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EVALUATION, CHOICE AND USE OF POTATO
VARIETIES IN KENYA

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Abstract

This paper describes the role of the potato in the Kenyan food system, the distribution of potato varieties and how farmers evaluate and choose them. The Kikuyu and Meru tribal groups were found to be the main potato producers in Kenya where potatoes are attractive because of their dual nature as food and a cash crop. There are a great number of potato varieties in Kenya, both "official" and "local". Nyayo, the most popular and widespread, is a local variety which is not officially recognized by the National Potato Program and is not produced as certified seed. Farmers use a number of objective and subjective criteria for choosing among varieties. Although farmers may evaluate a variety as good, other considerations such as trader preference, final use and availability of seed can dissuade farmers from cultivating a particular variety. Evaluation and choice of varieties are thus seen as two related but different activities. Farmers tend to grow a mix of varieties, some of which are dropped frequently because new varieties are substituted for seed renovation. Neighbors are a major source of information about new varieties and the community serves as a seed bank for farmers when they run short of their own seed. Only a small percentage of farmers use certified seed. This reflects its high price and poor distribution, as well as the lack of certified seed of preferred varieties and farmers misunderstanding or lack of information about this potential resource.

Compendio

Este documento describe el papel de la papa en el sistema alimentario en Kenya, la distribución de las variedades de papa y cómo los agricultores las evalúan y escogen. Se encontró que los principales productores de papa eran las tribus de Kikuyu y Meru, donde la papa es muy atractiva debido a su doble papel de alimento y cultivo comercializable. Existe un gran número de variedades de papa en Kenya, tanto "oficiales" como "locales". Nyayo, la más popular y difundida, es una variedad local no reconocida oficialmente por el Programa Nacional de Papa y que no se produce como tubérculos-semillas de categoría certificada. Los agricultores utilizan criterios objetivos y subjetivos para seleccionar entre las variedades. A pesar de que los agricultores puedan considerar una variedad como buena, existen otros puntos para tomar en cuenta como son la preferencia del comerciante, el uso final y la disponibilidad de tubérculos-semilla que pueden motivar o persuadir al agricultor para que siembre una determinada variedad. De este modo, la evaluación y selección son vistas como dos actividades relacionadas pero distintas. Los agricultores tienden a cultivar una mezcla de variedades, algunas de las cuales son dejadas de lado porque llegan otras variedades para la renovación de tubérculos-semillas. Los vecinos son una buena fuente de información acerca de las variedades nuevas y la comunidad sirve como banco de tubérculos-semillas para los agricultores cuando a éstos les escasea. Sólo un pequeño grupo de agricultores utiliza tubérculos-semillas de categoría certificada. Esto se refleja en su alto precio y escasa distribución, así como también en la carencia de tubérculos-semillas de categoría certificada de las variedades preferidas y el desconocimiento o la falta de información entre los agricultores sobre el tema.

Résumé

Ce document décrit le rôle tenu par la pomme de terre dans le régime alimentaire des Kényens, la distribution des différentes variétés de pomme de terre ainsi que les critères selon lesquels les agriculteurs les jugent et les choisissent. Il s'est avéré que les tribus Kikuyo et Meru sont les principaux producteurs de pomme de terre du Kenya, où ce produit est doublement prisé, d'une part pour ses qualités nutritives, et d'autre part parce qu'il est commercialisable et signifie donc un certain revenu. Il existe un grand nombre de variétés de pomme de terre au Kenya, soit "officielles", soit "locales".

La plus connue et la plus répandue, Nyayo, est une variété locale non reconnue par le Programme de Pomme de Terre et n'est donc pas cultivée comme semence certifiée. Les agriculteurs choisissent leurs variétés d'après différents critères autant subjectifs qu'objectifs. Il peut arriver par exemple qu'un agriculteur juge une variété bonne, mais ne la cultive pas pour autant après avoir considéré certains facteurs tels que son utilisation finale, l'existence de la semence ou bien son acceptation sur le marché.

Par conséquent, le jugement et le choix des variétés sont donc liés mais n'en restent pas moins deux critères bien différents. Les agriculteurs préfèrent donc souvent cultiver plusieurs variétés à la fois, dont certaines sont quelquefois abandonnées car de nouvelles apparaissent dues à un renouvellement des semences. Ce sont souvent les agriculteurs du voisinage qui fournissent les meilleures informations concernant les nouvelles variétés, et par conséquent le village sert de banque de semences aux agriculteurs dont les propres réserves sont épuisées. Seulement un faible pourcentage d'agriculteurs utilise des semences certifiées. Cela explique pourquoi elles sont chères et mal ou peu distribuées, et pourquoi il y a un manque de semences certifiées de certaines variétés et donc aussi pourquoi les agriculteurs ignorent ou comprennent mal les informations correspondantes à cette ressource pourtant importante.

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I. Introduction

Potatoes are a relatively new but important crop in Kenya. While the Kenyan government has shown its commitment to potato production by creating the National Potato Research Station (NPRS) and by providing for the production of certified seed, farmer level information about the distribution and use of potato varieties -- both official and local varieties -- is still lacking.

This study documents current distribution and farmer evaluation of officially recognized and local varieties, the channels through which farmers learn about varieties, and husbandry and use of the crop.

Little significant improvement in yields has occurred during the entire period that potatoes have been cultivated in Kenya. However, production has grown via expanded area and increased numbers of producers. Production has shifted from a commercial export orientation to domestic consumption, most of which occurs in the production areas (Durr and Lorenzl, 1980).

A great number of both "official" and "unofficial" potato varieties are currently grown in Kenya. Officially released varieties are those which the government has declared distinct, varietally pure, uniform, stable and of exceptional agroecological value. These characteristics are tested in distinctness, uniformity and stability (DUS) experiments and National Performance Trials (NSQCS, 1983). "Unofficial" or local varieties have not yet been tested or have not met the above criteria for designation as "official" and they are not endorsed for use by the government.

Certified seed for selected varieties is produced by the Agricultural Development Corporation (ADC), a parastatal organization, in conjunction with the NPRS-Tigoni and its substations. In 1988, ADC produced certified seed for the varieties Roslin Eburu (B53), Romano, Anett, Pimpernel, Dutch Robijn, Desiree, Feldeslohn and Kenya Baraka. Based on a recent survey of farmer preferences (Bos, 1988), ADC has proposed to produce only six varieties for future multiplication: Kerr's Pink, Desiree and Romano (red varieties) and Anett, Roslin Eburu and Kenya Baraka (white varieties). ADC estimates put the percentage of farmers who use certified seed at less than 5%.

Utility of Variety Documentation

Current information about the distribution and evaluation of potato varieties can be compared in the future with prior and subsequent data to determine the rate and nature of change in variety use and to monitor the spread of varieties. Knowledge of local potato germplasm management practices provides information about the agroecological limits faced by the farmer. The documentation of existing varieties is a necessary first step in the effort to prevent genetic erosion (Brush, 1987). Farmer evaluations of varieties can help establish guidelines and objectives for potato breeders regarding acceptable or desirable potato characteristics and facilitate prediction about acceptance or rejection of new varieties. Finally, an understanding of the channels through which the farmer learns about new varieties is invaluable for extension education.

Methodology

Data collection took place between June 15 and September 3, 1988.¹ Interviews were conducted with 154 opportunistically-selected farmers located in Rift Valley, Central and Eastern Provinces. In this case "opportunistically" indicates that the farmers interviewed were not part of a

¹ The principal limitation of this study was the short duration of data collection. Because of the heterogeneous nature of potato production in Kenya, a thorough study would require that time be spent in many more production areas. Researcher fluency in the many languages and dialects spoken by potato farmers would eliminate many translation problems which inevitably arise.

random sample, but were selected on the basis of their availability and willingness to be interviewed. Information was also obtained from market traders, agricultural extension officers, the head of a farmer training center, employees of the Agricultural Development Corporation, non-potato producing farmers and current and former employees of the National Potato Program, National Seed Quality Control Service and the Ministry of Agriculture. Interviews were unstructured but were conducted with pre-determined topics in mind. An effort was made to speak with all members of households, especially the females, who are the farmers in Kenya. Use of participant observation in data collection assured a more credible picture of potato production: interviews were thus conducted in farmers' fields and potato stores. Thirty-three potato samples were collected for identification, propagation and retention of germplasm (Table A1). A total of fifty differently-named varieties were encountered growing in farmers' fields (Table A2).

Study sites were chosen on the basis of existing literature, the suggestions of Kenyans knowledgeable about potato production areas, and the general accessibility of the area. Interview sites were selected on the basis of their importance in regards to potato production and production potential.

II. Potatoes in the Kenyan Food System

The potato (*Solanum tuberosum*) was introduced into the British protectorate of Kenya at the end of the nineteenth century where it was grown by and for the European community. After World War I, African farmers in Kenya began to grow potatoes for domestic use as well, primarily in Rift Valley. Between the World Wars, government facilities were established and expanded to produce new varieties and to conduct agronomic studies. After World War II, the government supported research primarily on disease control while importing new seeds. By that time, potato production had moved from Rift Valley to Kiambu, Murang'a and Nyeri Districts and Elburgon and Meru Districts, the two main producing areas.

After independence, the government reestablished the scientific basis for potato improvement by entering into cooperative programs with the German Technical Assistance agency and the British Overseas Development Authority. Starting in 1968, work was begun on establishing a National Potato Research Station in Tigoni and three allied substations. Responding to a serious shortage of seed in the late 1960's, several varieties were imported from West Germany. Anett and Maritta are the two remaining varieties from that program. Maintenance breeding of selected varieties and production of basic seed were the activities of the station.²

Kenya's population is estimated at 24 million. The annual growth rate, at about 4%, is one of the highest in the world. If the fertility rate remains constant, the population will grow by 4.3% annually to reach 38.5 million in the year 2000. (Tostensen and Scott, 1987). Agriculture is the leading sector in Kenya. The expansion of food crops is therefore expected to finance development in other sectors of the economy, but arable land is limited.

About 70% of the population is engaged in agriculture, contributing about one-half the GDP and producing almost all of the country's food supplies. Nevertheless the growth of Kenya's agricultural GDP is less than the rate of its population growth. Due to concern over this high rate of population growth, the target long term growth rate of food crop production is 5% per annum.

