Cost of Maize Production under Different Systems in Kenya: The Role of Policy Interventions

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SUMMARY

In Kenya Maize is a major staple crop, often equated to food security. High cost of production is one of the major challenges facing maize sector in Kenya. To address this, the government initiated a fertilizer subsidy program and maize output price support. In a study to shed light on implications of these intervention, we established that the cost of production under different systems are still high and that maize production is not a viable venture in small scale production systems where land rent and working capital is used. Similarly, commercial fertilizer prices are still high since the share of fertilizer to total cost of production ranges between 17 and 28 per cent even with government fertilizer subsidy program in place. We find that government output price support creates undue advantage to some farmers occasioned by relatively higher NCPB prices. We therefore, recommend need for better management of fertilizer prices and input subsidy by exploring potential of engaging private sector in managing the input subsidy program. On output price support, invest in interventions that will increase production and productivity and let market forces to determine the prices.

BACKGROUND

Maize is the staple food in Kenya with over 85 per cent of the population relying on it for their diet. A large proportion of the farmers depend on maize farming for income-generation. It is produced by large and small-scale farmers with **the latter** accounting for about 70 percent of the total production. The large number of small scale farm households involved in maize production is indicative of the importance of the crop as well as its potential in improving the country's rural livelihoods, poverty reduction and food security. However, production costs and marketing expenses, soil quality, area under production, pests and diseases influences producer's net income, whereas output price support continue to give undue advantages to a few farmers and contributes to welfare losses to consumers due to high maize prices. Improving maize production efficiency through reduction of production cost and appropriate use of inputs to ensure acceptable profitability for the producers and lower food prices for the consumers has been a major challenge for the government. To address the problem, the Government through the Ministry of Agriculture, Livestock and Fisheries (MoAL&F) in the financial year 2008/9 launched an aggressive programme to provide subsidized fertilizer to farmers with the aim of reducing fertilizer prices, bring down the farmers' production cost and increase their profits from maize production. Fertilizer prices have continued to decline though, it is not clear if the decline is indeed due to the fertilizer subsidy or other external factors are playing some role. Similarly it is not clear by what level the farmers have been able to reduce the cost of maize production by using subsidized fertilizer. Finally the strategic grain reserves to cushion the country against food security emergencies have continued to be low.

OBJECTIVES

The objective of this policy brief is to provide information on the cost of maize production in Kenya and how it varies across different production systems, across counties as well as to establish if the cost of maize production is sustainable under smallholder farming system. It also evaluates how the cost of maize production differs with the generalized fertilizer subsidy provided by Government and finally evaluates the effect of output price support through NCPB on producer's margins. The main questions is whether these interventions achieve their intended goals, what is the cost saved and revenue gained per unit with use of subsidized fertilizer and output price support?

DATA AND METHODS

To obtain the requisite information for farm budgets in the 2014/2015 cropping year, the typical farm or agri-benchmark approach was used. This approach involves use of a panel group of participants comprising of farmers in a selected area, and experts from the area who are knowledgeable in production of the crops, to create typical farms. The experts include agricultural extension officers and farmer group leaders. A structured questionnaire was used to collect information from farmers in a focus group set-up. A typical large scale farmer characterized by over 50 acres under maize, highly mechanized, and use of commercial fertilizer. Whereas a typical small scale farmer had below 10 acres under maize, less mechanized and use commercial fertilizer. Costs for different production systems in major maize growing regions (Trans Nzoia, Uasin Gishu, Nandi, Kakamega, Nakuru, Bungoma, Narok and Migori) were compared by the fertilizer regime.

KEY FINDINGS

Cost of Maize Production: Majority of large scale maize producers use rented land and borrowed capital. The results strongly suggest that cost production in 2014 was between KES 1,577 to 1,665 (Table 1). Similarly, Tegemeo household data 2014, show that only 19.6% of the small scale farmers rented in land to produce maize hence the majority use own land. Assuming 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 working capital, the cost of production was between KES 1,618 to 1,819 (Table 2). Aggregating cost of maize production in the high potential maize growing regions with land rent and working capital was KEs 1,597 and 1,771 for large and small scale producers respectively. Without land rent and working capital the cost of production was between KES 1,171 and 1,156 for large and small scale production systems respectively. Narok, and Nakuru Counties were seriously affected with poor rains and Maize Lethal Necrosis Disease (MLND) and high cost of labour in Migori, hence increasing the cost of production.

