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THE IMPACT OF WAGE LABOR AND MIGRATION ON LIVESTOCK AND
CROP PRODUCTION IN AFRICAN FARMING SYSTEMS

Carol Kerven

INTRODUCTION

In many rural societies of Africa, migration for wage employment has long been integral to the domestic economies of farming families. An abundance of research attests to the prevalence of outmigration in widespread regions of Africa, and many case studies have reported on the impacts of migration upon rural production (for reviews of the literature, see Adepoju, 1979; Byerlee, 1972; Connell et al, 1976; Gerold-Scheepers and van Binsbergen, 1978; Swindell, 1979; van Binsbergen and Meilink, 1978). Yet despite evidence that crop and livestock systems may be transformed through the process of outmigration, this issue has largely been overlooked in agricultural research - a pattern perpetuated within Farming Systems Research [FSR] (Eicher and Baker, 1982). As has been noted in a major contribution to FSR, "Until recently, it was assumed in the literature (on agriculture) that farmers engaged in tropical agriculture were, or aspired to be full-time farmers" (Norman et al, 1982). Despite the holistic framework espoused within many FSR models, it seems that there is still a pervasive bias focussing on the on-farm economies of farm families. The off-farm sphere is typically relegated to a residual category, receiving little or no attention - implicitly justified along the lines of "those who are interested in FSR/E are predominately interested in agriculture" (Hildebrand, 1982). This may be so, but the clients of FSR frequently do not share this view; they are, on the contrary, interested in making a living, as indeed is emphasized within FSR conceptual models. The issue of outmigration from farming communities thus forces us to confront an ambiguity between the stated objectives, prescribed methods and actual practice of FSR. This ambiguity is essentially that in order to understand crop and livestock systems we must look beyond these systems to the choices facing rural inhabitants, which increasingly include wage employment and migration.

This paper discusses some of the implications of outmigration for rural production systems in Africa, beginning with an overview of major issues. This is followed by a review of selected examples in different regions in Africa which illustrate the variety of interactions between crop production, livestock systems and outmigration. It is the contention of this paper that migration affects many of the variables central to an FSR agenda. These include: farm family decision-making and allocation of resources, the opportunity cost of family labor, returns to labor and agricultural labor patterns, constraints to

production, sources and changes in family income and investment, willingness and ability of farmers to adopt innovations, management capacity and lastly, the relative attractiveness of crop versus livestock enterprises. Empirical studies in Africa indicate that outmigration has repercussions on each of these variables and has precipitated fundamental shifts in production goals, methods and output. The study of farming systems will remain incomplete unless the nature of these shifts is better understood.

RURAL OUTMIGRATION, AGRICULTURAL DEVELOPMENT AND FSR: AN OVERVIEW

Extent of Migration and Wage Employment in Africa's Rural Areas

The farmers and pastoralists of Africa have frequently had experience with wage employment, whether as seasonal migrants, long-term migrants or working locally (Swindell, 1979). In some regions, large segments of the adult rural labor force may be absent at any one time, following a pattern that has prevailed for several generations - notably, in the Sahelian region (Amin, 1974; Colvin et al, 1981; Kuper, 1965), Central and Southern Africa (Bohning, 1981; Palmer and Parsons, 1977; Parkin, 1975).

Patterns of migration take several forms and vary within different regions of Africa. Most migration studies in Africa have reported on rural-urban longer term migration, though intra-rural seasonal migration is more prevalent (Adepoju, 1979). Migrants frequently circulate back and forth between sending and receiving areas, and the overall rates of migration are therefore hard to measure (Yap, 1977). However, an estimate of net rural outmigration from 1950 to 1980 is indicated by the fact that in that period, the proportion of Africa's population living in non-rural areas has doubled - from 15% in 1950 to 29% in 1980 (Rogers, 1982, based on United Nations figures using individual country definitions of non-rural, usually any locality of more than 2,000 - 5,000 inhabitants). In 1980, Africa's rural areas had a population growth rate of 1.9% compared to an urban growth rate of 5%, and a recent assessment noted that rural-urban migration in less developed countries as a whole showed "no signs of abating" (Rogers, 1982; see also Findley, 1977).

The extent to which rural dwellers are involved in non-agricultural work is likewise difficult to enumerate, partly due to the lack of research attention to this topic (Chuta and Leidholm, 1979; but see bibliographies by Meyer and Alicbusan, 1979; Meyer and Grewal, 1983). Although there are problems of underestimation and definition, it is estimated that at least one-fifth of the rural labor force in West and East Africa is primarily engaged in non-farm work, while an additional one-fifth may be involved in part-time or seasonal non-farm work in some African countries for which data are available (Chuta and Leidholm, 1979). These authors comment that "in terms of employment, non-farm activities are quantitatively an important component of the rural

economy that should not be overlooked in the design of rural development policies" (Chuta and Leidholm, 1979). The share of rural family income derived from non-farm work is also considerable: for example, non-farm income constituted 36% and 28% of rural household income in Sierra Leone and Northern Nigeria (Chuta and Leidholm, 1979), 22% among small farm units in Malawi (Anderson and Leiserson, 1980), 39% among lower and upper middle income rural households in Botswana (Republic of Botswana, 1976) and a "significant share" of total rural household income in Kenya (study cited in Meyer and Grewal, 1983). The importance of non-farm work to African farm families was demonstrated in the landmark study by Cleave (1974); "The non-agricultural activities are found by Cleave to be a significant part of total labor requirements (among farming households)...too often technical advice... fails because it ignores the farmer's viewpoint and takes no account of the opportunity cost of new and alternative techniques in terms of the on-going operation of the whole farm - with the highly balanced timing and differing opportunity cost of nonagricultural as well as agricultural labor activities" (Waters, 1975).

The Role of Agricultural Development

The accelerating trend of rural outmigration combined with a decline in the proportion of labor force members engaged in agriculture is a subject of concern to many Third World governments. Between 1950 and 1970, the growth rate of the agricultural labor force in Africa declined relative to the rural non-agricultural and urban labor force (Anderson and Leiserson, 1980). Governments are confronted with rising demands for food to feed growing urban and non-agricultural populations, balance of trade deficits due to increased food importation, and declines in agricultural exports (Rhoda, 1979; Findley, 1977). The consequences in terms of urban unemployment and pressure on urban services are severe.

In response, many Third World governments have initiated policies designed to stem the flow of rural outmigration, with agricultural development programs expected to play a crucial role in this direction (Rhoda, 1979; Whyte, 1981).¹ This anticipation was based on the

¹For example, the Botswana Government views the rate of rural-urban migration in Botswana as one of the main issues to be redressed by development in the arable farming sector; the most recent National Development Plan states that "improved agricultural productivity" is intended to "raise arable incomes" to "create employment in the lands areas to absorb rural underemployment and reduce rural-urban drift", while the other goal is "to increase production to achieve sustained self-sufficiency in basic grains...plus export surpluses" (Republic of Botswana, 1980). As will be discussed in Case Study No. 5 of this paper, research projects in arable agriculture in fact pay little attention to the potential for reducing rural-urban migration in Botswana.

assumption that migration is primarily determined by rural-urban income differentials, following Todaro's influential model of rural-urban migration in less developed countries (1969; Todaro, 1980). Thus, it has been assumed by Third World Governments and donor agencies that agricultural development would raise rural productivity and therefore rural incomes to the point where the main impetus for outmigration would cease - an assumption that remains unproven, according to Rhoda (1979). Likewise, agricultural development would resolve the food deficit and balance of trade problems by increasing production of food within developing countries, provided that rural farmers could be persuaded to remain in production. However, an extensive review of the literature concludes that some types of agricultural programs may actually increase the propensity for rural farming people to migrate away and suggests that in the future such programs investigate in greater depth the relationships between outmigration and agriculture (Rhoda, 1979).

