



PROCEEDINGS OF THE BREAKFAST POLICY MEETING

ON

**COST OF MAIZE PRODUCTION ACROSS DIFFERENT SYSTEMS AND
REGIONS IN KENYA: IMPLICATIONS FOR FOOD SECURITY AND PRICING**

HELD AT SAROVA PANAFRIC HOTEL, NAIROBI, ON TUESDAY 14TH JULY, 2015

INTRODUCTION

Maize production in Kenya has continuously faced a number of challenges that have hampered food availability and access. The predominant challenges include low productivity, high input costs, post-harvest losses, climate variability and change, among others. To address the challenge of high input costs, the government launched an aggressive programme of providing subsidized fertilizer to farmers. It was expected that this programme, coupled with other interventions, would bring down the costs of maize production and consequently maize flour prices. In addition, the government is investing in large scale irrigated maize production in order to reduce reliance on rain-fed agriculture, and thus deal with the problem of perennial maize shortage.

Given the strategic role that maize plays in food security and household income, it is imperative to have continued assessment and deliberations on feasible options that could lower costs of production and hence ensure competitiveness in production and lower consumer prices. In light of this, Tegemeo Institute of Agricultural Policy and Development of Egerton University has been carrying out annual assessment of production costs for maize to help inform on this debate. The Institute recently assessed the cost of production for the 2014/15 cropping year under different production systems and fertilizer access regimes, the viability of irrigated maize, and the status of the current food situation in Kenya. Findings from the study were presented in a breakfast meeting held at the Sarova Panafric Hotel, Nairobi on 14th July, 2015. The meeting brought together representatives from the Ministry of Agriculture, Livestock and Fisheries (MOAL&F) at both National and County levels, County Governments representatives, farmer organizations e.g. Cereal Growers Association (CGA), Kenya National Federation of Farmers (KENAFF) and the East African Federation of Farmers (EAFF), Parastatals, Non-Governmental Organizations, Research Institutes (e.g. KARLO, KIPPRA), Private Sector, Universities, Media among others key stakeholders in the maize sector.

PROCEEDINGS

SESSION ONE: WELCOME AND INTRODUCTION

The meeting started with the moderator Dr. Simon Kimenju welcoming all the participants and thanking them for allocating time to come and deliberate on issues of food security, especially with respect to maize which is as an important staple crop and source of income to most households. After a word of prayer from Ms. Millicent Olunga from Land O'Lakes the moderator then led the participants through a brief session of self-introduction and later welcomed Dr. Mary Mathenge, the Director of Tegemeo Institute of Agricultural Policy and Development to give some welcoming remarks.

Welcoming Remarks and Workshop Objectives

Dr. Mary Mathenge, Director– *Tegemeo Institute*

Dr. Mathenge welcomed the participants and thanked them for finding time to attend the meeting and for waking up early to beat traffic jam. She acknowledged the presence of representatives from the Ministry of Agriculture, Livestock and Fisheries (MOAL&F) led by Dr. Johnston Irungu, the Director of Agriculture --Crop Management, State Department of Agriculture including several representatives from the county level, representatives from Egerton University, specifically Prof. Gowland Mwangi, the Deputy Vice Chancellor, Research and Extension, and Dr. William Chong, a member of Egerton University Council, civil society and research institutes, among others Dr. Mathenge then invited Prof. Gowland Mwangi, the Deputy Vice Chancellor, Research and Extension to give a few opening remarks.

Opening Remarks: Prof. Gowland Mwangi-*Deputy Vice chancellor, Research and Extension, Egerton University*

Prof. Mwangi welcomed all the participants on behalf of Egerton University and recognized the presence of Dr. William Chong, a member of the University Council, Dr. Johnson Irungu from the MOALF, the county directors and representatives of all other groups present at the meeting. He started by acknowledging the fact that Kenya as a developing country is faced by food security challenges as demand for food is higher than the supply, and that production is not only insufficient but sometimes unsafe. Hence there is a need to address food insecurity by focusing on issues of

cost of production, safety of production and distribution. He highlighted that Egerton University is working towards meeting the needs of the growing population by advising on the various interventions needed to promote continuous food and livestock production. He added that Egerton University has released new millet and sorghum varieties and is still looking for ways to make the seeds accessible to farmers. He called upon those working with farmers within various counties to get in touch with the University to share their needs and also access the new varieties.