Broad self-sufficiency in major foodstuffs is both a medium and long range goal. The performance of export crops is currently much better than food crops and "...unless there are substantial increases in the production of domestically consumed crops, the country now faces the prospect of spending an increasing proportion of its foreign exchange earnings on importing its food supplies" (Tostensen and Scott, 1987; p.33). In 1985, a necessary purchase of high-priced maize caused Kenyans to realize that the combination of slow agricultural growth and a rapidly growing population could spell increasing dependence on imported food supplies. Although the government wants to concentrate on seven commodities -- tea, coffee, maize, wheat, milk, meat and horticultural crops -- other crops (tuber crops included) will remain important to farmers and important in terms of government support measures. Two-thirds of the planned 5% per annum increase in food production is expected to come from increases in yields, with more intensive husbandry and a shift to labor-intensive crops emphasized to augment agricultural employment.

While the potato is not a primary crop, for many farmers it is an important food and cash crop whose increased production can contribute to the national objective of diversification. In a recent comparative study (Ballestrem and Holler, 1977), potatoes were shown to mature four times faster, to yield seven times more kilograms per hectare and to provide more kilocalories and almost twice the amount of crude protein than maize, the local staple. Variable costs are higher for potatoes, but they provide more harvests per year and are thus a steadier source of income/food. Horton (1987) points

² See Durr and Lorenz, 1980, for a detailed history of potato production in Kenya.

out that the combination of high yields, short vegetative cycle and high price makes the value of potato production per hectare higher than most other food crops grown in developing countries. Potatoes have the additional advantage of being both a cash and food crop, making them attractive to farmers who are marginal commercial producers. Farmers caught in a cost-price squeeze where the cost of production is greater than the prevailing market price can consume their potatoes and avoid total loss. Potatoes have an established place in the diets of several Kenyan ethnic groups and are widely served to foreign tourists.

In 1986, potato production was estimated to cover 75,000 hectares with an average national yield of 10 metric tons per hectare (Bos, 1988). It should be noted that estimates of potato production vary tremendously, depending on the information source (Durr and Lorenzl, 1980).

In Kenya, farming units of all sizes produce potatoes although the smallest tend to produce primarily for home consumption. Small farmers are arbitrarily designated by the government as those with 20 hectares or less although the average size of a smallholding is about two hectares. Defined thus, smallholdings in Kenya account for three-fourths of the total agricultural output and 55% of the marketed output. They also comprise over 85% of the total agricultural employment and 70% of the total employment in Kenya (Tostensen and Scott, 1987). Since independence, production of cash crops and commercialization have moved towards small-scale farming.

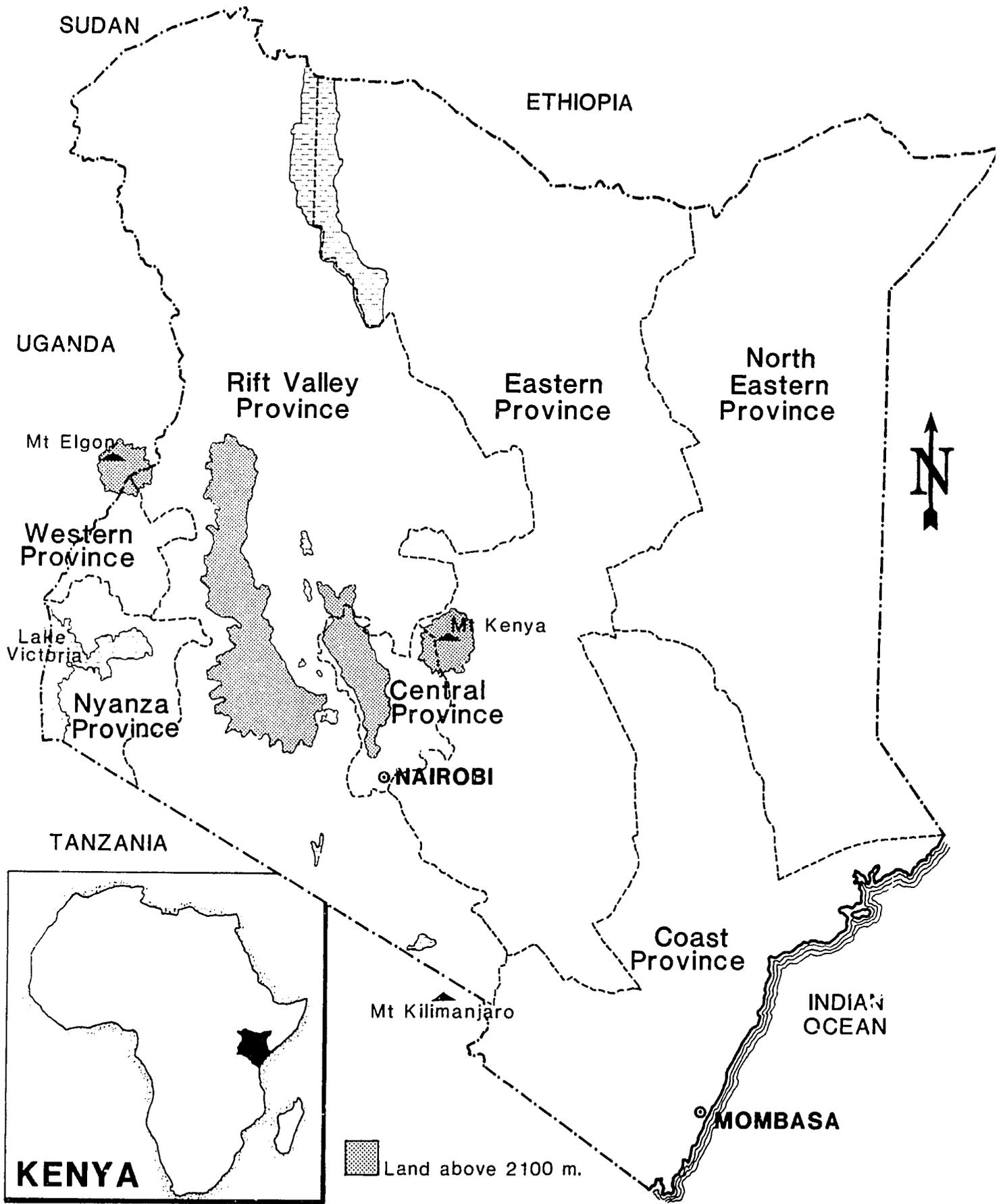
Smaller farmers indicate that subsistence needs must be met first, and potatoes are sold only if they are in surplus. The absence or presence of "surplus" may be determined by the size of the household and the yield obtained during any one season. Although the responsiveness of peasants/farmers to economic incentives has been questioned by development scientists, ample literature shows them to be innovative when feasible. Kenyan potato farmers are no exception. The widespread use of new potato varieties is proof that farmers are willing to innovate when they perceive that there are benefits.

Most farmers follow diversification strategies which inevitably include cultivation of maize coupled with any variety of vegetables -- potatoes, cabbage, kale, tomatoes, aubergines, peas, carrots, beans -- and an assortment of farm animals which may include goats, chickens, sheep and cattle. In tea and coffee zones east of the Rift Valley, maize, beans and potatoes are important food crops while west of Rift Valley maize, finger millet and sorghum are most important (Durr and Lorenzl, 1980).

The heterogeneous nature of African cropping systems is noted in several studies (Schneider, 1981; Haugerud, 1984). Crop diversity can be interpreted as a spatial spreading of labor requirements, opportunistic use of labor supply, and means of spreading crop availability (Schneider, 1981); or a spreading of risk in time and space (Haugerud, 1984). Pockets of specialty production arise where there are markets: the production of French beans for export in Central Imenti Division, Meru District, for example, or onions in Ruguru, Nyeri District. Among all but the largest farmers, first priority is given to crops for home consumption, saleable produce being that part designated as "surplus". Even the largest farmers produce crops for home consumption, but may not bother to produce the entire range of food products that the household will consume. Of the potato-producing farms visited during this study, it was rare not to find maize and beans in the fields, these being (along with potatoes) the major components of a favorite dish eaten daily when these ingredients are available.

Potato Production Areas in Kenya

Potato production is confined primarily to the Highlands, the centrally-located lands which straddle Rift Valley and surround Mt. Kenya and the Aberdare Range (Map 1). The most important potato growing areas are Molo/Mau Narok in Nakuru District; western Aberdares and Ol Kalao;



Map 1. Provinces of Kenya

Kinangop in Nyandarua District; the eastern Aberdares in Kiambu; Murang'a, Nyeri and Meru Districts (Map 2).

Gender

In Kenya, as in much of Africa, farmers are female. "Female labor, in fact, constitutes perhaps as much as two-thirds of the total labour force in agriculture. Besides being responsible for the cultivation of food crops, women shoulder a major part of the work load in cash crop production" (Tostensen and Scott, 1987; p. 61). Agricultural production for household use lies within the female realm of tasks while commercial production includes both women and men. While men disavow participation in subsistence production but often claim to be in charge of cash crop production, there was no evidence in this research that women are ever absent from either endeavor. Men may (or aspire to) spend their productive years in paid employment, while women consistently work in the *shambas* (fields) if the household has access to land. This particular division of labor is the legacy of the colonial experience in which many adult males were compelled to work off-farm and often outside the home area to earn cash to pay taxes imposed by the government (Heyer, 1981). For this reason, it is the women who are, in general, more knowledgeable about potato production and varieties, although it may be argued that they have less access to formal channels of information (farmer training, extension officers, agricultural fairs) than men. Female membership in agricultural cooperatives is very low and their inheritance and property rights are limited. The incongruity of female workloads and their social status is reflected in their exclusion from vital decision-making responsibilities at higher levels.

