INFLUENCE OF PRODUCTION STRATEGY ON ORGANIZATIONAL PERFORMANCE OF SEED MAIZE COMPANIES IN KENYA

Munyaradzi Jonga  
Jomo Kenyatta University of Agriculture and Technology (JUKAT)  
School of Entrepreneurship, Procurement and Management  
(email: jongamun@gmail.com)

Esther Waiganjo  
Jomo Kenyatta University of Agriculture and Technology (JUKAT)  
School of Entrepreneurship, Procurement and Management

Agnes Njeru  
Jomo Kenyatta University of Agriculture and Technology (JUKAT)  
School of Entrepreneurship, Procurement and Management


ABSTRACT

This study focused on the influence of production strategy on organizational performance of seed maize companies in Kenya. A cross-sectional survey research design was used to collect data from the target population which comprised of seed maize companies in Kenya. The sampling frame of the study was the registered seed maize companies at the Seed Trade Association of Kenya which was the unit of analysis while the respondents were the managerial employees within the seed companies and key seed experts in Kenya. Primary data was obtained by administering questionnaires to four employees within each seed company. The four employees were randomly selected from the production, marketing, finance and warehousing departments. Interviews were conducted with key seed experts who were selected through snowballing and judgment technique. The collected data was analysed using SPSS software. Factor analysis was done to establish the appropriateness of the questionnaire constructs. Both descriptive and inferential statistics were used. Inferential statistics included the use of bivariate analysis and a multiple regression model was used in order to establish the effect of production strategy on organizational performance of seed maize companies. Production strategy was statistically significant in explaining organizational performance of seed maize companies in Kenya. Production strategy and organizational performance had a strong positive relationship as indicated by a correlation coefficient of 0.821 (82.1%). The fitted regression equation showed that one positive unit change in production strategy’ effectiveness leads to a change in organizational performance at the rate of 64.6%. Results indicated that manual methods of seed production created volume deficiencies in the market, while mechanized production methods and investment in state of the art processing facilities ensured bulk output and product quality leading to low costs per unit and customer satisfaction respectively which improve business performance. Further, use of experienced production & field staff and investment in research
were found to increase quality of seed and enhance sales. The results also showed that the location of the production unit and cost of inputs affected cost of production and eventually the selling price of seed. The study recommends using mechanized production, investment in research and state of the art processing facilities and employment of experienced staff which lead to efficient production, higher output, economies of scale and ultimately high quality seed. All these will lead to good business margins and enhanced organizational performance.

**Key Words:** Production strategy, Organizational performance, Seed maize companies, Productivity Levels

### 1. Introduction

Despite the heavy reliance on agriculture in African economies, the productivity levels of the various cropping systems remain very low. The average yield of course grains (maize, sorghum, millets) in Africa is < 1.4t/ha, compared with 5.6t/ha in developed regions (FAO, 2012). This is mainly due to suboptimal use of required inputs, low usage of improved seeds (Msuya and Stefano, 2010) and poor crop husbandry practices. The low usage of improved seed contributes significantly to low productivity and profitability in the smallholder farming sector in Africa.

Maize is the most important staple crop for over 90 percent of the population in Kenya (International Service for Acquisition of Agri-biotech Application (ISAAA), 2001). It is important for food security, generation of farm income and rural employment. It accounts for more than 20 percent of all agricultural production and 25 percent of agricultural employment in Kenya (Republic of Kenya, 2004). Kenya produces about 2.4 million tonnes of maize per year on 1.5 million hectares of land (FAOSTAT, 2002). Maize production in Kenya takes place under both small–scale and large–scale farming systems with the former accounting for 75-80 percent of total production (Kamidi, Cheruiyot, Osore & Barasa, 1999).

