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Improving Women's Agricultural Productivity as Farmers and Workers

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ABSTRACT

An overview of the role women play in agriculture is useful when devising strategies to increase female income and productivity. Part I of this paper presents evidence on the importance of women in the rural economy using cross-country statistics and rural household studies. Findings from time allocation studies are used to identify policy variables that might increase women's participation in more productive activities. Part II explores gender-specific barriers and constraints, especially differential access or control of productive resources—land, tools, extension and credit—and the social and institutional factors contributing to such differences. Part III analyzes gender differences in agricultural productivity more rigorously, using evidence from econometric studies. These studies examine how different levels of education, land and other inputs affect technical efficiency, labor productivity, earnings and the adoption of technology. They also point to ways whereby productivity gaps may be remedied through the provision of key services, such as extension and education. Part IV of the paper examines how agricultural policies may affect women differently than men, drawing from case studies in Africa, Asia and Latin America. Part V then reviews how specific barriers faced by women have been addressed in Bank agricultural projects and suggests guidelines for the design of future Bank projects. Two appendices provide information on the cross-country statistics and the time allocation studies used in the paper.

1. AN OVERVIEW OF RURAL WOMEN

1.01 In every region, but perhaps most in Africa, millions of women work as farmers and so affect family food security, national agricultural output, and the environment. Nearly 80 percent of economically active women in sub-Saharan Africa and at least half in Asia are in agriculture. In the developing world as a whole, women play the primary role in food production: FAO estimates that women account for 70 to 80 percent of household food production in Sub-Saharan Africa, 65 percent in Asia, and 45 percent in Latin America and the Caribbean. As men migrate in search of non-agricultural employment opportunities in many countries, women are undertaking men's traditional tasks while attending to their families' household needs. Thus, strategies to increase productivity and incomes in the agricultural sector will have to recognize the importance of women as economic agents in the rural economy – as farmers, managers of natural resources, and casual workers.

1.02 Rural women undertake a major proportion of farm work, are responsible for family food security and home production, are often involved in post-harvest processing and marketing, and yet often have lower levels of human and physical capital, and less access to information, resources, and markets, compared to men. A critical question is the extent to which rural women's welfare and productivity have been limited by social, institutional, and policy-induced constraints which may be different or more binding for women than for men.

1.03 This paper provides an overview of women in agriculture, in order to identify barriers and constraints they face, and to propose strategies to increase their productivity, incomes, and welfare. Part 1 presents evidence on the importance of women in the rural economy using cross-country statistics and rural household studies. Part 2 explores barriers women may face due to differential access to and control of productive resources—land, tools, extension, and credit – and the social and institutional factors contributing to such differences. Part 3 discusses gender differences in agricultural productivity using evidence from econometric studies. These studies examine how different endowments of education, land, and other inputs affect technical efficiency, labor productivity, earnings, and adoption of technology. They also point to ways whereby productivity gaps may be remedied through the provision of key services such as extension and education. Part 4 reviews how the impact of agricultural policies may differ by gender, drawing from case studies in Africa, Asia, and Latin America. Part 5 examines how gender-specific barriers and constraints may be addressed through programs and projects, and highlights lessons learned from implementation experience. It concludes with guidelines to improve the design and implementation of gender-sensitive projects in agriculture.

Cross-Country Evidence

Characteristics of the Agricultural Sector

1.04 Table 1 relates indicators of the structural characteristics of the economy, such as

the importance of agriculture in output and employment, to the importance of women in agriculture.¹ Differences in labor productivity in the agricultural and nonagricultural sectors and the ratios of females to males age 10 and over in rural and urban areas provide a rough picture of sectoral productivity differences and gender differences in migration. Agriculture's contribution to GDP ranges from a high of 61 percent in Burundi to a low of 4 percent in Japan. With the exception of mineral and oil-exporting countries, agriculture accounts for the bulk of employment in Africa, Southeast Asia, and South Asia.

1.05 Despite the importance of the agricultural sector in output and employment, labor productivity is low relative to nonagriculture. In most countries, value added per worker in the agricultural sector is less than 50 percent of that in the nonagricultural sector, due to both low levels of productivity and pricing policies biased against agriculture.

Gender composition of agricultural labor force

1.06 There is substantial variation in the gender composition of the agricultural labor force. Women make up a high proportion of the agricultural labor force in sub-Saharan Africa, followed by East Asia and Southeast Asia (Figure 1). Women also account for a significant portion of agricultural employment in some European countries, notably Hungary, Portugal, and the former Yugoslavia. In contrast, the agricultural labor force in Latin America, North Africa, and the Middle East is predominantly male, although this may reflect undercounting of women's participation.

1.07 The last two columns of Table 1 show the ratio of females per 100 males age 10 and over in urban and rural areas. Females outnumber males (the ratio is greater than 100) in the rural areas of Africa, East Asia, and Southeast Asia (with the exception of China, Korea and the Philippines). Males outnumber females (the ratio is less than 100) in the urban areas of Eastern Africa, South Asia, and West Asia, while females dominate urban areas in countries with high female out-migration such as Latin America, the Philippines, and Thailand. Rural female to male ratios greatly exceed urban ratios in Africa, while the reverse is true for Latin America and the Caribbean (Figure 2).

1.08 A breakdown of agricultural employment into categories of farm owners and managers, unpaid family workers, and hired workers shows that farm owners and managers account for the majority of the agricultural labor force across countries, although wage labor is the dominant category in many Latin American countries (Figure 3). However, females tend to be under-represented among farm owners and managers, and tend to be classified as unpaid family workers. Women also account for a lower proportion of hired labor in agriculture (Figure 4).²

¹This table is patterned after Table 2 in Islam and Mueller (1991) but has a wider geographic coverage. Although more recent data may be available on variables such as GDP and ratios of value added, this table presents the years for which data on the gender composition of the labor force are available.

²Sri Lanka is an exception, since women account for the bulk of hired labor in tea plantations.

Table 1: Characteristics of the Agricultural Sector and Agricultural Labor Force, Rural and Urban Sex Ratios, Selected Countries

Region	Country	Year	Share of Agriculture in GDP %	Average Annual Growth Rate of Agriculture		Share of Agriculture in Total labor Force %	Share of Females in Agricultural labor Force %	Ratio of Value Added per Worker in Agriculture to Non-Agriculture	Females per 100 Males, Urban	Females per 100 Males, Rural
				1965-80	1980-90					
<u>AFRICA</u>										
Eastern Africa										
	Burundi	1979	61	6.6	3.1	93	56	0.12	68	115
	Malawi	1977	42	4.1	2.0	83	52	0.15	73	119
	Rwanda	1978	42	n.a.	-1.5	93	54	0.06	72	114
	Zambia	1980	14	2.2	3.7	36	41	0.29	93	124
	Zimbabwe	1982	14	n.a.	2.4	54	50	0.14	79	122
Middle Africa										
	Cameroon	1976	28	4.2	1.6	74	47	0.13	89	123
	C.Afr.Rep.	1975	38	2.1	2.7	84	53	0.11	111	119
Northern Africa										
	Morocco	1982	15	2.4	6.4	40	16	0.27	100	107
	Sudan	1973	44	2.9	n.a.	64	28	0.44	82	112
Western Africa										
	Mali	1976	58	2.8	2.3	82	15	0.31	104	112
<u>LATIN AMERICA</u>										
Caribbean and Central America										
	Costa Rica	1973	19	4.2	3.2	35	2	0.44	118	90
	El Salvador	1971	27	3.6	-0.7	54	4	0.31	119	96
	Mexico	1980	9	3.2	0.4	25	12	0.29	102	92
	Nicaragua	1971	25	3.8	-2.6	47	3	0.38	128	94
	Panama	1980	9	2.4	1.9	25	3	0.29	111	87
South America										
	Brazil	1970	12	3.8	2.8	44	10	0.18	110	93
	Chile	1982	6	1.6	4.2	17	3	0.28	107	79

