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DRIVERS OF AGRICULTURAL LAND SUBDIVISION IN DRYLANDS OF KENYA: A Case of Kajiado County, Kenya

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ABSTRACT

Private dry agricultural land sizes are reducing over the years mainly due to subdivisions, contrary to the theoretical and general expectation that they are held and used in large contiguous sizes. This paper investigates the significant drivers of agricultural land subdivisions in Kajiado County, Kenya. The paper used a mixture of primary and secondary research methods to investigate this phenomenon. Primary data was mainly obtained from 203 agricultural landowners in the study area. The data reveals that socio-cultural and economic factors are the most significant drivers of agricultural land subdivision in the study area: agricultural land inheritance practices, individualization of tenure, price of agricultural land and demand for urban housing. Firstly, the paper recommends that the national and county governments should put in place appropriate and clear policy, legal and institutional frameworks to prescribe allowable minimum economical/optimal agricultural land sizes in various agro climatic zones. Secondly, individual titles should have restrictions on the minimum allowable sizes depending on the location and use of the land. Thirdly, government and private sector should support agricultural enterprises, including livestock production to make agricultural activities economically viable and reduce the influence of attractive agricultural land prices. Fourthly, urban revitalization strategies and urban land banking should be encouraged as means of providing urban housing in the urban areas.

***Key Words**: Subdivision of Agricultural Land, Drivers, Drylands*

INTRODUCTION

Globally, agriculture remains the single largest employer and provides livelihoods for more than 40 per cent of the globe's population. Besides, agriculture is the world's largest source of income and jobs for rural communities. Agricultural land, therefore, remains a key resource for the rural communities as well as urban dwellers. Thus, the size of agricultural land is as important as the distribution and access to this resource.

Over 80 per cent of Kenya's population reside in rural areas and obtain their livelihoods from agricultural land. Indeed, agricultural sector in Kenya directly contributes about 26 per cent to the Gross Domestic Product (GDP) annually, accounts for approximately 65 per cent of national's total exports and creates over 70 per cent of informal employment opportunities in the rural areas thus making it a backbone of Kenya's economy. Agricultural land in Kenya plays a key role in poverty reduction in the lives of vulnerable groups such as the pastoralists and subsistence farmers who derive their livelihoods mainly from agricultural activities (Government of Kenya [GoK], 2016; 2010).

Kenya's landmass is approximately 582,646 square kilometres of which about 98 per cent is land and 2 per cent is water surface. Only about 20 per cent of Kenya's land is arable while the bulk of the land (over 80 per cent) is arid or semi-arid (ASALs). Besides, about 75 per cent of the Kenya's populace resides in the arable lands, thus contributing to high population densities in those lands (GoK, 2009). Essentially, the medium to high potential agricultural land in Kenya is already subdivided into small units which may be uneconomical.

Agricultural land in Kenya, including ASALs, however, is being subdivided into small sizes (sometimes below 1ha) despite the enormous importance it has on economic development. At the national level, the average farm size is approximately 2.5ha, with 98 per cent of agricultural land sizes being about 1.2ha (The Centre for Land, Economy and Rights of Women, 2006; Syagga & Kimuyu, 2016). This phenomenon has raised concerns among land administrators and managers, policy makers and general public that such transformations may impact negatively on the productivity of the agricultural land (GoK, 2009; Kelleher, *et al*., 1998). There is need therefore to understand significant drivers behind this phenomenon especially in the dry agricultural lands which support extensive livestock production systems.

THEORY

Drivers of Agricultural Land Subdivisions

Identifying the drivers of agricultural land subdivision (ALS) requires an examination and understanding of how people make land use decisions and how various factors interact in specific localities to influence their decision making process (Lambin *et al*., 2003). The drivers of ALS vary with localities, for instance, the Scottish government (2009) categorised the drivers in rural Scotland under environmental, demographic, economic, technological, policy, institutional, cultural and social factors while Chazan & Cotter (2001) categorised drivers of ALS in United States as population and household size, personal housing style preferences (demographic), government policies and economic stimulus. Jiang *et al*. (2013), Lo & Yang (2002) and Liu *et al*. (2004) identified the same drivers of land subdivisions in China.

Lambin *et al*. (2003) generalised the drivers and broadly categorised them into natural/environmental changes, economic and technological, demographic, institutional, cultural and social factors. They went on to clarify that these drivers are either direct or indirect and agricultural land subdivision into small sizes and subsequent conversions in a locality is usually occasioned by a combination of several factors. Olson *et al*. (2004) concluded that agricultural land subdivisions and subsequent conversions of use in East African countries, Kenya included, are generally occasioned by drivers such as government policies and laws, economic factors,

population growth and migration, land tenure arrangements, market access and environmental conditions. From these broad categories of drivers of agricultural land subdivisions, it seems that the following are the likely drivers in most localities.

Natural Environmental Factors

Physical or natural environmental changes have been observed to interact with the human decision making processes that cause ALS. Highly variable environment conditions, for instance, usually occasioned by changes in climate are likely to magnify the pressures of agricultural land subdivisions (Olson *et al*., 2004). Although other drivers, such as socio-economic factors may operate independently, natural environmental changes may interact with other drivers to influence ALS (Lambin *et al*., 2003). Environmental factors are important due to their influence on agriculture, the main rural land use activity.