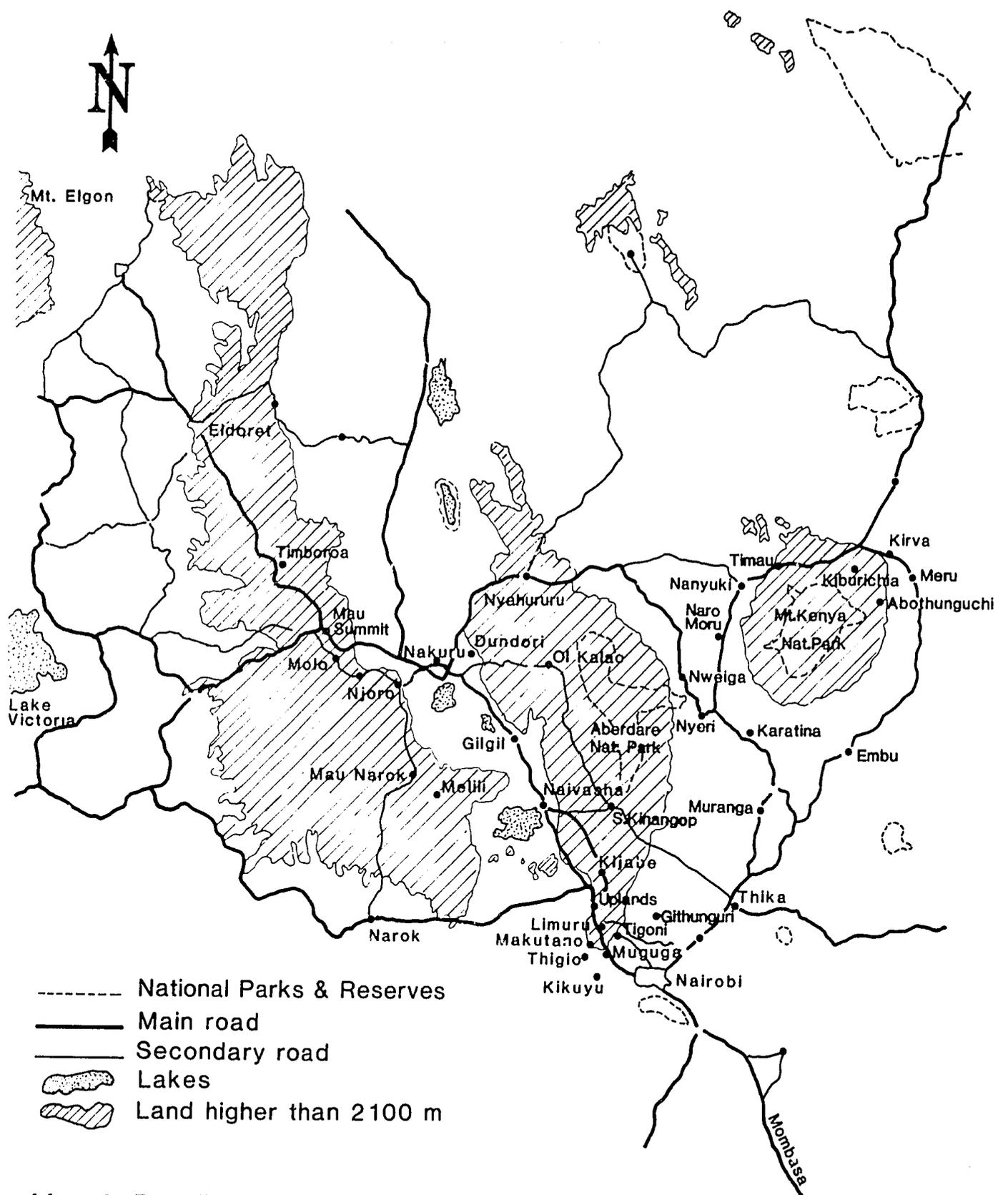
Ethnicity

Ethnic affiliation is correlated with choice of crops and even occupation. Masai and Samburu ethnic groups are generally known as pastoralists, not farmers. Luo and Luhyas in Western Province farm land suitable for potatoes (Durr and Lorenzl, 1980), but do not favor potato production. Kikuyu and Meru are the best known farmers of potatoes. The Meru are located in Meru district, north and east of Mt. Kenya. Kikuyus are concentrated in Central Province (especially in Kiambu District), but since independence and the opening up of lands formerly held by white settlers, Kikuyus have spread north and west, often taking their favorite potato varieties with them as well as incorporating new varieties into their fields. A greater percentage of Kikuyu than any other group have moved to areas outside their original lands, this movement being prompted by higher rates of population growth and subsequent pressure on the land. In 1984, about one-fourth of all Kikuyu farmers were producing potatoes (Berg-Schlosser, 1984).

Cultivation Practices

Potato farmers participate in agricultural and nonagricultural activities. One or more household members employed off-farm may also work on the farm casually. Smallholders rarely own agricultural machinery. The hoe is the most common farm tool. Farmer's fields are contiguous to the farmhouse so, unlike many other areas in the developing world, the farmer does not spend much time walking to and from her fields.

Potato seasons in Kenya are dictated by the bimodal rainfall patterns except in a few irrigated areas. Most potato farmers plant potatoes twice a year, retaining seed from the previous harvest for use in the next planting season, which generally corresponds with the peak rainfall periods. Planting practices and field care are variable within the Highlands. The advantages of fungicides are generally appreciated but many farmers do not use them due to the high cost. Rotation is not possible on many small farms. Regularly-scheduled seed renovation (the use of clean seed from sources other than one's



Map 2. Detail of primary potato production areas

own fields) is practiced in only a few areas. Farmers generally look for new varieties rather than for clean seed from existing ones. This is due to lack of association of disease with seed degeneration. Farmers know that yields of any given variety decline over time, but this is generally attributed to the variety, not to the robustness of the seed that is planted. In addition, the cost of renovating seed on a regular basis is high.

When asked to enumerate the varieties they grow, many farmers list only those produced for market or those which they consciously make an effort to reproduce. If pressed for more information, they may discount additional varieties as only being for home consumption or, more often, label the unenumerated ones as volunteers. Many of these volunteer varieties, however, remain in the fields for years, neither tended nor eliminated. Farmers often turn to these maverick tubers when their other seed stocks are degenerating. Farmers speak of "bringing back" varieties which they have grown in the past by multiplying the volunteers. By leaving volunteers, farmers maintain a buffer stock of varieties which can be activated when needed. While this is not the only method that farmers use to change the varieties that they are cultivating it is especially important in terms of genetic maintenance and variability.

Seed potatoes may be stored in covered or uncovered heaps in the field or indoors, either , or in pits dug in the fields or in gunny sacks stored indoors or out, or left in the field until planting time (Table A3).

Among the farmers interviewed during fieldwork, 70% grew more than one potato variety. This figure is skewed by the large percentage of farmers (57%) in Meru who grow only Kerr's Pink. Most farmers grow potatoes in pure stands, but occasionally they are intercropped with maize or a horticultural crop. Farm size does not appear to be correlated with the number of varieties grown. The use to which the potatoes are put -- home consumption or sales -- is a more important determinant. Commercial growers tend to plant fewer varieties. Most farmers grow a mix of both red and white varieties.

Variety Nomenclature

It is difficult to comprehend the distribution of potato varieties based on the local names, which can vary from place to place. Variety names become approximations of their former selves, for example, B53 (Roslin Eburu) becomes B52. Potato varieties may be named after the local farmer or person who introduces them -- Golof after a former British administrator, or Ngrigacha (agriculture) after the agriculture agent, which is used to designate Kerr's Pink and possibly Mariva (Haugerud, 1984). A variety may also be named for the area in which it originated (Meru or Kinare-Mwene, for example) or it may be given a general descriptive name (Purple, Blue, "Looking Up"). At times, the nomenclature of officially recognized varieties and unrecognized lines becomes confused, such as the local variety called "Desiree" (after the released variety of the same name) which is believed by some scientists to be an escaped clone from the National Potato Program. Because the locally-named "Desiree" is bitter during times of insufficient rains, potato traders in some areas refuse to buy any tubers called by this name.

The names of varieties or lines can be further complicated by factors which have nothing to do with the tuber itself. The potato commonly known as "Nyayo" is often referred to by different local names including Ndera-ciana ("fasi growing to feed kids"), Marigat, Baika, Mithonaingi, Ikinya ("footstep" in the Kikuyu language), Narok, and Naroko. "Nyayo" (meaning "footstep" in Swahili) is the nickname of President Moi and many farmers believe that they are forbidden to refer to a line of potatoes by this name. Although they are aware that "Nyayo" is the common name, they cautiously use the local designation or do not mention this variety at all in order to avoid any problems.

III. Evaluation and Choice of Varieties

The Evaluation Process

For farmers, evaluation and choice of potato varieties are not synonymous. This dichotimization can be confusing -- if farmers are rational actors, how can they reject varieties which have been selected in national trials? Or how can they reject varieties that they themselves rate highly? Evaluation of a variety and the choice to grow it can be different phases in a process that is specific to individual farmers. This allows the situation in which a farmer might evaluate a given variety as "good", but still not choose to adopt it. A confusing aspect of the evaluation/choice dichotomy is the fact that either may precede the other. A farmer may evaluate a particular variety in her neighbor's field and then choose to try it herself. Or a farmer may consciously choose to try a variety about which she knows nothing so that she can evaluate it based on its performance in her own field.

Farmers evaluate and choose potato varieties differently than biological scientists do. While the scientist conducts controlled trials to test for limited characteristics, farmers evaluate varieties based on a combination of factors: agronomic characteristics plus the degree of understanding which a farmer has regarding potato production, the amount of flexibility afforded by the farmer's particular socioeconomic status, and the situations created by either human or physical forces which affect the farmer or the farm.

An evaluation of varieties based on ten characteristics described in the Potato Atlas of Kenya includes maturity, starch content, yield potential, storage life, drought resistance, blight resistance, leaf roll resistance, virus Y resistance, bacterial wilt resistance, and meloidogyne resistance. Kerr's Pink is ranked the highest, followed by Maritta, Anett, Kenya Baraka, Pimpernel, Feldeslohn, Patrones, Robijn, Roslin Chiana, Kenya Akiba, Mirka, Urgenta, Roslin Eburu, Roslin Sasamua, and Desiree (Todd, 1976). Todd, however, suggests that these characteristics are not of equal importance to growers and states that a ranking based on characteristics which farmers prefer (early maturity, high starch content, good storage life and blight resistance) results in the following rank order: Anett, Kerr's Pink, Maritta, Pimpernel and Roslin Eburu ranking equally high followed by Kenya Baraka, Patrones, Robijn, Roslin Chania, and Urgenta, with Feldeslohn, Kenya Akiba, Mirka and Roslin Sasamua ranking lower and Desiree with the lowest ranking (Table 1). These rankings are in sharp contrast to the current popularity of varieties found in this survey (Table 2): Nyayo, the most popular variety, was grown by 53% of sample farmers; Desiree by 42%; Mukori by 25%; Roslin Tana and Kerr's Pink by 21%. Kenya Baraka and Maritta were grown by only 5% of the farmers sampled and Roslin Eburu, Kenya Akiba, Pimpernel, Anett, and Feldeslohn were grown by just 1% of the farmers sampled. The discrepancy between scientists' rankings and farmers' actual choice of varieties indicates that farmers' priorities are not clearly understood by scientists. The varieties currently grown by ADC for certification (Roslin Eburu, Romano, Anett, Pimpernel, Dutch Robijn, Feldeslohn, and Kenya Baraka) and those proposed for future certification (Kerr's Pink, Desiree, Romano, Anett, Roslin Eburu and Kenya Baraka) are also not a good reflection of what farmers are actually growing.

