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Niemeijer, R.; Hoorweg, J.C.; Braun J. von, Kennedy E.

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# 17 Commercialization of Rice and Nutrition: A Case from West Kenya

RUDO NIEMEIJER

JAN HOORWEG

## Introduction

The Kenyan government has actively encouraged cultivation of cash crops as part of its past and present development policies. Cash crop production of industrial and food crops has grown steadily, although the share of agricultural production that is marketed is still less than 50 percent (Kenya, Central Bureau of Statistics 1988). This chapter studies the cultivation of commercial rice at large irrigation schemes in Nyanza Province, western Kenya.

In Kenya, the pressure on arable land is already high (Kliest 1985). Irrigated agriculture offers an important means of agricultural intensification. Kenya's potential for irrigated agriculture is estimated at 500,000 hectares or more, of which, in 1985, some 40,000 hectares were actually under irrigation (Ruigu 1988). About 60 percent of the irrigated area belongs to large commercial enterprises and is used for cultivation of cash crops, such as pineapples, and horticultural crops. Another 10 percent of the irrigated area is accounted for by smallholder schemes, which have grown substantially in recent years (Ruigu 1988). The National Irrigation Board (NIB) manages another 10,000 hectares, with seven large schemes in different parts of the country, where mainly cotton, rice, horticultural crops, and maize are grown. At the NIB schemes, individual farmers are allocated plots to cultivate scheduled crops, and nothing but these crops. The schemes are centrally managed and the produce is centrally purchased. Clearing and preparation of the plots are taken care of by the management. Tenants have limited freedom in organizing their production and are largely dependent on deci-

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sions and practices ordained by management. Tenants at these schemes are faced with a twofold transition—to commercialization and to collective production under management of a parastatal body. This chapter focuses on this combined change and its impacts on household food security and child nutrition.

The NIB has, over the years, suffered various problems and setbacks and generally has not managed to achieve its initial objectives. By 1985, only one scheme had managed to pay its way, whereas the others still received government subsidies (Ruigu 1988). Production at the schemes has generally stayed below projected levels because of technical problems, while pests and diseases have further lowered yields. Considerable inequality exists among households within the schemes. For instance, analysis of production records at Ahero Irrigation Scheme revealed that because of differences in water delivery to certain parts of the scheme, some blocks consistently had lower productivity than others (Noy and Niemeijer 1988). In addition, factors such as the time when the plot is prepared, which is beyond the control of farmers, together with differences in individual farming skills, cause considerable income disparities among tenant farmers. Thus, a disaggregated view of irrigation and farm characteristics is needed to trace technological change and commercialization effects on household consumption and nutrition.

### **Commercialization and Nutrition**

Commercialization, as understood here, means increased production for the market, notably through the production of cash crops. Commercialization means that households increasingly use a significant proportion of their resources, such as land, labor, and capital, for cash crop production. Commercialization is not, especially in the early stages, an irreversible process; production for the market is usually the outcome of choices made by the producers, and households may decide on other crops from one year to the other or, at times, may even revert to subsistence production. Cash crop production also frequently means modernization and intensification of cultivation, notably through the use of fertilizers, insecticides, hired labor, and fixed capital investments, including, for instance, irrigation. Once the modernization process is under way, it is no longer easily reversible and, in the present case of tenants at large irrigation schemes, there is little element of choice left.

Commercialization can influence household nutrition in a positive, negative, or neutral way. Commercialized agricultural production may entail higher output of food crops or higher incomes to secure nutritional needs, or both. However, there is evidence of situations where productivity increases have been realized at the expense of the nutritional status of

the farming population or by increased maldistribution of wealth at regional, community, and household levels, or both (Fleuret and Fleuret 1980; Tosh 1980; Pinstруп-Andersen 1985; Pacey and Payne 1985; Maxwell and Fernando 1989).

