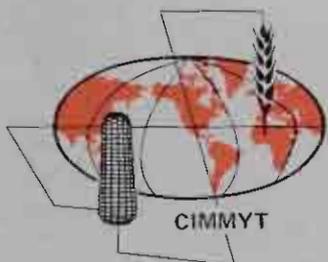


**LABOR USE PATTERNS FOR THE PRODUCTION
OF MAIZE IN SOUTHERN ZAIRE**

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This paper focuses on the use of labor in the production of maize in South-Central Zaire. In this area, as in other parts of Zaire, additional communal lands are available to many farmers, and land availability is usually not viewed as a constraint to expanding production. Farm size is relatively small^{1/}, however, and in the absence of significant mechanization^{2/}, the quantity of labor available and how it is used become significant factors in determining the amount of land farmed, the timing of various cultural practices, and ultimately, how much maize and other crops are produced.

Two considerations make this paper of interest. The first is the data themselves which describe which family members engage in which tasks related to maize production, use of hired labor, off-farm work, periods of labor shortage, etc. The second is the question of the importance of labor constraints in limiting maize production.

Observations and data presented here are based on field research undertaken by Mwamufiya in 1974 and 1975, in conjunction with Zaire's national maize program^{3/}. This research included a survey of 299 producers from four adjacent districts. Three of these districts, Mwene-Ditu, Gandajika, and Tshilenge, are in the region of Kasai Oriental, while Kaniama, the fourth, is in the region of Shaba.

^{1/} Survey data shows average farm size to be 1.59 ha., over all districts surveyed.

^{2/} For the entire survey area, 93 percent of the farmers sampled indicated that they till corn primarily with a hoe. Less than 5 percent reported any usage of the tractor for tilling maize.

^{3/} Mwamufiya's Ph.D. dissertation (2) provides a more complete description of the study and resultant findings. This is the second of three short papers taken from the original research.

Characteristics of Farmers in the Survey Area

Tables 1-3 contain descriptive data on farmers of the study area. These data require little explanation. Farm size is clearly the largest in Kaniama, where settlement occurred later than in Kasai Oriental and where population density and average village size are both lower. The average age of male heads of family is in the mid-forties, with a generally high proportion over 50 years old. Just over 40 percent of the farmers in the survey were greater than 50 years in age compared to a national average of slightly less than 30 percent in this age category (4). Family size averaged 6.6 members over all of the districts surveyed, which compares to a national average farm family size of 5.4 (4). A final point relates to education, with over 60 percent of the farmers interviewed having less than four years of formal schooling.

TABLE 1. Mean values for age, family size, total area planted, and percent of area planted to maize, with sample size, by district.

	Kaniama	Mwene-Ditu	Gandajika	Tshilenge
Age: Husband	44	44	43	48
Wife	32	28	28	28
Size of family	6.7	6.3	6.4	6.6
Total area planted (ha)	1.8	1.6	1.6	1.4
Percent of planted area devoted to maize alone	23	21	26	16
Percent devoted to maize interplanted with other crops	19	21	20	24
Sample size	108	67	68	56

TABLE 2. Age Distribution of male farmers, classified by district.

Age group	Kaniama	Mwene-Ditu	Gandajika	Tshilenge
Under 30	25	21	24	17
30-49	31	46	46	29
50-69	42	25	22	47
Over 69	2	8	8	7

TABLE 3.- Proportion of male farmers reporting years of formal schooling.

Years of Education	Kaniama	Mwene-Ditu	Gandajika	Tshilenge
0	33	34	35	32
1-3	26	27	27	30
4-6	31	28	22	21
Over 6	10	10	15	16

Division of Labor Within the Farm Family

Family labor availability depends not only on the size of the family, but on the division of work responsibilities between males and females, adults and children. In a few cases, all family members engage in the four principal tasks associated with maize production -- clearing, sowing, weeding, and harvesting. In most cases, however, tasks are carried out more by one sex or by adults rather than children.

Tables 4 through 7 indicate the family members who participate in each of the four tasks. Clearing land for maize tends to be an adult male responsibility, although females frequently share this work with males. Sowing and weeding are predominantly shared tasks, whereas harvesting tends to be more a female activity^{4/}. Of all the districts surveyed, Kaniama, where average farm size is larger, tends to have higher joint participation of both male and female adults.