Table 1. Potato varieties ranked on the basis of scientists' criteria and scientists' perception of farmers' criteria (20 points possible)

Varieties Ranked according to Scientists' Criteria		Varieties Ranked according to Scientists' Perception of Farmers' Criteria	
Kerr's Pink	11	Kerr's Pink	12
Maritta	11	Maritta	12
Anett	10	Anett	12
Kenya Baraka	10	Pimpernel	12
Pimpernel	9	Roslin Eburu	12
Feldeslohn	8	Kenya Baraka	10
Patrones	8	Patrones	10
Robjin	8	Robjin	10
Roslin Chiana	8	Roslin	10
Kenya Akiba	7	Urgenta	10
Mirka	7	Feldeslohn	5
Urgenta	7	Kenya Akiba	5
Rosling Eburu	6	Mirka	5
Roslin Sasamua	6	Roslin Sasamua	5
Desiree	5	Desiree	2

Source: Todd, J.M. 1976.

Table 2. Percentage of sample farmers growing given varieties (n = 154)

Variety	%	Variety	%
Nyayo	53	Anett	1
Desiree (local and official)	42	B	1
Mukori	25	Gituru	1
Roslin Tana	21	Feldeslohn	1
Kerr's Pink/Meru	21	C	1
Golof	6	Kigeni	1
Kinongo	6	Romano	1
Ngure	6*	Kenya Ruaka	1
Kenya Baraka	5	Purplu	1
Maritta	5	Njae	1
Kihoro	5	Suzanna	1
Americar	3	Cardinal	1
Roslin Bvumbwe	3	Kathama	1
Njine	3	Kinare-Mwene	1
Roslin Gucha	3	Kibururu	1
Arka	2	Karoa-Iguru	1
B53 (Roslin Eburu)	1	Muturu	1
Kiraya	1	Faraja	1
Kenya Akiba	1	Kiamucove	1
9	1	Michiri	1
Original	1	Rugano	<1
Gituma	1	Njine Giathireko	<1
Mukorino	1	Meru Mix	<1
Amiu	1	Bluc	<1
Pimpernel	1	Baranja	<1

Source: Own survey.

* Over-represented due to concentration of this variety in a small area.

Production Knowledge

The farmer's understanding of the production process will affect her evaluation of a variety. Many farmers in Kenya do not renovate potato seed on a regular basis and see no reason to do so (a notable exception are many of the farmers in the Meru area). Initial planting of poor seed stock will lead a farmer to consider that variety a poor producer. Because farmers are generally unaware of the effect of disease on seed quality, Kenyan potato farmers tend to adopt new varieties when yields drop in lieu of renovating their seed. This results in a frequent turnover of varieties. When yields decline and diseases increase, the "logical" remedy is to look for "better" varieties. Varieties may even be recycled among the same producers who claim that a variety no longer has the defects which were previously attributed to it. One farmer in Meru substituted the variety Ngure for Kerr's Pink because the latter was diseased. She said, however, that Ngure would also develop problems in the future and she planned to bring back Kerr's Pink once again. Varieties are said to "be used to the soil" when yields decline. If the farmer had associated disease with seed health, it is assumed that she would have renovated her seed instead of dropping the variety entirely.

Economic Status

Economic status guides farmers in their evaluations of varieties. Small farmers who produce potatoes for home consumption may judge a particular variety primarily on its resistance to late blight if blight is a common problem and capital for fungicides is nonexistent. Larger farmers with sufficient capital for inputs need not worry about the price of fungicides and may evaluate the same variety on the basis of tuber size or marketability instead. Small farmers with little capital prefer varieties which require a minimum of inputs while larger, richer farmers may prefer high-input varieties which give high yields. More marginal farmers may also prefer varieties which produce consistent, stable yields rather than less reliable varieties with high yield potential. Cultivation of a mixture of varieties with different maturation periods results in staggered harvest and, thus, a continuous food supply.

Farmer Preference

In addition to agronomic characteristics, farmers' preferences also affect their evaluation of varieties. Subsistence farmers want potatoes that taste good, whereas commercial producers may grow some varieties for sale and maintain stands of "unmarketable" varieties for home consumption. Although farmers generally prefer higher yielding varieties, low yields of varieties which produce tasty tubers for home consumption are more accepted than low yields of varieties produced for the market. Farmers prefer varieties for home consumption which are amenable to traditional methods of food preparation. Red varieties, which are said to boil quickly and mash easily, are favored for home consumption (although some farmers believe that several red varieties cause cancer). White varieties, on the other hand, are preferred by hotels for making chips or french fries (see also Haugerud, 1985). Female farmers may prefer potatoes which are more suitable for home consumption than for the market. This is especially true since production for home consumption is women's work. One study conducted in Kenya found that female-headed households "...allocate household income in such a way as to acquire more calories per adult equivalent, than do male-headed households" (Tostensen and Scott, 1987; p. 55).

Evaluation and Choice Criteria

Evaluation and choice of potato varieties depend both on characteristics of the farmer which are salient to the decision-making process and characteristics of the varieties. The former may include:

- gender
- socio-economic status

- size of household
- level of education
- knowledge of effective husbandry
- access to channels of communication about potato production
- production objectives (home consumption or market sales).

Characteristics of potato varieties which Kenyan farmers list as relevant to their needs include (not in order of preference):

- blight resistance
- lack of need for purchased inputs
- use of minimal growing space
- high yielding
- good cooking qualities
- good taste
- storability
- marketability
- maturation period suitable to farmer's objectives (most prefer a short maturation period for commercially-produced varieties)
- suitably short dormancy period
- production of sufficient quantities of seed
- resistance to drought and heavy rains
- production of edible tubers in spite of disease
- availability of seed
- good germination of seed
- production of large tubers, but not so large as to encourage hollow heart
- texture sufficiently firm to withstand the stress of transport
- color, which can be closely associated with marketability
- shallowness of eyes for ease in peeling and
- suitability to the local soil and climate.

Farmers are concerned that varieties grown for home consumption be tasty, yield well and be resistant to late blight. Marketed varieties should have good demand from the traders, yield well and require few or no capitalized inputs.

Evaluation and choice of potato varieties by Kenyan farmers is thus based on a number of considerations which change as rapidly as the weather, the farmer's finances and production objectives, the farmer's knowledge about potato production, the market price of potatoes or even the state of farm to market roads during the rainy seasons.

Evaluation of Specific Potato Varieties

Because farmers evaluate potato varieties under different ecological and economic conditions, their evaluations of any particular variety are not uniform. Certain characteristics appear to transcend these local conditions, however (Table A4). Below are listed farmer evaluations of a selection of some of the more common varieties.

Nyayo. This variety, which is not officially recognized by the National Potato Program, was grown by over half of the farmers in this survey- more than any other variety. Nyayo receives especially high marks from farmers for its high yields. However, the average number of years it has been grown is only 3.5, which may indicate that seed has not yet had time to degenerate where seed renovation is not practiced. Farmers mention that Nyayo produces many and large tubers, is tasty, cooks quickly

and matures early. Nyayo had been dropped by only a negligible number of the farmers in this sample. There is disagreement among farmers regarding the resistance of Nyayo to late blight, the amounts of water needed and its marketability.

Desiree. This variety, grown by about 40% of the farmers in this survey, had been grown by those same farmers for an average of five years. Desiree, however, is not only the name of an officially released variety, but a local variety as well and for this reason there is a great deal of contradiction in farmers' evaluations. Farmers who like "Desiree" say that it gives big tubers, has high yields, exhibits good eating qualities, grows fast and stores well. Farmers who find fault with "Desiree" say that it is susceptible to blight, not very marketable, and is bitter when it receives insufficient rain. The fact that there are two different potatoes with the same name makes it difficult to assess either one without positive identification in each particular case. The bad characteristics of one variety may make the other unattractive to both producers and traders. Desiree had been rejected by about a tenth of the sample farmers.

Kerr's Pink. Of all the varieties encountered in this survey, Kerr's Pink is the longest-lasting of the nationally-accepted varieties. Grown by a fifth of sample farmers, it has been in their fields an average of 16 years. It is cited for its good eating and cooking qualities, early maturity, high yields, and -- above all else -- its marketability. Kerr's Pink is highly associated with the district in which it is grown, so much so that it is popularly referred to by the same name, "Meru". Kerr's Pink replaced Roslin Eburu (B53) as the most popular variety there in the early 1970's. Kerr's Pink had been dropped by approximately 10% of the farmers in this sample, only one of whom was from Meru (and she had plans to cultivate it again).

Mukori. In Melili, Mukori presents an example of a variety which has been recently introduced (about five years ago) and is still yielding well. Mukori receives mixed reactions from farmers in other areas in Kenya. Overall, farmers note that it is somewhat resistant to blight, tastes good (is "sweet and mealy") and has desirable cooking qualities. Mukori was grown by a fourth of the farmers in this survey; it had been dropped by very few farmers.

Roslin Tana. This released variety was cultivated by a fifth of the sample farmers. It receives praise from farmers for high yields, resistance to late blight, and marketability. Especially favored in the South Kinangop area, Tana's distribution there is probably due in part to the location of a National Potato Program substation in that area. It had been dropped by only a few sample farmers.

Kenya Baraka, Kenya Akiba and Roslin Bvumbwe. These three varieties are recognized by the National Potato Program. Kenya Baraka was grown by 5% of the sample farmers, Kenya Akiba by 1% and Roslin Bvumbwe by 3%. Since the number of sample farmers growing these varieties is so small, their comments cannot be considered representative.

Maritta. Grown by a small percentage of the sample farmers, Maritta elicits negative response for production of too-large tubers which develop hollow heart. It had been dropped by almost a fifth of the sample farmers.

Golof. Golof is an old official variety that is still grown by 6% of the farmers in this sample. Although it is neither marketable nor blight resistant (according to farmers), it is good for home consumption and has good cooking qualities. One fourth of the sample farmers had dropped this variety.

Ngure. This is variety only encountered in this survey in Meru. It was grown by 6% of the sample farmers there, despite the dominance of Kerr's Pink. It has been grown an average of only two years by sample farmers and appears to be increasing in popularity. Farmers compare it favorably with

Kerr's Pink and maintain that traders are interested in buying it, although there is no agreement as to the degree of demand or the relative price that it fetches. Some farmers say it yields better and matures faster than Kerr's Pink.