In addition to the impacts of outmigration upon crop and livestock systems, induced changes in these systems brought about through agricultural programs may in turn stimulate further outmigration. This occurred for example in Ethiopia, where a crop technology package resulting in higher wheat yields was so successful that large land owners dispossessed tenant farmers who had adopted the new technology - thus causing outmigration (Whyte, 1981). The interactions between agricultural productivity and outmigration are clearly dynamic and complex and cannot be ignored if agricultural development is to fulfill its expected role of raising rural people's incomes overall and increasing total agricultural output - goals which may conflict in some cases.

FSR projects aim to introduce changes in farming systems which are acceptable and beneficial to farm families or households. FSR is therefore concerned with how these units function, their choices, objectives, and capacities for changing their production systems. Outmigration of farm family members affects the functioning of all farmers' capacity for adopting changes in the farming system and may result in changes favorable or detrimental to agricultural production. Therefore, migration is relevant to several basic precepts of an FSR perspective, including: i) the focus on farm families or households, which are ascribed the "pivotal role" within farming systems (Norman et al, 1982); ii) the determination of the farm family's goals, priorities, and motivations, which are accorded a crucial position in understanding the farming system (Collinson, 1982; Norman et al, 1982; Shaner et al, 1982); iii) the study of how farm families make decisions about allocating the resources of labor, capital, land and management under their control (CIMM/T, 1980; Gilbert et al, 1980); ; iv) the FSR goal of improving farm family welfare or farm productivity - the literature suggests considerable ambiguity as to which of these goals FSR aims to achieve.

Farming Households, Families and Migrants

The constitution and functions of farm families or households is a logically prior issue to the study of their goals, allocative procedures and increases in welfare or productivity. FSR expositions typically do not specify precisely what is meant by the "family" or "household" (the terms are often used interchangeably, as in Norman et al, 1982), although this unit features prominently as the methodological lynchpin of FSR. The question of what social group is the most appropriate unit of analysis for agricultural research is a vexed one. Eicher and Baker point out that this question has been the subject of debate within francophone African studies, in contrast to anglophone agricultural researchers who generally assume that the "household", defined as those "who eat from the same pot" is the appropriate unit of analysis (Eicher and Baker, 1982). Apart from the fact that such a definition is limited to a group's food consumption patterns, and that only partially, since in rural society people may eat from different pots at different times and places, such a narrow delineation of instrumental groups preempts the study of which people actually participate in organizing production, decision-making, generating and sharing income, and accumulating wealth. As Guyer has indicated in her discussion of how the concept of household has evolved in African studies, rural agricultural societies are not simply composed of congeries of households; however, she notes with reference to economists working in Africa, "If the approach to understanding patterns of behavior is via decision-making, then it becomes critical to define the units in some kind of unambiguous way which can be modelled statistically. The household lends itself to this: it apparently has a locus, resources, and a labor force..." (Guyer, 1981). But this model may be very misleading for a number of reasons, including the fact that "although the house and farm just sit there to be visited and counted, people come and go" (Guyer, 1981).

One can infer from some standard FSR works that the farm household is conceived of as the minimal social unit which controls and allocates the factors of production for the purpose of achieving particular ends, and is the unit primarily affected by the consequences of these decisions. Its members are both producers and consumers in that they contribute to the unit's means of livelihood and are sustained by the unit (Gilbert et al, 1980; Norman and Gilbert, 1981). Although this formulation stresses the functional rather than residential structure of a household, other FSR definitions include co-residence as an attribute of households; as for example in Shaner et al (1982), which posits a congruence between "normal" co-residence, consumption, production and division of duties.

The intended distinction, if any, between family and household is unclear in FSR definitions; e.g. "The household comprises the farmer and other members of the family" according to Shaner et al, (1982, emphasis added), and the discussion on decision-making in their guide to FSR refers mainly to the family (1982). Is this just a semantic quibble or does this ambiguity reflect a deeper problem? Should co-residence be a

precondition for family or household membership within the context of FSR field studies? These are questions raised by the phenomenon of outmigration from farming societies. If there are family members absent from the household who otherwise fulfill all the functional criteria for membership apart from normal co-residence, is it legitimate to exclude these absentees from the scope of research, as it in fact usually occurs in FSR field studies? For migrants from farming families represent part of the family's resources of labor and management, migrants frequently contribute to the farm family's means of livelihood, consume a portion of the farm output, participate in and are affected by family decisions. Their activities as migrants are partly geared towards meeting family objectives, and they usually engage in agricultural tasks at some point in their lives, whether before migrating, intermittently during their migrant careers or when they return permanently to the family farm. For these reasons in addition to affective ties, migrants are usually regarded as part of the family by its members - although it should be noted that migrants are sometimes "lost" to the rural family in cases where they permanently settle elsewhere and break off contact with their rural family. The evidence from African research is, however, that significant social and economic linkages are most often maintained between migrants and their rural families (van Binsbergen and Meilink, 1978; Rempel and Lobdell, 1978). In many essential ways, migrants may therefore be considered as farm family members, even if they are not, by virtue of their absence, continual household members.

Farmers' Goals and Objectives: The Role of Migration

A generally-accepted precept within the FSR literature is that farm families have diverse goals which shape their decisions and allocation of resources with regard to three major economic activities; crop, livestock, and off-farm enterprises (CIMMYT, 1980; Gilbert et al, 1980; Shaner et al, 1982). FSR practitioners distinguish FSR from the more traditional "top down" approach by stressing the practical benefits of beginning from the client's objectives and goals (Collinson, 1982; Hildebrand, 1981; Norman et al, 1982). Research attention is however generally restricted to the first two on-farm activities; for example, in Shaner et al's extensive guidelines to implementing FSR, there is no discussion of why or how farm families might choose to allocate some of their labor to wage labor migration, or what the consequences of such decisions might be upon the farming system (Shaner et al, 1982). The neglect of off-farm employment, including migration, is explicitly mentioned in Norman et al's major work on Northern Nigerian farming systems (1982). The authors of this work remark on the extent and potential implications of off-farm work, though much of their data is drawn from another study conducted at a different time period. In another example, it is clear that farmers' goals and objectives are presumed by FSR studies to be limited to the farm. The report on a CIMMYT - sponsored FSR research project in Zambia begins a chapter headed "Farmer's Objectives, Priorities and Resource Endowments" with the statement; "Farmers' objectives and priorities are manifested in

what they do on their farms" (CIMMYT, 1978), although the same report notes elsewhere that among the sampled farm families, 57% had one or more "members of the household working in towns..." comprising approximately 30% of the total adult labor force within the sample (CIMMYT, 1978). A quarter of the sampled farm families received remittances from these absent members, but no further information is given on migrants' incomes, why these people are absent or the effects of their absence on the farming system.