Cost of Production with Input Price Support: We found that the cost of producing a bag of maize with subsidized fertilizer among large farmers was KES 1,485 in Trans Nzoia and KES 1,384 in Uasin Gishu. Cost saving per bag with use of subsidized fertilizer was 11% and 15% whereas revenue gain per acre was 30% and 41% in Trans Nzoia and Uasin Gishu counties respectively. Use of own land and resources reduced the cost per bag to about KES 1,000 in both regions (Table 4). Cost per bag with subsidized fertilizer among small scale producers where land rent and borrowed capital are used was KES 1,436 in Bungoma and KES 1,603 in Kakamega. However, most small scale farmers do not rent land hence most of them produce a bag of maize at about KES 1,000 with subsidized fertilizer. Cost saving per bag arising from this was highest in Trans Nzoia (15%) whereas revenue gain per acre was highest in Uasin Gishu County (33%). Generally maize production is not a viable venture for small scale farmers where land rent is involved even with subsidized fertilizer because small scale farmers in these regions realized margins lower than 30% of the cost of production (Table 4).

The average cost of production where land rent and working capital are used was KES 1,405 and 1,551 for large and small scale producers respectively. And about KES 1,000 in both production systems without land rent and working capital. The higher cost of production among small scale farmers was attributed to inadequate inputs use and high cost of labour

Table 3: Large Scale Cost of Production – **With Input Price Support**

County	Trans Nzoia	Uasin Gishu
Maize yield (bags/acre)	**25**	**26**
Sale price per 90kg bag	2,400	2,300
Total revenue/acre (TR) [1]	**60,000**	**59,800**
Total production costs with WC	**37,128**	**35,932**
Cost per bag with LR &WC	**1,485**	**1,384**
Breakeven yield (90kg bags)	16	14
Profit per bag (Ksh) with LR & WC	*915*	*916*
Profit as a % of cost/bag with LR &WC	62%	66%
Cost saving/bag with LR & WC	11%	15%
Revenue gain/acre with LR & WC	30%	41%
Cost per bag without LR & WC	1,060	972
Profit per bag (Ksh) w/o land rent	1,340	1,328
Profit as a % of cost/bag w/o LR & WC	126%	137%

Source: Field data 2014

Table 4: Small Scale Cost of Production – **With Input Price Support**

County	Trans Nzoia	Uasin Gishu	Bungoma	Kakamega	Nandi	Nakuru	Narok	Migori
Maize yield (bags/acre)	**18**	**23**	**16**	**17**	**17**	**9**	**7**	**11**
Sale price per 90kg bag	**1,950**	**1,700**	**1,800**	**2,400**	**1,800**	**2,200**	**2,000**	**1,900**
Total revenue/acre (TR)[1]	**32,400**	**39,100**	**28,800**	**40,800**	**30,600**	**19,800**	**14,000**	**20,900**
Total production costs (TC)	**28,746**	**33,754**	**22,972**	**27,255**	**26,638**	**27,664**	**23,039**	**27,813**
Cost per bag with LR & WC	**1,597**	**1,468**	**1,436**	**1,603**	**1,567**	**3,074**	**3,291**	**2,529**
Breakeven yield (90kg bags)	10	14	8	7	10	8	9	11
Profit/bag (Ksh) with LR & WC	353	232	364	797	233	-874	-1,291	-629
Profit/loss/bag with LR & WC (%)	22%	16%	25%	50%	15%	-28%	-39%	-25%
Cost saving/bag with LR & WC	15%	11%	15%	8%	9%	8%	5%	8%
Revenue gain/acre with LR & WC	10%	33%	25%	7%	23%	193%	-22%	-70%
Cost per bag w/o LR & WC	**1,034**	**1,011**	**954**	**1,014**	**1,039**	**1,957**	**2,476**	**1,978**
Profit per bag (Ksh) w/o LR & WC	916	689	846	1,386	761	243	-476	-78
Profit per bag w/o LR & WC (%)	89%	68%	89%	137%	73%	12%	-19%	-4%

Source: Field data 2014

Share of Cost Components

Analysis of cost components show that share of fertilizer, land rent and other intermediate inputs pushed up the cost of production in large scale system. While among small scale farmers labor, fertilizer and land preparation were major cost components. Comparing share of costs in both production systems, labour in small scale system was 18 percentage points above that in large scale. Could this high cost of labour be the source of inefficiency among small scale maize producers? (Figure 1) To understand the source of high labour costs, further analysis of labour among small scale producers revealed that weeding constituted between 36% to 53% of total labour cost followed by harvesting hence the need to explore technologies that is less labour intensive and cost effective to reduce cost. (Table 5)

Sources of Subsidized Fertilizer: In rolling out the fertilizer subsidy program, the objectives were to influence fertilizer commercial prices, bring down the cost of production and increase yields hence output.