Notably few families report children participating in maize production. Fewer than 10 percent of sampled households report children engaging in any activity. They are said to be busy in school and unable to help at the necessary times. However, the fact that all respondents to the survey were adults may lend a downward bias to the reporting of child participation.

Two questions were put to the farmers about decision making. One dealt with decisions of which crops to plant and the area to be assigned to each. In less than 4 percent of the cases were women reported to take these decisions alone. For the most part such decision making is a male prerogative with over three quarters of the Kasai Oriental

^{4/} Marketing (not shown in tables) is even more dominated by females than is harvesting. For the entire survey area, less than 10 percent of the households reported marketing to be a males only activity, while roughly 60 percent reported women only. Parenthetically, it is noted that only 66 percent of the farm units surveyed sell a portion of their crop. It is estimated that sales account for 19 percent of overall production in the survey area.

TABLE 4. Percent of households reporting participation of various family members in clearing maize plots.

	Kaniama	Mwene-Ditu	Gandajika	Tshilenge
Children only	2	2	10	2
Male adults only	33	72	45	48
Female adults only	1	5	13	11
Male and female adults	64	21	31	39
Children and adults	0	0	1	0

TABLE 5. Percent of households reporting participation of various family members in sowing maize plots.

	Kaniama	Mwene-Ditu	Gandajika	Tshilenge
Children only	6	3	6	2
Male adults only	3	23	26	17
Female adults only	7	6	6	10
Male and female adults	83	68	62	70
Children and adults	1	0	0	0

TABLE 6. Percent of households reporting participation of various family members in weeding maize

	Kaniama	Mwene-Ditu	Gandajika	Tshilenge
Children only	8	2	9	4
Male adults only	4	20	21	12
Female adults only	1	8	6	11
Male and female adults	86	70	64	73
Children and adults	1	0	0	0

TABLE 7. Percent of households reporting participation of various family members in harvesting maize.

	Kaniama	Mwene-Ditu	Gandajika	Tshilenge
Children only	5	2	8	4
Male adults only	5	12	9	15
Female adults only	20	57	33	43
Male and female adults	69	26	43	32
Children and adults	1	3	7	6

farmers saying that these decisions are made by males. In Shaba (Kaniama), 48 percent of the respondents said that decision making is a family matter, while 45 percent claimed that these decisions are made entirely by males.

A second question dealt with the decision on how maize is to be allocated among various uses -- consumption, sales, seed, animal feed, or beverages. Women figure more prominently here, but even so, over half of the households interviewed said that these decisions are taken by males.

Off-Farm Income and the Labor Market

The farm labor market is not highly developed in the survey area. There is little reliance on outside workers to supplement the family labor force during peak work periods, nor do farmers engage much in outside work to augment their own incomes.

Table 8 illustrates the low rates of hired labor use. A somewhat larger proportion of families reported using hired labor for harvesting (9 percent of all units sampled) than for weeding (8 percent) or planting (6 percent), but still the difference was negligible. Tshilenge, the district with the highest population density and largest average village size of those areas surveyed, tended also to have the greatest use of hired labor. It should be pointed out, however, that the hiring of labor is widespread among the large commercial tobacco growers of the Kaniama area. Many tobacco farmers also grow maize.

TABLE 8. Percent of families reporting use of hired labor in planting, weeding, and harvesting of maize.

	Kaniama	Mwene-Ditu	Gandajika	Tshilenge
Planting ^{a/}	5.6	4.5	4.4	10.7
Weeding	5.6	7.5	10.3	10.7
Harvesting	6.6	9.0	11.8	12.5

^{a/} Includes both clearing and sowing.

While most of the farmers interviewed had some off-farm work experience, few had income from off-farm activities in the year of the survey (Table 9). It is notable that few of the farmers of the area had off-farm work experience on commercial farms. The higher proportion reported from Kaniama undoubtedly reflects work in that area's large commercial farms. The contribution to family support of the farm family by family members working off the farm is also notably low.

TABLE 9. Percent of households reporting income or work experience off the farm, by district.

	Kaniama	Mwene-Ditu	Gandajika	Tshilenge
Outside income by farmer or spouse	8	15	22	16
Previously worked off the farm	54	63	38	54
Worked off farm on commercial farm	22	4	9	7
Have children with off-farm jobs	5	12	12	23
Family members contributing from off-farm jobs	3	2	6	7

Rather than a cash labor market, farmers in the study area still tend to rely more on traditional work sharing. People from the same village agree to join together for clearing, sowing, and harvesting, in order to speed the completion of these tasks. In more densely populated areas, around urban centers, job sharing at harvesting has gradually evolved into more hiring of services for payment in maize itself.

