, thus leaving Central, Eastern and Coast provinces combined to be producing only about 22% (Kenya, 2011).

Past studies indicate that Rift Valley Province with its leading fertile maize producing counties of Trans Nzoia, Uasin Gishu, Nakuru, Kericho, Nandi, Bomet and parts of Narok leads in maize production, accounting for 45-50% of the national output per year (Odhiambo, 1994, Gitu 1992,). Western Province with her fertile counties of Kakamega, Vihiga, Bungoma and Busia comes in a far distant second by accounting for just about 15%. The two provinces are then followed by Nyanza Province (12-15%), Eastern Province (8-14%), Central Province (8-10%) and Coast Province (2-5%). It should be noted that the North Eastern Province is too marginal for maize, unless produced under irrigation, has been left out in most of the analysis done so far. The map in figure 2.1 shows the maize surplus and deficit areas in the country.

a) Maize surplus regions

From the preceding analysis and discussion, we can see that in terms of maize production volume and disposal, the Western part of Kenya is largely a maize surplus region. As already pointed out, Rift Valley Province with its counties of Trans Nzoia and Uasin Gishu leading in the North Rift region, followed by Nakuru in Central Rift and Kericho and Bomet in the South Rift Regions is the grain basket of Kenya. However, as will be pointed out later, some counties in the arid parts of the Rift Valley like Turkana, Pokot, Samburu in the North and Kajiado in the South are maize deficit and are paradoxically the leading crisis areas whenever the country has poor harvest (see map in figure 2.1).

Western Province has been a maize surplus region most of the past, however with its fast growing population and the resulting pressure on land, it can now be best described as “occasional maize surplus” region. The climatic conditions and the soils are good for maize in this region, but most of its production (with exception of Lugari District in Kakamega County) is mainly for subsistence with any little surplus only sold in the local markets. Nyanza Province too, used to be a surplus production region but can now also be classified as occasional maize surplus region due to increasing population and dwindling farm sizes in the areas. The counties of Kisii, Nyamira in the old Kisii District have good maize production but are overwhelmed by high population which makes local demand absorb most of the maize with less left for interregional trade with other counties. The old South Nyanza District, now consisting of Migori and Homa Bay counties has always been classified as a maize surplus area. However, with the expansion of sugar cane production

in the fertile zones of the two counties, coupled with increasing population pressure being felt in their newly created districts, the region can now be regarded as only “occasionally maize surplus” area. The other counties in Nyanza like Kisumu and Siaya are also regarded as marginally maize surplus areas. Large parts of the Nyanza counties around Lake Victoria are actually maize deficit zones as will be explained in the next section dealing with maize deficit areas. Suffice to mention here however, that Nyanza and Western Provinces as a whole are largely occasional maize surplus regions and with their fast growing population, their local production of maize may soon not be adequate for the region and may rely on supply from their neighboring Rift Valley maize surplus region; or from cross-border trade from neighboring Uganda and Tanzania.

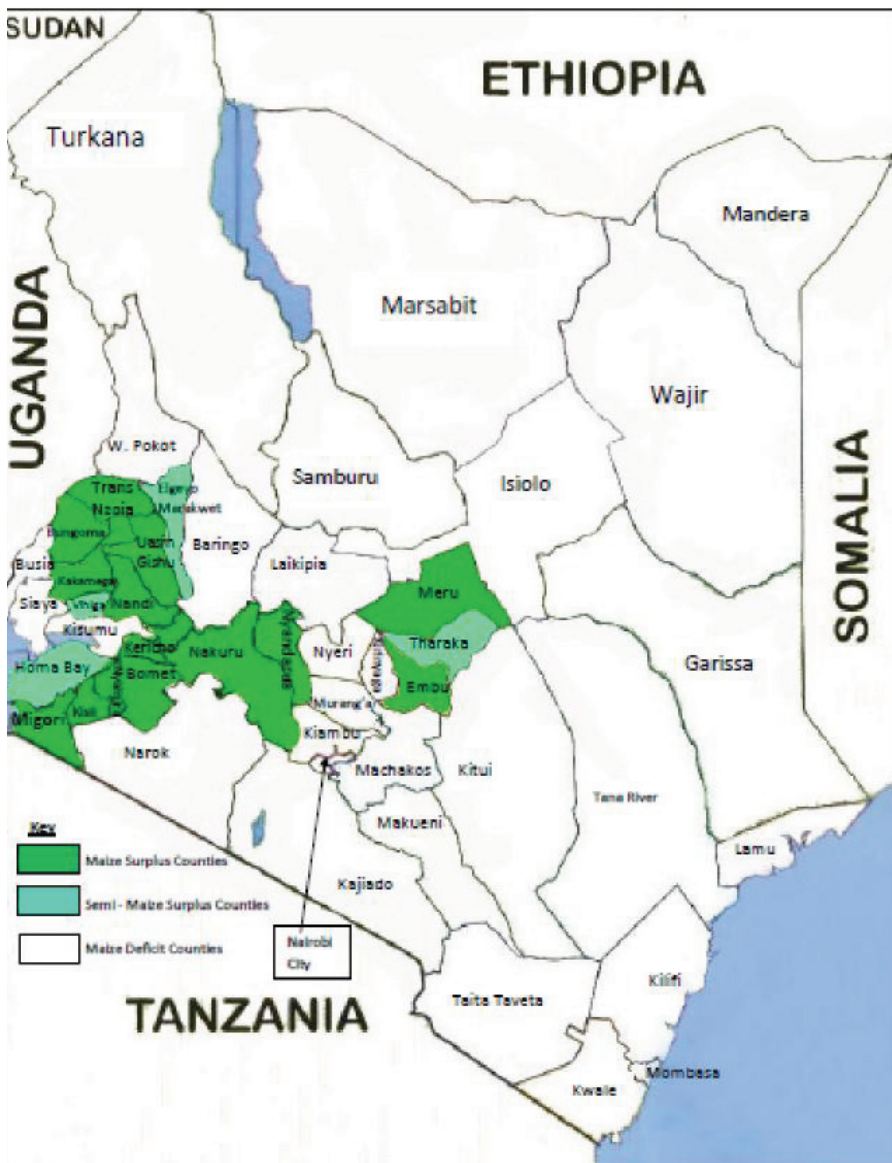


Figure 2.1 Map Showing Maize Surplus and Maize Deficit Counties in Kenya

b) Maize deficit areas of Kenya

The map in Figure 2.1 shows the maize surplus and the maize deficit areas in Kenya. It also shows the expected direction of flow of the maize produced in the country through the marketing channels or through famine relief agencies from the surplus regions or from import sources to the areas of demand.

All the regions classified as Arid and Semi Arid Lands (ASALs) of Kenya are maize deficit. Such areas have marginal potential lands and harsh climate which cannot support maize production. These areas are settled by pastoralists or agro-pastoralists who largely depend on livestock keeping for their livelihood. Thus the whole of North Eastern Province covering the counties of Garissa, Isiolo, Wajir, Mandera and Marsabit is a maize deficit area and relies on maize from other regions of Kenya. The Coast Province with its counties of Kwale, Kilifi, Tana River, Taita Taveta and Lamu is also a maize deficit area. As noted earlier, the province accounts for only about 2-5% of the national maize production. The county of Taita Taveta grows some maize in the Wundanyi area, but the production is not adequate. Tana River County has the potential to grow maize under irrigation system using the Tana River. However, attempts to rehabilitate the old cotton irrigation scheme at Hola and Bura by planting there maize in 2010 showed promising results but the farmers under the project felt cheated as they could not cope with the post-harvest handling, storage and marketing of the bumper harvest. Media reports in the television and daily newspapers gave vivid accounts of the dilemma facing the poor farmers when their maize was later condemned as unfit for human consumption and had to be destroyed by the government due to aflatoxin infestation. This dilemma was ironical because, as the people in neighboring districts and other parts of the country were starving and suffering from serious lack of maize, while the maize at these irrigation schemes was being destroyed.

Other ASAL areas experiencing maize deficit situation are the northern counties of the Rift Valley Province such as Turkana, Samburu, West Pokot, Laikipia and Baringo, and the South Rift Counties of Kajiado and Narok. However, Narok County has some pockets of maize production in areas bordering the counties of Migori, Kisii, Bomet and Nakuru counties, but experiences poor production in its central parts and in areas bordering the Kajiado County.

Eastern Province is another area in the country that is largely maize deficit, especially in the ASAL counties of Kitui, Machakos and Makueni. However, the counties of Meru and Embu are occasional maize surplus areas but their surplus production is readily consumed locally and therefore, cannot have sufficient impact on the lower deficit regions of the province. It should be noted that the ASALs have potential for agricultural development and by implication, maize production potential if irrigation can be successfully developed in the region. The ASALs as a whole account for about 80% of land in the country but only about 18% of the population live there. North Eastern Province alone, whose 2009 population census was withheld, was home to about 1.2 million people in 2003 with the highest growth rate in the country, estimated at about 9.5% as opposed to the national average growth rate of 2.9% (CBS, 2001; KNBS, 2007). Apart from pastoralism, crop based agricultural production in the province and other ASAL areas are quite limited due to the harsh climate, poor soils and widespread land degradation. According to recent Household Budget Survey carried out in 2005/06, some of these areas suffer from the highest food poverty in the country with some areas like North Eastern Province recording about 66% of its population consuming fewer calories than the Standard FAO/WHO recommended level of 2,250 kilo calories per day. These areas are perennially dependent on food relief with an estimated 30% of food supply including maize being brought to the region by government and non-government relief agencies (KNBS, 2007).

The ASAL areas development agenda is another story that is outside the realm of this paper. However it is worth mentioning that it will remain maize and food deficit areas for a long time in the foreseeable future unless heavy investment is undertaken in irrigation, land reclamation, development of network of infrastructure, market development and marketing institutions. In some parts of the ASAL areas particularly in the North Eastern Province and in drier parts of the North Rift insecurity problems are so prevalent that no meaningful development both in agro-pastoralism and pastoralism can thrive to provide livelihood and food security for the people in these regions. Analysis of economic activities in these ASAL regions of North Eastern Province and the drier marginal parts of North Rift, show that about 80-90 percent of the population are directly engaged and dependent on livestock production (Rakotoarisoa, 2008). The so called agro-pastoralist communities in these areas are to be found in the areas bordering the medium and marginal potential districts, but even here food crop production consisting of maize,

sorghum, millet, cowpeas, green grams and cassava is low. However it is estimated that even here only 10% of the people grow crops (Kenya, 2011).

During the 2011 Kenya Red Cross Society's appeal for donations towards food relief for the hunger stricken people in ASAL areas in Northern Kenya, it was estimated that about 3.5 Kenyans in this region were facing starvation following the 2010/2011 severe drought that led to massive loss of livestock and no harvest. The school feeding program in the area was increased, targeting about 400,000 pupils in school as most of the pastoralists are nomadic and move around in search of water and pasture.

In terms of land area coverage, about 80% of Kenya, mainly the ASAL areas can be regarded as maize deficit. By extension it follows that these areas are also food deficit. As noted already 60-64% of the population here lives below the poverty line and further 66% experience food poverty (KNBS, 2007a).

Maize production costs and competitiveness

Although maize is grown in many parts of Kenya, its profitability and competitiveness at farm level or regionally depends on the agro-ecological zones, the level of management or the level of crop husbandry practices on the farm, the resulting yields obtained, the cost of production as reflected in the prices of inputs, and the prices of the final product. Maize production involves specific operations which will require expenditure items that include: a) Land rent or its opportunity costs; b) Land preparation which includes clearing, ploughing, reploughing and harrowing; c) Planting either by hand or by a planter; d) Seeds usually hybrid, composite or local; e) Fertilizers for planting and top-dressing; f) Chemicals, usually pesticides for control of stalk borers and other field and storage pests; g) Weeding usually by hand or by use of herbicides; h) Harvesting which includes stooking and dehusking; i) Shelling either manual or by a sheller machine; j) Drying and bagging; k) Transportation on farm and to the market and; l) Other miscellaneous cost items including fixed costs.

The intensity and level of management of these operations and the inputs involved to some extent determine maize yields in any given agro-ecological zones. Of course as would be expected, yields, expressed as bags or tonnes per hectare are higher in the high potential areas followed by the medium potential, but are quite low in the marginal agro-ecological zones particularly in the ASALs. Thus maize yields in the maize surplus areas are higher than

those in the maize deficit areas. Similarly, because of high technology and management practice levels, the large scale farms like those in Trans Nzoia, Uasin Gishu and Nakuru counties, invariably have higher yields than smallholder farmers in similar zones or elsewhere for that matter (see Tables 2.5a to 2.5c). The cost structure for large scale maize production shows that the system is capital intensive as compared to the small scale farms that are more labour intensive. Nyoro (1992) reported that in maize production in Trans Nzoia for example, machinery took the highest proportion of production cost outlay accounting for about 35.6% of the total cost. This was followed by individual cost items such as fertilizers (27.3%), labour (11.2%), pesticides (9.2%) in that order, and leaving other miscellaneous cost items as a group to take up 16.8%. On small scale farms, the same study reveals that machinery feature very little or none at all, leaving labor to be the major mode of production accounting for about 79.3% of the costs. Fertilizer accounted for only 8.3% of the costs, while other miscellaneous costs accounted for 12.4% on the small scale farmers.

On regional basis, past studies (Ackello-Ogutu and Odhiambo, 1986 and Nyoro, 1992) have shown that even among the large scale farms there are cost differences with those having their own machinery incurring lower costs than those hiring such machinery. Again generally, costs per bag of maize produced are lower in good harvest years than in drought years when yields are low. This phenomenon is observed in all agricultural zones and on both large scale and small scale farms. The general observation is that per unit costs of maize production are invariably low in the maize surplus areas like in the counties of Trans Nzoia, Uasin Gishu, Kericho, Nandi, Kisii, Nyamira and Meru than in the deficit areas. The costs are moderately high in the counties of Siaya, Nyeri, Nakuru and Kakamega. On the other hand, production costs are highest in the maize deficit areas such as the counties of Kwale, Kilifi, Kitui, Makueni and Machakos in Coast and Eastern Provinces not to mention the case of other ASAL areas and counties in North Eastern provinces and far North of Rift Valley Province, where yields are low and crop failures are common.

Analysis of maize competitiveness at farm and regional levels (Odhiambo and Musyoka, 2010) indicates that in the maize surplus areas in Rift Valley Province large scale maize production competes favourably with dairy and wheat enterprises. Maize is also competitive on smallholder farms in Rift Valley where it competes with dairy, tea and coffee. Using unit cost ratios

for comparison of competitiveness it has been found that in Uasin Gishu large scale farms, the unit cost ratio for maize was 0.67 and 0.75 on good and average farms respectively, but unit cost ratio for the competing enterprises were 0.90 for wheat in good farms and 1.20 for average farm. In Kericho for example the unit cost ratio for maize was 0.32 for good, high technology farms and 0.36 for a farm of average level of technology, while unit cost ratios for competing enterprises in Kericho were 0.32 for dairy, 0.47 for coffee and 0.71 for tea. In Kisii the unit cost ratio for maize was found to be about 0.51 on good farms and 0.54 on average farms. If we assume the same production and cost structure for tea and coffee to be similar for Kisii and Kericho, maize production in Kisii competes favorably with these two cash crops. All these unit cost ratio analyses are based on a simple approach that measures Unit Cost Ratio (UCR) as the ratio of Total Cost (TC) of production to the total value of output (Siggel and Semogorere, 2004, Siggel, 2007). Those enterprises with UCR of less than 1.0 are competitive while those with UCR greater than 1.0 are not competitive and by implication the lower the UCR value the more competitive the enterprise.

An updated analysis of unit costs of maize production carried out for this paper using current (2011) production and price situation are given in Tables 2.5 a - 2.5 c below. The analysis shows that in the large scale sector as represented by Uasin Gishu County, maize is still competitive with or without fertilizer subsidy giving unit cost ratio below 1.0 and range from 0.46 in good farms to 0.97 in low technology farms. It should be noted that farms with low technology levels have unit cost ratio of 1.03 and make losses when they have no fertilizer subsidy. On small scale farms however, maize grown in the high potential areas like in Kisii County are only competitive with good technology with or without fertilizer subsidy. The average farm is not competitive and only makes profit if fertilizer is subsidized. However, low technology farms in the small holder sector cannot produce maize competitively with or without fertilizer subsidy. They have unit cost ratios with values greater than 1.0. The situation is even worse in marginal maize deficit areas where Kitui County for example can only produce maize competitively and make profit with or without fertilizer subsidy if farmers adopt high crop management technology. Average or low levels of technology lead to making losses and lack of competitiveness with unit cost ratio of 1.15 and 1.21 respectively. Maize production costs and unit cost ratios as would be expected is too high rendering maize there completely uncompetitive, except for few risk taking farmers who are willing and able to adopt high levels of production technology.

In concluding this section it is worth noting that competitive maize production occurs mainly in the high potential areas and more so on the large farms or on transition commercializing smallholder farms in these areas that are willing to adopt modern production practices. All other small holders will continue to remain subsistence farmers only producing for home consumption and with only occasional surplus for sale. The other smallholders in the marginal areas suffer low yields and sometimes total crop loss due to vagaries of weather. For such farmers, diversifying to other drought resistant or drought escaping crops like sorghum, millet and other root crops like cassava and sweet potatoes would be better and wise alternative enterprises. Such crops should be promoted by government with adequate research and extension services to back up their promotion.