To achieve these objectives the program aimed at absorbing 40% of the annual fertilizer requirement so that the rest can be provided by the private sector.

To ascertain whether these objectives had been achieved, we analyzed funding to the program relative to national requirement, access to various subsidy programs and price trends in major fertilizer brands in the market. Results show that since inception of the program six years ago, funding to the subsidy program has been increasing but has not reached the 40% of the national requirement that the government intended to absorb. In fact it has been mixed with the highest absorption rate being 31% in 2013/2014 financial year. The annual average in the last six years has only been 15% of the national requirement (Figure 2). We found out that the design of the programme affect accessibility by small scale farmers where farmers located close to the NCPB depots benefit more. Tegemeo household survey of 2014, showed that only 9 percent of 6,512 households interviewed reported to have received subsidized fertilizer between 2012 and 2014. Most of those who received the subsidized fertilizer got it from National Government/NCPB program. To give more insight on the accessibility of the subsidized fertilizer, we analyzed key agricultural and household's characteristics from Tegemeo household data 2014. Majority of farmers that received subsidy had some primary or O-level education. With exception of household head age, all other indicators showed significant relationship with access to subsidy. More farmers in high income group received subsidized fertilizer compared in those middle and low income group" This could imply that this program is not designed to benefit resource poor small scale farmers (Figure 3).