Specific and important environmental factors that may influence agricultural land subdivisions have been observed to include quality/fertility of the land, terrain/topography, location (for example near road networks) and climatic conditions (rainfall and temperature) (Chazan & Cotter, 2001; GoK, 2016; 2016a; Olson *et al*., 2004). When the quality/fertility and topography of land and climatic conditions (rainfall and temperature) are favourable, landowners may not be willing to subdivide their agricultural land since agricultural activities may be viable.

Similarly, when farms are located near transport networks farmers can transport their farm produce to the market with ease hence encouraging them to preserve the agricultural land. Concomitantly, these variables are also favourable to real estate development and may encourage real estate developers to buy land from the local landowners for real estate development hence fuelling agricultural land subdivisions.

Economic Factors

Broadly speaking, economic factors influence agricultural land subdivisions through market forces; supply and demand for agricultural land (Lambin *et. al*. 2003). Since supply of land is usually static demand for it becomes important in influencing the phenomenon of ALS. Economic drivers may also interact with institutional factors and policies (McDonagh, 1997; Thuo, 2013; Olson *et al*., 2004).

In particular, economic factors that are likely to influence ALS have been noted to include per capita income/poverty, demand for urban housing, agricultural productivity or farm-income and none/off-farm income (Ayonga, 2008; Chazan & Cotter, 2001; GoK, 2016; 2016a; Henry *et al*., 2012; Lee, 1999; McDonagh, 1997, Nkedianye *et al*., 2009). In East Africa, privatisation of former communal or group ranches has been stated as an important economic factor (Olson *et al*., 2004). Per capita income/poverty may influence agricultural landowners to subdivide their land and sell to the property developers, especially if the return from the agricultural activities and off farm income is not adequate to support their livelihoods.

Similarly, per capita income growth of the urban dwellers may encourage them to look for housing in the suburbs and nearby rural areas (away from pollution, congestion and general poor quality of life associated with urban areas), thus influencing demand for housing and increasing the rate of ALS. Technology is also likely to influence agriculture by intensifying land use and irrigation practices thus making it possible to maintain agricultural production and productivity levels after subdivision of agricultural land.

Demographic Factors

Changes, either positively or negatively, in local populations are likely to influence subdivision of agricultural lands. Important demographic factors in agricultural land subdivisions have been observed to include urban and rural populations' growth rates and may interact with government policies and economic drivers (GoK, 2016; 2016a; Henry *et al.* 2012; Jayne & Muyanga, 2012; Lambin *et al*. 2003; Lee, 199; Olson *et al*., 2004).

Lambin *et al*. (2003) noted that growth of urban aspirations and urban-rural population distribution are important factors in regional ALS within major urban centres, in peri-urban areas and even in remote rural areas. Increase in urban population puts land in the surrounding rural areas under a lot of pressure to transform to urban use such as residential use (Thuo, 2013).

Institutional Factors

Institutional factors mainly influence ALS indirectly but are influenced directly by political, legal and economic drivers and their interactions with individual landowner decision making. The use of resources such as agricultural land is facilitated by local and national policies thus institutions play a great role in the designation of property rights (Ayonga, 2008; GoK, 2016; Lambin *et al*., 2003; Olson *et al*., 2004; Thuo, 2013).

Olson *et al*. (2004) postulated that key institutional factors that may influence agricultural land subdivisions and transformations are technical capacity and involvement of public in land development decision making processes. Besides, institutional arrangements create exclusive individual property rights in land which, if not managed well, may result to too many owners holding small pieces of agricultural land that cannot guarantee efficient and optimal agricultural production leading to a tragedy of spatial anticommons (Heller, 1998).

Cultural and Social Factors

Numerous cultural factors may influence decision making process of an agricultural landowner. These variables are often related to political and economic conditions (GoK, 2016; Lambin *et al*. 2003; Nkedianye *et al*., 2009; Thuo, 2013; Scottish government, 2009).

Important sociocultural drivers of ALS in East Africa may include land inheritance practices and land tenure systems (for example customary rights), individualization of titles and acceptability to sell agricultural land (commodification of land) (Mburu, 2009). Insignificant factors have been identified to include changing distribution of land, wealth and power and commercialisation of labour and water resources. Competition or cooperation between groups and changing gender roles and responsibilities may be relevant as well (Olson *et al*., 2004).

Government Policy, Laws and Regulations (Political and Legal Factors)

Government policy, laws and regulations are important drivers of ALS. Policy is a course of action that is formulated and adopted to promote a desired future outcome hence inevitably an indirect driver of ALS (GoK, 2016; Olson *et al*., 2004). The influence of policy on ALS can be more meaningful when observed in an historical perspective to show the outcomes of their interactions with other drivers.

ALS in East Africa, for instance, reflects the influence of both colonial policy and laws extending back to the 19th century. Such regimes have shaped the land tenure systems with wide implications on the access and utilization of agricultural land. The colonial policies and legal frameworks used to enforce them led to alienation of land for Europeans settlements and large scale farming and ranching in the East African region (Partners News, Ogendo, as cited in Society for International Development, 2006). This affected the distribution of agricultural land between the native people and the colonial settlers in Kenya, Tanganyika and Uganda (Olson *et al*., 2004). Such regimes included, for example, the treaties between the Maasai and British in 1911 and 1912 in Kenya (Koissaba, 2015).