Table 2.5 a: Uasin Gishu 2010

Large Scale Farm Maize Production Costs and Returns with and without Fertilizer Subsidy

	Level of Technology					
	High		Average		Low	
With or Without Fertilizer Subsidy	With	Without	With	Without	With	Without
Yields (90 kg bag/ha)	70	70	50	-	30	-
Price per bag (Kshs)	1,800	1,800	1,800	1,800	1,800	1,800
Total Revenue(Kshs)	1,260,000	1,260,000	90,000	90,000	54,000	54,000
Total Costs of Production (Kshs/ha)	57,500	63,775	57,500	63,775	52,270	55,406
Net Returns (Kshs/ha)	68,500	62,225	32,500	26,225	1,730	-1,406
Unit Cost Ratio	0.46	0.51	0.64	0.71	0.97	1.03

Table 2.5 b: Smallholder Maize Production Costs and Returns with and without Fertilizer Subsidy in a Maize Surplus Area – Kisii County

	Level of Technology					
	High		Average		Low	
With or Without Fertilizer Subsidy	With	Without	With	Without	With	Without
Yields (90 kg bag/ha)	50	50	40	30	20	20
Price per bag (Kshs)	1,800	1,800	1,800	1,800	1,800	1,800
Total Revenue(Kshs)	90,000	90,000	72,000	54,000	36,000	36,000
Total Costs of Production (Kshs/ha)	57,500	63,775	57,500	55,406	47,000	47,000
Net Returns (Kshs/ha)	32,500	26,225	18,500	-1406	-11,000	-11,000
Unit Cost Ratio	0.64	0.71	0.80	1.03	1.31	1.31

Table 2.5 c: Smallholder Maize Production Costs and Returns with and without Fertilizer in a Maize Deficit Area (Kitui County)

	Level of Technology					
	High		Average		Low	
With or Without Fertilizer Subsidy	With	Without	With	Without	With	Without
Yields (90 kg bag/ha)	45	45	22	22	10	5
Price per bag (Kshs)	1,500	1,500	1,500	1,500	1,500	1,500
Total Revenue(Kshs)	67,500	67,500	33,000	33,000	15,000	15,000
Total Costs of Production (Kshs/ha)	40,000	37,000	38,000	37,000	20,000	15,000
Net Returns (Kshs/ha)	27,500	29,500	-5000	-4000	-5,000	-7,500
Unit Cost Ratio	0.59	0.55	1.15	1.21	1.3	1.0

Source: Calculated with Data from: District Farm Guides and Kenya Agriculture Economic Review of Agriculture (2010 and 2011)

Chapter Three

Maize Marketing System in Kenya

The maize marketing system had for a long time been under tight government control and regulation until 1994. This section of the paper will give a brief history of marketing system and then provide analysis of the workings of the present liberalized marketing system and the role played by the National Cereals and Produce Board (NCPB), a parastatal organization maintained as a player in the maize market in the post-liberalization era.

Background history of maize marketing

Historically, government controls over maize marketing was deemed necessary during colonial time and were therefore instituted to ensure that the European settlers had a safe and guaranteed local and export markets for their crop. As pointed out earlier, these settlers had found maize an easy, and inexpensive crop to grow for a variety of reasons. Besides; other European settlers with large plantations had also solicited for maize controls in order to be assured of local affordable supply to feed their labor force on the plantations and thereby keep labor wages and other costs low.

As pointed earlier out in Chapter 1, and as narrated by Zwanenberg (1972), in the 1920s when the world maize price was higher than the domestic market price, the European farmers through discriminatory policy influence enjoyed railway transport subsidies for their exports, and when the world prices of maize declined during the Great Depression of the 1930s, they were further subsidized by the colonial government to compensate them for the low prices. Again through KFA and other similar organizations they lobbied for a law passed in 1936 to allow the African maize market to be controlled such that the African maize had to be graded to meet specified export standards. It was also to be sold through government and KFA agents at a low price and to be shipped for export to face the low world market prices and create room for European maize in the then high priced domestic market. The arguments for a policy controlling the market were that the African farmers had low production costs and could afford to live cheaply; they also had no

overseas (UK) commitments and as such if not checked would undercut the European farmers if a free competitive maize market was allowed to operate in the country. The white settlers further argued rather weirdly that most of them had family ties in Europe or South Africa and elsewhere abroad which necessitated their commitment to incur travelling costs abroad at least once or twice a year to visit such relatives. Such discriminatory control policy systems were also aimed at (Zwanenberg, 1972 and Leys, 1975):

- a) Ensuring that the African maize coming to the market was up to the required quality as per stipulated grading standards. The white settlers believed that few African farmers were capable of producing quality produce, be it maize or any other crop newly introduced into the country including the export perennial cash crops like tea, coffee, pyrethrum and sisal
- b) Limiting African cash crop production so that they could earn less cash and thereby be able to supply wage labor to European estate farms. Africans had to earn cash to pay the mandatory hut or poll tax and also be able to buy newly introduced western consumer goods.

During the years of the Great Depression in the early 1930s when the world maize prices dropped below the local Kenyan market prices, and the cheeky white farmers lobbied for African maize to be exported and their maize to be sold in the domestic market erstwhile left for African farmers' maize when the world market was more lucratively higher than the domestic market. After the depression years and during the 1940s when the world market maize price rose above the domestic prices, the white settler farmers' influence over the control policy on maize marketing continued and they quickly pushed for a post-depression policy reversal so that the African maize was again to be restricted to the domestic market while European farmers' maize was to be re-channelled to the again lucrative export markets. During World War II, the production of maize and marketing was encouraged and controlled by the colonial government to support the war efforts. After the war and up to independence, maize marketing control remained a main feature of the agricultural sector in Kenya until 1993.

Thus, throughout the colonial era, the Kenyan agricultural dualistic society remained entrenched to ensure that Africans produced mainly food crops like maize, sorghum, beans, millets, potatoes and yams for the domestic

market. Special regulatory and commodity marketing boards were instituted and maintained to safeguard European interest and to market their produce (Van Zwerenberg, 1972 and Leys, 1975). Special regional maize marketing boards were set to regulate the marketing of the produce in African areas, while other special commodity boards and farmers' associations were set up and encouraged to support and regulate the production and marketing of white settlers' cash crops. After independence, these regional boards were amalgamated to become the Maize and Produce Marketing Board (MPMB), or later known as the Maize Produce Board (MPB) the precursor of what was later to become the National Cereals and Produce Board (NCPB) as we know it today (Odhiambo, et al 1994).

Post-Independence regulated maize marketing system

At independence, Kenya not only inherited the dualistic agricultural production systems of large and small scale farms, but also maintained and accommodated two parallel marketing systems for maize (Hasselmark and Lorenzl, 1976; Maritim, 1982; Odhiambo, 1989; DAI, 1989; and Odhiambo, et al 1994). The first was the official or regulated formal marketing system, dominated by the NCPB and its predecessor marketing boards. The official or the formal marketing system predominantly handled the large scale maize and some of the surplus production from smallholders. More importantly however, the formal marketing system directed its efforts to the urban areas and the maize deficit regions. The informal system on the other hand dominated the rural areas where smallholder maize was mainly channeled and only allowing some small portion to spill over to the NCPB dominated official or formal subsystem. Of course, after the market reforms involving market and price deregulation in 1994, the two subsystems were merged into one free maize marketing system with the NCPB left to play the role of the buyer and seller of last resort stabilizing the market (Odhiambo, 1996 and 1998). However in order to get a clear picture of what used to happen and what is currently happening in the maize marketing system now, the next two sections will present the analysis of how the formal and informal marketing systems operated and how the reforms were carried out that led to the present liberalized marketing system that merged the two.

The formal marketing system

Before the maize subsector reforms and the subsequent market liberalization, the formal maize marketing system was essentially monopolized by the National Cereals and Produce Boards (NCPB). The NCPB was by law empowered by the Government of Kenya under the Kenya Maize Marketing Act of 1962 (revised 1965 and 1972) and the National Cereals and Produce Board of 1985 to (Odhiambo, 1998):

- a) Purchase all officially marketed maize from both the large scale and small scale farmers and to sell such maize to large mills that produce flour to be sold to consumers.
- c) Import or export maize as need arose or as would be directed by government.
- d) Sell the maize as grain to wholesale and retail traders in the marketing system or directly to consumers in the urban or rural deficit areas.

The NCPB's monopoly over the formal marketing system and the government control over maize marketing were policies inherited and retained from the colonial policies which were established to protect European farmers, whom as we have seen, grew maize on a large scale as a cash crop. Again, most of the European farmers grew maize as an export crop and needed a regulated or controlled system that would assure them of a guaranteed market with an assured fixed price. Indeed during the Second World War, the Maize Control Board which was one of the predecessors of the NCPB was instituted with a compulsory order to ensure adequate maize delivery to the board to support the war efforts. After the war, the Maize Board reverted to its role of regulating the marketing system and providing the European farmers a guaranteed market and fixed prices.

When Kenya gained political independence in 1963, the new government inherited and retained most of the control mechanism in the formal maize marketing system. During the second decade of independence, it was found prudent to amalgamate the Maize Board with the Wheat Board to form the NCPB as a broad based parastatal organization that would handle not only maize and wheat, but also other produce like beans and minor grains such as rice, beans, sorghum and millet. More will be said later about the NCPB and its role during and after the maize market reforms

and subsequent liberalization. However, we need to point out here that the formal marketing system handled mostly the large scale farmers' maize and sold most of it to the large scale and medium sized millers. This aspect is discussed more in Chapter 4. During the market control the formal maize marketing system through the NCPB controlled about 30-40% of the marketed maize in the country with about 60-70% coming from the large scale farms. The smallholder maize therefore accounted for about 30-40% of maize going through the NCPB into the formal marketing system. All the movement and prices of maize and maize products were controlled by the government at all the marketing stages. The prices of maize and maize products were set on pan-territorial and pan-seasonal basis. To entrench its monopoly power in the market the NCPB had a network of buying centers and buying agents and depots in most of the maize producing areas in order to reach both large scale and small scale farmers in the country. The measuring units for buying and selling maize in the formal marketing system is the scale using table scales for bagged maize or a weighbridge or platform for bulk maize or for a large consignment of bagged maize delivered in trucks or lorries.

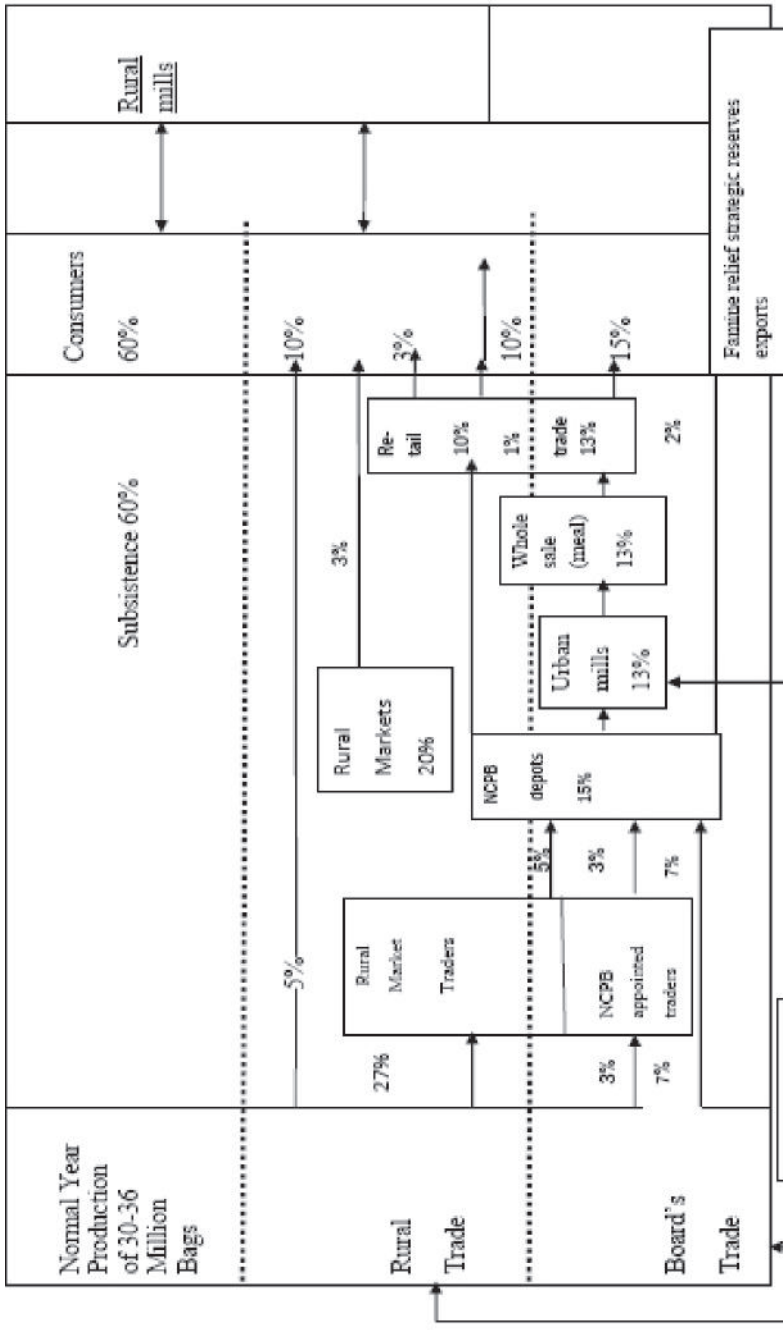


Figure 3.1: Maize Marketing Channels in Kenya, Before market Liberalization (1993)

Note: Normal Annual Maize Production is about 30-36million bags, but 2010 harvest was estimated at 38.5million bags

Source: Adapted from M.O. Odhiambo (1994) with new recalculated figures to reflect the 2010/2011 Situation.

The informal marketing system

It is worth stressing again here that before the reforms and the subsequent market liberalization, the maize marketing system in Kenya had the formal and informal marketing subsystems running parallel but complementing each other to some extent (Hasselmark and Lorenzl, 1976, Maritim, 1982; Odhiambo, et al 1994; and Odhiambo, 1998). While the formal marketing system was monopolized by the NCPB which in turn was under strict government control in terms of trade regulations and price setting at all its primary and secondary marketing, channels, the informal system was regarded as illegal but tolerated “free market”. Before the reforms, the informal marketing system operated under a lot of government restrictions on maize movements and quantity traded. However, the informal marketing systems dominated the most of the rural maize trade and served mainly the small holders with marketed maize surplus. The majority of these smallholders were in most cases net purchasers of maize, in that some of them would sell maize to the informal market at harvest time to meet some financial household obligations, only to turn back to the same market to buy back maize at times of maize shortage usually at higher prices.

Before reforms, the informal system consisted of mainly small scale traders who practiced arbitrage by buying maize from farmers or other traders in the maize surplus areas and then moving the maize to deficit areas where they sell it at some profit. Most of the maize was and still is transported using various modes of transport ranging from headlocks, bicycles, public transport vehicles like *matatus* and buses, pick-up or lorries. To circumvent the movement and quantity restrictions, some of the traders with lorries and larger quantity of maize than stipulated in law had to seek movement permits from the NCPB or the Provincial Administration or simply resort to bribing their way through police road blocks and other administrative law enforcement agencies. These practices and other restrictions made the informal marketing system inefficient and laden with high transaction costs.

The informal marketing system thrived despite the movement restrictions simply because most of the small holder farmers did not have easy access to the NCPB market, yet, those who had access to the NCPB found the quality requirements of the board were too stringent to meet in terms of maize grade and the dry moisture content (see Tables 3.1 and 3.2). Indeed, it was estimated that about 30-50% of smallholders had no access to NCPB and totally relied

on the informal subsystem for their maize sale. By 1980 and early 1990s before the maize market liberalization, the informal market altogether handled 50-60% of maize traded in the country and that about 70% of smallholders sold their maize through the informal marketing channel (Odhiambo, 1994).

Even before market liberalization, the prices in the informal marketing system behaved like those of a free market unlike prices which obtained in the NCPB dominated official formal marketing system that were controlled and fixed pan-territorially and pan-seasonally by government. The prices in the informal marketing system was set according to the supply and demand conditions and actually varied spatially and seasonally to reflect arbitrage and seasonal maize supply variations in the country. On overall, the informal market maize prices tended to be higher than the NCPB controlled prices, although they were influenced by the NCPB prices and tended to follow the trend of such officially fixed prices in the formal sectors. It is worth pointing out here that during maize shortages in the rural areas. Some of the NCPB maize found its way to the informal market as consumers and small traders were allowed to buy NCPB maize during such times. Again at harvest-time some farmers and traders in the smallholder sector sold maize to NCPB.

The traders in the informal system consisted of market traders, who were either sedentary or itinerant or both. Itinerant market traders would move to source maize from farms or from other traders in the maize surplus areas and transport it to market in the deficit areas where he/she would sell the maize to other traders and consumers. Sedentary maize traders on the other hand, never move out of their operating areas (market, shop, kiosk, stall or store), but instead purchase their stock from farmers or other traders who bring the maize to them or to the market where they operate.

The scale of operations for the market traders varied depending on the capital level of investment and the level of risk exposure they can afford to take given that the trade was regarded as illegal within the context of Maize Control Act. Before market liberalization the itinerant trader run a lot risk in terms of circumventing quantity and movement restrictions which were imposed on maize. Such traders often faced high transaction costs which apart from the purchase price and transfer costs, would also include bribing their way through the rent-seeking law enforcement agencies on the way. Some of the traders could be arrested, taken to court and fined or jailed for contravening the government restrictions. Depending on the scale of operations the

itinerant traders transported as little as head loads, bicycles loads, donkey loads or pick-up and lorry loads. Others used buses and *matatus* as modes of transport. Other studies like that done by Gsaenger and Schmidt, 1977; Schmidt, 1979; Martin, 1982; Barclay, et al, 1989; DAI, 1989 and Odhiambo, et al 1998 have even given them names directly, related to their modes of transport e.g.

- a) Bicycle maize traders
- b) *Matatu* and bus maize traders
- c) Donkey maize traders
- d) Pick-up maize traders
- e) Lorry maize traders

When the maize marketing system was finally liberalized at the end of 1993, all traders and farmers were free to move their maize in any quantity and to any part of the country as they may wish and charge any price they could get without any government interference. In the next section we look at the liberalized market and its impacts.

