
EFFECT OF LAND FRAGMENTATION ON SEED PRODUCTION AND QUALITY IN SABOTI SUB- COUNTY TRANS NZOIA COUNTY (KENYA)

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ABSTRACT

The broad objective of the study was to assess the effects of land fragmentation on seed production and quality among farms in Saboti sub-county. The study sought to achieve the following specific objectives: to establish cause of land fragmentation; evaluate the effects of land fragmentation on seed quality and production; and to evaluate the effects of land fragmentation on food security in Saboti Sub-County. The study adapted a descriptive research design. The target respondents were 360 small-holder farmers in the county. Probability sampling techniques was used in selecting the sample. The researcher targeted a total of 36 farmers from the sub county. The study used descriptive and analytical methods of data analysis which were mainly performed using the SPSS data analysis package. The data was analyzed using quantitative analysis method. The study showed that the need for diversification and crop rotate are the major reasons as to why farmers in Saboti engage in land fragmentation. Other reasons cited included: ease of supervision/ ease land administration; ease of pest control on small parcels; high population density / need to settle households; and need to increase subsistence food availability or household food security. The findings showed that land fragmentation affects seed production and seed quality. The findings showed that low volumes of production and isolation problems especially for maize production are the major land fragmentation related issues that have affected seed production and quality. Thirdly, the study showed that land fragmentation affects household food security. The study revealed that there is shortage of food for subsistence use because. The study recommends that the government (national and county) ought to put in place measures to discourage fragmentation of agricultural land in Saboti sub-county; as well as provide both financial and non-financial incentives for farmers to encourage land scale farming.

Keywords: land fragmentation, Seed production, Seed quality

1. INTRODUCTION

Land is critical to the economic, social and cultural development of Kenya Republic of Kenya has an area – 582,646 square km comprising of 19.8% land and 2.2% water surface. Land fragmentation is emerging as a side effect with detrimental implication for private and public investment, sustainable economic growth and social development. In the lead up to land

fragmentation, seed maize production started way back in 1963 when hybrid maize was introduced. The research work was then undertaken by national agricultural research station (NARS- Kitale) Kitale which was mandated to carry out maize breeding work. Today it still does maize breeding under Kenya seed co. ltd which is a government Parastatals also carry out research work on maize, wheat, pasture, sunflower, horticulture crops and other crops and also multiple dry process dress package and distribute seed throughout East and Central African region. The combination, of increased plants/ acre, cobs/ plant and grain / cob leads to higher total grain yields. Kenya hybrids yield at least 40-50% more than the open pollinated types used before hybrid development. in addition, hybrids are selected to perform better under both good husbandry and also adverse conditions under good conditions hybrids give higher responses to such factors as fertilizers ad population than unimproved maize and even with poor husbandry, the hybrids are superior. This necessitates hard work and careful supervision particularly during the crucial fertilization period. At harvest, the cobs from the seed parents are carefully harvested, diseased cobs and grains are discarded and the cobs are delivered to seed driers where through selection is carried out on each individual cobs to ascertain that it conforms with its varietal description as well as removal of off types, rotten cobs, weevil cobs, diseased cobs and any other undesirable characteristics before its conveyed to drying bins

2. MATERIALS AND METHODS

The study adapted a descriptive research design. This is because there was need to determine how changes in one variable produce a change in the other. The researcher conducted a field study in the target area. The study design was based on the use of questionnaires that were used as data collection instruments. Data collection was mainly done through use of questionnaires as a data collection instrument. Thirty six questionnaires were administered to randomly selected respondents in the sample. The Questions in the questionnaire comprised of both open ended as well as closed ended questions to suite the research.

Before the data was analyzed all questionnaires were first checked to find out whether they are answered adequately. The information was then coded and entered into a spreadsheet and analyzed using SPSS (Statistical Package for Social Sciences). The study used descriptive and analytical methods of data analysis which were mainly performed using the SPSS data analysis package. The data was analyzed using quantitative analysis method. The data was presented by use of tables, bar charts and pie charts for ease of reference.

Causes of Land Fragmentation

The findings therefore show that the need for diversification and crop rotate dominates the reasons as to why farmers in Saboti engage in land fragmentation.