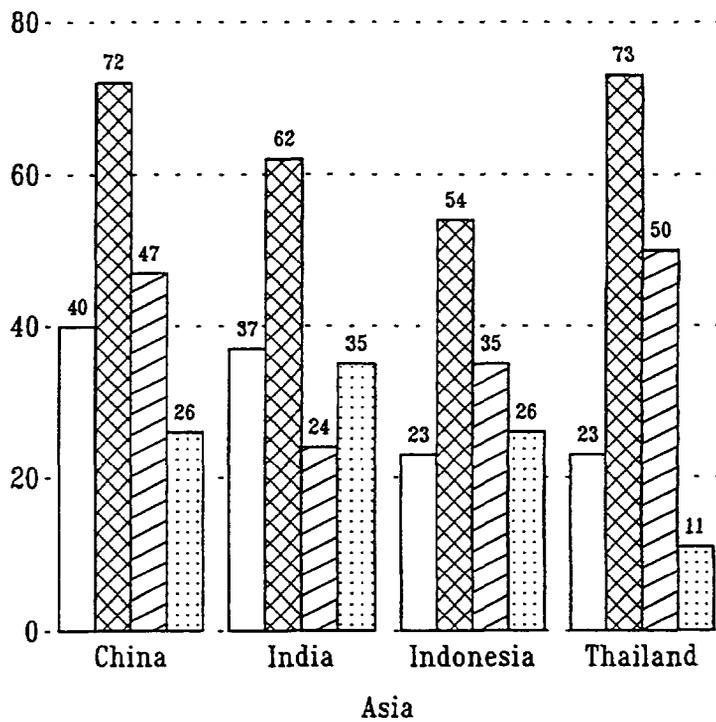
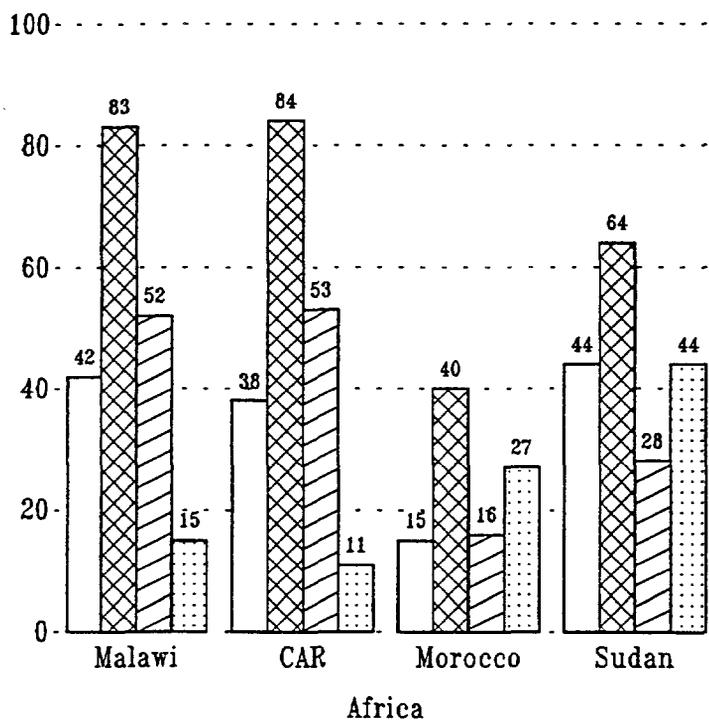
Table 1. (continued)

Region	Country	Year	Share of Agriculture in GDP %	Average Annual Growth Rate of Agriculture		Share of Agriculture in Total labor Force %	Share of Females in Agricultural labor Force %	Ratio of Value Added per Worker in Agriculture to Non- Agriculture	Females per 100 Males, Urban	Females per 100 Males, Rural
				1965-80	1980-90					
	Colombia	1973	24	n.a.	n.a.	27	n.a.	0.87	126	90
	Peru	1981	10	1.0	2.8	35	14	0.22	102	100
	Venezuela	1987	6	3.9	3.1	13	3	0.42	103	86
ASIA										
East Asia										
	China	1982	40	2.8	6.1	72	47	0.26	88	95
	Japan	1980	4	-0.6	1.3	10	49	0.34	102	104
	Korea, Rep of	1980	15	3.0	2.8	32	44	0.37	102	97
Southeast Asia										
	Indonesia	1985	23	4.3	3.2	54	35	0.26	102	106
	Philippines	1981	23	3.9	1.0	47	26	0.34	110	98
	Thailand	1980	23	4.6	4.1	73	50	0.11	106	102
South Asia										
	Bangladesh	1981	47	0.6	2.6	77	n.a.	0.26	72	95
	India	1981	37	2.5	3.1	62	24	0.35	88	94
	Sri Lanka	1981	28	2.7	2.3	37	25	0.66	88	99
West Asia										
	Syrian Arab Republic	1984	20	5.9	-0.6	24	25	0.77	93	105
	Turkey	1980	23	3.2	3.0	58	54	0.22	88	106
EUROPE										
	Hungary	1980	17	2.7	1.6	10	0	1.86	106	101
	Greece	1981	18	2.3	0.7	27	30	0.57	107	99
	Portugal	1980	8	n.a.	n.a.	25	51	0.28	111	105
	Yugoslavia	1981	13	3.1	0.7	27	47	0.41	103	93

n.a. Not available

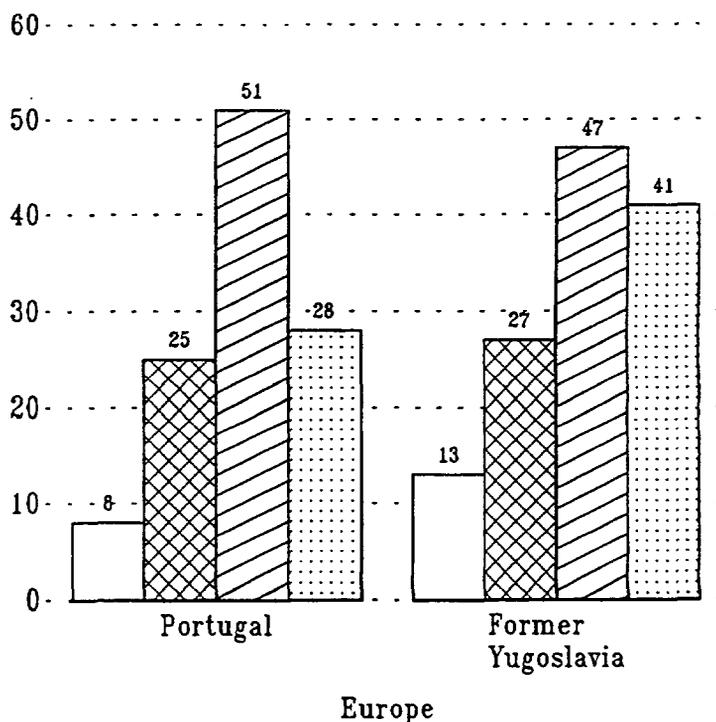
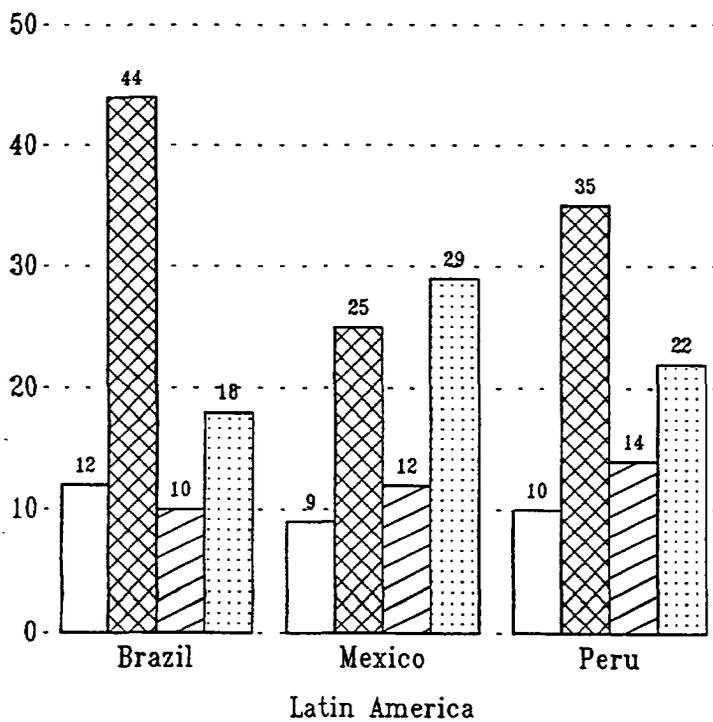
Same: Social Indicator Database, World Bank (1992)