Findings from different studies in Kenya are equivocal, with different results reported for different crops in different parts of the country. Korte (1969) found nutritional deficiencies among rice growers in Mwea Irrigation Scheme, despite economic progress. Elsewhere in Central Province, a positive relation was found between involvement of households in coffee cultivation and the nutritional status of their children (Hoorweg, Niemeijer, and Steenberg 1983; Hoorweg and Niemeijer 1989). An analysis of national survey data in two areas studied pointed at a negative correlation between involvement in sugar cultivation and nutritional status in one area and no such correlation in the other (Kenya, Central Bureau of Statistics 1979). Cotton and pyrethrum production, however, were found to be neutral to preschooler nutrition, while coffee and tea production showed no consistent relation. Haaga et al. (1986), analyzing the same survey data, concluded that the cultivation of export crops (coffee and tea) is not generally associated with a higher percentage of stunting. Instead, they concluded that a general association exists between increased landholdings, increased income, and better nutrition and suggest that the effects of cash cropping may possibly be damaging among farmers with very small holdings. However, in households with malnourished children in Central Province, the percentage of the holding devoted to cash crops was not higher than among the general population; this was also the case for households with very small plots (Hoorweg and Niemeijer 1982, 1989). Another study among sugar growers found that food crop production was not negatively affected by sugar cultivation nor was there any negative influence on the nutritional state of young children (chapter 16).

Irrigated cultivation at large schemes in Kenya implies not only changes in agricultural techniques and farm management practices for the farmers concerned but also changes in patterns of income generation and food supply. Scheme production implies a significant transition for the smallholders concerned, with many farm families becoming dependent on agricultural sales to secure their livings. This transition has not gone without problems. In the schemes in Nyanza Province, the first paddy harvests yielded some 6,000 kilograms per hectare, but yields soon became much lower and went down to 2,000 kilograms per hectare. Since then, the situation has improved and yield levels have doubled. Moreover, the planned double-cropping system was not realized; instead, the cropping rate in recent years has been nearer to 1.5 (Noy and

Niemeijer 1988). This pattern of decline after initial success was also observed among rice irrigation schemes in The Gambia (chapter 22).

Nutrition conditions at some of the large schemes in Kenya are reasons for concern and have repeatedly received publicity in the national press. Low income levels of the tenants, diseases associated with stagnant water, unbalanced diets because of a possible change to rice as a staple food, and unbalanced spending of money incomes are speculated to be among the causes of the nutritional problems at these schemes. This chapter assesses the nutritional conditions prevailing among the farming households at two rice schemes in West Kenya: the Ahero Irrigation Scheme and the West Kano Irrigation Scheme, situated on the Kano Plain.

### **The Study Area**

The Kano Plain covers an area of about 650 square kilometers, located near the town of Kisumu in West Kenya. The landscape consists of a wide alluvial plain through which a number of rivers run west toward Lake Victoria. The plain is bordered by hills to the east and steep escarpments to the north and south. The climate is relatively dry with high average temperatures during the day. The soils, of the black cotton type, are fertile but difficult to drain, and seasonal floodings and water-logging limit agricultural potential.

The population density in the area was 177 persons per square kilometer in 1979 (Kenya, Central Bureau of Statistics 1981), with households mostly living in scattered compounds or in homesteads on the slightly higher grounds. Households go through a distinct cycle, beginning with the establishment of a compound. With an increase in the number of children and with children growing older, there is a period of expansion. There is further expansion when the husband marries additional wives who also move into the compound and when sons marry and bring their wives to live at the compound. In a later phase, the parental household may decrease in size when some sons start building their own compounds and most of the girls are married off. When the head of the parental compound dies, new cycles are started on the new compounds of the sons.