That the process of labor migration is vital to understanding the conditions of farming in Zambia (in this case) was demonstrated more than forty years ago in the pioneering work by Richards (1939). She remarked that "... many of the food problems of the Bemba are typical of those that exist in all such manless areas in Africa" (1939), ascribing the high rate of male outmigration (up to 60% of adult males) as due to the inability of local agriculture to produce enough cash for people's needs (including tax). Male absenteeism further reduced the productivity capacity of agriculture, to the point where farmers were barely able to produce enough food. The effects of labor migration upon production among other groups in Zambia have been reported in a number of studies (including Watson, 1958; van Velson, 1959; van Horn, 1977; Muntamba, 1977). For example, a study in the same District (Seronje) as the CIMMYT FSR study found that remittances from migrants are used by their families to buy farms, purchase implements and seeds, hire labor and build up non-agricultural enterprises (cited in Rempel and Lobdell, 1978). One can conclude that for the Zambian farmers studied in this case (CIMMYT, 1978), what farmers do on their farms also includes leaving their farms, and that cash income is one of their priorities - however, neither this priority nor its implications for the farming system are examined in this FSR study.

Migration and Farm Family Welfare

There appears to be a divergence of opinion within the FSR literature as to whether the objective of FSR is to increase farm family welfare through overall improvements in the farming system, (the position implied in Norman et al, 1982; Norman and Gilbert, 1981) versus a more focussed and limited attempt to increase the productivity of specific crop or livestock enterprises within the farming system of the client group (for example, CIMMYT, 1980; Collinson, 1982; Fuldbrand, 1981; Zandstra, 1981). This divergence is discussed by Byerlee et al (1982). In both cases, outmigration will have an effect on whether these FSR goals can be achieved, and how increases in welfare or productivity are to be measured within FSR projects. If the objective of an FSR project is to increase farm family welfare by improving the farming system as a whole, then the whole farming system must first be understood. This includes the contribution to welfare made by farm family migrants, and the constraints to production imposed by outmigration. Welfare is of course a difficult concept to specify and measure. However, few would now argue that welfare in agricultural

societies consists only of meeting food requirements (a point made in the seminal discussion of "Z" or non-farm activities, by Hymer and Resnick, 1969). Most farming societies in Africa operate within a cash market economy, in which certain necessary or desired goods and services must be paid for in cash - in particular, food to supplement inadequate production or to diversify diet; certain inputs necessary for farming or livestock enterprises (hired labor being a major item); clothes, housing, consumer goods and education.

Not all of these needs and wants can always be paid for out of the sale of crops or livestock. Cash must be derived in other ways, the most prevalent being off-farm employment including wage labor migration. This is indicated by the findings on how migrants' remittances are used by their families in rural areas. Various studies in Africa report that such cash remittances are mainly for the "purchase of consumption goods to meet everyday needs" (Rempel and Lobdell, 1978), and secondly to pay for childrens' education (see also Connell et al, 1976). The use of remittances to hire labor for crop and livestock tasks has been noted in the case of Senegal (cited in Adepoju, 1979), Ghana, Zambia, Liberia and Malawi (cited in Rempel and Lobdell, 1978); Nigeria (cited in Connell et al, 1976); Lesotho (Murray, 1981) and Mauritania (Dussauze-Ingrand, 1974). The use of remittances to pay for childrens' education has been noted in Kenya and Nigeria (cited in Rempel and Lobdell, 1978). Even where migration results in a shortage of labor for production in the sending area, remittances may be insufficient to compensate by hiring local labor; instead, families of migrants may use their remittances to build houses or in other "conspicuous consumption" (Connell et al, 1976; this is reported by a study in northern Tanzania). Commenting upon this, Connell et al note that, "Remittances are not just an economic phenomenon...To the migrant they may represent his continued stake in the village economy and social hierarchy. Both to him and to the wider family unit, they are a means by which to enhance standing and prestige in the community" which of course may reflect long-term goals of security (noted in the cases of Liberia and Mauritania (Connell et al, 1976).

There is ample evidence that through outmigration, farm families have been able to satisfy some of their welfare requirements. This implies that FSR projects must compare the economic implications of meeting welfare needs via on-farm activities, since this is in effect how farm families evaluate their alternatives and act accordingly. If farmers are to be viewed as rational, then we must assume that migration of some family members is usually a rational decision, undertaken for the purpose of ensuring or increasing family welfare. In as much as income is a major factor of welfare, migrants' families may be seeking either more income or a different kind of income (cash), for which there may be an acute demand in semi-subsistence economies.

In cases where FSR projects are intended to increase the productivity of particular crop or livestock enterprises, (for example, research on crops such as maize, wheat, etc.) it may be assumed that

off-farm activities are less relevant to the scope of the research. However, even within such research efforts, the importance of economic analyses in addition to agronomic research is now generally stressed (Collinson, 1982; Byerlee et al, 1982). In other words, recommended new technologies pertaining to particular crops or livestock species must be shown by FSR research to be economically viable and advantageous to farmers as well as being biologically optimal (Collinson, 1982).

As has been discussed in this paper, the domestic economies of farm families are often not exclusively based on farming or livestock. The investigation of whether an innovation is economically acceptable should therefore take into account the implications of non-farm activities. For example, the opportunity cost of additional family labor required to practice an innovation may be very high, if some family members have the option of earning wages in employment elsewhere (see Anderson and Leiserson, 1980). A striking illustration of the way in which agricultural projects overlook the relationship between technological innovations and off-farm employment is provided in the case of Plan Puebla - though not an African example, the point is applicable. At the inception of this ambitious project to improve maize productivity among small farmers in Mexico, a survey revealed that off-farm income accounted for 40% of the survey farmers' income, while maize provided only 21% of total family income (Whyte, 1981; Redclift, 1983). Redclift remarks that "The implications for the plan (to increase maize yields) for labor use were also considerable and it became clearer that the opportunity costs of participation were considerable ... although the new technology substantially increased the productivity of the land, it did little to increase the productivity of labor. Indeed, the greater expenditure of management time, which the new technology implied, meant that the participants in the project were less free than nonparticipants to supplement their farm income from nonfarm sources" (1983, emphasis added). As Whyte concludes, "...the problem of raising family incomes was much more than a maize production problem" (1981).

On the other hand, migrants' families may have access to capital generated from remittances or from migrants' savings. In some cases, migrants' families have spontaneously adopted new forms of agriculture, made possible through investments of such capital (for example, cash-cropping, shifting from crop emphasis to cattle, mechanization, changes in cropping systems - cited in Connell et al, 1976, case studies in Libya, Malawi, Mauritania, Tanzania: Miracle and Berry, 1970 for case studies in West Africa and Zambia). However, investment of migration earnings into innovative productive spheres has been the exception rather than the rule, and has usually been restricted to better-off families (Lipton, 1980). These findings raise the issue of whether technical innovations requiring more capital expenditure will be feasible only for wealthier families. The economic attractiveness of a particular agricultural innovation may thus be affected by alterations in farm family labor and capital resources as a result of outmigration. Changes in labor and capital ratios will be reflected in farmers' willingness and ability to adopt innovations. These are questions

meriting closer study in FSR projects which propose to increase the productivity of particular enterprises within the farming system while taking into account their economic consequences.

