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LAND REGISTRATION AND ITS IMPACT ON
SMALL-SCALE FARMING IN KENYA;
THE CASE OF MBEERE IN EMBU DISTRICT

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LAND REGISTRATION AND ITS IMPACT ON
SMALL-SCALE FARMING IN KENYA:
THE CASE OF MBEERE IN EMBU DISTRICT

ABSTRACT

The rationale for land registration has been that security of land tenure gives farmers incentive to improve their farms in rural areas. This is made possible by the provision of title deeds. Farmers with title deeds, it is argued by policymakers and some academics, are able to acquire credit which they invest in their farms. This is alleged to result in increased land productivity, income and employment. Thus, land registration has been instrumental in agricultural development in rural areas.

The purpose of this study therefore is to investigate whether land registration in a small scale farming, semi-arid area, namely, Siakago and Gachoka Divisions in Embu District, has increased productivity, income and employment.

It is argued in this study that there may be other important intervening variables which explain agricultural development in rural areas. In order to find out whether this is so, the effect of land registration will be measured in productivity, income and employment in the designated rural areas.

Consequently, a functional model which relates relevant variables through given set of hypotheses has been developed. The stated hypotheses will be tested by using primary and secondary data. The primary and secondary data will be obtained from land registration records, stated government policy formulations and questionnaires.

The outcome of this research project will hopefully shed light on the existing land registration programmes in Kenya particularly in the low potential, semi-arid areas. In addition to this, it would help in the reformulation of policies concerning land registration in particular, and alternative employment and income generating programmes in rural areas in general.

INTRODUCTIONTHE PROBLEM STATEMENT

In Kenya, like most of the Third World, 85% of the population lives in the rural areas (House and Killick 1983: 31). These rural areas are characterized by low levels of industrialization and a predominance of the agricultural sector in employment and income generation. Where the agricultural sector is dominant in the economy, and provides most of employment (even though labour productivity is low), government's policies especially those concerned with agricultural development are important determinant of rural change. They are important in promoting better methods of farming so as to increase output, foreign exchange earnings, employment, distribution of income and food production. Agriculture provides two-thirds of Kenya's GNP and 80% of the export earnings. As such, the sectoral objectives have been to increase food production, agricultural employment and exports. The emphasis especially after independence has been on small-scale farmers in terms of increased inputs and credit availability, extension services and provision of training programmes. In arid and semi-arid lands (ASAL), in which one-third of Kenya's output is expected to come from, one of the major policies has been to improve agricultural services which will result in output increasing technology (Development Plan 1984/88: 185).

Since non-agricultural sectors are small, it becomes imperative to extract a surplus from the agricultural sector in order to increase investment, and growth in these sectors. A transferable surplus will be available if and only if part of agricultural production is sold to other sectors. Consumption should be less than the total income from agriculture. Furthermore, savings must be more than agricultural investment (Griffin 1974: 105). The linkage between modern sector and agricultural sector is important for industrialization to be realised. This realization is due to the derived demand for capital goods which result from an increase in the production of consumption goods (de Janvry 1981: 27). Marketed surplus in real products - food, raw materials, and financial surplus are crucial for industrialization. Food should reach the urban sector otherwise, either the labour force in the urban sector will be reduced or wages will rise because food is a basic wage good. As food prices go up, and wages rise profit margins are reduced. The raw materials are important since they provide the key industries with necessary inputs. Financial surplus on the other hand

determines the resources which can be transferred from the agricultural sector to the non-agricultural sector. The type of the agrarian structure of a given country will influence the size of the marketed surplus. It will also determine its extraction and the mode of its utilization.

In Third World countries there has been a need for agrarian reform. That is, a wider structural change in agricultural sector. This is due to the fact that these countries are characterized by unequal distribution of land, and there is a correlation between the ownership of land and the type of institutions which provide technical assistance. For instance, financial institutions such as commercial banks and even Agricultural Finance Corporation (AFC) which supposedly cater for small-scale farmers, require land titles as a prerequisite for obtaining credit. It is the perception of these institutions that smallholders are involved in subsistence farming rather than cash crops. As such, lending to smallholders puts these institutions at a high risk (World Bank 1985: 77). Moreover, in these countries, there is imperfection in factor markets. Accessibility to factors of production is limited to large landowners and those with off-farm income. This has an effect on the allocation of resources within agricultural sector.

The agrarian reforms which are usually advocated in the Third World may or may not include land reform. Agrarian reforms would consist of agricultural policy modifications. Such modifications would be concerned with price policies so as to turn terms of trade in favour of the agricultural sector, allocation of resources to agriculture, extension, training and storage facilities, provision of physical supplies such as fertilizers, increasing credit purchase; and providing infrastructure to facilitate production (World Bank 1975: 22).

Agrarian reform should include land reform if land is not fairly distributed before agrarian reform. Land reform in this case is a necessary condition for agrarian reform, but not a sufficient condition for agricultural development. Land reform is usually implemented in order to attain economic and political objectives. The economic objective is to increase output per unit of land, and an increase in employment in rural areas. The subdivision of large estates on farms into small units of production has been seen as increasing efficiency: smallholdings being more productive per unit of land and per unit of labour than large farms. Such reforms occurred in Brazil where increased yields per acre were estimated at 20%. Similarly

in Columbia land output rose by 17% as a result of land reform (Griffin 1974: 222). In Kenya there was an increase of marketed output in the 1960s and early 1970s, from small farms (Heyer 1974). Small-scale farming resulting from land reform is supposed to reduce inequality and increase in total output. The political objective is to stabilise the masses in the agricultural sector by creating a land-based petty bourgeoisie.

In a development context land reform is or could be seen as a part of agrarian reform (World Bank 1975: 22). All agrarian reforms implemented in Africa and elsewhere have been intended to show the importance of improved land tenure in economic growth and agricultural development.

In 1950's, Kenya embarked on an agrarian reform programme which was characterized by adjudication, consolidation and registration of land. These programmes were first implemented in certain parts of the country, namely, the Kikuyu Country (Sorrenson, 1967) which is predominantly a high potential agricultural area. These areas, suitable for mixed farming and with a satisfactory land tenure system, were supposedly to provide the economy with surplus crops, stock products and cash crops. The emphasis of these programmes was on small-scale farming, but while they appeared economical they were politically motivated in the sense that the main objective was to calm down the Mau Mau uprising and create an African middle class which would support the status quo. For instance, Swynnerton pointed out that "appreciation of and insistence on sound cultural practices, on plant sanitation, legislation, cooperative marketing and so on must come from large groups of progressive African farmers" (Swynnerton, 1954: 8). Land adjudication and registration programmes continued after independence and are still in progress and after covering the high potential areas, they have now been expanded to medium and low-potential areas.

According to the Swynnerton Plan, land reform in Kenya aimed at promoting capitalist development in agriculture by changing the agrarian structure. This was done in order to increase income distribution in rural areas and also to raise productivity and employment in order to meet the demand for food and foreign exchange.

The first phase of the reform was land adjudication which was supposed to phase out the customary land tenure system. The second phase was land consolidation - bringing pieces of distant land under common

ownership together; through this the problem of land fragmentation was expected to be solved. The third stage was land registration designed to create security of ownership and a land market. This was done by issuing title deeds which could be used as security for obtaining credit (Okoth-Ogendo, 1976: 167-169).

According to Swynnerton, the provision of title deeds was the key to agricultural development. He points out that:

Sound agricultural development is dependent upon a system of land tenure which will make available to the African farmer a unit of land and a system of farming whose production will support his family at all levels, taking into account pre-requisites derived from the farm, comparable with other occupations. He must be provided with such security of tenure through an indefeasible title as will encourage him to invest his labour and profits into the development of his farm and as will enable him to offer it as security against such financial credits as he may wish to secure from such sources as may be open to him. The commitment that land chattels will be mortgaged as security against loans and that they will be "sold up" if he defaults must be fully accepted by the farmer in applying for loans and by the government in preparing any legislation covering land tenure and agricultural credit (Swynnerton, 1954: 9).

The Swynnerton Plan was supposed to solve the problem of fragmentation, provide a land market, eliminate all types and levels of litigations and provide employment. Furthermore, the provision of title deeds would provide incentives to invest in land. Land productivity would increase and hence rural incomes.

According to Swynnerton Plan, the African tenurial system was not conducive to efficient utilization of land. Under the customary law, land was at the disposal of communities with identical lineage living within a defined area. The interest of these groups was represented by elders (e.g. aramati among the Kikuyu) and/or various types of councils of elders. Each member of the kin and ethnic group had usufructuary rights to land. Rights were either obtained through birth in a given family group, or through marriage, but rarely through purchase. Land ownership was in the hands of a given groups while rights to its use were individual (Podeworny, 1974: 99). According to Mbilinyi: "Ownership patterns vary from common or group ownership of land and land resources to individual ownership, to a combination of the two types of ownership (FAO 79: 71)". In this case, individual rights were confined only to cultivated areas while pastures in general and non-arable land were subject to collective utilization. The African tenurial system led to fragmentation, shifting cultivation, and litigation. This was seen as a hindrance to agricultural development. Some people however argue that cropping patterns and the following

system managed soil fertility to provide enough food without commercial inputs.

The rationale for land reform leading to the new land tenure system according to Swynnerton Plan is as follows:

- (a) Increase output through land consolidation. Not only would consolidation bring the cost of cultivation down but farmers would be able to acquire credits through the use of title deeds as collateral. Through the use of such credits farmers would be in a position to buy irrigation equipment, fertilizers, sprays, and other farm inputs.
- (b) Land productivity would increase because of the adoption and use of modern or purchased farm inputs in production. This would imply a change in quantities and qualities of agricultural products. This would also imply an increase in farm income and this would enhance demand for agricultural products.
- (c) Increase in employment would occur because increased farm activities call for the use of labour from both the formerly unemployed, and maldistribution of resources were inevitable stages of economic development according to Swynnerton (1954: 10) the landless class would be a source of labour for the large commercial farmers and later for a growing industrial sector.
- (d) Innovations and lifting of restrictions on African agricultural production.

