Review

Maize Hectarage Response to Price and Non-price Incentives in Malawi

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Accepted 4 March, 2014

A study was conducted to explore the nature in which smallholder maize producers respond to price and non-price factors. Specifically the study aimed at assessing the hectarage response of smallholder farmers in maize production to price and non-price factors. Using a case study of farmers in Lilongwe District, the study employed an Auto-regressive Distributed Lag (ARDL) model to assess the farmer’s responsiveness. Data for a period of 20 years ranging from 1989 to 2009 was used for the analysis. Study findings show that the important factors affecting smallholder farmers’ decision to allocate land to maize included the lagged hectarage allocated to maize, availability of labour and inorganic fertilizer. Lagged maize prices and weather were found not to be statistically significant in influencing farmers’ decision to allocate land to maize. The research concludes that price incentives are on their own inadequate to influence smallholder farmers’ decision to allocate land to maize. This is because farmers are largely constrained by land and cash resources with which to hire labour and to purchase inorganic fertilizer. Therefore policy needs to go beyond market and price interventions as a means of incentivizing staple food production as non-price incentives are critical in influencing smallholder farmers’ production decisions in relation to maize.

Keywords: Food security, Price and non-price factors, Auto-regressive distributed lag.

INTRODUCTION

Malawians is the central reason behind continual government support. Lack of investment and development of the sector has resulted in poverty and productivity traps that have further constrained input and output market development, and the ability of rural poor people to protect themselves from wider economic shocks. Jere (2008) further points out that this has been the case because the majority of producers in the agricultural sector are poor-resource farmers, such that the need for government intervention in the sector is, sometimes, a necessary prerequisite for meaningful development. Mataya and Kamchacha (2005) indicated that government intervention in the market place has been justified by the existence of market failure and the need to ensure adequate supply of commodities with some degree of price stability. Until 1994 prices of agricultural commodities were controlled with the exception of maize. This was made possible through the
establishment of the Agricultural Development and Marketing Corporation (ADMARC) which was solely responsible for purchase and sale of agricultural produce and inputs, respectively. ADMARC maintained pan-seasonal and pan-territorial prices for produce and inputs, of course at a cost to government mounting indebtedness. In spite of implementing the International Monetary Fund and World Bank supported Structural Adjustment Programme, Government continues to intervene in the market by fixing maize price at levels that are often not in line with existing market conditions. Mataya and Kamchancha (2005) further reported that maize shortages and acute fluctuations in maize prices in Malawi have been associated with government interference in the marketing system while availability of maize supplies and stability in prices have been associated with private sector participation.

With prices that are often below the cost of production, many large scale farmers have abandoned maize production in recent years. This means that maize production as of now has remained largely on the part of smallholder farmers (CISANET, 2008). Therefore this study concentrated on the maize price volatility and how smallholder farmers are responding to the changes. According to Jayne et al. (2005), Malawi has been described as the country with the highest magnitude of maize price instability amongst four countries (Kenya, Zambia, Zimbabwe and Malawi) analyzed in the region between 1994 and 2003. There is also a widespread recognition that the existing maize marketing policy environment in Malawi is not generating the growth in farm productivity required to raise living standards and reduce poverty.

One of Malawi’s major development challenges is to identify and put in place policies, institutions, and investments that will enable agricultural marketing systems to catalyze productivity growth on the millions of smallholder farms in the country. Problems of uncertainty, price instability, access to markets, and weak coordination between the various stages in the food supply chain, pose major challenges for marketing actors and the policy makers (Jayne et al., 2005).

In most countries, the objectives of government intervention in the maize market have included the improvement of national level food self-sufficiency and stable consumer prices but none of the countries have been particularly successful in achieving either of these objectives (Conroy, 1993). In Malawi banning of unscrupulous traders from purchasing maize from smallholder farmers at low prices, high consumer prices for maize, its low stock availability, speculative pricing tendencies by private traders, public pressure on cheaper government prices and opening of ADMARC markets to sell maize and increasing vulnerability have all assisted Government to declare a policy reversal to turn ADMARC into a monopoly and monopsonist agency in maize markets without regard for implications that the policy would render to agricultural and market development in Malawi (CISANET, 2008). The key issue is that government has always found itself caught up in this dilemma. On the one hand government is concerned that the escalating prices will increase vulnerability among the net food buyers. On the other hand, lower producer prices act as an implicit tax that hurt maize producers and may in the medium to long-run have adverse effects on the supply response.