THE INTEGRATION OF AGRICULTURE AND MIGRATION: FIVE CASE STUDIES

The role of migration within farming systems can take several forms and serve a variety of functions. Some of these differences are apparent in the five examples presented in this section. The first case (Kenya) concerns several pastoral groups who have sent out younger men mainly so as to earn money which can be invested back into cattle; some pastoral groups, however, have begun to settle and farm in the course of migrating for wages. The second case (Tunisia) elucidates the process by which the proceeds of migration are used by wealthier farmers to intensify commercial crop production, and also shows how ethnic diversity is linked to different patterns of outmigration. The third case (Lesotho) is an example of national dependence upon outmigration and the consequences of massive migration upon agricultural production as a whole. The fourth case (Upper Volta) also concerns national outmigration on a large scale, and serves to point out some issues which need to be considered in the design of agricultural development. The last case (Botswana) provides more data than previous examples and indicates the differential impact of migration upon crop versus livestock farming systems.

Case Study No. 1: Northern Kenya

The first case study deals with outmigration from several pastoral societies to a regional town in Northern Kenya, based on the study entitled "Savannah Town: Rural Ties and Urban Opportunities in Northern Kenya" (Hjort, 1979). There have been remarkably few full-scale studies of outmigration from pastoralist societies in Africa, largely due to the focus of researchers rather than the infrequency with which this has occurred (Dyson-Hudson and Dyson-Hudson, 1980).

Four different groups of pastoralists in Northern Kenya are involved in migration to the town of Isiolo; these four are Turkana, Borana, Somali and Samburu. "All have in common the fundamental fact that their herds have not sufficed for making a living" (Hjort, 1979). Beginning from the premise that households have to maintain viability, the author notes that "many households must have a high degree of flexibility and combine incomes from as many different sources as possible" (1979). The pastoralist groups have experienced different pressures leading to outmigration, pursue somewhat varied paths of migration and use the income from migration in dissimilar ways. Nevertheless, underlying common patterns are observed.

The Turkana have been migrating to the town ever since its establishment, and many migrants have become settled into the urban

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economy, breaking ties with their pastoral origins. Turkana outmigration was impelled by a series of natural disasters including drought and livestock diseases as well as a high human/stock ratio and pressure on grazing land. Among the Samburu, guerilla raids as well as drought meant a loss of cattle; some Samburu responded by attempting irrigated farming and selling milk locally. When this was found to be inadequate, younger men started to obtain work with the region and to migrate to Isiolo (Hjort, 1979).

Differences of tribal organization and values also are reflected in various migration patterns. For instance, among the Turkana, individual lineages are the primary social grouping, in contrast to the Borana, for whom clan membership is paramount. Thus young Turkana men have a great incentive to go to town and start their own "line" by becoming economically independent; bridewealth among Turkana is also quite high, and young men must accumulate capital for this purpose. On the other hand, Borana men undertake outmigration for the main purpose of rebuilding their family herd. The Borana are thus "target workers", and show little interest in taking up farming, which is practiced on the outskirts of the town (Hjort, 1979). In their efforts to maintain the viability of family herds, Hjort remarks that "Among (Borana) brothers, the choice is often to send away one (as a migrant) as an effort in a total fraternal strategy" (1979). Clan structure exerts social control on young Borana men and extends to urban-based kinsmen, who are able to control access to employment through kinship linkages and brokerage. The level of social control means that for the Borana, "household members are often sent to Isiolo with the explicit intention of earning money" (1979) on their father's behalf. In general, for the pastoralists, Hjort concludes that "(wage employment) presents a new opportunity to improve a social position by building up large herds and by fulfilling traditional obligations of redistribution...the effect of such diversification is a spreading of risks. Hence...a pastoral community becomes stratified, depending on a degree of access to cash" (1979).

Not all pastoralists return to a life of herding, as previously noted. Sedentarization due to wage employment is sometimes associated with the adoption of farming, which can be undertaken close to the town (1979). While a dependence on herding requires the gradual build-up of a herd large enough to sustain human needs, the acquisition of a farm plot is more dependent on having a wife to farm; thus younger Turkana pastoralists who have migrated to work in Isiolo have often married at an earlier age than is customary, and have started to farm as well - as explained by Hjort, because reliance solely on wage income is risky (1979).

In conclusion, the author comments that the local pastoral and agricultural economies are widely integrated into the regional economy represented by the township and its job opportunities. On the other hand, those who have migrated to town cannot usually earn sufficient income to live on and are thus dependent upon maintaining their ties

with their families in the hinterland, from which they will obtain a portion of their subsistence requirements. This necessity encourages dual participation in both pastoral and urban economies, both on the part of rural-based families and their urban kinsmen (Hjort, 1979).

Case Study No. 2: Southern Tunisia

The role of outmigration in an agro-pastoral society is portrayed in a study entitled "Nomads, Farmers and Migrant Labor in Tunisia" (Lee, 1979). The area studied is in the semi-arid zone of Tunisia, (150-200 mm. per year average) in which only one or two generations ago the population was semi-nomadic, and self-sufficient, depending upon large flocks of sheep and goats as well as grains (1979).

The current system of production is based on a mixture of small stock rearing, barley and wheat farming, and olive oil production; in addition, "migration (is) a strategy to produce cash needed for survival while a portion of the community remains behind" (1979) and "when the men are not involved in agricultural activities they are usually involved in a wage earning sector which will provide cash for family needs" (1979). Individual households depend on different combinations of cereal, olives, livestock and migrant labor. The differences are a function of several factors, including membership in particular ethnic groups within the community, family structure, access to land, length of residence in the community and family objectives. Thus members of a tribe which was first established in the village have had more time to develop their olive tree groves and have ceased to rely greatly on livestock; this tribe has achieved a certain degree of political power and through political "brokers" has obtained access to a migrant recruitment network. They are therefore heavily involved in both commercial olive oil production and migrant labor. In contrast, another tribal group in the community still relies on livestock income and is semi-nomadic; their olive trees are not yet fully productive and their men migrate away less frequently, being needed for shepherding (1979).

Crosscutting these tribal variations are the limitations and opportunities arising out of individual family structure; smaller nuclear families with only one adult male are less able to take advantage of wage work outside the community (1979). The community is further segmented according to wealth, which is measured by size of land holding; land availability together with family male labor is the indicator of a family's overall economic potential and will determine to some extent the type of strategy pursued. Size of land holding may be a dependent variable, however since it appears to be associated with family size and membership in particular tribal groups

Outmigration is extensive; about 58% of adult men aged between 15 and 60 migrate either seasonally to local towns or for periods of several years to Libya. Most men leave after plowing and the olive harvest, returning several months later in time for the grain harvest. Migration is closely tied to the sexual division of labor in that women

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do not participate in plowing or livestock activities, and consequently men are needed during much of the annual cycle. Families which contain more than one adult male can therefore diversify to a greater extent and obtain a higher level of income. Outmigration is necessary for most families, however, since neither large nor small land owners can produce enough grain to "insure family maintenance from year to year" (1979). "Migration, then, is not a total elimination of risks, but only the best alternatives ... available to the people to ensure economic survival" (1979). However, migration fulfills different needs among different families. Among smaller nuclear families with little land, supplementation of income by migrants' cash earnings on a short-term intermittent basis is predominant. Larger families with a higher local income send men away for longer periods of time (often to Libya where wages are higher), the men's absence in production being missed less.