In high potential areas, Swynnerton had the expectation of an increase in surplus food production which would feed urban populations, employed labour and provide enough cash crops for export. With regard to semi-arid areas, activities in stock production had to be increased. This in turn would provide employment for African labour.

Soon after the Second World War, the colonial government lifted some of the restrictions on cash crops grown by African farmers. But, it was the Swynnerton Plan which began "a systematic encouragement of African commercial agriculture for domestic urban and export markets with concentration on coffee, tea, pyrethrum and dairy cattle (Hinderink and Sterkenburg, 1987: 234)." However the policy favoured progressive farmers. Swynnerton argues that if the plan had to be accepted, "able energetic or rich Africans will be able to acquire more land and had or poor farmers less, creating a landless class", (Swynnerton, 1954: 10).

Land registration, under Swynnerton's framework continued in Kenya as a matter of policy. The 1970-74 Development Plan provides evidence of this fact. The plan pointed out that:

It has been government policy that the land tenure system in African areas of Kenya should be changed so that farmers can be provided with title deeds to their land where necessary so that scattered fragments of land can be consolidated into one holding (Development Plan, 1970-74: 210).

According to the Plan, farmers would be more willing to make long-term improvements of their land. Also they would get credits more easily because title deeds provide good security for agricultural loans. Consolidation of fragmented land would save time and money, and litigation would disappear. Land adjudication and registration and support for large farms from various government programmes such as the credit facilities from Agricultural Finance Corporation (A.F.C.) and extension services were included in agricultural strategic plan (Development Plan, 1974-1978). In addition, adjudication and registration have expanded to semi-arid areas. Due to natural resource constraints in these areas, the development of farming, may be less economical. These constraints include lack of enough rainfall which is unreliably distributed, and yields are erratic and depends on soil moisture. Livestock adapt well to semi-arid areas but the methods of keeping them are rudimentary thus resulting in low productivity.

Due to population pressure and landlessness in high potential areas, there has been a tendency of people to move from high to low potential areas (Peperkamp, 1986: 19). Increase in human population and poor management may result in these lands failing to sustain current human and livestock numbers. It is therefore important to seek for viable and acceptable policies to improve the situation.

The focus of this research is to investigate the viability of these small-scale holdings in a low potential area in terms of employment, productivity, and income distribution. This will be done by isolating the factors which contribute to agricultural development and constraints to this development in Siakago and Gachoka Divisions, Embu District.

Study Area

Mbeere comprises both Siakago and Gachoka Divisions of Embu District, which is located in the eastern parts of Kenya sharing borders with Meru in the north, Kitui in the east, Kirinyaga in the west, and Machakos in the south. The district consists of arid and semi-arid zones covering a total of 2,714 sq. km. with Siakago and Gachoka Divisions comprising 2,073 sq km. Of the 244,000 ha. of agricultural land 8,200 ha. are

in high potential areas while 86,100 ha. are in the marginal zones. 20,000 ha. are within medium potential areas. About 6,553 ha. of land are under coffee which is the most important cash crop in the district. This is within high and medium zones in Runyenjes Division. Cotton and tobacco which occupy 6,224 and 642 ha. respectively are grown in Mbeere.

Population

According to the Kenya Population Census (1979: 58-59) the total population of Embu District was 263,171. The above population was contained into 50,241 households, with a population growth rate of 4.18 per annum (Central Bureau of Statistics, 1984). Siakago which covers 779 sq km. with a density of 49 had a total population of 38,230 with 8,337 households. Gachoka had 76,812 people with 16,613 households. It covers 1,294 sq km. with a density of 59.

Mbeere was chosen for the study because land adjudication and registration have been going on since the 1970s and are still in the progress. Siakago Division represents areas where land adjudication and registration have been completed. Gachoka represents areas where land adjudication and registration are still in progress.

Rainfall

In both divisions the first rains start at the end of March and end in September. The reliability of rainfall in the first rains ranges from 350-450mm in Siakago and 300-350mm in Gachoka. The second rainy season starts in October and end in February. In Siakago and Gachoka, the reliability of rainfall ranges from 350-450mm and 250-300mm respectively.

Crops

Cassava, pineapples, mangoes, macadamia nuts, and citrus fruits are grown yearly. During the first rains, maize, especially "katumani", variety sorghum, bulrush millet, foxtail millet, beans, cowpeas, chick peas, green grams and sunflower have a high potential yield. Tobacco, soya beans, sweet potatoes and dolichos beans and onions have a fair yield. Crops which have a very good yield potential in second rains are sorghum, bulrush millet, green grams, cowpeas, pigeon peas, dwarf sunflower, "katumani" maize, dolichos beans, "mwezi moja" beans, cotton and sunflower have a fair yield potential (Jaetzold and Schmidt, 1983).

Livestock

In both Siakago and Gachoka, dairy production does not do as well as beef production. This is due to lack of water, suitable forage and dips. Other types of livestock are kept, and below is the population of livestock in both divisions.

TABLE 1

<u>Stock</u>	<u>Siakago</u>	<u>Gachoka</u>	<u>Total</u>
Grade Cattle	172	72	244
Zebu	19,000	43,000	62,000
Goats	39,584	5,426	45,010
Sheep	106	834	940
Foultry	24,149	69,454	93,603
Pigs	59	84	143
Rabbits	251	282	532

Source: Republic of Kenya, 1984/88: 23.

Significance of the Study

Small-scale farms especially those in arid and semi-arid areas (ASAL) have not been subjected to much social science research. Most research done on small-scale farming has been concentrated on high potential areas. Furthermore, the research has not been done on the economic impact of the possession of title deeds by households who have gone through land registration and those who have not. These research findings on land tenure in areas representing high to medium potential areas may not apply to marginal lands due to differences in ecology, infrastructure, and other factors. From the preliminary field observation in both Siakago and Gachoka divisions, most of the farmers are not aware of the role of extension services or the use of title deeds. In other words, the role of development programmes, has not been effective enough to arouse farmers to the possibilities of productivity-increasing techniques. For example, title deeds as security inducing incentives to farmers are of no importance to most small-scale farmers in low potential areas (Land Office: Embu, May 1986). It is the perception of most smallholders that they will not qualify for credit.

As such, they do not bother to apply for credit (World Bank, 1985: 73-85). The prerequisite of land collateral for obtaining credits from financial institutions such as commercial banks and particularly Agricultural Finance Corporation (AFC) disqualifies women as potential borrowers. This is because women are traditionally restricted from owning land. A total of 210 households out of 50,241 households in Embu District were to receive credit from AFC between 1985 and 1986. This included both small-scale and large loans. Out of 210 households, only 9 women got loans. They used other forms of collateral rather than land collateral (A.F.C. Office, Embu 1986: Kenya Census, 1979).

Given the factors of population growth and the needs of food and foreign exchange, semi-arid areas in Kenya should play a significant role as additional source of land for crop production. The study of small-scale farming in semi-arid areas is important because Kenya's population has been increasing by 4%³/year - one of the highest rate in the world. In Kenya, for example, as indicated by Migot-Adholla (1980: 146) both human and animal populations have increased. Yet the amount of land available remains constant. This has implications for the land holding capacity, and utilization techniques, resource basic method, preservation, and overall productivity.

In Kenya, 80 per cent of the land consists of arid and semi-arid areas. These areas support 20 per cent of the population and half of the country's livestock (Kenya 1986: 84). These lands, if well managed effectively, could be useful for agricultural development. In arid and semi-arid areas, drought resistant grains and other varieties of crops could do better if appropriate methods of farming are utilized. For instance, millet and sorghum do better than other grains and apart from their habitual use for porridge, could be used as a substitute for wheat flour and animal feeds. A market for wheat flour substitution and animal feeds would result in rise of income and food security in rural areas.

Of the country's meat consumption two-thirds, is provided by beef. The consumption is expected to triple by the year 2000. Goats and sheep have a share of almost a third of meat consumption. Moreover, the milk production is expected to double by the same year. 10 per cent of the country's annual average (1.6 billion litres) comes from arid and semi-arid areas which is the main concentration of production and consumption (Kenya Republic, 1986: 73). Improvement of these areas would not only

increase income, employment and output, but also nutrition standards in semi-arid rural areas. This can only be done through intensive research and allocation of resources to the small-scale farmers in ASAL areas. This could be a solution to population pressure, and food production in Kenya. As such, policies designed for handling such areas in order to minimize problems of small-scale farming would be important for the whole country. Land reform happens to be one of such policies in Kenya although de Janvry (1985) points out to the contrary that land reform in the Third World is no longer an effective policy alternative in promoting incomes and welfare for rural smallholders. In other words, land tenure reform is a necessary but not sufficient condition for advancing the economic gains of peasants.

The reasons for this are:

- (a) the political alliance for land reform must be capable of opposing an established capitalist class in agriculture;
- (b) all efficiency gains from land reform have virtually been exhausted;
- (c) domestic demand is no longer important as a macro-consideration since the industrial sectors are primarily export oriented;
- (d) the ruling class will give in grudgingly and in small doses (Elcher and Startz, 1985: 275).

The purpose of this study is therefore to examine land reform and its impact on agricultural development with specific reference to ASAL areas so as to seek some alternative approaches to rural agricultural development.

More specifically, the objectives of this study are as follows:

1. To compare the level of output between farmers with and those without title deeds. This, will be done in order to determine the effects of title deeds on sources and levels of credit, labour investment, agricultural inputs, improved seeds and fertilizers.
2. To determine how title deeds affect intrahousehold and inter-household rights to land.
3. To determine whether the prospect of acquiring a title deed creates land market.

4. To investigate the effect of title deeds on sexual division of labour among the rural households and how this affects the agricultural output.

Literature Review

In the existing literature on land tenure reform, land registration and the issuing of freehold title has been supported as well as opposed. In his study of various districts which had undergone registration in Kenya (Fleming, 1975) found an increase in marketed output, improved livestock, and capital investment. He also found that the farmers were using fertilizers and planting permanent crops. Since the study was done after registration, he concludes that registration gave an opportunity to invest in land, hence an efficiency and productivity gains (Fleming, 1975: 55). Between 1963 and 1966, the total value of marketed output rose from 49.5m to 56.3m in real terms. The peasants share in this value rose from 25% to 36%. By 1970 the distribution shares had risen to over 50%. The reason given for this was the provision of title deeds. In this point Fleming is not quite right because there were other contributory factors. For instance, the lifting of restrictions on cash crops in African farms was crucial in increasing a marketed output, and could have been a major reason.