Other land laws have granted natives power to subdivide and transfer agricultural land. Essentially, spatial anticommons property rights are created by government policies, laws and regulations under political and economic constraints (Heller, 1998).

RESEARCH METHODOLOGY

Research Design

Cross-sectional survey and case study designs were utilized in this study. Babbie (1994) postulates that survey design is probably the best method available for studying social phenomena because it allows researchers to collect original data for describing a population too large to observe directly. Subdivision of agricultural land into small sizes is a social phenomenon and a survey approach is appropriate. The choice of the study designs is influenced by the nature of the data and the essence of meeting the study objectives in a cost efficient manner.

Target population, sample size and sampling techniques

The total target population in this study included all agricultural land parcels and their respective owners in the study area who were accessible at the period of the study. Other respondents included Kajiado County land administration and management officials (County physical planners and surveyors; District physical planners and surveyors; County Land Management Board and Land Control Board).

To estimate the population of the agricultural land parcels and their owners in the study area, the study used the number of households in the study area according to the latest Kenya's national housing and population census statistics of 2009. The total number of agricultural land parcels and their owners was estimated to be approximately 5,000, which is less than 10,000 cases. According to Mugenda & Mugenda (1999), when the population is more than 10,000 a sample size of 384 is adequate. When the population is less than 10,000 cases, however, the following formula should be used to estimate sample size.

Box 1: Sample size for agricultural landowners and land parcels

nf = n/1+n/N Where:

nf = desired sample size when the population is less than 10,000
n = desired sample size when the population is more than 10,000
N = estimate of the population size.

Using the above formula sample size was calculated as follows:

Nf = 384/1+384/5,000 = 356.6 = 357 Agricultural land parcels & owners

Source: Adapted from Mugenda & Mugenda, 1999

The study used simple random sampling technique to access the targeted agricultural land parcels and landowners living in their land in the study area at the time of the field survey. This sampling technique was used to survey a total of 39 villages in the study area. Out of the 357 targeted agricultural land parcels and owners, 203 were accessible, resulting to a response rate of approximately 57 per cent which was adequate for analysis purposes (Mugenda & Mugenda, 1999).

Data collection tools

In this study, collection of data was done using both qualitative and quantitative methods to collect information on agricultural land subdivision. The data sought was mainly primary and secondary data. Primary data was sourced from the survey respondents while secondary data was sourced from libraries, internet and public/government offices, mainly from the Kajiado County government and local land control board. The tools that were used for data collection are as follows.

Structured observation method

Non-participant direct observation of documents and the land parcels in the study area was done in a structured manner and data recorded in the process of observations using a note book. The unit of observation was the existing agricultural land sizes and their proximity to services, among other physical factors that may influence demand for agricultural land or the rate of subdivisions. Structured observation method is advisable since it eliminates bias and relates to current information which is not complicated by past events or future aspirations. Besides, it is not dependent with respondent's willingness to participate in a study, unlike in questionnaire method (Kothari, 2004). Consequently, structured observation was used to gather data relevant to the study objectives.

Semi-structured personal interviews

Interview method involves presentation of oral questions and responses given in the same way by the respondents. Structured interviews are more economical, easier to analyse for generalization purposes and ensures high response rate. In addition, they allow the interviewee to clarify questions hence the researcher is able to gather more data than is possible using observation method (Babbie, 1994; Kumar 2005; Kothari, 2004; Nachmias & Nachmias, 2000). Thus structured interviews were conducted with the key study informants who include the county and district land officials (planners and surveyors), chairman of land control board and county land management board.

Semi-structured self-administered questionnaires/Schedules

Questionnaire is a proforma with a set of well sequenced questions relevant to the study objectives. Schedules/self-administered questionnaires are more appropriate where the respondents are not well educated than use of questionnaires (Kothari, 2004). Schedules are faster and ensure that data collected is complete without omissions/unanswered questions. They also enable high response rates and enables combination of different methods and personal contact possible (Babbie, 1994; Kumar, 2005). This study used schedules due to the above reasons to collect data from the agricultural landowners.

Data Analysis and Presentation

The analysis of the drivers of ALS was carried out by presenting the typical drivers identified through literature review to the study respondents to select the ones that are applicable in the area of study. The respondents were then asked to use a numerical horizontal scale of 1 to 4 to rank the drivers in their order of significance whereby 1=Not Important; 2=Less Important; 3=Important and 4=Very Important. Several researchers have used and recommended a horizontal scale of 1 to 4 to represent two extremes; 'not important' and 'very important', respectively. This scale is appropriate to avoid confusion on the respondents (Alreck & Seattle, 1995; Masu, Murigu, Talukhaba, as cited in Kieti, 2015). In so doing, the significant drivers of agricultural land subdivisions were identified and ranked in their order of importance.

