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**COLLECTIVE ACTION AND THE INTENSIFICATION OF
CATTLE-FEEDING TECHNIQUES: A VILLAGE CASE STUDY
IN KENYA'S COAST PROVINCE**

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ABSTRACT

The adoption of intensified cattle-feeding techniques by smallholders in Sub-Saharan Africa has been slower than anticipated. This study seeks to better define and understand the role of local collective action in conditioning the strategies that smallholders choose to intensify their cattle-feeding techniques. Collective action was analyzed as a determinant of the transaction costs of accessing feed for these techniques. An in-depth case-study method was used in a single peri-urban village that was at a low-but-increasing level of intensification of land use. The research found that cattle-keepers were intensifying their cattle-feeding techniques, but in a much more marginal, step-wise fashion than anticipated. The process of intensification involved changes in transaction costs, which were born differently by smallholders depending on their sources of wealth and personal networks. Whereas previous studies have found wealth to be a key factor conditioning the adoptability of new techniques, this study shows that personal networks can be used in some cases as a substitute for wealth.

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Kimberly A. Swallow*

1. INTRODUCTION

Throughout Sub-Saharan Africa, intensification of dairy production has been seen by policy makers as a possible solution to three problem areas: (1) dairy market supply deficits, especially in urban areas; (2) increasing land scarcity; and (3) the need for income earning opportunities for smallholders. It was anticipated that these opportunities and problems as viewed by smallholders would lead them to seek more intensive cattle-feeding techniques. To aid this process, technical assistance programs were designed to add an intensive cattle-feeding technique to the options available to smallholder cattle-keepers. The technique most widely recommended across sub-Saharan Africa was stall-feeding based on specialized feeds grown on-farm, such as Napier grass (*Pennisetum purpureum*) and *Leucaena l.*, and purchased agro-industrial by-products. Smallholders have chosen stall-feeding in the highlands of Kenya and Tanzania, but a slower-than-anticipated pace of intensification has been the norm throughout the remainder of the region (Gass and Sumberg 1993; McIntire et al. 1992).

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The purpose of the research reported here was to provide input into the process of reevaluating this technical support. This was done by providing a detailed view, from users' perspectives, of the issues involved in intensifying cattle-feeding techniques. It was hoped that such insight would provide policy makers, development workers, and extensionists with a more realistic understanding of the process of technique change, which would both engender respect for the time required and, if necessary, inspire the creation of a broader range of options.

It was suggested in the theoretical literature that the process of technical change involves local socioeconomic institutions such as rights of ownership of inputs and conventions about the means of accessing inputs (Platteau 1995). Empirical literature has shown these variables to be particularly important in the case of changing cattle-feeding techniques in sub-Saharan Africa. In this region, the recent history was for feed used in cattle-feeding techniques—for example, natural vegetation used in the herder-grazing technique—to be obtained from land that was not individualized (McIntire et al. 1992). Thus, this study focused on village-level socioeconomic institutions and collective action to establish, maintain, or change those institutions.

This village-level focus on understanding a process of change methodologically favored a detailed case study approach. The selected village was located within the milkshed of Kenya's second largest city, Mombasa. This area was chosen for several reasons. First, there were both demand-pull and cost-push factors to encourage commercial dairying in this area. Second, this area, like much of Sub-Saharan Africa, was at the early stages of intensification of land use which provided an opportunity to

study this process. Third, a dairy intensification extension program had been implemented in the area for 12 years prior to the study. Although the case-study villagers knew about the technical package of the program, most had chosen not to adopt it. The case study was undertaken between 1991 and 1995. Data were collected using both qualitative and quantitative methods. Primary data were collected from all 132 extended-family homesteads in the village. A detailed two-year study was done to document, on a weekly basis, the transactions over cattle feed of eight operators of cattle enterprises that were differentiated by commercial orientation and level of intensification of cattle-feeding techniques. The three commercial-dairy enterprise operators who used stall-feeding year-round were studied in the most depth. Information on collective action to reduce the information gathering, contracting, and monitoring and enforcement costs of these transactions was assessed through qualitative methods and secondary sources.

This chapter opens with a description of the case-study situation, including descriptions of the case-study village as a social unit as well as the cattle enterprises and cattle-feeding techniques used in the village. This background is followed by a short review of the relevant theoretical literature and a description of the conceptual framework that was used to guide the research. The research methods are then explained. Research findings are reported in three sections. In the first section, the eight case-study homesteads' heads are described in general while focusing on the personal wealth and networks of the three heads who are operators of commercial-dairy enterprises. The focus of the second section is the eight homestead heads' use of others' feed sources and the transactions used to access them. The third section contains a discussion of the

factors that shaped the village's capacity for collective action to support transactions over cattle feeds, especially during times of change. Finally, conclusions are discussed.

CASE-STUDY BACKGROUND

The case-study village was located in the milkshed of Kenya's second largest city and the capital city of Kenya's Coast Province, Mombasa. Intensification of dairy production in Mombasa's milkshed had been technically supported for some time, but it had not occurred at the predicted rate. Intensification of dairy production was expected in this area due to high market demand for milk in Mombasa, a relatively high population density, and declining income-earning potential from the traditional cash crop of copra. In 1992, the annual shortfall of milk production in Coast Province was 113 million liters (Mullins 1992). A technical package of improved breeds of dairy herds and stall-feeding was extended in Coast Province between 1980 and 1995 by the National Dairy Development Project. Complete confinement and use of the stall-feeding technique was recommended. Feed recommendations were based on forages planted on homestead plots—mostly Napier grass (*Pennisetum purpureum*)—or purchased agro-industrial by-products such as copra cake (Maarse et al. 1990). A major obstacle for potential adopters was the high cost of production due to a variety of factors including: (1) lack of formal credit; (2) increasing scarcity of land; (3) variable availability of feeds; (4) high labor requirements; (5) lack of adequate veterinary services; and (6) lack of marketing infrastructure such as a milk collection service. While as many as 350 coastal dairy operators once fully implemented the National Dairy Development Project package, field visits in 1994 revealed that very few still adhered to the prescribed package (Mullins et al. 1994).

The case-study village was connected to Mombasa by five kilometers of dirt road followed by 45 kilometers of paved road with good public transportation. Livelihood in the village was primarily based on subsistence production and remittances from income earned in Mombasa. Income from on-farm production was very low and unreliable. Bi-modal rains averaging 1,100 millimeters annually supported an intercrop of maize, cowpea, and cassava with coconut palms planted throughout the area (Jaetzold and Schmidt 1983). There was little-to-no use of chemical or organic fertilizers, or improved seed stock. In general, the farming system was a low-input, low-output system.

The village's human population density of 591.7 persons per sq km (Swallow 1996) and the low productivity of its soils meant that it was at a threshold of increasing population density and land scarcity. During the cropping season of 1992, only 44 (17.5 percent) of the 252 plots used by case-study villagers contained some fallow (Swallow 1996). While this degree of land scarcity meant that farmers could no longer rely exclusively on fallowing to renew soil fertility, they still did not use manure or other fertilizers. Consequently, the land area of the village was not sufficient to produce enough to feed the villagers year round, and basic food items were purchased during the long-dry season (Waaijenbergh 1994).