The same trend was found by Barber (1970) after a comparison of marketed output of main cash crops in four districts. Three of these districts - - Kiambu, Nyeri, and Murang'a had been fully affected by land reform. In Meru, only a little more than 10% of the area targeted for reform had been demarcated by mid-1965. Using coffee as an example there was an increase in coffee earnings from £4,000 to £234,300 in Kiambu from 1957 to 1963. In Nyeri, the increase range from £13,100 to £270,200 between 1954 to 1963. In Murang'a between 1954 and 1963, there was an increase from £30,900 to £461,100. But Meru which was least affected by land registration had the greatest increase, from £32,700 in 1954 to £1,027,500 in 1963. Meru, since 1930, has been growing coffee. The issue here is why there was a high increase in income in Meru where land registration had been less effective. This leads to an investigation of other factors such as policies adopted in order to control the political situation, which might have led to an increase in output rather than land reform per se.

The findings from these two studies fail to account for various intervening variables contributing to marketed output. Such factors could be ecology, prices, climate, infrastructure, supply and demand of products,

education, exposure to modern methods of production and perhaps, the level of previous innovation on farms. Moreover, these findings do not take into account the diversity of households of farmers, and of variance in incomes, innovation etc. This is because they are done in high potential areas and especially in Central Province where farmers have been exposed to modernisation in farming, and where resource allocation in terms of agricultural extension services, credit, etc. and infrastructure had been in capacity utilization assumed to be high and uniform. Furthermore, the marketed output as a measure of agricultural development especially in less developed countries would not be adequate because a greater proportion of economic activities are performed within households (where levels of specialization is low) and are geared to family consumption. This implies that due to lack of quantification of the various rural household activities, such activities and the resulting output may not be reflected in marketed output. Secondly, increase in output does not necessarily imply economic transformation. There has to be structural changes in order to induce complementary growth in all sectors of the economy especially in rural agriculture. Diffusion of gains in rural income among all sectors presupposes institutional changes which may not have been affected by land registration. As such, increase in marketed output cannot be a good measure for overall rural agricultural development. The underlying issue is whether sources and levels of cash and investment in all sectors of agricultural production have been affected by land registration.

Heyer, (1974) using differences in the growth of marketed output from different parts of Kenya as the primary indicator of differences in development, found that marketed output grew more rapidly in the 1960s and early 1970s. It rose more in small farms than in large farms, i.e. from 34.1m to 63.2m in 1973. In the same study, (1974) Heyer found that some districts have done better since land reform, while others have gained less and still others hardly gained at all. The areas with low rainfall have gained less than those with high rainfall. There have been no new products, new varieties, or changes in technology in low rainfall areas. In some of these low rainfall areas, the standard of living is low due to lack of productivity increasing techniques and population pressure.

Heyer argues that the increase in output in certain areas like in Central Province where land reform started before other parts, has been due to the fact that restrictions for growing cash crops in Central Province were relaxed in the 1950s. This Province also received development resources during and after the Emergency. The infrastructure that was

developed to help control the political situation benefited agricultural development.

de Wilde (1967: 54) argues that land registration by resolving disputes made it possible to plant tree crops on land where ownership of boundaries had been in doubt. This is questionable because in Meru coffee and tea had been doing well even before land registration. While land registration has perhaps resolved disputes among neighbours, it has contributed to disputes among family members (Njeru and Brokensha: 1977). A case in point is where a homestead consists of several wives and sons. This has some economical setbacks since the refragmentation of land may not be economically viable and banks are known to discriminate against land size in issuing loans.

de Wilde (1967: 51) found that in high potential areas income derived from dairying is a function of land registration. The land titles, gave farmers access to credit on the basis of mortgage for agricultural development. The loans were used to buy grade cattle, dairying equipment and for the construction of fences and cattle sheds. In low potential areas, de Wilde points out that income increase is due to limitation of tse-tse fly. The issue is whether there is a correlation between de Wilde's argument and land registration.

Vasthoff (1968: 22) says that banks preferred Africans who had non-farm income. This meant that a good many of loans went to employees having a farm as a second source of income. Thus the loans did not go to typical farmers, but those with reasonable current income, while the full time smallholders were neglected. Among from those who have title deeds, people with full employment and enterprises benefit from loans.

A study done on those who had obtained title deeds by Wilson (Wilson 1971: 16) in Bassi-Boitangare, Kisii found out that of the 25 people interviewed, almost half were from government establishments, 5 were government employees, 11 came from various types of trading, and only 9 were full time farmers. As regards credit, 13 people borrowed from the Standard Bank and only 3 of them were full time farmers, 4 were employed by the government and the rest were traders. Based on this, the bias is towards those with non-farm income. According to Wilson, it is the full time farmer who has benefited least from credit provision, even though he has more time to devote to his holding.

Among the beneficiaries of the credit obtained, it would be interesting to find what percentage of women received credit. In their study, Killick and House (1984) point out that women play the dominant role in small-scale farming but they do not enjoy much advantages in rural economy. Women play a major role in food production not only in Kenya but almost in all sub-Saharan countries. Women are active mainly in subsistence sector where productivity is very low. Boserup (1975) points out that:

As long as agriculture is mainly a subsistence activity, where most or all of the output is consumed by the family which produces it, women are forever found to take a heavy share of agricultural work either in the peak season or during the whole year (Boserup 1975: 12).

Rural women's plight in Africa has been described before and while it is true that cultural elements - chiefly male-female relationships - adversely affect women's position, various economic and political factors rooted in history, also work against rural women. For instance, during the colonial era, labour was needed for the settlers' farms and for the colony. Men left their homes to work, and women stayed behind. The women continued subsistence farming without the help of their men. The men who had jobs received food grown by their wives and mothers on the family holdings. The system was advantageous to the employers: they were able, to maintain wages that were below subsistence levels for the labourer himself, not to mention his family (Development Forum, Wangari and Koivukari 1986: 8-9).

Rural Development Programmes in Kenya do not pay much attention to women in rural areas. The Women's Bureau, although active and instrumental in obtaining funding, focusses on selected groups and areas. As reported by Rayah Feldman, (1984) nearly 90% of rural women in Kenya are excluded from the attention of the Women's Bureau. According to many surveys, the policies of agricultural development in Kenya focus on commercial farming and food production is considered secondary or neglected. Various studies indicate that in rural areas women continue to have less security of land tenure (Okoth-Ogendo, 1975). Any change in women's role in development should occur from bottom-up, as a result of historical and cultural change. Furthermore, change in women's position also depends on the class and power structure in the country as whole: improvement in the position of the poorest women and men may mean the loss of privilege of some other women and men. How do we reconcile these inequalities in wealth and power among women?

Another area in which banks discriminate is in regard to size of the farm. Wilson found out that farmers with less than 1.5 ha. are not usually considered for loans either by the Agricultural Finance Corporation (A.F.C.) or the commercial banks. The average Standard Bank borrower out of 13 who obtained credit in Bassi-Boitangare had 8.8 ha., almost 3 times the average farm size for the area (Wilson, 1971: 17).

It will also be interesting to find out whether loans obtained against title deeds have been used for the development of land or whether they were invested elsewhere or consumed. Various studies indicate that loans had been used for enterprises other than in the improvement of the agricultural development. Haugerud (1981) found out that most of loans obtained in Embu were invested in non-farm business, and land purchasing for later speculation. Wilson says that acquiring land is not always economical and may not be conducive to productive land utilization. In Bassi-Boitangare, people who had acquired land over ten years ago, had not utilized the land at all. They had not planted any crops or even cleared their new holdings.

The new land tenure system was supposed to increase the income of small farmers. However, studies done by Haugerud (1983) and Hunt (1978) in Embu and Mbeere respectively indicate that off-farm income is an important factor in generating more incomes within households. From her field survey and statistical analysis, Haugerud points out that non-agricultural economic pursuits in conjunction with land acquisition rather than small-scale agriculture are key factors contributing to economic development in rural areas. Such factors are education, off-farm employment and business. Haugerud (1983: 65) points out that:

Land tenure reform has been less important as a vehicle for capitalizing agriculture and encouraging agrarian entrepreneurship than it has been for institutionalising rural inequalities associated with reform income and access to state resources.

She argues that it is small farmers with non-farm incomes and large farms who are likely to invest in agriculture than are other smallholders. Hunt (1978: 73), using a multiple regression analysis found out that formal education of the head of households in Mbeere was significant and explained 19 per cent of variations in household wealth.

Killick and House (1983) argue that although agriculture dominates the rural economy, other activities contribute to the rural development. Such activities are marketing, education, government services, food processing, furniture making, tailoring and other trade. They point out that almost

a quarter of total rural employment is accounted for by non-farm activities and a similar proportion of total rural income (House and Killick, 1983: 33). According to them, it is the level of non-farming income which is the key element in determining the productivity and output of farming enterprise and the overall level of household income. In their study, they found that the richest smallholder families had a high level of non-farm income especially from regular employment, which provided security. The rich families also used more farm inputs and hired labour and had higher levels of farm output. In addition to this, they had more collateral with which to borrow additional funds. Then how can one argue that title deeds are a prerequisite to rural agricultural development if they do not in fact extend to the majority of farmers especially women and poor farmers? Acquiring of a title deed, while it gives security to a farmer, is a necessary but not a sufficient condition for agricultural development.

Land registration was seen as providing security and supposed to increase incentives in improving land. The survey in Bassi-Boitangare by Wilson (1971) showed that nearly three quarters of the 77 registered people sampled indicated that registration meant increased security of tenure. Many pointed out that registration gave them rights over their holdings. But the people who owned land jointly did not feel more secure as a result of registration. This is partly due to the disputes they were experiencing among themselves. According to Wilson, people had not changed their attitudes towards planting permanent trees because of registration. Any increase in investment on the farm since registration was due to farmer's capacity to invest. He argues that there is no correlation between the security of tenure and investment in the development of land in Kisii. Kisii is similar to Meru where restrictions of cash crops had been lifted by the colonial government in the 1930's. Since the small scale farmers produce mainly the means of subsistence for their families, they are bound to develop their holdings more productively simply because of land registration.