Kinongo and Kihoro. Grown by a small number of farmers, these are two very old varieties not officially recognized by the National Potato Program. Criticisms of these two varieties are mixed. The fact that farmers continue to grow these older varieties indicates that they have characteristics which are still valued.

Choice of Potato Varieties

Choice of a potato variety (Tables A5-A10) is not synonymous with evaluating it as "good". A farmer may have a positive evaluation of a given variety but choose not to grow it because of her particular circumstances. These circumstances may change, thus affecting the farmer's choice of varieties, while the farmer's evaluations of the varieties remain as before. Adverse weather conditions combined with poor seed health or lack of capital for inputs may create the conditions under which a farmer decides to reject a variety she has evaluated as "good" and seek a new one. Even varieties which do well in the field but are not in demand at the market may be dropped for varieties which are less suitable to the locale but more marketable. Varieties which perform well in all other aspects may be dropped or de-emphasized if they do not store well during the rainy season when roads become impassable to the traders, while those same varieties may be retained by subsistence farmers unconcerned with sales. What results is a complicated mosaic of local, personal, and infrastructural constraints which emphasizes a more micro-approach to analysis of farmer choice of varieties.

Some of the most common factors which influence farmer choice of varieties are: trader preferences, the limits placed on the farmer in her choice of varieties by the community-based gene pool, diseases and characteristics of the varieties themselves which make them unsuitable for cultivation in certain areas, the intended use of the potato, lack of farmer experience with certain varieties, the high cost of information, and lack of necessary inputs.

Trader Preference

Choice of variety by farmers who produce potatoes for the market is influenced by trader preference. In Kenya, potato traders respond to economies of scale which dictate that they travel to an area in which there is a sufficiently high concentration of the variety which they wish to buy. Since the price of varieties can differ appreciably, the traders assess their potential profits on the basis of how far they must travel to obtain specific varieties. One example can be seen in Meru, a district in Kenya well-known for its production of the Kerr's Pink. Although in general farmers express great satisfaction with this variety, it is generally acknowledged that its major attraction is marketability. Farmers maintain that it is primarily traders who buy this variety. This is the case for different varieties in other areas as well: traders go to Melili for the Mukori variety, to South Kinangop for Roslin Tana, to Dundori for the white varieties Nyayo and Roslin Tana, and to Naro Moru for Kerr's Pink. Several farmers in Meru mention that they are eager to try new varieties or to produce more of varieties other than Kerr's Pink but they are unable to sell them or can only sell them when there is a shortage of Kerr's Pink. Other varieties usually fetch a lower price when a market exists for them.

Although in this case Kerr's Pink is evaluated as a "good" variety and is also the variety of choice of most farmers, farmers first and foremost grow it because of the demands of the middlemen. Because communities tend to develop reputations for producing certain varieties and thus attract traders into the area who wish to buy that variety, it is very difficult for a farmer to be the only one producing a different variety. Not only will there be no source of seed in case she runs out, she will also lack a market for what she produces. One farmer in Kiburichia (who grows Kerr's Pink along with

many other varieties) maintains that she prefers to grow the variety Romano, but since the traders will not buy it, farmers do not grow it. Another farmer discussed the high yields of alternative varieties, but once again indicated that she cannot find a market for them. A farmer/market seller in Kiambu, however, grows Kerr's Pink only for home consumption because there are no buyers for that variety. Thus farmers must often choose to grow varieties which are marketable and eliminate other varieties which are "good" but not marketable or use them for home consumption only.

Community as Seed Bank

Potato farmers generally use their own seed potatoes, but when they run short, they usually buy more from their neighbors. Farmers within a given community, then, tend to cultivate more or less the same varieties because the gene pool is delineated at the community level. Because the community serves as a seed bank for individual farmers, they are assured that they can replenish their seed if their own supply falls short. They are, however, also limited in their choice of varieties to the ones produced locally. This does not mean that no new varieties ever enter the community. It does mean that new varieties tend to be well-distributed within a single community such that farmers can take advantage of the resulting economy of scale. Farmers newly migrated into an area often bring seed potatoes of the variety they were previously cultivating. If that variety does not interest other farmers, it is often dropped by the migrant. In the meantime, migrants into new areas state that they also try to obtain seed for the varieties being grown locally because they know that their neighbors have found them to be acceptable.

Individual farmers often complain that they would like to produce potatoes for the market but they are unable to attract traders by themselves -- some critical mass of production must be reached before it is profitable for traders to enter an area to buy.

Diseases and Environmental Constraints

Disease and ecological unsuitability are obvious constraints to production. These topics will not be addressed here, but it is important to note that late blight (*Phytophthora infestans*) is the most widespread problem in potato production in Kenya. In addition, of course, are the constraints to potato production which arise from differences in elevation, rainfall, temperature and soil quality.

Destination of Production

Use also influences choice of variety. Farmers who produce for home consumption only or those who sell only surplus have more flexibility in their choice of varieties than do farmers who are producing primarily for the market (see discussion of trader demand above). Farmers who produce for home consumption cite the cooking and eating qualities of different varieties as being important. Varieties which taste good but have low yields or give chatts (very small tubers) are far more acceptable to the non-market producer, while varieties which require more capitalized inputs may be rejected. Farmers who produce for the market often differentiate between those varieties which they will sell and those which will be consumed by the household. This differentiation is reflected in farmers' mix of white and red varieties.

Lack of Experience

Although farmers have experience growing many potato varieties, they seldom have information about or experience with all the varieties which exist in Kenya. The relative isolation of many potato production areas limits opportunities to learn about new varieties. In 1985, there were a scant 100,000 television sets and 1.6 million radios in a country of 24 million people. Mass communication is a potential rather than a current source of information for most poor farmers. The

price of information about new varieties may be very high if it means that a trip must be made to the local town or to the agriculture office to get it. In terms of time and money, it is easier for the farmer to wait for the information to come to her. However, one important and popular source of information are the Agricultural Shows of Kenya (ASK) held at the district level at various sites in Kenya during the year.

Not only do farmers have limited access to information about new varieties, it might be argued that experience in capitalized potato production itself is somewhat limited. It was not until after World War I that African producers in Kenya began to cultivate potatoes. Mellor maintains that traditional agriculture is relatively static and that "...decision-making for a dynamic environment, in which the farmer has substantial control over a wide range of forces, may not be a highly developed skill..." (1970, p. 210). It is possible that many potato farmers, especially within the context of little formal technical assistance and changing technology -- introduction of pesticides, fungicides, fertilizers, new varieties -- have not yet developed the level of expertise about potatoes that comes with generations of accumulated experience.

IV. Rejection and Loss of Varieties

Disappearance or rejection of varieties can be a complicated process which is voluntary or involuntary on the part of the farmer. Voluntary rejection of a variety occurs when a farmer consciously replaces one variety with another which she feels to be superior in some way. Involuntary "disappearance" of a variety occurs due to widespread disease (most commonly late blight) which destroys much of the potato crop in a given area, degeneration of seed stock, a change in the varietal repertoire of the community and/or pressure from traders.

Voluntary Rejection

Farmers often voluntarily reject the older varieties, (Kinongo, Kahoro, Kiraya, for example) when new varieties become available. While evaluation of the older varieties is not completely uniform, they are generally felt to be less resistant to late blight and lower yielding than the newer ones. Farmers do discern also that agronomic practices were changing at the time of adoption of the newer varieties -- few farmers used fertilizer or fungicides when they were cultivating the older varieties. The first wave of improved varieties thus had the advantage of being introduced more or less at the same time that more inputs were being used.

A farmer has two options when she wishes to eliminate a variety: she can sell or she can eat all of that particular variety. Either way, she leaves herself no seed to plant the following season. Elimination of older varieties usually occurs after older and newer varieties have been cultivated together for a number of seasons, allowing for comparison. No farmer in this survey indicated that she dropped a variety to make room for another one which she was not already growing.³

Involuntary Loss

Potato varieties (and sometimes potato production) are involuntarily eliminated by disease, seed degeneration and market pressures. In addition to consciously rejecting varieties, farmers also lose varieties to the vagaries of disease. Many farmers recognize the need to use fungicides, but either cannot afford to do so, try to save money by spraying less often than recommended or they use fungicides incorrectly (often by spraying only the topside of the apical leaves, thereby reducing its effectiveness). The mechanics of late blight and bacterial wilt are often only vaguely understood with the result that untended, they spread rapidly. Disease epidemics can and do destroy entire potato crops in a given area.

Seed degeneration, while not so immediately dramatic as disease epidemics, can nonetheless reduce potato cultivation to a cost-inefficient pastime. The accumulation of diseases (especially viruses) which are transmitted to succeeding generations via clonal reproduction dramatically reduces productivity within a short time.

Seed degeneration and disease are exacerbated by the limited sources from which farmers obtain their seed. Most farmers use their own seed or obtain it from neighbors. This means that tubers of a size which the farmer considers appropriate for use as seed are retained from one season to the next. With the exception of farmers in Meru District, farmers continue planting their own seed until problems develop. Dramatic declines in yield or increased incidence of disease may prompt the farmer to look for new varieties to cultivate rather than renewing her seed because the concept of seed

³ Not all "new" varieties are new in the temporal sense-"new" may mean that the variety is unfamiliar to a particular production area or merely that the area is new to potato production and that the growers have not had much experience with the varieties which are available.

degeneration/renovation is not fully understood. Farmers maintain that varieties can become "used to the soil" and that is the time to look for new varieties. One farmer in Nakuru District maintained that she always uses her own seed because "there are no new varieties to force a change of seed". Since there are no other affordable options to obtain seed, the farmer limits herself to a gene pool which is degenerating at the community level.

A final force which prompts involuntary rejection of certain varieties is trader demand for specific varieties from particular production areas. Trader demand results in rejection of varieties as well as directing choice of varieties. One farmer in Meru attended an agricultural demonstration in which she learned about the variety Desiree. She brought the new variety home to try it and claimed that it "gave good hills, yielded properly..." and she only had to spray twice, but the traders refused to buy it so she was forced to drop it.

Farmer Evaluation of Rejected Varieties

Whether voluntarily or involuntarily, potato varieties are dropped or disappear (Table A11). Although these varieties are gone, they are not forgotten -- farmers remember and can describe them quite well. Varieties rejected by the highest percentage of farmers in the survey were: Golof (24%); Maritta (17%); Kinongo (13%); while Mucuma, Kihoro, Kerr's Pink, Roslin Eburu (B53) and Desiree were all rejected or dropped by about 8% of the farmers. Many of the rejected varieties were very localized so the percentage rejection rates were quite low. What these percentages mean is unclear; they probably represent the degree of distribution of a variety more than an evaluative ranking.