Identification of significant drivers of agricultural land subdivision was done using the population mean score and the critical Z-value. Firstly, to further analyze and determine significant drivers of the ALS, the study used the population mean score ($\overline{X}$ = **2.5**), that is the middle point of the 1- 4 numerical score, to act as a decision point, whereby any driver whose mean score was found to be below this point was considered to be not significant and any driver with a mean score equal to or above this point was considered to be major or significant driver in influencing ALS. Masu, Murigu, Talukhaba, as cited in Kieti, 2015 have used similar approach. Thus, all the 25 drivers had two assumptions; that all the drivers are not significant in influencing subdivisions of agricultural land and all the drivers are significant in determining the subdivisions of agricultural land in the study area. A driver with a mean score of about 2.5 is considered to be average and

important. At this point, the insignificant drivers were dropped for purposes of subsequent further data analysis. Insignificant drivers are those with a mean score below 2.5.

Secondly, identification of significant drivers of agricultural land subdivision was further carried out using z scores. Z-test is a statistical test used to determine whether two means are different. This test is best used when the sample size is large (greater than 30 cases) because under the central limit theorem, as the number of samples gets larger, the samples are considered to be almost normally distributed a requirement for z-test. Besides, for each significance level, the z-test has a single critical value which makes it more convenient to use than the t-test which has separate critical value for each sample size and is best suited for small sample sizes (Kingoriah, 2004). Z-test was therefore used after setting the confidence level at 95%. According to Masu, (as cited in Kieti, 2015), confidence levels help in reducing chances of identifying a particular driver/factor to be significant when actually it is insignificant (Alpha error or type 1 error) or concluding that a particular driver is insignificant while it is actually significant (Beta error or type II error) (Harper, as cited in Kieti, 2015; Kingoriah, 2004).

Since the analysis of the drivers influencing subdivisions of agricultural land were only meant to provide policy direction to the land managers, confidence level was set at 95% to identify significant drivers. Thus z-test analysis provided a decisive way of identifying significant drivers of agricultural land subdivision in the study area. Z-test was performed only on the average/moderate and the major significant drivers as analyzed using the population mean score. The formula for computing z-value calculated for each average/moderate and the major significant driver is shown below, as suggested by Kingoriah, 2004.

$z = (\overline{X} - \mu) / (\delta / \sqrt{n})$;
Where z = Calculated z-value
$\overline{X}$ = Mean score for each driver
μ = Population mean score (x for this study is 2.5)
δ = Standard deviation
n = Sample size (n for this study is 357 cases)

Sirkin (as cited in Kieti, 2015) indicates that critical z-value at 95% probability/confidence level is 1.65. This was used as a decision point, whereby the z-value calculated for each driver was then compared with the critical z-value at 95% confidence level in one-tailed z-test. Where the z-value calculated for each driver was greater than the critical z-value at 95% confidence level, the study was confident that the particular driver was significant in influencing subdivision of agricultural land. Therefore, the critical z value (one-tailed test) at 95% confidence level is 1.65 hence any driver whose computed z value was found to be less than 1.65 was decisively considered to be less significant in influencing agricultural land subdivisions and vice versa.

RESULTS

Significant Drivers of Agricultural Land Subdivisions in Kajiado County

Through literature review, 25 typical drivers were identified to be possible drivers behind the phenomenon of agricultural land subdivisions in the study area. The drivers of agricultural land subdivisions in Kajiado County were hypothesized to be a function of demand and supply of agricultural land, which in turn is influenced by various physical, economic, demographic, sociocultural, institutional and political/legal factors. In a nutshell, these are the drivers that either motivate or block farmers from subdividing their land into small pieces. Significant drivers of agricultural land subdivision identified by use of population mean score are presented in table 1 below.

Table 1: Identification of Significant Drivers using Population Mean Score

Driver	Rating	Percentage (%)	Mean Score ($\bar{X}$)	Type of Driver
Land inheritance practices	Not important	0.0%		Socio-cultural factor
	Less important	0.5%		
	Important	10.7%		
	Very important	86.8%		
	Total		**($\bar{X}$ = 3.8)**	
Individualization of titles	Not important	0.5%		Socio-cultural factor
	Less important	0.0%		
	Important	7.6%		
	Very important	87.8%		
	Total		**($\bar{X}$ = 3.7)**	
Price/Value of agricultural land	Not important	6.6%		Economic factor
	Less important	4.6%		
	Important	34.7%		
	Very important	50.0%		
	Total		**($\bar{X}$ = 3.2)**	
Demand for urban housing	Not important	6.1%		Economic factor
	Less important	10.7%		
	Important	32.7%		
	Very important	48.0%		
	Total		**($\bar{X}$ = 3.2)**	
Future expectations on value of agricultural land	Not important	10.2%		Economic factor
	Less important	6.6%		
	Important	22.4%		
	Very important	56.1%		
	Total		**($\bar{X}$ = 3.2)**	