The Economic Review of Agriculture Report, Ministry of Agriculture (MoA) (2007) notes that Kenyans consumed 2.62 million tonnes of maize in 2002 representing 40-45 percent of their total calorie consumption. According to this report, maize consumption has risen steadily through the years to above 3 million tonnes in 2006. The Kenyan population is projected to continue growing at 3 percent per year (FAOSTAT, 2001). Despite efforts to ensure food security in Kenya, production continues to fall short of consumption therefore necessitating imports (MoA, 2007).
The country produced 2,454,930 tonnes of maize in 2004 and imported 241,757 tonnes to cover the deficit while in 2005 an amount of 2,918,157 tonnes were produced occasioning imports of 49,621 tonnes. Maize consumption is currently estimated at 3.6 million tonnes. The demand for maize is growing at 0.7 percent annually and, hence, consumption is likely to continue to grow faster than production.

Kenya needs to increase maize productivity and production to meet the growing demand and reduce imports of the commodity into the country and save the country of foreign exchange earnings. Growth in smallholder maize production in the 1960s and 1970s was attributed to successful diffusion of improved maize seed in Kenya (Smale & Jayne, 2003). Development and release of new maize varieties was matched with investment in agronomic research, extension, seed distribution systems, rural infrastructure and institutions to coordinate grain marketing with seed and credit delivery (Smale & Jayne, 2003). Production also increased through the expansion of the area under maize. With almost all the arable land under cultivation, long-term growth in maize production will come from yield improvement in areas already under crops including marginal or arid and semi-arid areas. This could be achieved through widespread access and use of technologies such as appropriate improved maize germplasm.

Kamau (2002) studied the Kenyan seed industry in a liberalized environment and found out that the potential market for improved seed is high yet not being fully targeted. The market was found to be shrinking as more farmers plant local varieties and recycled seed. Access to improved germplasm was found to be restricted by a number of factors that include: the highly fragmented structure and behaviour of farmers, poor access to credit (seed is not an attractive venture for commercial banks), high price margins for companies, use of agents and stockists that contribute to high seed prices to farmers, lack of information on the opportunities on both demand and supply side of the market and the performance of various players in the market, and macro-economic environment, interest rates, fees, costs and revenues. These factors impact negatively on the effective demand for seed, and may also have an effect of pushing traders and farmers to informal markets so as to avoid these costs.
2. Statement of the Problem

The current demand for improved maize seed in Kenya is about 39 000mt, yet the seed companies operating in this market space can supply only 72% of this demand (Langyintuo, Mwangi, Diallo, MacRobert, Dixon & Banziger, 2008). The shortfall in improved seed supply is being filled by use of inferior land races and other planting materials exchanged by smallholder farmers in their specific farming communities. The use of such unimproved planting materials, results in lower productivity and hence perennial food insecurity among the farming households (Pixley & Banziger, 2004).

In order to address the maize seed supply challenges, a lot of studies on seed supply in Kenya and the whole East African region were undertaken. These studies identified policy issues, technical and funding challenges as the main factors impacting on the seed businesses (Langyintuo et al., 2008). Policy issues on variety release, access to superior germplasm, seed certification regulations, human skills in seed production, funding, etc. were cited as some of the major challenges faced by the seed industry especially the new seed entrepreneurs (AGRA 2013). These challenges were tackled by various organizations in Kenya and elsewhere in Sub-Saharan Africa through the supply of superior germplasm by projects such as DTMA, WEMA, AGRA-PASS, IMAS and IRMA. Kenya also has a robust variety registration process that resulted in 82 maize varieties released for commercialization between 2002 - 2006 (Setimela, Badu-Apraku & Mwangi, 2010) and the number grew to 240 varieties in 2014. This shows that the number of improved maize varieties available is no longer a limiting factor for the growth of seed companies. Furthermore, a lot of capacity building was done through seed business grants and loans, training of plant breeders and seed technologists in order to support growth of new seed entrepreneurs (AGRA 2013).