Figure 1: Comparative Indicators on Agriculture and Employment, Low-Middle Income Countries, by Geographic Region



AVA/GDP Agr Labor Force Women in Ag LF AVA/NVA per Worker

AVA/GDP Agr Labor Force Women in Ag LF AVA/NVA per Worker



AVA/GDP Agr Labor Force Women in Ag LF AVA/NVA per Worker

AVA/GDP Agr Labor Force Women in Ag LF AVA/NVA per Worker

Figure 2: Share of Employment Categories in Agricultural Labor Force

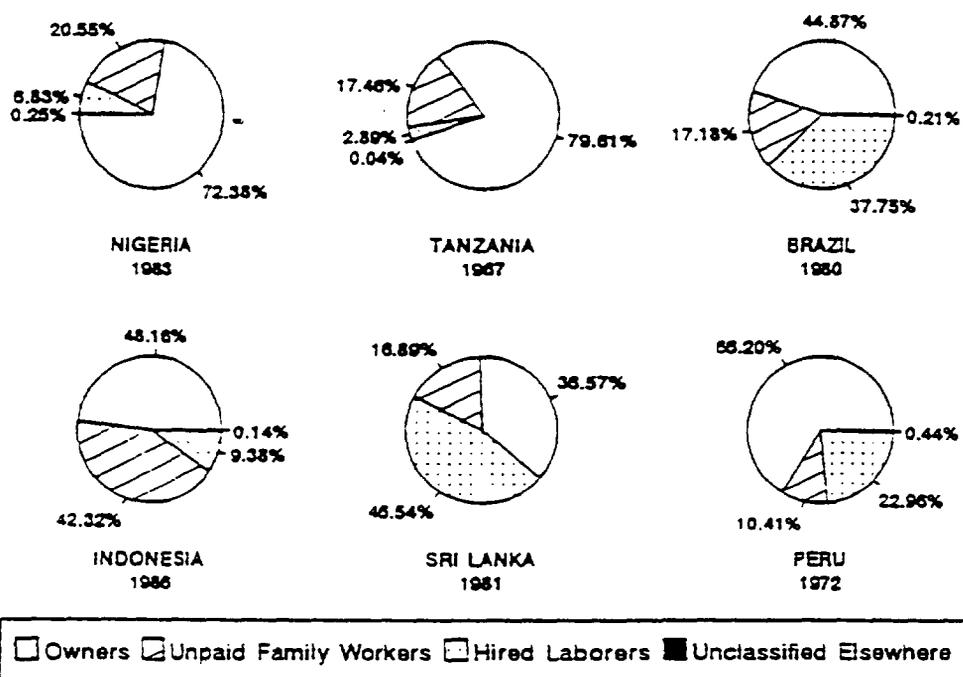


Figure 3: Female Share of Agricultural Employment Categories (Percent)

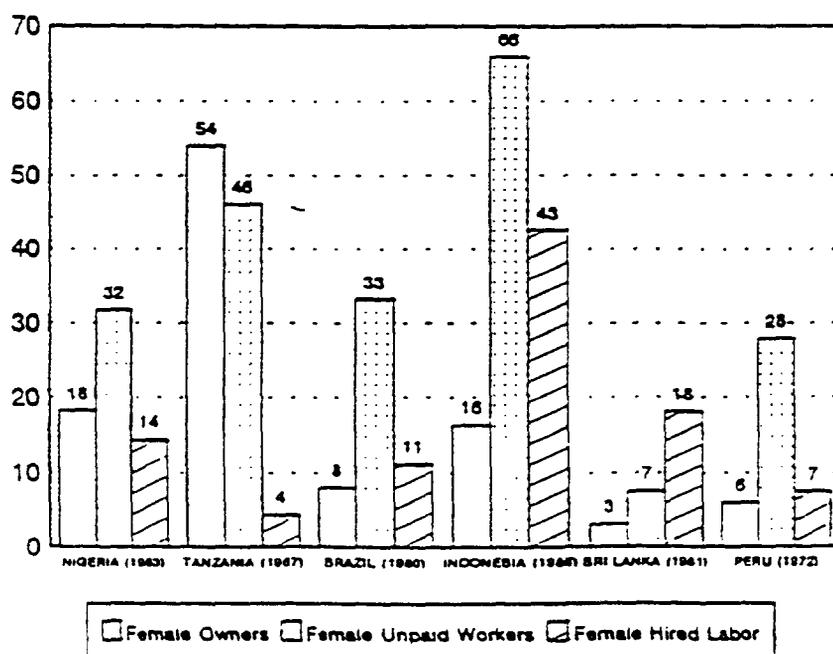
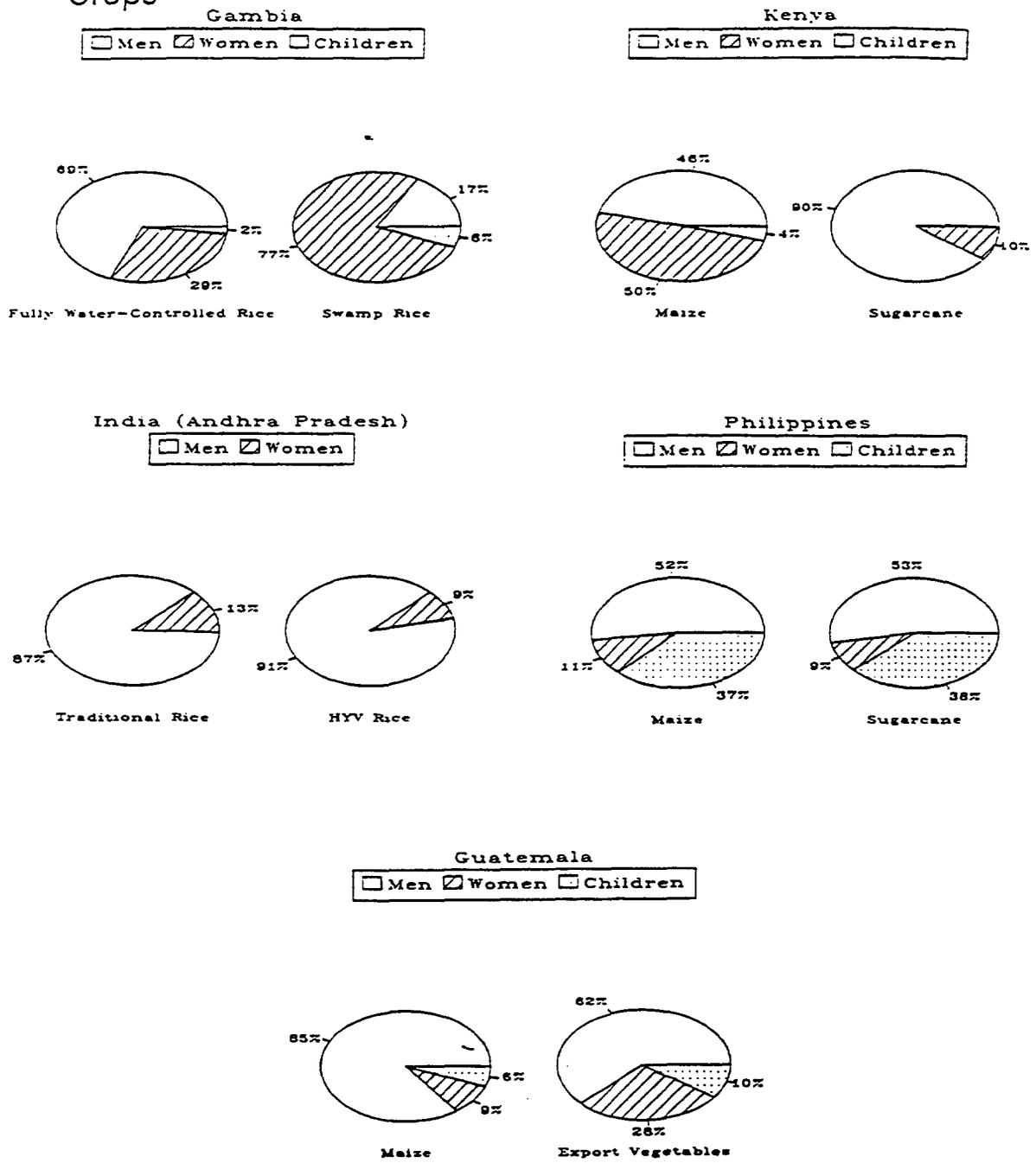