The purpose of the new land tenure system was to increase productivity, income distribution and employment. Within the programme, was the creation of "progressive farmers", a middle class among Africans, so as to divert them from the Mau Mau. This class was to provide employment for the landless. Swynnerton pointed out that "able, energetic or rich Africans will be able to acquire more land and bad or poor farmers less, creating a landed and a landless class." This, Swynnerton argued, was a normal step in the development of a country (Swynnerton, 1954: 10). Killick and House argue that consolidation creates unemployment and landlessness. "In Central Province the landowner possessing many fragments was unable to cultivate all of them and so allowed tenants at will ("ahoi") to cultivate the undesirable and more remote of these fragments (Killick and House, 1983: 52-53").

Registration according to Wilson (1971) resulted in many people losing rights to cultivate land. For example, tenants at will lost their rights. Furthermore, not all clan members were able to cultivate the clan land according to Haugerud (1983). Before registration, clan members were able to utilize the clan land and as such, landlessness did not exist especially in Mbeere before land adjudication (Njeru, 1978: 13-14). Moreover, land registration according to Brokensha and Njeru brought about a decline of the family and the clan. According to them, widespread selling of land introduced a further aspect of disorganisation.

OVERVIEW OF THE LITERATURE

The literature on this topic indicates that it is still an issue, that land registration has not always been followed with some agricultural transformation. There are views that see other factors as more important in agricultural transformation, and do not assign a significant positive contribution to land registration. The literature review has discussed findings, and methodologies used. It is important to discuss certain limitations in the methodological approaches used in such studies.

Both Heyer (1974) and Fleming (1975) use marketed output of agricultural products as the measure of land registration on economic growth. One of the limitations of this form of measurement is that costs of inputs are not accounted for in the analysis. It is not also shown whether this is due to increase in productivity or use of more resources or both. Fleming goes further to add another index in his analysis. That is, net profit on each farm over time. This is not enough to indicate that it was a result of land registration from 1964 to 1968 as the relationship between inputs and product prices determine net profit as well. Fleming argues that small farms are more productive than large farms. This is because of intensive labour use. The implication on this is that increased productivity is translated into high incomes and perhaps more farm employment through

hiring of labour. However, there is no statistical evidence in his study to show the same. It is just a conclusion. It is important to include subsistence crops in the analysis because in the Third World countries majority of people are engaged in the traditional sector where levels of specification are low and production is geared towards family consumption. The family takes the responsibility not only for distribution of food but for the consumption of family expenditure. As such it is not useful to focus only on marketed production.

In 1968, marketed production increased by 9.7 per cent. But this growth came from coffee and tea while food production declined (Economic Survey, 1968). One has therefore to make a distinction on whether land registration is more effective towards promotion of cash crops than food crops.

Njeru's study (1978) on land adjudication in Mbeere points out that landlessness has come about as a result of individualization of land. His study is based on frequencies. This type of methodology may lead to a biased conclusion because one finds that the percentages are not tested for the population sample and results can be by chance. There is a need therefore to test the variables for the population, if the sample chosen is representative of the population. Moreover, the study does not address itself to issues like productivity, employment and income.

Methodological limitations can lead to a variance in the results. Empirical evidences cited follow from the framework of analysis adopted, such that the present study will use an improved analysis to test various views. Economic models which will capture the important features of the land registration will be used in this study. The purpose of these models is to identify variables which influence income distribution (variation), productivity and employment in the process of economic development. The parameters of the models will be estimated from the fieldwork data. Consequently, tests on the estimated models will be carried out in order to see whether the variables constitute realities of the economy which will be relevant

not only to Mbeere people, but to the whole country. The understanding of these models will be useful in predicting the policies for improvement of economic welfare particularly in rural areas.

Conceptual Framework

The model of surplus labour economy is assumed in the analysis. Increased utilization of land resources for agricultural production implies an increased demand for other inputs for a certain technology of production. The aim in this study is to capture the likely effects of land registration on agricultural production, and this is designed to be analyzed using employment, productivity and incomes. Studies have shown that farmers (small and large scale) exhibit a rational economic behaviour, and that there is always an attempt to allocate available resources efficiently. Divergences from this view mainly occur, due to variances in concepts and assumption in the specification of a farm household behaviour. There is some conviction that a farm household is both a production and consumption unit, such that it has been found necessary to discuss separability and jointness in the specification of household models. It is safe to concentrate on the farm production aspects and ignore tentatively other production and consumption activities of the household. The question of whether (and how) land registration affects farm production is discussed (27-30pp).

We attempt to introduce this new variable into the general model of a farm-firm. As a model of resource allocation decision, the elements that are considered are:

- (i) Resource endowments and requirements for a certain mix of enterprise e.g. land, labour, capital and financial resources for purchase of other inputs.
- (ii) Farmer behaviour, as explained by objective(s), expectations and response to exogenous factors; risk, institutional factors etc.
- (iii) Certain assumptions are important, e.g. on the structure of the market for products and factors of production which determine prices and costs.

The problem for analysis, that a farmer faces is that of when to make a quasi-optimal decision. This partial-equilibrium is said to occur when the objective(s) is somewhat achieved, whether that of outputs, incomes, profit or expected utility maximization. Using a well-behaved profit and production or cost function, input demand functions can be derived. We can choose to use a profit (not income) function to derive a set of input demand functions for labour and capital (in a 2 inputs model).

Let the objective of the farmer, be maximization of expected net income. This is defined as total income less the costs of production. This objective is subjected to an income, and time (labour) constraint.

$$\text{Max } E(n) = \sum_{i=1}^n p_i Q_i (L/N, K, S) - wL - \sum c_i K_i \dots\dots\dots (1)$$

$$\text{Subject to } Y(\sum w_i t_i) + C_i (B_i) = WL + \sum c_i K_i + E_i \dots\dots\dots (2)$$

$$T = \sum t_i + h_i + I. \dots\dots\dots (3)$$

$$L = h_i + 1 \dots\dots\dots (4)$$

The variables are defined below:

- E(n) - expected net income
- P_i - market price of a farm product, Q_i
- Q(L/N,K) - a production function with inputs L/N as labour-land ratio, and K, other inputs.
- S - a risk index (variance due to randomness in output, if prices of products are non-random.
- W - wage rate
- C_i - Unit cost of other inputs used.
- Y - Total income from off-farm employment. A product of wage rate (W_i) and t_i, hours on off-farm employment plus remittances.
- C - Credit (in cash and kind) as dependent on a vector B for variables on farm household characteristics e.g. Title deeds and risk of default, credit costs, land size, etc.

- E_i - Household expenditures on other items consumed by the household.
- T - Total man hours available, as sum of man hours on off-farm employment (t_i), family man hours on farm production, (h_i), and hired man hour (l_i). Labour used in farm production (L_i) is the sum of family labour (h_i) and hired labour (l_i).

First order conditions (F.O.C) gives a set of partial derivatives (equations) which can be solved for optimal solutions to the unknowns. The maximum expected profit level is solved using optimal values of $(L/N)^*$, K^* , S^* , C^* , etc.

It is assumed by those who argue for land registration that extension services would direct farmers to the possibilities of improving their land. This is done by introduction of land saving and biological techniques. These techniques are supposed to increase yields per hectare. Once output increases, the process of production expands and more labour is needed for production, hence employment increases. However, it is not always the case that an increase in output is accompanied by an increase in employment. Productivity increasing innovations raise labour productivity. When this happens, few workers are required and some previously working people are displaced. This displacement would be conducive to rural-urban migration. Employment always exists according to the theory of flexible wages. Embodied in this theory is perfect competition and economic efficiency and that, forces of supply and demand determine employment and wage rate. Labour will always be demanded as long as the value of the marginal product produced by an additional worker is over and above his means of subsistence. When wage rates increase, more labour will be supplied. Consequently, this increase of labour will lower the wage rates to a point where demand equals supply. This situation would not apply in Third World countries, due to imperfect market prices and relative factor prices which are distorted (Griffin, 1974: 17, Todaro, 1977: 167).

According to Todaro, wage rates are not flexible due to institutional forces such as trade unions, poor mobility, discrimination, government policies etc. These are the underlying issues in wage

determination in Third World countries, where there is always unemployment and underemployment. Rather than a population pressure per se, market structure and land tenure system, are also contributory factors in wage determination and less employment in Third World countries (Griffin, 1974: 31). The control of the local labour markets and resources such as credit, water and land enables progressive farmers to reduce the wage rate and this results in less employment.

With accessibility to credit, farmers are supposed to invest in land. Investment in land calls for more activities. Output expands and, hence, employment increases. This situation, while seemingly valid, would apply to large scale farmers, and small-scale farmers in high potential areas. While credit may not be the only constraint as a source of income for farming, it may seem so to most farmers in rural areas, where non-farm opportunities are limited. Also, commercial institutions are reluctant to lend to non-export crop producers. Even those who meet this criterion, may not meet all the conditions required for acquiring credit. A.F.C. requires what is known as 5Cs. That is,

- Title deeds (collateral)
- Capacity to repay
- character of the farmer
- condition of the farm
- contribution of the farmer (AFC Office, Embu, May 1986).

