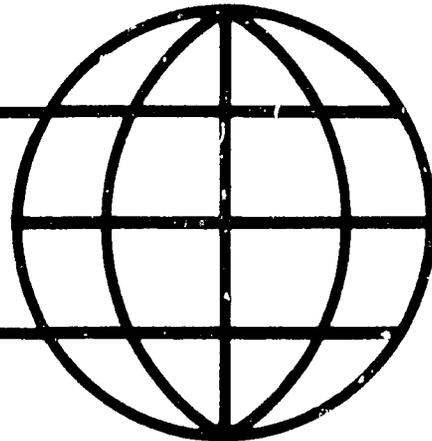


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**COOPERATIVE AGREEMENT ON HUMAN SETTLEMENTS  
AND NATURAL RESOURCE SYSTEMS ANALYSIS**

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REGIONAL ANALYSIS  
AND  
FARMING SYSTEMS RESEARCH

by

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Cooperative Agreement on Settlements and Natural Resource  
Systems Analysis

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"The micro-macro linkages...are very important but they remain the weakest part of FSR (farming systems research) programs. Because FSR programs concentrate on individual farming families, it is very difficult operationally or even conceptually to link evaluation from the societal point of view to evaluations for individual farming families" (Gilbert et al. 1980:42).

Interest in improving smallholder agricultural systems in the developing countries increased considerably in the 1970s and early 1980s. In part, concerns for equity and the "poor majority" swayed programs toward small farm enterprises, rather than large, highly capitalized farms. The present approach to farm family development emphasizes a decentralized strategy, one which argues for a "micro-orientation" (Norman et al. 1982:4) in agricultural research and in the application of new technologies. The impetus for such an orientation stems from the dissatisfaction with strictly commodity-oriented agricultural research, especially that focused on off-farm experiment station trials. Often the technologies developed on the research stations were not appropriate to address the constraints and needs of smallholder agriculture. As a result, they were unsuccessful in diffusing results to the farm family. The current wisdom in agricultural research emphasizes, inter\_alia, understanding the local farming system, promoting on-farm demonstrations, and working closely with the farm family to identify its priorities and needs. This approach to agricultural research and

development has become synonymous with "farming systems research" (Baker et al. 1983; Gilbert et al. 1980; Shaner et al. 1982).

The present paper reviews the conceptual framework for farming systems research, and suggests that it must pay more attention to processes and variables which originate beyond the individual farm or community. It is argued that regional analysis modified to incorporate production data can achieve this by: (1) addressing farm-level constraints which can only be properly understood at a regional level; and (2) providing a unit of analysis where macro/structural issues that affect the small farmer can be examined. The approach derives support both from recent field studies in economics and economic anthropology that indicate the difficulties of understanding farmer decision-making without placing it within a larger political economic context (Berry 1984; Deere and de Jainvry 1979; Wood 1981), and from FSR practitioners who advocate assessments of micro/macro linkages in farming systems studies (Behnke and Kerven 1983; Eicher 1980; Gilbert et al. 1980). Case studies from Africa are used to highlight this region-based model. It is shown that in the context of increasing production diversification (including non-farm activities) and articulation with larger spatial and political entities, the regional framework provides important insights into causes and processes of change in local production systems.

## Defining the Appropriate Concepts

Definitions of the farming systems approach are many.<sup>1</sup> In most cases, they include the following elements (based on Baker et al. 1983:2-3; Gilbert et al. 1980:2-3): (1) it is a holistic approach that views the farm family in relation to its total environment (both physical and social); (2) it focuses on the goals of the farm family and the constraints it faces; and (3) it evaluates the farming system in its entirety, as well as assessing the linkages among its sub-systems (e.g., cropping and livestock sub-systems). These characteristics are used to elaborate a farming systems model based on the farm family or household.<sup>2</sup> This paradigm, in turn, identifies farm-level constraints that need to be eliminated. Although there are no clear cut boundaries between the different stages of the farming systems approach, there tends to be a distinction between the research and extension stages. The diagnostic and design stages, on the one hand, are data collection oriented; while the testing and extension phases are focused on the actual transfer of recommendations and technology to the farmers.