Low yields and susceptibility to late blight are the two most frequent reasons given for dropping the older varieties. Many of the older varieties also produced a high percentage of chatts. Farmers indicate that some of the varieties just "disappeared" and they would like to have them back. Perhaps as an indication of the recent development of the potato as a commodity, very few farmers mention that they rejected the older varieties because they were not marketable. Farmers give a great deal of importance to marketability of the varieties which they are currently growing. The older varieties were felt to have been "pushed out" by newer varieties that were said to be superior. Several farmers likened new varieties to women's fashions, saying they wanted to try whatever was new. Although the older varieties are still grown in small quantities, the acceptance of newer varieties appears to be universal.

V. Information Channels

Of those farmers in the sample who listed their sources of information, 74% rely (at least in part) on other family members and neighboring farmers for information about the existence, characteristics and requirements of potato varieties. Farmers exchange information about the varieties they are growing but, more importantly, living in close proximity to one another facilitates a certain demonstration effect. Farmers watch their neighbors' fields to see how new varieties are progressing. If a new variety does well, the cultivator will have many requests for seed from her neighbors.

Information sources about varieties from outside the community include the market and various government institutions. Of those farmers who specified information sources, 19% learn about new varieties in the market. Farmers talk to market sellers when they are unfamiliar with varieties being sold. If convinced that the variety is promising, the farmer can buy a small amount of seed (or ware which will be used as seed) to try. If the seed does well, it can be multiplied each successive season.

Farmers also learn about new varieties from a number of government institutions. The Kenya Grain Growers Cooperative Union, ADC, extension service, district agricultural shows, Farmer Training Centers and research stations provide information about new varieties to 28% of the farmers in this survey. Because it is not the express mandate of these institutions to provide such information, new varieties can sometimes be misrepresented. The Kenya Grain Growers Cooperative Union sells certified seed, but the salespeople are not necessarily familiar with each variety or the advantages of using certified seed, although an attempt has been initiated to educate them about the product they are selling. The same may be said for agricultural extensionists who may not have specific information about new potato varieties. Farmers may misinterpret what they have heard about new varieties from these sources to other farmers. Lack of timely and accurate information about new varieties is not uncommon.

Knowledge of Certified Seed

Approximately 66% of farmers interviewed had never heard of certified seed, although this percentage does not necessarily mean that farmers have not heard of the varieties for which certified seeds are available. The 33% of farmers who had heard about certified seed does not reflect the accuracy of their information. The information that certified seed is "better" often becomes distorted to mean that certified seed requires no use of fungicides, that all "new" varieties originate as certified seed, or that any seed sold through institutional networks is certified.

Seed Sources

While 74% of farmers in this survey learned of new varieties from their neighbors, 70% actually use their own seed when possible and 58% rely on their neighbors for seed when their seed supplies run short. Although 28% of farmers learn about new varieties from some institutional source, only 5% of farmers in this survey actually purchase (or have purchased) certified seed and another 6% purchase noncertified seed from some government agency. A small number of farmers (4%) obtain seed from lorry traders who come to buy ware potatoes and also sell seed potatoes at the same time.

Although the government recognizes the need for production and dissemination of certified seed, this survey reveals several reasons for farmer's widespread failure to use it. The majority of farmers are not aware of disease transmission through seed tubers, nor are they aware what certified seed is or the advantages of using it. Also, farmers do not assign a cost to the seed which they produce themselves, and certified seed is more expensive than seed purchased from neighbors or in the market.

Farmers, being cash poor, are loath to spend money for an input which they can produce themselves "at no cost". Those who plant primarily for home consumption are not willing or able to renovate (buy) seed when they can get a crop -- albeit at a reduced yield -- using zero capital inputs.

Those farmers who recognize the advantages of using clean seed and are willing to buy it may still find it difficult to do so. Farmers complain that certified seed is often not available at designated distribution centers or is not available at the proper planting time.

VI. Meru

Meru District, the main commercial potato production area in Kenya, is distinct from other production areas in regards to the stability of varieties grown. Meru is closely associated with Kerr's Pink, a variety whose overwhelming popularity there has persisted despite attempts to introduce newer varieties. Kerr's Pink was introduced in Meru in 1927 and late blight appeared in Kenya in 1941. Since Kerr's Pink is susceptible to late blight, it was expected to be replaced first with Robijn in the 1950's and then with Roslin Eburu in the 60's and 70's (Todd, 1976). Kerr's Pink persisted in Meru although it was replaced in most other production areas. A 1976 survey of 36 Meru farmers (Fisher, 1976) showed that all grew Kerr's Pink, two grew Roslin Eburu, three grew Anett and one grew Roslin Tana. That dominance is consistent with information in this survey.

Farmers maintain that Kerr's Pink is the only variety that traders will buy from them unless supplies of potatoes run short. This is not to imply, however, that no other varieties are grown in Meru: farmers grow an average of two potato varieties. Because farmers are commercially-oriented, they often fail to list non-commercial varieties in their fields, disregarding them as "only for home consumption". Farmers may, in fact, not even mention the potato crop which is cultivated for domestic use. Traders come to Meru to buy Kerr's Pink and farmers respond to their demand by planting accordingly. Shortages of Kerr's Pink result in the appearance of markets for other varieties, however, and 43% sample farmers grow more than one variety as insurance for such situations and for home consumption. Ngure is a relatively new variety in Meru which farmers claim is becoming competitive with Kerr's Pink and many other varieties are grown for home consumption. While Meru is known as the source of Kerr's Pink, potato production is not so homogeneous in terms of varieties as its reputation implies.

Meru farmers are also different from farmers in other areas. While women participate in potato production, men are also much more involved because it is primarily a commercial activity. Farmers in this area are also able to withhold potatoes from the market until the prices rise. This marketing strategy is virtually unknown in other areas where farmers cannot afford to defer income from sales and are not assured of traders coming to buy at any time that they are ready to sell.

Yields in Meru are better than in other production areas -- the average yield is twice as high as elsewhere and the highest yields are greater than 20 tons/ha. Other differences include:

- farmers spray for blight at an adequate rate
- seed rate is higher
- farmers maintain pure stands of a single variety, and
- quality of planting materials is maintained by discarding poor crops and renovating with seed purchased from local farmers (Durr and Lorenzl, 1980).

Meru farmers do not use certified seed but they continue to produce good crops year after year without apparent serious seed degeneration. Renovation occurs on a regular basis with seed purchased locally. Farmers prefer to buy new seed from Kiburicinia, an area with an elevation sufficiently high to reduce disease.

Meru farmers use larger seed than is used elsewhere -- "seed" that in other production areas would be classified as ware. Meru seed is sold to local farmers at the same price as ware and smaller tubers are sold to traders as seed at a lower price. Because of the difference in preferred seed size, traders are able to make a profit on Meru rejects, selling them as seed in other districts. Many Meru

farmers complain that seed shortages limit their production. Greater sophistication in husbandry and marketing is probably a function of the commercial orientation of Meru farmers. In addition, farmers may be much better acquainted with their variety than in other areas where varieties change more rapidly. The somewhat larger farm size in Meru also facilitates better rotation schedules.

VII. Summary

This paper describes the distribution and use of potato varieties in Kenya and the processes of evaluation and choice of varieties which result in their acceptance or rejection by farmers. Field research was carried out from July through September of 1988 in selected potato production areas of Kenya. One hundred and fifty-four farmers were interviewed, in addition to market sellers, extension agents, district agricultural officers and agricultural specialists at the national level.

Potatoes are attractive to many farmers in the Highlands of Kenya because their dual nature as both a food and a cash crop gives farmers flexibility in the disposal of their produce. Increased production is necessary to help meet the demands of the country's very high fertility rate.

There are many potato varieties in Kenya, with distribution in a state of flux due to rapid change of varieties. When production levels fall, farmers use new varieties to recover former yield levels instead of renovating seed (farmers in Meru are an important exception). Familiarity, proximity, convenience and low cost of neighbors' seed tubers makes the farmer's own community her primary source of seed when she decides to renovate or change varieties. Customary reliance on neighbors for seeds results communities of farmers who grow more or less the same varieties because the gene pool is delineated that level.

A significant discrepancy exists between the varieties emphasized through the seed certification program and the varieties which farmers are actually growing in their fields. Certified seed is used by less than 5% of farmers. Potato varieties for which certified seed is produced do not correspond well to the varieties which farmers actually have in their fields. Of special note is the popular local variety Nyanyo, grown by 53% of farmers, but for which no certified seed is produced. The lack of certified seed for some of the more popular potato varieties coupled with its high price, lack of timely distribution, and farmer skepticism about its use points to serious differences in the way government program functionaries and farmers perceive of farmers' needs and activities. Cost/benefit analysis of certified seed use on a small farm is needed to assess the comparative economic merit of using local versus certified seed.

One source of possible confusion about variety preferences results from the related but different processes of evaluation and choice of varieties. Although potato breeders and farmers may concur on their evaluation of the relative agronomic merits of a variety, additional considerations such as farmers' production objectives, trader preferences, availability of seed, information flows and local environment influence farmers' choices of which varieties to grow. Evaluation and choice may overlap, but evaluation can precede choice and vice versa. Some farmers choose to grow varieties about which they know very little in order to evaluate them. In other cases, a farmer evaluates a neighbor's variety before choosing whether or not to grow it herself.

Farmers are especially concerned that varieties be late blight resistant and yield well. Farmers who produce primarily for home consumption are concerned that a variety taste good while commercially-oriented farmers are more concerned with marketability and reduction of capitalized inputs. These characteristics are but a few, however, of the many factors taken into account by farmers as they evaluate and choose varieties.

Communities or localities develop reputations among traders as the source of production for particular varieties, and commercially-oriented farmers are usually limited in their choice of which varieties to grow by trader demand. Farmers rely on their neighbors as their primary source of seed and information about varieties, thus the community serves as a seed bank for individual farmers.

Meru District was found to be quite distinct from other production areas because of the stability of a single variety -- Kerr's Pink -- over time, the higher level of farmer expertise in husbandry and marketing, the higher yields and the greater degree of commercialization.