It is therefore likely that due to the unstable maize prices and other non-price factors such as availability of fertilizer and weather smallholder farmers who are the custodians in maize crop production have responded in one way or the other since higher maize prices variability and inconsistencies in some of the non-price variables have posed a risk to producer investment. Use of agricultural inputs with exorbitant prices like fertilizer and seed is intensified with better crop prices as the farmers perceive profits while on the other hand poor prices may have contributed to low use of these agricultural inputs. At the same time smallholder farmers may adjust their production towards crops with promising prices on the market in order to improve their incomes. But the degree of responsiveness is basically an empirical question such that various theories have been developed and adopted to explain the dynamics of supply in agriculture (Albayak, 1998). Therefore it could be argued in this case that price and non price factors may have influenced maize hectarage response but there has been no empirical evidence as of recent to support this. This research therefore aimed to understand how the smallholder farmers have responded to prices and non-price factors using empirical evidence. In particular, the study explored how smallholder farmers in maize production respond to price and non-price factors with a focus on hectarage response to these factors.

**Theoretical Framework**

Supply response measures the degree to which the level of production and/or marketed surplus changes in response to stimuli provided by changes in some important variables mainly prices. It attempts to explain the behavioral changes of producers with respect to the production, consumption and exchange decision of a certain product or set of products due to changes in economic incentives (Nkang et al., 2007). Price expectations obviously involve uncertainty, and considerable work had been done on this problem before Nerlove. The earliest and simplest explanation of agricultural price expectations that producers are influenced solely by the most recent season’s prices and that price expectations are that this last season's price will prevail in the next period, is embodied in the so called
cobweb model. Over the years this has been proposed as illustrative of a number of economic market situations where changes in the quantity for market occur in a discrete rather than continuous fashion (Askari and Cummings, 1976).

The Nerlove model, hypothesizing farmer reactions in terms of price expectations and/or partial area (or production) adjustments has been adopted in this case.

The model basically consists of three equations (Askari and Cummings, 1976):

\[ A_t^D = a_0 + a_1 P_t^e + a_2 Z_t + U_t \]  \hspace{1cm} (1)
\[ P_t^e = A_{t-1}^D + \beta (P_t - P_{t-1}^e) \]  \hspace{1cm} (2)
\[ A_t = A_{t-1} + \gamma (A_t^D - A_{t-1}) \]  \hspace{1cm} (3)

Where

- \( A_t \) Actual area under cultivation at time \( t \)
- \( A_{t-1}^D \) Area desired to be under cultivation at time \( t-1 \)
- \( A_{t-1} \) Actual area under cultivation at time \( t-1 \)
- \( P_t \) Actual price at time \( t \)
- \( P_t^e \) Expected price at time \( t \)
- \( P_{t-1}^e \) Expected price at time \( t-1 \)
- \( Z_t \) Other exogenous factors affecting supply at time \( t \), \( \beta \) and \( \gamma \) are termed the expectation or adjustment coefficients

There has been some similar work which also has aimed at analyzing supply response of farmers. Nkang et al. (2007) state that the response of farmers to price and non-price incentives in sub-Saharan Africa (SSA) agriculture has received wide attention in the past because of the raging controversy among economists as to whether farmers in SSA are responsive to economic incentives and to what degree. They addressed the concerns using maize supply responsiveness in Nigeria as a case in point by using the method of co-integration and its applied error correction model. They found out that the response to real maize price is very high in particular in the short run and with a higher adjustment toward long-run static equilibrium and concluded that since maize supply benefits by a larger than proportionate amount by increase in the real price of maize their prices should be raised or at least not allowed to drop below their current levels by stimulating further demand.

Muchapondwa (2008) used relatively recent time series techniques on data spanning over different pricing regimes to estimate the aggregate agricultural supply response to price and non-price factors in Zimbabwe. He applied the ARDL approach to co-integration and produced consistent estimates of supply response in the presence of repressor endogeneity and also permitted the estimation of distinct estimates of both long-run and short-run elasticity when variables are not integrated of the same order. The results confirmed that agricultural prices in Zimbabwe are endogenous and the variables are not integrated of the same order hence use of the ARDL was worthwhile. He then concludes that agricultural price policy is rather a blunt instrument for effecting growth in aggregate agricultural supply.