Figure 4: Work Input by Men, Women and Children in Various Crops



1.09 The background provided by the macro data should be taken with caution since cross-country macro data usually understate the importance of women in agriculture. Estimates adjusted for undercounting suggest that on average women are 46 percent of the agricultural labor force in sub-Saharan Africa; 45 percent in Asia, 40 percent in the Caribbean, and 31 percent in North Africa and the Middle East (Dixon 1982: 560). Micro level studies, particularly time allocation and farming systems studies, may provide a more accurate picture of women's involvement in agriculture and the gender division of labor across crops and tasks.

Box 1. Counting Women in Agriculture

Conceptual and measurement problems contribute to the undercounting of women in agriculture. Methods used to analyze labor force participation in developed countries are inadequate for developing country agriculture since self-employment, seasonal work patterns, underemployment and a varied range of activities are more likely than regular wage work at a well-defined job (Dixon 1982). Furthermore, the distinction between domestic production for own consumption and economic activity for sale and exchange is less clear in rural areas, particularly for women.

With regard to measurement, the UN Population Census, ILO Labor Force Surveys, and FAO Agricultural Surveys, the most widely quoted sources of macro level statistics, are not consistently disaggregated by sex and mask important regional or sub-regional variations. They are also beset by enumeration problems. The main source of omission of female labor from statistical returns is probably an inadequate coverage of unpaid family labor, especially on smaller holdings on which female farmers predominate. Other sources of enumeration error are: (1) the short reference period which fails to capture seasonal female labor; (2) classification based on self-reported "primary economic activity," which women are more likely to declare as domestic rather than agricultural work; and (3) cultural attitudes which inhibit recognition of women's economic activities. This may underlie the classification of women into the category of unpaid family workers rather than farm managers in many countries, even those with a tradition of female farming (Safilios-Rothschild 1985). Indeed, revised estimates of the sex composition of the agricultural labor force for a sample of 82 developing countries suggest that women constitute over 40 percent of the total agricultural labor force in 52 countries, and over 50 percent in 24 of the countries (Dixon 1982).

Farming Systems and Family Structures

1.10 Farming systems, being locationally adapted, are intrinsically heterogeneous. Their diversity across countries and ecological zones within countries makes their classification into a definitive typology difficult. Furthermore, rural-urban migration, technological change, and changes in the gender division of labor have challenged the widely-used classification of African and Asian agriculture into "female" and "male" farming systems (Boserup 1970). It may be more useful to adopt a farm type classification using resource endowments and family types (Lele 1986) since the gender division of labor varies widely within each farm type.

1.11 Farming systems can be classified into three general types: (1) extensive, land-surplus systems; (2) intensively cultivated, labor-surplus systems with a unimodal farm size distribution; and (3) dualistic systems with different factor intensities between large and small farms (Lele 1986). These types have usually been associated with Africa, Asia, and Latin America, although changes in relative resource endowments (e.g. increasing population pressure on limited land in Africa) have caused these associations to break down. These systems coexist with different family structure "types": the polygamous societies of Africa, in which there is less congruence between women's interests and their husbands; and the monogamous extended/nuclear family type in Asia and Latin America, with agricultural decision-making primarily by men.

African family structures and farming systems

1.12 Table 2 presents data on the division of agricultural labor by crop, while Table 3 shows the

gender division of labor by task in African, Asian, and Latin American countries.³ In the four African countries (Gambia, Kenya, Nigeria, and Rwanda) represented in Table 2, family members provide between 70 to 95 percent of labor required in agriculture. While female family labor accounts for the bulk of family labor input in general, there is wide variation across societies and crops within a particular farming system. Gender division of labor by task is usually found in all farming systems (see Table 3), but the traditional gender division of labor by crop in African farming systems, although changing, can be traced to family structures in African societies.

1.13 Unlike the unified "family farm" in Asia, in most of sub-Saharan Africa, households hold several granaries or purses, controlled by men or women depending on different but complementary responsibilities to the household (Dey 1985: 423).⁴ Various authors (e.g. Whitehead 1984) have emphasized the "non-corporate character of the spouses' interest and the potential separation of their life courses." These features include "the flexibility of residence arrangements, with the absence of conjugality as a necessary basis for the domestic group; the existence of polygyny, giving varying degrees of concentration of wives amongst men of different ages and socioeconomic or political status; the likelihood and rates of divorce; and the asymmetrical relation of marriage to the kinship status of children (the 'lineality' of the kinship system)" (Whitehead 1984: 35, in Kumar 1987).

1.14 Table 2 shows that women tend to be involved more heavily in the production of traditional food crops (such as swamp rice in the Gambia; maize in Kenya; maize, sorghum and potatoes in Rwanda) while men contribute more labor to cash crops (irrigated rice in the Gambia; sugarcane in Kenya). While recent evidence suggests that women are now increasingly involved in cash crop cultivation (Saito et al. 1994), the traditional patterns of specialization can be traced to customary rights and obligations of men and women. In most African societies, women have a traditional obligation to produce subsistence food crops for home consumption, and to perform household maintenance activities such as fetching fuel and water. Traditionally, men have cultivated cash crops, the sale of which provides cash to meet non-subsistence obligations to wives and children. Men are obligated to provide the land and to be responsible for housing, taxes, ceremonial and religious obligations, and part of the school fees. In most patrilineal societies, men are responsible for surplus accumulation, usually in the form of cattle. This is linked to longer-term security, which may often be achieved through the exchange of cattle for additional wives (with concomitant increments in household labor supply) and through sale of cattle in times of crop failure (Kumar 1987:140).

1.15 In many African countries and ethnic groups, both men and women also have the right to cultivate a personal field from which they meet certain obligations to the household and their personal expenses. On these plots, there is a gender division of labor by task (Table 3). Planting, crop care, harvesting, processing and marketing are predominantly women's tasks, whereas plot preparation (seedbed construction, plowing) is a male activity in Asian and Latin American farming systems. Although men traditionally clear the land in African farming systems, evidence from Kenya suggests that women substantially control their own plots, and influence their husbands' plots, often becoming fully responsible for farming decisions and agricultural labor on plots of husbands who are away for most of the year (Safilios-Rothschild 1986). Indeed, Table 3 shows that women's contribution to agricultural labor in Kenya is more important on female-managed plots (Saito et al. 1994).

³Table 2 is similar to Tables 1 and 2 in Boserup (1970) but is not strictly comparable. Boserup presents hours per week worked by both sexes while the studies cited in this paper use total labor input by hired and family labor of both sexes over the entire cropping season. Since crops have growing seasons of different length, an average figure of hours per week may be misleading. Thus, the relative contribution of male and female labor is with reference to total labor input per crop. The data in Tables 2 and 3 also come from more recent farming systems studies conducted in the 1980s.

