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Raising the Productivity of Women Farmers in Sub-Saharan Africa

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The World Bank
Washington, D.C.

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The International Bank for Reconstruction
and Development/THE WORLD BANK
1818 H Street, N.W.
Washington, D.C. 20433, U.S.A.

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Manufactured in the United States of America
First printing February 1994

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ISSN: 0259-210X

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Library of Congress Cataloging-in-Publication Data

Saito, Katrine Anderson.

Raising the productivity of women farmers in Sub-Saharan Africa /
Katrine Saito with contributions from Hailu Mekonnen and Daphne
Spurling.

p. cm. — (World Bank discussion papers ; 230)

Includes bibliographical references.

ISBN 0-8213-2749-6

1. Women farmers—Africa, Sub-Saharan. 2. Women in agriculture—
Africa, Sub-Saharan. 3. Agricultural productivity—Africa, Sub-
Saharan. I. Mekonnen, Hailu. II. Spurling, Daphne. III. Title.
IV. Series.

HD6073.F32A3756 1994

331.4'83'0967—dc20

93-46883

CIP

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FOREWORD

Agriculture has long been the dominant sector in much of Sub-Saharan Africa in terms of output, employment and export earnings. Yet the performance of the agricultural sector has been far from satisfactory with the rate of agricultural output growth lagging well behind that of population. This poor performance is due in no small part to the failure of governments and donors to fully comprehend and respond to the growing role of African women in the economy.

This Report presents the findings of a UNDP-funded, World Bank-executed project on Raising the Productivity of Women Farmers in Africa. The Report is based primarily on four country studies - Burkina Faso, Kenya, Nigeria and Zambia. These studies document women's role in agriculture, identify and evaluate the key constraints they face in attempting to raise their productivity, and recommend measures to relieve these constraints. All four country studies entailed field work and benefitted from specialized studies undertaken by local researchers. The Report is also based on the evidence from rural household surveys in Kenya and Nigeria, which provided a rich body of information on the intrahousehold allocation of responsibilities and resources, as well as enabling gender differences in productivity to be analyzed and explained.

As this Report shows, women are so important to African agriculture that initiatives to raise the sector's productivity cannot afford to ignore them. Most farmers in Africa are women, and they produce more than three-quarters of the region's basic foodstuffs. Yet the economic, social and cultural environment in which they work, rear their children and manage their households is frequently unsupportive. In particular, women's access to agricultural inputs and supports services has not improved commensurate with their role as farmers, resulting in considerable loss in agricultural activity and output - more than 20 percent according to the Kenyan analysis. The recommendations of this Report are consistent with well-established tenets of agricultural development. Land and labor productivity, cost-effective extension advice, appropriate technologies and viable financial services are all important for effective agricultural development strategies. However, what this Report emphasizes is that agricultural development strategies have not adequately focussed on the clients. And, in Sub-Saharan Africa at least, the clients are increasingly women. If SSA is to revitalize the agricultural sector and improve household food security -- goals assigned high priority by all the countries in the Region -- raising the productivity of women farmers must be the centerpiece of agricultural strategy.

Ann O. Hamilton
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ACKNOWLEDGEMENTS

Many individuals and agencies have contributed to this Report. First and foremost is the United Nations Development Programme (UNDP) which recognized the importance of an extensive study of women farmers in SSA and the problems they face in raising their productivity. UNDP not only provided the financial resources for engaging local and international experts to advise on specific topics and for mounting the rural household surveys in Kenya and Nigeria, but its staff also provided professional support and encouragement throughout.

I am indebted to a small group of dedicated colleagues who worked with me as a team throughout the preparation of this Report. This team comprised Hailu Mekonnen who, helped by Jorge Castillo-Trentin, was responsible for the collection and analysis of the survey data from Kenya and Nigeria. Daphne Spurling who served as advisor on technical agricultural issues, prepared the Nigeria study, and contributed in a major way to the preparation of the entire report; Anne Grimsrud who helped assisted with the Zambia study; Nadine Horenstein who helped prepare the Kenya and Zambia studies; Judy Bryson who helped prepare the Burkina Faso study; and Ingrid Palmer who advised on the initial preparation of this Report.

In addition, I would like to thank researchers in each of the four countries studied. In Kenya, H.W.O. Okoth-Ogendo, Patrick Alila and L. Maurice Awiti carried out the survey and the preliminary analysis, assisted by E. Chebet, S. W. Gitahi and J.R.O. Onyango. Valuable contributions were made by John Gatheru, Jeddidah Gachanja and Grace Maina. In Nigeria, Rae Lesser Blumberg, Emelike Okoro, Janice Olawoye, Comfort B. Olayiwole, Anthony Ikpi, and Esther Walabai-Gadzama carried out the survey and prepared important background papers. The Burkina Faso study was co-authored by Ibrahim Nebie, Mariama Tani Yago and Della McMillan. Finally, Bonnie Keller prepared a useful review of the extension system in Zambia.

My colleagues in the Population and Human Resources Department of the World Bank have been extremely helpful in giving freely of their time to advise and comment on successive drafts. Ann O. Hamilton provided overall encouragement and support, and valuable contributions were made by Barbara Herz and Agnes Quisumbing. Special mention must be made of the significant contribution of Roger Slade, particularly to the Overview Report. Another major contributor was Maria Abundo, who with endless patience and great skill was responsible for the technical production of this Report. Mary Horne provided valuable editorial assistance.

There were numerous outside readers who made valuable comments on section of the report. Special mention should be made of the inciteful comments from Fakrouddin Ahmed, Harold Alderman, Graeme Donovan, Shem Migot-Adholla, Josette Murphy and Götz Schreiber. Many other readers also provided valuable comments; they are too numerous to list here but will recognize their contribution on reading this report. Their help was very much appreciated. And finally, special thanks to Sidney Chernick for his unfailing support and encouragement.

Katrine A. Saito

EXECUTIVE SUMMARY

1. The focus of this study is on women farmers in Sub-Saharan Africa (SSA) who now dominate the smallholder sector and account for more than three-quarters of the food produced in the region. Yet the economic, social and cultural environment in which they work, rear their children and manage their households is not supportive and, in some respects, actually hostile. Given the widespread food insecurity in SSA, this inhospitable environment results in large private and social costs.
2. Governments and donors alike realize that one of the critical factors in revitalizing agriculture in Africa is to raise the productivity of women farmers. Increasing the productivity of women farmers will contribute directly to higher output and improved household food security. Drawing on the widespread analysis and evidence elsewhere, it is likely that the greatest gain from raising women farmers' productivity would come in the form of improved child nutrition, increased capacity for education and more generally, an enhancement of the welfare of the rural household, an increasing number of which are female-headed.
3. The UNDP Regional Program for Africa recognized the importance of an extensive study of women farmers in SSA and the problems they face in raising their productivity. UNDP funded seven projects on this topic, of which this is one.
4. This Overview Report presents the findings of this project. It is based primarily on four country studies – Burkina Faso, Kenya, Nigeria and Zambia. These studies document women's role in agriculture, identify and evaluate the key constraints they face in attempting to raise their productivity, and recommends measures to relieve these constraints. All four country studies entailed some field work and benefitted from specialized studies undertaken by local researchers.
5. The report is also based on extensive household surveys in Kenya and Nigeria, with 720 and 750 randomly-selected households surveyed in each country, respectively. An important feature of these surveys was the collection of data on a plot-specific basis. Data was collected in this way because of the common practice in Africa of men and women managing their own plots. Based on the plot-specific information, farmer level observations were constructed by aggregating outputs and corresponding farm inputs on all his/her plots. Enumerators living in the villages undertook the field work over the cropping season and sections of the questionnaire were administered four times corresponding to the main phases of agricultural activity.
6. The key findings of this Report are as follows:
 - **The African rural household is changing and traditional farming systems are breaking down.** In response to evolving social and economic circumstances, particularly growing population pressure on an increasingly degraded land, men are migrating off the farm in search of more remunerative activities elsewhere, and the traditional pattern of intra-household rights and obligations is changing. The gender-specific nature of African farming is disappearing as women are growing crops (such as coffee and other cash crops), taking on tasks (such as land clearing) traditionally performed by men, and making decisions on the daily management of the farm and household.
 - **These evolving circumstances have changed the role of women in African agriculture.** In all four countries studied, smallholders are the core of the agricultural sector, and women

now comprise the majority of smallholder households. Women have become the de facto managers of the rural household.

- **Female-headed households are becoming increasingly common in SSA.** In Zambia, for example, they comprise about one-third of all rural households and up to 51 percent in the Northern Province. Such households tend to be particularly disadvantaged in their landholdings, supply of family labor, and extension contact.
- **Women work considerably longer hours than men on both agricultural and other tasks.** The range of tasks on and off the farm that SSA women farmers – especially those heading households– are required to perform is very broad, and calls for an application of time and energy that tests human endurance. The four country studies show rural women working, on average, fifty percent more hours per day than men. Clearly, there is a finite limit to the time and energy that women farmers can apply. Given the already large and growing contribution women farmers are making to agricultural production in general, and to feeding their households in particular, policymakers must recognize that any strategy to improve agricultural productivity that increases the demand for labor, especially female labor, must take the consequent opportunity costs fully into account.
- **Governments are beginning to realize that raising agricultural output and productivity means a greater focus on women farmers.** However, the pace of implementing the requisite supportive measures has been all too slow, resulting in considerable loss in potential output. Econometric analysis of the study's household survey data strongly suggests that **potential agricultural output is reduced owing to women's disadvantaged access to inputs and support services.** Although, the mean gross value of output per hectare from male-managed plots in Kenya was 8 percent higher than from female-managed plots, if women were to apply the same volume and quality of inputs as men, their gross value of output would increase by around 22 percent. This potential productivity gain can only be realized by substantially improving women's access to inputs and support services such as land, labor, technology, extension and credit.
- **Land Rights:** Since the 1960s, some attempts have been made to improve women's rights to land, but in practical terms, the situation has worsened: growing population pressure on increasingly depleted land has further weakened women's land rights, and as good agricultural land has become more scarce, women are managing even smaller plots. As pressure on the land increases and efforts to improve agricultural productivity intensify, it will be even more important to ensure that women have access to and control over adequate land. Women's legal rights to land throughout SS Africa, must be expanded and secured so that they can be implemented in practice.
- **Farm Size:** Within the context of a growing shortage of good quality farming land in SSA, women are particularly disadvantaged compared to men in the size of plots they farm. In Nigeria, for example, households headed by women cultivate a mean area one-third of male-headed households. However, given existing farming technologies, smallholders seem to be faced with a situation where available family labor and insufficient income to hire labor constrains the productive use of additional land. Because smallholder technology is labor-intensive, and because of acute seasonal labor shortages, more land, even if available, would not be a solution. Hence, smallholders, especially female, must gain access to more

inputs and better technology so that the returns to the land they have is increased - in short, their productivity is raised.

- **Labor:** All four countries face the paradoxical situation of a rural labor shortage within a labor-surplus economy with high population growth rates and high rates of unemployment. This has to do with the generally low level of labor productivity, reflecting smallholders', especially female smallholders', limited access to information and resources that would enable them to adopt different technologies, and increase labor productivity. With low average and marginal returns to labor, male family members in particular seek employment possibilities off the farm. That a high proportion of male heads and members of rural households are not engaged in farming is reflected in the findings of the WAPIA surveys. This reduces family labor supply and highlights the lack of cash or credit with which to hire labor. As a result, households adjust cropping patterns and farming systems to fit labor availability. They do this by limiting the area cultivated and planted, the amount of weeding or fertilizer applied, or by growing less labor-intensive crops such as cassava, and thus reducing labor value added. The solution lies in raising output by generating and employing superior technology.
- **Technology:** No matter how technically feasible recommendations may be, they cannot increase productivity unless they are implemented. Certain technologies may be less easily adoptable by female than male farmers because, as the four country studies have amply demonstrated, male and female farmers do not operate under the same conditions. Labor- and energy-saving technologies are women farmers' greatest need. In addition they require production technologies for their commodities, constraints and objectives -- which are not always exactly the same as those of male farmers. If gender-related problems are allowed to constrain adoption, women farmers will be further disadvantaged and efforts to increase national agricultural output and productivity will be compromised.
- **Agricultural research and technology** must focus more on the needs of the majority of farmers -- women -- by concentrating on the farming and household system, by increasing participatory research with male and particularly female farmers, and by improving feedback from gender sensitive extension agents and systems. Gender sensitive technology generation and promotion is possible. An understanding of women's farming role and constraints, including cultural constraints, is a prerequisite to devising suitable strategies. Evidence from the country studies suggests that appropriate technology equipment for women farmers should be economically accessible and viable. In addition, the necessary infrastructure and facilities should be available. Women should be included in the planning and trained in the operation of the technology, and the technology must be targeted at the person who will use it.
- **Extension:** Contact with extension significantly and positively affects the gross value of male farmers' output, but not female farmer's output. First, the diagnosis of gender differences in agricultural activities and constraints should be improved, and extension messages and delivery modified accordingly. And monitoring and evaluation should routinely be on a gender-disaggregated basis. The country studies show that there are many useful and practical examples of how to improve extension for women farmers in Africa, but a more intensified effort is needed.

- **Credit:** Cost-effective and sustainable financial services are critically needed by African smallholder farmers -- both men and women. As the country studies show, they are presently quite inadequate. Availability of inputs and technologies is to no avail unless farmers have the means to obtain or use them, and the seasonal surpluses of agricultural income may not be invested to full advantage. Financial innovations aimed at providing such services in a sustainable way should be identified - - particularly a greater effort is needed to explore and identify the informal savings and credit systems that are working for smallholders in Africa, together with ways of linking them to formal financial systems. Specific examples of such innovations are drawn from the Kenya and Burkina studies

7. **Conclusion:** Women are so important to African agriculture that initiatives to raise the sector's productivity cannot afford to ignore them. As this Report shows, women do most of the work on the farm and increasingly have become the key decision-makers. Despite this additional responsibility, however, women's access to agricultural inputs and support services has not improved commensurately. This results in a considerable loss in agricultural productivity and output -- more than 20 percent according to the Kenyan analysis. The recommendations set out in this Report are consistent with well-established tenets of agricultural development. Tenurial rights to land, land and labor productivity, cost-effective extension advice, appropriate technologies and viable financial services are all important for effective agricultural development strategies. However, what this Report emphasizes is that agricultural development strategies have not adequately focussed on the clients. And, in Sub-Saharan Africa at least, the clients increasingly are women. If SSA is to revitalize the agricultural sector and improve household food security -- goals assigned high priority by all countries in the Region -- raising the productivity of women farmers must be made the centerpiece of agricultural strategy.

Chapter 1. Introduction

1.1 This study focusses on women farmers in Sub-Saharan Africa (SSA) -- a region where the restoration of sustainable agricultural growth is among the highest development priorities of governments and donors. Since the role of women in African agriculture is already large and growing, they have a key role to play in revitalizing agriculture, especially food production. This study also comes at a time when many countries in Eastern and Southern Africa are facing one of the worst droughts of this century -- a harsh reminder of the continued vulnerability of food production in SSA and an urgent reminder of the need to raise the productivity of farmers.

1.2 Agriculture has long been the dominant sector in much of Sub-Saharan Africa in terms of output, employment, and export earnings. However, since the independence decade of the 1960s, much of the history of agricultural development in SSA is a story of development failure. This failure is reflected in a rate of agricultural output growth that lags well behind the rate of population growth. Between 1965 and 1990, agricultural production grew at an annual rate of only 1.7 percent or a little more than one-half the 2.8 percent average annual population growth rate. The gap between agricultural output and population growth widened significantly during the 1980s, especially the first half of the 1980s, when the rate of growth of output fell well below its longer-term trend rate and population growth accelerated. Hence, regional food imports (including food aid) increased substantially and today represent about 10 percent of food consumed in SSA. In the late 1970s, for the first time in its history, SSA became a net importer of food, and at current growth rates the food gap is projected to increase to more than 9 times today's gap by 2020 (Cleaver and Schreiber 1992). Even with the increased imports the per capita daily caloric supply in 1988 was virtually identical to that in 1965, while an estimated one-fifth of SSA's population -- 100 million people -- still remain food insecure, meaning that they do not consume enough food to ensure an active, healthy life. While imports were growing, agricultural exports were declining -- at least between 1970 and 1984 when a modest recovery began.

1.3 The comparatively poor performance of SSA agriculture is due to both external and internal factors. External factors, such as the extended period of depressed international prices for many of SSA's agricultural commodity exports, reduced the incentive to export and encouraged imports of food and other agricultural products. Most significant among the internal factors has been the poor policy environment for agriculture -- an environment in which overvalued exchange rates were tenaciously maintained and cheap food price policies were protected in many SSA countries so that the domestic terms of trade were strongly biased in favor of the urban areas. The origins of this policy of neglect in relation to agriculture can be traced to the post-independence period when many newly independent African states embraced the then popular development model favoring industrial activity over agriculture as the main engine of economic growth. As a result, few modern farming technologies were developed, disseminated and adopted and total factor productivity in agriculture declined. The decline in productivity has been exacerbated by the growing pressure on land exerted by very rapid population growth and the consequent increased use of less fertile land. Thus farmers trying to maintain real household incomes have diversified the sources of household income -- men have migrated to the cities and towns; women have sought more income-earning opportunities around the farm, sometimes contributing to the further degradation of the physical environment.¹

¹ The inter-relationship between agriculture, population and the environment has been well developed in Cleaver and Schreiber 1992.

1.4 Most SSA countries also failed to comprehend and respond to the growing role of African women in the economy. Increasingly women are responsible for decisions within the household that impinge on the volume and composition of agricultural output, household food security and the family's size, health, and educational attainment. These decisions also affect the rate at which SSA economic structures change and the size and quality of the labor force. Women farmers and entrepreneurs face special constraints that limit their options both outside and within the household. These constraints limit their contribution to the nation's production and diminish the economic and social welfare of their households. The future development of SSA depends in considerable measure on the fuller utilization of women's productive capacity, especially in agriculture because that is where they are mainly employed. How to achieve these productivity gains is the subject of this report.

1.5 This overview volume presents the findings of a UNDP-funded, World Bank-executed project on Women's Agricultural Productivity in Africa (WAPIA). The overview is based primarily on four country studies -- Burkina Faso, Kenya, Nigeria, and Zambia.² These studies document women's roles in agriculture, identify and evaluate the key constraints they face in attempting to raise their productivity, and recommend various policies, programs and projects to remove these constraints. All four country studies entailed some field work and benefitted from specialized studies undertaken by local researchers. The report is also based on the evidence from household field surveys in Kenya and Nigeria.³ This rich body of information has enabled differences in output between male and female farmers to be analyzed and explained. For example, this analysis shows that extension contact in Kenya contributes significantly and positively to output on male-managed plots, but not on female-managed plots, giving an insight into the effectiveness of current extension systems in at least one large country in SSA. Qualitative evidence compiled in the country studies reinforces this finding, suggesting that this condition applies widely in SSA.

1.6 To varying degrees this report has benefitted from direct operational experience in all four countries. In Nigeria, for example, the WAPIA project contributed to the initiation of changes in the extension service that have developed into what is now a nationwide Women in Agriculture program -- an integral part of the state-run extension services. This process provided valuable lessons on how agricultural research and extension can be changed to better help women farmers. The Zambia country study was discussed at a World Bank workshop for farmers and government officials, and the report's main recommendations were incorporated into the World Bank's agricultural strategy for Zambia. In Burkina Faso, a village-level participatory approach was adopted to discuss and disseminate the country study in draft. This month-long process provoked lively debate at the local and national levels and led to a critical review of ongoing programs aimed at raising women farmers' productivity. A local team then revised the draft report to reflect the outcome of the discussions. Finally, the principal findings of the Kenya country study were reviewed at a national workshop that brought together government officials, academicians and farmers.

² The four country studies are contained in Background Papers, Volume I (Saito et al, 1992), to this Report, which is in mimeo form; Volume II (also in mimeo) contains other background papers. Both are available from the author.

³ The widespread absence of gender-disaggregated economic and social data (a reflection of the lack of attention that analysts and policymakers have given to gender-related economic issues) necessitated the collection of primary data through rural household surveys.

1.7 To provide context, Chapter 2 of this overview volume briefly describes and compares macroeconomic and sector policies in the four countries. Chapter 3 discusses gender issues within the farm household and how the gender division of labor and decisionmaking is changing. It also examines women's participation in agricultural activities, looking particularly at the growing number and socio-economic importance of female-headed households. Chapter 4 presents an econometric analysis of the household data focusing on gender differences in productivity, and chapters 5 to 9 address the issues of land (chapter 5), labor (chapter 6), extension (chapter 7), technology (chapter 8), and credit (chapter 9), pulling together the lessons gleaned from the four case studies on how to best overcome the obstacles women farmers face, as well as lessons on those policies and programs that do not work and that should be avoided. The concluding chapter looks to the future and suggests possible strategies for raising the agricultural productivity of women farmers, and thereby increasing agricultural output in SSA.

Chapter 2. Economic Background of the Four Studies

A. Key Economic and Agricultural Indicators

2.1 All four countries studied -- Burkina Faso, Kenya, Nigeria, and Zambia -- fall into the low-income group of SSA countries, with per capita incomes below US\$400 in 1990, and are characterized by comparatively low levels of consumption and social welfare as evidenced by calorie supply, infant mortality, and educational attainment. All have very high population growth rates, although fertility rates for Kenya and Nigeria appear to have declined in the last few years.

Table 2.1. Key Economic and Social Indicators

Indicator	Year(s)	Burkina Faso	Kenya	Nigeria ^{1/}	Zambia
Population (millions) ^a	Mid-1990	9.0	24.2	115.5	8.1
Population (growth rate) ^a	1980-90	2.6	3.8	3.2	3.7
GNP per capita (in US\$) ^a	1990	330.0	370.0	290.0	420.0
GDP (annual growth rate) ^a	1980-90	4.3	4.2	1.4	0.8
Agriculture (% share in GDP) ^a	1990	32.0	28.0	36.0	17.0
Agriculture (% annual growth) ^a	1980-90	3.3	3.3	3.3	3.7
Agriculture (% share in total employment) ^b	1980	86.7	81.0	68.1	73.1
Food Insecurity (% of pop.) ^c	1980-81	32.0	37.0	17.0	48.0
Calorie Supply (% of min. req.) ^c	1988	90.0	89.0	91.0	..
Index of food production per capita 1978-81=100 ^c	1988-1990	114.0	106.0	106.0	103.0
index of cereal imports, 1974=100 ^c	1990	146.0	1253.0	290.0	107.0
Primary school enrollment ^a	1989	35.0	94.0	70.0	95.0
Infant mortality rate(per 1,000 live births) Average for low-income economies =100 ^a	1990	134.0	67.0	98.0	82.0

Notes: .. = Not available.

1/ Recent census data show a provisional population figure of 88 million.

a. World Bank, World Development Economies 1991.

b. World Bank, Trends in Developing Economies 1991.

c. Cleaver and Schreiber, The Population, Agriculture and Environment Nexus in Sub-Saharan Africa 1992.

2.2 In terms of its contribution to gross domestic product (GDP), employment, and foreign exchange earnings, agriculture is the dominant sector of activity in Burkina Faso and Kenya. Agriculture is also an important source of employment and output in Nigeria, but petroleum extraction and refining

is the major export sector. Agriculture is the main source of employment in Zambia, but copper mining and manufacturing are major contributors to output and to exports. Some key economic and social indicators for each of the four countries under study are presented in table 2.1.

2.3 Both GDP and agricultural growth were comparatively strong in Burkina Faso and Kenya over the 1980s but weaker in Nigeria and Zambia. Burkina Faso is the only country among the four where the growth of agriculture exceeded that of population but all four countries managed modest increases in per capita food production during the 1980s. Food supplies were augmented by imported cereals, with roughly one-third provided through food aid. Nevertheless, as table 2.1 shows, food insecurity in the four countries remains comparatively high. The clearest example is Zambia, where despite the increase in per capita food production and imports, the level of food insecurity at 48 percent of the 1989-91 population is among the highest in SSA. Food insecurity in Burkina Faso and Kenya is also high. Moreover, the distribution of food within Burkina Faso, Kenya, and Zambia is grossly inequitable, either because of transport inadequacies or the lack of purchasing power.

2.4 The food insecurity paradox in SSA, as the country studies in Volume II show, is that women (and children) comprise the vast majority of the food insecure population and yet they are the major producers of food for the SSA household. This paradox reflects the economic and social disadvantage facing women farmers and entrepreneurs in SSA; those who are the main victims of food insecurity are prevented from contributing fully to its elimination.

2.5 The structure of agricultural production and the farming systems employed vary among and within the four countries, reflecting differences in agroecological conditions and ethnic and religious attitudes toward land ownership and land use (table 2.2). The data in table 2.2 and the country studies presented in Volume II show that:

- Agricultural production in all four countries is predominantly rainfed and hence hostage to the vagaries of weather.
- The structure of agricultural production is geared largely to providing food for domestic consumption; only Kenya (tea and coffee) and Burkina Faso (cotton and livestock) are important exporters of agricultural products.
- Growth of agricultural output recorded by Burkina Faso and Kenya is attributable primarily to an expansion in area cultivated rather than to increased productivity of existing land area in use.
- With the exception of cereal crops in Burkina Faso and root crops in Zambia, the average yields for cereals and roots and tubers for the four countries compare favorably with those of other SSA countries, but are mostly well below yields obtained in Asian countries.
- Land quality and cultivable area per capita are falling in the face of rapidly increasing population pressures; all four countries face serious soil degradation problems and, with the exception of Zambia, a probable reduction in cultivable area by the year 2000.
- Farming remains predominantly traditional. Smallholder or subsistence farms use labor-intensive technology and few modern inputs. They produce little or no surplus output for the market. Even smallholder's own consumption is commonly below minimum dietary

requirements. Kenya is an exception, having raised the productivity of the smallholder sector through special efforts to diversify cropping patterns provide modern inputs, and encourage exports through competitive pricing.

- Fertilizer consumption in the four countries averages about 20 kg per hectare of arable land, about twice the average for SSA (9 kg per ha) but well below the average of 94 kg per hectare of low-income countries throughout the world.
- Increasingly decisionmakers in farming in all four countries are women; this change stems from the migration of men from rural to urban areas (Kenya, and Zambia, and southwest Burkina Faso especially) in search of superior employment opportunities. Hence, the high proportion of female-headed households in rural areas.

Table 2.2. Structure of Agricultural Sector

Item	Year	Burkina Faso	Kenya	Nigeria	Zambia
Per capita arable land (ha)	1990	0.40	0.10	0.29	0.62
Cropland and pasture used as % of total land area (ha)	1987	48	11	57	54
Share of agriculture in merchandise exports (%)	1989	88	85	5	3
Percentage of land irrigated ^{1/}	1989	0.1	0.1	1.2	0.1
Fertilizer used (kg/ha) ^{2/}	1989	6	48	12	17
Average cereal crop yields (tons/ha)	1989	0.7	1.7	1.2	1.7
Average roots and tuber yields (tons/ha)	1989	6.0	8.6	12.4	3.7
Share of total labor force in agric. (%)	1988	87	81	68	73
Women as % share in Agric. labor force	1988	-	-	21	40
Female-headed households (% of total rural households) ^{3/}	Most recent year	15	38	23	39

Source: World Bank, *Trends in Developing Economies*, 1991; Cleaver and Schreiber, "The Population, Agriculture and Environment Nexus in Sub-Saharan Africa," 1992; *World Development Report 1991*; and World Bank WAPIA Survey, 1989-90.

^{1/} Irrigated land as percentage of arable and permanent crop land.

^{2/} Fertilizer consumption in terms of plant nutrients per ha of arable land.

^{3/} These data are from sample surveys and may not be nationally representative. Kenya and Nigeria data are from the household surveys conducted as part of the WAPIA project.

2.6 A good insight into agricultural development in SSA over the past three decades can be gleaned from table 2.3 which clearly reveals the comparative deficiencies in SSA agricultural performance. It shows that SSA recorded the second lowest overall increase in cereal output of all the developing country groups. Yield gains were far less important in SSA than in all the other regions, and the expansion of area cultivated accounted for a much higher share of yield increase (47 percent) than in other regions. Current cereal yields in SSA are the lowest of all the regions of the world. This broader perspective of the development and current state of agriculture in SSA reinforces the conclusions reached earlier in this chapter, namely, that future agricultural development will have to rely much more on securing higher yields.

Table 2.3. Contribution of Increases in Area and Yields to Cereal Output, 1961-1990

Country Group	Total increase in output since 1961	Attributable to increased area (%)	Attributable to increased average yield (%)	Current yield 1988-90 (tons/ha)
Developing countries	118	8	92	2.3
Sub-Saharan Africa	73	47	52	1.0
East Asia	189	6	94	3.7
South Asia	114	14	86	1.9
Latin America	111	30	71	2.1
Middle East and North Africa	68	23	77	1.4
Europe and former USSR	76	-13	113	2.2
High-income countries	67	2	98	4.0

Source: World Bank, *World Development Report 1992*, Table 7.1.

B. Economic and Agricultural Background of the Four Countries

1. Burkina Faso

2.7 Burkina Faso is the poorest of the four countries. It is a landlocked country in the Sahelian zone and about 90 percent of the population lives in rural areas. Economic fortunes depend heavily on the weather. Burkina Faso's economic performance during the 1980s was, on the whole, satisfactory with GDP and agricultural growth both exceeding population growth. But this satisfactory performance was based on good weather and two unsustainable factors: rapid expansion in government spending, and the increased availability of new land recently freed from onchocerciasis (river blindness). Since 1988 GDP growth has dropped to less than 1 percent per annum because of poor rainfall and a mounting debt service burden. Faced with this deteriorating economic performance, the Government adopted a reform program with support from the International Monetary Fund (IMF) in 1989. The program addresses the country's structural imbalances by improving public sector resource management; reducing government participation in commercial and industrial activities and deregulating prices, removing restrictions on imports, and privatizing public enterprises.

2.8 Agriculture was assigned high priority in the First Five Year Plan (1986-90) and figures prominently in the Second Five Year Plan (1991-95). Government policy shifted from pervasive regulation of trading and commodity movements to a more liberalized system, and an earlier interest in

the establishment of state farms gave way to a focus on the individual producer. Indeed the draft Second Five Year Plan seeks to provide an "enabling environment" for private investment in agricultural activities.

2.9 Policy toward women also has been positive. The active participation of women in economic development has been encouraged by successive governments over the past decade. A strategy for women's participation in development over the Second Plan period assigns the highest priority to increasing the productivity of women in food production, processing, and marketing.

2.10 Burkina Faso's population growth of 2.6 percent per annum over the 1980s (2.8 percent during 1988-90) contributes to a variety of economic and ecological problems. Cultivable land, plant cover, and water resources are being overexploited in populous areas, leading to rapid soil degradation, erosion, and further desertification. The Government has committed itself to improved family planning services, a program to disseminate simple conservation technologies for soil, water, and biomass, and to spending more on agricultural extension.

2. *Kenya*

2.11 Agriculture is the mainstay of Kenya's economy, providing employment for about 80 percent of the labor force and contributing 26 percent of GDP. Two main export crops, tea and coffee, account for 45 percent of exports, with tourism being the largest foreign exchange earner. Kenya's relatively strong and diversified industrial base contributes about 17 percent to GDP and employs 7 percent of the labor force, but manufactured exports are low.

2.12 Following independence in 1963, Kenya's GDP rose at the annual average rate of 8 percent for a decade. The oil shocks of the 1970s severely affected the economy. Inappropriate policy responses turned the domestic terms of trade against agriculture, and slowed industrial growth. This situation was exacerbated by the collapse of the East African Community and inefficient public investments. During the early 1980s a number of stabilization and structural reform measures were introduced. These largely succeeded and economic growth recovered to an annual rate of 6 percent during 1985-89. But heavy reliance on foreign savings left the economy vulnerable to external shocks such as the 1991 Gulf crisis. Kenya is now wrestling with a much weakened balance of payments position stemming from a deterioration in its terms of trade, reduced horticultural exports (particularly cut flowers and fruits and vegetables), lingering effects of the oil price shock associated with the Gulf crisis, strong domestic demand, and lower than expected inflows of program assistance and tourism revenues. The Kenyan economy remains vulnerable to external developments and needs further structural changes to raise production and promote exports.

2.13 Historically the major thrust of Kenya's agricultural strategy was to foster smallholder production. When the need to correct structural deficiencies in the economy became evident, the strategy was refocused to include the objectives of increasing foreign exchange earnings from agriculture, enhancing food security, and creating rural employment. To implement this strategy the production of important food crops was to be intensified, research capacity expanded, and higher-value crop production favored. Attaining these objectives meant the implementation and management of a new set of price incentives; the main instrument employed was the steady devaluation of the Kenya Shilling. Revamping agricultural institutions was also called for. The changes in price incentives were promptly and effectively introduced. The required institutional changes were slower to take hold, and a number of anomalous policies and institutional weaknesses remain. This new agricultural strategy made an important

contribution to the 4.4 percent growth rate of agricultural output between 1985 and 1989. Especially noteworthy was the increased production of food and export products from smallholders.