APPENDIX

Description of Production Areas

In Rift Vally Province, farmers were interviewed in Njoro, Mau Narok, Timboroa, Mau Summit, Naivasha (Kinungi) and Eburu Divisions in Nakuru District; Melili in Narok District; and Naro Moru in Laikipia District. In Central Province, survey sites included Wangigi market, Kikuyu, Muguga, Makutano, Thigio, Uplands, Kijabe and Githunguri in Kiambu District; Dundori, Rurii and South Kinangop (Njabini and Nyakio) in Nyandarua District; Mweiga, Endarasha, and Ruguru and in Nyeri District; and Kihoro and Kandara in Murang'a District. In Eastern Province, Farmers were visited in Abothuguchi, Kiirua and Kiburichia in Central Imenti Division and Kangaita and Ngusichi in Timau Division, both of these divisions being in Meru District. In terms of wealth among the 33 districts in Kenya, these eight districts rank as follows:

Nakuru	2nd
Kiambu	3rd
Nyeri	7th
Meru	10th
Murang'a	11th
Nyandarua	19th
Laikipia	21st
Narok	32nd (Thomas, 1987).

Njoro

Most farmers in this area are land owners. This area was resettled about twenty years ago after independence, primarily by Kikuyus from Kiambu District. Potato-producing farms average around 25 acres in size, but there are many very large farms (several hundred acres or more) in this area producing wheat. A large variety of crops are grown on most. A very good network of tarmac roads makes this area highly accessible, especially to the nearby towns of Nakuru and Molo. Potatoes are grown in this area for home consumption and for sales of surplus: this is not a notable area of commercial potato production. The amount of land planted to potatoes is generally a very small fraction of the total acreage. The average number of varieties being grown in this area is three. Nyayo and Desiree are the two most favored varieties.

Farmers in the Njoro area indicate that their problems with potato production are primarily profit-oriented: marketing is risky, commercial potato production is not economical, prices are too low and have a tendency to fluctuate.

Mau Narok

This is an area of fairly recent Kikuyu immigration. Farms are small, averaging about 2.5 acres. Tenancy is not uncommon. Access to this area is very bad, especially during the rainy season when dirt roads become impassable. Farmers sell their potatoes to traders who come from Nakuru and Njoro. This year (1988) farmers in this area are receiving from 70 to 90 Kenya shillings per bag (low in comparison with prices elsewhere). Farmers grow an average of 3.6 potato varieties. Desiree and Nyayo are the most favored varieties.

Farmers list both pests and lack of money as problems. Rhizoctonia and late blight are prevalent diseases, while moles can also do great damage to tubers. Farmers complain that prices they are receiving are too low and the cost of inputs too high.

Timboroa

Timboroa, with an altitude of about 9,500 feet, is well-tuned into potato production and marketing. Lorry traders come to the area to buy and farmers received from 230-250 Kenya shillings per bag in 1988. Most of the farmers have been in this area ten years or less. Farm sizes averaged 2.6 acres and farmers grow an average of 3.8 potato varieties. Area devoted to potato production ranges from .12 to .6 ha. Nyayo and Desiree are the two most common varieties.

Mau Summit

An area of fairly recent settlement, Mau Summit appears to present a number of problems to potato production. There are few lorry traders coming into the area so surplus potatoes are sold along the road. Farmers claim to get only low yields and most production is for home consumption. Area under potato production appears to be small. Farmers grow an average of 2.8 potato varieties.

Naivasha/Eburu

Both of these areas have difficulties in potato production. Naivasha (Kinungi area) is plagued with a number of viruses and late blight, although people identify this problem as "drought". Many farmers have ceased potato production altogether, preferring to grow other more lucrative crops such as pyrethrum and onions. Despite the easy accessibility of the area, farmers complain that there is a lack of traders. It has been suggested that this area risks contamination because the closest source for new seed is Kinangop, which is currently suffering a major outbreak of bacterial wilt.

Eburu is also suffering from a lack of traders into the area and farmers have generally ceased producing for the market. Eburu is also threatened by impending plans for the construction of geothermal power facilities which may require relocation of some of the population. Farmers in both areas grow an average of 3.5 potato varieties.

Melili

Melili is a very interesting potato production area. Although high and quite isolated, traders go into the area over bad dirt roads to buy the variety Mukori. The length of their journey may be reflected in the relatively lower prices that farmers are receiving from the traders. Farmers in Melili are harvesting good crops, despite the fact that they do not follow many of the recommended cultivation practices: farmers generally do not apply fertilizers, do not plant their potatoes in straight lines, do not space the plants properly, and do not use the recommended size seed. Unlike other areas, the common practice is to cut ware size potatoes to use as seed. The fact that farmers are producing good crops under these conditions indicates that this is a very suitable area for potato production. Because of its apparent suitability and relative isolation, this area has good potential as a National Potato Program seed multiplication area. It is also an area that can benefit greatly from the timely introduction of certified seed. Because the locally popular variety Mukori does not produce many seed-sized tubers, farmers must use ware as seed. The introduction of a similar variety which produces more seed may be helpful if the market can be retained. Farmers in Melili grow an average of two potato varieties.

Naro Moru

Naro Moru is located on the western slopes of Mt. Kenya and most of the farmers there migrated from Meru in the early 1970's. There is little discernable difference between the farmers in this area and those of Meru -- they both overwhelmingly favor the variety Kerr's Pink and both are very knowledgeable about potato production. Potatoes are the main cash crop in Naro Moru. There are

few complaints about potato diseases and traders come regularly to the area, paying a generally higher price for potatoes than in most other areas outside of Meru itself. Farmers often hold their potatoes in storage to speculate on the market prices. A new irrigation system allows greater flexibility in planting. Farmers grow little more than an average of one potato variety. This low average is a reflection of the areas' similarity to Meru.

Muguga/Kikuyu/Makutano/Thigio/Uplands

These are traditional Kikuyu lands and the source of much migration to other areas of Kenya due to high population increases and land fragmentation. Farmers grow a diversity of crops primarily for home consumption, but, depending on the altitude, coffee, tea and some pyrethrum are also grown. Potatoes in these areas seem to be more decidedly for home consumption than in other areas of the survey -- sales of potatoes are on a very small scale. Desiree and Nyayo are the favorite varieties in this area, Mukori, Kerr's Pink and R. Tana are also popular. Farmers grow an average of three potato varieties.

Kijabe

Kijabe is much higher in altitude than most of Kiambu, and the climate is much cooler. It is located on the edge of the escarpment which overlooks Rift Valley and farmers have no problems with rain. Kijabe borders the main highway that runs between Nairobi and Nakuru and roads within the area are quite good as well. Farmers cite no complaints with marketing. Potato production is a commercial venture here. Nyayo and Desiree are the most popular, but farmers grow an average of almost five varieties.

Githunguri

Githunguri is a tea and coffee production area and potato production is primarily for home consumption. Farmers complain that the potato traders do not come into the area now as much as they did in the past. Kerr's Pink and Nyayo are the most popular varieties. Farmers grow an average of three varieties.

Dundori/Rurii

Potato production in Dundori/Rurii is both a subsistence and commercial occupation, but some larger-scale farmers in the area are leaving potato production because of what they cite as riskiness posed by price fluctuations. Traders (usually from Thika) come to buy white potatoes, of which Nyayo is the most popular. This is an area of high potential for expansion of potato production: maize, the staple crop, does not grow well so potatoes are important for subsistence as well as commercial purposes. In addition, there are good roads into Dundori and it is close enough to service the Nakuru market. Because farms tend to be larger than in many areas, rotation to eliminate bacterial wilt is possible. An average of three potato varieties is grown here.

South Kinangop

South Kinangop is an area of commercial production well-known to lorry traders who come to buy the variety Roslin Tana, but it is currently experiencing an epidemic of bacterial wilt which threatens potato production. Because small farmers cannot afford to rotate their crops or take other measures to avoid bacterial wilt, it is probable that potato production will decline. South Kinangop is also close enough to the Thika market to serve as a source of seed (in this case, contaminated). Crop rotation and use of certified seed should be emphasized in this area to preserve its viability for potato production. A National Potato Program substation is located at Njabini in South Kinangop and this

may serve as the source of information about new varieties for farmers in the area. Farmers grow an average of two varieties.

Mweiga

Mweiga has been settled about 25 years and most of the farms are seven acres or smaller. Access into Mweiga is over passable dirt roads. Traders come into this area and Nyayo is the most common variety. Bacterial wilt is present but not to a great extent. There is no renovation of seed at regular intervals. Some farmers are able to hold their ware potatoes in stores for price speculation. This area has potential to benefit from the introduction of certified seeds. Farmers grow an average of two varieties.

Endarasha

Marketing appears to be a problem in this area and some farmers are substituting commercial production of cabbages instead of potatoes. Seed renovation is not common. Farmers think that potato prices are too low, often the case with farmers who are commercially-oriented and who pay attention to prices of alternative cash crops. Roslin Tana and Nyayo varieties are the most common.

Ruguru

Ruguru is located next to a forest and farmers complain of elephant damage to their crops. Farmers are switching to horticultural crops for commercial purposes because of the better price they fetch. This is not an important commercial area. Bacterial wilt was observed here (some farmers claim it appeared at the same time that the irrigation system was put in the area). Farmers grow an average of more than three varieties.

Kihoro/Kandara

This is both a ware and seed deficit area. Some farmers appear to be buying diseased seed from lorry traders. Farmers in this area are fairly well off and some have heard of and even tried certified seed. This is not an area of commercial potato production -- most production is for home consumption. Some farmers do renovate their potato seed. Farmers maintain that supplies of certified seed in the area are neither reliable nor timely. Keir's Pink is the most popular variety in the area, seeds for which are purchased from Meru traders. Farmers grow an average of two potato varieties.

Appendix Tables

Table A1. Potato varieties collected for propagation and identification*

Variety	Collection Site
1. Amin	Kijabe, Lari
2. Arka	Njoro ?
3. Baranja	Sagana, Ruguru
4. Blue	Kikuyu
5. "C"	Kiamwagi, Mweiga
6. Desiree	National Seed Quality Control, Station, Sagana, Ruguru, Kijabe, Lari, Njoro, Mau Narok, Molo, Timboroa, Kiburichia, Meru
7. Giture	Kinungi
8. Kathama	Uplands
9. Kenya Akiba	Mau Narok
10. Kerr's Pink	Githunguri, Kiburichia, Meru
11. Kiamachove	Kandara
12. Kiamuchove	Kandara
13. Kibururu	Kijabe, Lari
14. Kigeni	Kiburichia, Meru
15. Kinare Mwene	Kijabe, Lari
16. Kinongo	Dundori, Njoro, Nakuru, Timboroa
17. Kiraya	Mau Narok
18. Maritta	Kinungi, Kijabe, Lari
19. Meru Mix	Kiburichia
20. Michiri	Kiburichia, Meru
21. Mukori	Mau Narok, Timboroa
22. Mukorino	?
23. Ngure	Kiburichia, Meru
24. Njac	Gitaru
25. Njine	Sagana, Ruguru
26. Njine Giathireko	Githunguri
27. Nyayo	Timboroa, Nakuru, Molo
28. Romano	National Seed Quality Control Station
29. Roslin?	Kijabe, Lari
30. Roslin Gucha	Abothuguchi, Meru
31. Rugano	Timboroa
32. Unknown	Endarasha

* Because the situation of varietal use in Kenya is changing, it is not always clear which varieties are being planted in which areas. To help clarify the picture, samples of undetermined, unfamiliar, or interesting potato varieties were collected for propagation and identification at Maguga research station.