Farming systems models, as reflected in most FSR work, divide socioeconomic variables into those that are under the control of the household (endogenous variables) and those external to it (exogenous variables). The emphasis in FSR is on analyzing the former set of variables (e.g., land, labor and capital), since they are assumed to be more easily defined and of immediate concern to farm decision-makers. Exogenous variables, which include marketing and non-farm employment activities, are

addressed, but because they are considered to be beyond the control of the farm family are given less attention. It will be shown later in the paper that FSR's theoretical framework focused on the individual farm enterprise permits only token consideration of these factors.

Similar to other systems-oriented models, the question of boundary delineation in FSR studies is critical. While most attention has focused on problems of defining an appropriate production unit (Behnke and Kerven 1983; Haugeraud 1982; Richards 1983), the delineation of the external environment is equally important. In other words, what is the spatial or areal context in which the farming system is located? The question is usually treated inconsistently in FSR, with in some cases ecological and climatic criteria defining boundaries (University of Chiang Mai 1980); in others enclosure is according to spatial distance from markets (Norman et al. 1982); and still in others delineation is made according to those "farmers who are homegenous with respect to their traditional cropping systems" (Hildebrand 1977:8). Thus on the one level emphasis is on the household; while on another level the aggregation of these units is addressed. When it comes to analysis, however, the difficulty of integrating these levels surfaces when household resource allocation is examined using a farming systems framework. For example, in their otherwise excellent study of a Nigerian farming system, Norman et al. (1982:108) frequently are confronted with the reality that "analysis of endogenous (household) influences is complicated by influences that are exogenous in nature". While they analyze non-household data, including regional marketing and non-farm

employment, the authors fail to demonstrate a framework for integrating these with their production data because of their reliance on the family farm model.

The understanding of interrelationships between components of the system--however defined--is integral to the FSR approach. However, analysis of systemic relationships usually is limited to different dimensions of the farm itself. In discussing the conceptual framework for farming systems research, Shaner et al. (1982:67-68) point to "interactions within the system" that include the interplanting of crops, the integration of sheep and cattle on the same pasture unit, and the on-farm integration of livestock and crops. He uses a model (based on McDowell and Hildebrand 1980), in turn, that lumps all off-farm variables under one category, 'markets', and essentially describes the interrelations between on farm livestock and crop production. This emphasis in FSR on interactions between components on the farm, particularly between different crop enterprises, accounts for its strong identity with the study of multiple cropping.

Regional analysis, in contrast to the above, deals mainly with linkages between the farm and different levels in the market hierarchy up to the regional town. Considerable attention is given to the elaboration of central places and settlement hierarchies, market periodicity, commodity flows, and economic linkages between sectors (e.g., agriculture and transportation) (Christaller 1966; Plattner 1975; Skinner 1976). Regional analysis is concerned with placing the production system in its spatial, historical and political contexts. While the focus

usually is on economic phenomena, social factors can be examined using the regional perspective (see Smith 1976a).

The delineation of boundaries also is critical for regional analysis. While region is a concept used increasingly by anthropologists and other social scientists, rigorous definitions of it are few. In many cases, arbitrary regional/administrative boundaries are employed which may have little relation to on-going social and economic processes. For the purposes of this paper, I treat it as an analytical unit which has boundaries defined according to the problem (s) addressed. A region then "is an area with a distinctive character identified by one or more spatially differentiating features" (Folke 1972:443), and which often serves to mediate between local-level and macro-level processes (Smith 1976b:6). While this definition allows for a hierarchy of regions--for example, micro-region, sub-region, macro-region, and global region--with very different scales associated with each, in this paper sub-national regional units will be emphasized.

How can the concept of region be utilized in farming systems research without neglecting farm-level variables? Can regional data (for example, on marketing or labor flows) be integrated with domestic production data, rather than treated as analytically distinct or opposed? The incorporation of the regional concept in farming systems research is best achieved when the research agenda is framed within a local production context. In such cases, a farm-level problem (s) (e.g., critical labor shortages, or inadequate capital resources) is identified and the regional dimensions of the constraint are addressed. The

production constraint is used as the entry point in the analysis. This problem-oriented approach is at the core of farming systems research (Norman et al. 1982). However, my perspective differs from the latter in that the production problem is traced to the regional level. In this case, regional analysis is used to elucidate a local farming issue, not to analyze an entire regional economy.