Table 1: Causes of Land Fragmentation

Cause of Fragmentation	Number of Respondents*	% of the total (out of 36)*
Crop rotation	36	100
Need for mixed farming	36	100
Ease of Supervision/ Ease land administration	33	91.7
Ease of pest control on small parcels	32	88.9
High population density / Settle households	28	77.8
Increase subsistence food availability	24	66.7
For optimal utilization of land	14	38.9
Security for the produce/ Risk spreading	11	30.6
Land succession / Inheritance by family	8	22.2

The second objective if the study sought to evaluate the effects of land fragmentation on seed quality and production in Saboti Sub-County. Table 4.9 shows the distribution of multiple responses regarding how land fragmentation is perceived to have affected seed production and quality.

The third objective of the study sought to evaluate the effects of land fragmentation on food security in Saboti Sub-County. The findings of Table 4.11 indicate the distribution of multiple responses regarding how land fragmentation is perceived to have affected household food security.

Table 2: Effect of Land Fragmentation on Household Food Security

Responses Provided	Number of Respondents*	% of the total (out of 36)*
Reduced acreage under food crops	36	100
Reduced seed varieties for food production	36	100
Reduced acreage under seed production	35	97.2

Reduced productivity means less food output per acre	33	91.7
Inability to employ advanced farming techniques	26	72.2
Disease outbreaks are have severe effects on small parcels	25	69.4
Inadequate storage space hence high wastage	24	66.7
	Number of Respondents*	% of the total (out of 36)*
Low volumes of production noted	36	100
Isolation problems especially for maize production	36	100
Seed contamination highly likely in small parcels	34	94.4
Reduced acreage under production	32	88.9
Increased cost of production per unit area	26	72.2
Small parcels not ideal for heavy mechanization	24	67.7
Increased competition from multiple producers hence poor production and quality compromise	22	61.1
Competing household needs for land affects the acreage allocated to seed production	22	61.1

* Row entries based on multiple responses analyses

Advanced Chi-Square Test Using Secondary Data from Kenya Seed Company

Advanced chi-square test was performed to assess the nature of relationship between land fragmentation, seed production and seed quality. The Chi-square test was intended to test how likely it was that an observed distribution is due to chance. It is also called a "goodness of fit" statistic, because it measures how well the observed distribution of data fits with the distribution that is expected if the variables are independent. The test was applied when you have two categorical variables from a single population. It was used to determine whether there is a significant association between the two variables. In the present study, post control secondary data was collected from the Kenya Seed Company from both the farmers that had their land fragmented and those that had not fragmented. The observations from both groups were cross correlated with the results on volumes of seed production as well as the quality of seed produced (gauged by seed variety grade). Two tests were performed; one for seed production volume and

another for seed quality. The null hypothesis for the chi-square test in the volume of production vs land fragmentation test was that land fragmentation and seed production volume are independent and the alternative hypothesis was the two attributes are related. In the second study, the null hypothesis was that land fragmentation and seed quality are independent while the alternative hypothesis was the two attributes are related. The tests were performed at 95% level of confidence. The results are presented in Table 4.10 below. The findings of the Table 4.10 show that there exists a relationship between the land fragmentation and the volumes of seed produced ($\text{Chi}^2 = 58.881, p < 0.05$), and the quality of seed produced ($\text{Chi}^2 = 16.921, p < 0.05$). This explains why the declining volumes and quality of seeds supplied to Kenya Seed Company has been declining. This relates specifically to the sampled farms within Saboti sub-county.

Table 3: Chi-Square statistics for the Relationship between Land Fragmentation, Seed

Land Fragmentation	Chi-square Statistics	Conclusion
Volume of Seed Produced	55.881*	Reject H0
Quality of Seed Produced	16.921*	Reject H0

Note * $p < 0.05$

H0: Land fragmentation and Seed Production / Seed Quality are independent

H1: Land fragmentation and Seed Production / Seed Quality are not independent

3. DISCUSSION

The first objective which the study sought was to establish the causes of land fragmentation in Saboti Sub-County. Other reasons eliciting responses from a majority included: ease of supervision/ ease land administration (91.7%); ease of pest control on small parcels (88.9%); high population density / need to settle households (77.8%); and need to increase subsistence food availability or household food security (66.7%). The other reasons cited but with fewer responses included the perception that fragmented portions will be optimally utilized (38.9%); perception that it is easier to secure farm produce in a small farm than a large farm (30.6%); and issues with land succession where the elderly subdivide the large tracts of land into small portion for their sons and daughters as inheritance.