Village as a Social Unit and its Institutions

The village was established in the 1800s, and at the time of the study consisted of 132 extended-family homesteads. Ethnically, the village's members were almost exclusively Giriama. There was little in- or out-migration, although many homestead heads and young people were nonresidents working in Mombasa, who remitted income to

their village homesteads. The religious composition of the village's homesteads was 58.3 percent followers of the customary religion, 25.8 percent Christians, and 15.9 percent Muslims (Swallow 1996).

The segmentary nature of Giriama society meant that the village was organizationally decentralized. Customary institutions were based on councils of elders, secret societies, and diffuse monitoring and enforcement. Councils of elders were *ad hoc* groups of homestead heads that mainly focused on the adjudication of disputes over tardy bride payment, theft, and especially, the ownership and inheritance of land and coconut palms (Spear 1978). Overlapping personal networks among villagers were based on several principles: (1) agnation (relationships traced through the father's bloodline); (2) matriliney (relationships traced through the mother's bloodline); (3) affinity (relationships based on marriage); (4) neighborhood; (5) friendship; (6) religious affiliation; and (7) other personal relationships.

There was to some extent a duality of local and national control of land in the village. Officially, land was managed under a system of individualized ownership and use. Indeed, all of the village's 3.5km² was held under individual title. Villagers had registered their titles in the early 1970s during a compulsory governmental land registration program. There were no spatial niches such as a forest, pasture area, or roadsides lacking individual claims other than the roadways themselves, footpaths, and water holes. However, coexisting in the same spatial niche with this *de jure* individualized system administered by the national government was a multiple-use

system that had customary roots and was decentrally managed by villagers through an evolving set of rules and conventions.

Historically, the latter set of institutions stipulated that cattle-keepers could graze their cattle on any piece of land in the village that was either in fallow or had been harvested, with no need to seek permission. Use rights were acquired by virtue of group membership. At the time of the case study, the vast majority of cattle-keepers in the village depended on forages accessed from land that was registered to another homestead. Few cattle-keepers held title deeds to enough land to herd their cattle year round. In addition, the needs of optimal sequencing of land use for cultivation and grazing, and the needs of optimal use of diverse agro-ecological niches for cattle feed meant that even those cattle-keepers with a favorable ratio of land to cattle could benefit from using other villagers' land periodically.

Recently, however, the institutions that supported secondary access to others' land were being viewed by some villagers in a new light. One cattle-keeping homestead head built the first two fences in the village to protect the forages that he planted for his commercial-dairy operation. Some noncattle keeping homestead heads had started grumbling about upholding the stipulations of good neighborliness when their cattle-keeping neighbors appeared to be doing better than they were. Several such homestead heads refused to allow use of their land by their cattle-keeping neighbors.

Cattle Production

Of the village's 132 homesteads, 37 (28.0 percent) kept cattle. The average herd size was 10.5 (s. d. 9.5) animals; the range was one to 35 animals. The cattle enterprise

types in the village were the traditional subsistence-oriented multiple-output enterprise that was operated by 35 homesteads, and the new commercial-dairy enterprise that was operated by three¹ homesteads. The cattle kept by operators of multiple-output enterprises were mainly zebu (*Bos indicus*) cattle, but a few operators kept first generation zebu-dairy (*Bos taurus*) crosses. Commercial-dairy enterprise operators, in contrast, kept cattle that were at least second-generation crosses. The herds of these enterprises were small, containing only two to three animals.

The ends sought by the operators of these two enterprise types were very different. A variety of ends were sought by multiple-output enterprise operators: (1) milk for home consumption; (2) plowing; (3) milk sales; (4) savings and investment; and (5) social benefits (i.e., funeral sacrifices, bride wealth payment, and status). In fact, of the 35 multiple-output enterprises, only 6 (17.1 percent) sometimes sold milk. Operators of commercial-dairy enterprises sought profit. Of the three operators of commercial-dairy enterprises, two sold milk locally and one sold milk to a small café in Mombasa. The latter transported the milk by bicycle and public bus. There were no milk collection, refrigeration, or transportation services offered in the village.

Each cattle-keeper in the village used one or more of three types of cattle-feeding techniques: herder-grazing, tethered-grazing, and supplemental stall-feeding. For the most part, cattle-keepers maintained the same combination of cattle-feeding techniques throughout the year. They responded to seasonal variations in feed supply mainly by

¹ Although there were only 37 cattle-keeping homesteads in the village, there were 38 cattle enterprises because one homestead operated two separate cattle enterprises—one each of the two cattle-enterprise types under operation in the village.

changing the way that the techniques were used. The area usually used for cattle grazing—whether herder- or tethered-grazing—was typically less than a 30-minute walk from the homestead and within the borders of the case-study village.

Herder-grazing was used by the vast majority of the 37 cattle-keeping homesteads in the village, and it was the only cattle-feeding technique used by 19 (51.4 percent) of those homesteads. While herder-grazed, the cattle were never left unsupervised. They were guided through irregularly shaped fallow fields scattered amongst cropped fields during the cropping season, and both fallowed and harvested fields during the noncropping season. Tethered-grazing was used by 18 (48.6 percent) of the 37 cattle-keeping homesteads in the village. It was done on the same types of fields as herder-grazing; the difference being that with tethered-grazing the cattle were tethered and left unsupervised while grazing.

Stall-feeding was used as a supplement to grazing by four homesteads in the village. No cattle enterprise depended solely on stall-feeding. Three of the four homesteads that used the technique were the three operators of commercial-dairy enterprises in the village, and one was an operator of a multiple-output enterprise. Cattle were stall-fed during the morning and/or evening milking sessions. A great variety of feeds were stall-fed: (1) species of natural vegetation; (2) crop and tree by-products and residues (such as maize bran);² (3) specialized planted cattle feeds (such as Napier grass (*Pennisetum p.*) and *Leucaena l.*); and (4) specialized purchased cattle feeds (such as

² The maize bran that was used in the case-study village was a by-product of maize being pounded into flour that was used to produce *ugali*, the main staple for human consumption.

copra cake). Cattle-keepers used larger quantities of the relatively cheap bulk feeds such as natural vegetation, or if possible Napier grass, and smaller quantities of the more expensive, higher quality feeds such as maize bran, or if possible *Leucaena l.* or copra cake.

The majority of cattle-enterprise operators did not think that land scarcity was yet so acute as to necessitate the cultivation of specialized cattle feeds. Only two homestead heads—both operators of commercial-dairy enterprises—engaged in the practice. Cattle-enterprise operators chose other methods of responding to increasing land scarcity: (1) reducing the size of their herds; (2) altering their use of the herder-grazing cattle-feeding technique; and/or (3) increasing their use of the more land-use intensive cattle-feeding techniques of tethered-grazing and supplemental stall-feeding.