### An Analysis of a Production System in a Regional Context: A Case Study

Empirical applications of the region-based approach in farming systems research are relatively few (see Hart 1980; 1981). Here I discuss in some detail how the regional analytic framework was employed to highlight production constraints in the Baringo District of northern Kenya (see Figure 1). The data are drawn from eighteen months fieldwork (1980-81) by the author, and while they are specific to Baringo, the results are likely to be applicable to other areas of Africa.

THE RESEARCH SETTING. Baringo is characterized by steep environmental gradients similar to most regions of Eastern Africa's Rift Valley. Altitude ranges from over 2,500 meters in the western part of the District to less than 1,000 meters in the semi-arid areas of the north, with variation being most dramatic on the eastern and western edges of the Tugen Hills, where in some locations elevation drops 1,500 meters over a distance of fifteen kilometers. Production systems in the region vary, to some extent, according to this gradient; that is, the most sedentary crop-based systems are found at the highest elevations, while

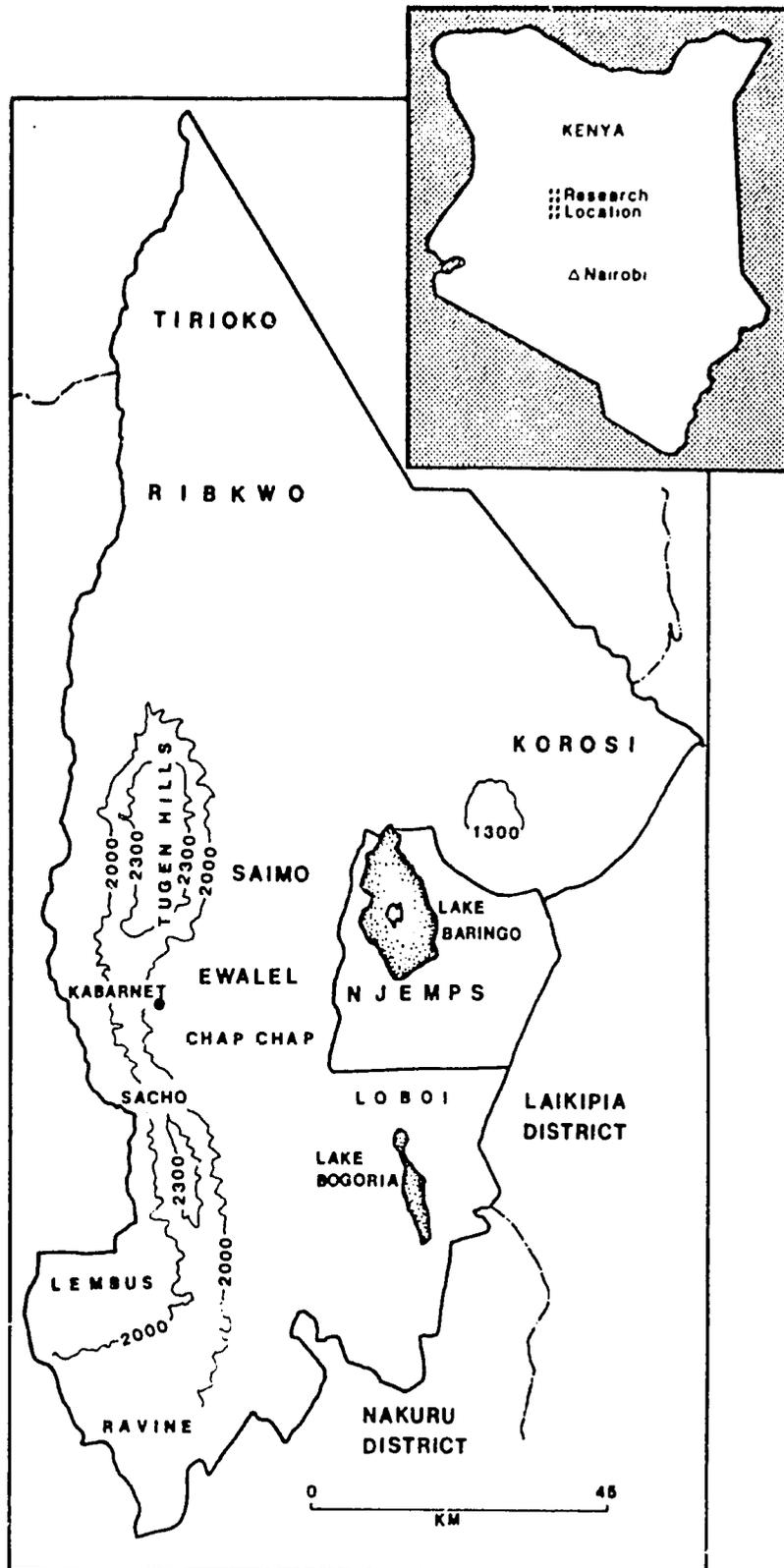


Figure 1. The Baringo Region

nomadic, pastoral specialization is, in turn, characteristic of the lowlands. Trade between the different ecological zones was considerable until recently.

The production system (Il Chamus agro-pastoralism) under study is located in the lowland, semi-arid area of Baringo, which makes up more than seventy percent of the District's approximately 10,000 square kilometers. Except for small pockets of irrigated agriculture, the Il Chamus (Njemps) economy for most of this century has emphasized livestock production<sup>3</sup>. Annual rainfall in Il Chamus (called Njemps Location) is low (640 mm per annum) and erratic providing an uncertain source of water for dryland agriculture. Both monthly and annual rainfall distribution vary greatly from year to year.

**IDENTIFYING CRITICAL PRODUCTION CONSTRAINTS.** An assessment of household production and consumption reveals that access to grain--whether from market purchase or domestic production--is a critical constraint which influences pastoral production. It is this commodity that allows Baringo's herders to survive the long dry season when pastoral food production is minimal. Data from twenty-nine homesteads monitored for production, consumption and marketing in 1980-81 illustrate this seasonal factor. During these years, average grain consumption per family of 6.8 Adult Units<sup>4</sup> varied from 3.4 