Smallholder farmers make up more than 80 percent of the active population of the Kano Plain. Crop production is mainly geared toward subsistence of the farm family. Maize and sorghum are the main food crops, supplemented, in some cases, by sweet potatoes and cassava. Cotton, rice, and sugarcane are the main cash crops. Agricultural techniques are mainly traditional in nature and, on the whole, are less

advanced than in other parts of Kenya. Consequently, yields are low. Crop production is usually accompanied by livestock rearing. Agricultural activity is supplemented with off-farm wage labor, for example, in the adjacent sugar estates north of the Kano Plain, in Ahero trade center, or in Kisumu. The NIB irrigation schemes also provide opportunities for casual labor to the surrounding population.<sup>1</sup> Even so, the Kano Plain with its high natural population increase offers only limited economic possibilities, resulting in considerable outmigration since the 1950s (Kliest 1984).

### **Irrigation Schemes**

The NIB established two large irrigation projects in the Kano Plain area: the Ahero Irrigation Scheme in 1969 and the West Kano Irrigation Scheme in 1976. Land was expropriated and the scheme plots were subsequently distributed among the previous owners and smallholder farmers from neighboring areas. In both schemes, 1.6 hectares of irrigated land are allocated per farming household. Together, the schemes in the mid-1980s covered a total area of 4,800 hectares, out of which 840 hectares were cultivated by 519 tenants in Ahero, while 553 tenants farmed 880 hectares in West Kano. In Ahero, nearly all irrigated farmland is used for paddy cultivation, whereas in West Kano, irrigated farmland is divided between paddy and sugarcane production.

Besides cultivating irrigated crops, tenants also grow rainfed crops, usually on a small area around the house but also on plots outside the schemes. Substantial differences exist with respect to access to rain-fed farmland; some tenants possess relatively large plots, while others have none. When the schemes were first set up, all tenants were obliged to live in designated villages within the schemes. Over time, these villages have become very crowded, compounds are close to each other, and there is little space for gardens. In these circumstances, it is difficult to build extra houses and there is little room for the traditional expansion of the homestead. In fact, sons, on reaching adulthood, are no longer allowed to reside in the scheme according to scheme regulations. Tenants are not allowed to keep cattle at the schemes. The lack of space is an important obstruction and a major reason for people's desire to move outside the scheme. Later, it was tolerated for tenants to take up residence outside the scheme and still retain their scheme plot.

Nowadays, tenants can be distinguished as either "resident tenants," who live within the schemes and have no or relatively little land outside

1. It has been estimated that about 40 percent of the agricultural labor in the schemes is provided by hired laborers (Houtman 1981).

the schemes, or “nonresident tenants,” who live outside the schemes and have more sizable tracts of nonscheme land. Depending on the scheme, an estimated 30–50 percent of tenants belong to the latter category (Sterkenburg, Brandt, and von Beinum 1982; Noy and Niemeijer 1988). There are also smallholder schemes in the area that were started by the farmers themselves and are controlled by farmers’ committees. Participating farmers individually cultivate a plot, privately owned or rented. Plots are much smaller in size than at the NIB schemes, and farmers generally start to cultivate only when and if they have labor available, thus facing considerably lower labor costs.

### **Study Design and Findings**

An initial survey was conducted during March–April 1984, which is the season of the long rains prior to the harvest of the main staple foods, maize and sorghum, and is a time when foodstocks are usually at their lowest level and nutrition problems are most manifest.

The study compares four groups of farmers, differing in their degree of participation in, and dependence on, irrigated rice production:

- nonrice growers
- resident tenants at the large-scale irrigation schemes
- nonresident tenants at the large-scale irrigation schemes who also farm sizable plots of land elsewhere
- individual rice growers who have a combination of resources similar to that of the third group but who usually cultivate only small rice plots.