⁴It must be noted that the concept of a unified Asian family with a single decisionmaker or common preferences has been challenged by empirical evidence. In Thailand, Schultz (1990) finds that men's and women's unearned income have different effects on men's and women's labor force participation decisions and women's fertility behavior. In the Philippines, father's and mother's individual endowments differentially affect bestowals of land and educational investments in sons and daughters (Quisumbing 1994b).

Table 2. Work input by women and men in developing country agriculture, various crops.

Country and study	No. of Households	Crops	Total Labor Input		Total Hired Labor (percent of total labor)	Total family Labor (percent of total labor)	Family Labor (percent of family labor)			
			units	Number			Men	Women	Children	
<u>Africa</u>										
<u>Gambia</u>										
von Braun, Puetz and Webb 1989	900 farmers	Fully water-controlled rice	person-days per hectare	349	25	75	69	29	2	
		Swamp rice		217	5	95	17	77	6	
		Maize		90	3	97	80	9	11	
		Groundnuts		141	6	94	69	26	5	
		Cotton		132	9	91	57	39	4	
		Total average		-	7	93	62	32	6	
<u>Kenya</u>										
Bouis and Kennedy 1989	181 farms	Maize	person-days per hectare	214	19	81	46	50	4	
		Sugarcane		-	-	-	90	10	0	
Saito et al. 1994	720 households	All crops, male-managed plots	hours	1600	17	83	40	54	6	
		All crops, female-managed plots	hours	2095	17	83	28	65	7	
<u>Nigeria</u>										
Saito et al. 1994	750 households	All crops, male-managed plots	hours	2034	13	87	40	48	12	
		All crops, female-managed plots	hours	2778	10	90	31	55	14	

Table 2 cont....

Country and study	No. of Households	Crops	Total Labor Input		Total Hired Labor (percent of total labor)	Total family Labor (percent of total labor)	Family Labor (percent of family labor)		
			units	Number			Men	Women	Children
<u>Rwanda</u>									
von Braun, de Haen and Blanken 1991	200 households	Maize	person-days	306	28	72	19	81	0
		Sorghum	per hectare	404	30	70	26	73	1
		Potatoes		434	23	77	42	58	0
		Sweet potatoes		398	17	83	15	85	0
		Peas and Beans		542	17	83	29	71	0
		Total					25	74	1
<u>Asia</u>									
<u>South Asia</u>									
<u>India</u>									
Agarwal 1985									
<u>Andhra Pradesh</u>	67 farms	Traditional rice	hours/hectare	1433.8	71	29	87	13	0
	62 farms	HYV rice	hours/hectare	1398.9	84	16	9	91	0
<u>Tamil Nadu</u>	59 farms	Traditional rice	hours/hectare	1386.9	88	22	81	18	1
	69 farms	HYV rice	hours/hectare	1466.6	88	22	79	20	1
<u>Orissa</u>	168 farms	Traditional rice	hours/hectare	1127.2	58	42	98	2	0
	73 farms	HYV rice	hours/hectare	1814.7	65	35	97	3	0

Table 2 cont...

Country and study	No. of Households	Crops	Total Labor Input		Total Hired Labor (percent of total labor)	Total family Labor (percent of total labor)	Family Labor (percent of family labor)		
			units	Number			Men	Women	Children
<u>Nepal</u>									
Kumar and Hotchkiss 1988	118 households		person-days per hectare						
		Wheat		177	10	90	49	51	-
		Maize		186	15	85	48	52	-
		Early paddy		228	7	93	51	49	-
		Paddy		318	15	85	61	39	-
		Ragi		288	5	95	41	59	-
		Mustard		130	19	81	44	56	-
		Blackgram		174	28	72	43	57	-
<u>Southeast Asia</u>									
<u>Philippines</u>									
Res 1985	25 households	Rice	hours per year	796	42	58	90	10	-
Bouis and Kennedy 1989	448 households	Maize	hours per hectare						
		Sugarcane farmer	per year	103.4	43	57	52	11	37
		Non sugarcane farmer		96.4	36	64	63	14	23
		Sugarcane		108.8	72	28	53	9	38
<u>Latin America</u>									
<u>Guatemala</u>									
von Braun, Hotchkiss and Immink 1989	160 farms	Cooperative members	person-days per hectare						
		Maize		119	55	45	85	9	6
		Export vegetables		890	36	64	62	28	10
		Traditional vegetables		416	28	72	61	25	14
<u>Peru</u>									
Deere and Leon de Leal 1982	105 households		hours employed	4727	29	71	75	25	-

Table 3. Women's participation on agricultural production by task, African, Asian and Latin American Countries

Country	Plot preparation	Planting	Cultivation and crop care	Harvest	Processing and marketing	Total
<u>Africa</u>						
<u>Kenya</u>						
Kakamega,						
Male-managed plots	43	43	45	49	28	40
Female-managed plots	55	65	61	63	76	60
Muranga,						
Male-managed plots	37	48	50	48	46	45
Female-managed plots	48	65	62	57	60	55
Kilifi,						
Male-managed plots	64	63	65	59	69	64
Female-managed plots	90	73	83	74	87	80
<u>Nigeria</u>	43	58	82	48	61	51
<u>Asia</u>						
<u>Nepal</u> (Hill systems)	0	64	72 ^a	52	-	54
<u>India</u>						
Andhra Pradesh	7	78	73 ^a	63	25	48
Tamil Nadu	0	69	85 ^a	64	41	55
<u>Sri Lanka</u>						
Irrigated	0	100	80	0	48	n.a.
Rainfed	0	91	80	0	52	n.a.
<u>Thailand</u>	16	29	33	0	67	n.a.
<u>Malaysia</u>	6	55	27 ^b	46	38	37
<u>Korea</u>	2	48	23 ^b	34	39	36
<u>Latin America</u>						
<u>Colombia</u>						
Non-capitalist	1	4	-	8	21	5
Advanced capitalist	4	7	11	29	53	18
<u>Peru</u>	12	20	19	33	34	21

^a Rice cultivation

^b Weeding

Source: Kenya and Nigeria from Saito et al. (1994); Latin America from Deere and Leon de Leal (1982); Asia from Unnevehr and Stanford 1985

Hired labor in Asian farming systems

1.16 One big difference between Asian and African agriculture is the importance of hired labor in Asia (Table 2). Unlike in Asia, where both male and female casual laborers account for a significant proportion of labor input, the casual labor market in much of Africa is still relatively small and mostly male. Another major difference is the large contribution of male family labor in Asian farming systems. Plow agriculture is the norm, and men typically provide the labor in land preparation, with women providing auxiliary labor in hand operations, such as planting (particularly transplanting rice seedlings), cultivation and crop care (notably weeding)(Tables 2 and 3). The importance of male and female labor in harvesting and post-harvest operations varies across countries.

Plantations and peasant agriculture in Latin America

1.17 In Latin American agriculture, there is a gender division of labor in both industrialized crop production and peasant farming (Ashby 1985: 21).⁵ In the large farm sector, women are hired as wage laborers for such non-mechanized tasks as coffee harvesting and cotton picking, or work with men as members of migrant family laborers doing piece work. Regional differences in the tasks men and women perform depend on the local supply of male and female wage labor and the substitutability of male and female labor in the large farm sector.

1.18 In the peasant subsector, there is substantial variation between cultural ideals (such as "machismo") and actual fulfillment of role obligations across cultures and within social classes in a particular culture. Although cultural ideals categorize house work as "women's work" and field work as "men's work", in practice, one can observe men and women working together in the fields, not necessarily demarcated into exclusive sex-specific tasks. This flexibility is related to cultural factors (strength of Hispanic versus Indian traditions); social class (whether income comes from land or wages); labor market conditions; and the degree of market integration of the peasant economy (Ashby 1985).⁶ When men work off the farm, women have higher rates of participation in traditionally male tasks. In Guatemala, for example, Table 2 shows that while women account for only 9 percent of labor in maize, they contribute a quarter of family labor input to growing traditional and export vegetables. In Peru, women's share of labor input across all crops is 25 percent. Women also contribute significantly to harvesting, post-harvest processing, and marketing in Colombia and Peru.