kilograms daily in the dry season when per capita milk consumption was near zero to 1.12 kilograms per day in the wet season when daily milk consumption was more than one liter per capita. Without access to grain, the viability of pastoral specialization in Baringo would be questionable (see

Bates and Lees 1977). Consequently, the proportionate mix of farming and livestock activities at the household level is influenced by both the price and availability of grain.

Because of its direct relationship to Il Chamus production, the grain market is used in the study to define the region. This unit corresponds closely with ecological variables and incorporates all of Baringo District with the exception of its western border lands, an area which is better integrated with the Kerio Valley economy. Ethnically, it includes the Il Chamus homelands and parts of the Pokot and Tugen territories. The regional grain market defines a distinct economic unit that includes both pastoral and agricultural sectors. While only a single variable--grain--is used to delineate the region, its importance as an integrative mechanism is such that other activities--for example, labor movements and livestock marketing--tend to be incorporated within its boundaries.

In recent years, several region-based changes have taken place that affect the Baringo area as a whole. Of these, the most pertinent for the Il Chamus economy are: (1) a shift to export crop production in south and north Baringo's agricultural zones; and (2) a decline in private grain trade and a more dominant role for government parastatals in the marketing of grain in Baringo. While the former change has reduced the amount of agricultural land devoted to food crops (maize and finger millet), and hence the amount of food surplus for trade, the latter change has created inefficiencies in the present grain marketing system. In part, both factors result in higher retail prices for grain in the Il Chamus area (called Njemps Location).

They also increase the risk of relying on the grain market for consumptive purposes.

From the post World War II era to the late 1970s, Baringo<sup>5</sup> was capable of meeting its grain needs in most years. Except during drought years, government presence in the market place was minimal, and an elaborate trade network developed between south Baringo's maize producing areas and the pastoral zone to the north. The grain was usually transported to the deficit areas (e.g., Il Chamus) by traders who either bought it directly from the farmers or from middlemen. The commerce was important for both grain producers and consumers.