He added that Egerton University also deals with policy issues with Tegemeo Institute taking the lead. With respect to the breakfast meeting, he encouraged the participants to be keen in order to understand the implication of cost of production and pricing. He pointed out that if food is expensive, then consumers will suffer, hence the need for the country to be competitive with the neighboring countries. Prof. Mwangi encouraged the participants to get in touch with the University for further engagement in case they want particular issues followed up.. He challenged Dr. Irungu to take the opportunity and learn the issues that the ministry needs to address. He then handed back to Dr. Mathenge who in turn welcomed Dr. Irungu to give his opening remarks and officially open the meeting.

Opening Remarks: Dr. Johnson Irungu-*Director of Crop Management, Ministry of Agriculture*

Dr. Irungu started by giving apologies from the Cabinet Secretary who was unable to attend the meeting due to other commitments. On behalf of himself and the ministry, he expressed his pleasure on the topic of the day. He appreciated Tegemeo Institute and by extension Egerton University for this study which he noted would promote better understanding of the constraints experienced in the maize sub-sector. He added that maize is an important crop for food security and that is the reason why reduced maize production is synonymous to food insecurity. He however reiterated that there is need to diversify into other crops and avoid over-reliance on maize, a move his ministry is keenly looking into. On the maize sub-sector, he outlined that MOAL&F was cognizant of the challenges which include; low productivity, high input costs, climate variability, post-harvest losses, market inefficiencies and the Maize Lethal Necrosis Disease (MNLN) which destroyed over 30% of the previous year's (2014) maize crop, among others. He said that the average national maize productivity is currently 20 bags per hectare as opposed to the potential of over 50 bags per hectare. This could be attributed to low use of modern technologies

including improved seeds, fertilizer application, agro-chemicals, low levels of mechanization and over-reliance on rain-fed agriculture.

The price per 90kg bag of maize grain varies between Ksh. 800 and Ksh. 3000 depending on the supply. This price variability makes it difficult for farmers to plan resulting to fluctuating acreage and production. According to Dr. Irungu, labor is a major cost driver of production and constitutes 45-50% of the total cost in small holder production. Increased use of modern technologies such as minimum tillage and use of herbicides would proportionately reduce labor costs. On maize meal value chain, he said that large millers control 35-40% while the small and the medium millers account for 55-60% of the market.

Dr. Irungu said that the ministry of agriculture has responded to challenges within the maize sub-sector by deploying various policies such as the three-tier Fertilizer Cost Reduction Strategy that comprises;

1. Fertilizer subsidy: Currently the implementation is being improved with the introduction of an e-voucher system
2. Encouraging local blending to enhance precise application of nutrients as per specific crop requirement
3. Bulk procurement which is intended to reduce cost per unit of fertilizer

Other interventions include growing of maize under irrigation which aims at minimizing fluctuations in supply as is the case under the rain-fed regime. He noted that the current overall post-harvest losses are estimated at 10% amounting to an estimated value of Ksh. 10.8 billion. The high losses affect availability of food and raw materials, incomes and job opportunities to many Kenyans. Dr. Irungu said the ministry is keen on Tegemeo's findings and recommendations thereof as they would inform future policies that the ministry will be formulating. Additionally, the findings would form policies to address the asymmetries related to produce prices that accrue to both producers and consumers, a key objective in the Jubilee government manifesto. He expected the study to elicit wide discussions from the floor and even afterwards among farmers and other stakeholders, which is an important debate in tackling challenges within the maize sub-sector. Dr. Irungu concluded by thanking Tegemeo for the invitation and other stakeholders for their participation, and officially opened the meeting.