Labor as a Factor Constraining Maize Production

It can be asked if labor constraints presently limit maize production. The data are inconclusive on this question. Hired labor is little used in maize production and additional family labor is apparently available: notably from adult women at planting and weeding time, and from adult men at harvesting time (see Tables 4-7). Thus, cultural dictates as to which activities are appropriate for men and which are appropriate for women may impose an artificial labor availability constraint.

On the other hand, several activities compete with maize for labor. Most Kasai Oriental farmers plant other food crops along with maize in August and September, while Kaniama farmers do most such

planting in September and October. Planting and subsequent weeding might exhaust all available labor. Still, Table 10 shows that most respondents from Kasai Oriental do not see August/September as the months in which labor is heavily used^{5/}. However, those in Kaniama do report September/October as among the critical months and also point to November, when weeding of maize is required, as critical.

TABLE 10. Percent of respondents reporting month for which labor is most heavily used in agriculture.

	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.
Kasai Oriental ^{a/}	2	4	13	9	8	5	4	19	25	12	-	-
Kaniama ^{b/}	18	23	22	9	4	6	9	6	1	1	1	1

^{a/} All respondents females. Districts of Mwene-Ditu, Gandajika, and Tshilenge combined.

^{b/} Most respondents male.

In responding to questions about what most limits maize production, and what most limits agricultural income (Tables 11 and 12), labor itself is given little emphasis. Even so, it might be argued that those pointing to tractors were really signalling that labor is scarce during critical periods.

TABLE 11. Percent of farmers reporting most important constraints limiting maize production.

	Kaniama	Mwene-Ditu	Gandajika	Tshilenge
Land	2	19	19	13
Labor	12	8	4	14
Tractor	50	22	22	24
Good seed & fertilizer	4	19	18	22
Other	32	32	37	27

^{5/} It should be emphasized, however, that in Kasai Oriental, the question about heavy labor use (Table 10) was asked of women in the marketplace. (It was included in the regular farm survey in Kaniama.) Women participate less in planting and weeding in the Kasai Oriental districts than in Kaniama.

TABLE 12. Percent of farmers reporting various alternative means of increasing agricultural income.

	Kaniama	Mwene-Ditu	Gandajika	Tshilenge
Larger farms	79	73	61	72
Chemical inputs	7	19	27	22
Other/no answer	14	8	12	6

A linear regression model was employed to investigate the effects of some aspects of the labor factor and other explanatory variables on the area planted in all crops and the area planted with maize. These variables were chosen as proxies for total farm output and total maize production, respectively, since actual output figures were not available. Results of the regressions are presented in Table 13. Those explanatory variables having a statistically significant impact on total area or area in maize are specifically designated.

TABLE 13. Estimated interdistrict regression coefficients

Explanatory variable	Dependent Variable	
	Total area	Maize area
Constant	51.08	41.18
Size of the family	8.17*	1.96*
Level of education of head of household	3.84*	0.68
Age of head of household	0.53	- 0.03
Average age of the wife	1.96*	0.71*
Number of wives weighted by age	- 0.43*	- -
Number of wives	- -	2.43
Size of the village	0.01*	- -
Distance to market	- 0.72+	- 0.12
Participation in CAKO scheme ^{a/b/}	21.74	12.40
Participation in TABAZAIRE scheme ^{a/b/}	-52.25*	-27.30*
Number of years under CAKO or TABAZAIRE supervised production	8.55*	- 1.14
Ownership of a bicycle or radio ^{a/}	27.04*	11.89*
Mwene-Ditu ^{a/}	-53.21*	-21.66*
Tshilenge ^{a/}	-99.43*	-30.71*
Gandajika ^{a/}	-44.32*	- 5.91
Coefficient of multiple correlation (R)	0.54	0.41

^{a/} Indicates that a zero-one "dummy variable" was used to classify this phenomenon.

^{b/} CAKO and TABAZAIRE are government-supervised programs for the production of cotton and tobacco, respectively.

-- Variable not used in a regression * Significant at the 5% level
 + Significant at the 10% level

The size of the family has a significant impact on both dependent variables, thus serving to underscore the importance of labor's influence on the amount of land which can be cropped.

Several variables were included to measure the influence of education and experience. The education of the head of household, in most cases a male, is significant in determining the total area planted, but not the area planted to maize.