The first significant government intervention (post World War II) in this regional trade occurred in the mid-1960s, a time when the state attempted to control surplus maize by establishing government buyers in the area (Little 1983b). It was their intention to insure that maize supplies were channeled to large urban centres. Formal control in the market place increased during the 1970s, as restrictions on trader permits were imposed. This resulted in a decline in intra-regional grain flows between agricultural and pastoral sectors, and the emergence of a vertical system whereby surplus was increasingly exported from the region. As a result, Il Chamus traders must presently travel outside of the region to purchase maize at state controlled depots. This accounts, in part, for higher prices (i.e., increased transport costs), as well as occasional grain shortages.

The Il Chamus response to these regional changes has been to increase its own production of grain. Due to low rainfall, this has mainly meant investment in irrigated agriculture; the area allocated to this activity has increased approximately three-fold over the past fifteen years. Associated with this production change has been an aggravation of labor shortages caused by the competing demands of agriculture and pastoralism (Little, forthcoming). At certain times of the year, peak labor periods for agriculture and pastoralism overlap which strains domestic labor supplies.

Labor bottlenecks are most severe at the end of the dry season (February and March) when both livestock and agriculture need considerable attention. Although priority is given to pastoral activities at this time, it is recognized that early field preparation and planting enhances the chances of agricultural success. Early sowing, usually because of timely field preparation, is one of the most significant factors which affect production. More than fifty percent of the variation in grain yields from both irrigated and dryland farming can be explained by this single variable (Little 1983a). While it is most critical for dryland farming, the time of planting also affects irrigated agriculture because water flow in the rivers declines after the first few months of the rainy season. Irrigated land should be planted within four weeks of the first significant rainfall.

Here again, the mechanism--hired labor--for overcoming this constraint requires attention to non-household variables. Indeed, much of the labor employed on Il Chamus farms during the

late dry season comes from other production zones in Baringo, particularly from the highlands where there is the emergence of a landless class. The use of hired labor in agriculture is widespread, with more than eighty percent of Il Chamus farmers with irrigated farms over .7 hectares (n=29) using wage workers. The viability of the present Il Chamus agro-pastoral economy is contingent on this labor market. Without hired labor, the Il Chamus would have to put off field preparation until after the rains arrived.

It should be noted here that hired labor is an increasingly important characteristic of African farming systems. In parts of the Sudan, for example, the hiring of agricultural labor seems to have replaced indigenous methods to mobilize workers (Reeves and Frankenberger 1981:24); while in other areas, it co-exists with the traditional labor exchange systems. A good illustration of the latter comes from eastern Senegal where in certain villages almost fifty percent of farmers utilize hired labor and labor from traditional work groups (West 1984:62). The presence of agricultural wage labor markets is noted for other regions of Africa (see Heyer et al. 1981). The significance of this for FSR is that labor can not always be treated as an endogenous variable under the control of the household.

**CASE STUDY CONCLUSIONS.** This brief examination of the Il Chamus agro-pastoral system identifies two main constraints: (1) the inability of the pastoral production system to provide adequate food throughout the year; and (2) inadequate labor resources. The strategies (grain imports and hired labor) for overcoming

these bottlenecks are best understood using a regional framework that focuses attention both on the farming system and on its linkages to other sectors of the regional economy. To rely solely on a farming systems model would impede an understanding of the nature and causes of these constraints.

It is likely that the labor and marketing constraints identified above could be traced to a more aggregated level than the region. Indeed, grain marketing in Baringo is clearly linked to national policy, which, in turn, reflects world commodity markets. In addition, one could examine the regional labor market in terms of national variables and policies. Yet to trace these processes beyond the region and attempt to relate them to local production, may create a conceptual gap too large to bridge without "blurring" the analysis of the farming system itself. The region is a more manageable unit to explore the impact of macro variables on local production.

The examination of production variables at a level beyond the farm or community allows for better informed policy recommendations. For example, changes in the Baringo grain market have clearly been detrimental to the Il Chamus producer. Considerable inefficiencies take place because the grain deficient areas import food from outside the region. A policy reform to increase intra-regional trade would enhance the long term stability and growth of the region, and of the different farming systems within it.