In the informal marketing system (just as is the case now in the liberalized market) maize is sold using various measuring units. The large traders like the lorry and pickup traders usually buy and sell their maize as wholesale where the maize is either sold in 90 kg bags and weighed using scales or in 2 kg *Kimbo* or *Cowboy* tins. At retail outlets however, maize is bought or sold using 2 kg or 1 kg *Kimbo* or *Cowboy* tins, although in some urban markets maize retailing can also be sold using scales as measuring units.

The liberalized maize marketing system

Introduction

After several steps and attempts to partially liberalize the maize market, the government finally announced on December 27, 1993 that the market was fully liberalized. Not many market participants believed the government was serious about the announcement, judging by past attempts of piecemeal liberalization followed by a series of policy reversals bringing back government control and regulations into the market. However, as it turned out the government stood by its announced market liberalization, and even

later pressure and appeals intermittently coming from farmers or consumers for the government to intervene were not directly heeded to, except through activities of the NCPB. As noted later the role of the NCPB in the liberalized market was that it had to be the “buyer and seller of last resort” whose role was to stabilize the free market by: (a) buying at slightly higher price above that prevailing in the free market when there is excess supply thereby cushioning the farmers against low free market price, and (b) by selling at a slightly lower price than the free market when there is shortage of maize and thereby protecting the consumers at such times when prices are high in the free market; (c) the NCPB was also charged with a social responsibility function of being the custodian of the strategic grain reserve (SGR) which was put at 6 million bags (but has often been operated at 3 million bags), that would be used as food security stock to be released in case of famine or a crisis of severe maize shortage arising from drought or a generalized crop failure.

Before discussing the operations of the liberalized maize market which has been in effect in Kenya since 1994 until the recent introduction of the Essential Commodity Act of September 2011 which brought back price control into the maize market, it would be appropriate to give a summary highlighting the history of the steps leading to full liberalization.

Summary of events and steps leading to maize market liberalization

As we have noted, the maize market control was introduced by the colonial government and fully inherited and retained or strengthened after Kenya gained independence in 1963. The NCPB reigned supreme as the monopoly parastatal body officially charged with maize trade. And as we have seen, there were restrictions instituted in terms of interregional or inter-market movement of maize and also in terms of quantities that could be moved. The NCPB and later the provincial administration had to give permits specifying the quantity, destination and ownership of any maize to be moved outside the official NCPB market channel. Police road blocks and barriers were erected on main routes or on suspected illegal routes, where contraveners would be arrested and their maize impounded. Those arrested were taken to court and given stringent jail terms or stiff fines. However, these restrictions led to maize smuggling and black market which encouraged and resulted in rent-seeking behavior whereby the law enforcement agencies or the permit issuing agencies could be compromised through bribery or other favors (Odhiambo et al, 1994).

The donors and other development partners, particularly the World Bank and the IMF through Structural Adjustment Programmes (SAP), the EEC (now EU) all tried to influence the government of Kenya to liberalize the market to make it more efficient. Of course the SAP and other related economic reform programs were not limited to the maize subsector alone but also covered reforms in other sectors of the economy.

Here below we provide a summary of the road-map leading to full liberalization of the maize market in Kenya. The journey to liberalization was checkered and was at times marked by a series of on-and -off policy implementation and reversals which really frustrated the major stakeholders in the industry including multilateral donors and other development partners. However, at long last in 1993, the government came out in earnest and proclaimed the market liberalized after various previous steps and attempts. The major hallmarks in the roadmap leading to the maize market liberalization can be summarized as follows:

i) The World Bank and IMF Structural Adjustment Programmes (SAP)

The Government of Kenya (GoK) at the instigation of the World Bank and the IMF undertook several successive stabilization and Structural Adjustment Programs (SAPs) in the 1980s. The initial SAP attempts were carried out between 1980 - 1984 but proved slow and seemed unsuccessful and frustrating to the World Bank and IMF due to lack of official firm commitment and compliance to policy prescriptions on the part of Kenya Government (Swamy, 1994; Odhiambo, 1998). This led to the suspension of adjustment lending by the World Bank. In the second phase of SAPs, the World Bank and IMF put stringent conditionalities, only releasing credit tranches to Kenya government when specified reforms within SAP were implemented. While the IMF conditionality was directed to general macroeconomic stabilization programs, the World Bank conditionality on the other hand focused its attention to specific reforms targeting building incentive structures for industry and agriculture including liberalization of pricing and marketing systems in these sectors. The maize market liberalization was included as a major program in Agricultural sector reforms during the period of 1986-1990. Thereafter gradual reforms including market liberalization in agriculture and other subsectors have been implemented.

ii) The European Economic Community (EEC) Cereals Sector Reform Program

The (EEC) Sponsored Cereals Sector Reform Program (CSRP) complemented the SAP of IMF and World Bank: Like other multilateral donors, EEC, the predecessor of the European Union (EU) took interest in Kenya's cereals sector reforms to supplement the World Bank and IMF SAPs efforts. The rationale for these efforts was that the market liberalization was expected to have positive impacts in the sector by reducing both operations and economic inefficiencies in the marketing systems. The EEC and GOK signed a memorandum of understanding (MoU) for a 5 year period with market liberalization timetable. During this time, the wheat and beans market eventually became fully liberalized in 1992. However, the government was slow in liberalizing the maize market which had to go through the following steps before eventually becoming fully liberalized at the end of 1993 (Odhiambo et. al, 1994).

1) The 4 Bag Rule

Under the movement and quantity restriction before the CSRP, one was allowed to move with only 2 bags (of 90kg each). However, in 1988 under the CSRP, this quantitative restriction was relaxed and raised to 4 bags per person per trip. This meant that farmers, small time itinerant traders and consumers could transport maize up to 4 bags without being harassed by the law enforcement agencies and without seeking an official permit to do so.

2) The 10 Bag Rule

One year after the implementation of the 4 bag rule (1985/89) under the CSRP, another relaxation was made to increase the quantitative restriction from 4 bags to 10 bags per person per trip. Anybody desiring to exceed this limit had to get a movement permit from the NCPB to avoid being arrested and prosecuted. This relaxation was meant to allow not only farmers and small traders to move more maize, but also meant to enable pick-up and small lorry traders to ferry maize to distant markets.

3) The 44 Bag Rule

In February 1991, under pressure from the CRSP, World Bank, IMF and other development partners, the GOK was able to raise the quantitative restriction from 10 bags to 44 bags allowed per person per trip. Again, a permit from NCPB was required if one needed to move any quantities of maize above this limit. This move was meant to open the market to more participants

including lorry traders and small millers who could then purchase maize not only from the small-scale farmers and traders, but also from the large farms which hitherto was only accessed by the NCPB.

4) The 88 Bag/20% Rule for Millers

As the GOK was relaxing quantitative restriction for individuals, a special relaxation on quantitative restriction was made for millers during the 1988/89 season. Under this rule, even large millers were allowed to procure up to 20% of their requirements directly from farmers or traders and the remaining 80% from the NCPB. This rule opened the market to the large millers to directly get maize from the farmers, albeit with a restriction that such purchases did not exceed 20% of the mills' annual maize requirements.

5) The 88 Bag Rule

The GOK in April 1992 made further concessions under the CSRP program and relaxed the quantitative restriction further by allowing individuals to move with up to 88 bags per person per trip. This was widely welcomed by the stakeholders and development partners as a positive move towards full liberalization. The rule opened up the market to competitive trading in the maize market and spatially separated markets in both the maize surplus and the maize deficit areas became integrated as reflected by differentials in prices related to transfer costs and other transaction costs.

6) Policy Reversal to 2 Bag Rule

The celebrations of the 88 bag rule was hardly over when the GOK in a surprising move announced in October 1992 that it had imposed a total ban on maize movement and only allowed 2 bags to be moved per person per trip as had been the case in days prior to the 1988 CSRP. This policy reversal shocked many market observers, not least, the development partners, particularly the EEC, the World Bank and the IMF. The private sector, particularly the millers and large lorry traders who had started investing on large-scale transport equipment and storage facilities were left wondering what to do next and whether to trust any future government policy pronouncements touching on the maize industry.

7) Policy Reversal again to 88 Bags

The ban and quantitative restrictions on maize movement remained in force for a full year, until October 1993 when the GOK announced a policy reversal allowing individuals to again move up to 88 bags per trip without a permit. This was soon followed by full liberalization announcement made on December 27, 1993.

8) Full Maize Market Liberalization

Perhaps reacting to adverse criticism it had to face from donors and other stakeholders following the policy reversal and the total movement ban on maize movement, the GOK decided to fully liberalize the maize market on 27th December, 1993. The World Bank and IMF conditionalities and pressure from other stakeholders became too much for the government to resist. The section that follows presents an analysis of the full maize market liberalization and its operations and impacts.

Maize Marketing after Full Market Liberalization

The full liberalization of the maize market meant in effect that the formal and informal marketing systems which operated as parallel systems became fused into one free market system, theoretically at least, supposed to give opportunities to enterprising and efficient participants in all the channels. However, following the official announcement of a fully liberalized maize market in December 1993, the 1994 New Year saw a lot of confusion in the maize market. Some “doubting Thomas’s” did not trust the government pronouncement and still believed the usual policy reversal statements would soon come to nullify the newly found freedom in the maize market. For a time the private sector participants did not want to risk investing on large scale facilities for maize trade. However, the celebratory mood was widespread among maize traders who felt they would practice maize arbitrage freely by getting maize from surplus regions and transporting it to deficit areas for sale at remunerative prices and thereby make enough profit to ensure their business sustainability. The maize retail prices rose sharply immediately after the market liberalization as a result of this profiteering mood felt by the majority of the traders. Producers also welcomed the liberalization as a move in the right direction, hoping that with a free market they would be able to dictate the farm gate prices to ensure their farming operations remained profitable. They also felt that any increases in input prices that

would push up production costs, would be easily passed on to the traders and eventually to consumers through commensurate increases in farm gate prices. The large scale millers also felt relieved as they would resort to free market to source for their maize for milling directly from farmers or traders instead of relying on the NCPB monopoly for the supply as had been forced upon them by government legal restricts during the days of regulations and control in the market. Most millers moved fast to procure maize directly from farmers or traders at their own terms negotiated with such maize owners.

The NCPB was however, caught wrong footed by the announcement of liberalization. Just before the liberalization, the government had put the NCPB in a quite paradoxical situation where it actually subsidized the millers and by extension the consumers. Before liberalization, the NCPB had been forced to work with zero distribution and operating margin by being directed by GoK to buy maize from farmers or traders at Kshs 950 and sell again to millers at the same price of Kshs 950 at no profit at all. But even more absurd was an earlier situation before the zero margin operations, when the NCPB had been directed by government to buy a bag of maize at Ksh950 or more from farmers, but resell such maize to millers, traders and consumers at a ridiculously lower price of Kshs 670 per bag. The situation was of course unattainable, but worse still, it encouraged “insider trading” whereby some unscrupulous NCPB officials allegedly bought or sold the board’s maize at this ridiculous price of Kshs 670 per bag and simply recycled it by selling it back to the NCPB again at Kshs 950 and thereby making a cool profit of 280 per bag on the spot. This scam led to the arrest and prosecution of several officials of the board and thereafter the zero operating margins policy was discontinued to seal the loophole.

Meanwhile, it should be noted that before the market liberalization, the informal free marketing system operated with higher prices than those prevailing in the NCPB official market. This explains why apart from millers, the board also sold its maize to traders and consumers. The informal market prices at the time market liberalization was announced were ranging from Kshs 1,000 to about Kshs 1,200 per bag as compared to Kshs 950 in the NCPB channel. However, when full liberalization was announced, traders taking advantage of the free market supply and demand conditions, started to raise the prices. Soon thereafter retail prices reflected the law of supply and

demand in the free market and regional spatial market price differentials started to emerge. In Western Kenya for example, retail prices rose from about Kshs.1,000 to Kshs 1,100 per bag, while in the maize deficit areas like Eastern and Coast provinces the prices rose up to about Kshs 1,500 per bag. Prices in Nairobi stabilized at around Kshs 1,450 per bag while in Eldoret, a town in the maize surplus region prices remained at about Kshs 1,000 - 1,100 per bag. The NCPB at this time could not compete with a price of Kshs 950 which they had been paying at time the market liberalization was announced. The board had to raise the prices it offered to farmers and traders in order to remain relevant in the new market environment. It did not take time to realize the liberalized market was acting as a double-edged sword cutting both ways from the farmers through to the traders, NCPB, millers and the consumers as the law of supply and demand and its automatic pricing mechanism came in to play.

First to feel the rude shock were the farmers in the maize surplus region of the Rift Valley. It happened that the liberalization announcement came at harvest time in this region, and farmers had thought that this time around they could not be forced to sell to the NCPB at Kshs 950 per bag, but would instead use their newly earned freedom to negotiate for a higher price with any buyer willing to offer them what they regard as the remunerative price. Indeed, millers and traders were coming up to their farms scouting for maize thereby even reducing them the burden of transport charges they used to foot when shipping maize themselves to the NCPB depots or to the NCPB buying centres. However, the farmers were rudely awakened to the fact that the free market also meant that the millers and traders had their own expectations and that their driving force was anchored on the ability to make profit in their respective business operations and to that end, they had also turned to bargaining for even lower prices. Thus, to the surprise of the farmers, the free market traders and the millers were willing to pay only Kshs 700 per bag instead of the official NCPB price of Kshs 950. The millers also argued that those farmers or traders having their own transport that would deliver maize to the millers' godown would be paid Kshs 1,050 per bag. This was free market at play giving signals through its pricing mechanism that only those operating efficiently would survive in such a market.

The farmers were to further find out that at this price the millers also put very stringent high quality requirement standards including strict observance of requisite moisture level of the maize at 13% moisture content for every

delivery consignment (see Table 4.1). Soon, farmers began to feel frustrated with the new free market mechanism and started urging the government to intervene at least to direct the NCPB to purchase their maize at a “reasonable” price that would not drive them out of farming business. Here in lies the dilemma the government has had and still continues to face up to now (2011); that whenever farmers start harvesting they press government to guarantee them a reasonable price through the NCPB and that they should not be left to the vagaries of free market and what they regard as the exploitative operations of middle men.

Millers at the time of liberalization felt relieved and were able to get their maize from the farmers and traders in the free market. The millers also felt that they had to raise the price of flour which hitherto had been strictly controlled and fixed pan-territorially and pan-seasonally by government. So, initially the millers increased the price of flour above its previously regulated level. The wholesale price of the 24kg bale of flour was raised from Kshs 360 to Kshs 500; while the retail price of the 2kg maize meal packet was also raised from Kshs 32.50 to Kshs 50. However, the consumer reaction was swift as most of them turned away from the fine sifted maize meal from large millers to the “*posho*” mill flour from small hammer mills. Most consumers in the rural areas and in small urban centres in the maize surplus areas or areas with adequate maize distribution resorted to buying own maize and taking to hammer mills for grinding. So, the large millers in such areas were adversely affected. Large millers in cities like Nairobi and Mombasa were however not much affected, although more *posho* mills emerged in some low income areas of these cities and other urban centres to cater for the poor consumers turning away from the expensive flour from the large mills.

Consumers also became affected adversely by the market liberalization particularly those who had been cushioned by controlled maize and maize meal prices in the formal market. The free market resulted in raised consumer prices as maize price increased in the open market and the maize meal prices from large mills were also retroactively increased. Many of them as noted already adopted a coping mechanism of resorting to *posho* flour ground in hammer mill which sprung up all over the rural and sub-urban areas. As the market started to adjust to the pressures of the reactions from the participants in the free market, millers soon realized that they were having stock piles of unsold maize meals as some consumers resorted to the cheaper *posho* meals.

Within the first four months of the free market environment, the large flour mills reduced their prices to Kshs. 450 – 480 per 24kg bag down from Kshs 500 where they had raised them immediately after liberalization.

In concluding this section, it must be pointed out that the reactions to the impacts of liberalization as discussed in the preceding section emphasizes what market participants and the government should expect when free market is at play. It gives signals through its pricing mechanism warning the participants that only those operating efficiently would survive.

NCPB and Maize Liberalization

What we have seen so far is that although the history of the NCPB can be traced to have its roots from the colonial market controls, it was formed in 1979 when the then Maize Produce Board (MPB) and the Wheat Board both inherited from the colonial government were merged into a single parastatal to handle the marketing of maize, wheat, rice, millets and other produce such as beans, peas, oil crops and other minor crops. The amalgamation of the Wheat Board and the MPB followed poor performance and weak financial bases of the two boards in the 1970s. The NCPB was established under the Kenya Maize Marketing Act Cap. 320 to handle all maize and other produce officially purchased or sold in the country. Again as we have seen, before the reforms, the NCPB monopolized the formal or official maize marketing system and was the only body that could import or export maize wherever such need arose. Other activities of the NCPB included the issuing of maize movement permits to traders and farmers as it was illegal to move more than two 90 kg bags of maize until the partial liberalization of 1988 which gradually eased the quantitative restrictions later to 10 bags. The NCPB was also the agency mandated to issue milling licenses to all millers who in turn had to buy all their maize requirements from it. The Board was therefore the sole supplier of maize and wheat to the larger mills and urban consumers.