Meeting objectives: Dr. Mary Mathenge-Director, Tegemeo Institute

Dr. Mathenge started by stating that she was happy for the partnership that Tegemeo Institute has had with MOAL&F over the years. She then went ahead to the meeting objectives highlighting the importance of agriculture in the Kenyan economy and the role that maize plays in food security. She concurred with Dr. Irungu's speech on the challenges that bedevil maize production in Kenya and enumerated the various government interventions on the sector that include, the fertilizer subsidy program, producer price support through purchases by the National Cereals and Produce Board (NCPB) and the expanded irrigation capacity. Given the strategic role that maize plays in food security and household income, Dr. Mathenge noted that it is imperative to have continued assessment and deliberations on feasible options that could lower costs of production and ensure competitiveness and hence lower food prices

The director explained that Tegemeo Institute had recently conducted studies to;

- Assess the cost of maize production for the 2014/15 cropping year under different production systems and fertilizer access regimes
- Assess the viability and cost of production of irrigated maize
- Understand the current food situation and prices in Kenya

These studies were meant to address the following research questions:

1. What is the cost of maize production in Kenya and how does it vary across different production systems and regions/counties?
2. Are the costs of maize production sustainable under smallholder farming system?
3. How does the cost of maize production differ with the generalized fertilizer subsidy provided by Government? Does this programme achieve its intended goals? What is the cost saved per unit with use of subsidized fertilizer?
4. What is the effect of producer/output price support provided by Government (through maize purchases by NCPB)? Is this consistent with the input (fertilizer) subsidy programme?
5. What is the cost of maize production under irrigated production system and what are the potential benefits and limitations of irrigated maize?
6. What are the trends in maize grain and meal prices and implications for pricing?

7. What is the current country's food situation following the 2014/2015 cropping year?

The presentations and discussion thereafter would shed light on these questions. Dr. Mathenge then reiterated the main objectives of the breakfast meeting which were to:

- 1) Share the findings of the studies with key stakeholders for discussion and feedback, and,
- 2) Provide a forum for open discussion among stakeholders to enable identification of appropriate policy options.

She enumerated the three presentations for the day as:

- 1) Cost of Maize Production across different Systems and Regions: Implications for Policy and Food Security
- 2) Can Irrigation be an answer to increased Maize Production and Food Security in Kenya?
- 3) Trends in Maize Grain and Flour Prices: Implications for Food Security

In emphasizing that the presentations are meant to elicit discussions from the participants, Dr. Mathenge indicated the importance of the plenary session and welcomed all to actively participate. She then invited Mr. Joseph Opiyo to make the first presentation.

SESSION TWO: PRESENTATION ONE

Presentation by Mr. Joseph Opiyo-Senior Research Assistant, Tegemeo Institute

Mr. Opiyo's presentation was titled: *Cost of maize production across different systems and regions in Kenya: The Role of Policy Interventions*. The study recognizes that in Kenya, maize is a major staple crop, often equated to food security. However its production has continuously faced a number of challenges including farm level issues (credit facilities, high input costs, and post-harvest losses), stagnating growth in crop productivity, and climate variability and change. Other challenges include; diseases such as the Maize Lethal Necrosis Disease, lack of competitiveness of maize evidenced by production systems of our neighbors (Tanzania and Uganda) and insufficient budget allocation to agricultural research. To address these challenges, the government has launched several interventions. One of the interventions is the fertilizer subsidy program whose aim was to influence fertilizer prices, bring down the cost of production and increase yields and consequently output. To achieve these objectives, the programme aimed at absorbing 40% of the annual fertilizer requirement so that the rest can be provided by the private sector. The government also supports maize output market by purchasing of maize from farmers at prices higher than market prices to provide incentive to producers.