Data were collected during a single-visit survey. They covered household composition and conditions, household resources (agricultural production, livestock, and off-farm employment), food consumption (household and individual consumption), and nutritional status (of young children and their mothers). Food consumption data were collected by the 24-hour recall method, and supplemented with observational data from a smaller survey.<sup>2</sup>

A summary of the main economic characteristics of the four groups is presented in table 17.1. Not surprisingly, in view of the residency regulations, the household size of the resident tenants is lowest. The household size of the nonresident tenants, in turn, is highest, with the two other groups in between. Nonresident tenants have the largest land resource base, combining four acres under cash crops with considerable

2. A detailed description of this survey is presented in Kliet (1984) and Niemeijer et al. (1985 and 1988).

**TABLE 17.1** Resource base of sample rice farmers in West Kenya, 1984

| Characteristic                        | Non-Rice Growers | Individual Rice Growers | Nonresident Tenants | Resident Tenants |
|---------------------------------------|------------------|-------------------------|---------------------|------------------|
| Number of households                  | 134              | 54                      | 64                  | 83               |
| Household size <sup>a</sup>           | 7.9              | 8.8                     | 10.3                | 7.3              |
| Migrant worker <sup>b</sup>           | 0.8              | 0.8                     | 0.6                 | 0.1              |
| Cash crop area (percent) <sup>c</sup> | 21               | 17                      | 68                  | 78               |
| Cropped area (acres)                  | 2.8              | 3.5                     | 5.9                 | 5.1              |
| Cattle (percent) <sup>d</sup>         | 38               | 41                      | 31                  | 8                |

SOURCE: Niemeijer et al. (1985).

<sup>a</sup>Average number of people per compound.

<sup>b</sup>Average number of migrant workers per compound.

<sup>c</sup>Combined average area share for rice, sugarcane, and cotton in total land use.

<sup>d</sup>Percent of households with cattle present.

participation in other economic activities. Individual rice growers and non-rice growers derive considerably less income from cash crops, but have more food crops under cultivation and more off-farm income, and are more involved in keeping cattle. Comparing these four groups, it is clear that resident tenants are an atypical group. They have a large area under cash crops, but in other respects—food crop area, livestock, and off-farm income—they are far behind the other groups and are mostly dependent on their rice cultivation, although some of the resident tenants have a small income from horticultural crops grown on the bunds between the rice fields. Rice production of the two tenant groups is virtually identical, but that of the individual rice growers is smaller.<sup>3</sup>

### *Income Diversification*

Table 17.2 gives estimates of the annual incomes of the four groups, based on the survey findings and where necessary complemented with information from other studies.<sup>4</sup> Included in the total income is the

3. The paddy harvests of the two groups of tenants, as reported for the period March 1983–March 1984, were 62.5 and 64.0 bags, respectively. For the purposes of this study, the cultivation of sugarcane by farmers in the West Kano scheme is relatively unimportant—it averaged only 0.5 acre per farmer over the two groups. Furthermore, at the time, the results for sugarcane cultivation were poor. Marketing problems caused serious delays in harvesting, and the returns to sugarcane in the early 1980s were even lower than those to rice cultivation (Houtman 1981).

4. The starting point for all estimates was the survey data (Niemeijer et al. 1985), together with field notes on household budgets collected for a small number of households (Veenstra 1987). Further data concerning farming budgets were available from Jaetzold and Schmidt (1982) for non-rice growers, and Houtman (1981) for tenants at the NIB schemes, while Sterkenburg, Brandt, and von Beinum (1982) gave results of incomes obtained in a single-visit survey for all groups. Incomes from rice farming were further verified from the yearly reports of the NIB schemes and Noy and Niemeijer (1988).

**TABLE 17.2** Estimates of annual income of four groups of farmers in West Kenya, 1984

| Income Characteristics                     | Non-Rice Growers | Individual Rice Growers | Nonresident Tenants | Resident Tenants |
|--|------------------|-------------------------|---------------------|------------------|
| Share of total income (percent)            |                  |                         |                     |                  |
| Cereals/legumes                            | 24               | 20                      | 14                  | 11               |
| Livestock/horticulture                     | 22               | 22                      | 10                  | 8                |
| Off-farm income                            | 50               | 38                      | 27                  | 14               |
| Cash crops                                 | 4                | 21                      | 49                  | 67               |
| Income/consumption unit <sup>a</sup> (KSh) | 1,163            | 1,315                   | 1,275               | 1,317            |
| Income diversity                           | Medium           | Diverse                 | Medium              | Specialized      |
| Income diversity index <sup>b</sup>        | 19               | 8                       | 17                  | 28               |

SOURCE: Survey by the authors.