1.19 The picture above does not adequately reveal the heterogeneity and dynamism of farming systems all over the world. Farming systems and family structures are continuously evolving. For example, the growing prevalence of female headed households is due to very different reasons in Africa, Asia, and Latin America. In Africa and parts of Asia, the migration of men to cities leaves women in charge of farming. In Latin America, the absorption of male labor into plantations has led women to migrate to cities, such that female headship is more likely to be an urban phenomenon. It has been argued that dualistic, bimodal patterns of development, such as

⁵This description of women in Latin American agriculture draws heavily from Ashby (1985), who also presents a typology of rural women in Latin America. Another excellent reference for women in Latin American agriculture is Deere and Leon de Leal (1982).

⁶Although men and women may participate in the same field operations, there are certain tasks reserved for men, usually those involving animal traction and farm machinery.

those experienced in Africa and Latin America, are conducive to individual migration, while broad based rural growth, as in the successful East Asian economies, induces family rather than individual migration (Lele 1991). To the extent that development policies contribute to changes in farming systems and family structures, policymakers need to evaluate the unintended social costs and benefits of agricultural policy.

Time Allocation of Men and Women

1.20 In addition to agricultural production and market work, women also perform household production activities such as child care, food preparation, and provision of fuel and water. If total time is divided between market production, home production, and leisure, Table 4 suggests that women devote more time to productive activities than men. When time spent on home production is included in the computation of full household income, women contribute between 40 to 60 percent of household income (Table 5).⁷

Box 2. Women's Contribution to Full Income

Women's contribution to household income is often understated because they are usually involved in nonmarket activities for which monetary values are not assigned. One criterion commonly used to distinguish production from consumption activities is the "third person criterion" (Reid 1934:11), that is, whether the performance of an activity can be delegated to a paid outsider or not. When these activities are included in the computation of full household income (defined below), women's contribution to full income may lie in the range of 40 to 60 percent.

Conventional household income can be measured in terms of payments to resources owned by the household or in terms of household expenditures (King and Evenson 1983). In the first case, household income is the payment to nonlabor assets held by a household plus payments to household members for work performed. Alternatively, it can be measured as the sum of expenditures on consumption and investment goods. Full income, on the other hand, includes payments to nonlabor assets, payments required for the production of market goods (including farm production and wage employment), plus the value of time devoted to home production as well as the value contributed to home production by home capital. The expenditure definition of full income would be the sum of expenditures on home goods and on investment goods.

Although a full income measure would capture more accurately women's contribution to household welfare, estimating full income is problematic. It is difficult to classify home production as production or consumption, even when using the "third person" criterion, due to the jointness of production activities. Women may increase their work intensity by overlapping tasks, making it difficult to assign a monetary value to a unit of time (Floro 1992). Monetary valuation of nonmarket goods is in itself problematic since current methods in use—assigning market prices and imputing shadow prices—have their limitations (King and Evenson 1983:48-49). Nevertheless, women's contribution to household income—and to national income—will tend to be understated unless household production activities are explicitly accounted for.

⁷Goldschmidt-Clermont (1987) provides a compilation of studies which evaluate the economic value of unpaid household work in Africa, Asia, Latin America, and Oceania.

Table 4. Time Allocation patterns of rural women and men (in hours & fractions of hours)

Location	N		Market production		Home production		Total		Ratio Women/Men
	Men	Women	Men	Women	Men	Women	Men	Women	
ASIA									
Bangladesh (rural)	48	36	6.97	4.73	0.34	6.20	7.31	10.93	1.49
	138	174	7.04	1.61	1.29	6.68	8.33	8.29	0.99
<u>Java</u>	31	33	7.90	5.94	0.72	5.14	8.62	11.08	1.28
<u>Nepal</u>	135	171	7.96	7.41	2.12	5.02	10.08	12.43	1.23
<u>Philippines</u> ^a	99 HHS		6.85	2.57	1.30	7.42	8.15	9.99	1.22
AFRICA									
<u>Botswana</u>	957 HHS		3.70	1.80	1.43	4.38	5.13	6.18	1.20
<u>Ivory Coast</u>	720 HHS		2.52	1.42	1.40	5.03	3.92	6.45	1.64
<u>Tanzania</u>	105	105	5.85	4.96	1.79	4.56	7.64	9.62	1.25

Note: HHS - households

^a Joint activities were measured separately, thus total daily activities may exceed 24 hours

Source: McGuire and Popkin (1990)

Table 5. Women's Contribution to Full Household Income in Rural Areas

Country	Percentage
Burkina Faso 1981	All wives 38 - 61
Cameroon 1974	58.1
Lebanon 1984	10
Nepal 1970	50
Philippines 1975	42 Mother 34 Father 23 Children

Source: Goldschmidt-Clermont (1987), from various studies

1.21 Women's choice of activity depends on the returns available which, in turn, are determined by their productivity in those activities. Productivity reflects not only the labor women can contribute, but also their human capital, i.e. education and health. The returns reflect their access to information and to markets for labor, capital, services, and products. However, women's ability to choose particular activities may be limited by social and cultural beliefs regarding which roles and activities are appropriate. Expanding women's access to information and markets, and their ability to choose among various activities may be essential to their allocating time to more productive uses.

2. GENDER-SPECIFIC CONSTRAINTS IN AGRICULTURE

2.01 Despite women's importance in agricultural production, and significant contribution to full household income, women usually have lower levels of physical and human capital compared to men. These disparities persist due to legal, social, and institutional factors which create barriers for women.

Land Rights

Legal, religious, and customary rights

2.02 There is wide diversity in laws governing women's rights to land and other property. Property and inheritance rights may be governed by the Civil Code, personal laws of religious communities, or customary laws. Different systems often exist in the same country, so individuals have some choice in the disposition of property (Wazir 1987). Most religious laws, however, discriminate against women in land rights. In Hindu law, women did not have the right to own, acquire, or dispose of property, although they may have the right to some personal property.

Despite legal reform, loopholes in legislation prevent equalization of inheritance rights. In particular, laws reforming women's right to succession in India did not mention agricultural lands and tenancy laws, such that in a majority of Indian states, legislation gives female heirs a very low priority in the list of heirs to agricultural lands. In Islamic law, women's land ownership rights are explicit, but they do not always control de facto land use. Furthermore, Islamic law limits the share to female heirs to one-half of that given to males. Daughters may also receive their share of the inheritance in the form of household goods and jewelry, but not in land or farm implements.

2.03 In some Southeast Asian countries, however, customary law gives women independent land rights. In Indonesia, the Philippines, and Thailand, women can own, inherit, acquire, and dispose of property in their own right (Wijaya, 1985; Wazir 1987). Among ethnic groups which have bilateral kinship, which account for the majority of the Indonesian population, customary law (*adat*) gives sons and daughters shares to property from both parents (Wazir 1987; White 1976). Despite provisions for equality of inheritance between sons and daughters in civil law, actual practice may differ. Philippine law gives women the right to hold property in their own name, but income from the wife's pre-marriage property is considered conjugal income whose use is subject to the husband's consent. Although tenancy law gives priority first to the wife, and then the children, according to age, in succession of tenancy rights (Yorac), sons typically receive land in tenant families (Takahashi 1974; Umehara 1979). In Philippine rice villages, daughters typically receive less land and nonland assets than sons (Quisumbing 1994b).