Despite all these efforts to address the policy, regulatory, technical and funding challenges faced by new seed maize entrepreneurs, the seed demand of 39 000mt in Kenya is still being unmet. The supply of 28 000mt (which is 72% of the actual seed maize demand) is dominated by only five big seed companies yet there are 104 registered seed companies in Kenya (AGRA, 2013). These five seed companies have been dominating the Kenya seed market for more than two
decades. This is despite all the interventions done by various organizations, NGOs and projects to enhance the performance of the new seed maize entrepreneurs.

The past and current interventions focus much on external and technical factors affecting seed businesses. However, these alone, are failing to enhance organizational performance of many seed companies especially the new seed entrepreneurs. As a result their strategic growth is very slow and their competitiveness is very limited. This is resulting in failure to meet the full demand for improved maize seed in Kenya. As highlighted by Langyintuo, Mwangi, Diallo, MacRobert, Dixon and Banziger, 2009, the reforms done in the seed sector which resulted in four-fold increase in the number of seed companies in the last decade were insufficient as the quantity of maize seed produced and marketed did not grow in tandem with the increase in number of seed companies. Furthermore, the Kenyan seed sector is classified to be in the Late Growth stage (stage 4) of seed sector development that is characterized among other things, by favourable seed policies that facilitated establishment of many new seed entrepreneurs, with 82 seed companies having been registered by mid-2010 (AFSTA 2010) and growing to a total of 104 by 2012 (AGRA, 2013).

The major challenge is that the majority of the new seed entrepreneurs are not achieving the required growth to compete and contribute to the already unsatisfied seed maize market in Kenya. Many new seed entrepreneurs remain small, producing less than 500mt of seed annually (MacRobert, 2009). This study therefore, sought to establish the influence of production strategy on organizational performance of seed maize companies in Kenya.

3. **Purpose of the Paper**

To establish the influence of production strategy on organizational performance of seed maize companies in Kenya.

4. **Literature Review**

4.1 **Production Strategy**

Organizations can gain competitive advantage from implementing lean production practices. Such practices enable the organization to get superior performance through reduction of wastes
and other related costs (Ohno, 2008). Lean production refers to a business model that emphasizes on meeting customers’ expectations by delivering quality products at the least cost when required. Womack and Jones (2006) states that lean strategies can resolve severe organizational problems and additionally can be a powerful approach to gather and unite several change initiatives throughout the whole organization. Bicheno (2005) claims that in batch production about 98% of time activities are not of value. In order to implement the concept of lean manufacturing successfully, many researchers emphasizes on total commitment by top management of the organization (Alavi, 2003).

Most organizations pursue lean production practices in response to their need to fundamentally improve business competitiveness by reducing costs while increasing product quality and customer responsiveness, including meeting delivery time. According to Boyer and Sovilla (2009), managers should also work to create interest in the implementation of lean. The business competitiveness needs can manifest through increase in direct global competition or from evolving customer or supply chain expectations. Lean practitioners often acknowledge that successful lean implementation can require a real or perceived business crisis to justify or foster receptiveness to the significant transformation that lean requires to an organizational culture and process. Studies have been done to show the role of lean production system. According to a case study of Kodak Canada Inc., Kodak’s Director of Global Manufacturing and Logistics, Charlie Brown steered the company towards adopting lean productions in 1998, by adopting Kodak Operating System (KOS). Lean therefore, has not only improved procedure, reduced inventory and enhanced ergonomics, but it allows the company to fine-tune its chemistry and keep pace with changes in demand.

In a study to assess the success of methodologies geared at enhancing the sustainability of quality seed production and supply, Guei, Barra and Silue (2011) investigated how smallholder seed enterprises could strengthen their capacities for rice, sorghum, maize, and millet seed production. The study involved mobilizing and training groups of farmers in technical aspects of seed production such as organization of farmers into autonomous seed producer groups, selection of seed production sites, crop management, weed control and crop protection. The focus of this training was to build the groups as business units to enhance the multiplication and supply of
varieties of maize, sorghum, and millet. The study concluded that seed production required quite an amount of financial and technical support, especially in the beginning stages and therefore, it was crucial to sensitize and train seed producers’ organizations while building alliances among all partners, producers, and local research and development agencies.