2.14 It will be difficult for Kenya to maintain past high rates of agricultural growth without deliberate efforts to overcome the growing scarcity of good quality arable land. Agricultural growth has come from expanding the cultivated area, subdividing large farms and cultivating them more intensively, and cropping pattern changes such as the introduction of hybrid maize. Nearly all the good agricultural land is utilized or unavailable and population growth has led to a shortage of cultivable land and to the overuse of much of the land under cultivation. The spread of hybrid maize has reached, if not saturation point, at least all the most suitable areas; the same is true of smallholders' production of profitable export crops. Irrigation to increase production is unlikely to be economic.

2.15 World Bank studies show two strategies to be promising. The first is to raise smallholders' productivity and income per hectare. At present smallholders' yields are approximately one-half those of large-scale farmers and smallholders have less than 2 hectares on average and produce mostly for subsistence. Increasing the yield of maize is a prerequisite to releasing land to higher-value commodities because farmers are risk-averse and prefer to ensure their own subsistence by producing maize. The second and more problematic strategy is to increase the cultivated area by reducing the area presently used for livestock. There is also some scope for raising production in the arid and semiarid areas; this, however, requires the application of technologies consistent with environmental conservation.

2.16 A major challenge for Kenya's future economic development comes from the 3.9 percent annual population growth rate.¹ Annual employment must grow from the 3.4 percent of the 1970s to at least 4.2 percent to accommodate the growing labor force. Most employment growth can come only from the agricultural, rural nonfarm, and urban informal sectors. The government is focusing on accelerating agricultural growth by improving incentives and removing constraints, and strengthening infrastructure in rural areas and small towns to support rural nonfarm activities. To keep pace with population and labor force growth and to forestall an increase in rural unemployment and poverty, agricultural output must increase by at least 4 percent a year. As expanding the cultivable area is difficult, the major focus will have to be on raising yields, diversifying output and adopting improved farming practices such as high-yielding varieties, fertilizer, and disease and pest control. Appropriate pricing policies, improved research and extension services, and greater private sector involvement can contribute significantly to raising yields.

2.17 The long-standing emphasis of Kenya's agricultural strategy on smallholders has had a favorable impact on rural women. Since independence Kenya has encouraged women to participate in the development process. The government's attitude is reflected in its sponsorship of two major international conferences related to women, one that closed the UN Decade for Women in 1985, the other the International Safe Motherhood Conference in 1987. One example of progress is the new Kenyan law permitting women to own land in their own right.

2.18 As the following chapters and the Kenya country study show, Kenya's agricultural future depends critically on further raising the productivity of the smallholder sector, dominated by women.

¹ A recent survey shows a decline in the total fertility rate from 7.7 to 6.7 and a nearly 50 percent increase in the contraceptive prevalence rate between 1984 and 1989 from about 15 to about 28 percent. Over the longer-term, continued improvement in female education and family planning services will further contribute to this fertility decline.

Because of male migration off the farms the number of female-headed households (FHH) has increased. These households generally are poorer than male-headed households (MHH), with fewer income-earning adults, and less access to land, credit, and extension services. Efforts are underway to identify ways to assist women, reduce poverty among FHH, increase agricultural productivity, and improve nutrition. The primary focus is on reaching women through agricultural extension, expanding secondary school places for girls, improving health and family planning services and developing community-based water supply schemes.

3. *Nigeria*

2.19 Nigeria, with its petroleum, natural gas, and agricultural resources, has considerable potential for development. Petroleum production accounts for 25 percent of GDP, over 80 percent of foreign exchange receipts, and 70 percent of budgetary revenues. Vast natural gas reserves are only beginning to be exploited. Agriculture employs over two-thirds of the labor force, mostly in small-scale farming. Agricultural productivity is low, but prospects for improvement are favorable through small-scale irrigation schemes, expansion of cultivated area in the Middle Belt, and improved technology.

2.20 With the increase in petroleum prices in the 1970s, Nigeria's exports rose to US\$26 billion by 1980 and per capita GNP rose to more than US\$1000. With the fall in oil prices, per capita GNP dropped to US\$300 in 1989, a level more consistent with the country's socioeconomic and infrastructure indicators which place Nigeria among the poorer countries of Sub-Saharan Africa. In mid-1986 the government introduced a stabilization program, designed to restore balance of payments equilibrium and price stability, and a Structural Adjustment Program (SAP) that combined trade policy and exchange rate reforms aimed at promoting economic efficiency and long-term growth. Despite some variability in the government's commitment to the structural adjustment program and weak implementation capacity, the reforms have reduced the macroeconomic imbalances and eliminated the most serious distortions in the incentive system. Public expenditures have been rationalized, real interest rates have turned positive, and the real exchange rate has been devalued by 70 percent.

2.21 Agricultural production in Nigeria has varied inversely with the level of petroleum revenues. When petroleum prices rose, domestic agricultural production had to compete with massive imports of food facilitated by an overvalued exchange rate and plentiful foreign exchange, and agricultural exports (cocoa, palm oil, and groundnuts) became uncompetitive internationally. Domestic agricultural production staged a comeback when oil prices declined in the early 1980s, and the real exchange rate was devalued. The introduction of the SAP in 1986 shifted the domestic terms of trade in favor of agricultural activities. Agricultural output grew by 4 percent in 1989 and 4.5 percent in 1990 compared to an annual average of -1.4 percent between 1973 and 1979 and 1.3 percent between 1980 and 1988.

2.22 Most smallholders, especially women, concentrate on food crops and have benefitted from higher food prices. Evidence suggests that more women farmers are moving into commercial food production. The Government has ambitious crop production targets for the next five years; over 8 percent a year growth in all crops; 6 percent for millet, sorghum, and cassava; and 10 percent for maize. These targets can be fulfilled only if farmers face adequate price incentives and, in particular, women farmers are given better agricultural support services, such as extension, credit and marketing.

2.23 Over the past five years, Nigeria has taken very significant steps to more effectively help women farmers. Following a series of consultations supported by the UNDP and the World Bank since 1987, the extension services of the Agricultural Development Projects (ADPs) in all states now have a

Women in Agriculture (WIA) program which provides women farmers with a broad spectrum of support. Retraining and redeployment of home economics agents has greatly increased the number of female agents and improved the supply of technical information to women farmers. Women's groups have increasingly been used to disseminate information and training in extension, credit, and other related activities.

4. *Zambia*

2.24 Zambia's economy depends heavily on copper, which contributes 85 percent of the country's export earnings. Copper revenues were used to build the capital- and import-intensive economic structure with extensive state ownership and control and to create a policy framework that encouraged consumption at the expense of saving and investment and discriminated against the development of indigenous resources, especially agriculture. With the collapse of copper prices in 1975, heavy foreign borrowing maintained this policy and the resulting debt continues to burden the economy. By 1982 the economy was in deep crisis. Several externally supported efforts to restructure the economy have been largely ineffective.

2.25 Poor economic performance has depressed living standards during the past several years: key indicators have deteriorated, particularly those related to health, nutrition and education. The availability and quality of publicly-provided social services have declined dramatically and falling real incomes have sapped the ability of families to purchase such services privately.

2.26 The future economic development of Zambia depends on diversification and structural transformation. Zambia's copper industry is waning: output is expected to fall to less than one-half of current production levels by the year 2000 and to decline steadily thereafter. Economic growth will have to come from agriculture, industry, and services. Agricultural output is strongly influenced by the weather, which can cause large swings in production. Indeed Zambia is one of the southern African countries experiencing the present devastating drought and is relying on emergency food supplies. The only realistic option for the future is to foster the growth of non-traditional exports, from the agricultural sector, to replace declining copper exports. Because Zambia's economy must undergo structural transformation before it can hope to establish sustained growth in per capita incomes, the best that can be expected over the medium term is a real GDP growth rate somewhat above the very high 3.7 percent a year population growth rate.

2.27 Attaining this ambitious objective will depend crucially on securing increased agricultural production after the end of the current drought. A long period of neglect, especially of the smallholder subsector, many of whom are women, has resulted in a level of agricultural production well below its potential. Smallholders comprise about 75 percent of the farming population; women farmers comprise the majority either by sharing responsibility in a male-headed households or by being solely responsible in a female-headed households. The attainment of aggregate and agricultural sector growth targets will depend primarily on raising the productivity of women farmers. The Structural Adjustment Program 1990-93 (SAP) assigns agriculture a critical role and calls for a wide range of reform measures including a number focused on smallholder farmers. These include programs to focus agricultural research on the needs of smallholder farmers, and to improve smallholder's access to rural financial services, agricultural extension, adaptive research, inputs and marketing services, rural transportation, and human development facilities.

Box 2.1. Structural Adjustment and Women

The economic shocks that most of the developing world experienced during the 1970s and early 1980s caused much economic havoc. However, they also revealed in a stark manner the fundamental productive and institutional weaknesses of many of these countries. By the early 1990s most of the countries in SSA were implementing Structural Adjustment Programs (SAPs) with the support of one or more multilateral financial institution. The central thrust of these programs is to restructure the pattern of production to accord more with changing comparative advantage in a shrinking global economy. Restructuring production patterns entails relative price changes that provide incentives to produce and consume tradables rather than nontradables and means moving capital and labor from lower- to higher-yielding productive sectors. One of the common consequences of the changes in relative prices is a shift in the terms of trade in favor of agricultural activities as opposed to urban-based activities. Within agriculture the response has a gender dimension varying according to the price impact on cash crop farming (mostly the responsibility of male farmers) and food production for household consumption (mostly the responsibility of women farmers). The usual case is that the relative price of agricultural products rises, but cash crop prices tend to rise more than the price of food crops. The exact outcome is difficult to trace. When it comes to response decisions on production and mobility the intrahousehold division of rights and responsibilities and bargaining dynamics are critical factors in outcomes. The surveys undertaken in Kenya and Nigeria shed some light on the impact of SAPs on output and income of women farmers, but the data are not able to support robust conclusions. It is still necessary to rely on inferences in suggesting likely outcomes.

Structural adjustment policies may not have the anticipated effect because of gender differences in the ability to respond to changes in incentives. In Nigeria for example, the adjustment program entails a shift in relative prices intending to alter the composition of agricultural output. But the intended outcome may be frustrating for a variety of gender-related reasons. These include:

- Women's more limited mobility between and within sectors because of discrimination outside the home - for example in access to credit - and because of asymmetric rights and obligations within households. As shown in chapter 3, a higher proportion of women's than men's time is committed and little, if any, room remains at the margin to participate in any new activity. Women also have much less extensive "ownership" rights to land than that of men (Chapter 5), and hence their ability to respond to changing economic circumstances is less than men's.
- In activities undertaken jointly with husbands, women tend to have less control over proceeds and hence may not fully benefit from them (para 3.12). Therefore, women will not have the same incentives as men to respond to price changes affecting such activities. Throughout SSA, the prevalence of own-account activities of women is striking and may well reflect their concern over a lack of benefit from the proceeds of jointly managed plots.
- Reproduction precommits women's time: certain activities are excluded, skills decumulate, long-term contracts are terminated and health deteriorates. Women are thus confined to a range of economic activities in which discontinuity in the availability of labor is relatively unimportant.
- Nonprice factors can be just as important as price adjustments to restore macroeconomic balance and to achieve a sustained supply response from poor households. Technological, institutional and infrastructural factors also may need to be changed. Without such changes producer price shifts may result only in shifts in crop composition rather than an overall increase in output (Lele 1988). For example, in northern Nigeria land and labor shifted in favor of cotton and groundnut production at the expense of sorghum production, but with little overall increase in agricultural output.
- Even a shift in composition to more market-oriented crops is constrained by the need of small farmers to meet domestic subsistence requirements. To enable farmers to feed themselves, they need access to land and new technologies. This is particularly relevant for women farmers as the main producers of food. As discussed in subsequent chapters, production technology for mixed cropping is inadequate, because the emphasis has been on monocrop research. More appropriate agroprocessing technology research is urgently needed.
- Women are much more bound into the non-monetized and non-tradeable sectors of the economy than men because of their responsibilities as mothers and family welfare maintainers. Much of their inputs (time, labor) and outputs (commodities, services) and non-tradeable and non-monetized, and hence little affected by changes in the incentive structure.

C. Concluding Note

2.28 In many ways these four countries represent the SSA region as a whole. With few exceptions SSA countries are struggling to correct deep-seated structural imbalances and distortions in their economies. Many have assigned agriculture a major role in propelling economic development over the medium term. All the formal structural adjustment programs include pricing policies, which tend to shift the internal terms of trade in favor of rural as opposed to urban activities, and strengthen institutional changes supporting agricultural production. Indeed a recent study (Jaeger 1992) shows that the countries in SSA that have changed the economic environment through structural adjustment programs have experienced better agricultural output performance than those which have not implemented structural reforms. How structural adjustment policies relate to women farmers is described in box 2.1.

2.29 Evidence suggests that SSA governments are beginning to realize that raising agricultural output and productivity means a greater focus on women farmers. However, the pace of implementing the requisite supportive measures has been all too slow. A faster pace of agricultural output generated by women farmers will increase agricultural production and yield valuable benefits in the form of improved household food security, better nutrition and health status for women and children, and higher levels of educational attainment. Perhaps the most far-reaching social benefit is that increased incomes earned by women farmers will almost certainly lead to reduced fertility rates, thus helping to speed the demographic transition to lower population growth rates in SSA countries.

Chapter 3. The Gender Dimension of Agriculture

A. Intrahousehold Arrangements

3.1 The typical farm household in SSA is a complex institution. The complexity stems from distinct production units within the household, some managed by men, some by women, and some jointly. Adding to the complexity, the separate own-accounts of men and women frequently have more than one line of production. This is especially true for women, who may tend family plots, their household garden or their own farm plots, and may engage in petty trading in the informal sector or in other economic activities. Thus, in contrast to other parts of the world where households customarily function more like a single economic unit with common goals, resources and benefits, the pervasive practice in the African household is that family members have separate, and sometimes competing, own-account activities. Thus, the individual rather than the household constitutes the basic unit of production in SSA.

3.2 Individuals are responsible for mobilizing factors of production, on barter or monetary terms, for use in joint- and own-account activities. Exchanges of goods and services among household or compound members are common and elaborate arrangements determine the extent to which individuals can decide on the disposition of their produce -- how much to sell, retain, consume, process, or store. Within the rural household a complex set of rights and obligations reflecting biological differences, social and religious norms, and customs dictate the division of labor, land and proceeds between these production units. These generally disadvantage women, resulting in asymmetric economic and social relationships, and hence distorted terms of exchange among household members.

3.3 The nature of these intrahousehold "markets," the complexity and asymmetry of the rights and obligations between men and women in farm households, and their evolution matter from both an equity and an efficiency viewpoint. The effectiveness of policy interventions and agricultural support services hinges critically on a solid understanding of **who is doing what with what at the household level, and of the dynamics of rural intrahousehold decisionmaking**. For example, lingering rigidities in the gender division of labor within farm households inhibit the substitutability of male and female labor across different economic activities, thus weakening the effects of incentives intended to induce shifts in labor supply.

3.4 The traditional farming pattern of men and women can be summarized as follows:

(a) Farming tasks: men traditionally cleared the land, and women undertook most remaining farming activities, particularly weeding and processing. Among the Yoruba in Nigeria, for example, men traditionally prepared the land and women selected the seeds, planted, processed, stored and traded the produce.

(b) Farming activities or enterprises: during most of this century, men have been most active in cash crop production, while women have been mainly concerned with food and horticultural crops, small livestock, agroprocessing, and trading. In many societies, men also trade. Women's activities tended to be homestead-based for biological and cultural reasons. In the forest zone in Nigeria, for example, there has been a traditional division between men's cash tree crops (such as cocoa and oil palm) and women's food crops (maize).

(c) Separate fields or plots: men and women were each responsible for their own inputs and controlled the output. Within rural households in SSA land is traditionally owned by men, but

plots of land have been managed jointly or separately by men and women. On jointly-managed plots, men and women typically shared labor, and used the proceeds for family purposes.

(d) Rights to resources: within households, traditionally women have fewer rights than men to resources such as land, labor, technology, information through extension, and credit.

3.5 **These traditional farming patterns in SSA are changing.** The organization of farm labor and production responsibilities varies widely. While gender-disaggregated time-series data are lacking, the trend is clear; the gender-specific nature of farming is disappearing. This change is due to two factors. First, the rapid increase in population pressure which has overwhelmed African farming traditions. Such traditional systems "worked well and could evolve slowly when population densities were low and populations were growing only slowly. But the stress of high population growth rates over the last 20 to 30 years has meant that farm holdings are no longer adequate to support the household" (Cleaver and Schreiber 1992). In Kenya, for example, the mean size of farmholding surveyed in this study was 2.1 hectares, or 16 to 40 percent below the government's estimates of the minimum needed to sustain a family (depending on agroecological zone). Second, the pull of perceived employment opportunities off-farm -- in urban areas, mines and plantations. As a result, men have turned to off-farm work and their wives have remained on the farm where they have become the *de facto* farm managers. In Kenya, for example, over 86 percent of extension agents surveyed were working with women farmers: 44 percent with women farmers in their own right and 42 percent with women farmers who represented their husbands in their absence.

3.6 Farming patterns can also change quickly and profoundly. An irrigated rice project in Gambia aimed to benefit rural women by increasing the yields and commercializing a "woman's crop." Because of complex household rights and obligations, the outcome of the project was dramatic and unexpected: men established rights to the irrigated land; men took control of the irrigated rice crop; men's income increased; women's labor input into the communal crop increased; and dryland crops replaced swamp rice as women's own-account crop (box 3.1).

3.7 Zambia provides an excellent example of how farming systems have changed. Traditionally men and women farmed separate fields and performed separate as well as joint tasks. Men were responsible for clearing land and tilling soil, helping women plant and harvest, and building granaries. Women prepared the soil, planted, weeded, kept animals and birds out of the fields, harvested, and transported produce to the village for storage and preservation. Women also grew vegetables, kept small livestock or poultry, and collected wild plants, nuts, and fruits. Men contributed to the household's food supply through hunting and fishing. Demographic and socioeconomic changes, particularly the development of the mining industry and the consequent male migration from rural areas, have had a major impact on the traditional gender pattern of farming. Overall the contribution of women to agricultural production in Zambia now greatly exceeds that of men both in traditional farming households (those that do not produce hybrid maize) and in more commercialized farming households. On average women contribute 18 percent more labor than men to farm activities (Mwila 1981, Keller and Mbeme 1988).

Box 3.1. How Household Dynamics can Affect the Outcome of a Project

An example illustrates the complexity of household dynamics, and demonstrates how easily upset can be farming systems and the control of resources and proceeds. Household farms in the Gambia comprise two areas: a communal area worked by all household members under the direction of the husband who is responsible for the production of family food, and private fields used by individuals for private income. Swamp rice, evenly split between a communal and private crop, was grown mainly by women. They were responsible for demarcating the plots, organizing labor activities, storage, and marketing the surplus. The project replaced the rainfed swamp rice with pump and tidal irrigated rice, and supplied technical packages. Yields increased from 1-2 tons/ha to 6 tons/ha.

The project aimed to benefit rural women by increasing the yields and commercializing a "woman's crop". Women were to be given priority access to project plots, with formal leases, and registration. Because 87 percent of land registrations made in 1982 and 1983 were to men, land titles were redistributed in 1984 with 99 percent being claimed to be retitled in favor of women. However, only 52 percent of the women surveyed in the IFPRI study were actually registered as the official tenant, and only half of those had real decision-making authority over field activities. Dey (1984) suggests that the men "established rights to the land which are now being inherited by their sons" after clearing the land and building the infrastructure.

Rice changed from being a 50:50 communal/private crop grown by women to almost exclusively a communal food crop. As a consequence:

- control of the rice crop moved from women to men with de facto concentration of decision-making authority in men.
- labor shifted from private to communal work but the increased labor demands fell more on the shoulders of women than men. The transfer of labor was 22.5 percent for women and 6.9 percent for men.
- because family food is now from communal irrigated rice plots on which women are obligated to work, men could reduce either the area of other rainfed community plots or could his cash outgoings on food. Men effectively increased their income partly due to women's extra work on communal rice from which she derived no additional material. Men's extra income has generally not filtered back to wives and children.
- Since the irrigated plot was not available for private crops, women's private production shifted from rice to groundnuts and cotton. Most women have higher real incomes today from groundnuts than the ever did from rice. As a result, they have been taking an increasing role in decision-making related to expenditures and an increasing role in actual spending (Webb 1989; Dey 1984).

3.8 The gender division of labor by tasks also is breaking down and farm women are increasingly undertaking tasks previously done by men (box 3.2; see also paras 6.3-6.5). In fact, they now do most farm operations themselves with supplementary help from family and hired labor. In Kenya, for example, a higher proportion of women than men are engaged in most phases of the production cycle on food as well as cash crops and livestock, in addition to their work preparing food, caring for children, gathering water and fuelwood, and in varied income-earning activities. In all districts women are more regularly engaged than men in all farm activities. The distribution of labor for maize by type of activity shows that 87 percent of women work regularly in planting, weeding, and harvesting compared to 54 percent of men. In addition over half the women are involved in marketing the maize crop. Although the proportions of both women and men involved in cash crop cultivation are modest, women work more regularly than men on coffee, tea, pyrethrum, and cotton production. Women surveyed in both Kenya and Nigeria, for example, are now clearing land as well continuing the weeding, harvesting, and processing. The same trend can be observed for men; the Kenyan survey indicates little gender specialization with respect to farming tasks. In other words a high degree of substitutability of female for male labor across the full range of farming tasks has emerged.

Box 3.2. Changes in Gender Distinctions of Crop and Task: Burkina Faso

Changes are occurring in agricultural production patterns in Burkina Faso. Increasing population pressure on the land has meant declining yields among the Mossi group, and output from household plots are insufficient to meet their needs and those of their children's. As a result women are devoting more time to their individual plots and planting a larger portion of their plots to basic foodstuffs such as millet and sorghum at the expense of such crops as peanuts. Among the Gourma who live in the Eastern Region where population density is low, population growth has resulted in the cultivation of larger fields. Male labor has been drawn into off-farm activities. These two changes have placed additional burdens on younger women who are performing more of the agricultural work as well as continuing to work on household plots even when their children are old enough to help.

3.9 The gender division of labor by agricultural activity or enterprise is becoming less distinct. While the traditional pattern of men growing cash crops and women food crops is still common, fewer crops are now produced exclusively by men or by women. Crop distribution data for Kenya from the WAPIA survey show that both food and cash crops are grown by men and women. Thirty-three percent of women surveyed grew coffee compared to 26 percent of men. In Muranga District more female than male respondents had a plot of coffee and more women alone than men alone decided on the inputs and controlled the proceeds from coffee plots. Similarly both men and women were growing food crops: 81 percent of women grew maize compared to 53 percent of men, and 83 percent of women grew beans compared to 34 percent of men. There was some gender specialization with four crops; substantially more women than men in Kakamega grew bananas and groundnuts, while the cultivation of coconut and cashew in Kilifi attracted more male than female farmers. Similarly in Oyo State, Nigeria, palm oil was grown by 14 percent of women surveyed and 26 percent of men, and cocoa was grown by 19 percent of women and 48 percent of men. Although men are more involved in cash crop production, women increasingly are contributing substantial labor to cash crop production both on their own and on their husband's fields.

3.10 The survey data from Kenya suggest that there are in fact no crops in which only men or only women do all the work. In particular little difference exists between food and cash crops in terms of the proportion of female labor input. These data confirm other surveys documenting the preponderance of female labor input in farming (Collier 1991; paras 3.18 and 3.19). Women are engaged on a more regular basis than men in all farm activities and phases of the production cycle.

3.11 Women have traditionally kept small livestock, such as sheep and goats, but there is evidence that they also are rearing cattle, traditionally a male preserve. In Kenya similar proportions of men and women surveyed in Kakamega and Muranga Districts kept livestock -- women kept mostly poultry, sheep, and goats but also some cattle, while men concentrated more on grazing cattle. For all rural households in Burkina Faso, livestock are a principal investment as well as a form of saving. Small livestock, sheep, goats, and chickens are especially important as a source of investment and income for women (McMillan and others 1990). Most women who own animals allocate little time themselves to caring for them; most of the work on small stock in Mossi and Bisa households is performed by boys. Fulani women are an exception as they own their cattle as well as small stock and take primary responsibility for milking cattle and selling milk and milk products.

3.12 Both men and women in the rural household make decisions on what to farm, how to farm it, and how to dispose of the proceeds, but these decisions are usually specific to the plot they

manage and the revenue it yields. While some men and women do make certain decisions on each others plots, essentially they each manage their own separate plots (table 3.1). Jointly-managed plots, once typical, are becoming rare, and comprised less than 5 percent of all plots surveyed in Kenya and Nigeria.

Table 3.1. Decisionmaking Responsibilities by Gender in Kenya and Nigeria
(as percentage of decisions made)

Head of Household ^{1/}	Male				Female	
Farmer using plot	Head		Wife		Head	
	Kenya	Nigeria	Kenya	Nigeria	Kenya	Nigeria
Who decides what to plant?	(703)	(2213)	(236)	(789)	(140)	(436)
- Husband	88	73	40	23	1	-
- Wife/Woman	10	21	59	76	94	98
- Other	2	6	1	1	4	2
Who decides to use fertilizer?	(252)	(1080)	(115)	(258)	(47)	(164)
- Husband	86	94	25	24	0	1
- Wife/Woman	12	5	66	71	94	97
- Other	3	1	1	5	6	2
Who decides to use improved seeds?	(270)	(456)	(113)	(110)	(54)	(78)
- Husband	87	79	43	37	4	-
- Wife/Woman	10	18	56	62	87	95
- Other	3	2	1	1	10	5
Who decides to sell the crop?	(202)	(1536)	(55)	(508)	(41)	(304)
- Husband	93	68	25	21	0	-
- Wife/Woman	6	25	75	66	93	98
- Other	1	7	0	13	7	3

Note: Actual sample sizes given in parentheses. They show responses for those plots where the decisions applied and were made.

^{1/} Defined as households headed by single, divorced or widowed women, and households where the spouse has been absent for 6 months or more.

Source: WAPIA survey.

3.13 The survey data from Kenya clearly illustrate the distinction by gender on use of plots, use of resources, and control of the produce. These decisions depend on such variables as the crop, whose plot it is, and the type of decision to be made. Geographical diversity reflects different social mores; for example, in the predominantly Muslim district of Kilifi men made more of the decisions both on their own plots and their wives' plots than in other parts of Kenya. The main conclusions on who makes the decisions are:

- Men and women make most of the decisions on their own plots, but each has some influence on their spouses' plots.
- Husbands have more influence on wives' plots than vice-versa (for example, in male-headed households men make 80 to 90 percent of the farming decisions on their own plots, and women make 60 to 70 percent of the decisions on their own plots).

- Women's decisionmaking powers on their own plots are reduced when husbands are resident (women make 60 to 70 percent of the decisions), and increased when women head the household (90 percent). A woman has more influence on her husband's plots when he is away (about 20 percent of decisions) than when he is resident (about 10 percent).
- Husbands influence their wives more on what to plant and whether to use improved seed than on whether to use fertilizer or to sell the crop, both of which are decided mostly by women especially when it concerns their own plot. The demarcation of decisionmaking on credit use is less clear cut.
- Female heads of households make most of the day-to-day decisions concerning running the farm, but fewer of the decisions (15 to 20 percent) that require major cash outlay, such as hiring a tractor. These decisions are frequently made by sons.
- When both husband and wife are present on the farm, each usually keeps the proceeds of his or her own plots (84 percent of men and 76 percent of women), and more husbands (24 percent) than wives (11 percent) keep the proceeds of the others' plots (table 3.2).

Table 3.2. Paying for Fertilizer and Control of Income from Crop Sales by Gender in Kenya and Nigeria (as percent of all transactions)

Head of Household	Male				Female	
Farmer using Plot	Head		Wife		Head	
	Kenya	Nigeria	Kenya	Nigeria	Kenya	Nigeria
Who pays for the fertilizer used on his/her own plot?	(248)	(1039)	(111)	(239)	(47)	(169)
- Husband	97	92	78	32	0	1
- Wife/Woman	2	6	22	61	89	83
- Other	-	2	0	7	10	16
Who sells the crop?	(251)	(1530)	(72)	(506)	(50)	(299)
- Husband	77	69	15	10	0	-
- Wife/Woman	20	29	85	88	88	95
- Other	3	2	0	2	12	5
Who keeps the proceeds?	(251)	(1537)	(72)	(508)	(50)	(304)
- Husband	84	89	24	16	0	-
- Wife/Woman	11	10	76	82	86	99
- Other	5	0	0	2	4	1

Note: Actual sample size given in parentheses.

Source: WAPIA survey.

3.14 The traditional gender division of intrahousehold rights and obligations is also weakening. The traditional male obligation to clear and prepare the land on their own plots, family plots, and women's plots, has been very much weakened; the survey data from Kenya and information from the other countries studied show women to be heavily engaged in these farming tasks. In all three districts surveyed in Kenya female farmers relied more on their own labor to clear land than on male

labor, while at the same time contributing to this task on men's plots. Women also hire a significant volume of male labor for clearing. In the Kilifi District more female than male labor was actually engaged in land clearing. This change is partly because bush regrowth on land under short fallow is relatively easy to clear.

3.15 The major factor contributing to the breakdown in the traditional structure of rights and obligations within the rural household is the departure of males from their rural households in search of income-earning opportunities elsewhere. The women, left in charge, have acquired *de facto* rights and obligations formerly the responsibility of the male. Two additional interrelated factors have contributed to loosening the traditional structure of rights and obligations within the household: (i) the increased monetization and commercialization of intra-household and extra-household transactions, and (ii) more earning opportunities for rural women. Acquisition of even small amounts of cash enables male or female household members to overcome or escape from traditional rights and obligations.

3.16 Another major factor weakening the traditional structure of rights and obligations is the effect of education on decreasing the human capital gap between the genders. An example is provided by Kenya, where extremely low primary enrollment rates for girls during the 1960s grew to over 90 percent by 1985 (World Bank 1989a). The survey data from Kenya provides support for the hypothesis that mothers' education has a significantly positive influence on the education of their children, in particular that of girls (para 3.25, table 3.4). Better educated girls, in turn, become better educated mothers who, facing superior income earning opportunities, provide finer education to their own children.

3.17 Among Muslim families, the traditional structure of rights and obligations between men and women seems to be changing more slowly. In parts of northern Nigeria for example, the husband remains obligated, much as in the past, to provide shelter, food (produce or money), water, fuelwood, housekeeping money, and support for the children. The wife provides some food from small plots within or near the compound, prepares food, cares for the children, and does the domestic chores. Once these obligations are met, both are free to follow independent economic interests. Within the compounds, however, women earn income from activities, such as food processing, sewing, weaving, and trading, and they retain control of the income they earn from such activities. Muslim women in seclusion now play an active role in managing farms. In northern Nigeria studies during the 1970s found that Muslim women provided only about 1 percent of the labor on family farms and 10 percent of hired labor on non-family farms (Pittin 1984; Longhurst 1980, 1982). In the WAPIA survey of 1990, farming was cited as the primary or secondary occupation by 22 percent of the Muslim women surveyed.

B. The Role of Women in Agriculture

3.18 These changes in intra-household arrangements have exerted a profound impact on the role of women in African agriculture. Specifically, women now constitute the majority of smallholder farmers, provide most of the labor, and manage many farms on a daily basis. Many women head households.

3.19 In all four countries under study smallholders are the core of the agricultural sector, and women are the majority of the countries' smallholders. In Kenya, for example, 61 percent of rural women surveyed cited farming as their main occupation, compared to only 24 percent of men. Similarly, in Nigeria women are critically involved in the agricultural economy throughout the country, although the range of their activities varies among ethnic groups. Among the 750 rural households surveyed, farming was the main occupation of 88 percent of female household heads and 58 percent of

male household heads, and of 46 percent of all women and 66 percent of all men. The situation is somewhat different in Zambia, where large commercial estates occupy much of the best land, and 75 percent of the rural population farm only 13 percent of the arable land, mostly at a subsistence level. Within this smallholder sector, however, women are especially important, constituting the majority of farmers and heading one-third of all farm households. Even in Burkina Faso, with its high incidence of polygamy and the organization of households in compounds, women, especially between twenty and forty-four years of age, exceed the number of males in that age group in the agricultural labor force (Burkina Faso Government 1985 Census).

Table 3.3. Average Daily Hours in Agricultural and Nonagricultural Economic Activities by Gender

	Burkina Faso		Kenya		Nigeria		Zambia	
	Men	Women	Men	Women	Men	Women	Men	Women
Agriculture	7.0	8.3	4.3	6.2	7.0	9.0	6.4	7.6
Non-agriculture	1.7	6.0	3.8	6.1	1.5	5.0	0.8	4.6
Total	8.7	14.3	8.1	12.3	8.5	14.0	7.2	12.2

Source: Saito et al, 1992.

3.20 Women work more hours than men, both on farming and in total. Not only do women outnumber men in the agricultural labor force, but they also work more hours in agriculture than men. In Kenya, for example, women spent an average of 6.2 hours per day in agriculture compared to 4.3 for men. When time spent on agricultural tasks is added to women's other responsibilities, women's work days become very long. As table 3.3 shows, Kenyan women spent an average of 6.1 hours daily on nonagricultural tasks compared to 3.8 for men, resulting in a daily total of 12.3 hours worked for women compared to 8.1 for men. Taking unweighted means, women's average work days were about 50 percent longer than men's (12.9 hours compared to 8.2 hours). An average of 13 hours' work a day is debilitating to body and spirit and cannot be expected to result in satisfactory results for either farm output or household management. A similar picture emerges for the other countries studied.