Table A3. Number of farmers using particular methods of seed storage by area

Area	Storage Type				
	Heaps Outside	Heaps Inside	Pit	Gunny Bag	In-field
Njoro	2		1	3	
Mau Narok	2	2	2	1	
Timboroa	1	4	3		
Mau Summit	2	1		1	
Kiambu					
Kikuyu/Muguga		3	1	5	
Makutano/Thigio/Uplands	3	1	2	4	
Kijabe		4		1	
Githunguri	1	5		3	
Dundori/Rurii	1	8	3		
South Kinangop	1	3		4	
Melili	5			2	2
Naivasha		2	1	1	
Nyeri		9	1		
Naro Moru	1		5		
Ruguru		2	2	1	
Kandara/Kihoro	1	4			
Meru					
Abothunguri	3	6	1		
Kiburichia	2	1	6		
Timau	1	3	2		
Total number	26	58	30	27	2
Percentages	18	41	21	18	1

Table A4. Farmers' perceptions of qualities of selected varieties listed according to frequency of response. (Qualities mentioned only once are not included)

Variety	Number of Farmer Responses
<u>Nyayo</u>	
good yield	28
blight resistant	12
produces large tubers	8
susceptible to blight	7
good taste	7
good market	6
resists drought	5
cooks quickly	5
yields well in long rains, not in short	4
produces many tubers	4
mashes well	3
sprouts quickly	3
maturs early	3
good for home consumption	3
does not need much fungicide	2
gets hollow heart	2
no market	2
better in short rains	2
does not cook well	2
<u>Desiree</u>	
high yielding	10
good taste	8
susceptible to blight	6
bitter when little rain	5
big tubers	4
not very marketable	4
grows fast	4
needs long rains	3
storage problems-turns purple	3
resists blight	2
marketable	2
<u>Kerr's Pink</u>	
good taste	13
marketable	10
high yielding	7
traders want this variety only	5
not blight resistant	5
good cooking qualities	5
blight resistant	3
tuberizes early	3
can replant seed longer	2
sprouts faster	2
<u>Mukori</u>	
high yielding	4
blight resistant	4
good market	4
good taste and texture	4
good cooking qualities	3
low yielding	2

(cont.)

Table A4. Cont.

Variety	Number of Farmer Responses
<u>Kenya Baraka</u>	
stores well	2
blight resistant	2
large tubers	2
<u>Roslin Tana</u>	
high yielding	8
resistant to late blight	8
marketable	4
makes good chips (French fries)	3
requires long rains	2
tastes good	2
produces many tubers	2
does not cook well for home use (boiling)	2
stores well	2
<u>America</u>	
high yielding	2
<u>Ngure</u>	
same price as Kerr's Pink	3
traders buy only after Kerr's Pink finished	2
can yield greater than Kerr's Pink	2
high yielding	2
<u>Golf</u>	
good for home consumption	2
<u>Maritta</u>	
develops hollow heart	2
<u>Arka</u>	
high yielding	2
good market	2
<u>Kinongo</u>	
not resistant to late blight	2
low yielding	2
used to suffer from late blight but not now	2
<u>Kiraya</u>	
produces chatts	2
<u>B53 (Roslin Eburu)</u>	
blight resistant	3
<u>Kihoro</u>	
high yielding	2
<u>Njine</u>	
not drought resistant	2

Table A5. Most frequently cultivated varieties by location

Area	Variety
Nakuru District	
Njoro	Nyayo, Desiree
Mau Narok	Nyayo, Desiree
Timboroa	Nyayo, Desiree
Mau Summit	Nyayo
Naivasha	Desiree, Maritta
Eburu*	
Marok District	
Melili	Mukori
Laikipia District	
Naro Moru	Kerr's Pink
Murang'a District	
Kihoro/Kandara	Kerr's Pink
Kiambu District	
Wangigi**	
Kikuyu/Muguga	Nyayo, Desiree
Makutano/Thigio/Uplands	Nyayo, Mukori
Kijabe	Nyayo, Desiree
Githunguri	Kerr's Pink, Nyayo, Desiree
Nyandarua District	
Dundori/Rurii	Nyayo
S. Kinangop	Roslin Tana
Nyeri District	
Mweiga	Nyayo
Endarasha	Roslin Tana, Nyayo
Ruguru/Nyeri***	
Meru District	
Abothunguri	Kerr's Pink
Kiirua	Kerr's Pink
Kiburichia	Kerr's Pink
Timau	Kerr's Pink

* Eburu sample too small to be meaningful

** Wangigi varieties discounted because interviews were not conducted in farmer's fields

*** Ruguru/Nyeri varieties fairly equally divided among "C", Njine, Nyayo, Faraja, Desiree and B53 (Roslin Eburu)

Table A6. Number of sample farmers using given varieties - Nakuru District

Variety	Njoro	Mau Narok	Timboroa	Mau Summit	Naivasha	Eburu
Nyayo	4	4	7	3	1	1
Desiree	4	6	5	2	3	1
America	1	1	-	-	-	-
B53	1	-	-	-	-	-
Golof	2	1	-	-	-	-
K. Baraka	1	1	-	1	-	-
Maritta	1	-	-	-	2	-
Mukori	1	2	4	2	-	-
Arka	-	2	-	1	-	-
Kiraya	-	1	-	-	-	-
K. Akiba	-	1	-	-	-	-
Bvumbwe	-	1	-	1	-	-
9	-	1	-	-	-	-
Kinongo	-	1	4	1	-	-
Kihoro	-	-	3	1	-	1
Original	-	-	1	-	-	-
Gituma	-	-	2	-	-	-
R.Tana	-	-	1	-	-	1
Purple	-	-	-	1	-	-
Anett	-	-	-	1	-	1
Amin	-	-	-	1	-	-
"B"	-	-	-	-	1	-
Gituru	-	-	-	-	1	-
No. sample farmers	6	7	7	5	3	2

Table A7. Number of sample farmers using given varieties - Narok, Laikipia and Murang'a Districts

	Narok District Melili Area	Laikipia District Naro/Moru Area	Murang'a District Kihoro/Kandara
Mukori	8	0	0
Kerr's Pink	0	7	5
Desiree	4	0	1
Nyayo	1	2	2
K. Baraka	2	0	0
Kinongo	1	0	0
Kiamucove	0	0	1
Muturu	0	1	0
No. sample farmers	8	8	5

Table A8. Number of sample farmers using given varieties - Kiambu District*

Variety	Muguga/ Kikuyu	Makutano/Thigio Uplands	Kijabe	Githuguri
Mukori	6	8	-	2
Desiree	9	5	4	5
Nyayo	8	11	4	6
Kerr's Pink	3	-	-	7
Maritta	2	1	1	-
K. Baraka	1	-	1	-
R. Tana	3	3	1	1
Njae	1	-	-	-
Suzanna	1	1	-	-
Arka	-	1	-	-
Golof	-	1	-	1
Bvumbwe	-	2	-	-
Njine	-	1	-	1
Cardinal	-	2	-	-
Kathama	-	1	-	-
Gituru	-	-	1	-
Amin	-	-	1	-
Kinare-Mwene	-	-	1	-
Kiraya	-	-	1	-
Kihoro	-	-	1	-
Kibururu	-	-	1	-
Karua-Iguru	-	-	-	1
No. sample farmers	9	11	4	9

* Farmers and market sellers interviewed in Wangigi market not included.

Table A9. Number of sample farmers using given varieties - Nyandarua and Nyeri Districts

Variety	Nyandarua District		Nyeri District	
	Dundori/Rurii	S. Kinangop	Mweiga/Endurasha	Ruguru/Nyeri
Nyayo	12	-	10	3
Desiree	6	3	2	2
Mukori	5	1	-	-
R. Tana	7	8	3	-
Bvumbwe	1	-	-	-
Kerr's Pink	2	-	-	-
America	3	-	-	-
Golof	1	1	1	-
Kinongo	2	-	1	-
Njine	1	-	-	2
Mukorino	1	-	-	-
Kihoro	1	1	-	-
Amin	-	1	-	-
Pimpernel	-	1	-	-
Anett	-	1	-	-
R. Gucha	-	1	-	-
B53 (R.Eburu)	-	1	-	1
Feldeshon	-	-	1	-
"C"	-	-	1	2
Faraja	-	-	-	2
No. sample Farmers	13	8	10	5

Table A10. Number of sample farmers using given varieties - Meru District

Variety	Abothunguchi/Kiirua	Kiburichia	Timau
Kerr's Pink	10	8	8
Golof	1	-	-
Maritta	1	-	-
R. Gucha	1	-	-
Ngure	2	8	-
Kigeni	-	1	-
Desiree	-	3	-
Romano	-	2	-
R. Tana	-	1	1
K. Baraka	-	1	-
K. Ruaka	-	1	-
No. sample farmers	10	10	8

Table A11. Percentage of sample farmers rejecting varieties

Variety	%	Variety	%
Golof	24	Gakwa	1
Maritta	17	Gitambia	1
Kinongo	13	Kibunja	1
B53 (Roslin Eburu)	9	Bvumbwe	1
Kihoro	8	Anett	1
Kerr's Pink/Meru	8	Gitoberi	1
Desiree	8	Roslin Gucha	1
Mucuma	7	Garbat	1
Giture	6	Blue	1
Karoa-Iguru	5	Wagaca	1
Njine	5	Ntuka	1
C	5	Kirao	1
Kiraya	4	Michiri	1
Kenya Baraka	4	Romano	1
Mukori	3	Kigeni	1
Roslin Tana	3	Kenya Akiba	1
Njae	3	Nyayo	1
America	2	Kwaberia	1
9	2	Kibururu	1
Gatonye	2	Nyakiura	1
Mubururu	1		
Keni	1		
Mweri Umwe	1		

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