5. Methodology
This study used a cross-sectional survey research design. A survey research design was used to collect data from the members of a population in order to determine the current status of that population with respect to one or more variables. It was therefore, a self-report study which required the collection of quantifiable information from the sample. A survey research can be descriptive, exploratory or involving advanced statistical analyses (Mugenda & Mugenda, 2003). The correlation approach was used and it involved collecting data in order to determine whether and to what degree a relationship exists between two or more quantifiable variables. The degree of relationship was expressed as a correlation coefficient (R). Since this study was concerned with discovery and deeper understanding of associations among different variables that affect seed business growth and financial performance, a descriptive study with correlational approach was used (Cooper and Schindler, 2011).

The target population of this study comprised of 24 units of analysis which are the seed maize companies that are registered with the seed trade association of Kenya (STAK) from which the accessible population was drawn. The sample size for this study was 96 employees who were obtained first by selecting through purposive sampling four departments from each seed company, namely; production department, marketing department, finance department and warehousing department. Four employees from each seed company were randomly selected one each from the four departments. The study also interviewed 30 seed experts who were selected through snowballing technique who helped on elaboration of study variables. The snowball technique was used in conjunction with the judgment technique. This involved getting the sample through referral networks (Cooper & Schindler, 2011). Primary data was collected by use of questionnaires, coded and analyzed using SPSS version 20. The data collected from seed experts was subjected to content analysis and key summaries were made. The findings are presented in form of tables and discussions and interpretation of the same given.
6. Results and Discussion

6.1. Response Rate

The number of questionnaires administered to all the respondents was 96. A total of 79 questionnaires were properly filled and returned from the seed companies’ staff. This represented an overall successful response rate of 82%. According to Mugenda and Mugenda (2003), a response rate of 50% or more is adequate. Babbie (2004) also asserted that return response rates of 50% are acceptable to analyze and publish, 60% is good and 70% is very good. This high response rate implies that the results can be generalized to the whole population and it’s a good representative of the target population.

6.2. Reliability Analysis

Using Cronbach’s Coefficient Alpha test on production strategy, a coefficient of 0.957 was found as shown in Table 1. These results corroborates findings by Saunders, Lewis and Thornhill (2009) and Christensen, Johnson and Turner (2011) who stated that scales of 0.7 and above, indicate satisfactory reliability. Based on these recommendations, the statements under the production strategy variable of this study were concluded to have adequate internal consistency, therefore, reliable for the analysis and generalization on the population.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Production Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of items</td>
<td>7</td>
</tr>
<tr>
<td>Cronbach's Alpha</td>
<td>0.957</td>
</tr>
</tbody>
</table>

6.3. Factor Analysis

The factor loadings for sub-constructs of production strategy showed that all the statements attracted coefficients of more than 0.4 hence all the statements were retained for analysis. According to Rahn (2010) and Zandi (2006) a factor loading equal to or greater than 0.4 is considered adequate. This is further supported by Black (2002) who asserts that a factor loading of 0.4 has good factor stability and deemed to lead to desirable and acceptable solutions.
6.4. Descriptive Statistics

The objective of the study was to determine the influence of production strategy on organizational performance of seed maize companies in Kenya. Table 2 indicates that 86% of the respondents agreed that manual methods of seed production can create volume deficiencies in the market, 87.3% agreed that mechanized production methods can ensure bulk output leading to low cost per unit and hence improve business margins and 87.4% agreed that cost of inputs affect cost of production and eventually the selling price. Furthermore, 83.5% agreed that location of the production unit can influence the retail price of seeds, 88.7% agreed that use of experienced production and field staff can influence the quality of seed output and 84.9% agreed that investment in seed research can influence the quality of seed produced and affect the sales. Finally, 84.8% of the respondents agreed that investment in state of the art seed processing infrastructure pays off in the quality of seed produced. The mean score for the responses was 4.11 which indicates that many employees agreed to the statements regarding influence of production strategy on organizational performance of seed companies.