Customary land tenure systems	Not important	5.1%		Socio-cultural factor
	Less important	4.6%		
	Important	30.5%		
	Very important	54.3%		
	Total		**($\overline{X}$ = 3.2)**	
Off-farm income	Not important	6.1%		Economic factor
	Less important	8.7%		
	Important	42.3%		
	Very important	40.8%		
	Total		**($\overline{X}$ = 3.1)**	
Price/Value of urban land	Not important	6.1%		Economic factor
	Less important	8.7%		
	Important	42.9%		
	Very important	38.3%		
	Total		**($\overline{X}$ = 3.1)**	
Rural population growth rate	Not important	8.7%		Demographic factor
	Less important	6.7%		
	Important	34.4%		
	Very important	45.1%		
	Total		**($\overline{X}$ = 3.1)**	
Urban population growth rate	Not important	6.2%		Demographic factor
	Less important	11.3%		
	Important	51.8%		
	Very important	25.6%		
	Total		**($\overline{X}$ = 2.9)**	
Supply of agricultural land	Not important	10.7%		Economic factor
	Less important	8.7%		
	Important	43.4%		

	Very important	31.6%		
	Total		**($\bar{X}$ = 2.8)**	
Proximity of agricultural land to services	Not important	12.8%		Natural/Physical factor
	Less important	21.4%		
	Important	48.5%		
	Very important	15.3%		
	Total		**($\bar{X}$ = 2.6)**	
Agricultural land use policies and laws	Not important	20.8%		Political/legal factor
	Less important	17.8%		
	Important	35.0%		
	Very important	21.8%		
	Total		**($\bar{X}$ = 2.5)**	

Source: Field Survey, 2016/2017

The factors that had a value rating with a mean score of less than 2.5 (population mean score) were considered to be statistically less significant in agricultural land subdivisions and included: temperature ($\bar{X}$ = 1.1), topography ($\bar{X}$ =1.2), rainfall ($\bar{X}$ =1.3), Cost of agricultural finance / interest rates ($\bar{X}$ =1.5), demand for agricultural products ($\bar{X}$ =1.6), availability of agricultural finance / credit / capital ($\bar{X}$ =1.6), public participation in agricultural land development decision making process ($\bar{X}$ = 1.6), Farm income ($\bar{X}$ =1.7) , Off-farm income ($\bar{X}$ =1.7), local land institutional technical capacity ($\bar{X}$ =1.9), quality / fertility of land ($\bar{X}$ = 2.0) and commodification of land ($\bar{X}$ = 2.3).

The analysis of 25 factors by the use of population mean score failed to conclusively isolate the significant factors influencing agricultural land subdivision in the study area. The reason was due to the fact that confidence levels had not been put into consideration. This would help in lowering the errors that come with identification of the significant factors. The errors can be reduced by using Z test for the statistical significance on these factors to further identify the significant ones.

The drivers whose mean score rating were equal to or more than the population mean score ($\bar{X}$ = 2.5) are significant in influencing subdivisions of agricultural land in the study area. Z test was done on the factors which were significant and also average in terms of their influence on the agricultural land subdivision and are shown in table 1 above. Table 2 below indicates the results for the Z test for each of the factors with mean score rating equal to or more than the population mean score (**2.5**).

Table 2: Identification of Significant drivers using Critical and Calculated Z values

Variable	Critical Z value at 95% confidence level (one-tailed test)	Calculated Z value	Remarks
Agricultural land inheritance practices	1.65	42.32	Factor is significant
Individualization of titles	1.65	32.06	Factor is significant
Price of agricultural land	1.65	30.89	Factor is significant
Demand for urban housing	1.65	26.54	Factor is significant
Future expectations on the value of agricultural land	1.65	25.89	Factor is significant
Customary land tenure systems	1.65	22.56	Factor is significant
Off-farm income	1.65	22.09	Factor is significant
Price of urban land	1.65	21.67	Factor is significant
Rural population growth rate	1.65	20.78	Factor is significant
Urban population growth rate	1.65	16.52	Factor is significant
Supply of agricultural land	1.65	1.254	Factor is not significant
Proximity of agricultural land to services	1.65	0.89	Factor is not significant
Agricultural land use policies and laws	1.65	-1.53	Factor is not significant

Source: Field Survey, 2016/2017

From the above analysis, it is clear that 10 out of the13 factors have the calculated Z values greater than the critical Z value at 95% confidence level. The ten factors were found to be significant in influencing agricultural land subdivisions.

A summary of responses from the Kajiado land officials indicates that the key drivers/challenges facing administration and management of agricultural land in Kajiado County is inadequate institutional capacity mainly in form of inadequate technical staff and finances to carry out proper and effective control of land development. The local land control board, for instance, has no physical planner and has got only one land surveyor. Similarly, the Kajiado County Land Management Board is facing similar technical staff deficiency since it has no physical planner and has got only one land surveyor. This may affect negatively development control efforts in the area. The chairman of the local land control board also lamented lack of clarity on the role of the National Land Commission [NLC] or the newly established county land management boards and the local land control boards, citing unnecessary interference from the County government.

In addition, the chairman of the local land control board, the local land institution under which agricultural land subdivision falls directly, cited government's limited role in control of private property development. This challenge could be based on the erroneous assumption that ownership right, as guaranteed in the Kenyan Constitution 2010, is equal to user rights hence private landowners are expected to use their private property as they deem fit, without state interference (neoliberalism tendencies). These frustrations could also imply inadequate land administration and management policy and regulatory guidelines.