3.21 There is a marked seasonal pattern to the type of work performed, with women's labor input exceeding men's in both the rainy and dry seasons. During the rainy season in Burkina Faso, for example, farming activities are compressed into a few, extremely busy months. Both men and women spend less time in the fields during the dry season. During the dry season women trade, process, and sell shea nuts and locust beans, brew and sell beer, and prepare cooked foods for sale. Water collection, a woman's responsibility, takes more time in the dry season because nearby supplies dry up. Women also spend more time collecting the additional wood needed for agricultural processing activities and stockpiling fuel for the peak busy agricultural season. Irrespective of differences in seasonal activity, women's labor input exceeds men's at all times of the year (Delgado 1979; Monimart 1989).

3.22 The female-headed household (FHH) is a growing phenomenon in SSA. Female-headed households in Zambia, for example, constitute about one-third of all rural households (and up to 51

percent in the Northern Province), compared to 28 percent in the early 1980s (United Nations 1991). FHH emerged as men were drawn to Lusaka and the copper belt while female migration was legally restricted prior to independence and was socially and economically difficult thereafter. Rural outmigration, most common from the Northern, Eastern, and Lusaka Provinces, led to rapid urbanization and a large and growing number of rural households without male labor. In Kenya the number of FHH also is large and growing. Thirty percent of households surveyed by WAPIA were headed by women. These findings are supported by other surveys, such as the government's 1988 Rural Labor Force Survey (GOK 1992). In Nigeria 16 percent of households surveyed by WAPIA were headed by women, but with marked regional variation. In the east in the traditionally "female farming" Imo State, nearly one-quarter of households were headed by women. Oyo State in the southwest, where Yoruba women traditionally trade rather than farm, had the lowest level of female heads (7 percent), although this low figure may reflect the ethnic norm of a male relative heading a family during a husband's absence. In Kaduna State in the north where 15 percent of households were female-headed, there was major religious difference between male and female heads of households; male heads were equally divided between Muslim and Christian, whereas 92 percent of female household heads were Christian. Over three-quarters of women heading households in Kaduna were widows, only in Oyo were a substantial proportion (39 percent) of female household heads married.

3.23 Female-headed households are far from homogeneous, and tend to fall into three groups: autonomous households recognized and accepted as headed by women, mostly widows or single women; households headed *de facto* by wives during the male head's "absence" for different periods of time, the degree of autonomy and independence of action of these female heads varying with ethnic mores and personal circumstances; and polygamous households, where co-wives head economic subunits (of themselves and their children) within the household.

3.24 Although the practice of male outmigration in SSA is common, in some societies the wife who remains behind may not head the household. In Burkina Faso for example, FHH are uncommon despite heavy male migration to cities and the coastal countries of West Africa. Men are most often absent in their twenties and thirties (in the rural labor force, women exceed men in the age group twenty to forty-four, but not during adolescence or after age forty-five) and Burkina's polygamous society absorbs these "lone" wives into the extended family. Within the family compound, however, wives pursue their own-account farming, managing their farming activities on their own plots, and participating in joint family farming activities (McMillan, Nana and Savadogo 1990).

3.25 The main characteristics of female-headed households are as follows:

- **Women heading households are younger than men heading households.** Women heading households surveyed in Nigeria were slightly younger than male heads. Household heads and other household members were younger in the north than in the east or west, reflecting the younger age of marriage. In Kenya also female household heads also were younger than male heads (table 3.4).
- **Women heading farm households have lower levels of education than men, and lower than other women.** In Nigeria for example, women heading households had, on average, 1.6 years of education compared to 3.0 years for men, whereas all women surveyed had 2.5 years of schooling compared to 3.6 for men; in Kenya women heading households had 3.4 years of schooling on average as compared with 3.8 for men (table 3.4).

- **Children of FHH have more years of schooling on average than those of MHH.** In Nigeria in all areas surveyed, the average educational level of children of FHH was higher than those of MHH (4 years to 3 years). The difference is striking in Kaduna where children of FHH had almost twice the schooling of children from MHH. In Kenya the differences were smaller with 2.6 years of schooling of children in FHH compared to 2.4 years for children in MHH (table 3.4).
- **Landholdings of households headed by women are much smaller than of those headed by men** (para 5.15). In Nigeria for example, the FHH surveyed had only one-third the area of MHH, and in Kenya the holdings of FHH were 65 percent those of MHH.
- **FHH tend to be smaller in size and have fewer farming adults than MHH.** In Nigeria for example, FHH surveyed averaged 4.9 persons compared to 7.6 persons in households headed by men, and had 1.5 farming adults compared to 2.1 in MHH. Even more striking is the Northern Province of Zambia where FHH had an average of 3.4 persons compared to 6.5 persons in MHH (Hurlich 1986). The smaller number of farming adults in FHH point to a lower family labor supply than for MHH. In Oyo State in Nigeria for example, the supply of family labor in FHH was much more restricted than in MHH. And women's use of hired labor, often paid for with remittance income, was insufficient to compensate. Similarly surveys in the Central and Southern Provinces of Zambia show that FHH have less family labor available and fewer resources with which to hire labor than MHH. Field data from these Provinces show that over 41 percent of FHH had no adult males in residence (Milimo 1989).
- **FHH are relatively undercapitalized.** The survey data show that, in Kenya for example, FHH have less than one-half the total value of farming equipment of MHH. Most farm by hand with simple hand tools. Few have access to tractors or to oxen, although women in northern Nigeria increasingly use oxen for cultivation.

3.26 Taken together, the relative deficiencies in the major productive inputs -- land, labor, and capital -- make the task of producing enough food more than usually difficult in FHH. In response to the input deficiencies, FHH tend to pursue farming strategies which are different in degree from those of other households. In the "slash and burn" Northern Region of Zambia, for example, FHH prepare smaller fields in sites with fewer trees; however, since the ash generated from felling and burning trees is correspondingly less, lower yields are obtained. Finger millet is grown for beer-making and the proceeds used to hire labor for other farming activities. Cassava, which requires neither ash nor fertilizer and is not labor-intensive, is also grown; however, it is less nutritious than other food crops (Sikana and Siame 1987). Such strategies and other coping mechanisms do not fully compensate for women's lack of access to the main factors of production, and FHHs therefore tend to fall into the poorest category of households. The WAPIA survey did not collect data on household expenditure and income, but numerous other surveys and studies confirm that the incidence of poverty among FHH is high. In Kenya, for example, significant income differences between households headed by women and men have been recorded -- one study found the mean annual income in MHH to be 19 percent greater than in FHH (ILO 1986).

3.27 However, an important distinction must be made between FHH that receive remittances and those that do not. FHH with reliable remittance income are considerably better off than those without. In Kenya many FHH are benefiting from remittance income. Most transfers of income are within nuclear

Table 3.4. Characteristics of Male- and Female-Headed Households in Kenya and Nigeria

	KENYA		NIGERIA	
	Male	Female	Male	Female
(Sample size)	(508)	(199)	(633)	(117)
Gender of head as % of all HH	72	28	84	16
Religion of HH head				
% Christian	72	84	56	85
% Muslim	10	12	40	11
Marital Status of HH head				
% married	95	67	99	19
% widowed, divorced	4	31	1	75
% single	1	2	-	6
Mean age (years)				
HH heads	53	47	50	47
All family members	24	22	23	22
% HH heads > 60 yrs.	16	9	22	9
Education (no. of yrs.)				
HH head	3.8	3.4	3.0	1.6
Children in HH	2.4	2.6	3.0	4.0
No. of individuals/HH	8.6	8.0	7.6	4.9
No. of individual farming/HH	2.3	1.7	2.1	1.5
Dependency ratio*	0.7	0.7	1.0	0.8

Note: Dependency ratio is the number of individuals aged under 14 and over 60 divided by the total number of adults in the household.

Source: WAPIA Survey.

families or between close families, with 42 percent of the value of such transfers being from husband to wife. Although remittance income can be used to relieve labor constraints faced by FHH by hiring labor, the unreliability of transfers makes farm management that much more difficult. Married women surveyed in Kenya whose husbands were absent had the highest income among FHH because of the remittances received from absent husbands. Other data show that these remittances are often insufficient to compensate for the household's weak position stemming from fewer income earners (ILO 1986).

C. Rural Women's Nonfarm Activities

3.28 With growing population pressure on the land and fragmentation of holdings, few rural households can subsist without some form of off-farm income. The smallholder sector throughout SSA is characterized by the extent and diversity of nonfarming activities. Approximately one-third of smallholder family incomes in Kenya is derived from off-farm sources, with an additional 10 percent coming from remittances (GOK 1988). Lower-income smallholders are especially dependent on off-farm income for their survival. One study suggested that in Kenya 77 percent of family income of these lower-income smallholders came from off-farm sources (Wisner 1986).

3.29 Men are more likely than women to engage in off-farm wage employment; in Kenya, for example, five times as many men as women surveyed were in paid off-farm employment. Women on the other hand stay on the farm because of their lesser mobility resulting from child-rearing responsibilities, their lower education levels which limit their access to paid employment off the farm, and the family's desire to retain rights to the land by maintaining occupancy. Women, however, pursue a wide range of businesses around their farming activities and are involved in many more income-earning activities than men. In Kenya 62 percent of women surveyed by WAPIA were undertaking three or more activities compared to only 30 percent of men. By contrast 35 percent of men were involved in only one activity, compared to 7 percent of women. Similarly in Nigeria most women surveyed were pursuing three or more activities compared to only one-third of the men. The numerous activities of women reflects four stimuli: the inability of farming to provide sufficient income to sustain the household; the inability to gain sufficient income from a single non-farm activity; and the desire to minimize risk through diversifying income sources (box 3.3), and fourth, the severe constraints on women's time which make it extremely difficult, if not impossible, for them to work full-time in jobs in the formal sector. Of course, many are "self-employed" on a part-time basis in the informal sector or work as casual laborers in agriculture.

Box 3.3. The Importance of Off-farm Income for Rural Women in Burkina Faso

Interviews were conducted with 136 male household heads and 136 women (one from each of the households) at six AVV resettlement sites. At the Linoghen site, which has emerged as an important settler-managed regional market, the value of the women's off-farm income (derived mainly from sales of processed and unprocessed agricultural commodities and water products) was greater than the value of their net crop production. The survey also indicated a positive relationship between income from other sources and net crop production of the women. Rather than resulting in a neglect of agriculture, in areas where incomes from off-farm sources were higher, women's net crop production also was higher. The much greater importance to women of off-farm sources of income than for male household heads is shown also by the relative proportions of off-farm income in total incomes (McMillan, Nana, and Savadogo 1990).

3.30 Typically the activities women pursue are linked with their agricultural activities, require little working capital, are compatible with the time they have available, and provide income which they control. Trading agricultural produce is traditionally a female activity; women sell both their own produce for cash income as well as their husbands' for small commissions in cash or kind. Beer brewing, making and selling snack foods, or processing produce for distribution farther afield are also typically female activities. In Zambia for example, women brew beer, weave, make and sell snacks, perform casual work on large farms, and trade in vegetables, pulses, and rootcrops. In Northern, Central, and Southern Provinces, fishing, fieldwork on others' farms, and trading in food and clothing are important sources of income for rural women. Among men and women resident on the farm, more women than men were found to earn off-farm income and in the Southern Province women earned almost three times as much as men (Due and Mudenda 1984).

3.31 **Processing of agricultural products** is carried out mainly by women. It can be extremely labor-intensive and time-consuming. In Burkina Faso, for example, the grinding of grain requires an average of one and one-half hours per day (McSweeney and Freedman 1980). In Nigeria the preparation of gari from cassava involves many steps, and to produce a typical 125 kg. bag of gari (enough to feed a family of 6 for 2 to 3 weeks) requires 200 tubers, and a processing time of around 70 hours. During the peak agriculture season, time spent on processing activities is shorter, with a concomitant negative

impact on the nutritional quality of meals. While in the dry season more time is spent on processing for home consumption and for sale (Cashman 1990).

3.32 Processing activities are an important source of rural employment and income. For example, a survey of 21,433 workers in 11,945 rural establishments in eastern Burkina Faso found that 48 percent of the enterprises and 50 percent of the workers were involved in beer brewing, and the processing of shea butter, locust bean (to make soumbala) and peanut oil (Wilcock and Chuta 1982). The gathering and processing of secondary food crops and wild products is mainly a female activity and contributes to both diet and income. These items are often multipurpose, and many are naturally drought-resistant, providing critical energy and nutritional supplements during the hungry season.

3.33 The impact of processing activities on the environment, however, can be negative due to the quantities of wood consumed. In Burkina Faso for example, a study in 1970 found that beer brewing consumed 650,000 metric tons of wood a year (Saul 1981). Since then the population has doubled, and assuming no change in the per capita consumption of beer, the wood usage would now amount to 1.3 million metric tons a year, or approximately one-third of the estimated annual fuelwood usage in the country. In addition to beer brewing, wood consumed in other processing activities represents a significant portion of overall requirements because large quantities of wood also are used in shea nut and soumbala processing.

3.34 **Storage of food crops** is critical to achieving food security on both national and local levels; it assures more stable supplies and hence narrows price variations. In most of SSA storage facilities are inadequate and ineffective. It is estimated that one-fourth of all food produced is lost to spoilage, insects, and rodents. The Nigerian Stored Products Research Institute estimates losses in storage in 1985 as being 30 to 50 percent for grains, roots and tubers (Okojie 1991). Lack of sufficient on-farm storage also hastens the sale of food at harvest time even if it means buying back food later in the season, often at higher prices. A review of storage policies in Kenya pointed out some of the weaknesses in the system: 80 percent of producers did not have adequate storage facilities to store their maize or could not afford to store maize for more than two months. This resulted in a depletion of their food reserves and limited their ability to bridge the gap between harvests (Maritim 1985). Sixty percent of Nigerian farmers surveyed by WAPIA had storage problems: by far the most important problem was the lack of facilities.

3.35 Women are heavily involved in **marketing all types of agricultural products**, yet official marketing agencies are usually not geared to handle the needs of smallholders. In Kenya, for example, large- and medium-scale farmers sell almost all their maize through the government parastatal, but only 20 to 30 percent of smallholders' maize is sold to National Cereals Produce Board. Informal markets handled most of the maize, beans, other pulses and minor crops for smallholders. Kenyan agricultural marketing cooperatives handle the production, processing, and marketing of the main cash crops. Female membership in these cooperatives remains very low. Explanations include women's lack of title to land, which is often required for membership, women's lack of regular income to pay monthly contributions, and their low educational attainment, which limits their understanding of cooperative regulations and by-laws.

3.36 **Woodfuels** are the largest source of household energy in Sub-Saharan Africa. About 90 percent of all households use woodfuels for cooking, the main energy-user (Barnes 1990). In addition woodfuels are used intensively in such agroprocessing activities as fish smoking, shea nut processing, and beer-brewing. In semiarid areas the demand for woodfuel is a major cause of the decline in tree cover. "Excessive logging and felling, combined with poor regeneration capability, have set in motion a

downward trend that has been sharply accelerated by prolonged periods of drought and increasing livestock pressure on young regrowth. Woodfuel extraction considerably exceeds regrowth in many areas. Fuelwood shortages in fact limit the "carrying capacity" of arid and semi-arid West Africa more than do low crop and livestock yields" (Cleaver and Schreiber 1992, p. 48).

3.37 Women are the worst affected by the fuelwood crisis. As the main gatherers, transporters and users of fuelwood, they must walk ever further to gather fuelwood. In Kenya the time needed to fetch fuelwood has more than doubled over the past fifteen years (GOK 1988). And on the Central Plateau in Burkina Faso, where population density is high and the demand for fuelwood has exceeded supply for many years, women spend thirty-two to thirty-five hours per week collecting wood¹ (Monimart 1989). Fuelwood shortages also limit women's income-earning activities such as food processing, beer brewing, fish smoking, and pottery -- all of which require fuelwood. In parts of Burkina Faso, for example, despite the importance of beer brewing to women's income, the time spent collecting wood is making it increasingly difficult for them to continue (Monimart 1989).

3.38 Throughout SSA the women are responsible for water collection for the household. Although there are obviously wide geographical variations in rural water supply, fetching water typically involves several hours a day. In Kenya, for example, women on average spend four hours daily fetching water compared to one hour of men's time (GOK 1988). In Burkina Faso and northern Nigeria, water is generally available nearby in the rainy season, but during the dry season, women must make long trips to collect water, even waiting overnight for holes in river beds to fill with water.

3.39 Almost exclusively women provide and prepare the family's food -- a time-consuming and arduous process. Time-use studies from various parts of Africa have found that women spend on average two to three hours a day preparing food. Women choose from among foods available in the market or those produced on the farm, and allocate food to individual family members. Their keen awareness of the quality, characteristics and uses of different foods relevant to household food security has important implications for the focus of agricultural research and the content of agricultural extension messages, as discussed in Chapters 7 and 8.

3.40 As farming becomes a more difficult and unrewarding enterprise, women are being drawn into low-paying, casual agricultural labor or off-farm labor as an economic necessity. In Kenya for example, one-third of casual agricultural workers are women, a much higher proportion than among regular workers, and most are poor and landless (Monsted and Riunge 1987). The growth of large commercial farms, and in particular the increased number of "emergent" farmers from the better-endowed end of the smallholder sector, has expanded the rural market for wage labor.

¹ Time use data on off-farm activities should be regarded as indicative rather than definitive since they may include other activities such as child care, or may be the time spent by only one woman per family specializing in that activity.

D. Concluding Note

3.41 Changing intra-household arrangements are exerting a profound impact on the role of women in African agriculture. Women now comprise the majority of smallholder farmers, and a growing proportion heads households with their own specific characteristics and constraints. With growing population pressure on the land, few rural households can subsist without off-farm income. Men are more likely to pursue off-farm wage employment, while women undertake a wide range of businesses around their farming activities.

3.42 As Palmer has noted, " There is a matrix of locality-specific demand and supply factors of a rural wage labor market that is highly stratified by gender. Women and men have their respective economic opportunity costs that they experience individually. It is not feasible to plan structural changes in smallholder agriculture on the basis of a presumed homogenized household labor force. The consequences of ignoring gender-differentiated labor deployment issues is dramatized most strongly in the case of female-headed households" (Palmer 1991, p. 38).

3.43 The range of tasks on and off the farm that the SSA woman farmer - - especially those heading households - - is required to perform is very broad, and calls for an application of time and energy that tests human endurance. They work considerably longer hours than men on both agricultural and other tasks. Clearly there is a finite limit to women farmers' time and energy. Given the already large and growing contribution women farmers are making to agricultural production in general and to feeding their households in particular, policymakers must recognize that any strategy to improve agricultural productivity that increases the demand for labor especially female labor, must take the consequent opportunity costs fully into account.

3.44 It is also clear that policymakers must develop strategies which avoid perpetuating the conditions faced by women farmers through their female offspring. Analysis of the determinants of schooling, for example, shows that girls are the most negatively affected by those activities which raise their opportunity cost. Rural families will tend to underinvest in girls' schooling if the opportunity cost in doing so is higher than that of boys and, possibly, the returns to educating girls are lower in other activities (Volume III, Background Papers, chapter 5).

Chapter 4. Gender Differences in Agricultural Productivity¹

A. Introduction

4.1 Within a given agroecological environment, agricultural productivity is determined by the amounts of land, labor, capital, and other inputs that are used, and by the quality of these factors such as the fertility of land, the dispersal and fragmentation of plots, the health and education of the farmer, and the form that capital takes, e.g. tractors, hoes. As a general proposition and providing technologies and managerial skills are the same, farmers who have identical access to identical factors (both quantity and quality) will produce identical outputs of a given crop. That is, their productivity will be identical. If they use different technologies or different quantities of these factors, or there are differences in the quality of these factors, their productivity will differ. Thus, there may be differences in the productivity of men and women farmers. Such differences are likely. Men and women within the African rural household pursue their own-account activities both on and off the farm. They also have different endowments (such as land rights and education), and different access to technologies (extension), to factors of production (such as labor and capital), and to support services (such as credit).

4.2 Using the data from the rural household surveys of Kenya and Nigeria, this chapter examines men's and women's productivity in agriculture and the relative contributions of different inputs and factors of production. In addition, influences on the adoption by men and women of selected agricultural technologies are examined. The methodology of the rural household surveys is presented first, then the analytical approach is discussed, and lastly, the results are presented.

B. The Rural Household Surveys

4.3 Rural household sample surveys were undertaken in three districts of Kenya namely, Kakamega, Muranga, and Kilifi, and in Oyo, Kaduna and Imo States in Nigeria. These districts were selected to capture differences in cropping patterns, ecological conditions, and the role of women in agricultural production. A random sample of 720 households was selected in Kenya (240 in each district) and 750 households in Nigeria (250 in each state). The household questionnaires comprised several parts including a household roster and sections that asked questions about land, family labor and hired labor (both by principal agricultural activity), use of improved seeds, fertilizer and agrochemicals, contact with extension, use and cost of credit, housing, nonfarm employment, education and health. Enumerators living in the villages undertook the field work over the cropping season and each section was administered four times corresponding to the main phases of agricultural activity.

4.4 An important feature of these surveys was the collection of data on a **plot-specific basis**². Data was collected in this way because of the common practice in Africa for men and women to manage

¹ This chapter presents the econometric analysis of productivity and technology adoption. Readers who wish can move directly to Sections D and E for the empirical results.

² Most farm management studies are based on data collected at the household level. In such studies, all land is lumped together in one farm. In addition, labor inputs are often aggregated into total family labor or total hired labor. Such data, by not separating the information for each plot, are too aggregated to address differences between men and women in agriculture. Including observations for more than one plot for the same farmer may bias the statistics. Ideally, a random effects model should be used to accommodate this. However, the results of the farmer level analysis are little different from the plot level, implying that any such bias is not strong.

their own plots (Chapter 3 of this report), and the underlying assumption that farming decisions made by a plot user on one plot are largely independent of similar decisions by another user on another plot. Based on the plot-specific information, **farmer level** observations were also constructed. Thus, where an individual farmer had more than plot, all outputs and the corresponding farm inputs on all his/her plots were aggregated to create a farmer or farm level observation.

4.5 Community questionnaires were also administered to rural village heads to take account of the proximity of villages to extension centers, paved roads, water markets, power supply, health centers, schools, etc. This information was collected primarily to assess the impact of infrastructural variables on the adoption of agricultural technology.

C. Analytical Variables and Methods

4.6 A production function is a technical relationship between output and factors of production. It is an algebraic expression of the transformation of factors of production into output. The production function, therefore, represents the technology used by farmers, based on the technical methods of production. The estimated coefficients on the input variables are estimated from the data and indicate how strongly each input affects output - in other words, give the response of output with respect to the various inputs. Differences in efficiency between men and women can be captured by a shift parameter, which indicates technical efficiency differences, and by the coefficients on the inputs themselves. If a shift parameter in the form of a female farmer dummy has a positive and significant coefficient, then female farmers using the same techniques and inputs are technically more efficient than male farmers. Differences in input coefficients across gender mean that females combine inputs differently from men, and, when evaluated in the light of their production function and prevailing prices can indicate differences in allocative efficiency. Studies based on production functions can guide resource allocation. For instance, using production functions, production elasticities of inputs can be evaluated, and the elasticity of substitution between inputs and the returns to scale can be examined. These characteristics are useful tools for economic analysis and policy formulation.

4.7 The results in this section are obtained from estimating a Cobb-Douglas production function. The mathematical representation of this function is:

$$Y = A X_0^{\beta_0} X_1^{\beta_1} X_2^{\beta_2} \dots X_n^{\beta_n}$$

where Y and the X_i 's are output and inputs, respectively and the β_i 's are parameters. The Cobb-Douglas production function is used widely due to a number of desirable properties. One of these desirable properties is that $\beta_1, \beta_2, \dots, \beta_n$ in equation (1) are the elasticities of output with respect to the relevant input. A critical assumption in equation (1) is that $\beta_1, \beta_2, \dots, \beta_n$ are positive and each is less than one, i.e. $0 < \beta_1, \beta_2, \dots, \beta_n < 1$. The sum of the β_i 's also provides the returns to scale parameter. Another attractive property of the Cobb-Douglas function is that, econometrically, it is easy to estimate, because in its log form, the parameters are linear and can be estimated easily using the Ordinary Least Squares (OLS)

method.³

4.8 The variables used in the productivity analysis are listed in Table 4.1. The dependent variable is the gross value of output since intercropping is a common farming practice in both Kenya and Nigeria.⁴ For the plot level analysis, the dependent variable is the gross value of output per hectare of the main food crops. For the farmer level analysis, the dependent variable is the gross value per hectare of selected crops produced on all his/her plots. In Kenya, the crops selected are maize, beans, and cowpeas (as monocrops or intercropped with one another); in Nigeria, all food crops grown are included. These crops were selected for two major reasons: they are the most commonly grown crops in all districts; and the form of the production function for these crops is assumed not to vary across districts and gender. These assumptions allow comparisons of the productivity of male and female farmers. A comparison of the productivity of inputs based on production functions from gross value of output per hectare for all crops, including such tree crops as coffee, would be inappropriate since the production cycle of annual crops differs from that of tree crops which have long gestation periods. If all farmers don't grow similar crops on their plots, there will be differences in crop technology which would give rise to differences in the estimated elasticities.

4.9 Both conventional and non-conventional inputs are used as explanatory variables. The main conventional inputs are land cultivated, family labor and hired labor disaggregated by gender.⁵ Capital stock is represented by the market value of all tools and equipment owned by all members in the

³ For more details see Walters (1963) and Fuss or McFadden (1978). The Cobb-Douglas model does have some limitations. since it treats input choices as exogenous, it is susceptible to management bias. Ideally, input choices should be modeled simultaneously with the production function, but this usually requires price variation. Alternatively, the analysis might be done in profit-price space with dummy variables to pick up differences in constraints. These could be economic constraints linked with gender but also technological ones including soil quality. Education can still be included as the approach does not rule out differences in technological efficiency. In addition, the Cobb-Douglas form is not flexible for modeling complements and substitutes, such as the relationship of land and labor or the role of labor availability in choosing variable inputs. A variation of this theme is the constancy of elasticities. Average elasticities are compared in this chapter, and if elasticities are not, in fact, constant and levels of inputs differ markedly, this comparison is not valid. This can be addressed with log quadratic (or translog) functions. A more robust test of differences in elasticities would involve pooling the male and female observations and including interaction terms between gender and the level of input. This would test the differences by parameter instead of the overall regression, as the Chow test does.

⁴ Ideally, the quantity of a crop produced is the most appropriate dependent variable in a production function analysis. For Kenya, Oluoch-Kosura (1983), Rukadema (1978) and Moock (1973) take this approach in analyzing the productivity of maize farmers. However, the monocrop sample for maize in this study was too small to allow this approach. It is, however, a common practice in the agricultural economics literature, especially where more than one crop is grown on a plot, to use the gross value of output (obtained by summing the gross value of individual crops) as the dependent variable. For example, see Huffman (1976), Bardhan (1973), Mijindadi (1980) and Norman (1982).

⁵ It is recognized that hired labor may not be entirely substitutable for family labor. Benjamin (1992) finds that hired and family labor are homogenous, while Vijverberg and Deolalitan (1987) found the reverse.

household.⁶ This is not a perfect measure of capital as a factor of production as it may also measure wealth or assets. Most of the non-conventional inputs are represented by dummy variables.⁷ For instance, an index representing tenurial status was constructed by considering the extent of control a plot user has over a plot in terms of the ability to improve, sell, rent, mortgage and lend the plot. If a farmer had the right to do all the above, a 1 was assigned to the tenure variable and 0 otherwise. Dummy variables are also used to represent the use of insecticide, tractor use, gender of farmer, extension contact, soil fertility. District dummies are also included for Kakamega to account for possible unobserved differences in underlying conditions in the districts such as differences in ecological conditions, cropping patterns and other agronomic factors. The dummy for Kilifi is the omitted category in the regressions. The education and age variables are represented in years.

Table 4.1. List of Variables

Variable Names	
1. Value of crops (Ksh)	8. Capital (Ksh)
2. Land (Hectare)	9. Human Capital
3. Family labor (hours)	Years of Education
Total male labor	Age (years)
Total female labor	Gender dummy (1=male, 0=female)
	Extension contact dummy (1=contact, 0=no contact)
4. Hired labor (days)	
Male labor	10. Soil fertility dummy (1=very fertile/fertile, 0=not fertile)
Female labor	
5. Fertilizer (Kgms)	11. Tenure dummy
	(1=improve/sell/rent/mortgage/lend, 0=not..)
6. Insecticide dummy (1=used, 0=not used)	
7. Tractor dummy (1=used, 0=not used)	12. District/dummy (Kenya)
	Kakamega
	Muranga
	Kilifi (omitted category)

⁶ The concept of capital in a developing country context is often problematic. In agriculture, the components of capital can include hand tools and equipment, buildings, livestock, and tree crops. For the purposes of this study, it is primarily hand tools and simple farm equipment that are taken into account. Ideally, it is the flow of capital services, not the stock of capital that should be utilized in the analysis. Since it is often difficult to obtain such information, the stock of capital is taken as a proxy for the flow of capital services. The information that allowed the creation of the capital variable was obtained using a section in the questionnaire on implements which was administered to adult members in the household with at least one plot to farm. Since all plot users didn't fully answer this section, information on types and market value of implements was incomplete. On the other hand, these farmers had provided sufficient information on other inputs and outputs in other sections of the questionnaire. To address this problem, the total market value of all tools owned by the household level was assigned to each farmer and plot user in that household on the assumption that, since most of the tools are hand tools, members of the household may have access to these tools (common pool of capital) without much difficulty. Given the communal spirit that exists in farming communities in Africa as a whole, this may not be an unrealistic assumption.

⁷ Institutional factors such as tenurial status and agroclimatic considerations such as soil fertility and ecological conditions are important in explaining variations in output, but such factors are difficult to measure. Dummy variables are used as proxies for these and other variables that are difficult to measure accurately.

D. Model Results for Kenya

4.10 All Plots.⁸ The results for the all plots model (presented in table 4.2⁹) show the expected signs for almost all conventional variables. The coefficient of multiple determination adjusted for degrees of freedom indicates that 71 percent of the variation in plot level gross value of output per hectare is associated with the factors of production specified in the model. The most important inputs in this model are female family labor, capital, fertilizer, female hired labor and male family labor. These inputs influence output positively and significantly. Male hired labor is insignificant. Extension contact and location are also important in influencing output. All other variables do not affect output significantly.

4.11 The estimated elasticities are as follows: female family labor input (0.24), male family labor (0.15), capital (0.17), fertilizer (0.16) and female hired labor (0.15). The elasticity of female family labor is almost twice that for male family labor. Given these elasticities, a 10 percent increase in female family labor input results in a 2.4 percent increase in output, while a 10 percent increase in male family labor input results in an output increase of only 1.5 percent.

4.12 Hired male labor is not important in the production of the crops selected for this analysis. Hired female labor, elasticity 0.15, however, influences output positively and significantly. The elasticity of hired female labor is lower than that for female family labor. This is to be expected given that family members working on the farm are likely to be more knowledgeable about their farming operations than hired labor.

4.13 Capital, which may proxy household wealth, significantly and positively affects agricultural production though less than female family labor -- a 10 percent increase will result in an increase in output of only 1.7 percent. Fertilizer is also significant: a 10 percent rise in its use increases output by 1.6 percent, somewhat lower than might have been expected.

⁸ Farmer level regressions are not discussed here as the results were very similar to the all plots model. Details are to be found in Saito et al, 1992.

⁹ Production functions were estimated for each of the three districts. The results, however, were not as satisfactory as those for male and female plots/farmers estimated for the three districts combined. Part of the problem was the small number of observations for each individual district. A variety of specifications was also tried. The most important one included the use of activity-specific labor inputs (planting, weeding, harvesting labor) as explanatory variables. Dummies for important crops were also utilized to account for variation in cropping patterns. At the plot level, a number of plot characteristics (dummies for slope and clearance from trees) were included. In general, these specifications did not provide significant results. The results reported here are the most robust.