The differences in family resource patterns and cash needs are reflected in the uses to which migrants' earnings are put. As Lee points out, "a change in the allocation of time and resources in the local economy has begun to change the productive capacity" (1979). The principal use of migrants' earnings is for buying food for families, paying for tractor services and purchase of consumer goods; house building is also significant (1979). But among the larger land-owners, wage earnings are also invested into olive groves and the purchase of more land, representing a growing economic differentiation among families and a tendency for larger farmers to become more commercial (1979). Sons of the larger farmers are often better-educated and can obtain higher-paying wage work outside the community; the money which they save is then used back home to hire tractors needed to till the olive groves, for land purchases, and for hired labor to replace the absent sons. Since wages are higher outside the community, the use of migrants' earnings to hire local labor is more efficient. Migrants' earnings are not invested into livestock, which have a low market price and are less valued as a source of status than in former times (1979). However, some tribal groups with access to more land keep bigger flocks, which can be partially fed from the residue derived from pressing olives. Therefore increased olive production made possible through cash investments also leads to larger livestock herds, in some cases.

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In conclusion, wage-earning migrants form a vital part of the farming system in this case; as seasonal migrants, they continue to be involved in agricultural decisions and return home monthly to help out in agricultural tasks (1979); they retain their links to the land and to their families (1979); their income makes an important and significant contribution to basic family food needs and for wealthier families, permits expansion into commercial agriculture. Lee remarks that "The traditional ways of exploiting the land...are no longer viable and new economic strategies must be found. Migration is one such strategy and it affects different families in different ways" (1979). In the longer term, the author anticipates that outmigration will reinforce a deeper level of economic stratification, as formal education of the younger generation opens up further wage employment opportunities which can be

utilized by those farmers who already have access to greater local resources (1979). The scope of this study demonstrates that analysis of farming systems should include social units beyond the household - it has been shown that membership in different tribal groupings determines to a considerable degree the type of agricultural strategy pursued and the economic potential of different activities. Finally, the study describes in more detail than can be presented here how the local system of production is changed as a result of outmigration; for example, the increasing dependence on tractors to replace absent men, which in turn releases more men who can then migrate away.

Case Study No. 3: Lesotho

Lesotho presents one of the most dramatic and well-documented cases in Africa of how wage labor migration has become fully incorporated into the rural economy and system of production, as described in Murray's work, "Families Divided: the Impact of Migrant Labour in Lesotho" (1981). A capsule history of agriculture in Lesotho begins in the late nineteenth century, following the consolidation of the Basotho nation into a country. European settlement in the surrounding region initially prompted a "widespread and vigorous response by [Basotho] to new market opportunities" as the Basotho "bought ploughs, planted assiduously and sold the grain to meet the needs of the distant mining camps" (Murray, 1981). Soon thereafter, demand for labor at these mining towns combined with local inflation encouraged Basotho men to begin migrating away from the country. Near the turn of the century, pressure from white farmers brought about restrictions on the sale of Basotho grain while drought and other natural disasters caused further reduction in grain exports. Male outmigration to the mines accelerated. Despite a second surge in grain and wool exports following World War One and high prices, the slump of 1929 together with a severe drought dealt a great blow to Basotho livestock holdings and grain production. Meanwhile, increases in gold prices stimulated demand for African labor at the mines, to which Basotho men responded. By the 1930's, Lesotho had begun to import large quantities of maize; a dependence which has continued and increased up to the present time (Murray, 1981). Lesotho had evolved from "a granary to labour reserve" (Murray, 1981).

During this century, population pressure on land has increased markedly, more land area has been brought under cultivation and productivity in terms of output per ha. has declined (Murray, 1981). There are now an estimated 275 persons per km² of available arable land (Murray, 1981). It is widely recognized that the vast bulk of rural farm families are unable to produce sufficiently to feed themselves (Cobbe, 1982; Murray, 1981, *passim*; How and Fowler, n.d.). This is hardly surprising when it is considered that the average size of land holding is less than 2 ha. and that the usable land is severely eroded - due to pressure and the mountainous terrain (Cobbe, 1982). This lack of agricultural self-sufficiency is evident in the fact that only about 6% of mean rural household income is obtained from crop production and 11% from livestock production (Murray, 1981). The average income for rural

households without migrants in 1980 is given as 40% of the Poverty Datum Line (Cobbe, 1982). At any one time, nearly two-thirds of rural households will contain at least one migrant worker employed outside (Murray, 1981). Overall income from migrant labor provides 70% of mean rural household income; however, the proportions of income derived from crops, livestock and migrant labor vary widely, depending on household size, composition, family life cycle and the resources available to families (Murray, 1981). Thus larger households with more adult men can potentially generate more migrant income while older household heads are more likely to have acquired farming land and cattle.

Currently, an estimated 160,000 members of Lesotho's labor force are absent in South Africa, which is about one quarter of the national labor force (Cobbe, 1982). In the mid 1970's, approximately 44% of adult men aged 20-59 were absent from the country, almost all of whom were working, either legally or not, in South Africa (Murray, 1981). The consequences of this massive rate of outmigration for the organization and output of agricultural production cannot be overemphasized. Most men work on contract at the mines, for an average of 13-16 years in their lives, returning home every year for periods of rest between contracts. As Cobbe remarks, "there is at most times a scarcity of adult able-bodied males in rural areas, and many of those present regard themselves as 'resting' between contracts and are not very interested in direct participation in agriculture" (1982).

The implications of outmigration for agricultural production are discussed at some length in Murray's work. To begin with, it is stressed that far from migration "supplementing" agriculture, successful farming is dependent upon receipt of migrant's income and "migrant wage-earning capacity, rather than farm income, must be viewed as the independent variable in assessing the manner in which individual households dispose their resources" (Murray, 1981). Farmers rarely possess all the resources necessary for production, such as ploughs, draught oxen and labor. Two surveys in Northern and Southern Lesotho reveal that between three-quarters to three-fifths of land-holders did not own ploughs; while between four-fifths and two-thirds did not own oxen (cited in Cobbe, 1982). The shortage of labor is self-evident, and is noted by Murray's study in one area, where 63% of households had no adult male present at the plowing time, the peak labor demand (1981). Farmers obtain the required inputs by a variety of methods, most of which involve cash payments - that is, by hiring draught oxen, labor or contract teams to undertake the plowing operation (Murray, 1981, also shown in Cobbe, 1982).

Murray remarks that "successful farming therefore requires investments which are expensive in terms of cash, labour time and social organization" (1981). These investments are critical to production, and are obtained from migrants' earnings. However, Murray notes, "rising industrial wage levels in South Africa have contradictory implications...On the one hand, they have greatly enhanced most households' capacity to invest in agriculture. On the other hand, they have greatly

increased its opportunity cost. Thus one effect of recent substantial wage increases [in South African mining industry] is to expose the relative futility of engaging in agriculture at all, at a point where migrants find it more sensible to buy food directly than to undertake the uncertain effort of growing it at home" (1981). A further relationship between production and migration is described by Cobbe, and is that migrants' families may continue to farm even though the operation is deficit-financed (inputs are greater than the value of output). The reason is that under land tenure laws, arising out of land pressure, land which is not farmed for several years may be confiscated by local authorities and allocated to another family (1982). Migrants, however, need to retain their access to land for the time when they "retire" from their migrant careers.