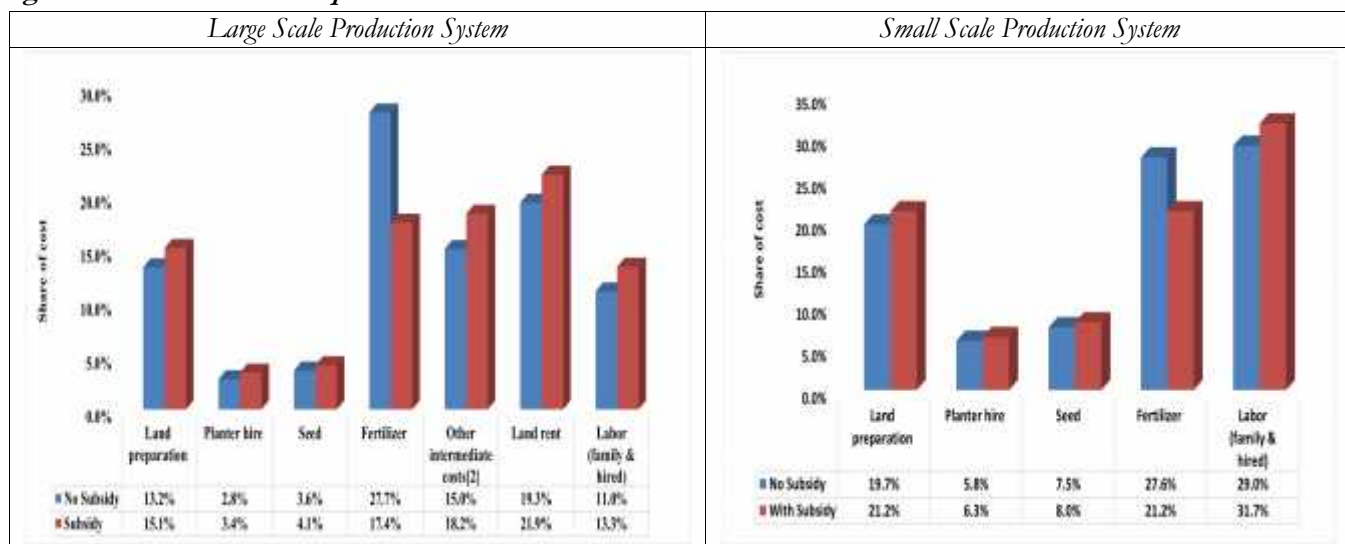*Figure 1: Share of cost components*

Table 5: Share of labour components to total labour cost

Share of labour components	Trans Nzoia	Uain Gishu	Bungoma	Kakamega	Nandi	Nakuru	Narok	Migori
Planting	2	1.3	22	15	3	19	19	14
Weeding	50	50	36	53	53	47	52	48
Fertilizer Application	3	5	4	5	4	5	0	5
Harvesting	35	29	30	13	26	21	22	22
Plant protection	0	5	0	5	0	2	0	0
P/H handling	11	10	9	9	15	6	7	10
Share of labour to total cost	31	34	34	33	21	47	44	43
Average cost per bag	1124	1072	1039	1059	1090	2037	2544	2068

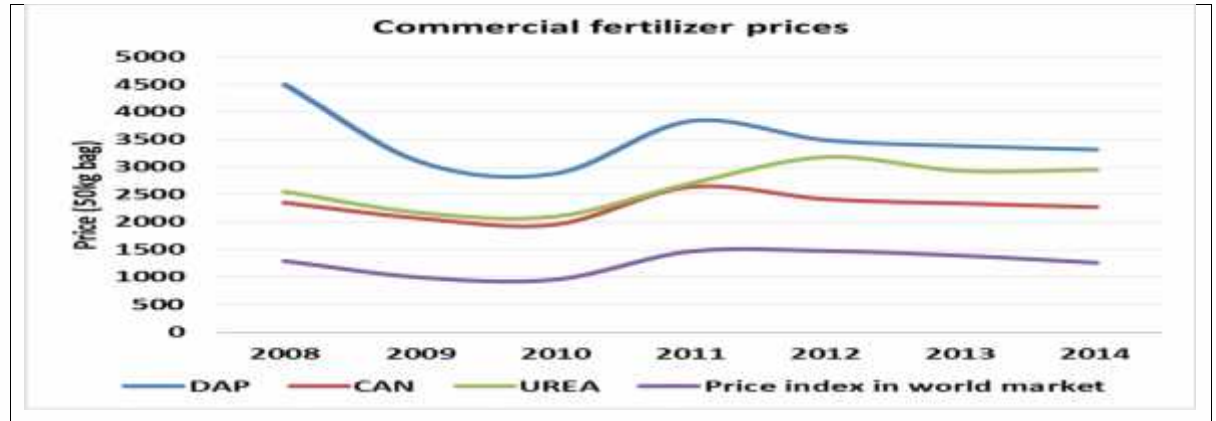Figure 2: Share of subsidized fertilizer to total national requirement
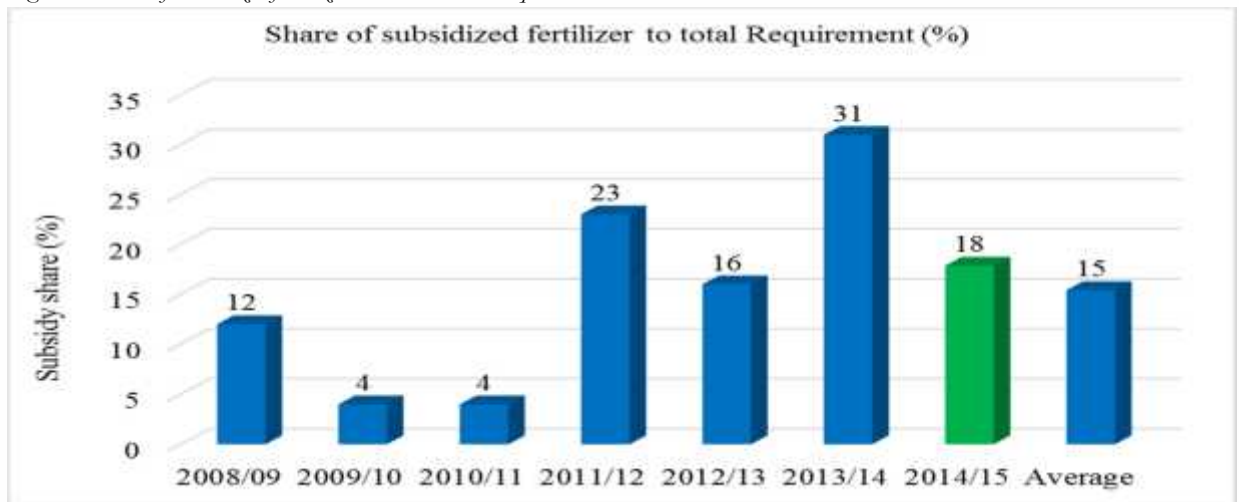
Source: ERA 2013 MTEF 2015/16, KNBS