Table 4.2. Plot Level Estimates of Cobb-Douglas Production Functions for Kenya
(Dependent Variable: Gross value of output per hectare of maize, beans and cowpeas)

Explanatory variables	Coefficients (t-statistics in parentheses)		
	All plots	Male plots	Female plots
Constant	3.384 (7.61)	2.867 (5.64)	4.413 (4.73)
Land	0.058 (0.86)	0.113 (1.42)	-0.037 (0.28)
Capital ^{1/}	0.165 (4.44)***	0.173 (4.12)***	0.114 (1.46)
Family labor			
total male labor	0.145 (2.68)***	0.115 (1.75)*	0.201 (2.14)**
total female labor	0.244 (4.25)***	0.303 (4.54)***	0.235 (2.01)**
Hired labor			
male labor	0.017 (0.35)	-0.057 (0.98)	0.189 (2.29)**
female labor	0.151 (3.05)***	0.277 (4.63)***	-0.126 (1.33)
Fertilizer	0.160 (5.75)***	0.139 (3.83)***	0.163 (3.22)***
Insecticide dummy (1-0)	0.019 (0.12)	-0.157 (0.86)	0.291 (0.93)
Tractor dummy (1-0)	0.164 (1.38)	0.058 (0.44)	0.236 (0.76)
Human capital			
formal education (yrs)	-0.011 (0.74)	-0.003 (0.14)	-0.055 (1.75)*
age (yrs)	0.001 (0.18)	0.004 (0.57)	-0.015 (1.53)
age squared	-0.000 (1.12)	-0.000 (1.20)	-0.000 (0.21)
extension dummy	0.462 (2.44)**	0.635 (2.76)***	0.002 (0.01)
gender of plot user (1 if male)	0.031 (0.28)		
Tenure dummy (1-0)	0.064 (0.68)	0.086 (0.83)	0.012 (0.06)
Soil fertility dummy (1-0)	-0.023 (0.23)	0.120 (0.96)	-0.231 (1.38)
Location dummy (1-0) ^{2/}			
Kakamega	0.604 (3.89)***	0.861 (4.22)***	0.468 (1.70)*
Muranga	0.490 (3.31)***	0.602 (3.43)***	0.400 (1.43)
Adjusted R ²	0.71	0.72	0.73
Number of observations	494	351	143

^{1/} This is a household level variable.

^{2/} These dummy variables represent differences in districts where farm households live.

* significant at 10 percent level.

** significant at 5 percent level.

*** significant at 1 percent level.

4.14 Regarding the human capital variables, the education variable represents years of formal schooling. In general, farmers with some formal education might be expected to acquire new ideas and information more successfully than those which are less educated, and thus improve their productivity; a positive correlation between education and output is therefore be expected. However, the coefficient

for education is small, has the wrong sign and is insignificant. Education may, however, be endogenous with some other variables in the regression thus reducing its significance. It is also possible that the content of formal education has little bearing on farming skills as a whole. In fact, the process of formal education orients students away from agriculture and the returns to education in off-farm work may be higher. The age and gender of the plot user also do not significantly affect agricultural production.

4.15 The positive and significant coefficients associated with the dummy variable representing extension contact shows that the gross value of output for farmers who had contact with extension agents are higher than those who did not. The positive and significant coefficients of the dummy variables representing Kakamega and Muranga indicate that, as expected, the gross value of output of the selected crops is higher in these districts than in more arid Kilifi.

4.16 The insignificance of the coefficients associated with insecticide use and tractor use may be attributed to known low levels of use of these inputs in the production of food crops in Kenya. Tenure also does not seem to affect output.

4.17 Male-managed plots:¹⁰ Female family labor remains the most important factor of production in the results for male plots. Other important variables are hired female labor, capital, fertilizer, and male family labor. The elasticities of these variables are 0.28, 0.17, 0.14, and 0.12, in that order. The elasticity of female family labor (0.30) is more than twice that for male family labor (0.12). As with the results for all plots, hired male labor is not significant. Contact with extension agents positively and significantly affects output in all plots and in male plots. Location characteristics again, are also significant.

4.18 Female-managed plots: The most noticeable result in this category is the positive and significant coefficient for female family labor. Its elasticity at 0.24 is relatively high, suggesting that women are highly productive on their own plots. Another noticeable result is that male hired labor on female plots has a positive and significant coefficient with an elasticity of 0.19. Male family labor on female plots also has a positive and significant effect on output; in fact, male family members are also nearly as productive on female plots as women themselves. In fact, the elasticity of male family labor is higher (0.20) on women's plots than on all plots (0.15) and male plots (0.12).

4.19 Unlike the results for male plots and all plots, capital (as measured here) plays a minor role in influencing yield in female plots. Fertilizer, however, is more important in the production of food crops on female plots than in male plots. In addition, unlike the results for male plots, extension has an insignificant effect on the production of crops on female plots. Education has an unexpectedly negative sign but is only weakly significant.

4.20 Marginal value of family and hired labor: The marginal value product of a factor is the additional return from adding one more unit of that factor, holding all other inputs constant. Comparing the marginal value product of a factor with the prevailing factor cost (opportunity cost) sheds some light on the efficiency of resource-use. A marginal value product which exceeds its opportunity cost suggests that there is scope for profitably raising output by increasing the use of that factor. Conversely, increasing the use of a factor which has a marginal value product less than the associated opportunity cost

¹⁰ The disaggregation into male and female managed plots was made following Chow tests which showed that the two samples have significantly different structures of production.

will decrease profitability.

4.21 Comparison of marginal value products (calculated on the basis of the production function estimates and the average values of output and labor used) for male and female labor (both for family and hired labor) indicate an excess supply and hence inefficient use of both family and hired labor. According to Moock (1973), such an excess supply of labor and the accompanying inefficiency may be partly explained by cultural factors such as "pride" (a farm laborer may decide not to work for a wage which is below a minimum wage set by himself) on the part of hired labor and the sense of obligation to the community on the part of the employer. A wealthy member of the community who employs farm laborers may be hiring more laborers than really needed just to maintain a good social standing among members of the community. In both cases, the wage offered may be higher than the corresponding marginal value product of labor thus creating the inefficiency pointed out above.¹¹

4.22 Gender differences in productivity: Although the foregoing results show some gender differences in the use and productivity of several factors of production, they do not directly address gender differences in productivity. Using mean values of output, men are seemingly more productive than women: male plots have a gross value of output of 3706 Ksh per hectare and women 3417 Ksh per hectare. But they have also have different human capital endowments and different access to factors and inputs. The question thus arises: if women had the same quantities and quality of factors as men, would they be as productive as men?

4.23 To answer this question, the coefficients from the production function estimates for female plots and the mean values of the independent variables for male plots were used to predict the value of output for females. This was compared with the predicted value of output using the mean values of the independent variables for women's plots. As noted above, with existing endowments, men's mean gross value of output per hectare is 8.4 percent higher than women's. This simulation exercise suggests that if women had the same access to resources as men, the value of their output would increase by about 22 percent which would more than fully close the gap between male and female output. Because output on women's plots would rise by more than the difference between the mean values of men's and women's output these results suggest that women may be better farm managers than men. This difference may arise because the crops on which this analysis is based (maize, beans, cowpeas) are crops which tend to be grown extensively by women, and in which they may have developed superior expertise. Similarly, when women are assigned the mean values of land and fertilizer used by men (keeping all other variables at the mean levels for women) the value of women's output increases by 10.5 percent and 14.6 percent, respectively. Full details are presented in Saito et al (1992).

E. Model Results for Oyo State, Nigeria

4.24 Factors contributing to men's and women's agricultural productivity were also examined for Nigeria using data only from Oyo State.¹² The analysis was undertaken at both the household and

¹¹ Shapiro (1983) states the evaluation of efficiency on the basis of the comparison of marginal value product with factor cost is appropriate primarily to modern, competitive situations and not to most peasant agricultural situations. He argues that most peasants are mainly subsistence oriented and are largely outside the area of competition. The comparison, however, can shed some light on the degree of inefficiency in resource allocation.

¹² Although satisfactory for descriptive purposes, the data from Kaduna and Imo States were excluded from the analysis reported here due to discrepancies in the units in which output was measured.

the plot level -- for a total of 226 farm households and 1,174 plots respectively. The main regression estimates are given in table 4.3 while further details are presented in Saito et al (1992).

4.25 The farm household-level regression results show that the most important factors of production for all farm households were land, capital (value of tools and equipment), male and female hired labor, and female family labor. Land was found to be especially important with a coefficient of 0.345. Capital also exerted a positive and significant influence on gross value of output, with an elasticity of 0.11. The coefficients for hired female labor (0.033), hired male labor (0.030), and female family labor (0.029) were also significant, while male family labor was insignificant for the all-farmer regression. The elasticities for hired male and female labor were almost the same (0.030 for male and 0.033 for female labor). While the use of insecticide (expressed as dummy) significantly increases the value of output, surprisingly fertilizer was found to be insignificant.¹³ This latter result may reflect the virtual breakdown in the fertilizer distribution system during the year of the survey resulting in poor supply and little use. The gender of the household head (also expressed as dummy) was negative and insignificant, suggesting that there is no difference in technical efficiency between male and female farmers. Both education coefficients are negative and insignificant. The extension contact dummy was also insignificant.

4.26 The plot level regression results for all plots show that land is again an important variable with an elasticity of 0.084. Both the male and female family labor variables are positive and strongly significant, with similar elasticities of 0.034 and 0.039, respectively. The coefficients of both male and female hired labor are positive and significant, and the elasticity of female labor (0.031) is twice as high as that of male labor (0.017). As with the all farmers regression discussed above, the elasticities of family labor were higher than those for hired labor. Capital also significantly and positively affects gross value of production with an elasticity of 0.030. The male plot-manager dummy¹⁴ and insecticide use were also significant, while fertilizer use and extension contact were not. As in the all farmers regression, the age of the plot user affects gross value of output negatively. This may be attributed to the fact that the average age of plot users in the sample was relatively high at forty-seven years. The following section discusses the results on the basis of separate regressions for male- and female-managed plots.¹⁵

¹³ This may be due to the use of a dummy variable for fertilizer usage rather than the actual amount used.

¹⁴ The gender dummy variable was significantly different at the plot level but not at the farmer level. At the farmer level, most observations were of men. At the plot level, the more equal distribution of observations between the genders and greater degrees of freedom due to more observations allowed a more rigorous testing of differences. The positive male farmer dummy in the plot level results suggests that men could have better quality of inputs (e.g. land and capital) on their plots.

¹⁵ Again, the disaggregation was justified on the basis of Chow tests.

Table 4.3. Farm Households and Plot Level Estimates of Cobb-Douglas Production Functions in Oyo State, Nigeria (Dependent variable gross value of output per hectare of food crops)

Explanatory variable	Coefficients and t-statistics in parentheses			
	All farm households	All plots	Male-managed plots	Female-managed plots
Constant	3.596 (4.296)***	4.309 (6.721)**	5.604 (7.420)***	3.721 (5.149)***
Land	0.345 (4.50)***	0.084 (3.40)***	0.095 (3.43)***	0.010 (0.18)
Household Capital	0.115 (2.14)***	0.030 (5.06)***	0.025 (3.60)***	0.048 (3.94)***
Family Labor				
Total Male	0.009 (1.11)	0.034 (7.12)***	0.033 (6.28)***	0.023 (2.08)**
Total Female	0.029 (2.07)**	0.039 (6.73)***	0.056 (7.70)***	0.008 (1.76)*
Hired labor employed				
Male	0.030 (1.76)*	0.017 (2.43)**	0.021 (2.72)**	0.003 (1.17)
Female	0.033 (3.18)***	0.031 (5.00)***	0.026 (3.69)***	0.043 (3.28)***
Fertilizer (Dummy) ^{1/}	-0.100 (0.71)	0.082 (0.90)	0.059 (0.61)	0.222 (0.84)
Insecticide (Dummy) ^{1/}	0.556 (2.95)***	0.454 (5.31)***	0.411 (4.59)***	0.689 (2.49)**
Education 1-8 yrs. (Dummy)	-0.203 (1.34)	-0.288 (3.50)***	-0.281 (3.06)***	-0.398 (2.08)**
Education > 8 yrs (Dummy)	-0.078 (0.28)	-0.216 (1.39)	-0.276 (1.75)*	0.796 (1.13)
Age of HH Head (Dummy)	-0.015 (3.03)***	-0.006 (2.15)**	-0.007 (2.14)**	-0.006 (1.05)
Gender of Plot User (Dummy) (if male)	-0.130 (0.47)	0.559 (5.59)***		
Adjusted R ²	0.62	0.58	0.58	0.58
No. of Observations	226	1174	885	289

Source: WAPIA Survey.

^{1/} A dummy was used for both fertilizer and insecticide in view of the unreliability of the data on the quantities of both inputs. For both 1 = use of input and 0 = no use.

* Significant at 10 percent level.

** Significant at 5 percent level.

*** Significant at 1 percent level.

4.27 In the male plot regression, all the traditional factors of production (land, capital, male and female family labor, and hired male and female labor) positively and significantly affected gross value of output per hectare. Of these, land is the most important, with an elasticity of 0.095. Both male and female family labor are significant, and, as in the all plots regression, the elasticity of female family labor (0.056) is almost twice that of male family labor (0.033). The elasticity of hired labor (both for males and females) is less than that of family labor. There is, however, little difference between the elasticities of male and female hired labor. Among the other variables, insecticide is significant and positive as opposed to fertilizer and extension contact which are positive but not significant. Both the education variables have unexpectedly negative and significant coefficients. Age also negatively and significantly affects the value of agricultural production (the average age of males in the sample is forty-eight years).

4.28 The most important factors of production for women plot users are capital, male and female family labor, and male and female hired labor. Capital -- the value of farm tools -- also contributed positively to the gross value output of female-managed plots. However, the elasticity for capital is small -- a 10 percent increase in capital would increase output from women's plots by only 0.5 percent reflecting the low level of technology embodied in simple hand tools. The coefficient of female family labor (0.008) is smaller than that in the male plots and the all farmer regressions (0.056 and 0.029), respectively, and also less than the coefficient for male family labor (0.023) and female hired labor (0.043). The Nigeria country study (Volume II, Chapter 2) shows, that for women farmers, male family labor is important in land clearing and preparation and hired female labor is needed for the postplanting work. Hired male labor is 30 percent more expensive than female, and hence less demanded by female farmers than hired female labor. Unlike the male plot users, an increase in land would not significantly affect the total value of output for women. This may be because of the limited variation in the size of plots used by women (0.34 ha on average with a standard deviation of 0.2). Insecticide use contributed significantly to productivity, possibly due to the higher technical competence of farmers using insecticide and to the higher value crops with which insecticide is highly associated. Years of primary education again had a negative and significant effect.

F. The Determinants of Technology Adoption

4.29 A number of economic, infrastructural and human capital variables influence farmers decisions to use modern inputs. Hence, the role of land, capital, education, age, gender, labor supply, risk, extension agent contact, infrastructural development (paved roads, cooperatives, banks, and permanent daily markets) and ecological factors (location variables) and cropping patterns in the adoption of specific types of inputs were investigated using a logit framework. The results provide estimates of the effect of these factors on the probability of use of a specified input, given certain socio-economic characteristics at the farmer, household, and village level.

4.30 The empirical results for Kenya on the determinants of adoption of fertilizer, agrochemicals and improved seeds are generally consistent with a priori expectations about the role of education, extension services, development cooperatives, and other infrastructural and institutional structures such as roads, markets, electricity and banks. Numerical details are given in Tables 4.4, 4.5 and 4.6. The main conclusions are as follows:

4.31 A farmer's level of education positively and significantly affects the farmer's probability of adopting new technologies. A one year increase in education of male and female farmers, for instance, increases the probability of male farmers using fertilizer by 3 percent and female farmers by 4 percent. The corresponding increase in the probability of male farmers using agrochemicals is 1 percent and

female farmers 3 percent. In both cases, the probability that women will adopt these two inputs is higher given the same percentage increase in years of education. Similarly, women with some education are more likely to adopt improved seeds than men. Educating women, therefore, is more likely than educating men to increase the use of these inputs and technologies. However, this may well reflect the lower level of education that women have to start with. Women in the sample had only 3.4 years of education compared to 3.8 years for men.

4.32 The probability of using agrochemicals as a result of extension contact is higher for women (33 percent) compared to men (the coefficient for men is insignificant). Contact with extension also significantly affects the decision of both male and female farmers to use improved seeds -- extension contact increases this probability by 27 percent for male and 19 percent for female farmers. Contact with extension positively and significantly affects the decision of male farmers to use fertilizer, but does not significantly affect the female farmers' decision. Overall these results show that extension contact contributes positively and significantly to the adoption of modern farm inputs by both male and female farmers.

4.33 Among the **infrastructure and institutional** variables included in the analysis (electricity, paved roads, markets, cooperatives, and banks) the effect of **cooperatives** is noteworthy. Having a cooperative in the village was found to positively affect the decision of both male and female farmers to use fertilizer, and male farmers to use agrochemicals and improved seeds. As discussed in the country studies (Volume II), more men than women are members of cooperatives. Encouraging more women to become cooperative members would likely have a positive influence on their decision to adopt new technologies.

Table 4.4. Probability of Adoption of Improved Seeds at the Farmer Level: Kenya

	All farmers			Male farmers			Female farmers		
Sample size	495			309			186		
	Coefficient	Wald stat	Marginal Effects	Coefficient	Wald stat	Marginal Effects	Coefficient	Wald stat	Marginal Effects
Area of land holding	-0.092	(0.01)	-0.02	-0.002	(0.00)	-0.00	-0.103	(0.74)	-0.02
Value of tools	0.531*	(10.71)	0.13	0.441*	(6.83)	0.11	0.839*	(6.18)	0.28
Age head	0.190*	(4.48)	0.05	0.315*	(6.38)	0.08	0.150	(0.53)	0.03
Age squared	-0.002*	(5.04)	-0.00	-0.003*	(6.81)	-0.00	-0.001	(0.54)	-0.00
Formal education	0.098	(1.81)	0.02	0.056	(0.24)	0.01	0.143	(1.50)	0.03
Ad HH males	-0.019	(0.01)	-0.00	-0.058	(0.35)	-0.01	0.037	(0.27)	0.01
Ad HH females	-0.171*	(2.40)	-0.04	-0.130	(1.48)	-0.03	-0.389*	(2.90)	-0.09
Dependents	-0.230	(1.46)	-0.06	-0.340*	(2.42)	-0.08	-0.172	(0.06)	-0.04
Gender HHhead	-0.386	(1.72)	-0.09						
Extension contact	1.081*	(2.01)	0.27	1.078	(1.01)	0.27	1.230	(1.47)	0.19
Cooperative in village	0.979	(0.90)	0.24	1.427*	(2.04)	0.36	0.532	(0.04)	0.12
Paved road	0.805	(1.72)	0.20	1.078	(0.81)	0.27	1.001*	(2.91)	0.23
Electricity	-0.386	(1.85)	-0.09	-0.413	(1.31)	-0.10	-0.401	(1.06)	-0.09
Distance to bank	-0.033	(0.92)	-0.01	-0.040	(0.98)	-0.01	-0.027	(1.19)	-0.01
Distance to permanent market	-0.016	(0.23)	-0.00	-0.036	(1.50)	-0.01	0.012	(1.16)	0.00
Male wages	-0.497	(0.50)	-0.12	-3.480*	(3.50)	-0.87	2.54	(1.68)	0.58
Female wages	-1.103	(0.00)	-0.27	1.503	(1.60)	0.37	-3.216	(1.08)	-0.73
Kakamega	0.753	(0.12)	0.18	0.099	(0.30)	0.02	1.996*	(2.08)	0.45
Muranga	0.750	(0.18)	0.18	0.465	(1.84)	0.12	1.503	(1.18)	
% correctly predicted	90			92			89		

Source: WAPIA survey.

* Significant at 10 percent level or less.

Table 4.5. Probability of Adoption of Fertilizers at the Farmer Level: Kenya

	All farmers			Male farmers			Female farmers		
Sample size	495			309			186		
	Coefficient	Wald Stat	Marginal Effects	Coefficient	Wald Stat	Marginal Effects	Coefficient	Wald Stat	Marginal Effects
Area of land holding	0.226	(0.97)	0.06	0.081	(0.10)	0.02	0.775	(1.78)	0.18
Value of tools	0.807*	(22.70)	0.20	0.941*	(16.42)	0.23	0.733*	(7.17)	0.17
Age head	0.125*	(2.99)	0.03	0.033	(0.13)	0.01	0.319*	(5.10)	0.07
Age squared	-0.001*	(2.82)	-0.00	0.000	(0.08)	0.00	-0.003*	(5.44)	-0.00
Formal education	0.111*	(5.73)	0.03	0.102*	(2.72)	0.03	0.173*	(4.31)	0.04
Ad HH males	-0.058	(0.29)	-0.01	-0.045	(0.09)	-0.01	-0.141	(0.54)	-0.03
Ad HH females	-0.181	(1.83)	-0.04	-0.135	(0.57)	-0.03	-0.295	(1.48)	-0.07
Dependants	-0.128	(1.14)	-0.03	-0.246*	(2.18)	-0.06	0.021	(0.01)	0.00
Gender HHhead	-0.164	(0.23)	-0.04						
Extension contact	0.424	(0.92)	0.10	1.103*	(2.71)	0.27	-0.009	(0.00)	-0.00
Cooperative in village	1.201*	(6.13)	0.29	0.90*	(2.10)	0.22	1.594*	(2.10)	0.36
Paved road	-0.562	(1.48)	-0.14	-1.050*	(2.11)	-0.26	-0.290	(0.13)	-0.07
Electricity	0.852*	(5.12)	0.21	0.691*	(2.14)	0.17	1.069	(1.81)	0.24
Distance to bank	0.021	(1.25)	0.01	0.033	(1.87)	0.01	0.027	(0.33)	0.01
Distance to permanent market	-0.020	(0.85)	-0.00	-0.026	(0.64)	-0.01	-0.020	(0.30)	-0.00
Male wages	3.198*	(3.62)	0.78	2.400	(1.07)	0.60	4.347	(1.76)	0.99
Female wages	-2.906*	(3.38)	-0.71	-3.354*	(2.12)	-0.84	-2.821	(1.08)	0.15
Kakamega	5.027*	(13.90)	1.23	3.418*	(4.42)	0.85	7.695*	(7.66)	1.75
Muranga	4.040*	(16.68)	0.99	3.015*	(7.08)	0.75	5.986*	(7.47)	
Maize	0.807	(1.89)	0.20	0.713	(0.84)	0.18	0.405	(0.09)	0.09
Coffee	0.573	(1.74)	0.14	0.636	(1.05)	0.16	0.670	(0.99)	0.15
% correctly predicted	83			86			81		

Source: WAPIA survey.

* Significant at 10 percent level or less.

Table 4.6. Probability of Adoption of Agrochemicals at the Farmer Level: Kenya

	All farmers			Male farmers			Female farmers		
Sample size	495			309			186		
	Coefficient	Wald stat	Marginal Effects	Coefficient	Wald stat	Marginal Effects	Coefficient	Wald stat	Marginal Effects
Area of land holding	0.112	(0.00)	0.02	-0.040	(0.03)	-0.01	0.492	(0.76)	0.07
Value of tools	0.521*	(11.72)	0.00	0.628*	(9.52)	0.08	0.479*	(2.22)	0.07
Age head	0.140*	(2.63)	0.03	0.038	(0.14)	0.01	0.484*	(6.36)	0.07
Age squared	-0.001	(1.94)	-0.00	-0.001	(0.11)	0.00	-0.004*	(5.60)	-0.00
Formal education	0.117*	(6.18)	0.02	0.087*	(2.01)	0.01	0.234*	(5.84)	0.03
Ad HH males	-0.010	(0.01)	-0.00	0.148	(1.16)	0.02	-0.352*	(2.20)	-0.05
Ad HH females	-0.199*	(2.58)	-0.04	-0.134	(0.078)	-0.02	-0.668*	(4.31)	0.09
Dependants	-0.022	(0.034)	-0.00	-0.032	(0.04)	-0.00	0.011	(0.00)	0.00
Gender HHhead	-0.837*	(4.65)	-0.16						
Extension contact	1.277*	(8.37)	0.25	0.749	(1.34)	0.10	2.349*	(9.33)	0.33
Cooperative in village	0.752*	(3.379)	0.15	1.056*	(3.54)	0.14	0.625	(0.43)	0.09
Paved road	0.838*	(2.32)	0.17	1.927*	(3.49)	0.26	0.949	(1.14)	0.13
Electricity	0.469	(1.38)	0.09	1.927*	(3.49)	0.26	0.418	(0.22)	0.06
Distance to bank	0.018	(1.14)	0.00	0.109	(0.04)	0.01	-0.028	(0.76)	-0.00
Distance to permanent market	0.039	(1.81)	0.01	0.041*	(2.725)	0.01	-0.054	(1.11)	-0.01
Male wages	2.180	(1.44)	0.43	-0.005	(0.013)	-0.00	3.200	(1.13)	0.45
Female wages	-1.839	(0.91)	-0.36	3.063	(0.75)	0.41	0.435	(0.02)	0.06
Kakamega	2.462*	(3.57)	0.49	-3.726	(1.16)	0.50			
Muranga	3.550*	(11.37)	0.70	2.807	(1.55)	0.38	4.136*	(3.01)	0.58
				5.510*	(7.03)	0.75	3.211*	(3.34)	0.45
Maize	-0.735	(1.34)	-0.14	-0.111	(0.02)	-0.01	-2.952*	(5.43)	-0.42
Coffee	2.144*	(25.55)	0.42	1.920	(10.39)	0.26	2.688*	(11.09)	0.38
% correctly predicted	85			84			87		

Source: WAPIA survey.

* Significant at 10 percent level or less.

4.34 The availability of **electricity** in villages positively affected the use of fertilizer and agrochemicals of all farmers (though it is insignificant for female farmers in fertilizer use). The results for **paved roads** are inconsistent: while the coefficient is positive for the use of improved seeds and agrochemicals as expected, the coefficient for fertilizer use is negative and not significant. Longer distances to **financial institutions** make it more difficult for farmers to obtain formal credit with which to finance the purchase of modern inputs. However, the sign of the coefficient is positive in the fertilizer and insecticide use logits. But, as discussed in chapter 9, very few farmers, especially female, obtained credit from formal institutions (banks) so this perverse result may not be important. Moreover, the strong association between cooperatives and technology adoption discussed above probably reflects the fact that cooperatives also extend the short-term credit needed for the purchase of fertilizer and other seasonal inputs.

4.35 Farmers with more **dependents** are less likely to use improved seeds than those with fewer dependents. This suggests that those farmers with a higher proportion of consuming members relative to producing members in the household may be more risk averse - that is adoption is hostage to the farmer's concern that the new crop variety will not yield the promised result.

4.36 Table 4.7 shows the **marginal effect** of an increase in each of the variables, on the probability of adoption holding others constant. This more clearly illustrates the importance of cooperatives and extension contact: the existence of a cooperative in the village and contact with extension both substantially increase the probability of adoption of improved seeds, fertilizer, and agrochemicals.

Table 4.7. Marginal Effect of a Cooperative and Extension Contact on Technology Adoption in Kenya
(percentage increase in probability of adoption)

	All Farmers	Male Farmers	Female Farmers
1. Cooperative in the village			
effect on:			
using improved seeds	24	36	12
using fertilizer	29	22	36
using agrochemicals	15	14	9
2. Contact with extension			
effect on:			
using improved seeds	27	27	19
using fertilizer	na	27	na
using agrochemicals	25	10	33

n.a. = Not applicable - refers to insignificant coefficients.

4.37 Logit functions were also estimated to examine the factors affecting a farmer's decision to use **credit**. The results are as follows: the distance to a bank significantly and negatively affected credit use of female farmers, but not male farmers. The existence of a cooperative in the village was strongly positive in its effect on credit use for both male and female farmers. Similarly the existence of both a permanent market and electricity positively and significantly affected use of credit by both male

and female farmers. Male farmers who grew coffee were more likely to use credit, but for female farmers, coffee growing had no significant effect on the use of credit. The variables which most strongly and positively affected credit use by females were the existence of a cooperative in the village, size of land holding, female wages, education and age.

G. Concluding Note

4.38 The preceding analysis strongly suggests that potential agricultural output is reduced owing to women's lower use of production inputs and support services. While on average, the gross value of output per hectare from male-managed plots in Kenya was 8 percent higher than from female-managed plots, if women used the same resources as men, their productivity would increase by about 22 percent. This potential productivity gain can only be realized by improving women's access to inputs and support services. How to do this is the subject of the following chapters.

Chapter 5. Women Farmers' Access to Land

A. Introduction

5.1 A critical issue for smallholders throughout Africa is the shortage of good quality farming land. Increasing population pressure and fragmentation of holdings have sharply reduced cultivated area per person. For women the situation is even more critical; faced with uncertain tenure and decreasing size and quality of plots to farm, they have an exceptionally difficult task maintaining levels of output and household food security. This chapter examines women's land rights, the size and quality of their land holdings, their means of acquiring land, and how they use it.

B. Land Rights and Productivity

5.2 A positive relationship is expected between individual land rights and productivity. Following Feder and others (1988), this relationship is hypothesized as follows: increased individualization of rights improves a farmer's ability to reap returns from investments on land, resulting in greater demand for land improvements and complementary inputs. Increased individualization of rights also can improve the credit worthiness of the farmers and enhance the chances of obtaining formal credit. However, a recent study found that, controlling for differences in land quality and household characteristics, no relationship was found between cross-sectional variations in land rights and productivity. This study did not examine differences between genders (Migot-Adholla and others 1991, p. 164). The production function analysis for Kenya discussed earlier did not support this finding, but did support the hypothesis of a positive relationship between land rights and productivity. Land tenure rights contributed significantly and positively to the value of total production of all plots, men's and women's taken together, and also men's plots taken separately. No significant relationship was found on female-managed plots, probably because the sample of women who own land was too small to provide a significant result, reflecting, in turn, that few women have rights to land.

5.3 Under customary law in all four countries, women traditionally had clearly defined rights to land; land was allocated to women from their husbands and natal families based on their position within a kinship group and, in particular, on their relationship to a male relative (father, brother, husband). These rights entitled women to farm the land, often in exchange for labor on their husbands' and other family plots. Zambia provides a good example of how indigenous land rights gave women some control over their land. Traditionally the right to use land was provided to both men and women by the community elders. Depending on the ethnic group these usufructory rights would come through the mother's line in matrilineal societies, the father's line in patrilineal societies, or both. Evidence suggests that women retained control over the land they used and its products.

5.4 Under colonialism three developments worked to the disadvantage of women in relation to their land rights. First, private ownership of land by individual registration was introduced. In Kenya for example, private ownership of land was introduced under the Swynnerton Plan. Although established to encourage African farmers to consolidate holdings under individual rather than collective ownership and to introduce more profitable crops and technology, the plan "set the precedent for post-colonial land tenure policies that legitimized differential access to land..." (Davison 1988a). By giving precedence to individual ownership geared toward men, the plan unintentionally undermined women's traditional access to land and marginalized their traditional use rights. The head of household, who was assumed to be male, was granted title and the right to mortgage or sell the land without the consent of other family members. Registration in effect converted men's land rights into absolute ownership. Because formal

title has legal standing, many women were left with much less secure tenure on the land than traditional usufructory rights provided (Davison 1988a and 1988b; Shipton 1987).

5.5 Second, the introduction of other legal systems resulted in a complex and often ambiguous legal structure that tended to undermine women's traditional land rights. Nigeria provides a good example. The Nigerian legal system comprises customary law, English law, and statutory law. Although the Land Use Decree of 1978 is *prima facie* gender-neutral, the actual rights of rural women in Nigeria are the result of the interaction of these three legal systems. Moreover this tripartite system functions simultaneously in conjunction with informal social controls, based on gender, ethnicity, and religion. The social norms governing day-to-day social and economic interchanges are highly specialized and controlling. Thus uncertainty clouds a woman's rights in relation to land and title and so limits her choices. Women are generally disadvantaged in entering land transactions because of the legal uncertainties affecting their tenure and lack of marketable land rights. Moreover World Bank studies suggest that women's relatively lower education levels compared to men's make it difficult for them to understand these legal complexities.

5.6 Third, the patriarchal nature of the colonial regime worked to the disadvantage of all peasant farmers, but particularly women. When European settlers arrived in Zambia, for example, land was always allocated to men. Later the colonial regime started to encourage African farmers, but productive resources including land were again directed to men. Thus men produced for the market whereas women continued to produce for the subsistence needs of the household.

5.7 Post-independence land policies have generally been gender-neutral in the sense of not actively discriminating against women. In practice, however, women's land rights have improved only to a limited extent. In Kenya for example, women now can legally own land, but very few actually do. Among the Luo in Nyanza District for example, only 6 percent of females surveyed were cultivating land registered in their own name (Green 1987).

5.8 Private ownership of land is a relatively new concept in Africa. There exists a continuum from community-controlled land to individualized ownership. A recent study found that where population pressure and commercialization have increased, the indigenous tenure systems have evolved from a system of communal property rights towards one of individualized rights (Migot-Adholla and others 1991). To better understand gender differences in "land ownership rights," within this spectrum, control over land disposition must be examined. The surveys in Kenya and Nigeria asked farmers whether they can improve, lend, rent, sell, or mortgage the land they are using (table 5.1). Most men and women farmers surveyed have the right to improve land, but women have substantially less control over other aspects of land disposition than do men. For example only about 30 percent of female household heads in Kenya and Nigeria could sell the land they were using, compared to about 60 percent of male heads.

Table 5.1. Land "Ownership" Rights by Gender in Households Surveyed in Kenya and Nigeria (percent of respondents)

	Kenya		Nigeria	
	M	F	M	F
Heads of households % farmers with right to				
Improve the land	84	85	79	70
Lend the land	69	51	74	58
Rent out the land	67	43	72	56
Sell the land	60	31	59	31
Mortgage the land	77	50	71	41
Members of households (excl. HH heads) % farmers with right to				
Improve the land	82	71	80	56
Lend the land	61	35	70	38
Rent out the land	55	33	64	31
Sell the land	50	27	30	17
Mortgage the land	65	39	74	36

Source: WAPIA survey

Note: Unlike other tables, de facto female household heads are excluded to avoid the bias of including land owned by absent husbands.