<sup>a</sup>In adult-male equivalent.

<sup>b</sup>Standard deviation of proportions of above-mentioned income characteristics.

income from cash crops (rice, sugar, and cotton), rainfed crops (cereals and legumes), livestock produce (milk and ploughing), horticultural crops (bund cultivation), and off-farm sources (casual labor, regular wage employment, and remittances). Total annual income estimates strongly reflect the description of the resource base given above. There are important differences among the four groups. Non-rice growers and resident tenants are groups with comparatively low total household incomes; individual rice growers and nonresident tenants have incomes that are 25–40 percent higher. However, these income differences largely disappear when income is corrected for household size. Income per consumption unit is more or less stable over the four groups. However, the four groups do differ by the composition of their incomes. Income is quite diversified in the case of individual rice growers but is largely restricted to one income source in the case of resident tenants. Non-rice growers and nonresident tenants take an intermediate position in this respect.

### *Consumption and Nutritional Differences*

In table 17.3, the four groups have been rearranged according to the degree of income diversification, ranging from specialized to diversified. With regard to food consumption, there is no change in the staple diet, and maize remains as important as elsewhere. This lack of change is understandable as calories from rice are more expensive than those from maize and sorghum by about a factor of two (Noy and Niemeijer 1988).

**TABLE 17.3** Nutritional conditions among farmers in West Kenya, by degree of income diversification, 1984

| Nutritional Indicators   | Resident Tenants | Non-Rice Growers | Nonresident Tenants | Individual Rice Growers |
|--|------------------|------------------|---------------------|-------------------------|
| Income diversity   | Specialized      | Medium           | Medium              | Diverse                 |
| Average household food consumption per consumption unit (kilocalories)               | 2,494            | 2,592            | 2,681               | 2,767                   |
| Percent of households with less than 60 percent of recommended intake <sup>a</sup>   | 26               | 21               | 23                  | 13                      |
| Average food consumption of preschool children (kilocalories)                        | 552              | 658              | 695                 | 684                     |
| Percent of children with less than 60 percent of recommended intake <sup>b</sup>     | 44               | 39               | 34                  | 32                      |
| Percent of preschool children with less than 90 percent of height-for-age standard   | 41               | 18               | 19                  | 14                      |
| Percent of school-aged children with less than 90 percent of height-for-age standard | 30               | 22               | 14                  | 18                      |

SOURCE: Niemeijer et al. (1985).

<sup>a</sup>Recommended intake = 2,600 kilocalories per consumption unit.

<sup>b</sup>Recommended intake on the basis of per kilogram body weight (FAO/WHO 1974).

There is a general improvement in nutritional indicators moving from incomes that are derived from one source to incomes that are more diversified. Other indicators also point in the same direction, although less consistently. Besides income diversification, no alternative explanations offer themselves for the identified differences between the nutritional characteristics of the four groups. There are no differences in health conditions: incidence of child health complaints and percentage of school-aged children with low weight-for-height were similar across the different groups, a finding similar to the other study from Kenya reported in chapter 16. The hypothesis that farming families at the schemes eat only rice and, therefore, have an unbalanced diet, was not confirmed; only small quantities of rice are consumed in addition to the main staple food, maize.

One group stands out, though in a negative way—namely, the resident tenants, who score lowest on all indicators, with 40 percent of the preschoolers and 30 percent of the school-aged children showing signs of stunting. The difference in nutritional indicators between this group and the groups with more diversified incomes is high. However, the difference in nutritional indicators between households with moderately diversified and highly diversified incomes is small. Apparently, negative nutritional effects of highly specialized incomes at low-income levels come into effect at a certain threshold, below which these effects become quite pronounced.