Kanwar (2004) wanted to check for structural homogeneity of supply response function of cocoa production between 1933 and 1983. Using aggregate production data and a modified Nerlove model, a generalized Chow test showed that the nature of the supply response function changed between 1947 and 1948 and again after 1961. These changes in the supply response function represented farmers’ reaction to changes in the institutional structure for buying and marketing cocoa that influenced the profitability of cocoa farming. When estimating supply response function for wheat in the Irbid Governorate of Jordan, Alwan (2002) also based on the Nerlovian Model. Wheat area, in the model, was the dependent variable in the supply response function. The independent variables were: wheat planted area in Dunums in the current and previous year respectively, the weighted price of wheat in the previous year deflated by the Consumer Price Index (CPI), the holding fragmentation coefficient in the previous year, the yield risk, and the amount of rain in millimeters during the early months of the season. The study concluded that: land holdings fragmentation was the major factor that negatively affects wheat production since the heritage system is the main factor that affects holding fragmentation. The lagged weighted prices were also found more suitable than the current weighted prices from an economic and statistical point of view. Thirdly, the partial adjustment coefficient was low which means that the farmers needed more than one year to change their producing habits. Finally, the farmers were found to be risk-neutral, because their decisions depend mainly on the level and distribution of rainfall during the rainy season.

Askari and Cummings (1976) stated that although industrialization remains the prime goal of political and economic planners throughout the developing world, the last decade has seen a strong resurgence of interest in and concern for agriculture. One area where such endeavors have been clearly evident has been the estimation of farmer supply response to prices and to other incentives. This sector of economic research was immensely advanced by Marc Nerlove’s seminal work of 1958. The Nerlove model, hypothesizing farmer reactions in terms of price expectations and/or partial area (or production) adjustments, has been adopted, modified and even extensively revised by numerous later authors in examining supply response.

Nerlove (1958), in his seminal study of dynamic response, proposed three types of output changes for consideration:
He restricted his attention to the two more common responses: short and long run responses to changes in price expectations, and to the problems of distinguishing empirically between the two. Braulke (1982) also concluded that judging by the number of studies which follow a particular approach more or less closely;

Nerlove’s famous formulation of agriculture supply response is certainly one of the most successful econometric models introduced in literature.

**Maize Production in Malawi**

The area planted with maize by smallholder farmers in Malawi estimated by the Ministry of Agriculture, Food Security (MoAFS) in the 2007/08 annual statistical bulletin was around 1.6 million hectares nationally with total production of 2.6 million metric tons. Estate maize production was very low, at an estimated 50,259 hectares of land and production of 142,737 metric tons in 2008 crop year. It is also worth noting that a significant amount of maize is intercropped with beans, pumpkins, peas, sorghum, etc. In general, farmers with small landholdings are compelled to intercrop, while those with enough land can afford to grow each crop separately (Mataya and Kamchacha, 2005). Figure 1 depicts smallholder maize production trends for the three districts in Lilongwe Agricultural Development Division. From the graph it can be seen that Lilongwe District is the leading producer of maize compared to the other two districts, hence the study concentrated on this district.

Smallholder maize productivity in the three districts has neither improved nor declined. This can be evidenced from the graph of production between 1998 and 2000 production seasons. Since the liberalization of the agricultural markets there has been a sharp increase in farm inputs prices due to the removal of subsidies especially fertilizer which is crucial in maize production, making it unaffordable to most smallholder farmers. As such maize prices drastically increased over the years (Jere, 2008). Jere (2008) also reported that in 2000 and 2001 most parts of the country experienced drought and flash floods as such production levels fell, coupled with bad government policies which resulted into the depletion of the strategic grain reserves the country experienced a state of national disaster. The continued importation of maize created macroeconomic instability due to foreign exchange drainage and high inflation. In essence maize becomes scarce and its average prices across the country kept sky rocketing until 2003 as depicted in Figure 2 below.