Cattle are essential to Basotho domestic economies; they provide draft power, milk, are a source of capital and are demanded for bridewealth. Yet half of all rural households do not own cattle, and the majority of those that do have small herds of less than 10 (Murray, 1981). Cattle ownership is very unevenly distributed, with 10% of households owning 60% of all cattle. The desire to purchase cattle in order to be self-sufficient and to pay bridewealth is an important factor in male migration, particularly acute since the price of cattle relative to South African wages has increased sharply (Murray, 1981). As Cobbe notes, "building up a herd can be a very important part of a migrant's strategies for converting migrant earnings into a rural situation which is also productive"(1982).

Clearly, the micro-economics of farming in Lesotho make very little sense unless the role of outmigration is taken into account. The implications for agricultural development are numerous and complex; some are discussed in Cobbe (1982). Several crucial points may be summarized here: The Lesotho Government objectives towards agriculture are manifold but not dissimilar to a number of other Third World countries facing the same dilemmas. They include national food self-sufficiency, increased productivity and incomes from agriculture, (particularly for the most disadvantaged rural poor), and social equity. Many of these goals would be familiar to FSR practitioners. However, the factor of outmigration strongly suggests that these goals may conflict with each other; "Food grain production as a full-time occupation is competitive with migration to work in South Africa only at levels of capitalization and land holdings that are feasible for very few rural households" under present conditions (Cobbe, 1982). In other words, the option of outmigration at relatively high income returns compared with what could be expected from agriculture without massive changes in scale imply that few farmers would benefit from increased crop or livestock productivity per se. This may be observed by the fact that although items of agricultural technology such as planters, harrows, and cultivators are available and cost less than a month's wages for a migrant, few farm families have purchased these items, which according to Cobbe, "says

more about the distribution of land and the perceived returns to investment in arable agriculture than about the availability of finance for investment" (1982).

In conclusion, it can be said that agricultural decline and stagnation in Lesotho bears a direct relationship to the deteriorating terms of trade between local production versus employment wages. This has raised the opportunity cost of male labor to the point where participation in subsistence agriculture is a residual activity, often undertaken at a loss, but still necessary for the partial support of migrants' families and for migrants themselves upon their return.

Case Study No. 4: Upper Volta

There is an extensive literature on the subject of migration from Upper Volta to other West African countries (e.g. as reviewed in Finnegan, 1980). This brief summary touches on some of the principal findings of the body of research which dates from the mid 1950's. Migration of Mossi men and later their wives and families to the Ivory Coast and Ghana has been massive; since independence in Upper Volta, internal rural-urban migration has become an additional flow of labor away from the rural production zones (Gregory, 1974). Recent and reliable figures are not easily obtained, but studies in the early 1970's suggested that up to half a million Voltaics may have been involved in migration to the south, while almost one quarter of the population aged above 14 years were estimated to have been absent from their homes at that time (Songre, 1973). In 1973, national surveys revealed that 45% of men aged between 15 and 39 years were absent, being involved in migration (Delgado, 1978). Earlier studies described most migrants as seasonal, being young men who left their family farms during agricultural slack periods to seek wage employment in the plantations outside the country (Finnegan, 1980). The seasonality of migration was undoubtedly overestimated by earlier researchers, who thus overestimated the beneficial and complementary aspects of Mossi migration (Finnegan, 1980). More than half of the international migrants stayed away for more than six months (Songre, 1973; Finnegan also describes the long-term nature of much international migration from Upper Volta, 1980).

Mossi men migrated mainly in order to obtain money, as stated by Songre: "The potential benefits [of migration] are primarily financial: the earnings from a job will enable [the migrant] to cover his own social and financial needs and, furthermore, to maintain any members of his family he has left behind, so that they can pay their taxes and living expenses generally" (1973). Migrants' remittances were found to be "directly used for immediate consumption and not for savings or investment" (Songre, 1973). This is also confirmed by Delgado (1978), who finds cash income from migrants being spent on consumer durables and "necessary outlays" such as clothing, medicine and taxes. Citing the

"definitive" French study of Mossi migration patterns (Delgado, 1978), it is found that one third of all rural household cash income was derived from migrants' earnings (Delgado, 1978).

The system of labor emigration from Upper Volta has been characterized in strong terms by Songre, at the time a regional labor inspector in Upper Volta: "Since colonial times...Upper Volta has been reduced to playing the part of a supplier of labour for the development of countries along the Gulf of Guinea...It is consequently a perfect example of an outback territory that never benefitted in any way from colonial development; on the other hand, with its plentiful supply of labour, it has provided the primary economies of the coastal areas...with a fair proportion of their labour force...[and] paid the price in terms of prolonged economic stagnation..." (Songre, 1973).

The effects of outmigration upon the structure and output of agriculture in Upper Volta have often been stated as detrimental (e.g. Gregory, 1974; Songre, 1973). Researchers point out the loss of labor resulting from such high rates of outmigration, which has not, it is argued, been compensated for through productive investments of migrants' earnings. This point is implied in Delgado's discussion of "discretionary purchasing power" in the form of surplus cash, which "could have been invested, in theory at least" into cattle or crops rather than, as has been the case, into consumption (Delgado, 1978). The fact that such so-called surplus cash is not invested into livestock or crop enterprises, however, raises an interesting question about farmers' perceived returns to capital in a mixed economy.

Perhaps even more interesting is the question of how outmigration has raised the opportunity cost of family labor. It is remarkable, therefore, that Delgado's detailed study of resource allocation between crop and livestock enterprises fails to examine the impact of labor migration upon local farming; in fact, it even excludes men absent for more than three months from the study altogether (Delgado, 1978). The hypothesis guiding his study would seem to have direct relevance to the issue of outmigration, in that the study dealt with "the high opportunity cost of labor at certain peak periods" which, combined with other factors, may have discouraged Mossi farmers from making greater use of cattle for draft and income purposes (Delgado, 1978). Greater utilization of cattle for draft power has in fact been an idea long favored by development planners in Upper Volta since the 1950's (Delgado, 1978). During the 1970's projects using animal traction on family farms received much encouragement from donor agencies, and several large studies were conducted on the feasibility of animal traction (Barrett et al, 1982). The failure of animal traction projects in the 1960's had been attributed to the critical labor shortage and the uneconomic returns to farmers using animal traction in experiments...one solution suggested was to encourage cash cropping (cotton in particular) which would yield greater profits (Delgado, 1978). However, cotton projects introduced in the 1930's by the French administration had also

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"foundered on a lack of manpower because the cotton growing season extends past the millet harvest, when seasonal migrants were away" (Finnegan, 1980).

Coming back to the late 1970's, we see that animal traction projects are still not cost-effective to the majority of farmers, at least in the short-to-medium term (Barrett et al, 1982). Adoption of the traction system (ANTRAC) requires capital investment, and the researchers conclude that the technical package is only suited to "economically diversified households who have easy access to cash" (Barrett et al, 1982). Moreover, the annual cash flow requirements of the technical package had to be met from non-farm income sources (1982). One of the solutions proposed by the researchers, so as to increase the economic viability of the traction scheme, is to develop a cash crop - cotton is specifically mentioned - which would hypothetically recoup some of the costs of adopting animal traction (1982). However, nowhere in this entire study of costs and benefits involved in adopting ANTRAC is the subject of labor constraints and labor opportunity costs due to outmigration ever discussed. Nevertheless the study repeatedly mentions the contributions to income provided by "off-farm" sources (usually noted as 'other'), and as has been shown, indicates that these sources of income are essential sources of capital to farmers participating in the project. It would seem that the lessons learned by the French in the 1930's have not yet been assimilated, and that rather than ascribing failure to the "learning period" of farmers, (Barrett et al, 1982), the "learning period" of research might be questioned.