One explanation is that varied resources facilitate households to spread risks across years, and ensure that income is evenly distributed and basic household needs receive balanced attention throughout the year. Where this is not the case, misfortunes can start a downward spiral toward nutritional deterioration.

To gain a better understanding of the mechanisms operating in such households, a second in-depth study was conducted during October–December 1986 in Ahero Irrigation Scheme among a subsample from the group of resident tenants—the most specialized group—studied in the initial survey described above. The detailed design of this study is presented in Noy and Niemeijer (1988). While average production of this group of resident farmers over the past 15 years equaled that of the scheme as a whole, individual plot production was determined to a large extent by the block in which the plot was situated and the season in which planting occurred, factors which individual households can do little about in a scheme with agriculture under supervision. Production factors under more household control, notably available household labor and income from off-farm employment, were positively related to paddy production, but livestock ownership was negatively related in regression analysis (Noy and Niemeijer 1988).

Analysis of food expenditures by income source within this rather specialized group revealed a striking difference between the use of male and female incomes for food. Per capita (per consumption unit) food expenditures were increased with income from casual labor by women and from local (illegal) sales of paddy and bund crops, incomes also in the female domain. Even within the altered household economy of the resident tenants, a traditional division of economic responsibilities prevails, in which women are mostly responsible for day-to-day matters, in particular, the provision of food, even when most food has to be purchased. Yet, in this scheme with specialized agriculture under central supervision, women's freedom to raise the resources for these day-to-day and food provision functions is severely constrained. Again, these findings are much in line with those from the other study on sugarcane in Kenya reported in chapter 16.

### **Conclusions: Income Diversification Matters**

Essential changes in farming practices for agricultural modernization include introduction of new crops and improved crop varieties, modern farming techniques and production methods, and alternative land tenure arrangements. These changes imply a large degree of commercialization of agriculture coupled with different forms of production, such as the corporate and private estates that prevailed in colonial times, the agro-industrial complexes and state farms of today, as well as small-holder farmers, whether or not organized in large-scale schemes or other forms of collective production (Hinderink and Sterkenburg 1987). In this chapter, we are dealing with large-scale schemes in which autonomy of individual farmers is quite limited. Management of such schemes has generally assumed that maximization of tenant incomes can be achieved by maximizing rice production and that this, in turn, will lead to greater well-being of the tenants. From the described experiences in Kenya, it has become clear that this process cannot be taken for granted. Moreover, tenant households are not as homogeneous as they are often perceived. Interests of the household heads, the official tenants, may differ from those of their wives and sons or other relatives who cultivate part of the rice plot or who provide part of the labor. Even when food has to be purchased, women are still responsible for provision of food and men are responsible for the lump-sum expenses, such as school fees, clothing, and economic investments.

From the findings of this study, an interesting mix of results emerged: a group with quite unfavorable nutritional conditions and a group with relatively favorable nutritional conditions are both tenants at the schemes, while individual rice growers outside the scheme also do

relatively well. It is the group that is mainly dependent on the specialized income from the plots in the schemes—the resident tenants—that shows symptoms of severe nutritional stress. Resident tenants have less land for rainfed agriculture, fewer employed migrants remitting funds to the household, and if they own livestock, they do not have usufruct, a major source of income for non-rice growers. Nonresident tenants, on the other hand, avail themselves of several resources in addition to the rice plot. This group of nonresident tenants has fewer nutritional problems, and this appears to be so because of diversification of income. In fact, in the income range observed here, composition of income appears to be more important than level of income for household nutrition. This finding runs counter to one of the basic assumptions underlying the organization of the rice irrigation schemes—namely, that tenants will be able to earn their living from commercial cropping as their only economic activity. The poor nutritional conditions among the resident tenants puts this assumption under question. On the other hand, in cases where commercial rice cultivation is only one of the available income sources, such negative nutritional differences do not stand out.