Employment

Although we are dealing with peasant economy where family labour is more important than in a market economy, it can be shown that labour demand L_1 is a function of some variables. Credit is expected to be correlated to land registration. While farm size is expected to be correlated with labour demand. In this case, these variables are included in the model below:

$$L = f(W, LR, Ext, LS, Credit, CF, 0) \quad (5)$$

$$\frac{\partial L}{\partial W} < 0, \quad \frac{\partial L}{\partial LR} \geq 0, \quad \frac{\partial L}{\partial Ext} > 0, \quad \frac{\partial L}{\partial LS} \geq 0, \quad \frac{\partial L}{\partial Cre} > 0, \quad \frac{\partial L}{\partial CF} > 0,$$

Where L = Employment (family and hired)
W = Wage
LR = Land Registration
Ext = Extension services
LS = Land size
Cre = Credit (cash and in kind)
CF = Cost of inputs
O = Other

When wage increases employment falls. Official wage rates (Ministry of labour) are assumed to be constant for occupations across households, which are the unit of analysis. Given land registration, the effect on quantity of additional employment cannot be determined before estimation is done. The estimation of the variable land registration will be done by dummy variables. With agricultural extension services, employment is expected to increase because more output is expected. With an increase in output more labour is needed for harvesting, weeding, transportation and so forth. Extension services will be measured in terms of visits to a farmer by agricultural extension officers. Given credit availability, it is expected that farmers would invest in land, thereby increasing activities which would call for more employment.

Land size is correlated with labour demand. Farmers with large farms, are expected to employ more people in their farms. The costs of inputs will show the relationship between labour and inputs. This relationship gives some ideas to the extent of labour-intensity in production, and adoption rate of improved farming practices. Thus, with labour-intensity and high rate of adoption, employment is supposed to increase.

Once land is registered, farmers are expected to improve their methods of production. The accessibility of farmers to credit would enable them to purchase productivity-increasing technology. This would increase farm output, and, hence, the income of farmers. Costs of inputs may also influence employment in that if the cost of inputs

is low farmers would expand their production and thus bring in more employment.

The final model of labour employment for which results will be reported will be based on the estimates of the variables stated above. This also, applies to relationships (6) and (7) which will be specified below.

Productivity Model

With regard to productivity, it has been pointed out that farmers with non-farm income and education, are more able to adopt new techniques than farmers who depend on farming as the only source of income. They have the capacity to repay loans because the incomes from farming and business are expected to be high even before acquiring credit. Conditions of the farm management and their personal contributions are expected to be good. And as such, they are in good standing with financial lending institutions. Farmers with education are expected to be more receptive to agricultural innovation. They are more willing to adopt new techniques than uneducated farmers. But one may also argue that this could be so only to a certain extent because one would expect that the more educated one is, the less time one spends on his farm. It would be the case only if the educated person is fully occupied in farming. One could also argue that a person, say, has gone through seven years of education is less receptive than a person who has gone through secondary school i.e. there is a positive correlation between education and agricultural innovation. While education is a factor which could be contributory to innovation, adoption of new techniques will depend on various factors. Such factors are costs of inputs, reliability of rainfall, accessibility to new techniques, markets, a rise in real wages and so forth.

Farmers will adopt a new technique if the costs of material inputs - credit, new seeds, fertilizer and other inputs in agriculture are less expensive relative to labour. Griffin (1974: 49) points out

that a new technique is adoptable and profitable to those who pay low wages relative to costs of material inputs. The cost of inputs while relatively cheaper to large farmers, is rather expensive to smaller farmers. Small farmers tend to adopt techniques which are labour-intensive. Furthermore, the uncertainty of rainfall is a limiting factor to adoption of a new technique. For instance, if rainfall is not reliable in all seasons, farmers may shy away from increase to output due to risks in crop failure. Instead, they will be concerned with their means of subsistence. A new technique will be accepted if farmers are assured of higher output in average year and few bad years (Griffin, 1974: 69).

Progressive farmers who, at the same time are influential persons have political power to influence resource institutions to cater their needs. A study done in Embu found out that "it was the influential person and the civil servant who used their knowledge of the law to acquire greater areas of land, at the expense of the poorer, less influential and less knowledgeable members in the district and community" (Feder and Romha, 1987: 33). Accessibility, therefore to new technology determines the pace and direction of innovation in rural areas.

Innovation, that is, increase on labour productivity through technical change may have a positive correlation with output increase and a negative one with employment. Although output is expected to increase, some of labour force employed before technical change would be displaced. This, together with low wages would lead to rural-urban migration.

The productivity model is expressed as:

$$Pr = f(Cre, nof, ed, CF, 0) \quad [27] \quad (6)$$
$$\frac{\Delta Pr}{\Delta Cre} > 0, \quad \frac{\Delta Pr}{\Delta nof} > 0, \quad \frac{\Delta Pr}{\Delta ed} > 0, \quad \frac{\Delta Pr}{\Delta CF} > 0,$$

- Where: Pr = Q/N quantity produced per acreage of maize, cotton and tobacco
- Q = is quantity sold or quantity consumed. The interest is on total farm output Q which is either sold or consumed by the household. Q is therefore the sum of marketed and non-marketed output.
- N = Land i.e. cropped land.
- Nof = (Non-farm income) Both variables are
- Cre = (Credit) important for hired labour and purchase of other inputs (cost of other inputs) although they do not affect productivity directly. In this model they are important because we have assumed a high adoption rate for modern farm practices, such that they become the constraints.
- CF = Total costs of inputs

Accessibility to credit would enable farmers to invest on their farms. This would in turn increase the output. The relationship between productivity and non-farm income would be hard to determine before estimation is done. The relationship between productivity and education would also not be determined before estimation. If the costs of material inputs and the loss of returns are high, the rate of innovation will be low.

According to economic growth models, income is a function of investment, which results in new capacity. The full utilization of this capacity leads to an increase in production and hence income. Investment presupposes capital. Investment is due to mobilisation of both domestic and foreign savings. All is needed is saving and investment of a certain proportion of GNP in order to generate economic growth. But a country may save while it lacks structured institutional conditions for generating growth. For instance, in some Third World countries there are problems associated with income generating activities especially in agricultural sector. Investment opportunities would be hard to predict due to various factors. Such

factors are prices of agricultural produce and demand for them which are internationally determined. The scarcity of capital, ecological factors and so forth contribute to the problem. The imperfection of factor markets in Third World countries contribute to biases in resource allocation in agricultural sector. The market structure will determine the adoption of new methods by the farmer, the readiness to innovate and the distribution of income (Griffin, 1974: 17). Relative factor prices which are distorted plus unequal distribution of land, imply that few farmers would not invest.

Land registration is supposed to counteract some of the constraints facing the agricultural sector in Third World countries. That is by creating an agrarian system which is more conducive to egalitarian rural development. Farmers with security of land are expected to invest in farming activities. They can use title deeds as collateral to obtain credit. The improvement of land either through intensive or extensive methods of production would result in high output, hence an increase in incomes which in turn are related to wage rates. If the wage rate is high, this will result in high income and if it is low, this means low income.

Land registration has not solved the problem of accessibility to factor markets. Farmers in high potential areas and those involved in large-scale farming are in better situation when it comes to resource allocation than those in low potential areas (AFC Office, May 1986). Due to functional dualism in Third World countries, wage rates especially those in agricultural sector are quite low, hence income is low (de January, 1986).

If prices of products are high and the costs of inputs are low, high income is expected. But prices of agricultural export products are internationally determined and demand of these products are unpredictable. Also, if fertilizer is used the expected result is that income would increase. New variety of seeds would generate better yields, hence, high income. Farmers would introduce new technology if the cost of new technique is less than labour cost.

Income Model

$$\text{Inc} = f(\text{WP}, \text{TD}, \text{CF}, \text{LS}, \text{EP}_i \text{Q}_i, \text{O}) \quad (7)$$

- Where:
- Inc = Total income
 - $\text{EP}_i \text{Q}_i$ = Total revenue
 - WR = Wage
 - TD = Title Deed
 - CF = Cost of Inputs
 - LS = Land Size
 - O = Other

A conceptual definition of income is necessary. This variable could be taken to be net or gross incomes. The two main household income sources, are earnings from off-farm employment, and from farm production. Thus we have incomes $(Y) = \text{Total wages} + \text{total crop and livestock}$.

$$\begin{aligned} &\text{Revenues} \quad - \quad - \quad - \quad (\text{identity}) \\ &(\text{WR} + \text{L}_i) + \text{P}_i \text{Q}_i \end{aligned}$$

L_i labour units to off-farm activities and Q is total output of a farm product. Land size affects level of Q . Costs of inputs affect Q_i through productivity increases and level of use of land. This again is an expenditure to the household. A variable of the farm output, marketed output, yield (Q output/land unit) might turn out significant. Prices of products are sometimes fixed (for scheduled crops), but prices in the parallel markets vary. If the official prices are considered, for a cross-section survey, there might be little or no variation.

Title deeds are to be measured, by considering the number of people registered for title deeds. Dummy variables will be used for those who have title deeds and those who do not. This is an important index for land sub-division, and across households, the influence of land sub-division on yield (output) is important. The number of people registered for TD 'per se' may not affect income. It does not

have a marginal contribution. What is important is whether there is some variation in household's income which can be explained by whether land is registered or not.

If the prices of products are high, income is expected to increase. Due to low wage rate in agricultural sector, income is expected to be low. If the cost of inputs is low, income would rise, but if it is high, income would be low. The right direction of effect of farm inputs on income can only be determined after estimation. Farmers with title deeds are expected to increase their inputs use and also expected to have high income.

HYPOTHESES

As indicated in the previous discussion the purpose of this study is to measure the effects of land registration on small-scale farming in both Siakago and Gachoka Divisions. The major theme of this study is that the holding of title deeds by rural farm households acts as an incentive leading them to increase their productive investment and become more receptive to new farming techniques subject to a number of specified intervening variables. This theme is broken down to the following specific hypotheses:

1. The acquisition of title deeds makes no difference on the level of production between households with and without title deeds.

This hypothesis will be tested by comparing output/labour ratio (Q/L) between households where land registration has taken place and where it has not.

Where: Q = either (a) quantity sold, or
= (b) quantity consumed
= Man-hours input

If the ratio is high, among households where land registration has taken place, this would imply that output has increased per unit of labour, and hence, productivity has increased. If there is a

difference, credit has no influence on farm output. Assuming there is difference, other independent variables such as education, non-farm income, cost of inputs will be estimated to see whether they have any influence on output level.

2. Households which have subdivided their land and been awarded title deeds are more productive than those among which subdivision and award of title deeds has not occurred.

In order to test this hypothesis, the output level of various subdivided farms after registration and that of farms which have not been registered and subdivided will be compared to see whether land registration and subdivision of land have any significant effect on agricultural output. Other explanatory variables which may influence the level of output will be estimated. These explanatory variables are the same as those found in testing hypothesis one.