The government controls over maize marketing in Kenya were inherited from colonial times and the activities of the NCPB and its predecessor, MPB, were designed to (Odhiambo, 1989 and Odhiambo, 1998b):

- i) Ensure the availability of adequate food supplies to meet domestic demand and prevent malnutrition;
- ii) Stabilize maize supplies in both surplus and deficit areas;

- iii) To provide a secure outlet for smallholder production and prevent possible exploitation of smallholders by private traders;
- iv) To provide ready market for the large scale farmers and thereby give them the incentive and encouragement to boost maize production in their sector for national food security;
- v) To maintain maize strategic reserves that can be used to mitigate against any unexpected maize national or regional maize shortage crisis arising from drought or a crop failure.
- vi) To control grain smuggling to neighboring deficit countries. This however, has been a doubtful proposition according some observers who believe that unrecorded cross-border maize trade has been more in favour of Kenya with more of maize in such trading tending to flow more into Kenya than out of it (Odhiambo,1994b and Ackello-Ogutu and Echesah, 1997)

To facilitate its buying and selling functions, the NCPB maintained a network of depots, stores, buying centres and buying agents. At the height of its monopoly power in the 1970s and 1980s, the board was handling about 50% or more of the maize traded in the country of which 70-80% was from the large farms and 20-30% from smallholders. Despite its extensive network of depots and buying agents, it has been estimated that while virtually all the large scale farmers had access to the board as a market outlet, about 30- 50% of small scale farmers had no access to this official marketing outlets (World Bank, 1982). Before the reforms of 1993, the majority of small scale maize producers depended on the informal or the parallel unofficial maize marketing subsystem for the sale of maize. The rural consumers also depended on the informal marketing system for most of their maize purchases and only resorted to NCPB when there were local shortages of the crops. It is estimated that farmers in the smallholder sector retain about 70-80% of their production for on-farm subsistence consumption. In Kenya as a whole, it is estimated that all farmers on average retain about 60% of annual maize output for onfarm use as food, for livestock feeding and as payment in kind or ration to farm workers (Odhiambo, 1989, Odhiambo 1994a). This situation is still very much the same even after the market was liberalized.

With market liberalization, the NCPB lost its monopoly grip and control of the maize marketing system on December 27th 1993 after a protracted five year gradual attempt at liberalizing the market where it had together with its predecessors maintained a hard grip for over half a century. Again as we have seen, after the GOK had indicated its willingness to liberalize the grain market under the IMF/World Bank sponsored SAPs, it managed to negotiate with the European Community (EEC now EU) to provide funding for undertaking a gradual Cereal Sector Reform Programme (CSRP) to be implemented within a period of 5 years. Under this programme, the markets for wheat, beans and other minor grain cereals were fully liberalized by 1992, while the liberalization of the maize market was left to go through a slow and controversial process until 1993 (Odhiambo, 1994a).

The Impact of the free maize market following grain market liberalization

Immediate reactions to maize market liberalization

The dismantling of state controlled monopoly of NCPB and subsequent removal of quantitative and movement restrictions together with price decontrol in maize trade meant the end of the dichotomous characterization of the maize marketing system as either informal (unofficial) or formal (official) subsystems. The two subsystems fused into one free marketing system attracting new entrants in form of large, micro and small enterprises engaged in maize trading and milling. There were mixed reactions when the maize marketing system was finally liberalized in 1993. Farmers and private traders jubilated over the move and expected the prices to rise at farm and all market channel levels not only to reflect costs of production and marketing, but even to the extent of allowing excess profits to be made by participants in the system. Consumers on the other hand were apprehensive expecting higher prices and exploitation by middlemen and other market participants. The donor community and some policy analysts also accepted it with skepticism, not ruling out a possibility of another policy reversal by the government. As it turned out, the GOK this time was serious and committed to its decision to liberalize the market and soon embarked on restructuring the NCPB with a view to making it fully commercialized in its operations and becoming the custodian of maize strategic reserve under specified performance contract arrangements. As we shall see later, the NCPB

was also later charged with another social function of not only maintaining the national grain strategic reserve (SGR), but also stabilizing the maize market by going in to buy maize at harvest or during glut at slight above free market price to cushion farmers from exploitation by middlemen at such times. Conversely the board was directed to protect consumer at times of maize shortages by selling its maize from its stores and SGR stocks or from import sources to reduce such shortages and thereby keep consumers' maize and maize meal prices to reasonable levels.

The impacts of maize market liberalization

What then has been the impact of the maize market liberalization in the last 18 years since it was effected? And after all these years since 1993, why has the government of Kenya found it necessary to go back to price control policy in the maize market as announced in the Kenya gazette giving the presidential assent to the new Essential Commodity Price Control Act of September 2011? These and many other related pertinent questions beg for answers. Again as noted earlier, initially the maize and maize meal prices rose sharply in the market as had been expected immediately the market was liberalized, but only for a short time. In order to put the discussion into the right perspective, it is worth having in retrospect, an idea of the prevailing situation immediately before and after the proclamation of market liberalization by the GoK. Just four months before the liberalization was announced, the NCPB through advice from GoK had increased the producer price of maize from Kshs.600 per 90 kg bag to Kshs 950, and was selling it at ex-depot price of Kshs 1,280 to millers, traders and consumers countrywide. However, when full liberalization was announced, millers and private traders started buying maize directly from farmers mostly at their own (millers' and traders') terms. Millers started claiming that they could import maize as cheaply as Kshs 700 per bag and that the NCPB selling price of Kshs 1,280 was expensive and unjustified. The immediate result was that the NCPB was caught up with maize stock-piles that it could not sell and it soon ran out of funds to make further purchases or to pay farmers for old purchases it had made with promissory notes. As the NCPB ran out of funds, most of the farmers had no option but to sell their maize to the free market traders and the millers even though they offered much lower prices at Kshs 700-900 per bag instead of Kshs 950 which had been prevailing under the NCPB monopoly market.

The situation did not change much as of 1994, but the farmers were in for a shock during the harvest season of 1995/96 when maize nominal producer price plummeted to Kshs. 400 – 500 per bag following a good harvest in that year. Farmers, especially the commercially oriented large-scale operators rose up in arms protesting against the low prices offered in the free market and implored the government to order the NCPB to go back into the market to rescue them from the exploits of millers and private traders. With prompting and funding from the government, the NCPB went back into the market offering Kshs 655 per bag as opposed to Kshs 400-500 offered by millers and the traders. The NCPB's move was ostensibly meant to stabilize the market but it did not have any impact as the government funding to the board was inadequate and it soon ran out of funds again; as had happened in 1994, the board was again caught up with expensive maize stock it could not sell in the market. Following the experience, many farmers especially those in the large scale farming areas that traditionally depended on the board for their maize sale became quite disillusioned with the liberalization of the market. Their experience in the wheat market was no better as millers found it cheaper to import than purchase the local wheat. Farmers were altogether disenchanted with the newly liberalized maize market and started to lobby for government intervention.

The government on its part reiterated that it had no intention of going back on its reform process and only resorted to increasing the variable duty charged on imported grains and other agricultural commodities as the only policy protection it could provide to the farmers. The duties were first fixed at 25% but have since been increased to 50% for wheat and maize following recent complaints from farmers about cheap subsidized wheat and maize being dumped in the country. The duties are supposed to be reviewed from time to time and have to be in line with the regulations of the World Trade organization (WTO) to which Kenya is a signatory. Because of the WTO's requirements the government has resisted pressure from farmers to use non-tariff barriers like the banning of cereal and sugar imports as a means of protecting local producers.

Since 1993, the NCPB's role in the grain market has been drastically reduced. In 1994 and 1995 for example the Board purchased only about 600,000 bags per year compared to 7-13 million bags it used to purchase and sell when it had full monopoly of the official marketing system. Indeed in 1996 and 1997

when the country was faced with maize shortage, the NCPB did not actively get involved in the domestic grain market partly due to lack of funds and partly because it was directed by the government to concentrate on relief efforts on behalf of the government, especially as regards tendering for such imports and distribution logistics in the famine affected areas.

The poor maize harvests in the two seasons of 1996 and 1997 following the 1994 reforms provided a testing opportunity as to how far the government was committed to the market liberalization. Although such shortages occasioned by the poor harvests have been regular and severe, it has been gratifying to note that the government has not found it necessary to interfere with the operations of the free market until just recently when the Essential Commodity Price Control Act 2011 was introduced. Before this new control bill of 2011 the only intervention as was done last year (2011) has been to temporarily suspend the duty on maize and other foodstuffs to encourage private traders as individuals or firms to import such items and sell in the local market and boost the local supply. Private traders have always responded positively to the opportunity and for the first time Kenyans went through a severe crop failure and maize shortage but without experiencing the queuing for maize and maize meal as used to be in the past whenever such shortages occurred and everyone was just looking forward to NCPB as the only savior. This time, as pointed out already, the NCPB concentrated its efforts on relief efforts with the government relief agencies in the badly affected areas, while the private traders and firms took care of the rest of the country. The maize prices which at that time had started rising sharply as a result of the poor harvest were later stabilized at affordable levels by the imports brought in by private traders. The government was saved from the hustle and direct costs of importing maize as had been the case in the past as private traders took part in the maize trade.

Another aspect worth mentioning as regards the liberalization of the maize marketing channels is that farmers who used to sell their maize to NCPB immediately after harvest have now adopted practicing on-farm shortage so that they can sell their maize to the free market when prices have improved. Subsistence farmers and smallholders who used to sell most of their maize at harvest only to go back to the market to buy maize again during shortages have also learnt to provide their own food security by storing portions of their harvest for home use. Since the old pan-seasonal and pan-territorial

pricing systems which used to be practiced by the NCPB no longer obtains, everybody including farmers, millers and consumers are only too aware that prices will be low at harvest and can rise very high in the course of the year as supplies dwindle. Storage though not yet a widespread practice among farmers and traders is on the rise and gaining popularity. However, most recently many farmers have found more challenges in maize storage and losses in post-harvest handling has been estimated at about 30%. The NCPB therefore introduced Warehouse Receipt System (WRS) to help farmers in storage at the NCPB depots at a fee. This aspect will be discussed later as to its merits and demerits and farmers' views about it.

Before ending the analysis on the maize market liberalization, it is worth stressing at this point again that the GOK's position on the future of NCPB has been and still is that it would never be wound up or privatized under any reform programme. Instead, according to the Policy Framework Papers on Reforms (1994 and 1996); it has been classified as one of the strategic parastatals that was to be restructured and maintained under state control. The original plans were that it had to be transformed into a fully autonomous commercially viable entity free to make independent commercial decisions and competing at par with other market participants. However, this extreme view was shelved, and instead in mid-1996 a team of experts was engaged to advise and help commercialize the board. The experts drew up guidelines and recommendations to GOK for commercializing the board, but it took some time before the board started on commercial operations. One explanation given for the delay was that the board during the first two seasons after the market liberalization was too busy with the relief operations during the maize shortages in the country. The government also took some time to look for funds to advance to the board to carry out its new mandates of commercial functions and the social responsibilities. However, with respect to the new mandate of commercial operations, the NCPB is expected to compete for grains purchases in the market with millers and the other now numerous and ubiquitous private traders without expecting any favour from the government. It is also supposed to be autonomous and has to enforce financial discipline and appropriate incentives that will enable it to maximize profits in all its operations in the local market and international trade. It was also proposed under the commercialization scheme that the NCPB's social functions carried out on behalf of GOK such performing relief operations and maintaining the strategic grain reserve would have to be adequately compensated for by the government.

However, farmers from time to time have never come to accept the autonomy and the commercial operations of the NCPB; and whenever they face low prices in the free market at harvest time, particularly when they have a bumper harvest they always must press upon the government to force the board to come to their rescue and offer them price above what the free market may be offering at such times. For example during the October/November harvest of 1997, wheat farmers protested against low prices being offered by millers and traders in the free market and the board was directed by the government to go into the market to stabilize the market by offering a price of Kshs 1,500 against the millers' price offer of Kshs 1,100. Similar protests by farmers have been witnessed in various years during maize harvesting time particularly among the large scale farmers in the Rift Valley. As recently as 2009 and 2010 the farmers' protests were louder even to the extent of lobbying against licensing traders to import maize and wheat to help build up domestic supply in the country as the NCPB ran out of stocks of these staples. This resulted in a sudden rise in maize and wheat flour prices and coming at a time of general high inflation, the consumers protested and sought government intervention. This may explain why the government had to yield and resort to the new Essential Commodities Price Control Act of 2011.

During the bumper harvest of 2010, the country was thrown into a crisis and great confusion. Some parts of the country in the Arid and Semi-Arid Land (ASAL) areas had total crop failure in over two successive years, while some parts of the country in the North Rift and in the Tana River and Hola areas had bumper harvests that farmers could not sell immediately or store safely. The latter area had its maize under a newly revived irrigation scheme which gave good harvest but for which neither the NCPB nor the farmers were prepared to handle. The maize was so poorly dried and badly stored that it was ravaged by both the Great Grain Borer weevil infestation and the aflatoxin fungal infection and had to be declared unfit for human consumption and was eventually destroyed under government supervision. While this was happening farmers in the North Rift areas of Trans Nzoia and Uasin Gishu were struggling to store their maize in an effort to wait for better prices as the free market was offering as low as Kshs 700 per bag down from the previous year's (2009) price of Kshs 2,500. The NCPB was at the time only willing to pay Kshs 1,000 per bag. After serious lobbying by farmers, the government finally intervened and gave the NCPB money directing it to pay farmers Kshs 1,800 per bag. As all these were taking place, the problem

spilled over to the 2011 season when serious shortages emerged again even in the areas normally considered safe with respect to maize supply. Prices rose to the unprecedented level of Kshs 4,000-6,000 per bag in some parts of the country between April and July of 2011. The prices later eased a little bit following the early harvest of the long rains crop in July and August in the lower parts of Western and Nyanza provinces. However, the harvests were far below their normal seasonal expectations and prices only dipped slightly to about Kshs 3,200 at a time when they should have been as low as Kshs 1,800-2,500. As this phenomenon continued, the perennially maize deficit areas were still facing another round of crop failure of three years in a row and were condemned to another episode of food relief by government and other NGOs again.

The essential commodity price control act of 2011 as major policy reversal in the maize sub-sector

If the government announcement of the maize market liberalization in December 1993 was regarded as a major surprise to many observers and stakeholders in the sector, the recent announcement in September 2011 of the re-introduction of price control came as a real shocker. After 18 years of liberalized marketing environment, and after resisting numerous past calls and pressure from farmers and consumers for its intervention in the market, nobody expected the Kenyan government to take such drastic measures turning back the gains of the free market the country has made all over these years.

However, in retrospect most skeptic observers and market participants back then in 1993 had doubted the sincerity of the government when it announced the market liberalization at that time, and many had expected to see policy reversed to take place as had been the practice in the past. The seemingly unresolved issues at the time of market liberalization 18 years ago were and perhaps still are. (Odhiambo, 1996)

- i) Is the maize marketing system able to thrive under a free marketing system in a country where there are major areas with deficit maize production? It was felt then and perhaps even now, that the maize marketing system was fragmented and under-developed particularly in the rural areas and that a few unscrupulous traders with easy access to funds could easily exploit both producers and consumers

- ii) The private sector with its profit maximization motives may not market maize to the remote areas of the country where shortages tend to re-occur more frequently. The infrastructure and the road networks in such remote areas are either non-existent or so poor that they would escalate the marketing transaction costs and thereby adversely affect profit margins for those venturing into maize trade in those areas. This then makes it incumbent upon the government and relief agencies to be the only bodies able to operate in such regions supplying maize and other food items whenever there are shortages and food crisis affecting such areas. Private traders in a free market system are not to be expected to be philanthropic enough to take operations in these areas.
- iii) The private sector again cannot be expected to invest in the development of infrastructural facilities in the country to facilitate trade. They cannot also be expected to invest in the stocking and maintenance of the maize strategic grain reserve (SGR) for the country. This can only be done by the government through the NCPB. This explains why the NCPB though commercialized during the reforms had also to be retained by government as a strategic parastatal organization charged with maintaining the SGR and also performing the other social functions of procuring, storing and distributing famine relief maize.
- iv) Another persistent issue at the time of liberalization in 1993 and which is still unresolved in the maize marketing system is whether or not the private sector is prepared to conduct the maize trade efficiently in terms of economic, operational and pricing efficiency without resorting to exploitative tendencies.
- v) Before liberalization, the movement and quantity restrictions slapped in the maize system by government control had not encouraged investments in large scale transport or storage facilities among the traders. Indeed, before liberalization the free informal marketing system although controlling about 70% of the marketed maize was dominated by the small scale traders, whose impact on the market, if at all, was due to their sheer numbers rather than their scale of operations and efficiency (Odhiambo, 1988 and 1996). The situation has not changed much as the large scale traders have become only seasonal, operating more intensively during maize harvesting time, purchasing in bulk, drying and selling to NCPB,

millers, or to accessible deficit areas only. These large scale traders have invested only modestly in transport and storage facilities, preferring to depend mostly on hiring such facilities during peak maize trading season. The small traders, whether itinerant or sedentary still operate in the same style and scale as they did in the old days of market control, the only difference is that now they enjoy free movement with their maize without harassment from law enforcement agencies.

- vi) At the time the donor agencies and other development partners were pressing the government for the maize market liberalization, they were also pushing for full liberalization of trade in other commodities in the country including those that the government considered then as essential in the lives of many Kenyans. Thus, in the long run the government eventually liberalized trade and price controls for such commodities like fuel, sugar, cooking fat, meat, milk, wheat flour, bread and many others. Consumers, especially in the urban areas, which had been protected through price control, have never been happy with the price decontrol of these commodities. They felt exposed to the risks of price increases, which manufacturers and traders often pass on to them as cost of production increase following vagaries of inflation, depreciating of the Kenya shilling, rising input prices, or changes in government tax levels. The ever-present question has been: “for how long was the government going to resist the persistent pressure from the consumer on the one hand, and the farmers, manufacturers and other producers on the other?” And which side would win?

Is the 2011 price control there to stay?

This is the mind boggling question posed by both the industry stakeholders, policy analysts and observers of the Kenyan Economy at large. The discussion in the next section presents some of the possible responses to this question.

a) Views Supporting Control

- i) Some people particularly the consumers have supported the new Essential Commodity Act of 2011 based on the following reasons.
- ii) Traders of the essential commodities tend to collude and do not allow the competitive market structure to prevail where the law of supply and

demand would set prices that would equilibrate the market. Left on their own, the private sector traders would continue to increase prices at will to the detriment of the consumers.