In 2004 the government embarked on a Targeted Input Programme (TIP) which distributed free fertilizer and seed to poor farmers to enable them cultivate at least 0.5 hectare of land. Despite implementation of this programme, production of maize was low in the season because of the effect of a dry spell. The country experienced high levels of food shortage felt especially in the 2005 and 2006 lean period. The government also intervened by fixing the maize price at MK17/kilogram to protect the consumers and managed to import about 300,000 metric tons of maize (GoM, 2005). In this context, the government started implementing the
Agricultural Input Subsidy Programme (AISP) in the 2005/06 season with the objectives of improving smallholder productivity and food and cash crop production and reducing vulnerability to food insecurity and hunger. This was the start of the end of the era of food insecurity in Malawi. Following the implementation of the AISP which coincided with good rainfall production tremendously increased and many smallholder households had abundant food enough to feed themselves to the next harvest season (Nankhumwa, 2007).

Review of Maize Policies

In response to the ensuing economic crisis between 1981 and 1987 the Government of Malawi, like those of many developing countries turned to the IMF and the World Bank for financial assistance in the form of Stabilization and Structural Adjustment Loans (SALs). Much of the loans’ conditionality focused on the agricultural sector and the major aim was to remove the incentive bias against smallholder farmers. Key reforms focused on increasing the production of smallholder farmer exportable cash crops, namely tobacco, groundnut and cotton, by increasing the producer prices offered by ADMARC. At the same time maize prices were held down to reduce the relative price of food crops so as to encourage more export crop production. With regards to this in 1987 Malawi faced a food crisis as a result of a decline in maize production per capita and a collapse in ADMARC’s ability to purchase maize. The crisis was due to inappropriate and poor sequencing of price and market liberalization (Harrigan, 2003).

CISANET (2008) reported that previously, ADMARC used to enjoy policy support and funding from the state to manage smallholder marketing up to the late 1980s when the new concept of market liberalization started with the reforms in the tobacco market followed by liberalization of the maize market. Prior to liberalization ADMARC faced various problems in terms of managing its monopoly status, size and mandate especially in terms of financial viability. In order to maintain viability and reduce ADMARC effects on the economy, the organization underwent over seven reforms before the advent of market liberalization ending up with commercialization reform. Due to market liberalization, ADMARC lost out in terms of legal statutes and share of the market to private marketing organizations and the alternative marketing arrangements expanded rapidly as evidenced by ADMARC’s loss of share and closure of some of its markets deemed as non-profitable.

However growth of the private traders in maize market has been less than vibrant given the absence of infrastructure especially in more remote rural areas leading to market failure. As a result, private traders have tended to take advantage of the low bargaining power and lack of organization among smallholder farmers to buy maize at very low prices (CISANET, 2008). Agricultural commodity prices with the exception of maize were deregulated towards the end of 1980s. Liberalization of the maize market was undertaken slowly because of the sensitivity surrounding this commodity. In 1995 Government introduced a price band with a view to maintaining some degree of price stability in the market. A price band is essentially a form of price support programme characterized by a floor price and a price ceiling in favor of consumers and producers, respectively (Mataya and Kamchacha, 2005)

Mataya and Kamchacha (2005) further reported that during the period the price band was implemented, the government set the price ceiling below the import parity price although private traders charged close to import parity price during times of scarcity. The moral of the story is that any price below the breakeven price erodes producers’ incentive to produce maize, whereas any price above encourages farmers to engage in commercial production of the crop. In order to implement this programme, ADMARC was constrained to operate within the band while other traders were free to use market determined prices making the former a buyer of last resort. The price band resulted in a dramatic increase in a number of small-scale traders with rapid turnover of stock. The band progressively widened, eventually approaching import/export parity prices. However, Government required ADMARC to continue to provide producer price support at government determined prices; but ADMARC was unable to successfully defend the ceiling price with its available resources. As a result the price band was eliminated in December 2000 (GoM, 2005).