Case Study No. 5: Botswana

The summary presented here is based on the recent publication of results from a national study of migration in Botswana.² This study consisted of a national sample survey of rural and urban dwelling units, interviewed in four seasonal stages (Republic of Botswana, 1982). Further data and analysis on some of the points discussed here can be found in Kerwen (1982; 1983). The intention here is to highlight some relationships observed between outmigration and the organization of crop and livestock production in Botswana.

Botswana's population is highly mobile, moving between villages and agricultural zones on a seasonal basis, between rural areas and towns for longer periods, between rural areas and the South African mines and

²The National Migration Study was financed by the United States Agency for International Development and the Botswana Government. The survey was based on a sample of approximately 3 1/2 % of all dwelling units, rural and urban. In-depth sociological studies were conducted in conjunction with the national survey. The author gratefully acknowledges all her colleagues in the Study, but is solely responsible for the views expressed in this paper.

between rural villages. Almost a third of the labor force (people aged more than 15 years) are absent from their homes for more than one year at one time, with 21% of the labor force migrating within Botswana and 8% migrating to work in South Africa (Republic of Botswana, 1982). Being a migrant is associated with being in wage employment; about half (49%) of the formally employed within the country are either long-term or short-term migrants. The main determinants of rural outmigration among the labor force are found to be income differentials and the probability of obtaining a wage job (Lucas, 1982).

Outmigration from Botswana's rural areas in order to seek employment began as early as the middle of the last century, as men sought work on the mines and farms of what was to become South Africa (Schapera, 1947). During this century up to independence in 1966, mine labor employment in South Africa was the principal form of wage work for Botswana men, there being very few jobs available within the country itself (Schapera, 1947). Since independence, domestic formal employment has been increasing rapidly, mainly located in four urban centers - from 1971 to 1981, Botswana's urban areas have quadrupled in size and formal employment growth rates have been around 14% per year (Kerven, 1983).

Botswana's rural dwellers are characterized as agro-pastoralists in that dryland cereal farming is combined with livestock raising. Rainfall is erratic, low and unevenly distributed, making crop farming a risky undertaking, while extensive range lands, man-made water points and high export prices have generally favored cattle keeping. Crop production and cattle ownership is inequitably distributed, with approximately half of rural dwelling units neither owning cattle or producing crops, recorded in a good rainfall season (Kerven, 1982). About half of all rural units have both land and cattle, while a further third have land but no cattle (Kerven, 1982).

Among crop farming units, about 90% are unable to produce enough crops to meet basic family subsistence requirements even in good rainfall years, while in moderate drought years (occurring about one in four years), only about half of land-owning farms even plough their lands (Kerven, 1982). Nor do cattle supply an adequate source of income for most cattle-owners, since the herd sizes are small (less than 20 head for half of all cattle owners). Only a fraction of cattle owners possess enough to yield a regular source of cash income - generally thought to be above 50 head, which accounts for less than 10% of the rural population as a whole, and about one quarter of farm units (Carl Bro, 1982; Kerven, 1982).

The population of Botswana has been unable to feed itself from farming for most of this century (Schapera, 1947). The role of migration in Botswana's rural economy is mainly to supplement inadequate incomes from crop and livestock production. Wage labor migration is part of a life cycle, as most migrants eventually return to their rural homes and take up farming or pastoralism once again, at the end of an employment career. Wage employment offers a source of cash to

impoverished rural families, which is mostly used to buy food, but is also needed for clothing, medical and school expenses. Only a small portion (about 13%) of wage income is invested into crop or livestock enterprises, and that only by a fraction of all migrants - (a total of 16% of all rural dwelling units invested in production, mainly cattle-related, a proportion of which was derived from the sale of cattle rather than wage income [Lucas, 1982]).

Wage employment is highly integrated into the rural economy; fully three-quarters of all rural dwelling units have at least one wage-employed member during a year. More than two-thirds of rural units have an absent wage earner, and 45% have a resident wage earner (Kerven, 1982). Wage labor has become incorporated into rural people's lives, and the income that it generates has become a preponderant source of subsistence as is demonstrated by the results of a national rural incomes study in Botswana (Republic of Botswana, 1976). It was found that low-to-middle income rural households derived only 16% of their annual income from agriculture, with roughly equal proportions coming from livestock and crops. In the middle-to-upper income group 4% of annual income accrued from crops and 32% from livestock. Within both these groups, however, 36% of annual income accrued from employment earnings (Republic of Botswana, 1976).

Given the high degree of overlap between agro-pastoralism and wage employment that occurs among Botswana rural families, it is to be expected that rural outmigration will have profound and widespread effects upon the system of production. Firstly, the high rate of rural outmigration has affected the division of labor in family agriculture, in at least two ways. Some farming households are left with insufficient able-bodied adults to carry out required tasks, and secondly, the agricultural work load has devolved onto those people left behind in rural areas, particularly onto women. It was found that one-third of farmers who did not till their land stated lack of labor as the reason they did not plough (the major reason for not ploughing is lack of rain). Hiring of agricultural labor was found to be closely tied to the number of adults available in the farm units; the fewer the adult family members, the more often the farm units hired labor.

With regard to changing agricultural work patterns, it is noteworthy that the system of animal-drawn ploughing was long considered male task, due to the heavy labor involved. In the late 1970's, however, it is found that in almost half of all farm units, women were carrying out ploughing tasks, while a quarter of all farm units had no males engaged in this task at all. Women now must participate in virtually every task connected to farming or livestock, in addition to their customary responsibilities for the home and children. Women have also become the heads of farms; about one quarter of all land-holding farm units are headed by women.

Agro-pastoral units headed by women fall into several categories; those with adult males associated (whether present or absent), those

without adult males associated, and those units headed temporarily by women in the absence of the male head, usually a husband. Female-headed units without any adult men associated are uniformly in the worst situation with regard to production. These units were the least likely to have larger-sized farms, or to plough their land even in a good rainfall year. The majority of these units stated that not being able to afford hiring labor for ploughing was the reason they did not plough their land (54% of female-headed units with no adult males gave this reason, compared to only 14% of female-headed units with adult men and 13% of male-headed units). The costs of production are higher for female-headed units in general, but especially for those without adult men, of whom 72% had to spend cash to farm their land, compared to just over half the male-headed units who had cash costs. The costs cannot necessarily be paid out of absentee remittances, if there are no adult men to migrate. Thus among female-headed units with no adult men, only 13% received cash remittances during a year, while de facto female-headed units (with male heads absent) much more frequently received remittances (64% did, during a year).

The lack of an adult male in a rural family also reduces the likelihood of that unit owning cattle, the major source of wealth in rural society. Thus, only 22% of all rural dwelling units headed by women with no adult men have cattle, in contrast to 65% of male-headed units which own cattle, 55% of female-headed units with adult men, and 51% of de facto female-headed units. Among those with units which do own cattle, those headed by men, (either present or absent, as in the case of de facto female heads) are more likely to have larger herds of greater value.