- iii) Some of the essential commodities like maize, maize meal and sugar are basic requirements to all households and unplanned increases in their prices will be detrimental to the poor households particularly the marginalized and the vulnerable groups. The argument here is that the government must protect such people.
- iv) With rising inflation such as that being witnessed in Kenya (during the 2011/12 period), where it has moved from about 4% to 17% within a year, many households particularly the low income groups have had their purchasing power severely eroded and may not afford the basic commodities if prices are allowed to increase freely without control.
- v) Controlling the prices of the essential commodities, especially those of maize and maize meal which take about 25% of the common man's food budget appears appealing populist sentiments, especially when such prices are characterized by extreme variability and volatility.

For the last 18 years since the maize market liberalization, both farmers and consumers have come out once in a while to press for price control whenever they felt squeezed by the free market price mechanism, but as we have said the government has often resisted or ignored such appeals.

In this respect, farmers have to some extent been lucky in that at times when free market farm gate prices for maize have fallen too low; their appeals to government to intervene through NCPB have often been headed with the government ending up directing the board to buy the farmers' maize at a slightly higher price suggested by government. For example in 2010 when traders were offering about Kshs 700 - 1000 per bag the NCPB was directed to pay farmers Kshs 1,800. During harvesting period of the year 2011 the government had directed NCPB to pay farmers Kshs 3, 000 per bag for the new season's harvest when traders in the free market were offering Kshs2, 500 per bag.

For consumers however, the situation has been different since the market was liberalized 18 years ago. They have been left to face the free market price which has been quite variable and volatile. The last five years have not only

seen rising commodity prices in the domestic and world markets, but also experienced low supply in both markets. Consumers have also faced rising inflation and general high cost of living during the same period and have therefore agitated for government intervention to control the rates of price increases for the essential commodities including maize and maize meal. The political leaders in the country seem to have heeded the consumers' complaints which they had repeatedly ignored in the past.

In 2011, parliament at last decided to intercede on behalf of the consumers and passed a bill re-introducing price control, for essential commodities in Kenya. The President initially hesitated to sign the bill, but as the inflation in the country got worse culminating in unprecedented increases in the prices of fuel, sugar, maize, maize flour and other essential commodities, he finally gave in and signed the Bill in September, 2011 thereby ushering in a new era of price controls in Kenya. At the time of writing this document (October, 2011) the bill had not been operationalized to become effective, except for fuel where the government had earlier on started price interventions.

b) Views against the Price Control Bill

- i) As the debate on whether or not to control prices again in Kenya raged in the country, several views opposing the move have come forth, and these include some of the following:
- ii) The price controls will bring back inefficiencies in the market as it will dampen the entrepreneurial initiative and competition in the market. Planning for production, marketing and profitability will be difficult.
- iii) Price control is likely to lead to hoarding of commodities and speculation among the producers and traders. This will create shortages and in the long run end in raising prices of the commodities even further.
- iv) Under price control regime, producers, traders and other commodity dealers will look for markets outside Kenya and some may relocate to invest in other countries with free markets. Again, if and when exporting such commodities are banned or restricted by law to ensure adequate supply in the local market, illegal trade or smuggling will spring up to create a "black market" for such commodities and local shortages will emerge. It will also become expensive in terms of policing to prevent such trade and effect the ban. Corruption including bribery and rentseeking behavior will get entrenched into the system to help circumvent such legal restrictions.

- v) If and when price controls give rise to local commodity shortages, the country will be forced to import such commodities at high extra cost and at the expense of eroding the foreign exchange reserves that would be better used to import capital for development.
- vi) Other stake holders in the maize industry and other sectors producing some essential commodities also argue that “you cannot control the price of commodities you do not produce.” The argument here is that the government does not produce maize, maize meal or other essential commodities and could not therefore control their prices.
- vii) Yet other analyst and observers argue that with overall reforms in the country including the recent promulgation of the new Kenya constitution, the government is going to find it hard to convince investors and other stake-holders that re-introducing price control is the best policy option it can resort to in this day and age. The re-introduction of the price control regulations is therefore regarded as retrogressive and a setback in the scheme of things when everybody in Kenya and the world over is striving to strengthen the free market environment.

Policy options open to government instead of price control

There are several policy options open to the government which it can pursue instead of reverting to the old and draconian price control regulations. The proponents of the views opposing price control as a policy have based their argument on the premise of the virtues of the mechanism of a free market and its price equilibrating mechanism which if allowed to function smoothly is likely to lead to higher marketing efficiency. The primary value of the unregulated price system is that it summarizes information in a form that can be readily conveyed to producers, traders, and other stakeholders and participants in the industry or the economy at large. The government therefore ought to revert to the liberalized market regime that the country has had for the past 18 years. A summary of available alternative policy options that could be used instead of price control in the maize sector are given below; but a more detailed discussion is presented in Chapter 5:

To stave off pressure from maize farmers regarding the farm gate prices for maize, the government should keep depending on the NCPB to act as buyer and seller of the last resort, going into the market when farmers are harvesting and supply is higher than the free market is able to handle. The board then

can offer prices above what free market traders and millers are paying to farmers which is usually low at such times. From experience, the board of course should know at what price it is likely to sell the maize later, which obviously must be higher than the price at harvest to enable it to cover its trading and storage costs. As noted already this market stabilization and commercial maize trade were some of the stipulated functions and activities of the NCPB took up when it was restructured instead of being privatized following the reforms and market liberalization in the 1990s. The board is also expected to use its purchases during such periods of excess supply to restock the country's SGR and to procure any maize it thinks would be required by government for the social functions of relief food supply in the areas affected by food shortages occasioned by crop failure rising from drought, floods or other calamities.

As buyer and seller of last resort, the NCPB is also expected as we have seen, to come to the consumers' protection by selling its stock of maize into the free market when shortages occur and prices rise beyond their normal level. In this way the consumer buying maize in the free market will get relieved as the boards supply into the market helps to lower the market price.

During maize shortages in the country the millers would also get maize at lower prices from NCPB and be able to pass on the benefit to consumers by lowering the price of maize meals sold to the consumers.

Other policy options open to government is to pursue strategies that would expand domestic maize production through irrigation, improving yields at farm levels, and providing ancilliary services and facilities such as research, extension service, farm credit, fertilizer subsidy and infrastructure that would boost production and marketing in the sub-sector. These aspects are discussed later in detail in the last chapter as part of the way forward in the industry.

Maize quality in the Kenyan market Informal quality assessment

The quality of maize traded in Kenya vary from with source of supply and post-harvest handling of the commodity. In the rural areas the maize quality is judged subjectively by sight and organoleptic assessment by market participants (Odhambo, 1994). Quality inspection in these informal markets is based on the human senses of touch, sight and smell to gauge moisture content, impurities, odour and colour of a batch of maize. From experience of farmers and traders maize is judged to be of good quality if the subjective assessment on these parameters is high.

NCPB quality requirements

In the formal maize marketing system which includes NCPB channels and those of the large scale and medium scale millers the maize quality standards are based on laid down parameters of quality that are measurable. In general, the NCPB maize purchases are based on Fair Average Quality (FAQ) limits which are reviewed from time to time. For maize these limits are derived from the Kenya Bureau of Standards (KEBS) for dry shelled maize. In general the NCPB has six (6) purity standards which in order of superiority include K_1 , K_2 , K_3 and K_4 , Under-grade and Rejects (see Tables 3.1 and 3.2). When NCPB receives maize from farmers or traders at their depot, the maize is subjected to laboratory tests using these standards and any shelled maize that does not make it to the grades of K_1 to K_4 and is not falling under 'reject' is classified as 'under grade'. Maize classified as 'reject' is unfit for human consumption and is normally destroyed and should not be allowed in the market. Basically, the grades and purity standards of maize are based on the proportion of its content of foreign matter, broken grains, pest damaged grains and other discoloured, rotten or defective grains (Table 3.2).

Some farmers, especially those whose post-harvest storage and handling of maize is poor have been heard to complain of these NCPB grading standards as too high and demanding whenever their batch of maize is rejected by the board. The NCPB has recently introduced Warehouse Receipting System (WRS) to help farmers store their maize in good quality while waiting for prices to improve in the market. This aspect is discussed in section 3.7.3. Millers buying maize from farmers and traders also follow the laid down KEBS quality standards. During excess maize supply in the market some farmers have had their maize rejected on what they say as on flimsy grounds and millers become stricter on quality standards. However during shortages the same farmers claim that some millers have been seen to lower their quality requirements to some extent. Table 4.3 shows some quality requirements set by large maize millers.

Table 3.1: NCPB Maize and Produce Grading Guidelines (FAQ) Standards for shelled maize

Defects	Grade Requirements (% by weight maximum)			
	K1	K2	K3	K4
Foreign matter	1	1	1	1
Broken Grains	2	3	4	4
Paint damaged grains	4	7	10	15
Other coloured grains (rotten, diseased and discoloured grain)	2	3	4	6
Total defective grain	10	13	20	30

Note: FAQ specifications are used by NCPB for purchases and storage guidelines and not for maize sold out which must conform with KEBS specifications.

Table 3.2: National Cereal Produce Board's Fair Average Quality (FAQ) Specifications for shelled maize and other commodities

Defects	* FAQ Limits (% maximum by weight)			
	Open stored maize	Bulk stored maize	** Beans	All other produce
Foreign matter	1.0	1.0	1.0	1.0
Broken Grains	1.0	2.0	2.0	--
Splits grains	6.0	4.0	5.0	--
Other coloured grains (rotten, diseased and discoloured grain)	2.0	2.0	3.0	--
Total defective grain	8.0	5.0	7.0	*** 6.0
Moisture Contents	13.5	12.5	15.0	***

NCPB Warehousing Receiving System (WRS) for farmers' quality storage

a) Why Warehouse Receipt System was introduced?

For a long time the government of Kenya has been frustrated by the high post-harvest losses that maize farmers incur during on-farm storage. Such losses estimated at about 25-30% include ravages by storage pests, infestations by aflatoxins, moulds and other fungi, direct rotting either as a result of poor drying and low moisture or as a result of leaking stores farms (Kenya, 2011 and NCPB, 2011). These losses are experienced on both large scale and small scale farms. Among the notorious pests are like;

- i) The weevils, particularly the Great Grain Borer (GGB) nicknamed '*Osama*' by the farmers due to its vicious attack on maize which if unchecked, soon turns the grain into a powdery mixture of flour and its excretion wastes. The GGB is not native to Kenya, but is believed to have been introduced into the country from South America in the late 1970s with imported or aid relief maize. The GGB is known to attack maize even when still standing in the fields unlike the common weevils that attack maize usually in the stores. The other common pests are the rodents that bore into grain stores and eat away the maize, while at the same time wetting, soiling and breeding in the same stored grains there by leading to fungal attack, rotting and other insidious damages to the produce.
- ii) Another phenomenon is the growing theft of maize from farmers' fields before harvest or in stores after harvest by what has been referred to us 'human pests'. With growing population, increasing unemployment and dwindling farming land, Kenya is facing a daunting threat from the unemployed youth, some of whom have resorted to stealing, violent robbery and even theft of farm products. This type of deviant behavior among the youth was rare in the old cultural set up; however with the breakdown in the rural cultural norms and taboos, the youth are increasingly adopting stealing of produce with impunity and as a way of life.

In an attempt to reduce on-farm maize storage losses, the government has in the past trained and employed some extension agents to teach farmers on the best practices in the farm grain storage through the Ministry of Agriculture Extension Services. Other donor Agencies like the United

State Agency for International Development (USAID) and the Swedish International Development Agency (SIDA) have all assisted through aid and technical assistance to let the government come up with more efficient and appropriate on farm storage structures and the necessary chemical and cultural on farm storage practices that would help reduce the high storage losses. Unfortunately, these initiatives carried out in the late 1970s and 1980s seemed to have had no noticeable impact and on-farm grain losses continue to be high in Kenya. More recently (in 2009/ 2010), an attempt by the government to introduce maize production under irrigation in Tana River and Hola areas, which seemed so successful in terms of maize yields and farmers' response became a disaster due to poor storage and lack of access to ready market. The government through the NCPB did not respond to buy the farmers' maize in time due to lack of funds. This was a paradoxical situation in the country in that as the bumper maize harvest in Tana River was being destroyed, in another part of the country in Turkana County, and in other parts of Northern Kenya people were facing devastating hunger and starvation.

In order to stem the rising on farm storage losses, the NCPB with encouragement and funding from the government and other development partners have recently introduced the Warehouse Receipt System (WRS) where the board takes in farmers' maize for safe storage until prices in the free market are good enough or when the farmer is ready to sell it. After accepting the farmers' maize for storage the NCPB issues the farmer with a special receipt which the farmer keeps and can use as collateral to apply for bank loans. When initially introduced, farmers were made aware of the terms and conditions of the WRS and the benefits such a system had for them. The farmers were also informed that they were to participate voluntarily in WRS where they have to deliver their maize to any NCPB stores and depots nearest to them where they are charged Kshs 160 per 90 kg bag and a further Kshs 15.00 per bag per month for storage. The farmers can decide to sell their maize later any time to any buyer of their choice and would not be forced to sell to NCPB or to the government to the end of storage. The board on its part agrees to store the maize to a maximum of 6 months or up to that time when the farmers would like to withdraw their maize earlier for sale or for own use. The WRS facility enables farmers to store their maize safely and with assured acceptable quality and moisture content. It also enables the farmers to avoid selling their crop in the free market immediately after harvest when the prices are usually too low. The WRS therefore helps to

cushion the farmers against exploitation by middlemen, large scale itinerant traders and private millers who tend to buy the maize at low prices during the harvesting season. For example, in 2010 private traders were offering to buy maize at between Kshs 700 to Kshs 1000 per bag at harvest time while the NCPB was directed by the government to offer to pay farmers Kshs 1500 per bag. The farmers on their part wanted to be paid between Kshs 2000 to Kshs 2500 per bag at that time. Later in the season as maize became scarce, the NCPB increased its purchasing price to Kshs 1800 per bag. In the harvesting season of 2011, following rising cereal prices in the regional and world markets, the farmers were asking for a price of Kshs 3500 per bag at harvest time, while the private traders on their part offered to buy the maize for between Kshs 2000 to 2500 per bag. The government on its part advised the NCPB as buyer and seller of last resort to pay farmers Kshs 3000 per bag.

Originally, when WRS was first introduced, the NCPB took in the maize without paying the farmers immediate cash, and instead issued the farmers with receipts which they were to keep and could use as collateral to get credit from selected banks partnering with the board for immediate financial needs. They were also informed that the charges for storage would be paid by farmers at the end of the storage period. Farmers have not been happy with the idea that they could not be paid cash on delivery of their maize to NCPB depots as used to be the case before WRS was introduced. As a result, some of the farmers with immediate or urgent cash have often fallen prey to the middlemen and millers who though offering low prices could pay them cash on the spot. After successful lobbying by farmers' groups, and their political representatives, the NCPB in 2011 harvesting season modified its WRS conditions and offered farmers the option of being paid Kshs 3,000 cash on delivery for those who want to sell their maize to the board immediately instead of just offering it for storage and waiting to sell it at a better price later. Another relaxation of the NCPB conditions for WRS in 2011 was that the board would accept farmers' maize at a higher maximum moisture content of 18% instead of the early requirements of 14% moisture content which the board then had to dry to the acceptable optimal moisture content of 13% before storage. These new changes in the NCPB's WRS conditions have been seen as positive and welcome news by the maize farmers and the response has been witnessed in form of the long queues of lorries waiting to deliver their maize to the major NCPB depots in the North Rift and Western Kenya where there was a bumper harvest 2011.

b) Advantages of Warehouse Receipt System (WRS)

Warehouse Receipting System (WRS) is basically a method of trading in grain that has been used in other countries and recently introduced into Kenya whereby grains like maize and wheat is deposited in a certified warehouse (NCPB in the case of Kenya) by a farmer or a trader. The depositor (Farmer/Trader) can decide to immediately sell the grain or store it while waiting for a better price (East African Grain Council (EAGC, 2010). According to EAGC and NCPB the depositor while waiting for a better price in future, can use the stored grain as security to access credit from banks which may offer credit up to 60 to 80% of the prevailing market value of the grain. Such loans will enable the farmer or the depositor to carry on with his normal operations or meet any other immediate financial obligations while waiting for a better price. On overall the following major advantages have been advanced for WRS: (EAGC, 2011 and NCPB, 2011);

- i) It enables aggregation of larger and tradable volumes of maize from scattered small scale farmers there by exploiting economies of scale in trading and storage operations.
- ii) The farmers are able to store their maize under optimal conditions using professional managers, modern drying and storage equipment. The NCPB uses modern bulk drying machinery equipped with automatic temperature, air and moisture regulating systems.
- iii) The farmer is assured of security of the maize while in the stored with a guarantee of not incurring losses from human or other pest damage or losses arising from moisture and rotting which are common features with traditional on-farm storage.
- iv) WRS allows the farmers to delay selling their maize at harvest time when prices are low and wait until the prices in the market are better.
- v) While waiting for maize prices to improve, the farmer using the WRS receipt from NCPB as security can access loans from financial institutions for immediate cash needs and other farm operations including purchasing farm inputs.
- vi) It increases financing of the agricultural sector to bring about investment in infrastructure such as warehouses, trucks and grain processing thereby increasing efficiency in the grain value chain.

- vii) The WRS allows farmers to access larger and more formal markets and enables them to sell to anyone in the market anytime either face to face or at a distance since the warehouse receipt issued by NCPB assures the buyer that the stored grain exists in real time, place and form and in known quantity and quality. This almost approaches what happens in future markets operating in the USA and elsewhere in developed countries in the world.
- viii) During the period of storage or at the end of the storage period, the farmer is free to sell the maize to any preferred buyer including private individuals or firms and to NCPB or relief agencies.
- ix) WRS enables transfer of maize from one owner to another without the added cost of transporting the commodity from one store to the next along with handling on and off trucks, bagging and re-bagging which would increase the possibilities of spillages and pilferage.
- x) Farmers are free to access market information regarding supply and demand conditions and prevailing prices from the NCPB, the extension officers, the media and other sources and can strategize and plan when and where to sell his stored maize.