DISCUSSION

The important drivers of agricultural land subdivision in the study area, as ranked by the respondents and z test, are discussed below.

Land inheritance practices

Agricultural land inheritance practices was rated as the most significant driver of agricultural land subdivisions in the study area ($\overline{X}$ = 3.8, Z = 42.32). Indeed, a total of 120 landowners (59%) had acquired their land

through inheritance while 19 landowners (9%) reported to have subdivided their agricultural land among their sons without selling a portion. This finding concurs with findings of a previous study by Mburu (2009) who found land inhertaice practices to be key driver of agricultural land subdivision in Gatundu district, Kenya. Thuo (2013) also established land inheritance to be an important driver of agricultural land subdivision in Kiambu County. Similarly, the Kenya draft National Land Use Policy (NLUP) and National Spatial Plan (NSP) have all identified land inheritance to be important driver of subdivision of agricultural land (GoK, 2016; 2016a). Elsewhere (Lambin *et al*., 2003; Scottish Government, 2009) socio-cultural factors have been found to be important drivers in agricultural land subdivision. Subdivision of agricultural land for inheritance purposes without enclosures/fencing off may not be a bad thing as it may not hinder large scale agricultural production and movement of livestock. This is made possible by the close relationship of the family members thus enabling land to be used as a whole and avoiding tragedy of the spatial anticommons (Heller, 1998).

Families are sometimes however not close-knit. Besides, private property rights grants landowners exclusive right of access and use. Moreover, some agricultural land may be idle or owned by non-agricultural owners. All these scenarios are likely to reduce cooperation in the community. Essentially, in the long run agricultural production may be curtailed due to increased transaction costs/cost of agricultural production (for example the time spent in informal negotiations and informal land management efforts).

Individualization of titles

Individualization of titles was ranked as the second most significant driver of agricultural land subdivisions ($\overline{X}$ = 3.7, Z = 32.06). A total of 198 landowners (98%) had reported to have private titles to their land. A similar finding was determined by Ayonga (2008) who found private title deeds without restrictions on the use of land to be important driver of land subdivision and land use conflicts in the peri-urban areas of Nairobi and Kajiado County. Thuo (2013) also found individualization of land ownership to be an important factor in influencing land subdivisions in urban fringes of Kiambu County while Olson *et al*., (2004) established private titles to be key driver of agricultural land transformation in east Africa. Previously the agricultural land in Kenya was mainly communally owned and issues of land subdivisions were not very common.

The land tenure in Kenya, however, has changed for most of the communal agricultural land to private ownership, making it easier to transact with agricultural land. This has largely been facilitated by the Registered Land Act, cap. 300 (repealed) which granted agricultural landowners freehold interest, with powers to subdivide and transfer land. The government intended to foster economic development by ensuring that agricultural landowners could access finance using their land as collateral. The private individual titles, however, do not have provisions on the allowable minimum land sizes, a situation that has partly led to the phenomenon of agricultural land subdivisions into small/uneconomic sizes. Therefore, private land rights in agricultural land appear to have promoted neo-liberalism tendencies by promoting superiority of private property, market forces, commodification of agricultural land and entrepreneurial character of landowners.

Price/value of agricultural land

The third most significant driver of agricultural land subdivisions is price/value of the agricultural land ($\overline{X}$ = 3.2, Z = 30.89). This is an economic factor which signifies presence of neo-liberalism through market forces of demand for agricultural land. Some previous studies have found a positive correlation between price of agricultural land and rate of subdivision (Chazan & Cotter, 2001; Lee, 1999; Henry *et al*. 2012; Olson *et al*., 2004). Locally, Thuo (2013) has determined price of agricultural land to be important in influencing subdivision of agricultural land, especially in the urban fringes of Nairobi City and Kiambu County. Nkedianye *et al*. (2009) also found price of agricultural land to be an important driver in agricultural land subdivision in some parts of Kitengela area near the Nairobi National Park. Data from the estate agents in the

study area revealed that the average price of the agricultural land in the study area has been increasing over the years from an average of about 1 million per ha in 2006 to an average of 7.5 million per ha in 2015, translating to approximately 650% increase over a period of 10 years.

On one hand this positive trend in agricultural land value is likely to entice the landowners to subdivide and sell off portions of their agricultural land. The increasing average agricultural land value coupled with the perception that there is plenty supply of land in the study area could be motivating farmers to subdivide and sell off part of their land. These trends may also create favourable environment for private individuals to speculate on agricultural land as land investors expect to reap higher prices in the future. Lack of an effective taxation instruments and a regulation on the minimum land holding acreages are likely to further fuel these trends over time. On the other hand, however, high price/value of agricultural land is likely to restrain expansion of agricultural production since land would be expensive to acquire in the future. Economies of scale would thus be absent or expensive to attain for the farmers who would wish to expand their operations.

Demand for urban housing

Demand for urban housing was ranked as the fourth most significant driver of agricultural land subdivisions in the study area ($\overline{X}$ = 3.2, Z = 26.54). Previous studies which have identified this factor to be important in agricultural land subdivision elsewhere include Lee, (1999), McDonagh, (1997); and Thuo, (2013). Demand for urban housing could signify expansion of urban areas, pointing to a possibility of application of the urban growth theories such as concentric rings, sector and multiple nuclei or residential location theory.