C. Land Acquisition

5.9 The traditional barriers to women's acquisition of land have begun to break down. Some women now acquire land through purchase or inheritance, particularly women who head households. As table 5.2 shows, a higher percentage of women heading households surveyed in Kenya obtained their land through both inheritance and purchase than men. In Nigeria there was little gender difference in the means of land acquisition; inheritance dominated for both genders. A similar picture emerges for men and women who do not head households. Inheritance and purchase are the dominant means of acquisition in Kenya, whereas in Nigeria purchase is comparatively rare for both men and women. As land becomes increasingly scarce, borrowing (as in Burkina Faso, see box 5.1) and renting (as in Nigeria, see table 5.2) are becoming important.

5.10 The process of allocation of land by government can be biased against women as the Kenya data in table 5.2 shows. Land allocated by the Kenyan government has been inequitably distributed -- with around one third of male household heads being allocated land by government compared with one-quarter of female heads. By contrast, land allocated by the village is much more equitably distributed among men and women in both Kenya and Nigeria.

5.11 In Burkina Faso government interventions in land tenure have ignored the rights of women. A case in point is the planned settlement areas managed by the Volta Valley Authority, where title to all land was vested in the male household head; women had to clear land outside the settlement to establish their individual plots. However, current proposals to develop village land management plans as a basis for addressing both land tenure and environmental concerns indicate that the interest of all land users, including women, will be taken into account (McMillan 1983 and 1986).

Table 5.2. Land Acquisition by Gender in Households Surveyed in Kenya and Nigeria

	Nigeria		Kenya	
	M	F	M	F
<u>Heads of households % who obtained land by</u>				
Purchase	8	12	24	24
Inheritance	56	50	30	37
Given by family	5	4	4	8
Allocated by village	14	13	4	4
Allocated by government	-	-	32	23
Rented	15	19	3	2
<u>Members of HH (excl. heads) % who obtained land by</u>				
Purchase	2	3	30	40
Inheritance	65	42	31	43
Given by family	8	22	6	7
Allocated by village	19	15	5	2
Allocated by government	-	-	25	4
Rented	6	15	1	2

Source: WAPIA survey.

Note: Unlike other tables, de facto female household heads are excluded to avoid the bias of including land owned by absent husbands.

Box 5.1. "Borrowing" Land in Burkina Faso

Population pressure on an increasingly degraded land also is a problem in Burkina Faso, where most of the land suitable for farming is already allocated, and households must depend on "borrowing" land to farm. Households with land not in use are asked by the traditional authorities to lend to those with insufficient land, such as newly formed households and new arrivals in an area. There is a social obligation to lend unused land, and no rent is charged. However, the lending household can reclaim the land when they need it, and there is often a prohibition against tree planting by the borrower. As might be expected the most densely populated areas have the highest proportion of borrowed land in cultivation. For example 57 percent of cultivated land was found to be borrowed in a Mossi village (McMillan 1986 and 1990).

The pressure on land availability is resulting in increased internal migration by households. In the Central Plateau some of the migration is organized through the Volta Valley Authority which provides title to land for the migrants. There are also many spontaneous migrant households, most of which borrow land when they settle in new areas. However, none of these forms of land tenure, whether inherited, customary or borrowed, provides the farmer with title that could be used as security for a bank loan.

In most cases husbands allocate individual plots of land to their wives. If the household has insufficient land, the husband may borrow land for the wife, or the wife may borrow land from her relatives or friends. The tenure of borrowed land is insecure, and holders make few long-term improvements — such as soil and water conservation structures to their fields because they are unsure if they would benefit from the effort. Indeed the improvements themselves may cause the land to be reclaimed.

5.12 Some African countries have made efforts to ease the acquisition of land by women, especially through inheritance. In many parts of Africa traditional inheritance rights which disadvantaged women still prevail. Typically land allocated to women to farm is taken over by the community of her

in-laws upon the death of her husband or divorce. Women thus lose their marital land and they may also lose the rights to use land in their parental home because of the virilocal nature of most marriages (women moving to the residence of their husbands). A woman would, thus, be landless unless absorbed by either the community of her in-laws (a common practice in Burkina Faso) or her natal family. In Zambia for example, the objective of the new Intestate Succession Act is to eliminate unfair practices against surviving female spouses and children and to equalize rights of succession for males and females. However, the act specifically excludes land that, at the time of death of the intestate, has been acquired and held under customary law; this land reverts to the owners, who according to customary law are the community and the family of the deceased. The law allows widows to retain farm implements but provides no assurance that the land the widow has been working on and developing will remain hers (Milimo 1989; Due 1991).

D. Land Availability

5.13 The total available land area and its use in the four countries studied are shown in table 5.3. Nigeria and Kenya utilize about three-quarters of their total land area for agricultural purposes, (taking cropland and permanent pasture together). The equivalent figure for Burkina Faso and Zambia is about 50 percent. Kenya and Zambia assign one-fifth of their land to wilderness, including large national park areas. The expansion of cropland in Burkina Faso reflects the opening up of new lands freed from onchocerciasis. Forest and woodland areas are being depleted with consequent deleterious impact on the environment; the loss of forests has been proportionately greater in Nigeria and least in Zambia.

Table 5.3. Land Availability and Its Use

LAND AVAILABILITY						
	Total land area (000 ha)	Percent of total land area			Land with no inherent soil constraints (000 ha)	Population density 1990 (per 1000 ha)
		Arid	Semi-arid	Humid		
Burkina Faso	27,380	1	15	84	6,899	329
Kenya	56,697	71	14	15	7,342	422
Nigeria	91,077	0	8	92	7,797	1192
Zambia	74,072	0	2	98	2,426	114
LAND USE (as percent of total land area)						
	Cropland	Permanent pasture		Forest and woodland	Other land	
Burkina Faso	12	36		25	26	
Kenya	4	67		4	25	
Nigeria	34	44		14	8	
Zambia	7	41		39	13	

Source: Based on Table 17.1. World Resources: 1992-93.

5.14 Good farming land is becoming increasingly scarce in Africa. Population pressure on the land together with continued degradation are taking their toll on available farming land. In Zambia for example, the arable land area per capita has declined from 1.3 to 0.45 hectares over the last twenty-five years (table 5.4). All three districts surveyed in Kenya had high population densities with only 0.25 hectare of high-potential land equivalent per person (World Bank 1989). Similarly in Nigeria the prospects for cultivating more land without reducing the regenerative fallow period are limited. The World Bank estimates that in all zones about one-third of holdings are below the calculated poverty threshold size.

Table 5.4. Per Capita Arable Land in Kenya and Nigeria

Per Capita Arable Land Area (hectares)			
	1965	1990	2000 ^a
Burkina Faso	0.5	0.40	0.25
Kenya	0.2	0.10	0.07
Nigeria	0.5	0.29	0.19
Zambia	1.3	0.62	0.45
Sub-Saharan Africa	0.5	0.29	0.22

^a/ 1987 arable land areas have been divided by the projected population of the year 2000.

Source: World Bank 1992a.

5.15 Women have much smaller farms than do men. In Nigeria households headed by males cultivate a mean area of 2.6 hectares, or three times that of female-headed households (0.8 hectare). Even taking into account the larger size of male-headed households (7.6 people compared to 4.9 in female-headed households), male-headed households had double the land per capita of female-headed households. The gender differences are greatest in Imo State, where male-headed households cultivate five times the area of female-headed households; this is an area of Nigeria where population pressure on land is most intense. The same picture is found in Kenya, where holdings of female-headed households were 65 percent those of male-headed households (1.7 ha compared to 2.6 ha). Similarly, female household members (i.e. female farmers other than those heading households) also farmed much smaller plots than male farmers -- in Kenya, women farmed plots one-third the size of men (0.6 ha compared to 1.9 ha) and in Nigeria, about half the size (0.7 ha compared to 1.8 ha) (table 5.5).

5.16 Women not only farm smaller holdings than men, and also tend to have fewer plots. In Kakamega in Kenya, for example, where gender differences in holding sizes were greatest, 51 percent of female household heads had only one to two plots compared with 28 percent of male heads. Similarly at the household level a higher percentage of female- than male-headed households had only one or two plots. The same picture emerges in Nigeria, but the gender difference is less striking: 36 percent of female household heads had only one to two plots compared to 30 percent of male heads; at the household level 26 percent of female-headed households had only one or two plots compared to 13 percent of male-headed households.

Table 5.5. Land Holdings of Farmers Surveyed in Kenya and Nigeria by Gender
(hectares)

	Kenya		Nigeria	
	M	F	M	F
Households:				
<u>By gender of household head</u>				
Mean total size of household holding	2.6	1.7	2.6	0.8
Total number of people per household	8.6	8.0	7.6	4.9
Hectares per person	0.3	0.21	0.34	0.16
Holdings:				
<u>By gender of land user</u>				
Mean holding size of household head	3.1	1.3	2.2	0.7
Mean holding of household members	1.9	0.6	1.8	0.7

Source: WAPIA survey.

E. Quality of Land

5.17 Along with the declining size of holdings being farmed in Africa, their quality also is deteriorating as a result of a number of factors. One is the well-documented phenomenon of desertification in large parts of Africa, including parts of Burkina Faso and Nigeria. A second factor is the change in farming practices from the traditional land-extensive, low-input cultivation systems that maintained ecological balance to a more labor-intensive system. As population pressure on the land intensifies, farming practices change. For example, the traditional practice of slash and burn or shifting cultivation which enables land to be regenerated, is declining owing to a lack of male labor to perform the tasks of land clearing, and the infeasibility of allowing the land to be left unfarmed for a cropping season because of the loss of output and income. Moreover, environmentally beneficent management of the land is closely related to security of tenure -- and although women increasingly are the farmers, they rarely have land title, thus, their incentives and capacity to manage the land in an ecologically sound way are impaired. Furthermore, as pressure on existing land mounts, more and more marginal lands are being brought under cultivation. Maintaining the quality of the soil is seemingly impractical for the vast majority of African farmers. Agroforestry or alley farming has obvious environmental benefits but its introduction in Nigeria for example has proven very difficult due in part to the hesitancy of women to plant trees, an action that implies land ownership (Cashman 1990).

5.18 The environmental problems in Burkina Faso clearly indicate the importance of gender. Land with sufficient fertility and moisture content for reasonable yields is increasingly scarce in Burkina Faso. The country has a fragile agroecological environment; with growing population pressure, natural resources are being overexploited. Poor land management practices are already evident. Farmers are shortening if not eliminating the fallow period, and the traditional methods of halting soil erosion are inadequate. A World Bank study estimated that every year, cereal, fuelwood and livestock production foregone due to soil, water, and biomass losses costs the country about 5 percent of GDP. Women farmers know a great deal about managing natural resources, but this knowledge is not fully used because women have little security of land tenure and are rarely consulted in the policymaking process.

F. Concluding Note

5.19 Social and economic changes in Africa are being reflected in changes in traditional systems which allocated land for all family members, including women. Colonialism brought with it important changes in land rights -- the concept of private ownership of land, which typically benefitted men, the introduction of other legal systems, which complicated land rights, often to the disadvantage of women, and the allocation of new lands to white male settlers and then black African males but never women. Since the independence decade of the 1960s, some attempts have been made to improve women's rights to land, but in practical terms, the situation has worsened: growing population pressure on increasingly depleted land has further weakened women's land rights, and as good agricultural land has become more scarce, women are managing even smaller plots. Kenya and Nigeria survey data show, however, that women do not need land title in order to farm larger land areas. In both these countries women are obtaining land through purchase and inheritance, although in Kenya government allocations of land have clearly discriminated against women. Women do need land title to obtain formal credit and make investments in the land that will raise both the productivity of land and labor.

5.20 As pressure on the land increases and efforts to improve agricultural productivity intensify, it will be even more important to ensure that women have access to and control over adequate land. It has been argued that "unless legal measures and government policies designed to meet women's need for land security are put in place, Kenyan women's ability to sustain food production may be compromised..." (Davison 1988). Women's legal rights to land, not only in Kenya, but also throughout SSA, must be expanded and secured so that they can be implemented in practice.

5.21 Security of tenure and "land ownership rights" are more important to women than the quantity of land they cultivate. Because smallholder technology is labor-intensive (chapter 7), and because of acute seasonal labor shortages (chapter 6), more land, even if available, would not be a solution. Hence, smallholders especially women smallholders must gain access to more inputs and better technology so that the return to the land they have is increased - in short, their productivity is raised.

Chapter 6. Gender Patterns and Productivity of Agricultural Labor

A. Introduction

6.1 Traditional farming systems in SSA evolved when population density was still relatively low and environmental degradation unknown. Land was plentiful and was farmed using hand hoe methods. Most labor was supplied by the family including women and children. Within the farm household, as discussed in Chapter 3, a clearly defined division of labor by gender existed -- with men and women performing different tasks, growing different crops, and pursuing different agricultural enterprises. Because this farming system was labor-intensive and relied heavily on family labor, there was a strong economic motivation for high fertility rates and large families.¹ This farming system also resulted in low levels of labor productivity, levels estimated to be well below those of Asia (Delgado, Shekhar and Ranade 1987).

B. The Pattern of Agricultural Labor

6.2 The production function analyses in Chapter 4 showed that in Kenya family labor on both male-and female-managed plots contributed positively and significantly to the gross value of output. Interestingly, female family labor has a greater effect on output than male labor irrespective of whether the plot is managed by a man or a woman. But, with an elasticity of 0.24 female family labor is most important on female-managed plots, reflecting perhaps the incentive of working for oneself. The results from the Nigerian data were similar, although the coefficients were generally smaller than for Kenya.

6.3 The pattern of family labor use also supports the view that gender specialization -- men preparing the land and women planting, weeding, and harvesting -- is less distinct than it was. The evidence from Kenya suggests that the task distribution of women's labor on men's plots is similar to the distribution of men's labor on women's plots. No task is exclusively "male" or "female," and most are performed broadly in proportion to the total labor input by gender on the plot.

6.4 Hired labor tends to be used for certain tasks. The survey data show that female hired labor is more productive on male-managed plots than on female-managed plots. Similarly male hired labor contributes positively and significantly to output on female-managed plots. Hired labor tends to be used along traditional gender lines. Male farmers surveyed used female hired labor mostly for weeding and harvesting, while female farmers used male hired labor for such heavy tasks as ground cleaning. These separations are not complete: hired labor of both genders does both types of work on all plots.

6.5 The gender composition of labor used on both male-managed and female-managed plots in Kenya and Nigeria is presented in table 6.1. These data show the following:

- In both countries, women provide most of the family labor on plots they manage as well as on plots managed by men.
- Averaged over all plots, Kenyan women provide 84 percent more family labor than

¹ Studies have shown that the fall in fertility in response to women's increased education has been slower in SSA than in other parts of the world. One explanation may be the sustained demand for family labor (Gladwin 1991).

Table 6.1. Summary of Labor Use Per Hectare on Male- and Female-Managed Plots: Kenya and Nigeria

Source of Labor	KENYA				NIGERIA			
	Male plots		Female plots		Male plots		Female plots	
	No. of hours	% of total	No. of hours	% of total	No. of hours	% of total	No. of hours	% of total
<u>Family labor</u>								
Male	524	32.7	486	23.2	709	34.9	767	27.6
Female	722	43.1	1,135	54.2	857	42.1	1,368	49.2
Child	82	5.1	114	5.4	204	10.0	364	13.1
<u>Hired labor</u>								
Male	128	8.0	160	7.6	105	5.2	144	5.2
Female	136	8.5	176	8.4	107	6.8	107	3.8
Child	8	0.6	24	1.1	28	1.0	28	1.0
Total	1,600	100.0	2,095	100.0	2,034	100.0	2,778	100.0
Hired as % of total	17.0		17.0		13.0		10.0	

Source: WAPIA Survey.

Kenyan men, while Nigerian women provide 33 percent more than Nigerian men.

- Children account for only 5 percent of total on-farm family labor in Kenya and 10 percent in Nigeria; in neither of the countries do hired children provide more than about 1 percent of total labor applied.
- Hired labor contributes 17 percent of total labor input in Kenya, and about 11 percent in Nigeria. Hire labor use was about the same (in percentage terms) on men's and women's plots in both countries.
- On a per hectare basis, the use of labor on women's plots is higher than on men's plots (31 percent more in Kenya and 37 percent more in Nigeria).

6.6 These survey findings clearly confirm the widely held view that women are the "work horses" of SSA agriculture. Moreover, the 30 percent higher labor input per hectare on women's plots in both Kenya and Nigeria may well reflect the size, location, and quality of women's holdings and the technology employed. Women's plots compared to men's tend to be more widely dispersed, smaller in size, and poorer in soil quality. Constraints on women's access to land limits any benefits to be had from economies of scale. Moreover, land clearing and weeding need more labor on women's than men's plots because men have readier access to tools and equipment. In Kenya, 92 percent of women surveyed used hand cultivation methods only, while 38 percent of men used a more mechanized technology of oxen or tractor. The higher labor input on women's plots could also reflect an attempt to substitute labor for purchased inputs. As discussed in the Kenya Country Study (chapter 3), women adopt labor - rather than cash-based technologies.

C. Supply and Demand of Agricultural Labor

6.7 The demand for family and hired agricultural labor in SSA has been affected by several factors. First, the rapid population growth and urbanization characterizing nearly all of SSA raised the demand for food in general, and hence for agricultural labor. In SSA, and in the four country studies, the rate of urban population growth over the past three decades has been roughly twice that of population as a whole. Second, this increased urbanization has shifted the composition of food consumption to higher-valued and more labor-intensive products such as groundnuts and rice. The promotion of export crops such as coffee and tea reinforced this shift.² Third, as land becomes increasingly scarce and degraded, additional labor is needed to maintain if not increase historical yields. In Burkina, for example, the construction and maintenance of *diguettes* is highly labor-intensive. And fourth, World Bank sources show that the introduction of such yield-enhancing technologies as hybrid maize, fertilization, early planting and clean weeding call for a higher rate of labor input per hectare, in total or at peak times; moreover, additional labor is also needed to harvest and process the increased crop -- typically female activities. To these factors can be added the propensity of male plot managers to shift production to cash crops which generally require heavier fertilizer applications. This means more work for female family members on the cash crop plots, and they must also work on family plots. Men tend to neglect family plots in favor of farming activities that generate ready cash.

6.8 The supply of rural labor has been affected by two main factors. First, rapid population growth which increased labor supply much faster than the growth in labor demand, exerted greater pressure on the land and reduced farm size per capita. The net result has been to induce labor, especially male labor to move to the towns. Second, the large increase in enrollment rates of children, especially females, in rural primary and secondary schools has tended to reduce overall labor supply. As noted above, child labor is now little used among sedentary farmers. In the four countries studied the increases in primary school enrollment rates between 1965 and 1989 range from 200 percent in Burkina Faso to 70 percent in Kenya. For all of SSA the increase was about 60 percent³. Taken together these changes in the demand and supply of rural labor have resulted in shortages of agricultural labor, particularly seasonal, and women replacing men in the agricultural labor force, with possibly a net increase in the use of female labor.

6.9 The apparent contradiction between rural labor shortages in a labor surplus economy reflects the phenomenon of segmented markets. The notion of labor surplus applies essentially to the urban labor market, while that of labor shortage applies principally to the rural labor market. The marked seasonality of demand for agricultural labor, and the low average level of agricultural productivity

² Under the structural adjustment programs being widely implemented in SSA, there has been an increased effort to expand and diversify export crops to raise foreign exchange earnings, but with few exceptions - palm oil in Nigeria, cotton in Burkina Faso and certain horticultural crops in Kenya - these efforts have not resulted in major changes in the pattern of exports and hence little or no change in the gender composition of the agricultural labor force in the four countries studied. However, counter to traditional practice, the WAPIA survey in Kenya found a significant proportion of women taking up coffee cultivation.

³ The loss of output from the lower availability of child labor has to be set against the large private and social benefits to be gained in the long run from the increased school enrollments throughout SSA. Yet in the present circumstances of SSA agriculture, and harsh as it may seem, child labor could help alleviate seasonal labor bottlenecks in smallholder agriculture and hence contribute to productivity increases. One possible zero- or low-cost solution is to time school holidays to coincide with peak periods of labor demand. Kenya has already introduced such a scheme in some regions of the country but its impact on school attendance and performance has yet to be assessed.

explain the rural labor shortage. The demand for agricultural labor is highly seasonal. As research has long shown, the timeliness of planting and weeding operations has a great effect on crop yields. Yet optimum timing is very difficult to achieve in practice: the land cannot be prepared until softened by the first rains and crops planted too late fail to benefit from the flush of nutrients at the beginning of the season. In addition, different farming operations, crops, obligated and own-account activities, together with other on- and off-farm responsibilities compete for labor. The actual allocation of labor over the cropping season, as illustrated by the labor profiles for Tiv farm households in Nigeria (Burfisher and Horenstein 1985) is a compromise among these competing interests. On-farm labor use ranges from zero in February to over 40 person days per hectare in June. The pattern of allocation was particularly skewed among women (0 in February to 30 days in August) compared to men (0 in February to 14 days in April and June). The implications of this profile are that:

- labor use at the seasonal peak is highly productive. Thus, the marginal product of labor at these times is comparatively high;
- the productivity of labor diminishes rapidly if it is comparatively idle for the rest of the year. Thus, the average product of labor over the entire cropping season is comparatively low.

6.10 As discussed at the beginning of this chapter, the labor-intensive farming systems in SSA result in low levels of labor productivity. An excess supply and hence inefficient use of both family and hired labor is suggested by comparing the marginal value products for male and female labor (both for family and hired labor) (paras 4.20 and 4.21). Moreover, as discussed in the next chapter, more women than men farm without the benefit of technologies such as animal traction or tractors that could save labor in agricultural operations, fuel and water collection, and agroprocessing.

6.11 Shortages of agricultural labor, especially seasonal shortages, are now common in the four countries studied, and by extension, probably in many other parts of Africa. In Kenya, for example, about 60 percent of both male and female respondents surveyed cited the shortage of labor as their main production problem, and female farmers were particularly concerned with the inadequacy of family labor (50 percent compared to 37 percent of male respondents (table 6.2). In Nigeria, as many as 73 percent of the farmers surveyed complained of labor problems (69 percent of female and 76 percent of male respondents). The main complaint was the cost of hired labor, especially male labor which was 30 percent more expensive than hired female labor. The high cost of hiring labor was a special concern of women farmers. In Nigeria for example, the supply of migrant labor from neighboring countries was relatively plentiful during the 1970s when the economy was buoyant. However, with the decline in oil prices and the devaluation of the Naira relative to the CFA of neighboring countries, this supply has dried up. Female-headed households, with their smaller size and generally fewer resources to hire labor, are especially hard hit by seasonally tight labor markets even though they farm less land. In Nigeria for example, women farmers concerned with the lack of family labor and who could afford it were mostly hiring male labor to perform land clearing and preparation -- tasks which must be performed to coincide with the rains, hence, giving rise to a sharp seasonal peak in demand for hired labor.

6.12 Hiring labor especially to alleviate the seasonal bottlenecks depends on the availability of both financial resources and the right kind of labor to match needs. As noted, both may be a problem. The production function analysis for Kenya and Nigeria shows that male hired labor contributed positively to gross value of output on female-managed plots. But hired labor, especially male hired labor, can be costly. For example, serious farm labor shortages and high wage rates for hired labor were found in

Table 6.2. Labor Constraints and the Hiring of Labor by all Farmers Surveyed in Kenya
(percent of respondents)

	Mean		Kakamega		Muranga		Kilifi	
	M	F	M	F	M	F	M	F
<u>Labor problems</u>								
% farmers with labor problem	59	61	50	32	69	86	59	58
Of whom:								
Main problem was								
- insufficient family labor	37	50	13	38	31	47	60	79
- hired labor unavailable	11	9	7	8	20	9	5	11
- hired labor expensive	50	46	76	64	47	44	35	11
- exchange labor unavailable	1	0	3	0	1	0	0	0
- other	0	0	1	0	0	0	0	0
<u>Hired labor</u>								
% farmers generally hiring labor	32	41	40	38	37	57	21	19
Main reason for not hiring								
- lack of cash	60	54	55	32	37	66	76	75
- no need	24	34	35	60	33	12	15	21
- not profitable	14	12	10	9	29	22	7	0
- labor not available	2	1	0	0	1	0	2	4

Source: WAPIA survey.

southwestern Nigeria because of the availability of better paying jobs in cities. As a result the cost of hiring was beyond the reach of most farmers, and particularly women, forcing about 70 percent of female producers to reduce the size of their farms (Adeyemo 1984). Comparative data on the supply price of casual agricultural labor is not readily available. Data taken from table 11-7 in African Development Indicators show the ratio of average statutory minimum wage earnings to agricultural value added for each worker in the four countries studied. The ratios were approximately: 1:4 in Burkina Faso; 1:1.6 in Kenya; 1:1.7 in Nigeria; and 1:3 in Zambia. Other data for Kenya and Zambia show that average wages in manufacturing there are about five times higher than average income from agricultural pursuits on an annual basis. These earning differences are large and help to explain the apparently high supply price of hired labor in rural areas.

6.13 The many hours worked by women on farming tasks are in addition to the time spent on other activities. Women farmers devote at least twice as many hours as men to such "other activities" -- mostly childcaring, household management tasks (including water and fuel collection), agroprocessing and marketing. Women thus face a complex allocation problem; if income is to be maximized they must equate the marginal product of their labor in several competing activities. With little or no time available at the margin, any additional task -- even learning new technologies that can raise productivity -- must be done at the expense of other tasks presently undertaken.

6.14 Women's groups provide women with a way of tackling their labor allocation problem. Originally formed as mutual assistance groups or traditional savings societies, often with social welfare

goals, many of these groups have evolved into productive and economic entities engaged in a variety of community development, agricultural development, and income-generating activities. Of special interest in the context of labor use is the opportunity they provide to pool labor resources. By pooling their labor, the reciprocal labor obligation thus created helps women meet peak labor demands. Research studies have shown that women farmers were able to adopt hybrid maize because their participation in women's groups allowed them to pool their labor and undertake activities in a more timely manner (Clark 1985).

D. Concluding Note

6.15 All four sample countries have high population growth rates and labor surpluses reflected in high rates of unemployment. Moreover, overall labor productivity in Sub-Saharan African agriculture is low. With low marginal returns to labor, male family members in particular seek employment off the farm. That a high proportion of male heads and members of rural households are not engaged in farming is reflected in the findings of the WAPIA surveys. This reduces family labor supply and creates family labor shortages, particularly at peak season. These shortages cannot be alleviated by hiring labor partly because the supply price has been bid up by outmigration, and partly because most farmers -- particularly women -- lack the cash or credit with which to hire labor. There is evidence that households adjust their cropping patterns and farming systems to fit labor availability (Volume II, Chapters 2 and 3). They do this by limiting the area cultivated and planted, the amount of weeding or fertilizer applied, or by growing less labor-intensive crops such as cassava and thus reducing labor value added. The solution lies in raising the productivity of both land and labor by generating and employing superior technology - the subject of the next chapter.

Chapter 7. Agricultural Technology and Women Farmers

A. Introduction

7.1 Generations of farmers evolved farming systems that, in general, produced sufficient food and income for family needs. While circumstances were reasonably stable this production system was sustainable. However, demographic, economic, and environmental changes have upset the balance. Farm sizes are decreasing and traditional soil-restoration methods are becoming less feasible, yet the agricultural sector is expected to produce food for the growing rural and burgeoning urban populations and raw materials for the industrial sector. This chapter discusses how agricultural technology can help the farming community respond to these demands.

7.2 New or improved technologies¹ can increase the productivity of all farmers. Econometric analysis of data from the WAPIA surveys in Kenya and Nigeria (presented in chapter 4) and evidence from other analyses in Kenya and Zambia (Bindlish and Evenson forthcoming; Celis and others (eds) 1991) confirm the positive effect that the adoption of fertilizer and agrochemical technologies can have on the total value of output. Evidence from Zambia and the Kakamega District in Kenya point to the role played by adoption of fertilizer, hybrid maize, and animal and tractor cultivation technologies in the transition from subsistence to semi-commercial and commercial farmer status (Celis and others 1991; WAPIA surveys).

7.3 As the analysis of the WAPIA data in Chapter 4 showed, contact with extension increased the probability of both male and female farmers adopting new technologies. But extension did not increase the total value of output of female farmers as it did for male farmers. Possible explanations are that the technologies were in some way less suitable for women than men; the technologies were not correctly implemented; or some other factor such as constrained access to required inputs, was limiting the returns to the technology. Further investigation is required. (Explanations relating to extension are discussed in the following chapter.)

7.4 As shown in Chapter 3, agriculture is increasingly the responsibility of women. Women's concern to maintain household food security makes them reluctant to diversify out of the staple crops until they are confident of growing sufficient food to feed their families. Because of limited land availability, increasing the yield of the staple crop is a pre-requisite to releasing land for higher value crops. But many modern yield-increasing technologies do not reflect women's responsibilities or the constraints they face. Technical recommendations are frequently made "across the board," ignoring differences between client groups including male and female farmers. In Kenya, for example, technologies have not been adequately developed for different agroecological zones, and despite a shift in the research agenda to a farming system approach, more adaptive research is needed to make these technologies relevant to the labor, managerial, and capital constraints of smallholders. In addition, work in the World Bank shows that many technologies are management-intensive and incompatible with risk-aversion practices commonly used by smallholders, such as multicropping. Similarly, crop recommendations in Zambia are limited to monocrops, and research concentrates on hybrid maize and neglects species and varieties that are preferred for home consumption and storage. Two particularly striking gaps are a hybrid maize suitable

¹ Technologies come in many different forms including knowledge (such as planting densities, cultivation practices, weeding regimes, or farm management and planning), and technologies which embody knowledge such as new varieties and chemicals, tools, and equipment. Skills are needed to use technologies or combinations of technologies (such as in livestock rearing).

for mixed cropping, and fertilizer recommendations for the traditional maize varieties that are preferred for home consumption and storage (Jha, Hojjati, and Vosti 1991). Moreover, as the WAPIA data show, oxen are used more by men while women use hoes partly because of cultural and social norms, and partly because improved technologies have been developed for tasks that in the past were mostly carried out by men.

B. What Kinds of Technology Are Needed to Increase Women's Agricultural Productivity?

7.5 Some research themes will be of equal benefit to all farmers; others should concentrate on aspects of agricultural production of more interest to female than male farmers as some now do for males. The comments below on technology needs are in general terms because conditions between and within countries are very different depending on such local circumstances as the farming systems, present technologies, gender roles, and agricultural support systems. At the local level, proposals for specific research projects will need detailed analysis on a case-by-case basis. Increased factor productivity can be achieved only if the production and household systems are considered as a whole in the research and development process.

7.6 **Technologies Needed by All Small Farmers** All farmers can benefit from technologies designed to raise agricultural productivity and sustain the natural resource base. The problem of how to increase productivity on smaller farms under deteriorating environmental conditions affects all farmers and must be the first priority of research and development programs. Increased agricultural output to date in the four countries has been based more on area expansion than yield increases. As the country studies in Volume II show, with the exception of Zambia and the middle belt of Nigeria, expansion of cultivation into unutilized land of high potential is not an option for the future. Resource-poor farmers need field production technologies that can be adopted incrementally and which enable them to move gradually from subsistence to market farming. Research must focus on developing farming systems to maintain (and eventually increase) crop and livestock productivity without the use of rotational fallowing to restore soil fertility. This requires environmentally sustainable ways of intensifying production of crops and livestock; introducing higher-value commodities; and adding value at the farm-level. In arid and semiarid regions (for example, of Burkina Faso, Nigeria, and Kenya) this would require special attention to water harvesting and conservation techniques and small-scale irrigation.

7.7 **Technologies Needed Particularly by Female Farmers** As shown in Chapter 3, compared to men, women work longer hours in the fields in addition to their time on household tasks and income-generating activities. In Kenya, for example, women between the ages of 8 and 65 years work 52 percent more hours than men (GOK 1992). The adoption of yield-enhancing technologies often leads to an increased work load; high-yielding varieties, for example, are more demanding of timely cultivation, fertilization and clean weeding. All four country studies emphasize that rural women have little or no time available at the margin; any additional task must be done at the expense of tasks presently undertaken. Labor- and energy-saving technologies for women's tasks are essential. Although post-harvest machinery is the technology most often considered when referring to women, tools and equipment for farm activities are equally if not more important, as shown in a 1987 study on the appropriate technology needs of rural women in Nigeria (table 7.1). Women typically lack technologies to relieve time-consuming agricultural tasks such as weeding, transplanting, and harvesting. Whether this is due to the absence of suitable technologies or to financial, cultural or other reasons is a question for local analysis. Grinding, transport, and water and fuel collection are the main non-agricultural activities where appropriate technologies can reduce women's time and energy use. The principal technology needs of women farmers are summarized below.