METHODOLOGY

The description below refers to Figure 3 which shows the framework for farmer’s response to price and non price factors. Formal trade, informal trade, and inter-household trade will form the maize output market. The output market will influence the output prices which are also largely affected by government through policy intervention. Government policy through subsidies will also affect the agricultural input prices which will in turn affect the farmers’ decision towards production of maize. Government policy will also affect formal trade through export and import bans as well as land policy will also affect amount of land allocated to specific crops. Prices of other crops will also influence the farmer’s decision whether to invest in maize or not since the farmer will be eager to invest in other crops which might be perceived as much more profitable than maize. In turn the farmers’ decision will affect the amount of land and labour
Figure 3: Factors influencing smallholder farmers’ decision in maize production

allocated towards maize production. Household characteristics will affect the farmers’ decision to invest in maize and physical conditions such as weather will also contribute to maize productivity.

Demographic and Physical Data of the Study Area

Lilongwe district falls under Lilongwe Agricultural Development Division (LADD) in Central Malawi which has been nicknamed the ‘grain basket’ because of its high contribution to food crop production in the country. The region produces much of its maize from smallholder farmers. Lilongwe district has 19 Extension Planning Areas (EPAs) and 320 sections. There are 343,981 farm families of which 240,787 are male headed and 103,194 are female headed. Its population is about 1.9 million people representing about 15 percent of the national population. There is a total land area of 626,049 hectares under public land, 17,259 hectares under forest reserves and 278,400 hectares under freehold (Lilongwe District Agricultural Development Office, 2009). The climate of this area is generally warm to hot with mean daily temperatures ranging between 21°C in January and 15°C in June. The mean daily maximum temperatures range from 25°C to 27.5°C in January and from 22.5°C to 25°C in July. Annual rainfall varies between 810mm and 1020mm and much of this is experienced in the period between December and March, with minimal rainfall in November and April. The vegetation is mostly broad-leaved deciduous woodland. The area has some wetlands (dambos) that are usually water logged during the rainy season and are used for winter cropping (Sidik, 2006).

Sources of Data and Sampling Techniques

The study made use of both primary and secondary data. Primary data was collected by a structured questionnaire and Key Informant Interviews while secondary data was collected from the Ministry of Agriculture and Food Security 2008/2009 Annual Statistical Bulletin and data collected covers a 20 year period from 1989 to 2009. Data was collected using different teams including formal individual interviews with the sampled household heads through a structured questionnaire and key informant interviews. A multi-stage sampling procedure was used in this study. The first stage was to select two EPAs using purposive sampling based on maize production and availability of market prices in the district. The second stage involved selection of villages and the last stage involved selection of farmers using simple random sampling. A total of 100 farmers were interviewed in this study.

Analytical Technique

An Auto-regressive Distributed Lag Model (ARDL) was used in this study. The ARDL is a dynamic model, stating


that hectarage is a function of own hectarage, expected price, and some exogenous variables. A model is described as dynamic if the time path of the dependent variable is explained by its previous values (Gujarati, 1995). The model was lagged once and the lag length of the model was determined by the Akaike Information Criteria (AIC). The model was estimated using least squares method as presented below:

\[
\ln H_{mt} = \beta_0 + \beta_1 \ln H_{m,t-1} + \beta_2 \ln P_{m,t-1} + \beta_3 \ln Fert_m,t-1 + \beta_4 \ln WE_{t-1} + \beta_5 \ln L_{t-1} + \epsilon_t
\]

Where:

\( \ln H_{mt} \) Natural log of maize hectarage under cultivation in period \( t \); 
\( \ln H_{m,t-1} \) Natural log of maize hectarage under cultivation in period \( t-1 \). 
It is expected that farmers are willing to allocate more land to maize when they perceive favorable conditions. Therefore the coefficient of this variable is expected to be positive. 
\( \ln Fert_{t-1} \) Natural log of amount of fertilizer applied to maize in period \( t-1 \) used as a proxy of amount of fertilizer available. It is anticipated that the more the fertilizer is available the more a respective crop is going to be produced hence the coefficient is expected to be positive. 
\( \ln WE_{t-1} \) Natural log of weather variable estimated by the annual rainfall amount in period \( t-1 \). It is anticipated that the more the rainfall is conducive the more the farmers are going to allocate land to maize hence the coefficient is expected to be positive. 
\( \ln L_{t-1} \) Natural log of labour in man- hours applied to maize in period \( t-1 \). It is expected to be positive since the more the household has labour the more it is willing to cultivate more land.

\( \epsilon_t \) is error term assumed to be white noise 
\( \beta_1, \beta_2, \beta_3, \ldots \) are the coefficients to be estimated.