The study intended to inform on the cost of maize production under different systems and how this varies across different regions in Kenya. In addition, it sought to establish the effects of input and output price support on cost of production. On the assumption that large scale maize producers use rented land and borrow capital, the results showed that the average cost per 90kg bag in 2014 was between KES 1,577 to 1,665. Similarly Tegemeo household survey data of 2014 revealed that only 19.6 percent of the small scale farmers rented in land to produce maize hence majority use own land. Based on the assumption of no land rent and no working capital, the cost of producing a bag of maize among small scale farmers was ranging between KES 1,105 in Kakamega County to KES 1,214 in Trans-Nzoia. However, with land rent and working capital, the cost of production was between KES 1,600 to KES 1,800. Where subsidized fertilizer was used, the cost of production was between KES 1,384 to KES 1,485 by large scale producers whereas cost per bag by small scale producers was between KES 1,436 to KES 1,603.

From the results, it was evident that the cost of production under different systems is still high even with subsidized fertilizer and that maize production is not a viable venture in small scale production systems especially where land rent and working capital is used. This study also found that major cost components in maize production were fertilizer, labour, land rent, intermediate inputs and land preparation. Commercial fertilizer prices seemed to have stabilized but still relatively high since the share of fertilizer to total cost of production ranges between 17 and 28 percent whereas weeding constituted between 36 and 53 percent of total labour cost for smallholder farmers. Input price support through the generalized fertilizer subsidy program also reached only 9 percent of small scale farmers as it was noted that distribution outlets (NCPB depots) were located far from many farmers and that delivery of the fertilizer was very untimely.

According to Mr. Opiyo, there is need to explore other options that can reduce the cost of labor among small scale farmers and increase productivity to complement the fertilizer subsidy. To better manage fertilizer prices and input subsidy, there is need to explore private sector managed subsidy programs given their wide distribution network. The government output price support was also found to create undue advantage to a few farmers and relatively higher maize prices to producers since only 0.7 percent of farmers across 40 counties reported to have sold maize to NCPB between the years 2012 and 2014. Therefore the government should consider investing in interventions

that will increase production and productivity and let market forces determine the prices. This will result in affordable maize products for all consumers including farmers themselves.

SESSION TWO: PRESENTATION TWO

Presentation by Dr. Dennis Otieno-*Research Fellow, Tegemeo Institute*

Dr. Otieno's presentation was titled: *Can Irrigation be an Answer to Increased Maize Production and Food Security in Kenya?* This presentation first highlighted various policy actions that the government has adopted in order to increase food production. This includes a direction towards large-scale irrigation with increased funding allocation from KES 11.5 billion to 13.5 billion in the 2014/15 financial year. In relation to this, the government has developed irrigation policy and bills, carried out detailed design works, implemented new and rehabilitated existing irrigation projects and schemes. Dr. Otieno noted that irrigation has the potential to increase food output by about 100-400%. In Kenya, there is about 3 million acres of irrigable land but only 10% is currently being utilized. Therefore, a potential to increase food production exists. Despite the huge economic potential, inadequate information about profitability of irrigated maize has caused doubts about its economic viability leading to low engagement in it. Results showed that cost of production for irrigated maize was KES 15,705 per acre, which is KES 2,000 higher than that of non-irrigated maize. The average cost per bag was KES 1,428 for irrigated maize and KES 1,724 for non-irrigated maize. Although irrigated maize farming attains higher productivity, higher profit margins, higher margins per bag and also a higher percentage margin over cost compared to non-irrigated maize, the cost of production is also higher.

The results also implied that Galana Kulalu Irrigation scheme has the potential to increase the country's maize output by about 5.5 million bags within one growing season. It also has the potential to produce about half of the national food requirement i.e. 16.5 million bags, if production was to be done for three seasons in a year. This can improve the food security situation and the GDP of the country. Dr. Otieno noted that there are concerns relating to the political economy of irrigation. These relate to water use rights and efficiency, conflicts with the wildlife and the pastoral communities and competing national and regional interests. The study recommended that in order to lower the unit cost of production, give higher margins and exploit economies of scale, there should be efficient use of water and water application methods, intensive maize production with improved seed technology, and extensification given the available irrigable land.