2. CONCEPTUAL FRAMEWORK

The objective of the research was to identify the factors that affected the transaction costs of accessing feed for different cattle enterprises and cattle-feeding techniques in the situation of techno-institutional change described above. The focus of the analysis was on the difference between the transaction costs that were theoretically possible and those that were actually internalized by the transaction partners. Collective action in the form of the establishment and maintenance of institutions used in transactions was investigated as one of the factors that could contribute to this difference. Given that the case-study village was decentrally organized, the broadest possible notions of collective action were used. One of the tested hypotheses was that variations in

transaction costs and individuals' abilities to bear those costs condition individuals' choices to adopt new cattle-feeding techniques. The factors investigated as determining individuals' abilities to bear transaction costs were personal wealth and personal networks within the village.

Transaction Costs

According to Bromley (1989), transaction costs result from the information seeking, contracting, and monitoring and enforcement activities associated with transactions. Information is needed about the benefits-cost streams to be transacted over; their ownership; and others' preferences, willingness to exchange, and trustworthiness. Contracting involves negotiating, agreeing on, and formalizing an agreement of expectation.

The incidence of costs that are actually internalized by the transaction partners may be determined by a third party, such as a sub-group of the village, the village as a whole, or the national government. This is accomplished by establishing expectations, or institutions such as conventions or entitlements (rights), about specific aspects of a transaction such as the rights of ownership of the items being transacted over and the structure of the transaction. Aspects of the structure of the transaction over which expectations can be established include the incentives for cooperation, the extent of personalization of the transaction, and the *quid pro quo* or non-*quid pro quo* nature of the transaction.

Since establishment of such expectations bears a collective cost, different types of transactions have varying degrees of support depending on the expected collective

benefit. Bromley (1989) calls transactions over commodities that receive the most collective support “commodity transactions.” If a transaction does not have collective support, transaction partners can negotiate on a one-to-one bases through “bargaining transactions,” or they can attempt to change the level of collective support through “institutional transactions” (Bromley 1989).

Commodity Transactions

The focus in this study on collective support for transactions means that the primary unit of analysis is a set of institutions that transaction partners can use to reduce the transaction costs of their commodity transactions. This set of institutions will be called a “transaction sector” in this conceptual framework. The transaction sectors that will be used in the conceptual framework are, in the first instance, derived from Ostrom’s (1986) commonly-accepted model of three commodity and transaction-sector pairs: (1) private goods and the private sector; (2) common-pool goods and the collective-action sector; and (3) public goods and the public sector. The overriding principle for assigning commodities to sectors is the collective cost of defining private rights to the commodity, which is determined by the degree of rivalry of consumption and the cost of excluding consumption of the benefit streams that emanate from the commodity. Rivalry, also known as subtractability, is when one individual’s consumption of a benefit stream subtracts from the welfare that another individual receives from consumption of that same or another benefit stream. The costs of defining property rights are low if rivalry is low. When rivalry is very low or nonexistent, there may actually not be a need to define property rights at all. If the costs of excluding consumption are low, then the costs of

protecting private rights to the commodity are low. However, rivalry and excludability are separate characteristics such that one does not determine the other.

Since private goods tend to have high rivalry of consumption and low costs of exclusion, the collective costs of defining and protecting private rights of ownership are relatively low, such that property rights are best held by an individual and transactions are sufficiently supported by the private sector. In this sector, incentives for cooperation are based on utility, and transactions are impersonal and *quid pro quo* in nature. The collective costs of defining private rights to common-pool goods characterized by high rivalry of consumption and high costs of exclusion are prohibitive, so that the appropriate sector for supporting transactions over these goods is the collective-action sector. In this sector, the collective defines itself as the holder of property rights, normative-voluntary incentives support cooperation in transactions, and transactions are not *quid pro quo*. Finally, in the case of public goods characterized by low rivalry of consumption and high costs of exclusion, the public sector, where individuals' incentives for cooperation are based on the credible threat of enforcement by the state, is the most appropriate sector.

This commonly-accepted model of commodities and sectors was adapted to the objectives of the research project and the specifics of the case-study situation as they were understood during the initial phases of the research. Since none of the feeds used by the case-study homesteads resembled public goods, the public sector was removed from the model. In addition, the focus of the research was on a process of intensification of cattle-feeding techniques that was hypothesized to necessitate a change from the use of feeds that were common-pool resources to feeds that were private resources. This meant that

the continuum between the private and the collective-action sectors needed to be fleshed out.

Whereas cooperation during transactions in the private sector rely on the utility motive, reciprocal transactions, as noted by Oakerson (1986) and Polyani (1944), are motivated by normative-voluntary incentives, and the terms of transactions are based on a personal relationship between the transacting parties. Commodities transacted over using this set of institutions lie closer to the pure private than the pure common-pool good and can be said to occupy a “reciprocal-transaction sector.” Another transaction that has been embraced in the theoretical literature as a type of collective-action sector transaction is one in which a resource is owned by a collective and normative-voluntary incentives are sufficient to insure cooperation. In this case, members receive rights of use by virtue of their position in the collective such that transactions are impersonal. Commodities transacted over using this set of institutions lie closer to the pure common-pool than the pure private good. The sector in which this type of commodity is transacted over is called the “community-transaction sector” in the conceptual framework to be used here. Thus, the model of commodity transactions that is appropriate for the research consists of three transaction sectors: private, reciprocal, and community.

In the case-study village, the individual holder of rights to cattle feed transacted in the private- and reciprocal-transaction sectors was the head of the extended-family homestead. The holder of rights to commodities transacted over in the community-transaction sector was the village as a whole. Private sector transactions were operationalized as those for which *quid pro quo* payment was necessary to access feed.

Reciprocal-transaction sector transactions were operationalized as those for which permission was needed but no immediate *quid pro quo* payment was expected.

Community-transaction sector transactions were operationalized as those for which no permission was needed to access feed.

Bargaining Transactions

There are inherently some situations in which a collective will deem the costs of supporting a transaction in the ways just described to be unwarranted. Indeed, in Sen's (1984) view, when a collective does define rights to commodities, that definition is necessarily ambiguous to some extent. This is due to the increasing cost of specificity of rights, and thus the need to apply rights to a large number of circumstances. The result of this ambiguity is that rights themselves can be represented by 'fuzzy sets' which individuals are continually making efforts to bring into focus through one-to-one negotiations. The negotiations that take place in both situations are called "bargaining transactions" by Bromley (1989).

In the conceptual framework used to guide the research presented here, "fuzzy" area of transactions over commodities is called the "gray area." The characteristics of the transaction sectors and the gray areas are summarized in Table 1. It is hypothesized that in situations of change, the gray areas temporarily increase as transaction partners' search for a scheme of cooperation leads them to attempt to stretch the application of existing institutions to new situations (Mearns 1995). Operationally, it will be determined that a commodity was transacted over in a gray area between two transaction sectors when there were important instances in which it was transacted over in both sectors.