**Diagnostics Tests**

The estimation ARDL model may result in residuals that violate the assumption of normality of the error terms. This is a simplifying assumption of the classical normal linear regression model, and must be satisfied for the method of ordinary least squares to be the best linear unbiased estimator (BLUE) (Muchapondwa, 2008). To ensure normality of the residuals, the estimating equation used in this study is expressed in logarithmic form. The transformation is necessary because it ensures that the errors are both homoskedastic and normally distributed (Maddala, 2001). This is imperative to ensure the validity of the \( t \) and \( F \) tests. An additional advantage of using the logarithmic form is that the coefficient of the price variable can be directly interpreted as the short-run supply elasticity.

The Breusch-Godfrey LM test for autocorrelation was employed to allow a decision to be made regarding the presence of autocorrelation among the residuals. The Augmented Dickey-Fuller (ADF) test was used to test each of the variables for the presence of a unit root.

**MODEL ESTIMATION AND DISCUSSION**

Table 1 below shows the summary of results of unit root test of individual series used in the estimations of the hectarage equation. The Mackinnon approximate \( p \)-values indicate that we should reject the presence of a unit root at 5 percent significant level; therefore we proceed to do the estimations. Table 2 below shows results of multicollinearity test. The Variance Inflation Factors (VIF) for individual variables as well as the mean VIF are all less than 10. This indicates that there is no multicollinearity in the model.

Table 3 below shows results for autocorrelation. The \( p \)-value rejects the presence of autocorrelation at 5 percent significance level. Table 4 below shows results for heteroskedasticity test. The results reveal that there is no heteroskedasticity in the model. The adjusted R-squared is quite high indicating that 81 percent of the variation in the hectarage allocated to maize is explained by the model. The F-value is significant at 1 percent significant level (table 5).

The constant coefficient of hectarage equation (4.622) is significant at 10 percent significance level implying that farmers are still going to allocate 4.6 percent of the hectarage to maize regardless of the other observed variables. This is so because maize is the main key crop

<table>
<thead>
<tr>
<th>Variable</th>
<th>Order of Integration</th>
<th>Mackinnon approximate ( p )-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize hectarage</td>
<td>I(0)</td>
<td>0.7397</td>
</tr>
<tr>
<td>Annual rain</td>
<td>I(1)</td>
<td>0.6036</td>
</tr>
<tr>
<td>Labour for maize</td>
<td>I(1)</td>
<td>0.0994</td>
</tr>
<tr>
<td>Fertilizer for maize</td>
<td>I(0)</td>
<td>0.4999</td>
</tr>
<tr>
<td>maize price</td>
<td>I(0)</td>
<td>0.7856</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 2: Results for Multicollinearity Test

<table>
<thead>
<tr>
<th>Variable</th>
<th>VIF</th>
<th>1/VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize price L1</td>
<td>6.32</td>
<td>0.158251</td>
</tr>
<tr>
<td>Annual rain L1</td>
<td>6.02</td>
<td>0.166080</td>
</tr>
<tr>
<td>Labour maize L1</td>
<td>5.97</td>
<td>0.167472</td>
</tr>
<tr>
<td>Maize hectarage L1</td>
<td>4.64</td>
<td>0.215731</td>
</tr>
<tr>
<td>Fert maize L1</td>
<td>4.47</td>
<td>0.223883</td>
</tr>
<tr>
<td>Mean VIF</td>
<td>5.48</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Breush-Godfrey LM test for Autocorrelation

<table>
<thead>
<tr>
<th>Lags(p)</th>
<th>chi</th>
<th>df</th>
<th>Prob &gt; chi2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.815</td>
<td>1</td>
<td>0.0934</td>
</tr>
</tbody>
</table>

Table 4: Breush-pagan / Cook-weisberg test for heteroskedasticity

<table>
<thead>
<tr>
<th>Fitted values of maizehect</th>
<th>Ho: Constant variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi2(1)</td>
<td>15.3</td>
</tr>
<tr>
<td>Prob &gt; chi2</td>
<td>0.0015</td>
</tr>
</tbody>
</table>