Figure 3: Proportion that received Fertilizer Subsidy by income group
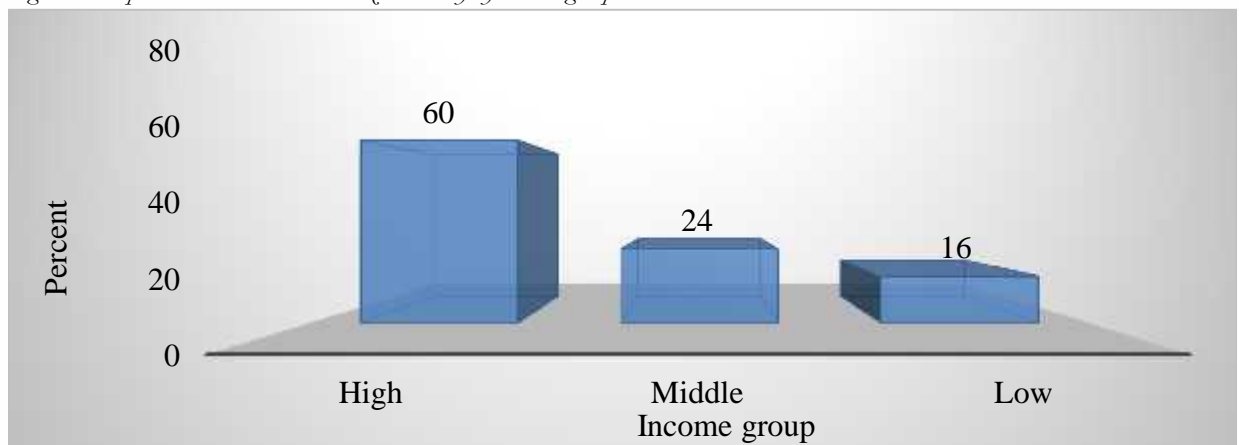
Source: Tegemeo 2014

Figure 4: Trends in commercial fertilizer prices 2008-2015

*Source: ERA 2013, TAPRA II, 2014, World Bank data.*

Effect of Government Producer/Output Price Support through NCPB

The government has been intervening in the input market through fertilizer subsidy program and in output market by buying Strategic Grain Reserve (SGR) at prices above the market price. Government maize buying through NCPB in the year 2015 was KES 2,800 per 90kg bag. The farm-gate prices however ranged between KES 1,930 and 2,333. Comparing the margins received by farmers under different production systems and fertilizer input regime, large producers who did not receive fertilizer subsidy but sold to NCPB earned 75 percent profit per 90kg bag whereas those with fertilizer subsidy and sold to NCPB earned 99 percent profit for every bag sold. Similarly profit per bag for small scale producers with no fertilizer subsidy but sold to NCPB leaped from 67 to 142 percent, while those with both input and output price support earned 173 percent. Results of the analysis shows that output price support distort market prices and give undue advantage to only a few farmers who are able to sell to NCPB. These high prices limit access to affordable maize to consumers. Why not invest more on fertilizer subsidy and other technologies that will help farmers increase production and productivity and let market forces determine the prices? In this way producers will get higher returns from their efficiency in production while consumers would benefit from affordable prices (Table 9). The question one would want to know is what proportion of small scale farmers sold to NCPB. Results from Tegemeo household survey 2014 collected from 38 counties reveal that only 0.7% of farmer sold maize to NCPB and that only those who were closer to the depots were able to sell to NCPB (Figure 5).