SESSION TWO: PRESENTATION THREE

Presentation by Mr. James Githuku- *Senior Research Assistant, Tegemeo Institute*

Mr. Githuku's presentation was titled: *Trends in Maize Grain and Flour Prices: Implications for Food Security*. In motivating his presentation, Mr. Githuku argued that in order to realize the food security objectives as stated in the country's constitution, interventions to reduce costs of production must translate to reduced consumer prices as would be expected in a perfect market setting. This is especially important for Kenya given that majority of maize producers, the staple food, are small holder farming households which are also net buyers of maize. It is therefore important to monitor whether producer cost reductions achieved through productivity increases are being transferred to the consumers. Comparing wholesale maize prices between Kenya and the world market, Mr. Githuku observed that the domestic market prices are higher. Thus without the 50 percent import tariff, the Kenya market would attract maize from the world market. Secondly, the local market prices do not move together with the world prices indicating that Kenya does not substantially depend on the world market for its maize.

The analysis showed that price trends in the domestic maize market are well integrated since price changes in one market are quickly reflected in the other markets. The retail maize grain and flour prices move together with almost constant margins but their trend is not in tandem with the wholesale maize prices. This raises questions on whether value chain players could be influencing maize flour retail prices. Using nominal current maize wholesale prices and generic costs for milling, Mr. Githuku observed that millers' margins appear to depend on the wholesale maize prices considering that 80 percent of the cost of milling is the cost of maize grain. Large millers who dominate the market for maize meal are able to stock during periods of low market prices. Millers and policy makers need to work together to establish if other transaction costs exist leading to the discrepancy between wholesale and retail maize flour prices.

Finally, the analysis showed that production of the staple foods is on the decline since 2012 with maize and wheat showing -7 and -33 percent declines respectively. Production in the important maize and wheat growing areas has declined due to the maize lethal necrosis disease (MLND) and insufficient rains. The maize (food) balance sheet from the MOAL&F shows the country will have a surplus at the end of September 2015. However, this is based on a projected harvest of 13 million 90 kg bags from the July-September period which therefore requires close monitoring to inform

proactive measures and avoid last minute interventions which have been shown to distort the market further.

Broader Issues: Dr. Mary Mathenge – Tegemeo institute

From the three presentations made, Dr. Mathenge highlighted the following broad issues for discussion;

1. The cost of maize production was evidently high and varies across regions and scale though with no clear benefits from economies of scale as would be expected.
2. Viability of maize production is an important question especially with respect to scale. This brings in issues of comparative advantage and diversification into other crops/enterprises for those with unprofitable production systems.
3. As for the fertilizer subsidy programme, the following issues are important:
 - a. Design: Important to ensure accessibility and inclusivity and reduce market distortions (NCPB achieves on average about 15% of fertilizer market)
 - b. Intended Goal: Noted that reduction in cost of fertilizer and affordability may have been fairly achieved but this has not reduced the price of maize/maize meal—why?
4. Producer/output price support:
 - a. Given the profit margin of between 43%-173% for those who benefit from both fertilizer subsidy and producer support, this seems to give undue advantage to some farmers
 - b. Inconsistent Policies: The Producer maize support (buying by NCPB at higher than market prices) seems to be inconsistent with the fertilizer subsidy program with respect to high level goals of reducing maize prices and making food affordable by all citizens:
 - i. Input Subsidy: Lower fertilizer prices results in overall reduction in cost of production and subsequently lower maize prices for consumers
 - ii. Producer Price Support: Purchases at higher than market prices results in generally high maize prices
5. It is evident that there is a potential for production of maize under irrigation. However, a major challenge is availability of adequate water and the political issues around

development of irrigation schemes like Galana Kulalu. In this regard, a major question is how to obtain optimal productivity amidst these challenges.

- a. Given the expected output of 40 million bags, very close to national consumption, what is the future of small-scale farmers who are the majority producers? Are they going to be phased out of maize production?
6. Maize Lethal Necrosis Disease (MLND): MLND leading to 30% loss in maize production raising the question of the nations' ability to contain the disease given its been almost 5 years now.
7. The cost of grain reportedly accounts for approximately 80% of the cost of milling. This significantly affects the cost of flour. What therefore are the interventions which can be done to reduce the cost of grain? Are there other cost reducing measures with respect to milling?