Table 7.1: Technology Needs of Rural Women

Activity	Priority ^{1/}	Comments
<u>Farm activities</u>		
Clear bush	High	Collective or hired labor
Till or ridge	Medium	Improve hoe; information on flat vs ridge
Plant or transplant	V high	Simple and manual; grains, legumes and cassava
Apply fertilizer	V high	Reduce wastage of expensive input
Weed	V high	Mechanical rotary hoe; avoid dangerous herbicides
Harvest	V high	Legumes in particular
<u>Home activities</u>		
Fetch firewood	Low	Use kerosene
Cook	High	
Wash clothes and dishes	Medium	
Childcare	High	Playpen, and so forth, to reduce carrying on back
Thresh	High	
Dehusk	Medium	To enhance preparation of dishes
Sort, sieve, or clean farm produce	Medium	Put cleaning unit into thresher
<u>Income generating activities</u>		
Weaving	Medium	Training needed
Dyeing	Medium	Training, use of local herbs
Knitting or crocheting	Medium	Training
Sewing and mending	High	Training
Drying farm produce	High	
Grinding or milling	High	Family-sized equipment needed
Oil extraction	V high	Simple inexpensive machine
Storage	High	Cassava and yams
	V high	Vegetables
Packaging	High	Using local materials
Trading or hawking	High	Suitable containers
Transporting	V high	Improve carrying capacity of bicycles and motorcycles

Source: Federal Ministry of Agriculture, Water Resources and Rural Development, Government of Nigeria, 1987.

1/ Priority as accorded by rural women surveyed.

7.8 Production technologies Production technologies suitable for women farmers must reflect their current disadvantaged access to most resources and their wide variety of productive activities. Extension messages in all four countries concentrate on smallholder cash crops and on major food crops, although in maize areas, such as Zambia, the focus is usually hybrid maize (Jha, Hojjati and Vosti 1991). Minor food crops and small livestock have received less attention than their importance warrants for household nutrition and well-being.

7.9 About 1 percent of farm tasks in Africa are performed by mechanical means, about 10 percent by animals, and the remainder by human power (Ajayi and others 1990). Hoes are least disruptive to the environment, but inefficient. Women use hand tools and equipment much more than men. In Kenya for instance, hand cultivation was used on 92 percent of plots farmed by women, compared to 72 percent of men's plots. Oxen and tractors were each used on 4 percent of women's plots

and on 12 and 15 percent, respectively, of men's plots. Better-designed hand tools and also such labor-saving techniques as crop arrangements to reduce weed growth, minimum tillage, and herbicides could improve the efficiency of hand cultivators and be an intermediary step in the adoption of animal traction. A study in the Eastern Province of Zambia noted an increasing divergence in income and farm size between smallholders with access to oxen and those without such access (Jha, Hojjati, and Vosti 1991). However, as discussed later in this chapter, problems of successful technology adoption by female farmers go beyond questions of availability and accessibility.

7.10 Production technologies are needed to address the problem discussed in chapter 6 of labor shortage at the peak of agricultural season. Examples of such technologies include minimum tillage, sod seeding, herbicides, plant combinations or cultural practices to reduce weed growth, quick maturing varieties, or changes in the cropping enterprise mix to even out peaks in labor demand.

7.11 Technologies and strategies for natural resource management are urgently required as environmental degradation increases. Women are the major main users and managers of natural resources through their responsibilities for crop and livestock production, for household water and fuel supply, and for gathering of natural forest products. Burkina Faso provides two encouraging example of the effect of involving local populations, especially women, in the management of forest resources and in the promotion of water and soil conservation (box 7.1).

Box 7.1. Involving Women in Natural Resource Projects - Burkina Faso

1. *A project that encourages natural resource management and provides appreciable revenue for women - Burkina Faso.* The forest areas for a UNDP/FAO project in Sissili and Bazega Provinces were selected using satellite images and the participation of local population. The principal activities are the harvest of green wood between January and March; harvest of dead wood, harvest of forest seeds, germination of forest seeds, and beekeeping. About 2,000 people, of whom nearly 800 are women, participate in thirty-nine groups. Some revenue goes into the revolving funds of groups and is used, for example, to maintain dispensaries. Informal interviews with women show that they earn an average of 12,000 FCFA from green wood and up to 30,000 FCFA if they also collect dry wood. The project has introduced new beekeeping methods to women and also has helped one group to buy a karite press. Women's strong participation in the protection and regeneration of protected forests around their villages has been encouraged.

2. *The training of village technicians and promotion of conservation technologies.* The project Agro-Forestier with fewer than 6 field staff have trained village technicians in the use of water levels to identify contours along which are aligned rock lines (*diguettes*) to reduce soil erosion. The villages act as demonstration sites. *Zays* which are shallow holes filled with green manure and covered with soil, act as water collectors during the rains. Micro-organisms and termites act on the green manure to aerate the soil and improve water infiltration. *Zays* and *diguettes* in combination have improved yields by 50 percent (Oxfam 1989). The project has been successful because the technology is simple and easily understood; the extension is simple - technicians can be trained in 2 to 3 days; and, the benefits are obvious and the costs minimal. Female extension agents have recently been hired to train women's groups to build *diguettes* either on communal fields farmed by the group, or for other households for a fee (Ouedraogo 1988). Women have resisted placing *diguettes* on individual fields as they feared the fields would be taken over for household production. *Zays* are much less efficient in the absence of *diguettes*.

7.12 Process technologies Other areas of critical concern to women farmers that are not receiving adequate attention in research institutions are on-farm storage, pest control and reduction of food losses, and food preservation and preparation techniques. Produce that cannot be stored is often sold at a lower price even though, as the Kenyan country study reports, it is frequently bought back later at a higher price. Processing and storage is particularly important in the more humid areas. In Imo State,

Nigeria, for instance, 30 to 50 percent of the harvest is estimated to be lost in the processing, drying and storage sequence (Volume II, Chapter 3) and 80 percent of the tomatoes produced in Benue are estimated to spoil unless they are preserved by squeezing out the juice and sun drying the remainder (Olawoye 1991), increasing their value: a bag of fresh tomato at Naira 160 per bag would fetch Naira 500-600 when dried and sold later in the season (IAR/Ford Foundation 1992).

7.13 The processing of agricultural produce typically is carried out by women, often providing additional sources of income. However, given the primitive technology used, many agroprocessing procedures consume much time and energy for comparatively low yields (box 7.2). Improvements in agroprocessing and storage technologies, together with better rural infrastructure, market information systems, and transport could substantially raise labor productivity and yields.

Box 7.2. Labor Requirements for Manual and Mechanized Agroprocessing in Nigeria

"Threshing and milling of grains before pounding may take 2 to 3 hours each day and constitutes one of the most arduous, time-consuming tasks (a woman) has to perform" (Cloud 1977); 82 women hours are needed to process one drum of oil palm fruits. Cassava processing, for example, is a time-consuming, year-round activity that without a grating machine can occupy a woman for two days a week. Grinders, which can grate one basin of cassava in one minute compared to the two hours by hand, are estimated to be present in only 5 percent of Imo State villages (Ay 1990).

7.14 Off-farm technologies Fuel and water supply for the household and agroprocessing are typically women's responsibilities. Fuelwood accounts for 90 percent of household energy in SSA, and on the Central Plateau of Burkina Faso, for example, women are estimated to spend about 35 hours a week collecting it. Technologies that could reduce these time-consuming and energy-sapping activities include improved management of wood reserves; intermediate transport, rainwater collection and storage, and efficient fuel and water utilization. Successful projects using these technologies are discussed in the Burkina Faso and Kenya country studies (Volume II, Chapters 1 and 2).

C. Why Aren't Technologies for Women Being Developed?

7.15 Historically, smallholders in general, and in women farmers in particular, have been disadvantaged by formal research systems and related development schemes. Tropical agricultural research initially concentrated on the production of export crops and raw materials for industry by large-scale producers or smaller out-growers who were almost always men. Following independence countries placed more emphasis on food crops and small-scale farmers. The starting point was not current practice and its underlying rationale, but production under high levels of inputs and optimum growing conditions. The underlying assumption that farmers were male resulted in an almost complete disregard of the activities, tasks, and commodities that were traditionally a woman's preserve, even though these activities made major contributions to household production and income. As the Burkina Faso country study states: "Most research in the fields of agronomy, animal science, economics, and technology development is undertaken with male farmers. As a result, there are few appropriate technologies which increase women's agricultural productivity by reducing women's labor time needed for routine cultivation and domestic tasks" (Volume II, Chapter 3, p. 5). This is due to the preponderance of men in the research and extension services, the implicit undervaluing of activities because they do not appear in official statistics, and a lack of knowledge of intrahousehold dynamics.

7.16 The privatization of research currently being promoted is likely to exacerbate this neglect of women's concerns and needs. Private organizations will produce only goods for which they foresee a high probability of an attractive financial return. Smallholders are not used to paying for agricultural advice, and they have little money available to buy something which they can "borrow" from a neighbor. Smallholdings that produce little for sale and purchase few inputs are essentially cut off from information from extension services run by commodity marketing organizations and input companies. Although private research has advantages, especially for the commercial farming sector, the externalities in terms of social, economic and environmental benefits generated by research and extension programs for women farmers provide the economic rationale for a degree of public intervention.

7.17 African agricultural research systems should produce technologies to help resource-poor farmers make the most efficient use of their resources and increase the productivity of their land and their labor. A good understanding of their farmer clients should underpin the research process and the development of technologies and recommendations that extension agents can subsequently fine tune to the circumstances of individual farmers. This understanding can be obtained by involving farmers directly in the research process. The positive effect of client participation in research and development is illustrated by several success stories for Kenya (box 7.3). In contrast, the introduction of cassava and oil palm technologies in Nigeria (Volume II Chapter 3) shows the negative impact on women when technologies to help them are developed and implemented without a full understanding of their needs and gender dynamics.

Box 7.3. Farmer Participation and Successful Projects in Kenya

The Renewable Energy Development Project's target of 5,000 stoves was far surpassed by the 110,000 sold a year ahead of schedule. Local participation in the design of the new stove was extensive: scrap metal artisans were consulted about its manufacture and prototypes were tested in 600 households. The new stove has a fuel efficiency of 29 percent (or up to 50 percent with careful fuel use), pays for itself within eight weeks, and provides an annual return of up to 1,000 percent on the investment (WRI/IIED 1987 in World Bank 1992).

Involving women in the design, operation, maintenance, and training increased the efficiency of water projects and was key to the success of the Kenya Water for Health Organization (KWAHO) project in Kwale District. This NGO consortium organized cooperative handpump installation and maintenance with female extension workers, village decisionmaking, and local materials and labor. Backed by training in health, water use, pump maintenance, bookkeeping, and group organization. Involving women in the design, operation, maintenance and training increases the efficiency of water projects and was key to the success (Dankelman and Davidson 1988).

7.18 To develop a closer link between the farmer and the researcher, the Nigerian WIA program selected four regional research contacts from technology institutes to work closely with the WIA program on women's technology and research needs. These resource people identify the technology needs of women farmers, whether and how these needs can be met from available technology, and if not, how the research agenda of the institute they represent should be adjusted address this need. In some projects in Nigeria, staff in technical units are working side by side with extension personnel, an important step toward having technology tested and adapted by end users.

Box 7.4. Technology for Women: Institute of Agricultural Research-Ford Foundation Project, Nigeria

The Project

The two-year project at the Institute for Agricultural Research, Ahmadu Bello University focussed specifically on agricultural technologies for women. The project was adjusted in response to feedback from women.

The Approaches

- dialogue with agencies working with women (e.g. ADPs, individual projects, Better Life Program, National Council of Women's Societies); with agricultural equipment companies; with banks (for credit to women); and with the Agricultural Mechanization Research Program at IAR/ABU.
- spot surveys in 3 Local Government Areas (LGAs) of Kaduna and Kano States gave an overview of various tasks performed by women and identified the various constraints. Leaders of women's groups evaluated prototypes already developed. Areas of focus then selected were crop threshing, milk processing, and water transportation, and to lesser extent, oil extraction and cooking stoves.
- selected women's groups in the LGAs were trained to operate the prototype equipment and monitored for operational problems.
- fast feedback from user groups was established.

The Results

- the close collaboration between researchers and female users accelerated the adoption of new technologies among women.
- women provided excellent feedback which resulted in improvements to the equipment e.g. crackage of millet grains by the multi-grain thresher was virtually eliminated by covering the bars with rubber, e.g. as women did not find manual sieving a problem, the cleaning unit was removed. This not only increased output, but also men did not take over the operation as the sequential operation had not been totally mechanized.
- the number of enquiries from groups and individuals wishing to own equipment increased.
- increased awareness among researchers and management of the need (a) to aid women technologically in their farm and family activities; (b) for a wide spectrum of technologies for women's various tasks; (c) for training of female users; (d) for training of artisans in making, maintaining and repairing the equipment; (e) to understand the complexities of women's social systems, the dynamics of group formation, the economics of using the equipment, the importance of credit, and the need for greater coordination between and among the numerous agencies working with women.

Source: Terminal Report IAR Project G:11.8.16.3, Ahmadu Bello University, Zaria, Nigeria, January 1992.

7.19 The country studies point to the need to establish or improve data bases on the role of women in agricultural production and ancillary activities, including analysis by gender of activities, resource constraints, and the benefits to be gained by relaxing them. Research teams, including sociologists and economists can use such data to formulate the research agenda, plan research programs and trials, and evaluate results. The increasing number of adaptive and on-farm trials conducted on women's plots is a positive trend noted in all four countries. These efforts need to be expanded, however, as an agro-forestry project in Zambia demonstrates. The success of the on-farm trials on

women's plots in this project was compromised both qualitatively and quantitatively by having only a few female researchers on the team (Holden and Joseph 1991).

D. Why Aren't Available Technologies Being Adopted?

7.20 Available production technologies and equipment are not being used widely by smallholders because of a lack of awareness, difficulties in obtaining technology or inputs (such as fertilizer and labor), poor returns relative to the cost or time in obtaining inputs, lack of necessary complementary resources (such as credit), lack of relevance, lack of understanding of technology, and risk. Other reasons identified by an FAO report on Kenya were that the socioeconomic structures and dynamics were not carefully assessed, extension staff were unequipped or had insufficient time to assist in dissemination and adoption, manufacturers of the improved tools and equipment were too few in number, and extension and technology development for a particular activity were not always in the same ministry (Maina 1984). The main reason given by female farmers surveyed in Nigeria for not adopting recommended practices was that they were "too technical" indicating that they had been badly explained. Frontline extension staff in Muranga and Machakos Districts in Kenya said that, compared to male farmers, women's adoption of new technologies is constrained by inadequate cash, and by shyness in asking questions of extension agents. This is consistent with the other findings that women were better in adopting labor-based technologies than cash-based technologies (Bindlish and Evenson 1992). Technology adoption can also be hindered by a lack of secure tenure. In Burkina, for example, insecurity of tenure was one reason cited for women's reluctance to construct *diguettes* (Volume II, Chapter 3) or invest the time and money in alley farming in Nigeria (Volume II, Chapter 2).

7.21 New technologies may also not be adopted because of the failure to adequately involve women in technology design or implementation. Technologies to help women, such as woodlots, improved stoves and water supply innovations, are often targeted at, or depend on financial resources from husbands who may not benefit directly from their adoption. In a woodlot project in Malawi, for example, men sold for cash poles from the woodlots that were designed to produce fuelwood. Similarly, a forestry project in Ethiopia ran into problems because it forbade women to collect fuelwood from the newly-afforested land -- even though this was the only source of fuelwood in the area. On the other hand, two stove and water projects in Kenya were successful in large part because they deliberately involved, trained and targeted women. The improved woodstove resulted in a 50 percent saving in fuel (Volume II, Chapter 1).

7.22 The presence of cooperatives supplying such inputs as fertilizer, agrochemicals, and seeds significantly increases the probability of technology adoption but, as the country studies show, far fewer women are cooperative members than men. The T&V system specifically discourages the supply of these inputs by the extension service, and supply is variable among countries. Fertilizer can raise yields substantially. The econometric analysis (chapter 4) showed that if women used the same fertilizer input as men, (all other inputs remaining the same) the gross value of their output would increase by 14 percent. Fertilizer supply in much of SSA is problematic as the four country case studies show, and is one reason for the failure to achieve potential yields in such countries as Zambia (Jha, Hojjati, and Vosti 1991). Subsidized prices as in Zambia and Nigeria severely distort supply. Management, funding and logistical problems affect all stages in the supply of fertilizer from procurement and production to distribution. In Nigeria for example, fertilizer supply is erratically planned, chaotically distributed, and suffers mounting wastage and losses. In addition to aggregate supply problems, the units in which fertilizer and other inputs are sold are often inconveniently large for female farmers who generally have smaller holdings, less cash available, and more restricted access to formal credit than men. To overcome

these problems, Kenya has started supplying fertilizer in 10 kg bags and pesticides in comparably convenient amounts. Privatization of input supply is being encouraged but distribution problems, transport costs to rural areas, and the high unit transaction costs of supplying small consignments of a range of products to individual farmers are likely to remain major issues.

7.23 Farmers surveyed by WAPIA complained of the high cost of fertilizer in Kenya, where fertilizer is unsubsidized, and in Nigeria, where the subsidy is large amounting to five times the government's total budgetary outlay for agriculture, but farmers commonly pay 2 to 4 times the official price as various intermediaries cream off the rent. Fertilizer recommendations that are financially viable and reliable, make the most efficient use of the fertilizers, and reflect farmers' ability to purchase the input are more important from the farmer's viewpoint than recommendations that maximize returns or output. As the survey results showed, a major reason for smallholders not using fertilizer was lack of cash, highlighting the importance of short-term credit.

7.24 Everywhere the development and supply of tools and equipment is complicated by the lack of a centralized authority or coordinator to develop, test, evaluate, and promote adoption and local production and maintenance. A survey in Nigeria for example, concluded that many rural women were unaware of available technologies and needed encouragement to accept innovations; many existing technologies were not particularly relevant to women's needs; and infrastructure for making and repairing these goods was lacking (FMAWRRD 1987). The wealth of information and equipment available worldwide through the many appropriate/intermediate technology networks and organizations is not being fully tapped. Technologies appropriate for women farmers need to be identified and collected widely, screened for local suitability, tested and adapted under farmers' conditions, and their local manufacture promoted. A mix of actors can be involved: the public sector, universities, donors, NGOs, and commercial firms. In the short-term and during the early stages, the public sector or other agencies can be facilitators and, for example, bring together potential users, designers, and manufacturers. The aim should be the production, sale, and maintenance of the tools and equipment by local artisans and enterprises.

7.25 Technologies developed scientifically may not, for cultural reasons, necessarily be equally suitable for or adoptable by men and women farmers. Animal traction (box 7.5) and alley farming (box 7.6) provide examples of technologies women may find difficult to adopt. Animal traction is earmarked as a strategy for increasing agricultural production by increasing the area under cultivation in Zambia and the Middle Zone of Nigeria. But women's use of animal traction is constrained by cultural and financial factors. If animal traction is to be promoted, special efforts such as targeted training and credit may be needed to facilitate women farmers' use of the technology. Restricted access to credit, promotion of "male" crops or activities, and exclusion of women from training sessions on the use of certain equipment exemplify other ways in which women are hindered from adopting technologies.

Box 7.5. Constraints to Women's Use of Animal Traction

The idea of women using animal traction may not be culturally acceptable, and the technology may not be acceptable to women themselves.

Women often don't own traction animals and, unlike most other farming decisions, don't have decisionmaking powers over their use.

Where the use of animals is a male privilege, the introduction of animal traction may cause women to lose existing sources of revenue.

Animal traction for plowing increases cultivated areas thus increasing in the short term the amount of weeding and harvesting, often women's tasks. In the medium term the introduction of animal-drawn weeding implements speeds up weeding and it typically becomes a man's operation. Women then tend to do the relatively small amount of manual intrarow weeding.

Community ownership of mills and presses raises the problem of whether everyone should bring their own animal (husbands may not want their animals used) or whether the animals should be communally owned (with all the problems that entails).

Source: After Nelson-Fyle and Sandhu 1990.

7.26 The introduction of technologies has not always been beneficial for women, especially when it affects the gender division of activities and income within the household. The introduction of mechanization for palm oil processing in Nigeria is a classic case (box 7.7). "The pattern which seems to emerge is that only when concerted efforts are made to ensure that women are enabled to take control of their own technologies will (they benefit). If women do not have access to credit, extension advice, training, etc., then it is more likely to be male entrepreneurs who own the machines, and women who use them for a fee" (Carr and Sandhu 1988). A recent study of the institutional settings, technology selection process, and dissemination strategies of five agencies in SSA that assisted women to adopt and benefit from improved technology is summarized in box 7.8. The study found that assisting women to adopt improved technology may not be as the literature implies. "These better-performing women's technology programs assisted large numbers of women, in part, because (1) the agencies could use existing networks of women to identify women's needs and reach many women quickly, (2) the agencies consulted potential beneficiaries to identify the constraints women face in their work, and they used those needs to drive technology selection or development, (3) women modified their gender roles when necessary, (4) the agencies matched the technology dissemination strategy with the physical characteristics of the technology, and (5) where possible, they selected technology and designed projects so that poorer women could benefit" (M.P. McVay 1992 p.2).

Box 7.6. Alley Cropping and Gender Questions

Agroforestry or alley farming, the practice of growing crops between fast-growing leguminous trees or shrubs whose roots fix nitrogen in the soil, can increase the sustainability of arable farms. The particular benefit for women – allowing them to extend the cropping period before reverting to fallow – is important in many parts of Africa where land is scarce, usufruct rights end once the land goes into fallow, and labor for clearing land is scarce. As research in Kenya has shown, several aspects of the adoption and use of alley farming are affected by gender (Feldstein, Rochelcau, and Buck in Feldstein and Post 1989).

Elements of agroforestry	Technical specifications	Gender implications
Functions or uses Soil fertility Tree products Mulch Fodder Fuelwood Other	<ul style="list-style-type: none"> Improved crop production Rate of production 	<ul style="list-style-type: none"> Who determines priority use?
Location	<ul style="list-style-type: none"> Soil conditions Water availability Landscape niche (for example valley, slope) 	<ul style="list-style-type: none"> Whose space? Available for desired use? Private or public? Conditions? How far from where product will be used?
Arrangements	<ul style="list-style-type: none"> Spacing between crop rows, spacing within rows, effect of each on crop production and tree production Proportionality of species Orientation to sun and crops 	<ul style="list-style-type: none"> Will differ according to whose field or crop is at issue
Species	<ul style="list-style-type: none"> What characteristics are required? How well do the species achieve these benefits? 	<ul style="list-style-type: none"> Determined by dominant decision-maker about field and tree functions Access to and availability of desired species Are there cultural prohibitions?
Management	<ul style="list-style-type: none"> Effect of different cutting practices - frequency, method of cutting - on desired tree output, on fertility, on nearby crops (shade) Mulching - depth for fertility effects 	<ul style="list-style-type: none"> Who has responsibility for plant establishment? Who has harvest or cutting rights? What do they imply in terms of frequency and nature of cutting? Whose labor is required?

As explained in chapter 5 women have less secure land tenure and less right than men to plant trees, and men and women do not have equal rights to do what they want with the land to which they have usufruct access. These factors discourage women from planting alley farms. Gender differences continue after the plants are established. Depending on which species is planted and how plants are managed, the prunings can be used for a variety of purposes – as a nutritious source of animal fodder, as a mulch to reduce erosion, and to improve soil fertility by releasing nitrogen and potassium during the cropping season. The pruned branches provide fuelwood, stakes, or building materials. Many of these uses are mutually exclusive, someone has to decide on the desired objective and therefore on how the plants are to be managed. And within households women have fewer decisionmaking powers than men.

Box 7.7. Mechanized Oil Palm Processing - Women and the Environment are the Losers

Improved oil pressing technology often requires more fuelwood and water than traditional methods – an increased use of resources and no saving of total time (UNIFEM 1987, Ay 1990 in Olawoye 1991). Palm oil pressing had been exclusively a woman's activity, but with the introduction of machine technology men took it over because (a) the new technology was attractive, (b) the machine, designed for men, was too large for women to handle; and the daily time schedule for using the press was inconvenient for women. Consequently women lost income; they lost access to by-products of processing, which they had formerly used as fuel; and because all the oil extracted belonged to the men, women did not benefit from the increased oil production (Akande 1984). When palm oil is processed by machine, men control the income; when women process small amounts, they keep the kernels as their compensation.

E. Concluding Note

7.27 No matter how technically feasible recommendations may be, they cannot increase productivity unless they are implemented. Certain technologies may be less easily adoptable by female than male farmers because, as the four country studies have amply demonstrated, male and female farmers do not operate under the same conditions. Time and energy-saving technologies are women farmers' greatest need. In addition they require production technologies for their commodities, that are compatible with their constraints and objectives -- which are not always exactly the same as those of male farmers. If gender-related problems are allowed to constrain adoption, women farmers will be further disadvantaged and efforts to increase national agricultural output and productivity will be compromised.

7.28 Agricultural output and productivity can be raised if agricultural research is focussed more on the needs of the majority of farmers -- women -- and responds to farming and household system, by increasing participatory research with male and particularly female farmers, and by systematically improving feedback from gender sensitive extension agents. Gender sensitive technology generation and promotion is possible. An understanding of women's farming role and constraints, including cultural constraints, is a prerequisite to devising suitable strategies. Evidence from the country studies suggests that appropriate technology and equipment for women farmers should be economically accessible and viable. In addition, the necessary infrastructure and facilities should be available. Women should be included in the planning, and trained in the operation, of the technology. Extension services can help in this regard by ensuring that women are included in relevant extension activities, such as training in ox-cultivation. And the technology must be targeted at the person who will use it. For example, if it is not men's responsibility to collect and use fuel, they are unlikely to be persuaded to buy efficient stoves. The Burkina Faso and Kenya country studies provide several examples of women's successful adoption of technologies; special targeting to women and their participation from an early stage is a recurring theme of these projects. Mobile training in Zambia and the WIA program in Nigeria have increased women's exposure to new technologies. Above all, women need to participate in all stages of the process to ensure that the technologies developed are needed, suitable and adoptable.

Box 7.8. Developing and Disseminating Appropriate Technology (AT) for Women Farmers in Africa: The Findings of a Study of Five Success Stories

Issues	Findings	Successful Strategies
<u>Institutional agency</u> (Government vs NGO; women's vs mainstream)	All types of agency could reach women.	<ol style="list-style-type: none"> 1. Use existing women's networks. 2. Develop a business orientation and capacity, and minimize politicization of agencies through market research of AT, communication with potential users, and using agencies with technical and financial competence.
<u>Technology development and selection</u> Most engineers are men and few machines are designed with women in mind as owners or operators.	Interactive design processes were NOT necessary crucial in developing AT for women, but were significant in identifying women's needs and selecting AT.	<p>The agencies</p> <ol style="list-style-type: none"> 1. Consulted potential beneficiaries to identify needs. 2. Selected existing AT where possible or designing AT to fit those needs.
<u>Gender roles</u> associated with the improved technology are often viewed as major barriers to women adopting.	Women were able to step out of traditional roles and to perform tasks traditionally regarded as "men's".	<p>Women did not enter male-dominated sectors in the technologies studied, but did perform tasks considered as "men's". Gender roles changed by:</p> <ol style="list-style-type: none"> 1. Agencies supplying technical and managerial training to women, including those illiterate. 2. Simplifying the business procedures, e.g. changing a fee for service is easier than setting up a cooperative oil press. 3. The willingness of some women to challenge stereotypes, e.g. by building houses. 4. Women hiring men when they were unwilling or unable to do the task themselves, e.g., to run diesel engines or keep accounts.
<u>Dissemination strategies "extension approach"</u> (agencies donate and demonstrate equipment to user groups and hope women will adopt) vs <u>"market approach"</u> (agencies teach small firms to make the equipment which they then sell to individuals). "Extension" approach targets women, many induce dependence, and may not be sustainable or widespread. "Market" approach may not reach women.	The characteristics of the technology - affordability by rural women, technical complexity and scale - determined which were adopted. Technologies requiring financing, training and large-scale production were only adoptable by groups. While concentrating either on individual or group adoption, all case studies incorporated elements of both approaches.	<p>The extension approach to groups avoided dependence on the agency by:</p> <ol style="list-style-type: none"> 1. Doing a feasibility study before project implementation. 2. Women's groups buying the equipment and receiving no long-term subsidy. This put pressure on them to succeed and on agencies to produce a good product and good advice. 3. Using internal group mechanisms with (a) social cohesion and common high priority interest, (b) democratic control structure, (c) clear and established incentives, rewards and sanctions. <p>The market approach reached women because of:</p> <ol style="list-style-type: none"> 1. The user need and technology identification process described above. 2. Flexibility over time in who is trained to make the equipment and who distributes.
<u>Reaching the poor</u> AT may be detrimental to poor women as it does not reach them and replaces their paid labor.	AT does not necessary replace women's paid labor. Using feasibility studies increased viability but tended to benefit better-off women. All agencies chose the cheapest equipment but 3/5 were not affordable by poor women individually.	<p>The projects helped less well-off women by:</p> <ol style="list-style-type: none"> 1. Selecting technologies that were affordable for individual women. 2. Improving affordability in money and time through (a) credit, subsidies and user fees, (b) structuring the technology use into women's existing labor patterns. 3. Employing young, landless, poor women when labor was needed. 4. Broadening the range of women benefiting from the technology by allowing those outside the owner group to pay for its use.

Source: Improved Technology for Women in Africa, Mary Pat McVay, Master of City Planning Thesis, Massachusetts Institute of Technology, February 1992.

Chapter 8. Agricultural Extension for Women Farmers

A. Why Extension Should Address Women Farmers

8.1 Extension can increase agricultural productivity and rural incomes by bridging the gap between technical knowledge and farmer's practices. Several studies show that extension is generally cost-effective, and has a significant and positive impact on farmers' knowledge and adoption of new technologies and hence on farm productivity (Birkhaeuser, Evenson, and Feder 1991). As the productivity analysis in Chapter 4 showed, contact with extension in Kenya significantly and positively affected the gross value of output of all farmers when gender is not considered. Similarly in Zambia contact with extension positively affected the diffusion and adoption of new agricultural technologies especially for specialized commodities such as tobacco, cotton, sunflower, and soybeans (Celis, Milimo and Wanmali 1991). In contrast the weak state of the extension services in Oyo State, Nigeria at the time the WAPIA data were collected probably explains the insignificant impact of extension on the gross value of output at the household, farmer, and plot levels.

8.2 Extension services can increase agricultural productivity by:

- Collaborating with farmers and researchers in the development of new technologies (such as cultural practices, varieties, chemicals, and tools) in response to today's rapidly changing circumstances.
- Providing these technologies and information to as many farmers as possible in a timely and accurate manner, using a variety of communication and training methods.
- Encouraging farmers to informally test, adapt, and adopt the technologies thus improving productivity.
- Eliciting information about farmers' concerns and problems with different technologies and conveying them to research and technology centers.

8.3 In most SSA countries increased awareness of the important role played by women in agricultural production has resulted in governments intensifying efforts to improve women farmers' access to extension. Some countries have made more progress than others, as the boxes in this chapter show. In both WAPIA surveys, similar proportions of men and women farmers were in contact with the extension service -- 13 percent in Kenya and nearly 40 percent in Nigeria, although there are wide variations within countries. A noticeable feature of the surveys in both Kenya and Nigeria (table 8.1) is that fewer female than male household heads who farm had extension contact, but that female household members who farm have more extension contact than do male household members. These differences suggest that agents visit male-headed households and talk to female members of those households more than they visit female-headed households.

8.4 There is evidence that female-headed households are not well-served by extension in other SSA countries. Zambia, for example, has a very high number of female-headed households, but the already low agent-to-farmer ratio and the limited number of female extension agents has resulted in little interaction between female-headed households and agents: 82 percent of female-headed households had not been visited once by an extension agent in the past year. Only 30 percent of female-headed households said their agricultural knowledge had improved over the year, compared to 98 percent of

contact farmers (Sikapande 1987). In Zambia's Central and Southern Provinces, 79 percent of female heads of household could not remember the last contact with an extension agent, and only 15 percent had contact once or twice a year (Milimo 1989).

8.5 The Nigerian data emphasizes that the mere fact of having extension contact will not automatically result in increased output. While there was little **quantitative** difference in gender contact with extension (table 8.1), the Kenyan WAPIA data showed that contact with extension positively and significantly raised the value of output of male farmers, but not of female farmers, all other variables being held constant. Yet despite this result, women still want extension: a higher percentage of female than male noncontact farmers wished to become contact farmers, and many wives of male contact farmers attend extension meetings in their husbands' absence. However, the insignificant effect of extension on women's production raises

serious questions about the **quality** of the current extension system for women farmers. Why is extension contact with women farmers in Kenya not translated into increased value of output as it is with men? The econometric analysis found that extension contact increased the propensity of both men and women to adopt technologies (chapter 5). The WAPIA data also showed that female farmers generally have lower adoption rates than men, and that they tend to adopt labor-based rather than cash-based technologies. Thus, while extension contact increased the likelihood of all farmers adopting technologies, the technologies adopted by women did not translate into increased value of output.