Table 2: Production Strategy Descriptive Statistics

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Likert mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual methods of seed production can create volume deficiencies in the market</td>
<td>0.0%</td>
<td>10.1%</td>
<td>3.8%</td>
<td>75.9%</td>
<td>10.1%</td>
<td>3.86</td>
</tr>
<tr>
<td>Mechanized production methods can ensure bulk output leading to low cost per unit and hence improve business margins</td>
<td>0.0%</td>
<td>8.9%</td>
<td>3.8%</td>
<td>51.9%</td>
<td>35.4%</td>
<td>4.14</td>
</tr>
<tr>
<td>Cost of inputs affect cost of production and eventually the selling price</td>
<td>0.0%</td>
<td>8.9%</td>
<td>3.8%</td>
<td>49.4%</td>
<td>38.0%</td>
<td>4.16</td>
</tr>
<tr>
<td>Location of production unit can influence the retail price of seeds</td>
<td>0.0%</td>
<td>10.1%</td>
<td>6.3%</td>
<td>73.4%</td>
<td>10.1%</td>
<td>3.84</td>
</tr>
<tr>
<td>Use of experienced production and field staff can influence the quality of seed output</td>
<td>0.0%</td>
<td>8.9%</td>
<td>2.5%</td>
<td>20.3%</td>
<td>68.4%</td>
<td>4.48</td>
</tr>
<tr>
<td>Investment in seed research can</td>
<td>0.0%</td>
<td>10.1%</td>
<td>5.1%</td>
<td>64.6%</td>
<td>20.3%</td>
<td>3.95</td>
</tr>
</tbody>
</table>
influence the quality of seed produced and affect the sales. Investment in state of the art seed processing infrastructure pays off in the quality of seed produced.

<table>
<thead>
<tr>
<th>Percentage</th>
<th>0.0%</th>
<th>8.9%</th>
<th>6.3%</th>
<th>27.8%</th>
<th>57.0%</th>
<th>4.33</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>0.0%</td>
<td>9.4%</td>
<td>4.5%</td>
<td>51.9%</td>
<td>34.2%</td>
<td>4.11</td>
</tr>
</tbody>
</table>

For purposes of this study, the percentage of responses on “agree” & “strongly agree” and those on “disagree” & “strongly disagree” were combined to represent the degree to which the respondents agreed or disagreed respectively to the sub-constructs of cost structures.

The results agree with those of Guei, Barra and Silue (2011) who investigated how smallholder seed enterprises could strengthen their capacities for rice, sorghum, maize, and millet seed production. The study involved mobilizing and training groups of farmers in technical aspects of seed production such as organization of farmers into autonomous seed producer groups, selection of seed production sites, crop management, weed control and crop protection. The study concluded that seed production required quite an amount of financial and technical support, especially in the beginning stages and therefore, it was crucial to sensitize and train seed producers’ organizations while building alliances among all partners, producers, and local research and development agencies.

The findings further agree with those of Womack and Jones (2006) who stated that Lean production practices can resolve severe organizational problems and additionally can be a powerful approach to gather and unite several organizational change initiatives. Lean production therefore, has not only improved procedure, reduced inventory and enhanced ergonomics, but it allows the company to fine-tune its chemistry and keep pace with changes in demand as established in the Kodak case study.

Inefficient seed production function was highlighted by the seed experts as one of the factors affecting performance of seed maize companies. They attributed this to limited human resource skills and relevant technologies for parent seed production and maintenance. Limited seed production facilities such as isolated irrigable land and processing infrastructure were also cited to cause the inefficiencies in seed production. In addition, the seed experts observed that in
Kenya there is limited access to suitable out-growers to produce seed on contract as most of them have small land holdings making the required isolation of seed fields difficult. The out-growers also lack the required farm resources and facilities for productive farming. The experts alluded to low business margins due to high production and other operational costs in seed maize companies.