Table 1—Sectors for commodity transactions

	Private- Transaction Sector	Gray Area	Reciprocal- Transaction Sector	Gray Area	Community- Transaction Sector
Rivalry of Consumption	High	Intermediate	Moderate	Intermediate	Low
Costs of Exclusion	Low	Intermediate	Moderate	Intermediate	High
Holder of Rights of Ownership of Commodities	Individual (Collective Member)	Individual (Collective Member)	Individual (Collective Member)	Contested	Collective
<i>Structure of Transaction</i>					
Incentives for Cooperation	Utility	Contested	Normative-Voluntary	Normative-Voluntary	Normative-Voluntary
Personal/ Impersonal	Impersonal	Contested	Personal	Contested	Impersonal
Means of Access	Pay	Contested	Ask-But-Don't-Pay	Contested	Don't-Ask

Institutional Transactions

The choice to engage in a bargaining transaction is one response to a situation in which transactions over a commodity do not have collective support. An alternative response is to engage in an institutional transaction (Bromley 1989). During bargaining transactions, transaction partners bargain on a one-to-one basis within an existing institutional structure that defines transaction sectors for commodity transactions. In the case of institutional transactions, on the other hand, individuals engage in transactions to change that institutional structure. This could mean a change in the collective definition of ownership of the resource, for example.

In this conceptual framework, the ability of collective members to engage in institutional transactions depends on their capacity for collective action and the cost of institutional transactions. The same types of transaction costs that apply to commodity

and bargaining transactions apply to institutional transactions: information-gathering, contracting, and monitoring and enforcement costs. The transaction costs of institutional transactions are determined by several factors: (1) collective members' incentives to organize; (2) the costs of organizing the collective; and (3) the difficulty of solving the transaction problems in question on a collective basis. Collective members will have stronger incentives to organize if they are unable to bear the costs of bargaining transactions and they perceive that collective action can effectively reduce the costs of commodity transactions. The ability to reduce the costs of the costs of organizing a collective has been attributed to a variety of factors: (1) homogeneity of values and beliefs (Baland and Platteau 1996); (2) homogeneity of access to the resource (wealth) (Baland and Platteau 1996); (3) multiplexity of member relationships (Mearns 1995, Singleton and Taylor 1992); (4) appropriate nesting with outside organizations (both vertically and horizontally) (Ostrom 1990); and (5) a general state of stability of expectations (Mearns 1995, Mitchell 1973).

3. METHODS

Fieldwork was conducted in three phases from November 1991 to February 1995. Knowledge gained from each phase was incorporated into the design of the following phases. The overview phase consisted of a rapid appraisal, direct observation, a case study of one homestead in the case-study village, key-informant interviewing, and an indigenous knowledge study of the farming system that focused on livestock feeds. The purpose of the village case study phase was to identify the characteristics of the village as

a collective that conditioned the transaction costs of institutional transactions. During this phase, a village census, semi-structured key-informant interviews, and single-visit questionnaire interviews were conducted. The latter were conducted with all 132 homesteads in the village, and covered the socio-economic characteristics of the homesteads and, for the village's 37 cattle-keepers, details about cattle enterprises and cattle-feeding techniques.

The final homestead case study phase focused on production behavior and commodity and bargaining transactions. Data collection methods consisted of longitudinal monitoring using questionnaires, direct observation, and semi-structured interviews. The latter were conducted weekly over 105 weeks between 1992 and 1994, with eight of the nine cattle-keeping homesteads in the village that reported use of a cattle-feeding technique that was something akin to stall-feeding. More information about those eight homesteads is provided below. Longitudinal monitoring was used to collect data on a variety of variables: (1) the cattle-feeding technique used; (2) feed utilization; (3) the source of feed item; (4) the means by which feeds were accessed; and (5) the relationship between transaction partners. A herd-following exercise was done with two of the eight participating homesteads. These two homesteads were those who grazed their herds farthest from the homestead. Herd following was done to provide a spatial understanding of herding routes as well as a check on the numbers of transaction partners reported.

CASE-STUDY HOMESTEADS

The case-study homesteads were eight of the nine³ homesteads in the case-study village that reported using something akin to the stall-feeding technique at some point during the year prior to the start of the longitudinal-monitoring exercise. During that exercise, however, only four of these homesteads actually used the technique. The homesteads were one of the five case-study homesteads that operated a multiple-output enterprise and all three of the operators of commercial-dairy enterprises in the village. The latter were the homesteads that used the technique during almost every week that they were interviewed.

The heads of these homesteads shared common socioeconomic characteristics that set them apart from the average villager, but, as is described below, they maintained greatly different local personal networks. Like 93 (70.5 percent) of the 132 homestead heads in the village, each of these three homestead heads had worked off-farm. All three were Muslims—a minority religion in the village—with greater than average sources of personal wealth. This was significant since the greater atomism of Islamic beliefs had historically been used amongst the Giriama to resist the claims of kin for assistance and to justify individual gain from production (Parkin 1972). With respect to reliance on other individual's feed sources, the three commercial-dairy operators, due to their use of the stall-feeding technique, once again shared a common fate that set them apart from the other cattle-enterprise operators in the village. As can be seen in Table 2, cattle-enterprise operators who used the stall-feeding technique relied on other individuals' feed

³ One homestead did not want to participate in the exercise.

sources in only 28.8 percent of their use-instances, while operators who used the herder- and tethered-grazing techniques relied on these sources for 59.8 percent and 43.9 percent of the weeks that they used the techniques respectively.⁴ The three operators of commercial-dairy enterprises did, however, vary in their reliance on the different sources of cattle feed, as is described below.

Table 2—Use of others’ feed sources for all three cattle-feeding techniques

		Some Use	No Use	Missing	Total
<i>(weeks)</i>					
Herder-grazing		361 (59.8)	217 (35.9)	26 (4.3)	604 (100)
Tethered-grazing		301 (43.9)	361 (52.6)	24 (3.5)	686 (100)
<i>(Use-instances)</i>					
Stall-feeding	Individuals	332 (28.8)			
	Private Businesses	247 (21.5)	552 (48.0)	20 (1.7)	1,151 (100)
	Total	579 (50.3)			

Source: Longitudinal-Monitoring Exercise July 1992-94 (Swallow 1996).

Note: Figures in parentheses show the percentage of weeks that a technique was used (for herder- or tethered-grazing) or percentage of use-instances (for stall feeding).

One of the operators of a commercial-dairy enterprise was considered by other villagers to be an outsider. This person was one of the very few non-Giriama members of the village. He was also a relative newcomer, and neither he nor any other adult male homestead member actually resided in the village. This homestead head lived in Mombasa where he had been engaged in salaried employment for 10 years prior to the

⁴ The commercial-dairy operator who also operated a multiple-output cattle enterprise used other individuals’ feed sources far more for the latter—over 90 percent of

study. While a Muslim, he used his English name, suggesting a Westernized image. He had in fact attained one of the highest levels of formal education of the village's members. All of these factors limited his personal network within the village. As a result, this cattle-enterprise operator rarely used cattle feeds obtained from other individuals. As can be seen in Table 3, he relied on feed produced on his own land, which included Napier grass, for 71.9 percent of his use-instances, and on private businesses for 22.4 percent. Although his use was minimal, he did purchase some specialized feeds. Thus, this enterprise operator obtained feed from other individuals in only 4.0 percent of his use-instances. For the remainder of this report, he will be called the "self-reliant outsider."