In conclusion, Dr. Mathenge emphasized that in good practice, food security policies should consider both the producers and consumers (supply and demand) and that policy should not give undue advantage to one group at the expense of the other. This however requires a sober, prudent and cautious management of domestic policies to ensure a harmonized and consistent message and action by government and other stakeholders. In the long run, economic growth will only be assured if food prices are contained to allow for savings and investment.

The Director then invited Dr. Mercy Kamau to lead the plenary session.

SESSION THREE: PLENARY DISCUSSION

Chair: Dr. Mercy Kamau- *Senior Research Fellow, Tegemeo Institute*

Dr. Kamau acknowledged the participants for attending the meeting and invited the audience to give their feedback and/or observations. In a first round of questions, one participant sought clarification on whether large scale farmers growing fodder were considered in the analysis and whether it's good to advice farmers to grow fodder instead of maize grain and in what ratio. He also wanted to know how the government should buy strategic grain reserve (SGR) at existing market prices considering there were variations across regions. In addition, he wanted to know where other farmers were selling their maize since results from one of the presentations showed that less than 1% were selling to NCPB. Another participant wanted to know whether the balance

sheet presented took into consideration the current situation in the North Rift which seems to have had a bad harvest this year, yet it is the main grain basket. He advised the MOAL&F to revisit the maize growing areas and review the figures. In addition, another participant wanted to know whether the cost of installing irrigation equipment was considered in the computation of the cost of production under irrigation. He observed that on most occasions, there is always an assumption of ready available structures.

In response, Mr. Tom Ndiinya from MOAL&F explained that the balance sheet was being updated on a monthly basis based on data from field reports and hence the next one will reflect the current situation. In terms of maize marketing, Mr. Opiyo pointed that there were several maize outlets including middlemen, traders (both small and large), consumers, institutions, millers etc. where farmers sell their maize apart from the NCPB. Moreover, he confirmed that indeed some farmers in Trans-Nzoia were abandoning maize production and are now growing fodder such as Rhodes grass which can be harvested three times a year. According to the farmers, this is more profitable than maize farming. He stressed that farmers are always rational and the decision on whether to diversify into fodder in place of maize is an individual choice. In addition, Dr. Otieno confirmed that the cost of infrastructure was factored in the analysis under 'Operations and Management' costs which cater for irrigation infrastructure fee which is the repayment installment. Moreover, he emphasized that the cost of water per season was used as a proxy for both payment for infrastructure and water.

In a second round of discussions, a participant commended the good work by Tegemeo and sort clarification on whether green maize was considered in the analysis considering it is preferred by farmers and also fetches a higher price. Another participant also pointed out that small-scale farmers are struggling with commercialization as it is evident by their high production costs and consequently lower profit margins. He observed that there was need to develop innovative agriculture especially through zoning. In addition, he observed that farmers also need to be advised on diversification and to engage on productive activities for which they have a comparative advantage in. To reduce inefficiencies, a participant suggested that farmers should be encouraged to adopt mechanization since the current production system was too manual. Dr. Mathenge commented that diversification out of maize is a challenge. Farmers decision to grow maize even

when is not profitable is their rational decision. She added that farmers would consider diversification if they are sure that even if they don't grow maize, they would be able to source it at a more stable price. Hence there is need to stabilize the volatile maize prices. She reiterated the results of the presentation: that small-scale maize farming returns some margins and the problem is mainly the small volumes they handle.

A participant commented that there was a misconception regarding subsidized fertilizer. He suggested that the subsidized fertilizer as a government plan should not exceed 40% of the market share and it's currently between 18-30% since inception. He was of the opinion that if this market share level is exceeded, then the private sector would be eliminated from business. He highlighted that awareness of fertilizer use and existence of fertilizer subsidy is imperative to farmers and that the government is aiming at introducing the e-voucher system through Safaricom to enhance distribution and access. In addition, there is a plan to increase the fertilizer distribution points. Dr. Mathenge emphasized that the current fertilizer subsidy is a good idea and the question that needs to be addressed is whether it's attaining the intended purpose or there is need to re-design.