6.5. Production Strategy Linearity Test

Linearity of variables was tested using correlation coefficients as suggested by Cohen, Cohen, West and Aiken, (2003). To establish whether there is a linear relationship, the study used multiple regression analysis (Table 3). The results indicate that the variables organizational performance and production strategy had a strong positive relationship as indicated by a correlation coefficient of 0.821. This implies that there is a linear positive relationship between production strategy and organizational performance.

7. Regression Analysis

A multiple regression analysis was conducted to investigate the relationship between the independent variable which is production strategy and the dependent variable, organizational performance of seed maize companies in Kenya. This is represented by the overall model:

\[ Y = \beta_0 + \beta_1 X_1 + e \]

The coefficient of determination \( R^2 \) and correlation coefficient (R) show that the degree of association between production strategy and organizational performance is strong (Table 3). An \( R \) squared of 0.674 indicates that 67.4% of the variations in organizational performance are explained by the variations in production strategy.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>0.821</td>
</tr>
<tr>
<td>R Square</td>
<td>0.674</td>
</tr>
<tr>
<td>Adjusted R Square</td>
<td>0.67</td>
</tr>
<tr>
<td>Std. Error of the Estimate</td>
<td>0.37785</td>
</tr>
</tbody>
</table>
An F-statistic of 159.052 indicates that the overall model is significant (Table 4). The findings imply that production strategy was statistically significant in explaining organizational performance of seed maize companies in Kenya. The results are in support of Vonortas and Xue (2007) who while studying the process innovations of small firms in the USA, observed that economic incentives, internal resources, technical and organizational competencies that a firm has developed or accumulated over time and a firm’s linkage to external sources of expertise for learning about new technological developments were the major forces that influenced competitive advantage of firms.

Table 4: ANOVA for Production Strategy

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>22.708</td>
<td>1</td>
<td>22.708</td>
<td>159.052</td>
<td>0.000</td>
</tr>
<tr>
<td>Residual</td>
<td>10.993</td>
<td>77</td>
<td>0.143</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>33.701</td>
<td>78</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The production strategy coefficients that are presented in Table 5 show that production strategy contributes significantly to the model since the p-value for the constant and gradient are less than 0.05. The findings imply that one positive unit change in production strategy effectiveness leads to a change in organizational performance at the rate of 0.646 (64.6%). This confirms the positive effect of production strategy on organizational performance. The findings are in support of Danneels and Kleinschmidt (2011) who asserted that new product development for competitive advantage consists of bringing together two main components which are markets and technology. The fitted equation is as shown below:

\[ Y = 1.07 + 0.646X_1 \]

Table 5: Coefficients of Production Strategy

<table>
<thead>
<tr>
<th>Variable</th>
<th>Beta</th>
<th>Std. Error</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>1.07</td>
<td>0.203</td>
<td>5.281</td>
<td>0.000</td>
</tr>
<tr>
<td>Production Strategy</td>
<td>0.646</td>
<td>0.051</td>
<td>12.612</td>
<td>0.000</td>
</tr>
</tbody>
</table>
8. Conclusion and Recommendations

Production strategy was statistically significant in explaining organizational performance of seed maize companies in Kenya. The correlation coefficient of 82.1% showed a strong positive relationship between production strategy and organizational performance. The fitted regression equation also showed the positive effect of a unit change in production strategy on organizational performance of seed maize companies with a Beta of 0.646. This implies that one effective unit change in production strategy will lead into positive improvements in organizational performance at the rate of 64.6%.

Based on the findings of this study, it is recommended that seed maize companies should adopt and implement mechanized production methods. This would ensure bulk output leading to economies of scale and low production costs per unit and hence improved business margins. Also, it is recommended that seed companies should invest in research and state of the art processing facilities that ensure high seed quality that meets customer requirements and result in sales growth. Recruitment and retention of experienced production staff is recommended as well since the study’s findings showed that such staff contribute to the production of high quality seed.

References