The second operator of a commercial-dairy enterprise, while an insider to the village, placed himself too far above others to be accepted within the village. He did this by creating an image of himself as a model cattle-keeper. He was frequently visited by extension agents, and had successfully attempted many of the innovations presented to him, including the raising of a pure dairy cow and the cultivation of specialized cattle feeds—Napier grass and *leucaena l*. He also used some specialized-purchased feeds. The infrastructure for his cattle enterprise was the most extensive of any homestead in the village. His was the only homestead in the village that owned a donkey—useful in transporting the substantial quantities of water required by pure dairy cattle. The head of this homestead also showed his dairy cow at the provincial agricultural show. The extent of this homestead head's personal network within the village was limited not only by this

weeks—than the former enterprise, which suggests that this practice is not individual

reputation, but also by the fact that a good portion of his land—the portion used for cultivating specialized cattle feeds—was fenced such that other cattle-keepers could not use it. The jealousy of his neighbors caused them to spread rumors that he was crazy to take land out of food for humans, and put it into feed for cattle. His neighbors also thought that his use of a formal-sector loan to purchase his pure dairy cow was too risky. As can be seen in Table 3, this homestead head relied on his own sources of feed for 42.1 percent of his use-instances, and on private businesses for 29.2 percent, leaving 26.4 percent of use-instances in which feed was obtained from other individuals. This homestead head will be called the “model cattle-keeper.”

Table 3—Source of stall-fed feed items by homestead, percentage use-instances

	Private Businesses	Other Individuals	Own	Missing	Total
Multiple-Output Enterprise Operator	0	110 (78.0)	31 (22.0)	0	141 (100)
Self-Reliant Outsider	67 (22.4)	12 (4.0)	215 (71.9)	5 (1.7)	299 (100)
Model Cattle-keeper	145 (29.2)	131 (26.4)	209 (42.1)	12 (2.4)	497 (100)
Moderate Innovator	35 (16.4)	79 (36.9)	97 (45.3)	3 (1.4)	214 (100)
Total	247 (21.5)	332 (28.8)	552 (48.0)	20 (1.7)	1,151 (100)

Source: Longitudinal-Monitoring Exercise July 1992-94 (Swallow 1996).

The third operator of a commercial-dairy enterprise started his enterprise after first successfully establishing his multiple-output enterprise. This enterprise was, in fact, based on one of the largest herds of cattle in the village. This homestead head had an extensive personal network within the village because he maintained an image of being

specific, but rather enterprise and technique specific.

one of the villagers, and he had more moderate investment in and success with his dairy enterprise. Although he was a Muslim, he used his Giriama name. He had no formal education and had worked off-farm for only six years. The very fact that he kept zebu cattle contributed to his image of being like the others in the village. No infrastructure was used for the commercial-dairy enterprise, no forages were planted, and only a negligible amount of specialized-purchased feeds were used. As can be seen in Table 3, this cattle-enterprise operator's reliance on his own feed sources—45.3 percent of his use-instances—was about the same as that of the model cattle-keeper, but he obtained feeds from private businesses in only 16.4 percent of his use-instances, and from other individuals in 36.9 percent of use-instances. This homestead head will be called the “moderate innovator.”

4. COMMODITY AND BARGAINING TRANSACTIONS

COLLECTIVE SUPPORT FOR COMMODITY TRANSACTIONS

Collective support for transactions over cattle feed that took place in one of the collectively-defined transaction sectors came in the form of a set of expectations about ownership rights and the structure of the transaction in terms of incentives for cooperation, the extent of personalization of the transaction, and the *quid pro quo* or non-*quid-pro-quo* nature of the transaction. Rights of ownership of feed sources were based on the principle that individuals owned the product of their labor. This principle led to the traditional belief that fallow growth belonged to God (Mkangi 1975) since he was its producer. Two types of collectively-sanctioned incentives were used in transactions:

utility and normative-voluntary incentives. Sanctioning of utility, or the merits of personal gain, as an incentive came in the form of a commonly-held belief that individuals should reap the benefits of their labor. Normative-voluntary incentives included beliefs about good neighborliness, an ethos of sharing, and expectations of the rights and duties of personal relationships, especially those of agnates, affines, and matrilineal kin. Desirable behavior was encouraged through complements, the greatest of which was the ability to help others in need. Undesirable behavior was discouraged through diffuse infliction of guilt and shunning of errant individuals.

In general, information-gathering costs were reduced through the creation of reputations and gossip, as well as the existence of multiple spheres of interaction of villagers. Contracting costs were reduced through the maintenance of expected contracting procedures such as the use of witnesses. Enforcement costs were reduced through the use of fines, the sanctioning of some types of right-holder enforcement (such as certain uses of physical force), and stipulations against theft and physical violence. In extreme cases, support for enforcement could be found through *ad hoc* councils of village elders or the national government via the subchief.

Herder- and Tethered-Grazing Techniques

Transaction Sectors. Understanding of the appropriate sector for collective support of herder- and tethered-grazing transactions can be gained through examining the physical-technical characteristics of land in the case-study village at the time of the study. As was described above, intensification of land use had gradually increased to the point that competition over use of fallow growth for crop production and cattle enterprises was

beginning to be evident such that rivalry over land-based benefit streams was rising.

With respect to the costs of excluding use of land for grazing, since only two of the plots in the village were fenced, the costs to landowners of physically excluding others' use was prohibitive. Thus, the least-cost area of collective support for transactions to access land for herder- and tethered-grazing was the gray area between the community- and the reciprocal-transaction sectors.

Data from the longitudinal-monitoring exercise support this finding. As can be seen in Table 4, others' land was accessed without seeking permission during the majority of the weeks that others' land was used by the eight case-study homesteads for herder- and tethered-grazing. However, it was accessed with permission but without payment during a significant minority of those weeks. The relative position of transactions for the two techniques within this gray area is indicated by the different preference for use of impersonal⁵ relationships for the two techniques. Since most of the case-study homesteads had personal relationships with most of the homesteads within the usual grazing area, the result shown in Table 4, that the percentage use of personal and impersonal relationships was equal for the herder-grazing technique, suggests that the case-study homesteads actually preferred to use impersonal relationships for herder-grazing transactions. After all, by definition, an impersonal relationship meant that these homesteads were ones with which cattle-keepers did not relate in any other sphere of interaction, such that retaliation for unfavorable behavior was less likely than in personal

⁵ Personal relationships were relationships defined by respondents as that of relative, friend, or neighbor.

relationships. This meant that herder-grazing transactions took place closer to the community- than to the reciprocal-transaction sector. The homesteads that used the

tethered-grazing technique, on the other hand, appeared to be indifferent about the degree of personalization of the relationship with the landowner since the percentage use of impersonal relationships more closely reflected the percentage of those relationships in the usual grazing area.