3. Land registration has led to landlessness.

Data before and after the acquisition of title deeds among farmers will be collected. The data will indicate whether people have been moving from high potential to low potential areas after the acquisition of title deeds. If this is so, landlessness would be explained by land market and population growth in high potential areas. The data for population growth in this particular area will be obtained from two census periods from 1970s to 1980s. This will indicate whether population growth above natural increase has risen since land registration. Another factor which may influence the movement is an increase in income. Income is a function of price of products, wage rate, title deeds, cost of inputs and farm size.

4. Although the land ownership rights are traditionally invested with the men rather than the women, the latter are more active in agricultural production in rural areas.

The above hypothesis will be tested by data, collected before and after land registration. If there is a difference in performance between women and men an explanation for the difference will be

given. The difference may be due to the fact that men are mostly away earning additional income while women are left behind in farms. Information concerning the difference will be obtained through questionnaires.

DATA METHODOLOGY

STUDY DESIGN

The study deals with households which have gone through land reform and those who have not. In order to see whether there is any difference between the two types of households, the study looked for information of various kinds. For instance, information on farming activities would indicate whether farmers have adopted new techniques which would result in high productivity and hence incomes. Credit information would shed light on whether farmers are able to acquire credits through the use of title deeds. Farmers who have gone through land reform are supposed to feel more secure, because the individual ownership of land gives them security and as such, they are willing to invest in land. This type of investment would call for more farm activities which would result in employment. Information on landlessness would show whether landlessness is a result of land market created by land reform.

The information on households required designing of a sample that would represent two types of households in the chosen divisions.

Sampling Frame

The information on land demarcation and acreages and maps were obtained from District Adjudication Land Office and Department of Survey respectively. Then, a list of small-holding in both Siakago (574 holdings) and Gachoka (2,013 holdings) were provided by agricultural extension officers and chiefs from both divisions.

Sample Selection

From the list of small-scale farmers from both divisions, a sample of 180 households was selected. This was done by first giving serial numbers to the list and then using systematic random sampling technique. In Siakago where there were 574 households, one household was picked randomly and from there, every 6th household was picked until there was a total of 90 farmers. Since there were 2,013 households in Gachoka, one household was located randomly and from there every 22nd household was picked until there were 90 households.

Unit of Analysis

The rural farm households are the major units of analysis. The analysis considers the head of household to be the most knowledgeable person with regard to various issues relating to land rights, access to it, and use of it within the given household as social economic unit.

METHODS OF DATA COLLECTION

The data on which this study is based were obtained through various data collection techniques as indicated below.

Survey Data

The survey data were collected through structured questionnaires in which every respondent was given identical questions. In order to ensure uniformity of all the respondents, open-ended questions were worked in order to seek much information as possible. The respondents were therefore able to express themselves freely. The questionnaires were administered by the help of six research assistants who came from both divisions.

Secondary Data

Secondary data were compiled from available information in the National Archives, at Nairobi, from government records, land adjudication offices and other institutions which give loans and credit to farmers. Other sources of information are Central Bureau of Statistics, National Population Census, and Library materials.

Data Analysis

The method of ordinary Least Square (OLS) will be used in the estimation of the regression equations. In the class of all linear unbiased estimators, the OLS estimators have the minimum variance. The field data will be used in the estimation of linear and non-linear functional forms in order to get functional forms with the best fit. The explanatory power of each independent variable on dependent variable is important, because we can derive the policy variables which could be of great significance to policy makers. Correlation analysis in this study will help in respecification of the equations. For instance, in the correlation matrix, it will be possible to identify variables which are multicollinear. If high multicollinearity exists, it will not be advisable to include both variables, because they would affect statistical significance of certain variables, and consequently the inferences to be made from such variables. For example, in the independent variables it is possible that extension services could be correlated with fertilizer. If this is so, it means that extension services highly explains fertilizers, as well as a dependent variable like productivity. Where high correlation coefficients are observed between independent variables certain variables must be dropped.

Statistical methods will include frequency analysis which will be used to describe the households characteristics as well as reinforcing the estimation findings. Cross-tabulations will be used to summarize the major characteristics of variables and how they

relate to each other. The contingency tables will be used in the test of hypotheses.

Chi-square will be used to test the differences between farmers with title deeds and those who do not have.

Operational Definitions and Measurement of Variables

The conceptualisation of these variables was discussed under the theoretical framework. In this section an attempt will be made to concretise these variables through operational definitions and measurement of these variables.

Credit will be measured in terms of money acquired from established credit institutions (formal credit) and families or money lenders (informal credit). Information about credit will be obtained from government credit institutions, and from farmers through questionnaires.

Non-farm income will be measured in wage income which will be broken into six components:

- (a) Jobs requiring no-schooling;
- (b) Jobs requiring primary school education
- (c) Jobs requiring secondary school education
- (d) Jobs requiring technical school education
- (e) Jobs requiring agricultural training/education
- (f) Jobs requiring university education

Information will be obtained from farmers through questionnaires.

Costs of Inputs will be measured in Kenya shillings in terms of

- (a) Cost of fertilizer;
- (b) Cost of labour;
- (c) Cost of seeds.

Information will be collected from farmers, and will indicate whether the level of output has been explained by the above stated variables.

Price of Products will be measured in Kenya shillings. Information concerning price of products will be obtained from marketing boards and that of quantity sold from households.

Wage Rates will be measured in terms of Kenya shillings per man-hour. Information will be obtained from the Ministry of Labour.

Title Deeds will be measured in terms of number of people registered for title deeds. Information will be obtained from the Ministry of Lands and Settlement.

Land Size will be measured in terms of hectares and information will be obtained from Lands Office and Farmers.

Experience will be measured in terms of years worked on the farm. The data will be obtained from farms through questionnaires.

CONCLUSION

This study is about small-scale farming in semi-arid areas of Embu District. Specifically, the study examines the economic effects of land registration on income distribution, employment and productivity. The problem posed is whether land registration could be seen as contributint to agricultural development in rural areas or not. If land registration does contribute to rural development, what are the factors embodied in it that are contributory factors, and what are the constraints?

The study will be dealt with in depth once the results of field survey are analysed. This part will also include the policy and theoretical implications arrived by the study.

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hiring of labour. However, there is no statistical evidence in his study to show the same. It is just a conclusion. It is important to include subsistence crops in the analysis because in the Third World countries majority of people are engaged in the traditional sector where levels of specification are low and production is geared towards family consumption. The family takes the responsibility not only for distribution of food but for the consumption of family expenditure. As such it is not useful to focus only on marketed production.

In 1968, marketed production increased by 9.7 per cent. But this growth came from coffee and tea while food production declined (Economic Survey, 1968). One has therefore to make a distinction on whether land registration is more effective towards promotion of cash crops than food crops.

Njeru's study (1978) on land adjudication in Mbeere points out that landlessness has come about as a result of individualization of land. His study is based on frequencies. This type of methodology may lead to a biased conclusion because one finds that the percentages are not tested for the population sample and results can be by chance. There is a need therefore to test the variables for the population, if the sample chosen is representative of the population. Moreover, the study does not address itself to issues like productivity, employment and income.

Methodological limitations can lead to a variance in the results. Empirical evidences cited follow from the framework of analysis adopted, such that the present study will use an improved analysis to test various views. Economic models which will capture the important features of the land registration will be used in this study. The purpose of these models is to identify variables which influence income distribution (variation), productivity and employment in the process of economic development. The parameters of the models will be estimated from the fieldwork data. Consequently, tests on the estimated models will be carried out in order to see whether the variables constitute realities of the economy which will be relevant

not only to Mbeere people, but to the whole country. The understanding of these models will be useful in predicting the policies for improvement of economic welfare particularly in rural areas.

Conceptual Framework

The model of surplus labour economy is assumed in the analysis. Increased utilization of land resources for agricultural production implies an increased demand for other inputs for a certain technology of production. The aim in this study is to capture the likely effects of land registration on agricultural production, and this is designed to be analyzed using employment, productivity and incomes. Studies have shown that farmers (small and large scale) exhibit a rational economic behaviour, and that there is always an attempt to allocate available resources efficiently. Divergences from this view mainly occur, due to variances in concepts and assumption in the specification of a farm household behaviour. There is some conviction that a farm household is both a production and consumption unit, such that it has been found necessary to discuss separability and jointness in the specification of household models. It is safe to concentrate on the farm production aspects and ignore tentatively other production and consumption activities of the household. The question of whether (and how) land registration affects farm production is discussed (27-30pp).

We attempt to introduce this new variable into the general model of a farm-firm. As a model of resource allocation decision, the elements that are considered are:

- (i) Resource endowments and requirements for a certain mix of enterprise e.g. land, labour, capital and financial resources for purchase of other inputs.
- (ii) Farmer behaviour, as explained by objective(s), expectations and response to exogenous factors; risk, institutional factors etc.
- (iii) Certain assumptions are important, e.g. on the structure of the market for products and factors of production which determine prices and costs.

The problem for analysis, that a farmer faces is that of when to make a quasi-optimal decision. This partial-equilibrium is said to occur when the objective(s) is somewhat achieved, whether that of outputs, incomes, profit or expected utility maximization. Using a well-behaved profit and production or cost function, input demand functions can be derived. We can choose to use a profit (not income) function to derive a set of input demand functions for labour and capital (in a 2 inputs model).

Let the objective of the farmer, be maximization of expected net income. This is defined as total income less the costs of production. This objective is subjected to an income, and time (labour) constraint.

$$\text{Max } E(\pi) = \sum_{i=1}^n p_i Q_i(L/N, K, S) - wL - \sum c_i K_i \dots\dots\dots (1)$$

$$\text{Subject to } Y(\sum w_i t_i) + C_i(B_i) = WL + \sum c_i K_i + E_i \dots\dots\dots (2)$$

$$T = \sum t_i + h_i + I. \dots\dots\dots (3)$$

$$L = h_i + 1 \dots\dots\dots (4)$$

The variables are defined below:

- E(n) - expected net income
- P_i - market price of a farm product, Q_i
- Q(L/N,K) - a production function with inputs L/N as labour-land ratio, and K, other inputs.
- S - a risk index (variance due to randomness in output, if prices of products are non-random.
- W - wage rate
- C_i - Unit cost of other inputs used.
- Y - Total income from off-farm employment. A product of wage rate (W_i) and t_i, hours on off-farm employment plus remittances.
- C - Credit (in cash and kind) as dependent on a vector B for variables on farm household characteristics e.g. Title deeds and risk of default, credit costs, land size, etc.