Usufruct rights

2.04 Under customary law in many African countries, women usually had usufruct rights to some land; it 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 (Saito et al. 1994; Dey 1985). However, these indigenous customs have been modified by Western colonization which introduced private ownership by individual registration of land, and which often discriminated against women in titling. Furthermore, since women obtained land rights usually through a male relative, there was no guarantee that she would retain these rights in the case of death or divorce. In Kenya, Malawi, Nigeria, Tanzania, and Zambia, female-headed households (FHH) have smaller landholdings than do male-headed households (MHH) (Table 6). FHH's land cultivated ranges from 31 to 74 percent of land cultivated by MHH. Family size is also smaller in female-headed households, due to the absence of the male head. As a result, land cultivated per person does not differ much between MHHs and FHHs, although this ratio is lower for FHHs.

2.05 Absence of formal land rights and smaller land sizes cultivated by women may be critical since land is usually needed as collateral in credit markets. A farm household survey in Kenya and Nigeria (Saito et al. 1994) found that more male than female heads of households, and more male than female farmers, were able to exercise their land rights fully (Table 7). The ability of women to exercise the full range of land rights – to be able to sell or mortgage the land – may be essential to the functioning of land markets. While these rights may evolve from systems of communal control to individualized rights in response to commercialization and population pressure (Might-Adholla et al. 1991), in more monetized and market-oriented economies, land tenure security and the exercise of these rights may actually have a positive productivity impact (Feder et al. 1988).

Tools and Farm Implements

2.06 Female farmers generally own fewer tools than men, as shown by data from three African countries in Table 8. In a Gambian irrigated rice project area, 8 percent of men owned a plow, compared to none of the women. Less than one percent of women owned a seeder, weeder, or multipurpose cultivation implement, compared to 27 percent, 12 percent, and 18 percent of the men, respectively (von Braun et al. 1989). A household survey in three districts of Kenya found that women farmers had lower values of farm tools and equipment than male farmers (Saito et al. 1994). On the average, women had only 18 percent of the value of male farmers' tools and equipment, and this was as low as 7 percent in Kakamega district. If farm capital contributes positively to yields, then female farmers are more likely to have lower yields than male farmers.

Table 6. Size of holdings by gender of farm manager or household head, selected African countries

Country and year	Area cultivated		Family size		Area per person	
	Male	Female	Male	Female	Male	Female
Kenya 1973 ^{a,b}	1.8	1.2	n.a.	n.a.	n.a.	n.a.
Kenya 1989 ^{c,d}	2.6	1.7	8.6	8.0	0.3	0.21
Malawi 1983-84 ^{c,d}	1.3	0.9	4.9	4.0	0.26	0.22
Malawi 1986 ^{c,d}	1.9	1.4	n.a.	n.a.	n.sa.	n.a.
Nigeria 1989 ^{c,d}	2.6	0.8	7.6	4.9	0.34	0.16
Tanzania 1984 ^{a,d}	2.7	1.4	n.a.	n.a.	n.a.	n.a.
Zambia 1982 ^{a,d}	11.5	4.9 [*]	7.4	4.5 ^{**}	1.55	1.09
Zambia 1986 ^{a,d,e}	6.8	3.0 ^{**}	3.5	1.7 ^{***}	1.94	1.76

- Notes: ^a Area in acres
^b By gender of farm manager
^c Area in hectares
^d By gender of household head
^e Family size in adult-equivalents
^{*} Significant differences between means at $\alpha = 10\%$
^{**} Significant at $\alpha = 5\%$
^{***} Significant at $\alpha = 1\%$

Sources: Kenya 1973 from Moock (1976); Kenya 1989 and Nigeria 1989 from Saito et al. (1994), Malawi 1983-84 from Segal (1986); Malawi 1986 from Phiri (1986); Tanzania 1984 from Mollel (1986); Zambia 1982 from Due and White (1986); Zambia 1986 from Sikapande (1988)

Table 7. Land "Ownership" Rights by Gender in Households Surveyed in Kenya and Nigeria (percent of respondents)

	Kenya		Nigeria	
	Male	Female	Male	Female
<u>Heads of households</u> % farmers with right to				
Improve the land	84	84	79	70
Lend the land	69	44	74	58
Rent out the land	67	40	72	56
Sell the land	60	29	59	31
Mortgage the land	77	48	71	41
<u>Members of household</u> (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: Saito et al. 1994

Extension Advice⁸

2.07 In spite of women's important role as farm managers and agricultural workers, whether as family or hired laborers, they have not always been beneficiaries of extension systems. Traditional extension systems based on single-commodity extension often fail to consider women's crops and activities. Community or rural extension, on the other hand, covers the broad spectrum of women's activities, but the range of tasks covered may limit the time devoted to any single task. Furthermore, extension systems in many developing countries are overloaded; agent-farmer ratios in Africa, Asia, the Near East and Latin America range from one agent to 2,000 farmers, or even one agent to 3000 farmers (Table 9). In contrast, an extension agent in Europe and North America only needs to serve between 300 to 400 farmers. In addition to understaffed extension systems, women are under-represented among extension agents. Even in regions with a long tradition of female farming, such as Africa, only 11 percent of extension staff, and 7 percent of field extension staff, are women. Whereas female extension workers may be trained in agriculture, they are mandated to give advice on home economics subjects. This may constrain the delivery of agricultural extension messages to female farmers, who may be restricted from interacting with male extension agents, and who prefer to interact with female agents.

2.08 Evidence from a number of African countries suggests that male farmers have greater contact with the extension service than female farmers. Table 10 shows that male headed households are more likely to ever have contact with an extension worker than female headed households.

⁸The discussion of extension draws heavily from Saito and Spurling (1992).

Table 8. Farm Tools and Equipment by Gender of Farmer

Implement or type of technology	Men	Women
Gambia 1987 ^a		
Percent owning the tool		
Plow	8.2	0.0
Seeder	26.9	0.6
Weeder	12.4	0.2
Multipurpose implement ^b	18.1	0.4
Kenya 1989 ^c		
Value of tools and equipment as percent of male farmers'		
tools and equipment	100.0	6.8
Kakamega	100.0	132.3
Muranga	100.0	64.1
Kilifi	100.0	17.8
Overall mean		

^a von Braun, Puetz and Webb (1989)

^b An animal-drawn implement convertible for plowing, weeding, and groundnut lifting

^c Saito et al. (1994)

Table 9. Extension Agent/Farmer Ratio and Female Extension Agents

	Agent/farmer ratio ^{a/}	Women as percentage of	
		all extension staff ^{b/}	field extensions staff
Africa	1: 1,809	11.1	7.0
Asia and Pacific	1: 2,661	14.8	14.1
Near East	1: 2,499	19.5	9.5
Latin America	1: 2,940	14.5	13.9
Europe	1: 431	15.7	6.6
North America	1: 325	39.2	15.0

^{a/} Ratio computed by dividing the number of economically active adults in agriculture by the number of field extension officers and assistants available and then taking the mean ratio by country for each region.

^{b/}Includes administrative personnel and subject matter specialists.

Source: Tables 12 and 17 in Saito and Spurling (1992)

Table 10. Percent of families ever visited by extension worker by gender of household head

Percent Visited	Male headed household	Female headed household
Kenya 1989 ^a	12	9
Malawi 1989 ^b	70	58
Nigeria 1989 ^a	37	22
Tanzania 1984 ^c	40	28
Zambia 1982 ^d	57	29 ^e
Zambia 1986 ^e	60	19 ^{***}

Sources: ^a Saito et al. (1994)

^b Ministry of Agriculture, Malawi (1990)

^c Molle (1986)

^d Due and White (1986)

^e Sikapande (1988)

Credit

2.09 Lack of access to credit, both formal and informal, has important implications on the ability to smooth consumption and undertake productive activities. Where agricultural production requires lumpy equipment or cash inputs, credit makes possible the purchase of these inputs before income gains are realized. Credit is particularly important during the planting season when seeds and cash inputs have to be purchased, and in the lean season before harvest as stocks for consumption are depleted. Credit may also be essential to smoothing consumption in case of crop failure or drought.