The presence of a significant agricultural labor class in Baringo makes that group particularly vulnerable to any proposed capitalization of agriculture. For example, the government's

recent subsidized tractor lease program in Il Chamus has reduced the demand for hired labor at certain periods in the agricultural cycle (e.g., in the field preparation stage). While it is likely that there may be increments in production which may, in the short-term, have favorable employment effects, in the long run continued mechanization is likely to displace a large number of agricultural laborers. Therefore, what looks beneficial to the Il Chamus farming system may have negative implications for other population segments of the region. Regional analysis provides a conceptual framework that allows such policy questions to be explored.

#### The Realities of Rural Africa: Further Examples

In this section of the paper, other examples are presented illustrating both the complexity of African production systems and the need to broaden the scope of farming systems research. While discussion is limited to two topics--rural-urban linkages and regional food security--they both are issues of increasing importance to African agriculture.

**RURAL-URBAN LINKAGES AND THEIR IMPACT ON FARMING SYSTEMS.** The importance of off-farm employment in many parts of rural Africa complicates models of farm behavior (see Behnke and Kerven 1983; Kerven 1983). Rural-urban sector interdependencies in certain African countries are such that investment in the agriculture sector often derives from income earned in urban areas (Parkin 1975). Kerven's study (1980) of rural-urban dynamics in Botswana highlights this point. I quote (Kerven 1980:30, 52):

It has been shown that many rural and urban dwellers are mutually dependent and that agriculture is usually supplemented and subsidized by urban remittances...It has been the aim to show that the two sectors, "rural" and "urban", are not as distinct nor as economically differentiated as has sometimes been suggested.

Further evidence from elsewhere in Africa, indicates that ties to regional towns and cities are critical both for financing agricultural investment and for supplementing farm incomes (Haugeraud 1981; Matlon 1981). Colson and Scudder's classic study of the Gwembe Tonga (Zambia), for example, argues for the abandonment of the rural-urban dichotomy as a working concept (Colson and Scudder 1975); while in Kenya Livingstone (1981) points out that non-farm sources of incomes account for as much as 50% of rural household incomes. In another study from Kenya (Meyers 1981), it is shown that agricultural innovation is more closely correlated with access to non-farm income, than it is with farm-level factors. Farming systems studies must confront the fact that many Africans are part-time farmers.

**REGIONAL FOOD SECURITY AND MARKETS.** The Baringo study discussed above pointed out the effects of regional market changes on local food security and agriculture. Because it is a particularly critical issue in the study of African farming systems--one which is perhaps found in most African countries--I examine the topic again in the context of another region, northern Ghana.

The Northern Region (NR) of Ghana historically was a labor supply area for cocoa farming estates in the south of the country (this discussion is based on Shepherd 1981). Local farming systems in the north focused on traditional food crops (yams, sorghum and millet). Deficit areas, such as the north-east, were able to purchase food from other locations within the region. Important changes in the area's agricultural economy occurred in the 1970s--these seriously affected the viability of peasant farming. First, large-scale, mechanized rice cultivation was introduced in the area in the hopes of supplying food for urban areas and for the cocoa producing zone in the south. These enterprises were owned, for the most part, by wealthy individuals from the south who were allocated land in the region. The schemes were heavily subsidized by government and competed with land devoted to local food production. It is noted that "the emphasis on rice farming in the Northern Region has, according to Ministry of Agriculture figures, gone hand in hand with a reduction in yam acreage and a stagnation of millet and guinea corn (sorghum) acreage in the region" (Shepherd 1981:185). This has resulted in soaring inflation of food prices regionally and has made the deficit areas--which in some cases were encouraged by government to grow non-food crops--more prone to famine.

A second change is the rapid urbanization in the NR, particularly at Bolgatanga, which has drained surplus food from the rural areas. The growth of large towns was spurred by the subsidized rice schemes, which attracted urban-based businessmen from the south. They invested in agriculture, but resided in the

regional towns. The high purchasing power of urban residents redirected some of the food trade. In 1977, for example, Shepherd (1981:185) observed that "when there was plentiful food, if at high prices, on the Bolgatanga market, there was little or no food on Bawku market, and little or none in many villages and compounds.