8.6 The individual Country Studies (Volume II, Chapters 1-4) describe the extension systems and the provision of these services to women farmers in the four countries. These studies, and the household surveys in Kenya and Nigeria, indicate that what is required is better quality extension for female farmers, and more contact between extension agents and female farmers particularly female household heads. The specific needs and problems of women farmers must be addressed in the design and implementation of agricultural support services. "A reorientation of extension messages is necessary to improve the congruence of technical messages and communication strategies with the reality of small-scale agriculture -- that is, that many small-scale farmers are female" (Saito and Spurling, 1992). Special approaches are needed for the following reasons.¹

- Many male policy-makers, and extension and research staff lack understanding and knowledge of women's roles and constraints.
- Cultural norms constrain or reduce the efficiency of communication between the genders

Table 8.1. Extension Contact by Gender, Position in Household and State/District: Kenya and Nigeria (% of those farming in contact with extension services)

	Household heads		All farmers	
	M	F	M	F
KENYA				
Kakamega	9	9	12	13
Muranga	24	7	22	17
Kilifi	5	11	7	5
Overall mean	12	9	13	13
NIGERIA				
Kaduna	43	38	43	43
Oyo	35	0	30	26
Imo	31	7	37	51
Overall mean	37	22	36	41

Source: WAPIA surveys.

¹ These are examined more fully in Saito et al, 1992.

at all levels², including the household, and are exacerbated by the very few female agents and their tendency to concentrate on home economics subjects.

- Agricultural technical messages concentrate on the resources, commodities, tasks, and activities more relevant to men than women, whereas extension to women concentrates on home economics subjects.
- Women's attendance at extension activities is constrained by their lack of time and mobility resulting from cultural norms, their domestic responsibilities, and their heavy workloads (chapter 6).
- Women's more limited access to the factors of production including inputs, equipment (para 7.9), land (chapter 5), and credit (chapter 9)
- Women's lower levels of education and literacy may hinder their understanding of extension literature and active participation in extension activities. As the analysis in Chapter 4 showed, a farmer's level of education positively and significantly affects the farmer's probability of adopting new technologies. The T&V evaluation in Kenya showed that twice the number of farmers in households headed by someone with eight years schooling or more received extension advice than did farmers in households headed by someone without any schooling (Evenson and Bindlish 1992). In both the Nigerian and Kenyan WAPIA surveys, female farmers had less education than their male counterparts.

B. Is the Gender of the Agent Important in Improving Extension Services to Women Farmers?

8.7 The employment of female extension agents facilitates both quantitative and qualitative improvements. The WAPIA surveys in Kenya and Nigeria showed that, as would be expected, female agents had contact with more female than male farmers (table 8.2). Cultural and social restrictions on interactions between genders hinders easy communication between male agents and female farmers. In northern Nigeria, contact is almost impossible between male extension agents and Islamic Hausa women who are farmers and landlords from within purdah. In Kenya, while social norms do not prohibit male agents from contacting female farmers, the survey data do show that some problems and preferences are encountered.

8.8 Given that increasing numbers of women are farming and that extension services have very few female agents in the field, weak or ineffective communication between agent and farmer is a serious problem compounded by differences in ethnic group, language, educational, and social status. Although few female farmers surveyed said the agent's gender was their major extension problem, a sizeable proportion (37 percent in Nigeria, and 25 to 33 percent in Kenya) expressed a preference for agents of a particular gender (table 8.3). In Kenya, agents work with both male and female farmers, but women farmers surveyed preferred male agents to female agents because male agents provide more

² An evaluation of the T&V system in Kenya, contemporaneous with the WAPIA survey, found that when farmers in female-headed households had female agents with agricultural training their yields were 35 percent higher than average and significantly different from the yields resulting from the interactions between male agents and these farmers, or female agents and farmers from male-headed households (Bindlish and Evenson, forthcoming). Since "farmers in FHH" could include men, this data cannot be taken as a simple gender interaction. It does, however, provide evidence that communication is affected by gender.

agricultural advice while female agents concentrate on home economics. Moreover, 42 percent of male agents surveyed in Machakos and Muranga districts indicated problems working with individual women farmers; they perceived women farmers as having more difficulty than men in terms of access to capital, general interest in recommendations, and shyness; and many experienced problems in delivering messages about nutrition, childcare, and home improvement that are of particular relevance to women. Accounts of extension in Zambia report that delivering extension to women has been inhibited by the traditional cultural resistance of male extension agents to contact women as well as by men's limited training on crops generally cultivated by women (Chenoweth 1987).

Table 8.2. Farmers visited by Female Extension Agents (percent of farmers)

Gender of farmer	Male	Female
KENYA		
Kakamega	7	20
Muranga	10	12
Kilifi	6	25
Overall mean	8	16
NIGERIA		
Kaduna	2	14
Oyo	0	0
Imo	13	17
Overall mean	3	12

Source: WAPIA surveys.

Table 8.3. Farmers' Preferences for Male or Female Agents (percent of respondents)

	Male farmers preferring		Female farmers preferring	
	Male agent	Female agent	Male agent	Female agent
KENYA				
Kakamega	44	0	20	0
Muranga	17	3	19	4
Kilifi	19	6	13	25
Overall mean	24	3	18	7
NIGERIA				
Kaduna	33	3	10	35
Oyo	7	1	5	0
Imo	29	6	26	23
Overall mean	22	2	17	21

Note: The percentages unreported said they had no preference.

Source: WAPIA survey.

8.9 Women farmers' general indifference to the gender of their agent should be viewed in the light of answers to another question. Evidence from Kenya and Nigeria show that when extension agents visit farm households they tend to talk to men more than women. In Kenya for example, although there are few strong social interaction or cultural barriers between genders, only 64 percent of male farmers and 55 percent of female farmers surveyed said the agent talked to both men and women. And in Nigeria 86 percent of farmers in Oyo said that agents talked only to male farmers; this gender bias was less obvious in Kaduna (42 percent) and in Imo (29 percent). An apparent anomaly exists, with Oyo State providing an extreme example, between male agents not talking to women and yet those women farmers not preferring female agents. The explanation given by the survey supervisor for Oyo State probably has wide application: women farmers who have little contact with the extension service are willing to talk to any agent. Restricting themselves to the very few female agents might mean cutting

themselves off from all extension contact.

8.10 The gender of the agent would be less critical if information and other technologies made available by extension services to a household were effectively passed to all interested parties in the household. But husbands do not necessarily pass information or technologies to wives, particularly when they are gender-specific or gender-concentrated. In Zambia for example, men were given beakers for measuring fertilizer although it was the women who made the fertilizer applications. The women continued to apply fertilizer but in inappropriate amounts (NORAD 1985).

8.11 There are fewer female than male agricultural agents, their training and employment is often in home economics, and recruitment is hindered by financial constraints and lack of suitably qualified candidates (box 8.1). Few agricultural extension staff in Africa are female: 11.1 percent of all extension staff and 7.0 percent of field staff (Swanson, Farmer, and Bahal 1989), with actual proportions varying among and within countries. In Burkina Faso for example, about 15 percent of total extension personnel are women -- they have limited agricultural training; covered a broad range of activities including sewing, hygiene, and nutrition; and must often work simultaneously with several different donors or projects. In Zambia female agents comprised only 7 percent of all agents in 1987; by 1989, 8.4 percent of camp officers and 16 percent of block supervisors were women. Many of these women were commodity demonstrators with very little training, and cover home economics rather than agricultural topics. A disproportionate number work in urban areas because they wish to be posted close to their husbands (Safilios-Rothschild 1985).

Box 8.1. Recruitment of Female Agents in Zambia

Zambia's tight budgetary situation and limited accommodation facilities and other services in the field halted the hiring of new extension agents in 1987. The lack of opportunities for training and promoting more women extension agents in the near future is likely to adversely effect the government's policy of making women equal partners in its agricultural efforts. Women extension agents as role models for young girls and women farmers can be a powerful and profitable investment. Efforts should be made to systematically retrain and sensitize male extension agents to women farmers' specific roles and needs. Recruitment of female agents is difficult anyway because of a lack of qualified people "due to general discrimination (in practice, not in policy) against women throughout the educational structure" (Chenoweth 1987). At Zambia's agricultural colleges, the syllabi for women generally focuses on home economics topics (Volume II, chapter 4).

8.12 To increase the number of female extension agents, it is recommended that the teaching of scientific subjects to girls at school be promoted, girls be targeted for intake to agricultural colleges and more facilities for girls should be provided at such colleges. Such measures will take time to produce results, however, and more immediate progress is possible by redeploying other female agents such as home economists or rural development staff (box 8.2). Such redeployment should be accompanied by training programs to fill identified skill gaps among the redeployed agents. It is important that redeployed agents be fully integrated into the main extension service. To maximize the efficient use of existing female extension agents, they should have the same logistical support and pre-service training as men.

Box 8.2. Redeployment of Home Economics Agents

Increasing numbers of female extension agents - the Women in Agriculture (WIA) program of Nigeria

Pilot studies brought to the attention of government and donors the importance of women farmers and the ineffectiveness of the extension system in helping them. To remedy the situation, the Women in Agriculture (WIA) program was initiated. Through this program, many of the 4,500 home economists (HE), who had detailed knowledge of rural women and were farmers in their spare time, were transferred to an initially separate (now unified) extension service and given intensive training in agriculture and extension methodology. Little additional cost was incurred because the HE agents were already on the government payroll. These WIA agents give agricultural advice to women, explain women's farming activities to male agents, and resume their traditional HE programs during the non-growing season. The target is to have an administrator and a SMS (Training) at state headquarters, an SMS in each zone, and an agent in each block (and cell, if possible). They work more with women's groups than do male agents, but male agents also have a target of 20 to 30 percent of female contact farmers. WIA agent's time is split into 70 percent field production and 30 percent postharvest and home economics.

The WIA program, which is now fully integrated into the agricultural extension service, provides a broad spectrum of support for women farmers including:

- Skill Development Centers where tools and equipment are demonstrated
- Small Plot Adoption Techniques (test plots) are targeted for the fields of all women contact farmers
- Women's groups are encouraged to establish woodlots, alley crop, and plant vetiver for soil conservation
- Small livestock keeping and such crops as soybeans are promoted to improve family nutrition
- Oxen and donkeys for plowing and transport are promoted.

Marginalization of extension to women farmers by separation of agricultural and HE activities - Kenya

In Nigeria HE agents were successfully integrated into mainstream agricultural extension. Kenya moved in the opposite direction first by withdrawing HE agents from the agricultural extension service and second by introducing client exclusivity. Women (and men) farmers may be visited by either an agricultural or a HE agent, but not by both. Effectively women are seen by female HE agents and men by male agricultural agents. This measure does increase the number of clients reached, but it ignores the holistic nature of women's activities and women's major role in agricultural production and farm management, and precludes the use of HE agents in training male agents about women's activities, needs, and concerns.

C. How to Increase the Numbers of Women Farmers in Contact with Extension Service

8.13 Several strategies, or combinations of strategies, have been used successfully to increase the number of female farmers contacted by extension agents. The first step may be to consider the obstacles women face in meeting with extension agents. The point has been made in Kenya that many male agents "do not consider the time element involved in child rearing, food preparation, fuel gathering and other household chores" in scheduling meetings convenient for female farmers (Volume III, Chapter 1). Extension contact days in eastern Nigeria occasionally conflict with local markets operating on a 5-day cycle, and few women can afford to forego the income of a market day in order to meet the extension agent.

8.14 Incentives to encourage extension agents to meet with female farmers may be institutionalized into the reward system or internalized into the value system. An effective, although not

consciously intended, strategy in Imo State, Nigeria, included "reaching women farmers" in the ethos of extension staff. Project officials, perceiving strong donor support for increased attention to women farmers, were receptive to new ideas. They felt they were on the cutting edge of a new thrust in development programming and practice. This enthusiasm soon spread to grassroots extension agents and "a synergistic, positive feedback process was set in motion" (Volume III, Chapter 2, p. 29). The selection of Imo State as a WAPIA survey site and the spread of Imo State's innovations to the other states added to this enthusiasm and incentive to reach women farmers (ibid).

8.15 Increasing the numbers of female contact farmers A change in the selection criteria or procedures will often be required if more women are to be contact farmer in their own right (para 8.19). An alternative strategy is to accept as *de facto* contact farmers the wives of male contact farmers who work off the farm. Although the policy was not deliberately changed, this strategy has been very successful in Kenya. The numbers of female contact farmers has grown markedly. While the number of official female contact farmers has risen, many more act as contact farmers in their absent husband's stead (box 8.3).

Box 8.3. Increasing Numbers of Female Contact Farmers - Kenya

The numbers of female contact farmers has grown markedly in Kenya. Women constituted less than 10 percent of all contact farmers in a 1986 assessment, whereas in 1989-90, similar proportions of the male and female farmers surveyed by WAPIA were contact farmers. Women formed the majority of *de facto* contact farmers in Muranga and Machakos Districts where about one-half of the agents worked with women contact farmers in their own right and one-half with women representing husbands. The Ministry of Agriculture and Livestock Development likewise found that while increasing numbers of women serve officially as contact farmers, many more serve as *de facto* contact farmers because their husbands do not farm full-time. Nationwide about half the extension agents surveyed regularly visit official or *de facto* women contact farmers.

8.16 Extension to women's groups has been used to increase extension contact to women as all four country studies show. In Kenya, studies estimate that group extension could reach twice as many farmers at the same total cost as individual extension - and is particularly cost-effective for women farmers (box 8.4). And in Imo State, Nigeria, both extension agents and women farmers requested group rather than individual extension, the policy was changed with very successful results.

8.17 A 1988 seminar in Burkina Faso "Improving Agricultural Extension to Benefit Women Farmers" outlined two potentially successful strategies: (a) creating a "Bureau de Promotion des Activités des Femmes" within the Extension Department; and (b) requiring every extension agent to organize at least one exclusively women's group in addition to mixed groups. Implementing these measures has resulted in the following:

- An increase in total number of women's groups from 20 to 1,394. The women's groups have shown a high level of enthusiasm and more willingness than men's groups to learn new technologies.
- An increase in the number of women directly contacted by extension from 15,000 to 299,000.

Box 8.4. Group Extension Can Reach Twice as Many Farmers at the Same Total Cost as Individual Extension - and Is Particularly Cost-Effective for Women Farmers - Kenya

Groups are preferred to individual extension contact by both agents and farmers. Male extension workers find it easier to visit women's groups than individual women, especially in Muslim areas; farmer to agent ratios are maximized; and agents reduce their travel time and spend more time on site with the farmers. It is estimated that twice as many farmers can be reached at the same total cost by using groups rather than individual farmers and, because larger groups of women than men are willing to meet regularly, these economies of scale are greater with women than men (World Bank 1989a).

Because of Kenya's tradition of group self-help projects, agents have easily identified and worked with women's groups treating them as composite contact farmers. Although some agents report such problems as absenteeism and poor attendance, most evidence points to positive agent/group interactions; increased overall numbers of women farmers reached; increased adoption of extension messages; and the ability of male agents to address most issues. Three-fourths of the members of over one-half the women's groups in Meru and Muranga reported attending sessions regularly (Safilios 1986). Over two-thirds of agents questioned during the WAPIA extension survey in Muranga and Machakos were working consistently with women's groups, and over one-third of these agents work with more than three women's groups.

8.18 Targeting specific proportions of women farmers was the successful basis of the Burkina Faso strategy reported above. However, as a Zambian example shows, directives must be implemented if they are to be effective. In April 1985, the Zambian Director of Agriculture issued a memorandum to all extension staff stating that 50 percent of all contact farmers must be female and suggested that each district should select female-headed households as contact farmers in the same proportion as their representation in the district. However, an FAO paper noted, "extension workers collaborate with local communities to encourage the selection of well-known farmers with whom extension agents can interact. In most cases, women are not selected and as a result are virtually excluded from receiving extension services in those areas where T&V is widely implemented" (Phiri 1987). The situation has still not improved as Bliven (1991) estimates that only 5 percent of contact farmers in the Eastern Province are women.

D. How to Improve the Quality of Extension Services to Women Farmers

8.19 Improve Knowledge and Understanding of Women's Roles The preponderance of men at all levels from policymaker to field agent in government and other development agencies contributes to a lack of understanding of female farmers. To better understand women's agricultural activities and constraints, gender-disaggregated data should be collected and analyzed (box 8.5) and the results used in planning and implementing policies and interventions. The following exemplify additional successful ways of fostering a better understanding of gender among extension staff:

- To increase male agents' awareness and knowledge of women's activities and constraints in Nigeria, ex-Home Economics agents act as Subject Matter Specialists at fortnightly training sessions and discuss the messages from the perspective of women farmers (box 8.2).
- Self-training (*auto-formation*) was used very successfully in the preparation and running of two workshops on the Burkina Faso Case Study. Extension service staff researched and prepared papers on women's activities and on government and NGO projects to women farmers in the local region.

Box 8.5. Gender Analysis of Farmers and Farming Practices

When preparing extension projects, gender analysis is a useful tool to better understand:

Who are the farmers. Who is doing what in the farm household, and what might be done to increase their productivity?

What kinds of crops and livestock are grown/raised; do men and women have specific responsibilities, or are they shared or jointly undertaken?

What resources or inputs are needed for these crops and livestock; do men and women differ in their access to resources such as land, labor, credit, inputs; will unequal access limit output or productivity?

Who makes decisions, and on what? Do women as farm partners, workers and farm managers receive extension services based on their responsibilities?

Who controls the income, and from which products? Farmers invest more time and effort in production when they have and retain control over the outcome of their labor.

Who participates in and benefits from extension program activities? Do men and women attend in proportion to their importance in the farm labor force?

Source: Saito, Spurling and Zijp 1992.

Table 8.4. Content of Extension Advice by Gender

Gender of plot user	Kenya		Nigeria	
	M	F	M	F
No. in contact with EAs	63	38	224	269
% who received				
Vocational training	22	13	21	7
Fertilizer advice	70	77	87	94
Pesticide advice	74	68	75	78
Improved seed advice	73	84	77	84
Land use advice	70	79	74	81
Animal husbandry advice	28	25	42	39
Home economics advice	21	18	33	28

Source: WAPIA survey.

8.20 Improve the content of extension services to women farmers In general little difference was found in the subject of extension advice delivered to men and women in the WAPIA surveys (table 8.4). Similar proportions of men and women in contact with extension agents received advice on the main themes -- fertilizer, pesticide, improved seeds, and land use -- in both Kenya and Nigeria. Regions where extension advice was poor, such as Oyo State and Kilifi District, tended to be equally poor for both men and women. As expected, animal husbandry advice was linked to the prevalence of livestock-keeping in each region; but interestingly animal husbandry advice was given to similar proportions of

farmers in all areas surveyed. However, the recent decision in Kenya to split the home economics and agricultural extension sections of the Ministry of Agriculture will mean that once again extension activities targeting women farmers will concentrate on home economics and ignore agricultural activities (box 8.2).

8.21 Female farmers are disadvantaged by their limited participation in training courses (table 8.4). Attendance at vocational training sessions was lower for women than men both in Kenya (13 percent compared to 22 percent) and in Nigeria (7 and 21 percent, respectively). Only 7 percent of all farmers in the T&V evaluation had attended formal training at Farmers Training Centers, mainly current and past contact farmers, group members, and farmers from male-headed households. The number of farmers from male-headed households attending (34) was almost three times that of female-headed households (12) (Bindlish and Evenson forthcoming).

8.22 The Lima Program in Zambia (a government extension program for smallholders) illustrates how women farmers can be unintentionally discriminated against by agricultural extension messages that help medium-sized commercial farmers. The program's intention was to raise the productivity and incomes of smallholders and to make special efforts to improve women farmers' access to extension but:

- Recommendations for hybrid maize were the first to be released. Many small farmers, and women in particular, came to believe that Lima was hybrid maize and therefore not for them.
- Extension messages contained few if any practical recommendations for important smallholder (and women's) crops such as cassava, sweet potatoes, local maize, millet, and sorghum. Vegetables and fruits, almost exclusively tended by women, also received little or no attention.
- Recommendations were generally aimed at maximizing yields of a few favored cash crops
- The input-intensive nature of the recommendations made them unsuitable for both traditional subsistence and small-scale commercial farmers.
- Recommendations were not developed for the varying conditions existing in the country, for different agroecological zones, intercropping, or mixed farming systems, and no distinction was made between different types of farmers with regard to their cash and labor constraints and their willingness or ability to deal with risk (Sjostrom and Sikanyika 1984; Eklund 1985)

8.23 To improve the content of extension for women farmers, it is recommended that the relevance of technical messages for women farmers' activities and their production systems be reviewed and improved, and that extension messages for women contain the same agricultural information as those for men. It is also important to improve the generation of farm technology to make it more relevant and appropriate for women (chapter 7). Women's participation in formal extension training also needs to be increased by targeting women farmers and by making training programs more accessible to women. For example, by breaking the training into shorter modules and taking mobile training units to villages instead of taking farmers to residential institutes (as done successfully in Zambia).

8.24 Improve Communication between Male Extension Agents and Female Farmers To improve the communication between male extension agents and female farmers, it is recommended that

male agents be trained in methods of communicating, especially with women; that female extension agents make the initial contact with women farmers and introduce them to the extension system and to male agents (box 8.6); and that agent to farmer communications be monitored and evaluated from the farmer's viewpoint.

Box 8.6. Gender Targeting

Gender targeting – using female extension agents as the initial contact with women farmers – is an effective system for introducing extension services to women farmers. Female agents are assigned to work with women's groups with whom they establish trust and credibility. The groups gain confidence in dealing with the agent and are encouraged to raise questions about recommendations. Once effective communication between women farmers and the extension services is established, the female agent gradually introduces the group to the agent assigned to the area, usually a male. The female agent then moves on to work with other women's groups.

8.25 Monitoring and Evaluation (M & E) As the Lima Extension Program in Zambia showed, stated objectives are not always translated into actions. The only reliable way to evaluate the success of measures to help women farmers is to monitor routinely what happens, and to make modifications in light of the results. Hence, all extension programs should routinely collect gender-disaggregated data as part of the process of monitoring extension programs. M&E has been successfully used in Burkina Faso to modify extension policy and procedures (box 8.7).

Box 8.7. Analysis of Official Agricultural Extension Projects for Their Impact on Women Farmers - Burkina Faso

Mid-term evaluation of the World Bank-funded *Project de Renforcement des Structures d'Appuis aux Producteurs* found that preconceived ideas generally guide the identification of measures to aid women rather than a diagnosis of local conditions with the active participation of the beneficiaries. The following recommendations were made:

- Consider women's problems as problems of development as a whole.
- Place the Offices of Promotion of Women under the Regional Centers for Agropastoral Promotion and develop specific programs for women within each Regional Center for Agropastoral Promotion.
- Improve collaboration between different ministries and NGOs who work/intervene with women.
- Improve understanding by project staff of the local conditions and government objectives.
- Train women in such tasks and roles as management of mechanized mills.
- Employ male and female extension agents on equal terms.
- If there is a conflict between community and individual extension activities or between agricultural and commercial activities, ensure that women participate in individual activities, particularly commercial ones, so the benefits will accrue to them.

8.26 Coordinate or reduce the competition between donors for scarce resources Donors have different aid philosophies and agendas; they prefer to fund specific discrete projects to which the recipient country's staff and resources are often diverted. Zambia for example has about 100 donor-supported agricultural projects and another hundred under preparation and in Burkina Faso over 100 NGOs are active in the CRPA du Centre Quest alone. Donor-specific projects frequently are not sustained after the end of the funding period. Often the lack of coordination and conflicting objectives adversely affect the

success of government policy and the efficient use of government resources. Governments need to ensure that activities and services of different donors are complementary and not competitive. To improve the efficiency of donor-funded extension programs, governments should prioritize extension needs and hold regular donor coordination meetings, and donors should agree to cooperate and coordinate among themselves and with government so that their funding and activities fit into a unified coherent program.

E. Concluding note

8.27 As the productivity analysis of the Kenyan data in chapter 4 showed, contact with extension significantly and positively affected the gross value of male farmers' output, but not female farmers' output. To address the problem of improving extension to women farmers, three strategies need to be pursued simultaneously. These are:

- more female farmers need to be contacted by agricultural extension agents. Female heads of households are most in need of extension contact because relatively few are in contact with extension agents and are less likely than female members of households to receive information from close relatives. They also have considerable decisionmaking authority on whether or not to implement the advice.
- the quality of communication must be improved: male agents must be sensitive to the problems of women farmers.
- the messages must be suitable for the objectives and constraints of women farmers.

However, for extension to be fully effective, an adequate supply of complementary inputs must be readily available.

Chapter 9. Financial Services for Women Farmers¹

A. Introduction

9.1 Financial services are important instruments for improving productivity. They promote a more efficient allocation of resources among resource-surplus and resource-deficit agents in the economy; they can also make it cheaper and less risky to trade goods and services and to borrow and lend. For individuals with few assets, access to finance makes it possible to (1) smooth consumption over time, (2) finance technological and capital improvements and thereby raise productivity, (3) acquire working capital to obtain inputs in a timely way, and (4) take advantage of market opportunities.

9.2 For smallholder farmers all four features are important. The nature of smallholder crop production means that cash income is generally earned in a "lumpy" way - - when produce is sold after the harvest. The opportunity to save surplus income at that time, as well as to borrow at the beginning of the planting season to obtain needed production inputs, are important short-term financial needs of farmers. In addition, longer-term credit is needed for fixed capital improvements such as fencing, terracing, tree-planting, or small-scale irrigation.

9.3 Among the farmers surveyed in Kenya and Nigeria, cash flow problems were cited as a major problem, resulting in inadequate or untimely purchase of inputs, particularly fertilizer, improved seeds and hired labor. In Nigeria for example, cash shortage was the main reason cited for not using fertilizer by 45 and 48 percent of female and male respondents, respectively. Credit problems in general were cited by 74 percent of all farmers surveyed in Nigeria and by 67 percent of all farmers surveyed in Kenya.

9.4 The main credit-related problems cited by farmers surveyed were the unavailability of bank loans (39 percent in Nigeria and 12 percent in Kenya) and lack of collateral (20 percent on Nigeria and 42 percent in Kenya). One-third of all farmers surveyed in Kenya and 21 percent of those surveyed in Nigeria cited the lack of collateral as the main reason for not using credit over the preceding twelve months. Lack of awareness or information about the availability of formal credit was also a concern. Only 10 percent of farmers in Nigeria and 14 percent in Kenya complained of the interest cost being too high.

9.5 As the country studies show, rural people, especially women are heavily involved in farming and in a wide range of other income-earning activities. Improved access to financial services would enable them to acquire working capital for their farms and fixed capital to invest in other activities, such as agroprocessing equipment and storage facilities.

B. Formal Financial Services for Smallholders

9.6 Smallholders are not well served by formal financial institutions. Thirty percent of farmers surveyed in Nigeria and 12 percent in Kenya had obtained credit over the last twelve months. Of the total loans they received, only 13 percent in Nigeria and 5 percent in Kenya were from banks (table 9.1). Cooperatives were a more common source especially in Kenya where 42 percent of all loans

¹ This chapter draws on "Gender Aspects of Financial Services in SSA: Issues and Options (Lessons)", by H. Nankani 1991, and presented in Saito et al., 1992.

obtained were from cooperatives. But, the main source of credit for both men and women in the two countries was informal, from moneylenders, relatives, and credit and savings societies.

9.7 Some of the main problems associated with formal financial institutions providing financial services to smallholders are the following:

- The experience with **government agricultural finance institutions** in SSA, as elsewhere, is extremely poor. These institutions tend to cater to the medium- and large-scale farmers; no farmers surveyed in Kenya for example, had obtained loans from the government's Agricultural Finance Corporation, the main agricultural finance institution in Kenya, which deals mostly with medium- and large-scale farmers. Moreover, these organizations have tended to be financially unsustainable over time because of their reliance on public subsidies to underpin their subsidized interest rates, and their poor repayment record resulting from inefficient and ineffective screening of clients. The example of the Agricultural Finance Corporation of Kenya amply illustrates these weaknesses.
- The financial services provided by **cooperatives** are usually limited to short-term credit, and tied to the sale of a particular crop. In Burkina Faso, for example, most formal credit is tied to cotton, and the parastatal that buys cotton - SOFITEX - provides short-term credit for the purchase of inputs needed for the crop. As farmers sell the cotton crop to SOFITEX, loans are recovered by deducting the payments from the sales proceeds. Similarly in Kenya most of the cooperative credit is tied to the sale of coffee. Few cooperatives offer deposit facilities.
- Private commercial banks are not very active in rural areas because lending in such areas needs extensive outreach, tends to have higher transaction costs, and is more risky than other business. Some governments require a certain percentage of commercial bank lending to be directed to agricultural borrowers. For example, in Nigeria 45 percent of the lending portfolio of commercial banks must be allocated to agriculture. This not only distorts the financial market, but bankers find ways to avoid such quotas. Commercial banks usually require collateral which few smallholders can provide. This problem is discussed further below.

C. Women's Access to Credit from Formal Institutions

9.8 Among smallholders, women are particularly disadvantaged in their access to formal financial services. The country studies clearly show that fewer women than men obtained credit from formal institutions. In Kenya for example, only 3 percent of female farmers surveyed had obtained credit from a commercial bank compared to 14 percent of male farmers. Similarly in Nigeria, 14 percent of male and only 5 percent of female farmers surveyed had obtained credit from a bank (table 9.1).

Table 9.1. Sources of Credit by Gender in Kenya and Nigeria

	KENYA				NIGERIA			
	Household heads		Other household members		Household heads		Other household members	
	M	F	M	F	M	F	M	F
Number of observations	436	161	655	464	536	101	706	704
% getting credit	11	18	9	14	36	40	31	24
Source of Credit (as % of loans)								
Bank	13	3	14	3	15	3	14	5
Cooperative	58	31	56	38	24	5	24	11
Money Lender	15	55	17	37	13	10	12	8
Relative	17	24	15	29	37	43	41	46
Credit and Savings Society	4	3	3	3	32	48	30	34

Source: WAPIA Survey.

9.9 Not only did relatively fewer women obtain credit, but loans to women were also much smaller than those to men: the mean size of loans to women was only 42 percent of those to men in Nigeria and 61 percent in Kenya. In part this reflects the difference in loan source (bank loans tend to be larger than loans from other sources), but women received smaller loans from nearly all sources compared to men (table 9.2). The extent to which this is because women requested smaller loans than men is unknown, but given women's generally much smaller farms, this is very likely.

Table 9.2. Mean Size of Loan by Gender in Kenya and Nigeria

	KENYA (Ksh)				NIGERIA (Naira)			
	Household heads		Other household members		Household head		Other household members	
	M	F	M	F	M	F	M	F
Number of observations	589	274	802	597	702	184	901	874
Bank loans	5900	2625	8161	2063	2897	2010	3033	2056
Cooperative loans	4407	2935	4285	2461	726	425	751	344
Moneylender loans	167	998	751	803	858	398	828	345
Relative loans	497	460	569	294	1108	1108	1137	367
Credit savings society	540	250	7135	2525	998	299	976	585

Source: WAPIA survey.

The large gender differences in obtaining formal credit can be attributed to several factors:

- **Women are less mobile than men.** The very limited rural outreach of formal financial institutions together with limited transport facilities in rural areas affect all farmers, but women are particularly adversely affected because for them the opportunity costs of the time needed to travel are very high. The econometric analysis in Chapter 4 of the factors affecting the use of credit in Kenya showed that the distance to a bank significantly and negatively affected the use of credit by female farmers, but not by male farmers.
- **Women are less educated and less literate than men.** Despite progress in female school enrollment in many countries in SSA, a huge historical deficit of literacy exists among adult women; more than half the women in SSA over twenty-five years of age remain illiterate (Sivard 1990). Illiteracy is a major disadvantage in dealing with formal financial institutions. Besides being intimidated by formal banks and bankers, women are less able to comply with the requirements of formal banks such as completing application forms or formulating investment or cash flow projections. In Ghana for example, market women preferred informal group loans with higher interest rates to formal bank loans partly because "raising loans requires no big formalities" such as filling out several application forms (Gabianu 1989). The econometric analysis of the factors affecting the use of credit in Kenya found that the education of female farmers significantly and positively affected the use of formal credit, for male farmers the education level was not significant.
- **Women lack adequate collateral.** As shown in chapter 5 on land, women rarely have title to land, which banks typically require as collateral. In Kenya 50 percent of women surveyed compared to 35 percent of men cited lack of collateral as their main problem in obtaining formal credit. Similarly, in Burkina Faso lack of adequate collateral makes it difficult for women to obtain credit from such government institutions as the Funds for Water and Rural Equipment and the National Bank for Agricultural Credit (Morin and Buxell 1989).

9.10 In Kenya and Nigeria, the main collateral provided by farmers varied by locality; in Nigeria, land was the main type of collateral for both men and women, and co-signature of loans was also important for women. Pledging future crop sales was especially common in areas growing cash crops and where cooperatives were the main source of credit (as in Muranga in Kenya where coffee is widely grown and cooperatives are active in its marketing). Group guarantees accounted for less than 2 percent and 15 percent of the collateral provided by men surveyed in Kenya and Nigeria, respectively; no women surveyed used a group guarantee as collateral (table 9.3).