Table 4—Means of access to others' feed sources by relationship with the feed owner for all three cattle-feeding techniques

		Pay	Ask-No-Pay	No-Ask	Missing	Total
		<i>(weeks)</i>				
Herder-Grazing	Impersonal ^a		22	164	0	186
			(41.5)	(53.2)		(51.5)
	Personal		31	144	0	175
			(58.5)	(46.8)		(48.5)
SubTotal		53	308	0	361	
		(100)	(100)		(100)	
Tethered-Grazing	Impersonal	0	23	85	0	108
			(47.9)	(35.4)		(35.9)
	Personal	13	25	155	0	193
		(100)	(52.1)	(64.6)		(64.1)
SubTotal		13	48	240	0	301
		(100)	(100)	(100)		(100)
Stall-Feeding ^b (Use-Instances)	Impersonal	52	21	23	0	96
		(67.5)	(13.7)	(24.7)		(28.9)
	Personal	18	131	70	1	220
		(23.4)	(85.6)	(75.3)	(11.1)	(66.3)
Missing	7	1	0	8	16	
	(9.1)	(0.7)		(88.9)	(4.8)	
Sub-Total		77	153	93	9	332
		(100)	(100)	(100)	(100)	(100)
		(23.2)	(46.1)	(28.0)	(2.7)	(100)

Source: Longitudinal-Monitoring Exercise July 1992-1994 (Swallow 1996)

Notes: figures in parentheses refer to percent of weeks that a technique was used, or percent of use-instances, with column percentage above row percentage.

^a Personal relationships were relationships defined by respondents as that of relative, friend, or neighbour.

^b These figures include only cases in which other individuals' feeds were used. They do not include cases in which private businesses' feeds were used.

The single exception to the finding that transactions over land for herder- and tethered-grazing took place in the gray area between the community- and reciprocal-transaction sectors, was the case of these transactions when undertaken by operators of commercial-dairy enterprises. These operators were twice as likely as operators of multiple-output enterprises to seek permission for the use of tethered-grazing spots. The only cattle-keeper who made *quid pro quo* payments for tethered-grazing spots was the operator of the commercial-dairy enterprise who made the most profit from his enterprise—the model cattle-keeper. Thus, tethered-grazing transactions by commercial-dairy enterprise operators took place in the gray area between the private- and the reciprocal-transaction sectors.

Bargaining Transactions. The position of herder- and tethered-grazing in the gray area between the reciprocal- and community-transaction sectors meant that cattle-keepers bargained with landowners regarding which of the two sets of expectations they would use to guide their transactions. Cattle-keepers' interests were largely to use the expectations of the community-transaction sector, whereas landowners' interests were to use the reciprocal- or, in the case of tethered-grazing by commercial-dairy operators, private-transaction sector. This type of bargaining was more reactive than proactive, however, in that a cattle-keeper would for the most part assume use of the community-transaction sector, and wait for a response, if any, from the landowner. Given the existing institutional structure, the burden of changing the situation rested on the landowner.

There were, however, some unique interests of cattle-keepers who used the tethered-grazing technique, as well as those who operated commercial-dairy enterprises.

For users of tethered-grazing, the reciprocal-transaction sector did offer some benefits in that, if a request had been made for use of the land, the cattle were more likely to be observed by members of the landowner's homestead while being tethered. This reduced the likelihood that they would get loose and damage crops, which would result in conflict and fines. There was also a greater assurance that the cattle would not be harmed while they were grazing. Also, if use was based on permission, a contract for exclusive access could be established. The moderate innovator negotiated one such contract. For commercial-dairy operators, the profitability of their operations meant there was greater value attached to a reliable supply of tethering points, and a greater cost of harm done to cattle.

Cattle-keepers used several methods to capture as much bargaining power as possible. First, cattle-keepers guarded the historical precedent stipulating that others' fallowed and harvested fields were open for grazing by all, such that transaction over this use belonged in the community-transaction sector. Second, much effort was invested in establishing reputations as assertive cattle-keepers. The moderate innovator reported that he had to keep landowners accustomed to the idea that he would use their land unless they made it clear that they would stop him. He did this by routinely returning to the fields of homestead heads who asked him to leave. He continued to do this unless these landowners asked him to leave more than three times or threatened to use force. And, third, cattle-keepers developed tit-for-tat relationships such that, if a cattle-keeper asked another cattle-keeper's herder to leave his land, the offended cattle-keeper would

reciprocate. The moderate innovator had several tit-for-tat relationships with other cattle-keepers.

Noncattle keeping homesteads would stand to gain the most if access to their land were brought into the reciprocal- or private-transaction sectors. However, given the low-but-increasing level of intensity of land use described above, this interest was not very strong and the costs of acting on it could be great. On top of the actual costs of monitoring and enforcement that would be required to exclude unwanted use, there would be the social cost of going against the traditional norm of good neighborliness. Since most cattle-keepers had no choice—short of reducing their herd sizes—but to use the land of other villagers, this norm provided social pressure to support their access to others' land. In addition, almost every villager aspired to own cattle one day, and would want these norms to apply to themselves. A final cost was the possibility that beneficial relations with trespassing homesteads in one of the other spheres of interaction in this multiplex society would be curtailed. These norms tended to prevail over national ideologies of private land ownership, particularly in transactions between villagers who were not engaged in a commercial enterprise.

Even given these costs, if a landowner chose to defend his interests he could do so by fiercely protecting his land. He could do this by complaining to the local government representative—the subchief—or consistently or fiercely asking herders to leave his land. In one case, the moderate innovator's herd was chased away by a machete-wielding landowner. In the case of tethered-grazing, landowners' had several unique factors in their favor. Since exclusion was less costly, the overall cost of contracting was less than

with herder-grazing. With tethered-grazing, incidences of trespassing were less costly to detect, and information about the owner of the cattle was easier to obtain. Enforcement was easier in that cattle could potentially be removed or harmed by the landowner since they were left unsupervised.

Stall-Feeding Technique

Transaction-sectors. Given their variety of physical-technical attributes, stall-fed items were transacted in a variety of sectors and gray areas. The feed items that were transacted in the private-transaction sector were copra cake and maize bran. Both items were obtained exclusively by *quid pro quo* payment. Copra cake was exclusively purchased from private businesses. Use of the private-transaction sector for transactions over maize bran was consistent with its physical-technical attributes. Since it was a by-product of human food preparation within the homestead, it had near zero physical-technical costs of exclusion. However, it did have an opportunity cost since it was used as a feed in the poultry enterprises that were operated on a subsistence basis by the majority of homesteads in the village. The preference for the use of impersonal relationships in maize transactions, which is shown in Table 5 to account for 78.6 percent of the instances in which maize was used, is striking given the prevalence of personal relationships within the village. Maize was also the only feed obtained from individuals that was frequently purchased from non-case-study villagers.