A final factor is the state intervention in the regional food market. This action was taken to ensure food for urban centers in the south, but has had a devastating effect on the local farming systems in the NR. In the extreme, it has resulted in localized famines in the region. Areas that emphasized non-food crops are particularly vulnerable, since even those with money find difficulty purchasing food. The most affected location is the north-east of Ghana, where "prior to the 1970s, periodic food shortages...had been countered by imports into the area of millet, guinea corn and other crops in smaller quantities, which were grown in the less densely populated NR" (Shepherd 1981:184).

The stagnation of peasant agriculture in NR results in increased out-migration. Shepherd (1981:190) concludes that the two major constraints to the development of local agriculture are (1) the exploitative relationship between peasant farming and mechanized rice enterprises in the region; and (2) state intervention in regional trade. Both of these were identified by analyzing the links between the indigenous farming systems and the regional economy.

## Concluding Remarks

The preceding paper has indicated some of the insights that a region-based approach can add to farming systems studies. Like farming systems research itself, regional analysis is a perspective or "frame of reference". It is not a theory or a "field", and its merit in social science research should be judged on how well it informs upon a particular problem (s)--related to agricultural production, in the case of FSR. I have noted that the regional analytic approach is meant to supplement the farming systems approach by providing insights that are important, but missed at the farm-level. It is not meant as a substitute for production data collection, which should remain the core of farming systems research.

The realities of rural Africa challenge FSR's assumption that endogenous variables (land, labor and capital) are always under the control of the household. The importance of wage labor and non-farm sources of capital make this premise problematic. In addition, it raises the strong possibility that a strict focus on farm-level resources limits analysis to secondary, rather than primary causes of production changes (see Wood 1981:339).

The relationship of micro studies to the macro environment (including the regional economy) is an important issue in the social sciences. It is increasingly prominent in peasant studies, since there is a much clearer recognition today that "the organization of household production and consumption is influenced by forces that lie beyond the household unit" (Wood 1981:339). Interest in the micro/macro question comes from

theoretical schools as diverse as Marxism, neoclassical economics, and human ecology, and is increasingly of concern to anthropologists of varied theoretical persuasions (see Downing 1982; Godelier 1977 Guyer 1981; Long 1977; and Moran 1984). I have by no means resolved this dilemma; rather I have indicated one particular approach that holds potential for bridging this gap in the context of production (farming) systems research.

## NOTES

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1. The multi-disciplinary approach and its open-ended research directive (i.e., understanding the farming system in its total environment) can lead to different, and at times contradictory interpretations. The notion of understanding farming systems in their total, socio-economic and physical environment is not a novel idea. In fact, it has been an integral part of several cultural ecological and anthropological investigations dating back to at least the 1950s. It should also be noted that the

concept itself--farming systems--may bias analysis to the cropping component of the production system. A more general term, such as production system, raises the possibility that cropping may be only one of several livelihood strategies that a household pursues. In the paper, when the term farming system is used, it includes both farm and non-farm activities.

2. The use of the household as a significant unit of analysis in farm production studies recently has come under criticism (Guyer 1981; Gladwin and Staudt 1983). While recognizing its limitations, I use it in this paper both because it remains an important heuristic device (which I have not yet seen replaced by a more appropriate concept), and because the focus is on micro/regional linkages, rather than intra-household resource allocation or decision-making per se.

3. Due to the threat of large-scale livestock raiding, the nineteenth century Il Chamus economy was based primarily on irrigation, rather than animal production (see Little 1983a).

4. An Adult Unit (AU) equals 2300 kcal and represents a pastoral man or woman between the ages of 15-60 years. Persons over 60 years or 7-14 years and children below 7 years are equivalent to .67 AU and .25 AU, respectively.

5. The impact of colonialism very much influenced regional boundaries and economies in Kenya. This historical dimension must be incorporated into regional analysis, since regional boundaries change over time. For Baringo, regional integrity was greatest from the early 1950s to the 1970s, the period when the regional grain market was most important.

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