In conclusion, it can be observed that WRS if efficiently managed can be of great help to farmers in terms of providing safe and quality storage for their grains. The recent changes in the NCPB's terms and conditions for WRS allow farmers the option of being paid cash on delivery is also a welcome move as many farmers used to complain of delayed payments. During the introductory stage of the WRS, farmers were told that they would only get paid when their stored maize had been sold and most of them became reluctant to use the system and instead opted to sell the maize to middlemen who were ready to pay them on the spot though at low prices. Another welcome move is the accepting of a higher moisture content of maize of up to 18% then leaving WRS to dry it up to 13% moisture content. The initial requirement that maize delivered to the NCPB for WRS had to have moisture content of 14% and lower or face rejection which was a bit harsh. This requirement resulted in high rejection rate of the farmers' maize and again forced them to sell such maize to middlemen who readily accepted to buy it at lower prices and then dry it later.

Following the experiences the NCPB has had with the high post-harvest losses incurred by irrigation farmers in Tana River and Hola, the board with assistance from government has purchased mobile dryers that will be used to dry farmers' maize away from NCPB depots, especially in those areas without access to the board's depots. In concluding this section, it is worth recommending that the government and the NCPB should always assess the impacts of WRS and the mobile dryers and see whether or not post-harvest losses on farms have been reduced. One other aspect of maize quality concerns the inspection of maize imported into the country, some of which have generated a lot of debate among the stakeholders in the industry and instilling some fear among local consumers. Maize being imported into the country should undergo pre-shipment inspection at the port of origin by qualified agents and only maize meeting the Kenyan quality specifications should be allowed into the country. This will do away with cases where maize is rejected at the port of Mombasa making the importing parties to incur huge losses.

Chapter Four

The Maize Milling Industry

It has been pointed out that as a staple food, maize is eaten in a variety of forms and that the greatest portion of maize is consumed in form of flour used to cook *ugali* (thick porridge) and *uji* (porridge). The processing of maize into flour involves grinding the grain into a fine powder form using milling technology that varies in size and method of operation.

Categories of maize millers

The milling industry in the maize subsector is made up of four major categories of private sector operators with the following distinguishing features (see Odhiambo, 1994a, Barclay et. al, 1989 and Mukumbu, 1992):

a) The large scale millers

The large scale maize millers are located in the large cities and towns like Nairobi, Mombasa, Kisumu, Nakuru, Eldoret and other large urban centres such as Kitale, Thika, Machakos and Mwingi (Table 4.1). Most of these urban centres themselves naturally are maize deficit areas as they have huge population of consumers most of whom do not grow maize of their own. The capacity of these mills range from 30,000 – 200,000 bags per month or 2,700 – 18,000 tons of maize per month (Odhiambo, 1994a and NCPB, 2011). Before the maize market liberalization these mills were licensed by NCPB but after the liberalization, the registration and licensing is now done by the Ministry of Industrialization. However, a recent consultation during this study in 2011 revealed that NCPB has resumed registering all the millers that buy imported or donated relief maize from the board. This is done for accountability purposes and to help trace the distribution and eventual destination of such maize especially during the maize crisis when many queries tend to arise and maize become politically sensitive.

The quality of maize meal or flour that is produced by large mills is expected to conform to the regulatory standard requirement of Kenya Bureau of Standard (KEBS). Most consumers interviewed during the field survey for this paper,

believed that the larger the mill the better the quality of its maize flour. Many of the consumers, particularly those in the urban areas therefore, tend to have preferential taste for flour brands from the large millers such as the Unga Limited Group, Mombasa Maize Millers and Pembe Flour Millers.

The technology employed by the larger mills is that of roller mills, but the product is further refined into sifted degermed maize meal which is then packed into 1 Kg, 2 Kg and 5 Kg packets (Mukumbu, 1992 and Odhiambo, 1994a). The 1 kg and 2 Kg are further packaged into larger bundles of 20 kg for distribution to wholesalers and retail outlets including the supermarkets. The large mills also produce other products like cooking corn oil and some bran for livestock feeds manufacture. Another range of products produced in these mills include the wheat flour produced for the bakery and confectionary industries. Each mill has registered trademarks under which they sell their flour with labels on the packets.

As noted earlier, the large millers before liberalization, used to procure all their maize and other grain requirements from the NCPB, but after market liberalization they have been free to either buy directly from farmers or from traders and the NCPB, and under terms and conditions they are able to negotiate with such suppliers. They operate their own storage and transport facilities for the maize and for their products. The millers are also free to choose their wholesalers, retailers and distribution channels, and are free to suggest wholesale and retail prices to their agents and customers in the marketing channel.

Before market liberalization, the government fixed retail and wholesale flour prices and the milling trade margins just as was done in the maize trade. Indeed, as was the case with the maize prices, the government resorted to pan-territorial and pan-seasonal pricing for the milling products. Since they process huge quantities of maize, the large mills require a lot of storage capacity for both maize and flour, and have therefore invested in storage and transportation facilities within their premises and in areas where they have major procurement or distribution operations. After the maize market was liberalized in 1993, most of the NCPB stores have been idle and some of them have been leased to millers to use for bulking and storing of the maize they buy from different parts of the country.

Table 4.1: The Large Scale Maize Millers in Kenya with their Location and Capacities, 2011

No	Name	Location	Rated Capacity in mt/24hrs	Maize , flour-bags per day	100% Capacity per 10 days
1	Eldoret Grains Ltd - Eldoret	Eldoret	225	2,500	25,000
2	Maize Milling Co.	Eldoret	200	2,222	22,222
3	Unga Limited - Eldoret	Eldoret	180	2,000	20,000
4	Mombasa Maize Millers (Ksm) Ltd	Kisumu	120	1,333	13,333
5	United Millers	Kisumu	135	1,500	15,000
6	Eldoret Grains Ltd - Kitale	Kitale	120	1,333	13,333
7	Kitale Industries Ltd	Kitale	130	1,444	14,444
8	United Millers	Moi's Bridge	100	1,111	11,111
9	Kitui Flour Mills	Mombasa	240	2,667	26,667
10	Mombasa Grain Milling Company Ltd (MMM)	Mombasa	330	3,667	36,667
11	Mombasa Maize Millers Ltd - Mombasa	Mombasa	610	6,778	67,778
12	TSS Group	Mombasa	150	1,667	16,667
13	Eldoret Grains Ltd - Mwingi	Mwingi	90	1,000	10,000
14	Kabansora Millers Limited	Nairobi	100	1,111	11,111
15	Mombasa Maize Millers (Nrb) Ltd	Nairobi	255	2,833	28,333
16	Nairobi Flour Mills	Nairobi	120	1,333	13,333
17	Pembe Flour Mills	Nairobi	270	3,000	30,000
18	Unga Limited - Nairobi	Nairobi	450	5,000	50,000
19	Uzuri Ltd	Nairobi	180	2,000	20,000
20	Osho Grains	Nairobi	90	1,000	10,000
21	Capwell Industries	Thika	240	2,667	26,667
22	Chania Mills	Thika	144	1,600	16,000
23	Eastern S Flour Mills	Machakos	120	1,333	13,333
	TOTAL		4599	51,100	511,000

Source: NCPB, 2011

b) Medium sized mills

These mills are capable of producing both sifted and *posho* maize flour. They may mill their maize and sell the flour under their own trademark like the large mills. However, most of their work is targeted at milling for individual institutions and wholesale traders. On average, each of the mills can handle about 20 - 50 bags per day (Mukumbu, 1992 and Odhiambo, 1994a). However, with the liberalization of the maize and flour markets, some mills have invested in larger capacities so that some of them in this category now go up to as high as 30 - 78 bags per hour or 2.7 to 7.0 tons per hour, especially during the peak seasons. In general, their capacities can be between 300 - 4500 tons per month depending on the level of investment and the seasonal milling requirement. Most of these mills are found in town centres in the maize surplus regions and their peak milling period is during and immediately after maize harvest. The medium scale maize millers usually face stiff competition in trying to sell their flour brands within the established channels used by the larger mill. Their market and distribution channels are therefore restricted to the local surrounding regions except when there are national shortages as happened in May – June period of 2011. Table 4.2 gives a list of some of the medium and smaller mills registered with government and the NCPB and the brand names of their flour as of October, 2011.

Table 4.2 Medium to Small Millers

Mainly Allied to the United Grain Millers & Farmers Association (UGMFA)

	Other millers	Brand	Estimated Capacities (bags (90kg) per hour)
1	Aberdare Maize Milling Ltd	Aberdare MPA	75
2	Meru Central Multipurpose Co-o Society	Afya Rahisi	70
3	Rosanne Investments Co. Ltd	Ahadi	4
4	Beada Millers	Beada Flour	4
5	Besoko Millers Ltd	Besoko	4
6	Babaku Enterprises	Bongo	4
7	Cateress Milling Ltd	Cateress	78
8	Kapari Ltd	Chapa Royo	9

9	Family Flour Mills Ltd	Family Flour	7
10	Midland Millers	Hybrid Swara	60
11	Joli Millers	Joli	10
12	Kalwa Maize House	Karibu	1
13	Centaur Milling Enterprises Ltd	Karibu Nyumbani	10
14	Organic Virgin	Kenflour	5
15	Kifaru Maize Millers	Kifaru	4
16	Umoja Flour Mills Ltd	Lucky Star	7
17	Mama Millers Ltd	Mama	35
18	Maycorn Kenya Ltd	Maycorn	60
19	Swaminarayan Industries	Milky	12
20	Super Real Foods Ltd (Msafiri Flour Mills)	Msafiri	42
21	AUM Maize Millers	Nyuki	5
22	Meru Pendo Millers	Pendo	1
23	Kwest Millers	Pendo	2
24	Batian Grain Millers	Sana	24
25	Sava Industries	Sava	12
26	Katex Enterprises	Sawa	8
27	Pan African Grain Millers	Starehe	14
28	Sunrise Grain Millers Ltd	Sunrise	10
29	Njora Food Products	Superior	4
30	Sweet Meal Flour	Sweet Meal	4
31	Valley Posho Mill	Valley Star	10
32	Mabrouk Flour Mills	Neema	9
33	Daiga Millers	Rift Valley	15
34	Uchumi Grain Millers Ltd	Msosi	14
35	Summer Millers Ltd	Wembe	7
36	Range Food Products	Range Flour	10
37	Snow Maize Millers	Snow	10
38	Gakenge Maize Millers Ltd	Ziwa	10
39	Nanyuki Grain Millers	Manna	36
40	Sabco Millers Ltd	budget	10

41	Embu Food Industries	Besta	5
42	Nicely Nicey Maize Millers	Nicely Nicey	20
43	Glory Posho Mills		2
44	Subukia Millers & General Store		4
45	Faru Flour Products		8
46	Dandora Millers	Dan Mill/ Harmony	17
47	Jamhuri Grain Millers	Kitale	10
48	Kirima Millers	Kirima	10
49	Bima Grain Millers	Bima	4
50	Pamtac K. Ltd	Wamunyu Star	4
51	Garissa Maize Millers	Garissa	6
52	Queens Food Millers Ltd	Queens	2
53	FAJ Safeway foods Ltd	Insta Health Builder	2
54	Royal Maize Millers	Malkia	10
55	Pripal Millers	Kep Unga	4
56	Amos Ndungu Gatiki		4
57	Jikaze Maize Millers	Maba	10
58	Miriru Millers		2
59	Crown Foods Products		2
60	Thika Grain Millers		3
61	Umande Millers	Umande	2
62	Gilgil Grain Ltd	Asili	2
63	Migosi Cosmos Investments		2
64	Victor Posho Mill		2
65	Riconero Agency		6
66	Ng'ang'a Posho Mills		6
67	Belgut Enterprises	Kanga	6
68	Gatakari Millers	Bora bora	6
69	Mums General Suppliers	Mums	6

70	Milimani Stores Naivasha		6
71	Sifa Millers	Sifa	15
72	Proctor & Allan EA Ltd		10
73	Benmar Investment		2
74	Muki Maize Millers	Muki	7
75	Karanda Millers	Karanda	2

Source: National Cereals and Produce Board (NCPB, 2011)

a) Small maize mills

The small mills are capable of milling 5-20 tons of maize per day (Mukumbu, 1992). They normally have one smaller roller mill complemented by a hammer mill run mainly by electricity. During peak milling season they can do up to about 50 – 75 bags per day, but sometimes do as low as 2-3 bags per day during the off-season. Although they may mill their own maize and sell the flour within the surrounding areas, the bulk of their work is custom milling for farmers and traders, consumers or for private and governmental institutions like schools, hospitals and prisons in the rural areas or small urban areas. Most of them started with small investment as *posho* mills, but have graduated upwards as demand for their services increased particularly after market liberalization.

Some of the small millers have both a huller and the usual hammer mills so that they can produce the meal referred to as *posho* and the degermed brand of flour from hulled maize often referred to as No. 1 maize meal (Mukumbu, 1992 and Odhiambo, 1994a). Apart from milling under contract for customers, these mills also produce their brand of flour which they sell to local wholesale and retail outlets. They also face stiff competition not only from the larger and medium sized millers but also from rural and urban *posho* mills. Their flour is therefore sold at a lower price than those of their superior competitors.

b) Posho mills

The *posho* mills are to be found in most of the rural areas both in the maize surplus and maize deficit areas. They serve the rural households with small quantities of maize to be milled at any given time. The mills are mostly hammer mills powered by diesel engine although with the wide spread rural electrification program in the recent years, some of them are now driven

by electric power. These mills have taken over from the traditional hand stone grain grinding technology practiced by the rural women since time immemorial up to the 1950s and 1960s. Apart from being normally located in the rural market centres and villagers settlements, *posho* mills have also come up in large numbers in urban settlement. In Nairobi city and major towns for example, the mills are to be found within the low income areas or among urban low income groups where consumers can buy maize from traders in small quantities and take for grinding in such facilities.

The maize is milled as a whole meal without hulling or degerming or sifting at the rate of Kshs 10 per 2 kg *kimbo* tin or Kshs 400 per 90 kg bag. The poor or low income families find such maize meal cheaper than the packaged flour from the large mills. For example, during the maize shortage period of 2011, the large mills' 2 kg package of flour was retailing for Kshs. 180 - Kshs 190, or Kshs. 90 - 95 per kg, while the equivalent maize would cost the consumer Kshs 160/= which includes buying the maize at Kshs 150 per 2 kg tin and having it milled in a *posho* mill at Kshs. 10. This translates to about Kshs 75 per kg of *posho*. At harvest time in 2011, the prices fell and the large mills flour was selling at Kshs 60 per kg while the *posho* equivalent cost Kshs 40.

These mills serve farmers, consumers, traders and rural institutions like schools, food kiosks and restaurants. *Posho* mills mostly do not grind their own maize and therefore have no products to sell but almost exclusively depend on consumers' and other customers bringing in maize in various quantities to be milled at a fee which in 2011, was ranging from Kshs 10-20 depending on the locality.

Maize quality specification by millers

Before the maize market liberalization, the maize millers in Kenya got the bulk of their maize requirements from the NCPB. Such maize was in most cases of high quality at least conforming to the KEBS specification. With the liberalization of the market, the millers started sourcing some of their maize from farmers and traders in addition to the NCPB. Such maize is usually not of a guaranteed quality standard. Most of the large mills therefore have set minimum quality specification standards which suppliers must conform to (see Table 4.1). However, for general trade they are required to conform to KEBS specification as used by NCPB (see Tables 3.1 and 3.2 in Chapter 3). Some farmers have been heard to complain that the millers tend to be too

strict in grading when there is plenty of maize in the market, but seem to relax their standards when maize gets scarce. Millers however argue that farmers seem to be in a hurry to sell their maize even when the moisture content is still high. In such cases traders and millers with drying facilities take advantage of such farmers and buy such maize at prices negotiated below the market price then take it for drying at their own costs before selling to millers or the NCPB.

Table 4.3: Quality Requirement: Specifications of some Private Maize Millers in Kenya.

Defects/factory Checked	% maximum allowed by weight	Verbal Description and Comments
1. Impurities 2. Test weight per hectolitre	0	Free of impurities Good = 75kg/ hectolitre Average = 74kg/ hectolitre
3. Moisture Content	< 12.3	Properly dry
4. Insect Infestation		No infestation, no insect, almost no damage
5. Insect damage	0.5	Almost no insect damage
6. Foreign matter: - Maize Cobs - Stalks - foreign seed	<1 <1 <1	All should be less than 1%

7. Earth, Stones, Soil and Sand	0.3 = 0.4	Preferably zero
8. Germinated Grain	0	Nil
9. Mouldy, rotten grain	0	Should be zero to avoid αφλατοξιν
10. Musty (Peculiar smell or harvested wet)	0.5	Preferably nil
11. Discoloured grain:		
-- orange	0	Nil
--- yellow	0	Nil
12. Broken grains	0	Nil

Source: Authors' Field Survey, 2011

Pricing of the maize flour

During the days of the market and price controls before the market reforms and liberalization of 1993, the price of the maize flour in the formal marketing system was controlled by the government. The government not only controlled the farm gate prices of maize, but also fixed the NCPB prices and the price millers paid for the maize in the formal market. The government also fixed the price of the flour from the mill gate up to the wholesale and retail levels. The flour price was fixed pan territorially and pan seasonally each year. Of course as we have seen, the objective of the price control was to protect farmers and consumers at both ends of marketing channel. The maize and the flour in the informal marketing system again as we have seen, were traded under free market conditions where supply and demand determined the prices. Indeed, it was often argued that the NCPB controlled formal maize market and the fixing of flour prices were mostly meant to protect the vocal urban consumers who could easily riot at any slightest increase in price of maize or maize meal. The majority of rural consumers who used the informal market and were often less vocal were left to their own devices to face the vagaries of price variability and volatility.