Table 9.3. Collateral Provided for Credit by Gender in Kenya and Nigeria
(as % of loans)

	KENYA				NIGERIA			
	Household heads		Other household members		Household heads		Other household members	
	M	F	M	F	M	F	M	F
Land	8	7	10	9	25	33	23	24
Future Crop	73	79	71	79	19	33	20	29
Cosignature	8	0	10	6	23	33	20	14
Group guarantee	2	0	2	0	15	0	29	10
Building	0	0	0	0	10	0	12	19
Other	8	14	14	4	8	0	10	5

Source: WAPIA survey.

D. Informal Sources of Credit

9.11 Relatives, moneylenders, and savings and credit groups are by far the most important sources of credit for women farmers. The relative importance of these services varied widely both between and within countries. In the Kakamega District of Kenya, for example, the main sources of credit to women were moneylenders (56 percent) and relatives (35 percent), and in Nigeria, the main sources were relatives (56 percent) and credit/savings societies (34 percent).

9.12 Credit and savings groups are often cited as an important source of credit for rural women. By reducing the costs to both lender and borrower of information related to screening and strengthening repayment incentives, and contract enforcement, group lending can help to expand credit services to clients (Stiglitz 1990). Rotating savings and credit associations (ROSCAs), as well as geographical and kinship groups are widespread in SSA (Udry 1989), especially among women (box 9.1). They vary in their organizational structure and ways of operating. In Burkina Faso for example, ROSCAs (*tontines*) are common in rural areas, especially among women. The typical ROSCA has between twenty to thirty members who know each other, often because of location, activity, or kin, and group cohesiveness is fostered through frequent meetings that combine social and business affairs. Each member contributes a fixed sum of money on a regular basis to a pool and the group members receive the total amount collected in turn.

9.13 In Nigeria ROSCAs were the main source of credit for female household heads and second in importance to relatives for other female farmers. In Kenya, they were a surprisingly minor source of credit for both the male and female farmers surveyed. Although levels of membership in such groups were high, they far exceeded frequency of borrowing. Excluding the Kilifi district in Kenya, where membership was very low, 5 to 9 percent of men and 20 to 30 percent of women surveyed were members of savings and credit groups, yet only 2 of 34 male members and 2 of 100 female members had borrowed from their societies over that cropping season. This appears to reflect the prevalence of cooperatives in the districts surveyed and the widespread availability of crop-related, short-term credit from these cooperatives.

Box 9.1. "Evolution" of ROSCAs

Type I: Rotating Savings Associations (RSA)

Members pay a fixed amount at regular intervals, and each in turn receives the total amount contributed. When all members have received the full amount at least once, the next cycle begins. In most African countries, saving is the primary motive. When the credit element becomes larger, as in Asia, interest may be charged on an incremental scale, or competitive bidding may be used to turn the RSA into a ROSCA.

Type II: Rotating Savings and Credit Association (ROSCA)

Members pay fixed amounts at regular intervals. Part of the contribution is allocated to one member at a time in rotating order; another part is put into a general fund for loans, insurance, etc.

Type III: Non-Rotating Savings Associations

Members pay fixed or variable amounts at regular intervals. The contributions are deposited and paid back to individual members at the end of the stipulated period.

Type IV: Non-Rotating Savings and Credit Associations

Each member pays a fixed or variable amount at regular intervals. The income of the association from such sources as contributions, fees, penalties, joint businesses, etc. is put into a fund which may be utilized for loans, insurance, and social services. The fund may be established for a specified or unspecified period. Contributions may or may not be paid back at the end of a stipulated period. Interest rates tend to be high as they provide an additional source of funds.

ROSCAs are part of the informal financial sector and hence often lack legal status. Yet some do have an organizational structure headed by an elected executive committee. There may or may not be written rules and regulations. Membership lists are kept and some form of bookkeeping is undertaken. Local social contract mechanisms effectively prevent default or fraud.

Source: Adapted from Hans Dieter Siebel 1989.

E. Lessons Learned: Promising Approaches

9.14 By far the most serious problem among smallholders, women in particular, is the lack of formal credit. The interest paid on all loans - - both formal and informal - - was of much less concern to farmers surveyed than the availability of credit. A strong case can be made for expanding the supply of unsubsidized credit to women since specific gender-related constraints inhibit their access. Relatively low levels of education, unfamiliarity with modern financial instruments and institutions, and rural traditions that often limit their response to market opportunities all disadvantage women in their access to formal credit. Yet, evidence from Africa and elsewhere shows women to be reliable and responsible borrowers.

9.15 In the informal sector, savings and credit arrangements are either individual or group transactions. With individual-based arrangements -- such as relatives and friends, loans are typically provided without interest and require no collateral, and information asymmetry among borrowers and lenders is low. A major problem with individual-based arrangements is the limited amount of finance available. Personal savings, often accumulated through group-based arrangements, are common among women in Africa. They constitute an important source of supply and demonstrate a demand for financial

services.

9.16 Informal financial institutions also deal reasonably well with information asymmetry problems, but are particularly constrained by the limited volume of resources they can mobilize and by gender-related legal and cultural barriers. Money-lenders and ROSCAs efficiently overcome information asymmetry by making explicit or implicit use of direct and indirect mechanisms such as reputation effects, market interlinkages, geography/kinship, and group liability instruments. But money lenders have limited funds to lend and, because they typically live in the same economic environment as borrowers, adverse shocks in the local economy affect both. Friendship loans and trade credit are less efficient: they use fewer mechanisms to screen clients with the former relying on kinship and the latter on market linkages. Informal financial markets are generally sensitive to the legal/cultural/gender issues, and have low transaction costs. But they have one overarching limitation: they generate a low volume of credit because their ability to mobilize funds is limited to small groups in a geographically confined area.

9.17 Clearly there is room for innovation and development. One example is the Promotion of Rural Initiatives and Development Enterprises Ltd. (PRIDE), launched in Kenya in 1989. This scheme serves a large number of small entrepreneurs who have little or no access to financial services. One-third of its participants are women. To minimize risks PRIDE requires clients to pay an annual membership fee and make weekly contributions to a loan insurance fund. Clients can reclaim the money when they leave the program, but if they default, PRIDE has recourse to the fund. A particularly interesting feature of the program is the planned graduation of clients to commercial banks (box 9.2).

9.18 Despite numerous experimental efforts, many with strong donor support, to design credit systems to serve effectively the needs of African women farmers, none has yet succeeded on finding a replicable model. The Grameen Bank model from Bangladesh is often suggested as appropriate. One attraction of the Grameen Bank is its reliance on groups similar to the ROSCAs of SSA (box 9.3). There are doubts, however, as to whether it would work in SSA. One major difference is Bangladesh's extremely high population density which permits intense loan supervision at minimal cost. In most of SSA, this is not possible. Pilot projects attempting to replicate the Grameen Bank include the Pride Project in Kenya (box 9.2) and the CUSO project in Ghana. A longer track record is needed with both projects to assess their viability. Possible implications of Grameen Bank's financial sustainability and growth arising from the hidden financial and organizational subsidies of their non-credit services, also should be borne in mind.

9.19 A greater effort is needed to explore and identify the informal savings and credit systems that are working for smallholders in Africa, together with ways of linking them to formal financial systems once they have been made to work. Such linkages would help to deepen the financial sector. One possibility is to use the informal financial sector as "financial retailers". For example, a commercial bank or government financial institution could lend to an affiliation of informal financial schemes (such as the Groupement Zabre in Burkina Faso, see Box 9.4) which would then on-lend to their women's group members. Such an arrangement would help preserve the characteristics of the informal sector that constitute its strengths -- that is flexibility, rapidity, transparency of procedures, personal relationships, and low transaction costs. Such arrangements would require an imaginative linking of formal and informal institutions with competent NGOs, local bank branches and ROSCAs providing linking mechanisms between formal institutions and the clients. The affiliation arrangements of groups in the PRIDE organization in Kenya provides useful lessons (box 9.2).

Box 9.2. The Promotion of Rural Initiatives and Development Enterprises (PRIDE), Kenya

The PRIDE financial scheme in Kenya has interesting features which make it promising:

- Members select each other from persons who know or deal with one another in other activities thus effectively using geography/kinship, group-liabilities and peer-monitoring mechanisms. Members must have existing businesses and include those with very small informal sector activities.
- PRIDE groups are arranged in two tiers. At the lowest level is the Enterprise Group (EG), a self-selected set of five people, usually from the same community or market center. Each loan application by one member of an EG must be guaranteed by all five. Ten EGs form a Market Enterprise Group (MEG), also self-selecting and responsible for each others loans.
- The annual membership fee is 100 Ksh and 50 Ksh is paid weekly into a Loan Insurance Fund (LIF). The LIF is a forced saving element that reduces the risk of default and lower transaction costs. PRIDE can reimburse itself in case of default.
- Sixteen weeks of instruction are given before the first loan is disbursed.
- First loans are limited to US\$200, with each subsequent loan increasing by \$200 up to a maximum of \$1000. Interest is charged at 14.5 percent straight line or 27 percent on a declining balance, compared to a commercial bank rate of 15.5 percent. Many clients repay early in order to access larger loans.
- Loans are guaranteed for one year with weekly payments of principal and interest. Transaction costs are 11 percent.
- Branches are predicted to cover all recurrent costs after 18 months of operation, and capitalize loans through client savings after five years.
- PRIDE intends to graduate some clients to commercial banks.

Early indications are that PRIDE will be successful. However, schemes that do not rely on the use of collateral typically show initially high recovery rates. These tend to fall over time because screening quality declines, supervision becomes lax, and the decreasing prospect of future loans increases the incentive to default.

Box 9.3. The Grameen Bank and ROSCAs

Key factors in Grameen Bank's success

Organizational structure is hierarchical. Five people in each self-selected group, 5 groups constitute a "center" which interacts with one Bank Worker.

Non-collateral loans. ROSCAs and Grameen use "group solidarity" as a form of collateral. Group members are responsible both for assessing the character of borrowers and for the defaults of individual members.

Repayment schedule. Grameen requires that 2 percent of each loan be paid back during weekly meetings. In general, the amount lent, frequency of repayments, and duration of loan are tailored to the needs of the borrower and group. ROSCAs similarly schedule meetings and repayments to meet members' needs.

Training and technical assistance. Group meetings of the Grameen Bank and ROSCAs provide a forum for the delivery of non-financial services to the group.

Grameen's clients. Poor landless borrowers are targeted because rich clients will find the transaction and opportunity cost of attending weekly meetings too high.

Grameen's "corporate culture". "A dedication or commitment to thoroughness and accuracy in applying procedures, particularly concerning loan repayment; and high personal productivity" – appears to be an essential element in its success (to date). It may not be easily replicable or substituted for. This management philosophy has 6 components: a sense of higher purpose; a sense of ownership of the organization and its results by the employees; rapid and thorough feedback; good training of employees; a tight set of controls and audit; and staff advancement based on performance.

Positive characteristics shared by Grameen and ROSCAs

Low transaction costs per borrower particularly in Bangladesh with its high population density.

Minimized risks through group solidarity.

Flexibility with approaches modified to suit different credit needs while maintaining loan quality.

Quality of portfolio strengthened by providing start-up training and technical assistance, and by selected continuing services.

Source: Rippey 1988.

Box 9.4. Zabre Women's Association in Burkina Faso (Groupeement Zabre) - Credit to Rural Women

The Groupeement Zabre was founded in 1975 by five women and has grown steadily in membership. Today it includes about 10,000 women members in more than 100 villages. The growth of Groupeement Zabre was assisted by personnel from the Ministry of Health and Social Action and by financial support from NGOs and multilateral donors. Individuals receive loans of between 10,000 and 25,000 CFA. To date all loans have been repaid on time with interest. Flexible collateral arrangements and peer pressure from other group members to repay promptly have contributed to its success.

9.20

Formal financial institutions also need reform so that inter alia they become more

accessible to the poor. For example, these institutions should be encouraged to introduce financial innovations to reduce their transaction costs and risks of lending to the poor by adopting and adapting informal practices. Examples from Indonesia (where the government runs pawn shops) and India (where banks organize "chit" funds or ROSCAs) are worth examining to assess their relevance to Africa.

9.21 A third alternative is to use the solidarity principle to protect against individual and social risks. Using a "solidarity group" approach with joint liability for borrowing assumed by a group of borrowers can be a viable alternative to the more traditional collateral required by banks. Given the importance of social insurance in the rural sector, insurance schemes -- or deposits with a tied-insurance element -- hold promise. The "money-back" scheme in Ghana is a successful example of such a linkage (box 9.5).

Box 9.5. The State Insurance "Money Back" Scheme - Ghana

Launched in February 1987 by the State Insurance Company (SIC), this program combines informal group-based savings and lending with the safeguards and offerings of more formal financial institutions. The scheme -- called "Money Back" because a contributor gets her money back after one year -- links life insurance policy with saving and lending operations. Members, who are mostly market women, contribute daily any amount they choose in the range of 25 cents to \$4. After 6 months, contributors who have paid in at least 200 cedis (50 cents) daily qualify for a loan. In addition, healthy members between 18 and 60 years are entitled to life insurance, with premium schedules linked to daily contributions. Even if a contributor dies before her "money back" year is over, her beneficiaries receive the equivalent of her total annual contribution.

Advantages of the "Money Back" scheme are:

Information asymmetries are offset by limiting the geographic area of operations; interlinking savings, life insurance and occasional short-term credit transactions; and group or peer monitoring because most participants are also members of other groups. Thus many benefits of informal schemes are captured.

The scheme is flexible and changes to meet client needs: hours of operation are convenient for members, and lending periods increased from 30 to 90 days when clients demanded extended loan terms.

Interest rates compare favorably if the opportunity cost of borrowing from commercial banks is taken into account. Charges are 4 percent for 30-day periods, which at 48 percent per annum is greater than the commercial bank rate of 35 percent.

Transaction costs for borrowers and lenders are minimized. SIC's low-paid agents reach many borrowers quickly by visiting markets to collect payments. Clients like the informality of the market, and if payments are up to date, loans can be received the day they are requested.

Risk is negligible for borrowers and lenders. The SIC is a government entity that can guarantee the funds it holds. There is some danger that agents will abscond with daily takings or borrowers will default on their uncollateralized loans, but close relationships among market women impose social sanctions against such behavior. Contributors who fall behind are allowed to pay the arrears and have their insurance policies restored.

Economies of scale are provided. Each traditional savings -- "susu" -- although well organized and efficient in mobilizing savings, acts separately. SIC's superstructure enables it to provide additional services such as insurance and more flexible lending.

Evaluation:

Good public relations have enhanced the scheme's appeal. But it is relatively new and has not yet stood the test of time.

F. Concluding Note

9.22 Cost-effective and sustainable financial services are critically needed by African smallholder farmers – both men and women. As the country studies show, they are presently quite inadequate. Availability of inputs and technologies is to no avail unless farmers have the means to obtain or use them, and the seasonal surpluses of agricultural income may not be invested to full advantage. Properly designed and complemented by an enabling policy environment, credit can act as a catalyst to overcome such obstacles and help lenders overcome deficiencies in information. Initially, the objective must be to help female borrowers overcome the barriers that prevent them from borrowing from formal institutions. The key institutional challenge is to draw on the strengths of informal savings and credit systems – particularly in relation to client information and flexible collateral arrangements – to lower the transaction costs of formal institutions and to overcome the financial limitations of informal schemes by establishing links with formal financial institutions. Such links would expand access to credit for good borrowers and lower default rates for formal institutions. Targeting may also be needed, however, this should be temporary with criteria established for determining when it should end. Other broader financial sector reforms to remove existing obstacles to the efficient functioning of the market are also needed. These include decontrol of interest rates, more effective legal protection of claims, and a reduction in discriminatory pricing policies that reduce borrowers creditworthiness (World Bank 1991).

Chapter 10. Summary of Findings and Recommendations

10.1 Women are so important in African agriculture that initiatives to raise the sector's productivity cannot afford to ignore them. As earlier chapters have shown, women do most of the work on the farm and have become the key decision-makers on matters affecting farming practices. Yet women's access to agricultural inputs and support services is not commensurate with their farming responsibilities.

10.2 Drawing on the four country studies, this Overview Report has summarized the special difficulties women farmers in SSA face. The chapters have described the economic and social environment in which they work, analyzed the constraints that confront them, and identified a range of policy and institutional measures to remove or ameliorate impediments to raising their productivity.

A. Summary of Findings

10.3 **The African rural household is changing and traditional farming systems are breaking down.** In response to evolving social and economic circumstances, particularly growing population pressure on an increasingly degraded land, men are leaving the farm in search of more remunerative activities, and the traditional pattern of intra-household rights and obligations is changing. The gender-specific nature of African farming is disappearing as women are growing crops (such as coffee and other cash crops) and taking on tasks (such as land clearing) that were previously men's responsibility.

10.4 These evolving circumstances have exerted a profound impact on the role of women in African agriculture. In all four countries studied smallholders are the core of the agricultural sector and **women now comprise the majority of smallholder farmers, providing most of the labor and managing farms on a daily basis, and many are heads of households.** Women have become the **de facto** managers of the rural household. In Kenya, for example, 61 percent of rural women surveyed cited farming as their main occupation compared to only 24 percent of men. Women now work longer hours on a wider range of farming tasks primarily because of male migration of the farm. When this work load is added to their traditional responsibilities of child rearing, household management, and off-farm income-earning activities, their work day has become very long, about 50 percent longer than men's.

10.5 **Female-headed households (FHH) are a growing phenomenon in SSA.** In Zambia for example, they comprise about one-third of all rural households and up to 51 percent in the Northern Province. Such households are not homogeneous and tend to fall into three groups: autonomous households recognized and accepted as headed by women (mostly widows and single women); households *de facto* headed by wives during the male "heads" absence; and polygamous households where co-wives head economic subunits (of themselves and their children) within the household. Women heading households tend to have lower levels of education than men and other women, yet their children have more years of schooling than those of male headed-households. Landholdings of FHH are much smaller than MHH (in Nigeria they are one-third the size), and FHH tend to have fewer farming adults and less farming equipment than MHH (in Kenya they have less than one-half the total value of farming equipment of MHH).

10.6 Women farmers in general are disadvantaged in their access to resources and factors of production compared to men. Simple comparative evidence from Kenya, for example, suggests that

men's gross value of output per hectare is 8 percent higher than women's. However, chapter 4 concluded that if women had the same human capital endowments and used the same amounts of factors and inputs as men, the value of their output would increase by some 22 percent. Thus women are quite possibly better -- more efficient -- farm managers than men. Their productivity is well below its potential. Capturing this potential productivity gain by improving the circumstances of women farmers would substantially increase food production in SSA thereby significantly reducing the level of food insecurity in the region. If these results from Kenya were to hold in SSA as a whole and recalling that women produce an estimated 75 percent of the region's food, simply raising the productivity of women to the same level as men could increase total production by 10 to 15 percent.

10.7 Within a given agroecological environment, agricultural productivity is affected by the amounts of land, labor, capital and other inputs that are used, by the quality of these factors such as fragmentation and fertility of land, the education and health of the farmer, and the form that capital takes, e.g., tractors, hoes, and the technology used. Laws and institutional structures, public policy and the social fabric of the society all affect the access that farmers have to these production factors and inputs. These effects are not gender neutral. Although many affect male and female farmers equally, others affect women farmers disproportionately.

10.8 The econometric analysis in Chapter 4 showed that in Kenya and Nigeria contact with extension increased the probability of both men and women adopting new technologies, but did not increase the total value of output of women farmers as it did for male farmers. Possible reasons for this difference include a lack of complementary inputs, incomplete adoption, poor explanation and hence understanding of the technologies (women complained in both Nigeria and Kenya that the technology was "too technical"). The male-dominated research and extension staff frequently lack understanding of women's roles and constraints, and cultural norms hinder effective communication between male extension agents and female farmers. Furthermore, agricultural technical messages concentrate on the resources, commodities and tasks of more interest to men than women, while extension to women often revolves around home economics subjects. Finally, women's attendance at extension activities and training is constrained by their lack of time and mobility.

10.9 In other words, although the provision of extension services to women farmers has improved over the past few years, women's contact with extension does not have the same impact on output as men's contact with extension. The WAPIA survey results from Kenya and Nigeria show that the apparent quantitative equality between men and women -- similar proportions are in contact with extension agents -- masks inequalities within the female farmer population. Extension advice is skewed in favor of female household members who have relatively few decision-making powers. Compared to male heads or female household members, considerably fewer female heads, who are the most important group of women farmers in terms of their authority to change farming practices and the number of dependents for whom they are responsible, receive extension advice.

10.10 Smallholder agriculture in SSA is characterized by labor intensive technology and low labor productivity. The average and marginal productivity of labor are low because farmers, especially women farmers, lack complementary inputs that would raise their labor productivity. What is needed is a comprehensive upgrading of farm technology, especially for women farmers. About 1 percent of farm tasks in Africa are performed by mechanical means, about 10 percent by animals, and the remainder by human power. Women use hand tools and equipment much more than men. In Kenya, hand cultivation was used on 92 percent of the plots farmed by women, compared to 72 percent of men's. Oxen and tractor were each used on 4 percent of women's plots and on 12 and 15 percent, respectively,

of men's plots. Women typically lack technologies to relieve time-consuming agricultural tasks such as weeding, transplanting, and harvesting. Grinding, transport, and water and fuel collection are the main non-agricultural activities where appropriate technologies can reduce women's time and energy use. Without such labor-saving technologies and other complementary inputs (see below), women are locked into a low input, low output equilibrium.

10.11 Within the context of a growing shortage of good quality farming land in SSA, **women are particularly disadvantaged compared to men since they farm smaller plots of land with more uncertain tenure.** For example, Nigerian households headed by men on average cultivate three-times more land than female-headed households -- on a per capita basis male-headed households have double the land of female-headed households. Women also have more uncertain tenure than men. Since the 1960s attempts have been made to improve women's rights to land, but in practice the situation has worsened: growing population pressure on increasingly depleted land has further weakened women's land rights. Improving women's land tenure rights would not only encourage women to invest in the land they are using, but also to practice environmentally better farming practices. Land title would also improve women's chances of obtaining formal credit. Increasing output by expanding the area under cultivation is generally not an option in SSA because there is little arable land uncultivated. Moreover, the existing land under cultivation is increasingly threatened by degradation. However, even if women were able to increase the size of their holdings, given existing farming technologies, women and especially female-headed households would have difficulty in obtaining the additional labor needed to clear and farm it. Raising land productivity is of central importance.

10.12 The country studies show that **the percentage of women obtaining credit from formal financial institutions is less than half that of men.** Women farmers have less access to formal credit because: (i) they are less mobile than men, and given the limited outreach of formal institutions, the opportunity cost of the time needed to travel to and from is very high; (ii) women are less educated and literate than men which makes them less able to comply with the documentation needed by banks; and (iii) women lack adequate collateral, particularly land title. The main source of credit for women is informal -- families, relatives, and rotating credit schemes -- all of which have a major limitation: the amount of credit they can provide is small.

10.13 As described in this overview report, and in more detail in the country studies, there are ways to improve women's access to resources and so to raise their productivity. The major change required is that governments and donors should recognize women as the major agricultural producers. Once this is done, modest changes in policies and institutional behavior could produce bumper payoffs. However, gender-neutrality and barrier removal is not enough, unless women are positively targeted they tend not to benefit from efforts to improve the access of smallholders in general to resources. Ways must be found to provide women farmers with the same access to productivity-enhancing inputs and support services as men. This is not to argue in favor of measures to support only women but rather that their special problems need to be integrally viewed and addressed when development policies and programs are designed and implemented. The main strategies to improve women's access and so raise their productivity are summarized below.

B. Recommendations

10.14 Increasing agricultural productivity involves three sets of issues: **policy issues** of how to provide an enabling macroeconomic environment for farmers, particularly an appropriate incentive framework; **technological issues** of how to increase productivity within the confines of the agro-

ecological and physical environment; and **organizational issues** of how to improve agricultural support services to farmers and their access to inputs. Cutting across all three is gender. Hence, solutions to all of these sets of issues should explicitly incorporate gender. The recommendations and examples of interventions given below have cross-country relevance; country-specific policy and technical recommendations and other examples and more details can be found in the overview chapters and in the country studies.

1. *Labor Productivity*

10.15 To increase the productivity of women's labor, it is recommended that: **technologies that will reduce the time and energy women expend in carrying out agricultural and non-agricultural activities be developed and disseminated to women. Research should be conducted on labor-saving tools and equipment that are financially accessible and viable, suitable for the time and mobility, size and strength of women (including field tools, agroprocessing equipment, stoves, water collecting, and transport). Research is also needed on labor-saving production technologies (at the same time ensuring that women have access to the complementary resources or inputs needed if the technology is to achieve its potential). The participation of women in the development, testing and evaluation of these technologies should be increased. Extension or introduction of these technologies should be accurately targeted to women who are the potential users (for example, if it is not men's responsibility to collect and use fuel, they are unlikely to be persuaded to buy efficient stoves, or to harvest woodlots as fuel). Women should be trained in the operation and maintenance of the equipment. Rural infrastructure and facilities should be improved and expanded. The liaison between researchers, users, manufacturers, repairers and retailers should be improved; and that donors encourage and fund the development, adaption and adoption of labor-saving technologies by national and international organizations, support membership of research networks, and promote more effective liaison between donor agencies.**

10.16 The productivity of all agricultural labor, and women's in particular, is low. Labor productivity must be increased before women can take full advantage of cash-based technologies and before women, being assured of food security, can diversify into higher-value commodities. Two major reasons for this low productivity is the extreme seasonality of agricultural work and the labor-intensive technology used by women. Another factor highlighted in the Kenya Country Study is the financial unviability of many "income-generating" activities. It is recommended that technologies be developed that will reduce the seasonality of labor input demand. Labor peaks can be reduced, for example, through cultural practices (such as herbicides or sod-seeding) or varieties (short-term or tolerant of weedy conditions) or changing the mix of enterprises. School holidays can be timed to coincide with labor peaks as in Kenya. Cooperative arrangements for childcare, food preparation or other activities (as in the Yoruba society), or the traditional practice of pooling labor through women's groups should be encouraged. Filling-in troughs, in labor demand, for example by promoting dry season activities, can increase the productivity of labor throughout the year. It is recommended that the governments act to increase the marginal value product of labor and so allow a real increase in agricultural wages. An incentive framework (input and output prices) and promote other measures should be promoted. The financial viability of such women's group activities as posho mills should be investigated. This would require analyzing a sample of groups, identifying the problems, and training group members in accounting and management skills, and in skills directly related to the activity.

2. *Land Productivity*

10.17 Because of the low level of labor productivity of female farmers, it is unlikely that they would benefit from access to extra land even if more land were to be available. However, women's productivity is constrained by a number of land-related factors. Fewer women than men receive land allocated by governments and hence have less access to land that is likely to be irrigated or associated with schemes that include credit or input components. Women's fewer tenurial rights than men prevent them from adopting technologies, such as agro-forestry or conservation measures, that are designed to increase land productivity. Fewer women than men have registered title to land and hence women have comparatively more difficulty in obtaining formal credit. Women may be disposed of the right to use land on divorce or her husband's death.

It is recommended that governments take action to improve women's tenurial rights to land by enacting and enforcing gender equality in access to land and to tenurial rights. This will require government reviewing allocation laws and procedures, customary and statutory usufruct rights, and inheritance and deposition laws; and then making any necessary adjustment to laws, their interpretation and enforcement.

It is recommended that donors include gender equality as a condition of support for agricultural projects. Further it is recommended that donors address the issue of gender in land tenure studies and projects.

Because of land scarcity and the time constraints of women farmers, increased production will have to be based on increased land productivity rather than on increased area of land cultivated. Land degradation and the almost complete sedentarization of farming makes the development of soil, water and fertility conserving technologies based in part on women's indigenous knowledge as natural resource managers urgent.

It is recommended that measures be taken and technologies developed that will enable women to increase the productivity of their land. Research is needed on soil and water conservation and yield-enhancing technologies suitable for women farmers. Women must be included in planning and implementing soil and water conservation measures. Women should be trained in soil and water conservation techniques, and extension of these technologies should be targeted to women. The allocation of land, credit, and other resources for irrigated production should be gender equal. Improving women's access to credit, inputs and markets is also important.

3. *Quality of Extension Contact*

10.18 The quality of contact between extension agents and women farmers is affected by historical and cultural factors. Historically, development activities targeted male farmers. Men dominated the policy, management, and research and extension staff although women were major actors in agricultural production, marketing and transformation. To address this bias:

It is recommended that the numbers of female agents be increased. Recruitment (see below) or retraining and redeployment of other rural agents (see below) are two options.

It is recommended that communication between male extension agents and female farmers be improved. Sample strategies are improving the training of male agents in communication methods, introducing gender targeting (box 8.4), and using female agents (such as WID or female SMSs) to train male agents in the activities and constraints of women farmers. The agent/farmer communication should be monitored and evaluated from the women farmer's viewpoint.

It is recommended the agricultural proportion of the total extension advice received by women be increased. The content of the work of all rural agents targeting women should be analyzed and streamlined as necessary. It may, for instance, be possible to combine HE and agricultural extension services, to provide some in-service training and so increase agricultural extension for women farmers at little extra cost.

It is recommended that the relevance of technical messages for women's activities and their production systems be increased. A database on the role of women in agricultural production and ancillary activities should be established (or improved). The information gained should be used when formulating the research agenda, planning research programs and trials and evaluating results. More social scientists (e.g. drawn from university staff) should be included on research teams. The number of adaptive and on-farm trials on women's plots should be increased. Women should participate in planning the research program, selecting treatments, and evaluating trials. The relationships between extension contact and adoption, and between adoption and output for women farmers need to be monitored and evaluated, so that the reasons for any lack of a positive relationship are identified and converted.

It is recommended that donors take to ensure that the few female agents in rural areas are neither "poached" nor employed simultaneously by several "projects" so rendering them ineffective in any one job.

4. *Increase the Numbers of Female Farmers, particularly Household Heads, in Contact with the Extension Services*

10.19 The country studies show that fewer women farmers in general, and female heads of households in particular, are in contact with extension agents than are male farmers. Several strategies can be employed to increase the numbers of women farmers in contact with extension. These, however, will only be effective if the women, especially those heading households, regard the time spent with extension agents as productive.

It is recommended that more female agents be recruited. Promoting the teaching of science subjects to girls, targeting girls for intake to agricultural colleges, and providing more facilities for women at agricultural college may be necessary upstream strategies. Field agents should be provided with the resources to carry out their work: since the fewer numbers frequently have to cover a greater area than male agents, at the very least they should have equal access to transport and other resources. Cultural restrictions can be overcome, for instance by issuing mopeds instead of motor bicycles.

It is recommended that redeploying other female agents as agricultural extension staff should be considered as an option (see box 8.2 for Nigeria's successful and Kenya's less successful approach). Other rural female agents frequently have background and training in farming. Inservice training would be required to fill-in skills gaps.

It is recommended that the number or proportion of women participants in extension activities be increased. Specific numbers or proportions of women clients (individually or in groups) per extension agent can be targeted and linked explicitly or implicitly to agent incentives. The selection criteria for contact farmers can be adjusted so that more women qualify, or the wives of contact farmers can be accepted as de facto contact farmers. Providing agricultural extension to women's groups should be measured as it is more efficient than individual contact and is frequently preferred by women farmers. Meetings and farmer training sessions should be timed and sited so that they are convenient for women (e.g. held in the evenings, and sited at markets or grain mills). Breaking training into shorter modules, and using mobile training units to visit villages rather than bringing farmers to centers can also help.

5. *Constraints to Women's Access to Financial Services*

10.20 Most women surveyed who used credit obtained it from informal sources such as relatives and money lenders. Women are far less likely than men to obtain credit from formal sources or from cooperatives and development agencies tied to specific cash commodities. The informal sources that women are able to tap tend to have limited lending capacity and high interest rates.

It is recommended that accessibility of the poor and women to formal financial services be increased. Adopting and adapting informal practices can reduce transaction costs and lending risks. Innovative efforts to explore, identify and introduce mutually beneficial links between informal savings and credit systems and the formal sector should be encouraged. These links would help expand the supply of credit in rural areas while preserving the flexibility and information advantages of informal credit arrangements. The solidarity principle of joint liability of group members to protect against individual and social risks can be used as an alternative to the more traditional types of collateral such as land title. The informal sector can be used as "financial retailers". For example a bank could lend to an affiliation of informal financial schemes which would then on-lend to their women's group members.

C. *Concluding Note*

10.21 As this Report has shown, women do most of the work on the farm and increasingly have become the key decisionmakers. But, women's access to agricultural support services and inputs has not improved commensurately. This results in a considerable loss in agricultural productivity and output - more than 20 percent according to the Kenyan analysis. The recommendations set out in this Report are consistent with well-established tenets of agricultural development. Tenurial rights to land, land and labor productivity, cost-effective extension advice, appropriate technologies, and viable financial services are all important for effective agricultural development strategies. However, what this Report emphasizes

is that agricultural development strategies have not adequately focussed on the clients. And in SSA at least, the clients increasingly are women. If SSA is to revitalize the agricultural sector and improve household food security – goals assigned high priority by all countries in the Region – raising the productivity of women farmers must be at the center of agricultural strategy.

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