Table 5—Means of access to other individuals' stall-fed items by feed-type category and relationship to the feed owner

		Pay	Ask- No-Pay	No-Ask	SubTotal	Missing	Total
Maize Bran	Impersonal ^a	55 (78.6)	0	0	55 (78.6)	7 (10.0)	70 (100)
	Personal	8 (11.4)	0	0	8 (11.4)		
Banana Pseudo- Stems	Impersonal	7 (24.1)	2 (6.9)	0	9 (31.0)	1 (3.4)	29 (100)
	Personal	0	19 (65.5)	0	19 (65.5)		
Planted Feeds	Impersonal	0	0	0	0	0	4 (100)
	Personal	0	4 (100)	0	4 (100)		
Misc. Crop and Tree Residue ^b	Impersonal	0	2 (33.3)	0	2 (33.3)	0	6 (100)
	Personal	0	4 (66.7)	0	4 (66.7)		
Natural Vegetation & Maize Stalks	Impersonal	0	18 (8.1)	23 (10.3)	41 (18.4)	9 (4.0)	223 (100)
	Personal	0	103 (46.2)	70 (31.4)	173 (77.6)		
Total		70 (21.1)	152 (45.8)	93 (28.0)	315 (94.9)	17 (5.1)	332 (100)

Source: Longitudinal-Monitoring Exercise July 1992-1994 (Swallow 1996).

Notes: Figures in parentheses refer to percent of use-instances.

^a Personal relationships were relationships with relatives, friends, or neighbours.

^b Miscellaneous crop and tree residues and by-products include cassava leaves/peels, mango leaves, maize husks, and potato peels.

As miscellaneous crop and tree residues, and by-products and planted feeds were the only items obtained exclusively by asking-but-not-paying, they were the only items that were transacted over in the reciprocal-transaction sector. However, as can be seen in Table 5, there were only 10 instances in which transactions over these items were actually undertaken. More often, they were obtained from cattle-keepers' own sources. Use of the reciprocal-transaction sector for transactions over miscellaneous crop and tree

residues and by-products was consistent with these items' moderate rivalry of consumption and lack of opportunity cost. The physical-technical costs of excluding others' use of mango and cassava leaves were theoretically high as these plants were often far from homestead buildings. Once the plants were harvested, the costs of excluding others' use of maize husks, cassava peels, and potato peels was near zero as these items were by-products of crop processing that took place within the homestead. However, the self-reliant outsider did report a problem of theft of parts of maize and cassava plants. Planted feeds' high rivalry of consumption indicated that they would be most appropriately transacted over in the private-transaction sector, even though they were characterized by relatively high physical-technical costs of exclusion. Their exchange in the reciprocal-transaction sector during the longitudinal-monitoring exercise can be explained by the precedence of the particular relationship—that of matrilineal kin—between the transaction partners which may have carried more weight in determining the sector for these transactions than physical-technical characteristics. A summary of the analysis of the transaction sectors used to support transactions over feed sources used in all three cattle-feeding techniques can be seen in Table 7.

Table 7—Means of access to others' feed sources for all three cattle-feeding techniques by transaction sector

	Private- Transactio Sector (Pay)	Gray Area	Reciprocal Transaction Sector (Ask-No-Pay)	Gray Area	Community- Transaction Sector (No-Ask)
Herder-grazing				✓	
Tethered-grazing		✓ ^a		✓	
<i>Stall-feeding</i>					
Copra cake and Maize bran	✓				
Banana Pseudo-stems		✓			
Planted feeds			✓		
Misc. crop & tree residues & by-products ^b			✓		
Natural vegetation & maize stalks				✓	

Source: Longitudinal-Monitoring Exercise July 1992-94 (Swallow 1996).

^a This gray area was used by one commercial-dairy enterprise only.

^b Miscellaneous crop and tree residues and by-products include cassava leaves/peels, mango leaves, maize husks, and potato peels.

Bargaining Transactions. Banana pseudo-stems, natural vegetation, and maize stalks were the stall-fed items that were transacted in institutional gray areas such that bargaining transactions were used to access them. In general, with bargaining transactions for stall-feeding, enterprise operators were more pro-active than with transactions for the herder- and tethered-grazing techniques, even when the feed items used were the same, as with natural vegetation and maize stalks. Bargaining transactions over stall-fed items were differentiated by several factors: (1) the physical-technical characteristics of the feed item; (2) seasonal scarcity of feeds; (3) the enterprise type; (4) the degree of commercialization of the cattle enterprise; and (5) the enterprise operator's personal networks.

The high degree of rivalry of consumption and low costs of exclusion of banana pseudo-stems favored the use of the private-transaction sector. However, their zero

opportunity cost meant that they were transacted in the reciprocal- or community-transaction sectors except during the dry season when banana pseudo-stems were one of the only feed items available. This was the season when they were purchased by the self-reliant outsider who did not have many personal relationships in the village. As can be seen in Table 5, banana pseudo-stems were obtained by asking-but-not-paying in 72.4 percent of the instances in which others' sources of them were used; and, in 65.6 percent of these instances, personal relationships were used for transactions.

As can be seen in Table 5, natural vegetation and maize stalks accounted for the vast majority of use-instances⁶ in which stall-fed items were obtained from other individuals, and they were the only stall-fed item obtained without permission. These feeds' rising opportunity cost in terms of lost benefits to the farming system and high costs of exclusion were the context of the bargaining transactions. Cattle-keepers who used the stall-feeding technique were less likely than those who used the two other techniques to obtain natural vegetation and maize stalks without permission. As can be seen in Table 5, cattle-keepers who used the stall-feeding technique obtained these feed items without permission in 41.7 percent of the instances in which others' sources of them were used. As can be seen in Table 4, the comparable figure for cattle-keepers who used the other two techniques was an average of 82.5 percent of the relevant weeks. In addition, cattle-keepers who used the stall-feeding technique were less likely to use

⁶ One use-instance is one instance of use of a feed item by one homestead at least once during one week. Since no long-term storage of feeds was practiced in the case-study village—with the exception of feeds purchased in bulk from private businesses—an instance of use of another individual's feed item corresponded roughly to an instance of transaction over that feed item.

impersonal relationships in transactions over natural vegetation and maize stalks. As can be seen in Tables 5 and 4, whereas cattle-keepers who used the stall-feeding technique used impersonal relationships to access these feeds in 18.4 percent of the instances in which others' sources of the feeds were used, cattle-keepers who used herder- and tethered-grazing used impersonal relationships to access these feeds in an average of 36.8 percent of the relevant weeks. This greater reliance on personal relationships to access natural vegetation and maize stalks from other individuals for stall-feeding meant that a more extensive personal network was needed.

When the degree of commercialization of a cattle enterprise was analyzed, it was found to influence the cost of transactions for stall-fed items. The operator of the single multiple-output enterprise who used stall-feeding accessed feed through distinctly different means than the two operators of commercial-dairy enterprises who made consistent use of others' feed sources for stall-feeding—the model cattle-keeper and the moderate innovator. As can be seen in Table 6, the operator of the multiple-output enterprise used feed items without seeking permission in 50.0 percent of the instances in which he used others' feed sources, and he never paid to use a feed item. The two operators of commercial-dairy enterprises, in contrast, used feed items without seeking permission in an average of only 18.1 percent of the instances in which they used others' feed sources, and they paid to use feed items an average of 31.9 percent of those instances. The tradition of allowing the village's cattle-keepers access to natural vegetation and maize stalks without permission was called into question when these feeds were used in a nontraditional

technique, especially if that technique was used exclusively to make profit as the commercial-dairy operations were.