The adoption of technical innovations was found to be associated with migration, in terms of availability of farm labor, the receipt of cash remittances from absentees and savings from wages. Although very few Botswana farmers (11%) use anything other than conventional crop techniques (ox-drawn plough, with no inputs of fertilizer, pesticides, etc. or use of tractors, harrows, etc.), those farms units receiving higher levels of remittances from migrants were more likely to be using extension-recommended practices or to have purchased inputs (Kerven, 1982). In particular, the higher the level of wages earned by farm unit members (whether absent or present), the greater the adoption rate. On the other hand, lack of male adults among female-headed rural units was strongly associated with non-adoption of new technology and in fact with a much lower ownership rate of essential inputs, such as ploughs and draft animals.

Adoption rates of cattle-related techniques (e.g. supplementary feeding, health care, etc.) are overall much higher than adoption of crop techniques. Among cattle owners; 60% practice basic extension--recommended improved management techniques, while 30% use more capital-intensive practices. Cattle-owning units which received higher levels of remittances from absentees were more likely to be using the more capital-intensive methods, while those not receiving any remittances were unlikely to be using these methods. The results suggest

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that receipt of remittances may be a necessary condition of adopting improved cattle management practices, but that adoption is not dependent upon remittances but rather upon the scale of cattle ownership; the greater the herd size, the greater the level of adoption of extension-recommended practices. Lack of adult males in households headed by women was associated with a complete absence of capital-intensive cattle management methods, while no appreciable difference in techniques adopted was evident between units headed by women with adult men as members and units headed by men. This would imply that female-headed units with sufficient cattle and labor are as able as male-headed units to adopt improved management techniques. Lastly, regression analysis on investment patterns arising out of wage employment indicates that higher wage income (whether earned by resident or absent members) is strongly linked to cattle investment (purchase of livestock and related technology) but bears no relationship to crop-related investments (defined as mechanical equipment). As Lucas comments, "...expanded urban employment and consequential withdrawal of potential crop labour is not offset by investments out of (migrants') wages (Lucas, 1982).

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Some further observed relationships between outmigration and agro-pastoralism indicate that the crop and livestock sectors respond somewhat differently to outmigration, and that crop farming is more sensitive to the effects of outmigration. The absence of farm unit members who are employed in a Botswana town is shown by regression analysis to be associated with quite large increases in harvests, whereas there is no statistical relationship between urban migrants and cattle wealth, per se. Absence of a farm unit member at the South African mines is linked to a sharp decline in crop harvests (Kerven, 1982). There is also a tendency for substitution between wage employment and involvement in crop agriculture, in which cattle ownership appears to function as an intervening variable. Thus rural units which do not have a wage-employed member are more likely to be solely crop farmers, compared to units with wage-employed members who are more likely also to have cattle (Kerven, 1982). Since it has been noted that once a rural unit has a wage income, there is a propensity to acquire cattle, those units without wage income must be more dependent upon crop farm income in the absence of a means to purchase cattle. This relationship is confirmed by these further results; as remittances to rural units increase in value, so does cattle ownership, while on the other hand, the likelihood of the unit ploughing declines. Also, the greater the wage income of farm unit members, the less likely the unit is to plough crop land; 71% of farm units with wage-employed members in the lowest income group ploughed, compared to only 37% of farm units ploughing who had wage-employed members in the top wage brackets (Kerven, 1982). In summary, as outmigration from rural units results in a higher income, crop farming declines in appeal and cattle-raising becomes both more possible and more attractive.

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In conclusion, it should be noted that the Botswana Government's main initiative in the arable sector is not explicitly addressed to the

classes of small-scale producers involved in arable agriculture (Republic of Botswana, 1980). A large FSR project is being implemented with this group as the focus (ATIP, 1981). Yet the smaller-scale producers are precisely the group which, as has been discussed, are most reliant upon wage labor migration for supplementation of inadequate incomes from crop farming. Due to their involvement with migration, these farmers have subsequently also experienced many negative consequences of family outmigration: loss of labor, increased cash costs of production and loss of management skills, all of which have diminished their ability to invest in improved production systems. Moreover, low production levels among these farmers have been unfavorable to capital accumulation as savings in the form of cattle and wage income must be drawn upon to meet recurrent expenses. Low levels of savings have caused further deterioration in the propensity to invest resources into crop farming. Nor should the incentive factor be ignored: farmers who can expect crop failures due to drought and poor management, and who at the same time can rely upon cash income from migrant family members have little motivation to concentrate more scarce resources into an already low-yielding activity.

Currently in Botswana technical solutions to low agricultural productivity are being researched, with little attention paid to the opportunity costs of rural family workers who can earn much higher incomes in the wage sector if they migrate. In the past, many of these technical solutions were found to be only appropriate to wealthier farmers with sufficient family labor and capital resources to experiment with technical innovations. Small-scale farmers do not have the surplus labor or capital to risk in attempting new farming methods. Conversely, in Botswana little research attention is given to studying current adaptations based on intricate and flexible methods of agriculture and inter-household cooperation, as well as depending upon wage income from migration (Behnke and Kerven, 1983).

CONCLUSIONS: IMPLICATIONS OF OUTMIGRATION FOR FSR PROJECTS

It has been the contention of this paper that migration is often part of farm family strategies and that the impacts of migration upon farming systems may be considerable - this has been illustrated with reference to a number of African countries and five case studies. The latter have exemplified some of the range of positive and negative impacts upon production that result from the outmigration of some farm family members. In summary, these include changes in: techniques of production, emphasis of production, division of labor, the opportunity cost of labor, capital and management, and lastly, changes of output. Each case has also testified to the dependence upon wage income for the continued involvement of rural farmers and pastoralists in production. Yet the role of outmigration is rarely incorporated into farming systems research projects. This neglect may perhaps be attributable to the conventional assumption that Africa's rural economies are functionally discrete and therefore isolated from the modern economies centered in

towns and cities; rural inhabitants are assumed to be gaining a living from the land, with maybe some part-time income coming from trading or small-scale industry. Migrants are by definition absent part of the time, and upon their return, appear indistinguishable from farmers; flows of money, goods and services associated with migration are not readily observable. Migration from rural areas may therefore be "invisible" to the researcher, particularly if he/she is not looking for it.

A more pertinent reason why migration may be considered tangential to the methods and goals of FSR lies in the debate surrounding the cost of more "holistic" research, in terms of time, money and skills (Byerlee et al, 1982; Collinson, 1982; Norman and Gilbert, 1981). This is indeed a pressing and legitimate concern. The current FSR orthodoxy prescribes a series of "screening" surveys, intended to narrow down the salient variables to a manageable size which can then be more intensively studied over a longer time period. In practice, the variables selected for closer study are inevitably limited to the biological sphere of farming systems (see example, chart in Byerlee et al, 1982; timetable in Collinson, 1982). Several years of extensive research may be devoted to studying the agronomic features, yet the social system itself is presumed to be sufficiently understood after a few weeks of cursory surveys. One could convincingly argue, however, that human social systems are at least as complex as plant or animal biological systems. Time and expense may be better-saved, in the long run, if one has ensured that the variables chosen for intensive study are really the most relevant, given the overall objectives. The irrelevancy of much agricultural research in the past is now appreciated - basically, the farmer had been forgotten. FSR may fall prey to the same error unless more attention is paid to the entire range of diverse objectives and strategies actually pursued by farmers and their families. This paper has pointed to one of these alternatives - wage employment - which is increasingly being pursued by African farming families.

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