This driver, however, could easily be confused with speculation on the agricultural land. In-depth interviews with key informants and some landowners revealed that some developers were buying land from the farmers then subdividing into small sub-plots to sell to private individuals for housing development yet the area may be lacking basic services to support real estate development. From personal observations, some developers have constructed earth access roads to hoodwink land buyers that the agricultural land is ripe for development. From observations it was evident, however, that after the small sub-plots are sold no housing development takes place, possibly due to lack of supporting services. This leaves the small sub-plots 'undeveloped' for a long time thus taking agricultural land out of production prematurely.

Besides, all agricultural land should not be considered as future urban land. Agricultural land will continue to be important to both rural and urban dwellers thus vital agricultural land should be protected from subdivision into small sizes and subsequent conversion into urban use.

Future expectations on the value of agricultural land

Demand for urban housing and the increasing average price/value of agricultural land could explain why the respondents ranked future expectations on the value of agricultural land as the fifth most significant driver of agricultural land subdivisions ($\overline{X}$ = 3.2, Z = 25.89). This finding is similar to some previous studies (see Ayonga, 2008; Chazan & Cotter, 2001; Henry *et al*., 2012; Thuo, 2013). This driver, an economic factor, again shows application of neo-liberalism theory since change in market prices and values indicate market forces to be important market regulator.

Land investors are likely to influence high demand for agricultural land in the hope of reaping higher prices in the future. This seems to have created a 'buy-and-wait' trend in the agricultural land, making agricultural land not to be used productively and sustainably as per the prescriptions of the Kenya Constitution and the National Land Policy (GoK, 2010; 2009). This is because once agricultural land is subdivided into bare minimum sub-plots it is likely to influence future land use patterns and may hinder agricultural production or proper future urban development by creating incompatible land uses (Ayonga, 2008).

The 'buy-and-wait' trends in agricultural land appear to assume that residential development is the only urban development necessary both currently and in the future. Through personal observations, for instance, there were no many 'industrial or institutional land for sale' adverts in the study area. This may create problems in the future as urbanization engulfs the rural areas by making it difficult to plan for the various urban land uses. This has been evident in the peri-urban areas in Kenya (Ayonga, 2008).

Customary land tenure systems

Customary land tenure systems (men owning land on behalf of family) was ranked as the sixth most significant driver of agricultural land subdivisions in the study area ($\overline{X}$ = 3.2, Z = 22.56). Olson et al., (2004) & Nkedianye *et al*., 2009 have found customary land tenure systems to be important drivers of agricultural land subdivision in east Africa. This was mainly so because most of the decisions regarding land, including ownership and transfer of agricultural land, were found to be a prerogative of the male gender. Out of the 203 agricultural land parcels surveyed, 187 (92%) were registered in the name of the male head of the household and only 6 parcels (3%) were registered under the female head of family, mostly the female headed households.

Interviews with the land officials revealed that sometimes the men, under whom the agricultural land is registered, make decision to subdivide and sell/transfer portions of their land without consulting their wives and children. This allegation was further verified by existence of cases and caveats/prohibitions on land sales at the Kajiado lands office. Customary land tenure system is a sociocultural factor which could be used by landowners to achieve economic self-gratification, as per the dictates of the neo-liberalism theory. Besides, a total of 19 landowners (9%) reported to have subdivided their agricultural land among their sons.

Income of the agricultural landowner

Poverty/per capita income was ranked as the seventh most significant driver of agricultural land subdivisions in the study area ($\overline{X}$ = 3.1, Z = 22.09). The respondents reported that sometimes they sell agricultural land to meet their immediate domestic needs like buying clothes and paying school fees for their children. This finding concurs with some previous research (see Chazan & Cotter, 2001; Henry *et al*., 2012; Nkedianye *et al*., 2009; Thuo, 2013). The government of Kenya has also taken income of the landowner to be an important driver of agricultural land subdivision (GoK, 2016; 2016a). The total average annual income bracket (from both farm and off-farm ventures) for majority of the landowners (51%) were reported to be between Kshs. 201,000 – 250,000, mainly from agricultural activities.

This finding suggests that majority of the households could be living below the international poverty line of US$ 1.90 per day, considering the average size of the household of 5 members. According to the County Government of Kajiado (2013), and the Kenya National Bureau of Statistics [KNBS] & Society for Internal Development [SID], (2013), almost 50% of the Kajiado County's population lives below poverty line. Thus, agricultural landowners are likely to subdivide and sell portions of their land as a source of livelihood, yet majority derive their livelihood from the agricultural land through agricultural activities. Given the tendencies of neo-liberalists, market forces are bound to control the property market where the property owners are poor.

Price/value of urban land

Price of urban land was ranked as the eighth most significant driver of subdivisions of agricultural land in the study area ($\overline{X}$ = 3.1, Z = 21.67). Ayonga (2008) established that high price of urban land in Nairobi City has forced urban dwellers to look for cheaper land in the urban fringes of Nairobi and Kajiado County. Similarly, Thuo (2013) identified increase in price of urban land in Nairobi City to be an important driver of land

subdivision in Kiambu County. Elsewhere (see Chazan & Cotter, 2001; GoK, 2016; 2016a; Lee, 1999; McDonagh, 1997; Olson *et al*., 2004) previous studies have found value/price of urban land to be important driver of subdivision of agricultural land.