After the maize market liberalization as we have noted, the informal and formal marketing systems merged into one and the price of maize and that of flour were left to find their equilibrium levels through the mechanism of supply and demand. The price of the sifted maize flour from the large and medium scale millers has been always higher than the prices of the *posho* mill flour. The large scale millers always suggest the wholesale and retail prices as a guideline to their product dealers. However, wholesalers and retailers have often gauged the market and perhaps with consultations with the millers, have set different prices for different brands of flour produced by the competing large millers. In the industry, the flour from the Unga Limited Group of companies for example has often been sold at a price slightly higher than the flour brands from the other milling companies. At the time of writing this paper (October 2011), the Jogoo Unga brand of 2 kg from the Unga Limited Group was retailing at Kshs 120 while other maize flour brands from other millers were retailing between Kshs 110 to 115 in most of the Nairobi retail outlets. During the period of maize shortage in May – July period of 2011, the respective prices were Kshs 180-190 for Unga products and Kshs 165 – 175 for others.

Recently the government enacted, the Essential Commodities Price Control Bill of September 2011, to the surprise of most stake holders in the industry, and the donor community. However, some weeks down the line the government had not worked the modalities for operationalizing such controls in the maize and maize meal subsectors although these commodities have been listed as some of the essential commodities covered in the new bill. Analysts and critics of the bill as we have noted elsewhere in this document, questioned how the government would control maize and maize meal at the consumer end of the marketing chain without controlling the prices at the production and middlemen levels of the value chain.

Most analysts argue that the government should leave the market to operate freely as it had done under the liberalized environment for the past 18 years, and should only be able to delineate spots and areas where there are food crisis and famine and then develop targeted interventions strategies in terms of delivering of food relief or food subsidies to the affected persons or areas. This would require having in place an early warning system and a proper mechanism for identifying the affected areas, the number and the locality of

those affected or vulnerable groups that may need food assistance in terms of maize flour and other food items. So, we can conclude that the liberalized flour market has been competitive and should be given incentive to stay that way so that the prices can respond to the forces of supply and demand and be able to vary spatially and seasonally as the case may be.

A blanket market price control will not only prove expensive and unmanageable but will also lead to forced local shortages, hoarding, smuggling, and speculation. Also as noted elsewhere in this lecture, the role of the government should be that of providing a level playing field for the industry participants ranging from farmers, traders, millers, to the consumers and other stakeholders. The free market mechanism and its automatic price adjustment mechanism should be allowed to work without undue intervention from the government. The practice of the government funding and working through the NCPB as buyer and seller of the last resort in the industry has been accepted and embraced by most of the stakeholders and participants in the industry and should continue to be that way. Direct government control of prices may prove counter-productive and should be avoided as much as possible.

Chapter Five

Conclusions and Recommendations for Improving the Maize Subsector for Food Security

Introduction

From the analysis presented so far, it can be concluded that maize will still remain the most important staple crop in Kenya, both in terms of consumption and in terms of extent and intensity of production. It is also clear from the analysis that domestic production has been fluctuating around 27-36 million bags per year and unless something is done to boost the production Kenya will start importing maize on a regular basis in order to meet consumption demand to satisfy the fast growing population. The dilemma facing the country in the import scenario is that the world maize market price is not only subject to high variability and volatility, but is likely to remain high judging by the recent increases witnessed in the last five years. Maize supply in the world market has been low following the high demand for the commodity in other parts of the world for other uses like livestock feeds and for bio-fuel production.

There is therefore an urgent need for a government policy shift to boost local production of maize through providing incentives to farmers and the general private sector in the maize subsector. In addition, the government policy shift should also include increasing public expenditure in the agricultural sector and more particularly in the maize subsector in terms of (a) increased expenditure in maize research; (b) investment in irrigation to expand the area under maize crop in areas where irrigation is feasible and thereby supplement the rain-fed production; (c) Increased expenditure on agricultural extension services in terms of providing more technical staff and equipping such staff with adequate facilities for effective extension services; (d) Provision of adequate farm credit facilities to enable farmers to purchase the yield enhancing inputs like fertilizers and certified seeds. Where possible targeted input subsidizes should also be considered as has happened in Malawi; (e) Provision and development of infrastructure is also of paramount importance in boosting production and marketing of maize.

Good infrastructure enables farmers to have easy access to the market for both inputs and farm outputs.

Another policy shift needed is for the government to develop strategies of encouraging the diversification of the production and consumption of other food crops to help supplement or substitute maize as a staple. There is need to develop and promote some of the traditional maize substitute crops like sorghum, millets, cassava and other root crops like Irish potatoes and sweet potatoes to help ease pressure on maize consumption demand which is bound to get worse with the fast growing population.

How Kenya can increase total maize production

Faced with a fast growing population and the high demand pressure this places on maize as a staple food crop, there is an urgent need for Kenya to develop strategies for increasing its maize production.

The following are some of the ways that Kenya can increase its domestic maize production:

a) Boosting maize yields on farms

Increasing maize yields per hectare is one way open for increasing total production of the crop in the country. The national annual average yields of maize observed over the years are low and range between 13 – 22 bags per hectare or 1.2 – 2.0 tons per/ha. Potential yields in Kenya on the other hand have been put as high as 5-8 tons/ha as recorded in experimental research stations (Mose, 2011). These yield figures are also supported by the Kenya Plant Health Inspectorate Service (KEPHIS, 2011) National Maize Variety List which is published regularly to show farmers the approved hybrid and other certified maize seed varieties for planting in various agroecological zones in the country. This list indicates that grain yields of the various maize varieties range from 4 – 15 tons per ha. Such yield figures reveal a huge yield gap between the potential and the present average yields (Tables 5.1, 5.2, and 2.5a-2.5b in Chapter 2). From these statistics it is apparent that with special efforts on improvement of crop husbandry including proper use of modern purchased inputs in the maize farms, Kenya can have farm yields increasing by up to 100 to 500%. This implies that in terms of production, Kenya as a country can more than double its maize production without expanding the current land area allocated to the crop, but by simply giving the farmers appropriate incentives to adopt the recommended technology and crop husbandry practices.

Table 5.1: Maize Yield Gap by Various Agroecological Zones

	Coast Low	Mid Altitudes		Transitional Medium Attitude	High Attitude Late maturing
		Lower	Upper		
Area ('000 Ha)	22.2	217.7	116.8	111.0	720.0
Production ('000 Tons)	53.0	238.0	232.0	1,234.0	910.0
Research Yields (Tons/Ha)	3.3	2.7	3.7	5.2	6.7
Farmer Yield (Tons/Ha)	1.0	0.5	1.1	0.7	2.0
Yield Gap	2.3	2.2	2.6	4.5	4.7

Source: Mose, 2011

The average maize yield in the country rose in the 1960 and 1970s, but have remained almost constant around 2.0 tons per ha since then. The lowest maize yield is recorded in Coast and Eastern provinces and the marginal Arid and Semi-Arid Lands (ASALs) areas. High yields are realized in the major maize producing counties and districts in Rift valley, Western and Nyanza provinces. It is obvious that the Agro ecological zones as influenced by attitude, rainfall and soil conditions determine the natural maize yielding potential. However, crop husbandry, technology level and agricultural extension services will increase the yields actually realized on the farms thus the gap between the actual and achievable yields in both the high and medium potential areas and the low potential areas can be narrowed through deliberate policies aimed at boosting yield in each of the agro ecological zones.

Maize productivity or yield have been shown through field experiments and on-farm demonstrations to increase through the use of such recommended agronomic practices such as use of certified seed, early planting, proper spacing or optimal plant population per hectare, proper weed control and optimal fertilizer application. Allan (1980), for example, reported that experiments in the 1960s in Kitale Research Station estimated that about one bag of 90kg is lost per day of late planting per hectare. In practice most farmers plant their maize late due to a variety of reasons including some of the following:

- i) Late or delayed land preparation especially when farmers depend on hired ploughing and harrowing services.
- ii) Late arrival or poor distribution of seeds, especially when recommended certified seed is unavailable in some farming areas. Late arrival or poor distribution of fertilizers when farmers are forced to wait for this essential input and at worse the farmers may be forced to plant without fertilizers after a long wait
- iii) Lack of labor or machinery for planting particularly when many hectares are to be planted with maize. At peak of planting period farmers face many bottlenecks and compete for labor and for hired maize planters.

Other field experiments and on-farm demonstrations have indicated that proper fertilizer application can boost maize yield tremendously above those obtained without applying this important input. Table 5.2 below gives an illustration of how fertilizer application can increase yields substantially in selected Counties and agroecological zones.

Table 5.2 Possible Impact of Fertilizer Application on Yields in Selected Districts And Counties

Country/ district	Agro eco- logical Zone	Lasting yield without fertil- izer kg/ha	Yield with fertilizer Kg/ha	Increased yield from fertilizer kg/ha
Siaya	LM1	1,200	2,200	1,000
Bungoma	LH1	2,500	4,200	1,700
Kakamega	UM1	1,500	3,200	1,700
Nandi	LM1	2,000	3,300	1,300
Trans Nzoia	UM3	2,000	5,500	3,500
Muranga	UM2	1,900	3,000	1,100
Nyeri	UM3	1,800	2,800	1,000

Source: Ackello-Ogutu and Odhiambo (1986)

Irrigation as strategy for expanding land area under maize

Apart from improving maize yields per hectare in rainfed agriculture, one other option for increasing total maize production in Kenya is through a policy of promoting expansion of land put under maize through irrigation. With increasing population, there is already very high pressure on arable land available in Kenya, particularly under the traditional rain fed agriculture. Given that over 80% of Kenya is made up of Arid and Semi Arid Lands (ASALs), the rain-fed agriculture and hence traditional maize growing is concentrated in the remaining less than 20% of the country classified as the medium to high potential lands. The dilemma is that most of the population (about 80%) of the country is also disproportionately found in these medium and high potential areas and as a result farm sizes in some of the areas have been subdivided below their economic size. However, attempts to expand maize and other crop cultivation into ASALs have resulted in very poor yields or total crop failure as a result of the harsh climate with poor and unreliable rainfall. Indeed, most of the ASALs, where about 16-20% of the population lives, are characterized by livestock keeping as the major activity of earning livelihood by the agro pastoralists and pastoralist communities living in these areas (Rakotoarisoa, 2008).

In the foregoing scenario, one of the options open for increasing maize production under expansion of the land put under the crop is by adoption and investment in irrigation schemes. Kenya still has high untapped irrigation potential, and out of an estimated 540,000 hectares of irrigable land, less than 90,000 ha have so far been irrigated (Kenya, 2004).

Irrigation programs as a means for increasing arable land for maize production will need a co-ordinated policy for investment and development involving the following existing government ministries and departments:

- i) Ministry of Agriculture to provide technical input in terms of crop husbandry and extension services.
- ii) Ministry of Water and Irrigation to provide the necessary technical advice and actual implementation in the engineering, water supply and control and other infrastructural development, since under the current government set up it is the ministry responsible for irrigation in the country.

- iii) Ministry of Finance to be able to provide the necessary advice on funding and timely budgetary allocation for the irrigation projects.
- iv) Ministry of Environment and Mineral Resources to advice on the environmental management and sustainability of such projects.
- v) Ministry of Development of Northern Kenya and Arid Lands to be involved from the planning to the implementation of such programs since the irrigation schemes will mainly target marginal areas and arid lands.
- vi) Ministry of Roads and Public Works to provide technical input in the development and implementation of the infrastructure facilities including roads and transportation networks linking such schemes to markets for farm inputs and outputs.

The Kenyan Vision 2030 gives a very ambitious target for irrigation development which includes the expansion and rehabilitation of the schemes in Bura, Hola, West Kano, Bunyala, Perkerra, Kerio Valley, Mwea, Taita Taveta, Ewaso Nyiro North and Ngurumani (Kenya, 2007a and Kenya, 2009). Some of these schemes can be used to expand maize production in addition to using them for production of other crops.

The Vision 2030 and the Kenyan Agricultural Sector Development Strategy for 2009 – 2020 also envision expansion of irrigation schemes to other ASAL areas and also in some high and medium potential regions suitable for good potential for irrigation development. These policy documents indicate that the target is to develop about 32,000 ha per annum and to eventually have about 704,000 ha of new irrigation areas by the year 2030 (Kenya, 2004, 2007 and 2009).

In the production season of 2009/2010 the government in an attempt to follow and implement these irrigation policy targets, started rehabilitation and development of the Tana River schemes at Bura and Hola by helping the farmers to start growing maize on these old schemes. However, as pointed out already due to poor co-ordination, the otherwise successful maize production was faced with poor post harvest handling and lack of access to ready market which led to high losses incurred by farmers. The NCPB was not ready in terms of funding and logistics to come to the rescue of the farmers at the scheme. Ironically, most of the maize had to be destroyed due to aflatoxin

infestation and pest damage when people in other parts of Kenya faced serious maize shortages and starvation which resulted in new importation of maize by government and donors.

In order to expand maize production or any crop for that matter through irrigation, it is necessary for the government planners and policy implementers to pay attention to the following (Kenya 2009):

- i) Developing and operationalizing a national plan and policy including legal and institutional frameworks for implementing, managing and maintaining irrigation schemes.
- ii) Providing adequate and timely funding for investing in irrigation development, management and maintenance on a sustainable basis.
- iii) Provision of adequate and appropriate infrastructure including roads, electricity, drainage developments and maintenance.
- iv) Ensuring ready access to market and market information for farmers to help them sell their produce and to procure inputs easily.
- v) Provision of adequate extension services to farmers in order to impart to them the innovations and technical skills in the production and marketing of their produce.
- vi) Providing adequate research facilities with well trained technical staff and properly funded to tackle problems and constraints facing irrigated agriculture. Such research would tackle issues on crop husbandry, water management, soil fertility maintenance, mechanization and economic issues including marketing.
- vii) Creation of an enabling environment and incentive structures for effective farmers' organization and ensuring their full participation together with other stakeholders.
- viii) Provision of adequate credit facilities for farmers to be able to finance farming operations and procurement of inputs.

Maize research and development

Many developing countries including Kenya have assigned relatively passive role to agricultural research and development despite knowing so well the importance of agriculture in their economies (Schultz, 1990a). In many of these countries, the agricultural sector public expenditure as a proportion of government expenditure is very low and most of it goes towards recurrent expenditure so that research and development end up with meager allocation. In Kenya for example, the average allocation to the agricultural sector including rural development is about 4.3% of the national budget which is quite below the 10% stipulated in the Maputo Declaration by Heads of Government in the region (KIPPRA, 2010). This means that allocation to agricultural research is quite negligible. Indeed, none other than the government policy paper on Strategy for Revitalizing Agriculture (SRA) paints a gloomy picture on this when it admits that KARI, the premier government research institute, relies for funding its research operations almost entirely on donors (Kenya, 2004:39). Although the same strategy paper proposes to have government research funding increased gradually to reach 5% of Agricultural Gross Domestic Product. (AGDP) or 2% of the overall GDP by 2009/2010, this target remains a pipe dream.

Turning to maize research, it must be pointed out that a lot was done in breeding in the 1960s to the extent that Kenya realized a sort of green revolution in terms of high yielding hybrid and composite maize varieties produced by Kenyan research scientists then. There is modest maize research still done in Kenya especially by KARI but due to low funding the recent research output have not had significant and dramatic impact in terms of yields as was the case in the 1960s during the times of such renowned scientists as Dr. A. Y. Allan and the late Dr. Ogada of Kitale Research Station.

Apart from the need for adequate funding for maize research, there is also the need for providing highly trained critical mass of maize research scientists to make up a strong multidisciplinary team that can tackle research problems in the industry. The research scientist should be provided with adequate research facilities, offered attractive terms and conditions of service including competitive salaries and other employment benefits commensurate with their levels of training. The terms of service should not only be able to attract good scientists, but should also be able to retain them long in the service. High turn-over of research scientists can be counterproductive since some of the research processes are long-term and get disrupted when staff leave the organization frequently.

The research programme on maize should include:

- i) Maize breeding programs for high yielding, disease resistant and drought tolerant varieties for various ecological zones.
- ii) Experiments on good agronomic practices.
- iii) Other productivity enhancing research experiments including use of biotechnology and GMO techniques.
- iv) On-farm demonstrations and participatory research involving researchers, extension officers and farmers.
- v) Soil fertility maintenance including work on optimal fertilizer and manure application.
- vi) Economics of maize production including analysis of optimal input use in maize.

d) Provision of Adequate Maize Extension Service

Agricultural extension service is supposed to act as a bridge between research institutions and the farmers. In Kenya, agricultural extension has traditionally been sponsored and managed by the Ministry of Agriculture. The extension system has evolved and undergone changes since colonial time and even after independence in 1963. In colonial times, the approach in extension to African farmers was more through coercion and threats using the “do-it-or-else” methods to push adoption of new technologies or recommended practices among farmers. The approach was unpopular among indigenous farmers and although it had noticeable results, it had to be abandoned after independence.

After independence, the extension philosophy was changed to the “progressive farmer approach” whereby the extension workers identified good or progressive farmers whom they worked with and through whom neighboring farmers were supposed to learn from and copy the recommended crop or animal husbandry practices. This Farm Family visit approach in extension was criticized for discriminating against poor farmers, though it was less costly in terms of geographical coverage (Odhiambo, 1998). In 1982 the training and visit (T&V) extension approach was introduced as a pilot project while progressive farmers approach was still used in some districts.

In the mid 1980s the T&V was adopted by the Ministry of Agriculture and maize was among the crops covered in this method, but the coverage and intensity was limited to progressive farmers. This approach proved expensive in terms of logistics of arranging for the farm visits and the subject specialists that were to be included in such visits. Currently (in 2011) the Ministry is implementing the National Agricultural and Livestock Extension Program (NALEP) where, farmers are expected as individuals or as farmers' groups or Community Based Organizations (CBO) to seek solutions to their problems by taking their problems to the extension agents instead of waiting for the extension officers to visit their farms. The public extension in this approach is supposedly transformed in to Agricultural Advisory Services (AAS) playing a facilitating and linking role. This approach has been criticized as having very little impact on farm productivity and maize is no exception in this regard. No wonder most farmers interviewed during this study complained of not seeing extension staff as they used to see in the old days! Many farmers feel maize being an annual fast growing crop requires advice from the extension officers throughout the crops growing season.