Table 9: Cost of Production with Input and Output Price Support

	Large Scale		Small Scale	
	No Producer Support / No Output support	No Producer Support/ with Output support	No Producer Support / No Output support	No Producer Support/ with Output support
Maize yield (bags/acre)	26	26	17.4	17.4
Sale price per 90kg bag	2,333	2,800	1,930	2,800
Cost per bag with LR &WC	1,597	1,597	1,715	1,715
Profit per bag (Ksh) with LR & WC	737	1,203	215	1,085
Profit per bag with LR &WC (%)	**46%**	**75%**	**13%**	**63%**
Cost per bag without LR & WC	1,171	1,171	1,156	1,156
Profit per bag (Ksh) w/o LR & WC	1,162	1,629	774	1,644
Profit per bag w/o LR & WC (%)	**99%**	**139%**	**67%**	**142%**
	Producer Support / No Output support	Producer Support / with Output support	Producer Support / No Output support	Producer Support / with Output support
Maize yield (bags/acre)	26	26	17.4	17.4
Cost per bag with LR &WC	1,405	1,405	1,551	1,551
Profit per bag (Ksh) with LR & WC	928	1,395	379	1,249
Profit per bag with LR &WC (%)	66%	99%	24%	81%
Cost saving/bag with LR & WC	12%	12%	11%	11%
Cost per bag without LR & WC	**1,005**	**1,005**	**1,024**	**1,024**
Profit per bag (Ksh) w/o LR & WC	1,328	1,795	906	1,776
Profit per bag w/o LR & WC (%)	*132%*	*179%*	*88%*	*173%*

Figure 5: Proportion of farmers selling maize to NCPB
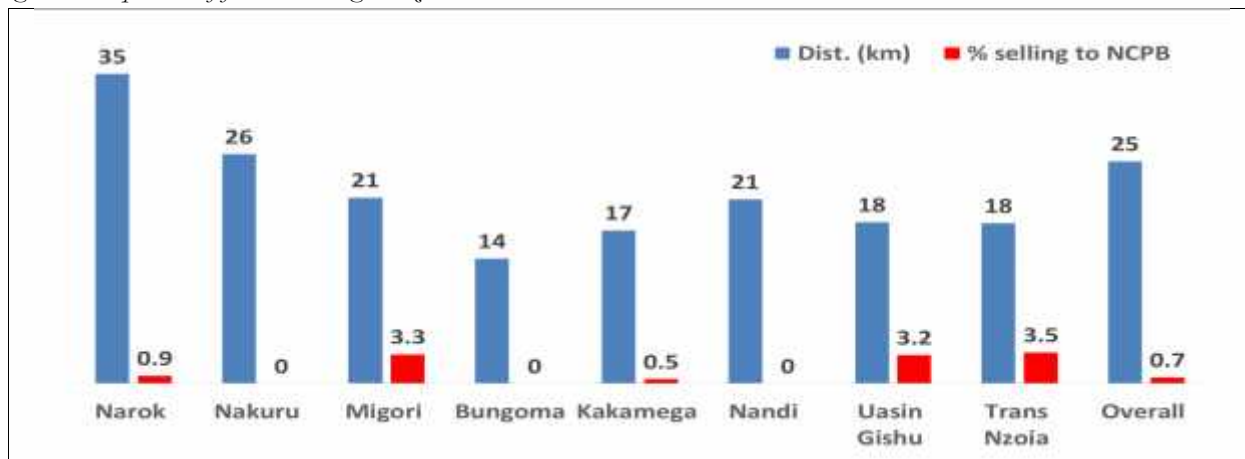
Source: Tegemeo dataset, 2014.

Conclusion

Cost of maize production is high where land rent and working capital are used. Major cost components for large scale maize farmers are fertilizer, land rent and intermediate inputs. Fertilizer, land preparation and labour, of which weeding constitutes between 36-53% of total labour cost are the major cost components for smallholder farmers.

Commercial fertilizer prices have stabilized but are still relatively high. This can be attributed to perfect price transmission reflected in the world market fertilizer prices and that funding to the subsidy program has been inadequate to meaningfully influence commercial fertilizer price. The design of the programme is not ideal for resource poor farmers.

Finally government output price support creates undue advantage to some farmers and makes maize prices relatively high.

Recommendations

Results show that major cost components for small-scale farmers is labour used in weeding and harvesting. We recommend need to explore technologies that could reduce the cost of weeding such as herbicides use since this will compliment fertilizer subsidy programes in reducing the cost of production and increase productivity.

To better manage fertilizer prices and input subsidy, there is need to explore private sector managed subsidy programs given their wide distribution network. Finally, the government should consider investing in interventions that will increase production and productivity and let market forces to determine the prices. This will ensure increased returns to all farmers and affordable maize for all consumers.

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