A participant proposed a further study to be done with a regional perspective (Uganda, Tanzania and Malawi) to establish what they are doing to make their maize cheaper compared to Kenya's. Another participant sought a clarification on whether the study considered 'hidden hunger' since the 17-United Nations Sustainable Development goals stress on quality and quantity. A participant commented that cost of maize production can be brought down by increasing output from the current 30 bags per acre to 40 bags per acre in the high potential areas and reducing the cost of weeding. In addition, crop rotation as a good agricultural practice could reduce the prevalence of MLND. She added that while there is emphasis on the use of inorganic fertilizer, recent past soil sampling results show that most soils lack adequate organic matter which is a critical component in production. She also proposed on fortification of maize to increase its nutritional quality and diversification into other high-value crops to reduce over-reliance on maize.

A participant wondered whether there was convergence of technology between small scale and large scale farmers since the difference in yield with subsidy was very minimal. He also questioned whether the country had reached its technology limit. Another participant also wanted to know

whether there was an element of weighting in computing real prices of maize. From a regional perspective, another participant also wanted to know whether the country needs to focus on preparedness now that maize situation in the North Rift and Uganda is not so good. In addition, he wanted to know whether the analysis was based on the intensity of fertilizer use and whether farmers are using the subsidized fertilizer on maize. He emphasized that issues of diversion may limit the programme from attaining its intended purpose and pointed that from the results, the programme is not reducing the cost of production as expected and wondered whether fertilizer national subsidy was a smart pro-poor policy or a political trap.

Consequently, a participant commented that majority of farmers are small-scale producers and the issues of technology and innovation cannot be ignored. He pointed out that Aflatoxin is a major constraint to maize quality especially in Meru region. He highlighted that the fertilizer subsidy programme was a good intervention and the government should target small-scale farmers who are the majority producers. Moreover, another participant proposed a study to be done on complimentary options for food security. He pointed out that there was need to emphasize on other emerging crops to help farmers diversify and relieve the current pressure on maize. A participant also commented that farmers need to be aware of all the available technologies for them to make their choice based on need and preference. He also noted that from the results, small-scale farming was not profitable in the short-run.

A participant wanted to know whether there were notable changes on spending on pesticides to mitigate MLND. He also wanted to know whether farmers sell all their maize harvests. Another participant commented that organized markets for farmers could be a solution to issues of technology and innovation. He added that there was need for farmers to act as agro-processors and take advantage of value addition technologies and group marketing. Moreover, he suggested that extension and advisory services could help farmers achieve the desired impact through groups. In response, Mr. Opiyo explained that his analysis considered the whole output (including unsold) and not just sales. He noted too that the MOAL&F has advised farmers to venture into crop rotation to minimize the prevalence of MLND.

In terms of maize pricing, Dr. Irungu explained that there was influx of maize from the region leading to stock piling. However, consultations were underway to determine factors to consider before setting prices. He added that set prices should not be below the cost of production or too high above existing market prices. With respect to MLND, the government has come up with short term interventions for the disease. He said that the Kenya Agricultural and Livestock Research Organization (KALRO) had tested a number of varieties and they are also seeking to understand the alternative hosts. Although weather was noted as a challenge, their ultimate aim is to develop resistant varieties.

Dr. Mathenge highlighted that Tegemeo partners with various stakeholders to obtain answers related to viability of maize production. She pointed out despite the low profits, farmers cannot stop producing maize because it is their main food. In addition, it is not possible for them to predict the output prices to inform them on whether to produce or not. This calls for farmers to be educated on the possible solutions. She also added that it was evident that small scale production was not profitable despite the slight margins. Therefore it was important to know the minimum size of land that should be cultivated to obtain optimal margins. In relation to input subsidy, she clarified that the research was not questioning it but wondering if it had achieved its objectives. With output price support, Dr. Mathenge said that it was not clear as to why NCPB was buying maize, and whether this policy was meeting its intended objectives. In response, Dr. Irungu explained that NCPB was a government agent and the purchase of maize by NCPB is meant to ensure that the market is not distorted. In addition, he said that the government was working to introduce a warehouse receipt system in collaboration with recognized banks to enhance financing.