On the Effects of land fragmentation on seed production and quality, the results show that all the sampled respondents were affirmative that low volumes of production and isolation problems especially for maize production are the major land fragmentation related issues that have affected seed production and quality. Other factors that were adversely mentioned by the respondents included: seed contamination highly likely in small parcels; reduced acreage under production; increased cost of production per unit area; small parcels not ideal for heavy mechanization; increased competition from multiple producers hence, poor production and quality compromise; and competing household needs for land affects the acreage allocated to seed production.

On land fragmentation and seed quality, the results showed that all the sampled respondents were affirmative that household has less food for subsistence use because: i) there is reduced acreage under food crops; and ii) there is reduced quality and number of seed varieties for food production. Other factors that were adversely mentioned by the respondents included: reduced acreage under seed production; reduced productivity means less food output per acre; inability to employ advanced farming techniques; disease outbreaks are have severe effects on small parcels; and inadequate storage space hence high wastage.

From the study findings it was concluded that the need for diversification and crop rotation were the major reasons as to why farmers in Saboti engaged in land fragmentation. Secondly, the study findings showed that land fragmentation affects seed production and seed quality. The findings showed that low volumes of production and isolation problems especially for maize production are the major land fragmentation related issues that have affected seed production and quality. Thirdly, the study showed that land fragmentation affects household food security. The study revealed that there is shortage of food for subsistence use because: i) there is reduced acreage under food crops; and ii) there is reduced quality and number of seed varieties for food production. Based on the findings above, the following recommendations were realized; including those raised by the respondents: The government (national and county) ought to put in place measures to discourage fragmentation of agricultural land in Saboti sub-county Provide both financial and non-financial incentives for farmers to encourage land scale farming. Provision of extension services where farmers can be educated or sensitized on the demerits of small parcels. The government ought to encourage farmers in quality seed production by setting seed villages within the highly productive zones. The government should set the minimum acreage allowable for seed contract farmers, as well as other minimum requirements before one is contracted by Kenya Seed Company as a seed producing contractor. The regional agricultural office should help farmers in setting up soil testing centres.

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REFERENCES

- Bentley, Jeffery, 1987. "Economic and Ecological Approaches to Land Fragmentation: In Defence of a Much-Aligned Phenomenon." *Annual Review of Anthropology* 16: 31-67
- Binns, O. B. (1950). *The consolidation of fragmented agricultural holdings*. FAO Agricultural Studies 11. Rome: Food and Agriculture Organization.

Blarel et. al, 1992. ” The Economics of Farm Fragmentation: Evidence from Ghana and Rwanda.”, World Bank Economic Review, vol. 6 no.2 May 1992

Dovring, F. and K. Dovring (1960). Land and Labor in Europe in 1900-1950. The Hague: Martinus Nyhoff.

Heltberg, Rasmus, “Rural Market Imperfections and the Farm Size-Productivity Relationship: Evidence from Pakistan”, World Development, Vol. 26, No. 10, October 1998

McPherson, M. F. (1982). Land fragmentation: a selected literature review. Development Discussion Paper No. 141. Harvard Institute for International Development, Harvard University.

Mwebaza Rose, & Gaynor Richard, 2002. “Land sector analysis; land market, land consolidation, and land re-adjustment component”, Rural Development Institute, The Government of the Republic of Uganda, 2002.

Nguyen, Tin, Cheng, Enjiang, 1996 “Land fragmentation and farm productivity in China in the 1990s”, China Economic Review, 1043951X, Fall 96, Vol. 7, Issue 2

Papageorgiou, E. (1963). Fragmentation of land holdings and measures for consolidation in Greece. In: Parsons, K. H., R. J. Penn and P. M. Raup (eds.) Land Tenure. Madison: University of Wisconsin Press.

Schultz, T. W. (1953). The Economic Organization of Agriculture. New York: McGraw Hill.

Simmons, S. (1988). Land fragmentation in developing countries: the optimal choice and policy implications. Explorations in Economic History 25: 254-262.

World Bank, (2005) “Land Consolidation Issues in Northern Vietnam – Institutions, Implementation, Impacts”. Working paper, The World Bank, 2005.