The extension services in Kenya has been criticized as having the following problems which must be addressed if crops like maize have to benefit from government extension service (Odhiambo, 1998):

i) Inadequate staff:

Following the retrenchment of government staff including those in extension service in the 1990s and the subsequent freeze in the hiring of new staff in the same period, the extension service has been poorly staffed and inadequate.

ii) Lack of staff motivation:

As a result of low pay, limited promotion opportunities and lack of incentive structure, most of the agricultural extension field officers say they are not motivated at all in their work. This was the feeling of some of the staff interviewed for this study. Lack of motivation among the staff means that their impact is low and not felt among farmers.

iii) Lack of Transport:

Unlike the situation in the 1960 and 1970s when extension service officers were provided with appropriate and adequate transport facilities, most of the field extension staff are now sedentary and operate largely from their offices

without paying regular visits to farms. Because of cuts in budgetary provision, the extension service is poorly facilitated in terms of transport facilities. In most districts, it is common to find that the extension officers have no vehicle for transport or the single vehicle they have is broken down due to lack of spares or is completely in a state of disrepair. In most cases subject matter specialists (SMS) and supervisors from district or divisional headquarters cannot move out to go and meet, train or supervise their junior field staff or the farming communities in general. In order to boost maize production and even the production of other crops, the government should ensure that the extension officers are provided with adequate transportation including vehicles, motorcycle and bicycle for various grades of extension staff from district to village or locations levels.

iv) Lack of money and resources:

Lack of money or low funding has been blamed for poor performance of the extension service in Kenya. This not only hinders traveling as noted already, but also reduces the capacity to hold seminars, conduct field demonstration and other training activities for both field staff and farmers.

e) Training and Investment in Human Capital

Effective research and extension services depend very much on the investment in human capital in terms of training of experts who can provide these services (Schultz, 1990b). Kenya needs to train a critical mass of multidisciplinary research scientists and extension specialists that would work in tandem to make new technologies and innovations readily available to farmers. This is particularly important in the maize subsector where the yields on farms are still very low compared to those obtained in research stations or by farmers in developed countries (see Tables 5.1 and 5.2). As Kenya runs out of options of increasing maize production through expansion of crop land, it must resort to intensification of production which in turn will require innovative research output and skilled extension personnel to ensure the uptake of such innovations by farmers. To do effective research, scientists and the extension staff should as noted already be provided with adequate requisite facilities and a good working environment.

Apart from the training of the research scientists and extension specialists, the Ministry of Agriculture should also ensure continuous capacity building and training of the lower cadre of extension front line staff like the Agricultural

Technical Assistants (TAs) and the Junior Technical Assistants who serve at the Locational and Sub-Locational levels. Another training aspect that used to be common but has gone down is the regular training of farmers in the Farmers' Training Centres (FTCs) and through on-farm demonstrations. This type of training should be re-activated and programmed as part of extension service and should be tailor-made to fit with farmers' felt need and according to crop or livestock enterprise of interest to target the producers. Maize crop should be one of such crops to be targeted under such training programs.

f) Provision of Agricultural Credit

Agricultural credit is crucial in the development and operations of commercial agriculture. However, most farmers have limited access to the conventional financial services due to the relatively high interest rates and commissions charged by commercial banks. Many banks also regard farming to be risky and are known to limit their lending to farmers. The government of Kenya is aware of this problem and has recently revived the Agricultural Finance Co-operation (AFC) which literally became dormant in the 1990s during the old Moi regime. The loaning activities of the AFC need to be revamped by government to adequately provide credit to the maize farmers to enable them afford essential inputs like fertilizers and machinery services on time to boost their yields.

For sustainability of such credit programs, farmers should also be given civic education on the need to repay the loans received from AFC and other lenders so that they are not always regarded as risky borrowers.

g) Fertilizer Application and Provision of Fertilizer Subsidy

Fertilizer application is necessary for increased maize productivity. Farm level fertilizer application in maize is still very low particularly among the small holder farmers. The situation has been made worse by the ever rising fertilizer prices which have made fertilizers become too expensive for most of the farmers. Although fertilizer consumption in Kenya increased from 264,251 tonnes in 1998/99 to about 503,800 tonnes in 2009/10 (Kenya, 2011), this rate of fertilizer use is still very low and translates to just about 9.7kg of fertilizer per hectare of agricultural land, leading to poor performance of the agricultural sector. Given that most of the recorded use of fertilizer in Kenya is invariably used in the high value cash crops like tea, coffee and horticulture, it must be that food crops like maize receive sub-optimal fertilizer use. Many

of the small scale maize farmers hardly use fertilizers, and the few that do, usually apply very low sub-optimal rates that cannot trigger significant yield response (Ackello-Ogutu and Odhiambo, 1986). The Economic Survey of 2011 attributes the improved agricultural performance of 6.5% growth rate realized in 2010 to government intervention of providing subsidized fertilizers during the 2009/10 season. This implies therefore that fertilizer affordability and by implication fertilizer subsidy can definitely have positive impact on maize production and make maize production become competitive (see Tables 2.5a - 2.5c).

Following the experience of Malawi from where Kenya has been able to import maize recently, fertilizer subsidy if well targeted and properly managed will boost maize production in the country. Provision of subsidized fertilizers will enable many maize farms to afford this vital input and use it at the recommended rates. Interviews with maize farmers during the writing of this report (September, 2011) indicated that while the price of fertilizers like DAP was about Kshs 4,500 per 50 kg bag in the free market, the subsidized one was selling at Kshs 2,500. Other fertilizers for planting and for top-dressing had almost similar price differential. This is a substantial saving that would act as an incentive to farmers to increase the use of fertilizers and thereby boost on their farm maize yields.

Provision of Infrastructure

Poor and inadequate infrastructure is detrimental to agricultural production and marketing. Maize farmers for instance suffer high transaction costs in sourcing inputs and in taking their produce to the markets. A case in point is what we have already alluded to regarding maize lost by farmers in the Tana River and Hola Irrigation scheme due to lack of market access. Farmers in some remote parts of the country have also suffered a similar fate. There is need for development and maintenance of main roads and rural access roads to help reduce farmers' transaction costs and increase their access to markets. Apart from roads, there is also need to have market centres and NCPB storage and drying facilities that are easily accessible by farmers. Following the Tana and Hola maize loss incidences, the NCPB in late 2011 purchased and mobilized mobile maize dryers to be availed to those farmers who have drying and post-harvest handling problems. However, without good roads even such mobile dryers may still not reach such remote farms.

Diversification of food production and eating habits and preferences for other crops

As demand pressure on maize increases without commensurate increases in production, there is need for a policy shift to promote diversification in both food production and consumption. Why must every farmer strive to grow maize even in areas where other crops would do better? Again, more importantly, we need to pose the question as to why everybody in Kenya must eat maize when other crops like sorghum, millet, cassava, Irish potatoes, sweet potatoes, rice and wheat could as well provide the calories requirements needed.

Analysis of land allocation to maize vis-à-vis other agricultural farm enterprises indicate that maize takes up about 1.6 million ha or 23% of agricultural land coming only second to area allocated to livestock for milk and beef (at about 3.2 million ha or 4%). Sorghum and millet take up only about 0.5 million ha. The other two important cereals, wheat and rice only account for about 150,000 ha or 2% and 1,240 ha or 0.2% of agricultural land respectively (Kenya, 2011). As can be seen maize takes up a disproportionate share of land in agriculture, and the unfortunate part of this phenomenon is that almost every farm household in Kenya, even those in areas less suited to maize including the ASAL areas grow maize even at the risk of getting no harvest. A concerted policy strategy effort should be directed at popularizing and reducing total dependency on maize. It is not only surprising, but also ludicrous to read from the recent Kenya Integrated Household Budget Survey (KIHBS) that about 93% of farm households in Kenya grow maize and that this proportion is even higher in the less suitable areas like Nairobi (97.6%) (Kenya, 2007).

Comparative figures for farm households' participation in the production of other crops are very low. For example only 5.8% of farm households in Kenya grow finger millet, 10.7% grow sorghum; 1.6% grow other millets; 9.0% grow cassava and 7.5% grow sweet potatoes. There is therefore an urgent need to promote these other crops, which were popular in the past but have now been neglected and referred to as orphan crops. Tanzania has had a good strategy of diversifying its food crops in the so called 'orphan crops' to help supplement maize and improve the food security in their country.

Not only do we need to promote the diversification of these crops in production, but we also need to encourage the people to diversify their tastes and preferences to embrace these food crops in their diets. Currently maize takes about 24% share in most household food consumption, while not crops and other cereals account for only 5.4% and 4.1% shares respectively as food items in the households in Kenya (see Table 1.2).

To promote diversification in production and consumption of these other food crops, the government should initiate active support and investment in improving research extension services and marketing systems for these crops. New technologies and innovations need to be introduced to farmers who must be guided to adopt them to enhance the production and competitiveness of these crops at farm-level. Currently most of the alternative crops have discouragingly low yields which cannot be compared to maize, but still they need to be promoted as less risky and more drought tolerant than maize in some of the agroecological zones unsuitable for maize.

Improvement of maize marketing systems

Apart from the strategy of improving maize production, there is need for also improving the marketing system to be efficient and accessible to all maize farmers.

a) Role of NCPB to be strengthened

The maize marketing though liberalized since 1993, is still inefficient thereby forcing the government to intervene from time to time through NCBP. This has been particularly so during the maize harvesting period when farmers are forced to pressurize the government to direct the NCPB to come to their aid by offering prices above the free market price. Worse still, during maize shortages especially in drought years, consumers also start calling upon the government to lower maize and maize flour prices when such prices rise uncontrollably beyond poor households and vulnerable groups. Quite often the government has come to farmers' rescue when farm-gate prices of maize have fallen drastically in the free market and directed the NCPB to purchase such maize at a suggested price above the free market price levels. Of course, as can be recalled, when the maize market was liberalized the NCPB was restructured to carry out three functions which included:

- i) Carrying out commercial trading functions when the market is stable and making profits like any other participant in the maize market.
- ii) Carrying out social functions operating as the market stabilizer where it remains the buyer and seller of the last resort. In such operation, it is expected to go into the market and buy maize for trade or for the grain strategic reserve (GSR) or for relief needs by offering prices above the free market trade thereby cushioning the farmers for possible exploitation by private traders and millers especially during excess supply. Alternatively when maize prices rise to high levels as to be detrimental to the consumers, the NCPB is supposed to sell the maize it is holding in its stores including the strategic reserves to the market to bring down the rising prices and thereby cushion the consumer. In the final analysis the NCPB in its role as buyer and seller of last resort should resort to buying maize from farmers at no more than export parity price and selling it at no more than import parity despite the pressure that may come from farmers during harvest or from consumers during shortages.
- iii) The third function is another social function of managing the strategic reserve as buffer stock and for emergency relief.

Since it was decided in 1993 that the NCPB would not be privatized like was done with some other parastatal organizations, its role should be strengthened further by providing it with adequate funding for its social functions. Such funds should be provided in good time so that it can carry out its functions efficiently and effectively. Instances have been reported when the board is unable to intervene in the market due to inadequate or delayed funding from treasury. The Ministry of Agriculture and Ministry of Special Programmes who have some stake in the board operations should be able to intervene on behalf of the board whenever treasury frustrates the smooth operations of NCPB. If the board is facilitated to carry out these stipulated functions as efficiently as possible then there would be no need for the government to re-introduce price controls in the sector as suggested in the 2011 Price Control Bill.

b) Pricing should not be controlled by government

Bringing price controls back after 18 years of market liberalization came as a shock to many stakeholders in the maize sector. The new Essential

Commodities Price Control Act of 2011 was a government knee-jerk reaction to inflation and general price increases in the economy and was meant to cushion consumers against the impact of raising prices. Unfortunately the food price increase is a recent worldwide phenomenon and controlling prices without boosting domestic production can prove counterproductive and result in discouraging private investors in the industry or may lead to hoarding of commodities and smuggling the commodities outside the country. The policy option as we have pointed out is to boost farm level production or increase domestic supply. In case of raising prices due to a crisis arising from drought or other calamity then the government can resort to the GSR and let the NCPB play its role of buyer and seller of last resort guided by export and import parities in pricing to stabilize the market. However in extreme cases the government can resort to providing food subsidy or food relief targeting the vulnerable groups or the regions most affected.

c) Provision of Market Information Services and Early Warning Systems

Marketing information is important for efficient functioning of input and output markets. Up-to-date, timely and relevant information is required by all the industry participants to help them make decisions regarding planning, organizing, monitoring and controlling their production and marketing operations. In the maize subsector farmers, whether commercial or subsistence, together with traders, millers, transporters, NCPB, input suppliers, government agencies, other institutions and consumers all need information to make their decisions. The government is therefore required to facilitate access to various pieces of information that meet requirements of the various stakeholders in the maize subsector. The Ministry of Agriculture has a department running agricultural and market information system, however, such information services ought to be readily available in a form that can be utilized by various participants in the maize subsector. The current sources of information in the maize sub-sector include:

- i) The mass media, both print and electronic.
- ii) Ministry of Agriculture especially the Extension workers.
- iii) Provincial administration officers especially in their *barazas* and other public gatherings.

- iv) National Cereals and Produce Board (NCPB).
- v) Special government publications including the Kenya Gazette.
- vi) The other participants in the subsector including farmers, traders, farmers' associations, traders' associations, millers, transporters and even consumers can also provide information.
- vii) Farmers' organizations such as Kenya Farmers Association (KFA), Kenya Grain Growers Association, East African Grain Council (EAGC).

The government should therefore provide an enabling environment to allow free information flow within the sector for the benefit of the participant. With the proliferation of mobile phones and FM Radio Stations in the country, there are now more effective, cheaper and quicker types of means and channels of information that can improve the activities in the industry if free flow of information is not restricted.

Summary of Strategies for Improving Maize Production, Food Security and Marketing

The following are some of the strategies that will improve maize production and marketing in Kenya (Odhambo, 1994a)

- i) Provide strategies and incentives that will increase productivity and total production of the maize crop by enabling farmers to adopt intensive and modern agricultural production systems.
- ii) Encourage such intensive production that entails embracing strategies that would give commercial orientation to farmers and expose them to modern farm management skills and crop husbandry practices. Commercial orientation of farmers makes them to embrace economic and social goals (e.g. income generation, profit maximization, food security and sustainability goals).
- iii) Deliberate strategies and policies will be needed not only to stimulate intensification of agriculture and maize production, but also to develop efficient marketing systems for the increased output. These will include strategies to (Kenya, 2004 and Kenya, 2009):

- Accelerate smallholders' transition from subsistence to marketable surplus production, while not forgetting to give the large scale farmers the necessary incentives to operate efficiently and profitably.
- Have policy formulation processes that involve maize stakeholders including all categories of farmers, input suppliers, stockists, traders, millers, researchers and extension agents.
- Provide public services through targeted government investments in rural infrastructure including road networks, market infrastructure, electricity, irrigation and agricultural research to bring new technologies and innovation to maize farmers.
- To reform the extension services to guide farmers in both the production and marketing of the maize.
- Reform the marketing institutions to improve the flow of inputs and outputs and to facilitate traders' and farmers' supply response to market forces.
- Facilitate strong linkages between rural producers and the urban and industrial markets for maize.
- Support as far as possible, the formation of farmers' associations or community based organizations (CBO) to enhance their bargaining power or facilitate their easy or cheaper market access.
- Encourage the development of rural agribusiness enterprises to take up maize related trading business as dealers both in the input and output markets.
- Facilitate training of the farmers, traders and other market chain participants in the maize sector. There again the use of FTC facilities should be revived.
- Foster the development of credit markets to facilitate production and marketing of maize.
- Develop institutions for enforcing rules and regulations and for dispute resolution and train the maize farmers and other market participants on their rights and obligations.

- Provide policy environment that liberalizes both the input and output markets and that enhances competitiveness in production and marketing.
- Foster good governance and fight against corruption in all institutions involved in the production, marketing and provision of services in the maize subsector and agriculture in general.

In conclusion, we can say that improvement of maize production and marketing does not lie in the government intervening through price control, but rather the solutions lie in the government's ability to pay attention to the following interrelated six I's:

Input: Especially fertilizers, certified seeds and mechanization.

Innovations: Especially provision of state-of-the-art well funded and adequately equipped and staffed research and extension programs that will churn out new technologies and innovations to farmers, traders, NCPB, millers and other industry participants.

Institutions: Providing relevant legal, economic, research, training, extension, financial or credit and other institutions for governance that will help resolve maize industry problems.

Infrastructure: Provision of necessary road, information and other marketing and communication infrastructure necessary for accessing input and product markets and for reaching out for other services.

Information: Realizing that information is power and therefore its provision and availability is necessary to empower farmers, traders and other participants in the maize industry. It is now believed that information should be regarded as an important input in any production and marketing business just like the traditional inputs such as land, labour and capital. All participants need timely and relevant information on demand and supply conditions for their products and inputs on prices and costs of inputs and products.

Incentives: Provision of adequate incentive structures is necessary to motivate farmers, traders, processors and other maize market participants to run the sub-sector efficiently, effectively and profitably.

These six I's will spur other I's like Investment, Intensification and Irrigation to be taken up by industry participants when the policy environment is made conducive to embracing these aspects in the industry. Finally, apart from policies aimed at expanding maize production, there is need for a policy strategy by the government to encourage diversification at farm level whereby farmers are encouraged to increase the production of other food crops to supplement maize. Kenyans in general must also be encouraged to diversify their eating habits to include other cereals and root crops like sorghum, millet, cassava and potatoes. This dual approach to change the production and consumption pattern in the food systems can greatly enhance food security at farm and national level particularly in areas less suited to maize production.

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