Dr. Joyce Malinga from KALRO-Kitale told the participants that it was possible for farmers to obtain high maize productivity from their farms if they follow recommended agronomic practices. She gave an example of a farmer who was harvesting 70bags/acre! She highlighted that although MLND was a constraint to maize production, KALRO and other partners are working towards obtaining varieties resistant to MLND especially for high potential areas. Meanwhile, she advised that good agricultural practices should be adopted to minimize the effects of these diseases.

SESSION THREE: WAY FORWARD

Chair: Dr. Justus Ochieng-*Research Fellow, Tegemeo Institute*

Based on the presentations and discussions, Dr. Ochieng highlighted the following as the recommendations from the meeting;

1. There is need for millers to be open and engage with other stakeholders in the sector and help in addressing the high consumer prices.
2. Considering the important role of maize in Kenyan households, it is important to advise farmers on how to implement issues of diversification to other crops to avoid overdependence on maize.
3. The current production system is too manual and there is need for farmers to employ mechanization even in small-scale production systems.
4. In relation to nutrition, food quality should be emphasized to curb issues of 'hidden hunger'.
5. A further research on the cost of maize production in the East African region is necessary to establish the cause of variations in maize prices. Notably, the cost of maize production is lower in Uganda and Tanzania than in Kenya thus regional comparison (Uganda, Tanzania and Malawi) would establish lessons for Kenya's maize sector.
6. An understanding of soils requirements is an important component of production considering that current soils do not have adequate organic matter that is important for increasing maize yields.
7. The role of extension education should be emphasized for farmers to adopt good agricultural practices (GAP).
8. It is important to determine the minimum acreage under maize that can be profitable for both smallholder and large-scale farmers.
9. Considering the prevailing conditions, the North Rift region which is the main grain basket, may not produce up to its potential. Hence there is a need to look for alternative means to offset the potential deficit.
10. It is important to redesign the structure of the fertilizer subsidy programme so as to reach many farmers. Government's plan to implement the e-voucher system will help address program targeting challenges.

11. Maize Lethal Necrosis Disease (MLND) has a negative effect on food security in Kenya through reduction in maize productivity. However, KALRO in collaboration with CIMMYT and the World Bank are working to come up with maize varieties that are less susceptible to the disease.
12. Evidence shows that group marketing of maize has a potential to provide farmers with better output prices. However, although there are many farmer groups in the rural areas, they are faced by many constraints. Ways to address such constraints in these groups should be explored so that they can take advantage of such opportunities.
13. There is need to adopt climate smart agriculture and enhanced capacity building for conservation agriculture in the country.
14. It is necessary to encourage farmers to adopt value addition techniques by putting incentive measures.
15. In terms of food pricing, there is need for continuous consultation between the MOAL&F and other stakeholders to develop an effective maize pricing policy.

Closing remarks: Dr. William Chong-Council member Egerton University

In closing, Dr. Chong thanked the participants for their patience and Tegemeo Institute for not only inviting him but also for their effort to bring all the stakeholders together to deliberate with government on these important issues that also touch on Vision 2030. He encouraged the participants, either working individually or collectively, to put their efforts towards influencing maize policies and provide mechanisms of implementing these policies. In addition he called on members of both County and National government to participate in such forums for legislation purposes. He emphasized that there was need for the legislators to divert their attention from just making laws to undertaking a situational analysis before coming up with bills and laws. He challenged the participants with a quote stating, “*we have come, learnt, interacted and therefore need to act*”.

The meeting ended at 12.00 noon with a word of prayer by Ms. Virginia Kimani from the Pesticides Residue Committee (PRC).

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