The personal network of the cattle enterprise operator was another factor related to means of access to the feed items used in the stall-feeding technique. Given his limited local personal network, coupled with his relatively sufficient personal wealth, the self-reliant outsider only used three other villagers' feed sources, and he only used them during the severe dry season. As can be seen in Table 6, this enterprise operator paid in 66.7 percent of the instances of use of these feed items. The model cattle-keeper, while an insider in the village, had a limited local personal network and therefore less bargaining power with his neighbors. He also had less land than the self-reliant outsider did. As a result, he was the only cattle-enterprise operator who paid for tethered-grazing spots. This commercial-dairy operator relied on private businesses for 29.2 percent of his use-instances. As can be seen in Table 3, he only relied on feed obtained through transactions with other individuals for 26.4 percent of his use-instances, and, as can be seen in Table 6, he paid for the feeds in 35.9 percent of those use-instances.

Table 6—Means of access to other individuals' stall-fed items by homestead

	Pay	Ask-No-Pay	No-Ask	Missing	Total
Multiple-Output Enterprise Operator	0	55 (50.0)	55 (50.0)	0	110 (100)
Self-Reliant Outsider	8 (66.7)	3 (25.0)	0	1 (8.3)	12 (100)
Model Cattle-keeper	47 (35.9)	62 (47.3)	20 (15.3)	2 (1.5)	131 (100)
Moderate Innovator	22 (27.8)	33 (41.8)	18 (22.8)	6 (7.6)	79 (100)
Total	77 (23.2)	153 (46.1)	93 (28.0)	9 (2.7)	332 (100)

Source: Longitudinal-Monitoring Exercise July 1992-94 (Swallow 1996).

Note: Figures in parentheses refer to percent of use-instances.

The moderate innovator had personal networks and thus more opportunities to use multiplex relationships as sources of bargaining power. He was also highly motivated to use his personal networks for this purpose since he had less personal wealth than the other commercial-dairy enterprise operators. He was able to gain more access to other villagers' feed sources outside of the private-transaction sector than the two other operators of commercial-dairy enterprises. As can be seen in Table 3, while this homestead head relied on his own feed sources about as often as the model cattle-keeper, he only relied on private businesses for 16.4 percent of his use-instances and he was able to use other individuals' feed sources in 36.9 percent of his use-instances. In addition, as can be seen in Table 6, he only paid for stall-fed feed items in 27.8 percent of the instances in which he used other individuals' feeds.

5. INSTITUTIONAL TRANSACTIONS

In the previous section, it was determined that at the time of the study many of the transactions over cattle feed in the case-study village were conducted through bargaining transactions in the gray areas between the three collectively-defined transaction sectors. This was the case for all transactions over feed sources for herder- and tethered-grazing, and, as can be seen in Table 5, it was the case for 75.9 percent of the instances of use of other individuals' stall-fed items. That such a large number of transactions took place in the institutional gray areas can be attributed to the situation of techno-institutional change in the village at the time of the study. In that situation, expectations about the sectors that

should be used to support transactions over some feed items had become dislocated. It is likely that bargaining transactions in these gray areas would, through repetition, create new collective expectations about the transaction sectors to be used for specific feed items and techniques. This is one means of changing collective expectations, or engaging in institutional transactions.

Centralized and more direct means of undertaking institutional transactions were not likely given the high transaction costs of organizing the village. These transaction costs were increased by village members' heterogeneity of values and beliefs about legitimate principles of leadership and processes for making collective choices. The main source of this heterogeneity lay in the religious make-up of the village: 41.7 percent of the villagers followed the more atomistic religions of Christianity and Islam (Swallow 1996). These atomistic beliefs presented a challenge to the legitimacy of the local leadership of homestead heads, the principles of social organization of gerontocracy and ascription based on Giriama custom, and Giriama views of land ownership.

The village's cost of institutional transactions was increased by the way that it nested organizationally with the national government. The national government involved itself in some local issues, but it did not involve itself in others; and, the distinction between the two was not clear to villagers. The national government provided an alternative, competing forum for dispute settlement and decision enforcement with respect to land ownership. Individuals could choose their forum and change forums if their first choice resulted in an unfavorable outcome (Spear 1978). Government officials were involved in keeping order by enforcing national laws and implementing public

policy, but they neither effectively involved themselves in the day-to-day management of local resources nor delegated authority to the local level (Waijenberg 1994). The national government lacked the resources and legitimacy to be effective in securing local expectations and in monitoring and enforcing laws and policies. Yet, lack of delegation of authority to the local level meant that there was confusion about which collectives' domain encompassed local resource management. Poorly defined and overlapping roles between local authority and the national government, as well as changes in land scarcity and commercialization contributed to a generalized state of instability of expectations about access to land-based resources in the village.

Finally, differences in production interests as well as personal sources of power—in terms of personal wealth and personal networks—made it difficult to create institutions to govern transactions over cattle feeds in particular. Those homestead heads with larger holdings of land and cattle were better equipped to engage in commercial production. While the remaining homesteads had a subsistence orientation (Thorpe et al. 1993), dependent on remittances to purchase the staple, maize meal, during the highest scarcity times of the year (Waijenberg 1994). Personal sources of power were becoming more heterogeneous through conversion to one of the world religions and unequal access to education, income through off-farm employment, and the national governmental system.

6. CONCLUSIONS

The study found that, contrary to the pessimism reported in the empirical literature, cattle-keepers in the case-study village were intensifying their use of cattle-

feeding techniques; however, they took different routes than anticipated. It was anticipated that cattle-keepers would respond to the need to intensify land-use with complete confinement of cattle, self-reliance in cattle feed, and use of the private sector for transactions. Particularly, it was anticipated that cattle-keepers would plant forages. However, amongst the villagers' varying responses to the need to intensify land use, the common thread was the choice of a middle road of marginal, step-wise change rather than the radical change that was anticipated.

At the village's low-but-rising level of intensification of land use, alternatives to complete self-reliance in feed were available: feed could be obtained from other villagers through secondary means. Use of these feed sources had the disadvantages of providing less nutrition and requiring higher transaction costs, but it also required lower inputs in terms of land, labor, and cash than the recommended feeds. Cattle-enterprise operators blended their use of the traditional, less intensive cattle-feeding technique of herder-grazing with the more intensive techniques and different types of feeds, which resulted in different levels of transaction costs. This choice of a marginal, step-wise style of technical change enabled learning on both the technical and institutional fronts.

Although the common thread was the choice of the middle road, the three cattle-keepers who had come the farthest along the road of intensification at the time of the study did so by making use of their varying sources of personal wealth and networks. The two cattle-keepers with the greatest sources of wealth but the most limited personal networks within the village were the least successful in their bargaining transactions with other villagers, but they could afford to rely on either their own resources or the private-

action sector. The cattle-keeper with the least sources of personal wealth but largest personal network relied the most on secondary access to other villagers' feed sources, and he was able to use his personal network to bargain for favorable access to that feed. Contrary to the usual view of collective action as an organized effort, it was the cumulative effect over time of separate, one-to-one bargaining transactions of these cattle-keepers with their fellow villagers that constituted collective action in the context of this loosely organized village.

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