This finding could be explained by the rising prices/value of urban land in Nairobi City (the largest and capital city/urban area of Kenya) and the surrounding/satellite urban areas. According to a property price index published by the HassConsult Limited (2016), the average price per acre of urban land in Nairobi increased from Kshs. 74.87 million in December, 2007 to Kshs. 441.32 million/ha in June, 2016 translating to an increment of 7.12 fold over the stated period.

Similarly, the price of urban land in the satellite urban areas, including Kitengela Township, went up from an average of Kshs. 5.93 million/ha to 39.04 million (6.47 fold) per ha over the same period. The increasing prices of urban land is making land within the urban areas to be way beyond the reach of the low and middle urban income earners, forcing them to look for affordable land in the surrounding rural areas hence fuelling subdivisions of agricultural land. Market land price/value is a function of the market forces of demand and supply. Therefore, price of urban land is an indicator of neo-liberalism tendencies.

Rural population growth rate

Rural population growth rate ($\overline{X}$ = 3.1, Z = 20.78) was ranked the ninth most important factor in influencing subdivision of agricultural land. This finding coincides with Jayne & Muyanga's (2012) who found rural population growth rate to be significant driver of agricultural land subdivision in the densely populated areas of central parts of Kenya. Lambin *et al*., (2003) and Olson *et al*., (2004) have also determined rural population growth rate to be significant driver of agricultural land transformation.

Positive growth of rural population coupled with agricultural land inheritance practices is likely to fuel subdivisions of agricultural land in the study area. Indeed, this is likely to be the future trend, if policy interventions are not put in place by the rural land managers. The population of Kajiado County, as well as the Kenyan population, has been growing over the years. The current population growth rate in Kajiado County is at 5.5% per annum which is almost twice higher than the national's population growth rate of 2.9% per annum (County Government of Kajiado, 2013). Rural population growth rate is a demographic factor which is likely to be influenced by the economic and other factors.

Urban population growth rate

Urban population growth rate was ranked as the last/tenth most significant driver of agricultural land subdivisions in the study area ($\overline{X}$ = 2.9, Z = 16.52). This driver signifies application of the urban growth theories which postulate that urban areas will always expand into the surrounding rural areas. Kenyan urban population has changed from 7% in 1960 to 26% in 2016 with an annual urban population growth rate of 4.2%. Kajiado County is, however, mainly rural with 76.2% of its population being rural while urban population stands only at about 23.8% up from 19.8% in 2009. This is an indication that Kenya is urbanizing over the years and urban land uses are likely to push away agricultural land use through agricultural land subdivisions and subsequent conversions. Increasing urban land prices appears to have aggravated the situation.

Urban population growth rate has been assumed to be an obvious and important driver of subdivision of agricultural land in many parts of Kenya (GoK, 2016; 2016a; Lambin *et al*., 2003; Olson *et al*., 2004). Previous studies in New Zealand have also found urban population growth rate to be significant driver of subdivision of agricultural land (Henry *et al*. 2012; Lee, 1999). The finding of this study has however shown that even though this is a significant driver in the study area it is not the most important. This could be due to

the location of the study area which focused on the rural areas only. It appears thus urban population growth rate may be most significant in rural/agricultural lands near urban areas but not in remote rural areas.

CONCLUSIONS AND RECOMMENDATIONS

The paper has revealed that socio-cultural and economic factors are the most significant drivers of agricultural land subdivisions in the study area. Based on the first five most significant drivers of agricultural land subdivisions, the paper proposes the following recommendations:

The national and county governments should thus put in place appropriate and clear policy, legal and institutional frameworks to prescribe allowable minimum economical/optimal agricultural land sizes in various agro climatic zones in Kenya.

Individualization of title was cited as the second most significant driver of agricultural land subdivisions in the study area. Since it is difficult and unnecessary to reverse agricultural land privatization trends, in any case it is assumed to be a cure of the tragedy of the commons, individual titles should have restrictions on the minimum allowable sizes depending on the location and use of the land. Where agricultural land is used for extensive livestock production system, for example, large tracts should be encouraged unless and until the owner wants to change the user.

Government and private sector should support agricultural enterprises, including livestock production, to make agricultural activities economically viable and competitive to reduce the influence of attractive agricultural land prices, the third most significant driver of agricultural land subdivisions. This policy measure would in turn raise the income of the landowners and help them invest in agricultural production.

Appropriate property taxation policies should also be used to discourage speculation on agricultural land. This intervention would discourage idle agricultural land thus avoiding land fragmentation. The allowable minimum economical agricultural land sizes in various agro climatic zones would also go a long way in this endeavor.

To reduce the influence of demand for urban housing on the agricultural land subdivisions, urban revitalization strategies and urban land banking should be encouraged as means of providing urban housing in the urban areas. Agricultural land should only be developed once basic services are provided thus public facilities requirement ordinances may go a long way in achieving this quest.

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