- E_i - Household expenditures on other items consumed by the household.
- T - Total man hours available, as sum of man hours on off-farm employment (t_i), family man hours on farm production, (h_i), and hired man hour (l_i). Labour used in farm production (L_i) is the sum of family labour (h_i) and hired labour (l_i).

First order conditions (F.O.C) gives a set of partial derivatives (equations) which can be solved for optimal solutions to the unknowns. The maximum expected profit level is solved using optimal values of $(L/N)^*$, K^* , S^* , C^* , etc.

It is assumed by those who argue for land registration that extension services would direct farmers to the possibilities of improving their land. This is done by introduction of land saving and biological techniques. These techniques are supposed to increase yields per hectare. Once output increases, the process of production expands and more labour is needed for production, hence employment increases. However, it is not always the case that an increase in output is accompanied by an increase in employment. Productivity increasing innovations raise labour productivity. When this happens, few workers are required and some previously working people are displaced. This displacement would be conducive to rural-urban migration. Employment always exists according to the theory of flexible wages. Embodied in this theory is perfect competition and economic efficiency and that, forces of supply and demand determine employment and wage rate. Labour will always be demanded as long as the value of the marginal product produced by an additional worker is over and above his means of subsistence. When wage rates increase, more labour will be supplied. Consequently, this increase of labour will lower the wage rates to a point where demand equals supply. This situation would not apply in Third World countries, due to imperfect market prices and relative factor prices which are distorted (Griffin, 1974: 17, Todaro, 1977: 167).

According to Todaro, wage rates are not flexible due to institutional forces such as trade unions, poor mobility, discrimination, government policies etc. These are the underlying issues in wage

determination in Third World countries, where there is always unemployment and underemployment. Rather than a population pressure per se, market structure and land tenure system, are also contributory factors in wage determination and less employment in Third World countries (Griffin, 1974: 31). The control of the local labour markets and resources such as credit, water and land enables progressive farmers to reduce the wage rate and this results in less employment.

With accessibility to credit, farmers are supposed to invest in land. Investment in land calls for more activities. Output expands and, hence, employment increases. This situation, while seemingly valid, would apply to large scale farmers, and small-scale farmers in high potential areas. While credit may not be the only constraint as a source of income for farming, it may seem so to most farmers in rural areas, where non-farm opportunities are limited. Also, commercial institutions are reluctant to lend to non-export crop producers. Even those who meet this criterion, may not meet all the conditions required for acquiring credit. A.F.C. requires what is known as 5Cs. That is,

- Title deeds (collateral)
- Capacity to repay
- character of the farmer
- condition of the farm
- contribution of the farmer (AFC Office, Embu, May 1986).

Employment

Although we are dealing with peasant economy where family labour is more important than in a market economy, it can be shown that labour demand L_1 is a function of some variables. Credit is expected to be correlated to land registration. While farm size is expected to be correlated with labour demand. In this case, these variables are included in the model below:

$$L = f(W, LR, Ext, LS, Credit, CF, 0) \quad (5)$$

$$\frac{\partial L}{\partial W} < 0, \quad \frac{\partial L}{\partial LR} \geq 0, \quad \frac{\partial L}{\partial Ext} > 0, \quad \frac{\partial L}{\partial LS} \geq 0, \quad \frac{\partial L}{\partial Cre} > 0, \quad \frac{\partial L}{\partial CF} > 0,$$

Where L = Employment (family and hired)
W = Wage
LR = Land Registration
Ext = Extension services
LS = Land size
Cre = Credit (cash and in kind)
CF = Cost of inputs
O = Other

When wage increases employment falls. Official wage rates (Ministry of labour) are assumed to be constant for occupations across households, which are the unit of analysis. Given land registration, the effect on quantity of additional employment cannot be determined before estimation is done. The estimation of the variable land registration will be done by dummy variables. With agricultural extension services, employment is expected to increase because more output is expected. With an increase in output more labour is needed for harvesting, weeding, transportation and so forth. Extension services will be measured in terms of visits to a farmer by agricultural extension officers. Given credit availability, it is expected that farmers would invest in land, thereby increasing activities which would call for more employment.

Land size is correlated with labour demand. Farmers with large farms, are expected to employ more people in their farms. The costs of inputs will show the relationship between labour and inputs. This relationship gives some ideas to the extent of labour-intensity in production, and adoption rate of improved farming practices. Thus, with labour-intensity and high rate of adoption, employment is supposed to increase.

Once land is registered, farmers are expected to improve their methods of production. The accessibility of farmers to credit would enable them to purchase productivity-increasing technology. This would increase farm output, and, hence, the income of farmers. Costs of inputs may also influence employment in that if the cost of inputs

is low farmers would expand their production and thus bring in more employment.

The final model of labour employment for which results will be reported will be based on the estimates of the variables stated above. This also, applies to relationships (6) and (7) which will be specified below.

Productivity Model

With regard to productivity, it has been pointed out that farmers with non-farm income and education, are more able to adopt new techniques than farmers who depend on farming as the only source of income. They have the capacity to repay loans because the incomes from farming and business are expected to be high even before acquiring credit. Conditions of the farm management and their personal contributions are expected to be good. And as such, they are in good standing with financial lending institutions. Farmers with education are expected to be more receptive to agricultural innovation. They are more willing to adopt new techniques than uneducated farmers. But one may also argue that this could be so only to a certain extent because one would expect that the more educated one is, the less time one spends on his farm. It would be the case only if the educated person is fully occupied in farming. One could also argue that a person, say, has gone through seven years of education is less receptive than a person who has gone through secondary school i.e. there is a positive correlation between education and agricultural innovation. While education is a factor which could be contributory to innovation, adoption of new techniques will depend on various factors. Such factors are costs of inputs, reliability of rainfall, accessibility to new techniques, markets, a rise in real wages and so forth.

Farmers will adopt a new technique if the costs of material inputs - credit, new seeds, fertilizer and other inputs in agriculture are less expensive relative to labour. Griffin (1974: 49) points out

that a new technique is adoptable and profitable to those who pay low wages relative to costs of material inputs. The cost of inputs while relatively cheaper to large farmers, is rather expensive to smaller farmers. Small farmers tend to adopt techniques which are labour-intensive. Furthermore, the uncertainty of rainfall is a limiting factor to adoption of a new technique. For instance, if rainfall is not reliable in all seasons, farmers may shy away from increase to output due to risks in crop failure. Instead, they will be concerned with their means of subsistence. A new technique will be accepted if farmers are assured of higher output in average year and few bad years (Griffin, 1974: 69).

Progressive farmers who, at the same time are influential persons have political power to influence resource institutions to cater their needs. A study done in Embu found out that "it was the influential person and the civil servant who used their knowledge of the law to acquire greater areas of land, at the expense of the poorer, less influential and less knowledgeable members in the district and community" (Feder and Romha, 1987: 33). Accessibility, therefore to new technology determines the pace and direction of innovation in rural areas.

Innovation, that is, increase on labour productivity through technical change may have a positive correlation with output increase and a negative one with employment. Although output is expected to increase, some of labour force employed before technical change would be displaced. This, together with low wages would lead to rural-urban migration.

The productivity model is expressed as:

$$Pr = f(Cre, nof, ed, CF, 0) \quad [27] \quad (6)$$
$$\frac{\Delta Pr}{\Delta Cre} > 0, \quad \frac{\Delta Pr}{\Delta nof} > 0, \quad \frac{\Delta Pr}{\Delta ed} > 0, \quad \frac{\Delta Pr}{\Delta CF} > 0,$$

- Where: Pr = Q/N quantity produced per acreage of maize, cotton and tobacco
- Q = is quantity sold or quantity consumed. The interest is on total farm output Q which is either sold or consumed by the household. Q is therefore the sum of marketed and non-marketed output.
- N = Land i.e. cropped land.
- Nof = (Non-farm income) Both variables are
- Cre = (Credit) important for hired labour and purchase of other inputs (cost of other inputs) although they do not affect productivity directly. In this model they are important because we have assumed a high adoption rate for modern farm practices, such that they become the constraints.
- CF = Total costs of inputs

Accessibility to credit would enable farmers to invest on their farms. This would in turn increase the output. The relationship between productivity and non-farm income would be hard to determine before estimation is done. The relationship between productivity and education would also not be determined before estimation. If the costs of material inputs and the loss of returns are high, the rate of innovation will be low.

According to economic growth models, income is a function of investment, which results in new capacity. The full utilization of this capacity leads to an increase in production and hence income. Investment presupposes capital. Investment is due to mobilisation of both domestic and foreign savings. All that is needed is saving and investment of a certain proportion of GNP in order to generate economic growth. But a country may save while it lacks structured institutional conditions for generating growth. For instance, in some Third World countries there are problems associated with income generating activities especially in agricultural sector. Investment opportunities would be hard to predict due to various factors. Such

factors are prices of agricultural produce and demand for them which are internationally determined. The scarcity of capital, ecological factors and so forth contribute to the problem. The imperfection of factor markets in Third World countries contribute to biases in resource allocation in agricultural sector. The market structure will determine the adoption of new methods by the farmer, the readiness to innovate and the distribution of income (Griffin, 1974: 17). Relative factor prices which are distorted plus unequal distribution of land, imply that few farmers would not invest.

Land registration is supposed to counteract some of the constraints facing the agricultural sector in Third World countries. That is by creating an agrarian system which is more conducive to egalitarian rural development. Farmers with security of land are expected to invest in farming activities. They can use title deeds as collateral to obtain credit. The improvement of land either through intensive or extensive methods of production would result in high output, hence an increase in incomes which in turn are related to wage rates. If the wage rate is high, this will result in high income and if it is low, this means low income.