Table 5: Regression Results of the Hectarage Equation

<table>
<thead>
<tr>
<th>Maize Hectarage Regressors</th>
<th>Coefficient Estimates</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>4.6225***</td>
<td>2.2271</td>
</tr>
<tr>
<td>ln H_{H,t-1}</td>
<td>0.4039***</td>
<td>0.2113</td>
</tr>
<tr>
<td>ln P_{H,t-1}</td>
<td>0.0525</td>
<td>0.1390</td>
</tr>
<tr>
<td>ln Fert_{H,t-1}</td>
<td>0.2815**</td>
<td>0.1262</td>
</tr>
<tr>
<td>ln WET_{H,t-1}</td>
<td>0.2353</td>
<td>0.1426</td>
</tr>
<tr>
<td>ln L_{t-1}</td>
<td>-1.1664***</td>
<td>0.6044</td>
</tr>
<tr>
<td>Adjusted R-Squared</td>
<td>0.8193</td>
<td></td>
</tr>
<tr>
<td>Prob &gt; F</td>
<td>0.0000</td>
<td></td>
</tr>
</tbody>
</table>

Note: ***significant at 10%, **significant at 5%, and *significant at 1%.

that affects food security amongst the smallholder farmers; therefore land will still be allocated to maize to cater for food security. Own hectarage of maize was significant at 10 percent significant level. A 1 percent increase in hectarage in the previous season induced a 0.4 percent increase in the amount of land allocated to maize in the current season. This indicates that previous hectarage allocated to maize exerts a significant influence in current allocation of land to maize.

Previous maize prices were statistically insignificant. This was the case regardless of the positive relationship between the amount of land allocated to maize and the previous prices. This indicates that maize prices did not influence the farmers’ decision in terms of the amount of land allocated to maize in the current season. Chembézi (1990) argued that smallholder farmer’s price risk is empirically less important and that they have developed a culture that maize apart from being a food crop is also a source of income. Fertilizer availability to smallholder farmers was also critical in determining the amount of land allocated to maize in the current season. A 1 percent increase in the amount of fertilizer available resulted into a 0.28 percent increase in the amount of land allocated to maize. This was significant at 5 percent significance level. This clearly indicates that farmers’ willingness to allocate more land to maize will depend on the availability of fertilizer.

Regardless of the positive relationship between the weather variable and amount of land allocated to maize, the weather variable (annual rainfall) was statistically insignificant. This implied that previous annual amount of rainfall did not play any part in terms of influencing the farmers’ decision in current allocation of land to maize. Labour was significant at 10 percent significance level. But contrary to the expectation there was a negative increase. A 1 percent increase in the amount of labour
resulted into 1.2 percent decrease in the amount of hectarage allocated to maize. This could be due to the substitution effect between land and labour as well as other variables.

CONCLUSION AND POLICY RECOMMENDATIONS

The study analyzed the extent to which smallholder farmers in Malawi respond to price and non-price factors in terms of amount of land allocated to maize using a case study of Lilongwe district. The study findings show that the social economic characteristics play an important part in determining smallholder farmers’ decision to allocate land to maize. In addition, results show that important factors that affect smallholder farmers’ decision to allocate land to maize were lagged hectarage allocated to maize, availability of fertilizer and amount of labour in a household. Lagged hectarage allocated to maize and availability of fertilizer had a positive and significant impact on maize hectarage. While the availability of labour resulted into a decrease in amount of land allocated to maize in current season. Lagged maize market prices and weather variable were found not to be significant in influencing the smallholder farmers’ decision in land allocation. Thus it can be concluded that maize price policies and market interventions are on their own inadequate to influence smallholder land allocation in the case of staple food production. In this study farmers were unresponsive to price factors but were responsive to non-price incentives.

In order to enhance maize productivity and production, government policy of subsidizing inorganic fertilizer or of making inorganic fertilizer less expensive for the poor should continue. There is also need for increased public investments in rural infrastructure and efficient facilities that facilitate fertilizer trade as will enhance access by smallholder farmers to inorganic fertilizer. Policy should also work towards consolidating smallholder land holdings to reach economies of scale thus ensuring that available land does not constrain efforts to increase production. Finally there is need for extension and agricultural advisory service providers to work with smallholders to enhance labour management skills and allocation. This can be achieved through capacity building efforts that hinge on farm business management skills and efficient allocation of available resources.

REFERENCES