The age of the head of household, a proxy for experience, is not significant, whereas the age of the wife is statistically significant in both regressions. Multicollinearity in the two age variables may explain the lack of explanatory significance for the husband's age. Nevertheless, these results serve to raise again the century-long debate as to whether it is the wife or husband who contributes more to production in the traditional African farm setting^{6/}. The lack of statistical significance of the husband's age should not be interpreted to mean that he is unimportant in the agricultural production of the study area. Tables 4-6 demonstrate the substantial role that he plays in providing labor for clearing, sowing, and weeding. Field observation suggests that the male role is even more important in the production of such commercial (non-traditional) crops as cotton and tobacco.

Many of the farmers in the survey area do participate in two government programs designed to stimulate the production of tobacco (the TABAZAIRE program) and cotton (CAKO). Participants receive advice from extension agents, access to tractor plowing services for land devoted to the specialty crop itself, and they can purchase certain specialized inputs through the administrative agencies. Regression results show the impacts of the programs.

Participation in TABAZAIRE has a negative impact on both total area in crop and the area in maize. This can be understood in that tobacco is a labor intensive crop -- devoting much effort to tobacco will severely limit the time available to plant other crops. Furthermore, the time period in which tobacco is produced (September through January) coincides with the peak labor demand requirements of cassava, maize, beans, and other traditional cash crops. In contrast, cotton production -- at least as organized through CAKO -- apparently does not conflict with the production of other crops. While not statistically significant, the regression coefficients for CAKO participation are both positive.

The length of time of participation in the two government programs was viewed as another experience variable. While length of participation has a positive impact on total area cropped, it has no significant impact on maize production per se. The interpretation of this result is that participants in the two programs learn little which may be usefully carried over to the production of maize.

^{6/} For discussion of this debate, see references (1, 3, 5).

The variable for ownership of a bicycle or radio was used to signify modern orientation^{7/}. It does have a significant, positive association with both total area and area in maize. More importantly, perhaps, it serves as an indication that these modern artifacts are a potential link between government programs and the better farmers. At present, there are few, if any, farming information programs available by radio in the study area.

The final three variables in the regressions are dummy variables used to distinguish the districts of Mwene-Ditu, Gandajika, and Tshilenge, from Kaniama, the district of reference. Their negative and (in most cases) significant signs can be taken to mean that Kaniama has otherwise unexplained advantages over the other three districts, in terms of both maize and general farm production. The availability of more land within walking distance, stemming from smaller villages and sparser population in Kaniama, is certainly one factor which may explain this difference.

Summary and Conclusions

This paper has explored the availability and use of farm labor in one of the principal maize production areas of south-central Zaire. Results indicate that farmers rely heavily on family labor for the production of maize and other crops. Of the farmers surveyed, 12 percent or less relied on outside hiring for principal maize production tasks. Low reliance on outside work as an additional source of income to farmers represents further evidence of the lack of an active labor market in the survey area.

The availability of labor from within the family itself appears to be constrained by the traditional division of tasks between males and females. Males tend to take the major responsibility for clearing maize land and, to a lesser extent, for sowing and weeding. Females, on the other hand, do a heavy portion of the harvesting and marketing. This is especially true in the Kasai Oriental districts of Mwene-Ditu, Gandajika, and Tshilenge.

In the Kaniama district of Shaba, there is some tendency for traditional roles to break down: both males and females participate heavily in all maize production tasks. It is not clear whether this is

^{7/} In retrospect, one may wish to quarrel with this interpretation. Cause and effect are at issue, i.e., Is a farmer more productive because of "modern orientation" or is he able to afford the artifacts of the modern world because he is more productive? Nevertheless, the authors feel that the final interpretation of the results for this variable is consistent with either case.

the cause or the effect of larger farm size. Population density and village size are both lower in Kaniama than in other districts, and this would presumably make available communal lands more readily accessible. Farm size is indeed larger in Kaniama. This suggests that improving accessibility to lands which lie more distant from larger villages may be a key to increasing farm size and production in the study area.

In general, there is mixed evidence as to labor's role as a constraining factor in production. When asked about limitations to increasing output, most farmers identified the need for more tractor mechanization, rather than labor per se. Yet perhaps this is nothing more than indirect recognition of the scarcity of labor at critical periods. Results of a linear regression clearly showed the importance of family size, an indicator of labor availability, as a determinant of total area cropped and area planted to maize.

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