Land registration has not solved the problem of accessibility to factor markets. Farmers in high potential areas and those involved in large-scale farming are in better situation when it comes to resource allocation than those in low potential areas (AFC Office, May 1986). Due to functional dualism in Third World countries, wage rates especially those in agricultural sector are quite low, hence income is low (de January, 1986).

If prices of products are high and the costs of inputs are low, high income is expected. But prices of agricultural export products are internationally determined and demand of these products are unpredictable. Also, if fertilizer is used the expected result is that income would increase. New variety of seeds would generate better yields, hence, high income. Farmers would introduce new technology if the cost of new technique is less than labour cost.

Income Model

$$\text{Inc} = f(\text{WP}, \text{TD}, \text{CF}, \text{LS}, \text{EP}_i \text{Q}_i, \text{O}) \quad (7)$$

- Where:
- Inc = Total income
 - $\text{EP}_i \text{Q}_i$ = Total revenue
 - WR = Wage
 - TD = Title Deed
 - CF = Cost of Inputs
 - LS = Land Size
 - O = Other

A conceptual definition of income is necessary. This variable could be taken to be net or gross incomes. The two main household income sources, are earnings from off-farm employment, and from farm production. Thus we have incomes $(Y) = \text{Total wages} + \text{total crop and livestock}$.

$$\begin{aligned} &\text{Revenues} \quad - \quad - \quad - \quad (\text{identity}) \\ &(\text{WR} + \text{L}_i) + \text{P}_i \text{Q}_i \end{aligned}$$

L_i labour units to off-farm activities and Q is total output of a farm product. Land size affects level of Q . Costs of inputs affect Q_i through productivity increases and level of use of land. This again is an expenditure to the household. A variable of the farm output, marketed output, yield (Q output/land unit) might turn out significant. Prices of products are sometimes fixed (for scheduled crops), but prices in the parallel markets vary. If the official prices are considered, for a cross-section survey, there might be little or no variation.

Title deeds are to be measured, by considering the number of people registered for title deeds. Dummy variables will be used for those who have title deeds and those who do not. This is an important index for land sub-division, and across households, the influence of land sub-division on yield (output) is important. The number of people registered for TD 'per se' may not affect income. It does not

have a marginal contribution. What is important is whether there is some variation in household's income which can be explained by whether land is registered or not.

If the prices of products are high, income is expected to increase. Due to low wage rate in agricultural sector, income is expected to be low. If the cost of inputs is low, income would rise, but if it is high, income would be low. The right direction of effect of farm inputs on income can only be determined after estimation. Farmers with title deeds are expected to increase their inputs use and also expected to have high income.

HYPOTHESES

As indicated in the previous discussion the purpose of this study is to measure the effects of land registration on small-scale farming in both Siakago and Gachoka Divisions. The major theme of this study is that the holding of title deeds by rural farm households acts as an incentive leading them to increase their productive investment and become more receptive to new farming techniques subject to a number of specified intervening variables. This theme is broken down to the following specific hypotheses:

1. The acquisition of title deeds makes no difference on the level of production between households with and without title deeds.

This hypothesis will be tested by comparing output/labour ratio (Q/L) between households where land registration has taken place and where it has not.

Where: Q = either (a) quantity sold, or
= (b) quantity consumed
= Man-hours input

If the ratio is high, among households where land registration has taken place, this would imply that output has increased per unit of labour, and hence, productivity has increased. If there is a

difference, credit has no influence on farm output. Assuming there is difference, other independent variables such as education, non-farm income, cost of inputs will be estimated to see whether they have any influence on output level.

2. Households which have subdivided their land and been awarded title deeds are more productive than those among which subdivision and award of title deeds has not occurred.

In order to test this hypothesis, the output level of various subdivided farms after registration and that of farms which have not been registered and subdivided will be compared to see whether land registration and subdivision of land have any significant effect on agricultural output. Other explanatory variables which may influence the level of output will be estimated. These explanatory variables are the same as those found in testing hypothesis one.

3. Land registration has led to landlessness.

Data before and after the acquisition of title deeds among farmers will be collected. The data will indicate whether people have been moving from high potential to low potential areas after the acquisition of title deeds. If this is so, landlessness would be explained by land market and population growth in high potential areas. The data for population growth in this particular area will be obtained from two census periods from 1970s to 1980s. This will indicate whether population growth above natural increase has risen since land registration. Another factor which may influence the movement is an increase in income. Income is a function of price of products, wage rate, title deeds, cost of inputs and farm size.

4. Although the land ownership rights are traditionally invested with the men rather than the women, the latter are more active in agricultural production in rural areas.

The above hypothesis will be tested by data, collected before and after land registration. If there is a difference in performance between women and men an explanation for the difference will be

given. The difference may be due to the fact that men are mostly away earning additional income while women are left behind in farms. Information concerning the difference will be obtained through questionnaires.

DATA METHODOLOGY

STUDY DESIGN

The study deals with households which have gone through land reform and those who have not. In order to see whether there is any difference between the two types of households, the study looked for information of various kinds. For instance, information on farming activities would indicate whether farmers have adopted new techniques which would result in high productivity and hence incomes. Credit information would shed light on whether farmers are able to acquire credits through the use of title deeds. Farmers who have gone through land reform are supposed to feel more secure, because the individual ownership of land gives them security and as such, they are willing to invest in land. This type of investment would call for more farm activities which would result in employment. Information on landlessness would show whether landlessness is a result of land market created by land reform.

The information on households required designing of a sample that would represent two types of households in the chosen divisions.

Sampling Frame

The information on land demarcation and acreages and maps were obtained from District Adjudication Land Office and Department of Survey respectively. Then, a list of small-holding in both Siakago (574 holdings) and Gachoka (2,013 holdings) were provided by agricultural extension officers and chiefs from both divisions.

Sample Selection

From the list of small-scale farmers from both divisions, a sample of 180 households was selected. This was done by first giving serial numbers to the list and then using systematic random sampling technique. In Siakago where there were 574 households, one household was picked randomly and from there, every 6th household was picked until there was a total of 90 farmers. Since there were 2,013 households in Gachoka, one household was located randomly and from there every 22nd household was picked until there were 90 households.

Unit of Analysis

The rural farm households are the major units of analysis. The analysis considers the head of household to be the most knowledgeable person with regard to various issues relating to land rights, access to it, and use of it within the given household as social economic unit.

METHODS OF DATA COLLECTION

The data on which this study is based were obtained through various data collection techniques as indicated below.

Survey Data

The survey data were collected through structured questionnaires in which every respondent was given identical questions. In order to ensure uniformity of all the respondents, open-ended questions were worked in order to seek much information as possible. The respondents were therefore able to express themselves freely. The questionnaires were administered by the help of six research assistants who came from both divisions.

Secondary Data

Secondary data were compiled from available information in the National Archives, at Nairobi, from government records, land adjudication offices and other institutions which give loans and credit to farmers. Other sources of information are Central Bureau of Statistics, National Population Census, and Library materials.

Data Analysis

The method of ordinary Least Square (OLS) will be used in the estimation of the regression equations. In the class of all linear unbiased estimators, the OLS estimators have the minimum variance. The field data will be used in the estimation of linear and non-linear functional forms in order to get functional forms with the best fit. The explanatory power of each independent variable on dependent variable is important, because we can derive the policy variables which could be of great significance to policy makers. Correlation analysis in this study will help in respecification of the equations. For instance, in the correlation matrix, it will be possible to identify variables which are multicollinear. If high multicollinearity exists, it will not be advisable to include both variables, because they would affect statistical significance of certain variables, and consequently the inferences to be made from such variables. For example, in the independent variables it is possible that extension services could be correlated with fertilizer. If this is so, it means that extension services highly explains fertilizers, as well as a dependent variable like productivity. Where high correlation coefficients are observed between independent variables certain variables must be dropped.

Statistical methods will include frequency analysis which will be used to describe the households characteristics as well as reinforcing the estimation findings. Cross-tabulations will be used to summarize the major characteristics of variables and how they

relate to each other. The contingency tables will be used in the test of hypotheses.

Chi-square will be used to test the differences between farmers with title deeds and those who do not have.

Operational Definitions and Measurement of Variables

The conceptualisation of these variables was discussed under the theoretical framework. In this section an attempt will be made to concretise these variables through operational definitions and measurement of these variables.

Credit will be measured in terms of money acquired from established credit institutions (formal credit) and families or money lenders (informal credit). Information about credit will be obtained from government credit institutions, and from farmers through questionnaires.

Non-farm income will be measured in wage income which will be broken into six components:

- (a) Jobs requiring no-schooling
- (b) Jobs requiring primary school education
- (c) Jobs requiring secondary school education
- (d) Jobs requiring technical school education
- (e) Jobs requiring agricultural training/education
- (f) Jobs requiring university education

Information will be obtained from farmers through questionnaires.

Costs of Inputs will be measured in Kenya shillings in terms of

- (a) Cost of fertilizer;
- (b) Cost of labour;
- (c) Cost of seeds.

Information will be collected from farmers, and will indicate whether the level of output has been explained by the above stated variables.

Price of Products will be measured in Kenya shillings. Information concerning price of products will be obtained from marketing boards and that of quantity sold from households.

Wage Rates will be measured in terms of Kenya shillings per man-hour. Information will be obtained from the Ministry of Labour.

Title Deeds will be measured in terms of number of people registered for title deeds. Information will be obtained from the Ministry of Lands and Settlement.

Land Size will be measured in terms of hectares and information will be obtained from Lands Office and Farmers.

Experience will be measured in terms of years worked on the farm. The data will be obtained from farms through questionnaires.

CONCLUSION

This study is about small-scale farming in semi-arid areas of Embu District. Specifically, the study examines the economic effects of land registration on income distribution, employment and productivity. The problem posed is whether land registration could be seen as contributint to agricultural development in rural areas or not. If land registration does contribute to rural development, what are the factors embodied in it that are contributory factors, and what are the constraints?

The study will be dealt with in depth once the results of field survey are analysed. This part will also include the policy and theoretical implications arrived by the study.

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