2.10 It has been argued that female farmers have less access to credit than male farmers. Evidence from Kenya and Cote d'Ivoire suggests that women have a lower likelihood of borrowing from formal sources and even from other individuals (Appleton et al. 1991). Holt and Ribe (1991) argue that collateral requirements, high transactions costs, limited education and mobility, social and cultural barriers, and the nature of women's business limit women's ability to obtain credit. Property which is acceptable as collateral, especially land, is usually in men's name, and the types of valuables women have (e.g. jewelry) are often deemed unacceptable by formal financial institution. The transactions costs involved in obtaining credit – transportation costs, paper work, time spent waiting, may be higher for women due to higher opportunity costs from foregone activities. Indeed, in rural Kenya, distance to a bank is a significant determinant of women's probability of obtaining credit, but does not affect men's borrowing behavior (Saito et al. 1994). Women's lower educational levels relative to men and their lack of familiarity with loan procedures, and social and cultural barriers may constrain their mobility and interaction with predominantly male credit officers or moneylenders. Exclusion from local groups, e.g. farmers' groups, may prevent women from receiving both credit and extension advice, particularly if the extension worker plays an important role in credit delivery. Women also tend to be involved in the production of relatively low-return crops. In Kenya, for example, coffee and tea growers are more likely to borrow from the formal sector than from other individuals. Since women are less likely to grow tree crops, formal sector lending to particular crops could indirectly discriminate against women.

2.11 Rashid and Townsend (1992) argue that the above reasons are not sufficient for women to be credit constrained. If household incomes were pooled and women and men had equal bargaining power within the households, constraints due to limited collateral, mobility, and education could be overcome by other household members' obtaining loans and turning them over to women. Women's low formal market participation and high informal market participation are not sufficient for them to be credit constrained overall, since women can transact in informal markets and have access to other sources of insurance and credit. However, men and women do not always have equal bargaining power in the household, and individual incomes are not always pooled, as a growing body of literature suggests (Schultz 1990; Thomas 1990). It is also possible that women may have lower probabilities of obtaining credit even in the informal market, as in Cote d'Ivoire (Appleton et al. 1991). Rashid and Townsend (1992) argue that women may be credit constrained because their role as primary caregivers and the health risks associated with childbearing leads to intermittency in employment which makes them risky clients for banks. Furthermore, social customs in some cultures prohibits women from receiving information from outside lenders – which would be important if information is not fully transmitted from husband to wife. Under these conditions of imperfect information and barriers to access, credit or insurance delivery systems need to be designed to overcome women's constraints.

Domestic Responsibilities

2.12 In most societies, women's role as primary caregivers may limit the time they spend outside the home, in market work, or in leisure. Rural women are heavily involved in home production activities, which include child care, food preparation, and hauling fuel and water. In Africa, women may spend as much as two hours a day on child care, three hours on food preparation, and two hours fetching fuel and water. In rural Asia, food processing activities take up two to three hours daily, and in rural Bangladesh, women may spend as long as six hours a day fetching water (McGuire and Popkin 1990).

2.13 Time allocation studies also show that pregnancy and child care activities reduce women's participation in market activities, although daughters or other female adults in the household often substitute for mother's time in housework. The substitution of daughters' time in housework, if at the expense of time spent in school, may have unfavorable consequences for the next generation's human capital. Cultural traditions of seclusion may also limit women's participation in activities outside the home.

3. GENDER DIFFERENCES IN AGRICULTURAL PRODUCTIVITY⁹

3.01 Women's limited control over productive resources and gender-specific constraints have important consequences for agricultural productivity. Econometric evidence on gender differences in agricultural productivity points to the importance of investing in women by increasing their human capital, through education and extension, and by increasing their access to physical and financial inputs. The econometric evidence is drawn from four types of studies: 1) production function-based estimates of technical efficiency differences; (2) estimates of labor productivity differences; (3) individual (gender-disaggregated) labor supply and earnings functions; and (4) studies of the determinants of technological adoption.

Technical Efficiency of Male and Female Farmers

3.02 Estimates of gender differences in technical efficiency are usually based on the production function approach. A production function is a technical relationship between inputs and outputs which specifies the maximum level of output possible given input levels. Technical efficiency reflects the ability of a manager to produce output, given input levels and technology. Most studies on differences in technical efficiency between male and female farmers found insignificant dummies for the gender of the farm manager or household head (Table 11). That is, female farmers are equally efficient as male farmers, once individual characteristics and input levels are controlled for.

3.03 Three studies for Kenya found that the gender of the farm manager was an insignificant determinant of output per hectare (Moock 1976; Bindlish and Evenson 1993; Saito et al. 1994). Moock's (1976) study of 152 maize farmers in Kenya's Vihiga district found that the female farmer dummy was positive but insignificant. Female farmers, who made up about a third of the sample, tend to make better use of labor on maize farms than men. However, men's yields were higher in more closely-planted farms. Extension contact tended to benefit men but not women, especially if the male farmer was not too well educated. Extension service thus appears to

⁹This section is drawn from Quisumbing (1994a), which also has a more detailed review of the methodology.

be a substitute for education: less educated farmers tend to substitute extension advice for lack of education. Results from separate regressions for male and female managed farms indicate that primary education has a positive and significant effect on yields for women, but a negative and significant effect for men.

3.04 Another study for Kenya (Saito et al. 1994) was based on a three-district survey conducted in 1989-90. Cobb-Douglas production functions with gross value of maize, beans, and cowpeas per hectare as the dependent variable were estimated at the plot level. The regression for all plots shows that, while positive, the male plot manager dummy is insignificant. Regressions were also performed separately for male and female plot managers/farmers. While the effect of extension is positive and highly significant for male plots, it is insignificant for female plot managers. This may indicate better use of extension services by men.

3.05 There may be significant gains from increasing women's levels of physical and human capital, as suggested by simulations using coefficients estimated in the above studies. Simulations performed using Mook's (1976) coefficients for female farmers suggest that if female maize farmers were given sample mean characteristics and input levels, their yield would increase by 7 percent. If they were given men's mean input levels and other characteristics, yields would increase by 9 percent. Giving all women at least a year of primary education raises yields by 24 percent, which reflects the gains to providing primary education in a setting where women have very low educational levels. Simulations with the Saito et al. (1994) coefficients suggest a 22 percent increase in women's yields on maize, beans and cowpea plots if women farmers were given the characteristics and input levels of male farmers. Increasing land area and fertilizer usage to male farmers' levels increased women's yields by 10.5 and 1.6 percent, respectively. These simulations need to be interpreted with caution since they do not reveal how levels of input demand may be raised. To a great extent, differences in input use are driven by differences in education, since more educated farmers are more likely to use modern inputs (See Section 2.4). Underinvestment in women's education would then have serious implications for agricultural productivity.¹⁰

3.06 An evaluation of the effects of the training and visit (T&V) extension system in Kenya offers insights into changes in the extension system since the 1970s (Bindlish and Evenson 1993). The T&V system, recently implemented with World Bank support, has altered the traditional British-style extension service, and has employed a substantial number of women as field agricultural extension workers, in contrast to home economics extension where women have traditionally specialized (Benor and Baxter 1984). In Kenya, where there is a strong tradition, particularly among women farmers, to form groups, farmers' groups have also been used as "contact points" by extension workers. The study, based on a national survey conducted in 1989-90, also finds that female heads are equally efficient as male heads (the female dummy is not significant), and that extension, measured by the ratio of field extension workers to farm households, has a positive effect on output and total factor productivity.¹¹

¹⁰These simulations may also inaccurately depict the gains if a change were to be affected, since the Cobb-Douglas production technology assumes constant elasticities, and presupposes that changing the levels of one input does not change the elasticities of other inputs.

¹¹An earlier version of the paper found that female heads were more productive when female extension workers were assigned to the sublocation. However, when the assignment of female extension workers was predicted based on locational characteristics, including the percentage of female farmers in the area, the interaction between female extension workers and female farmers became insignificant (Evenson 1993, personal communication). This suggests that placement of extension workers may be endogenous, and that female extension workers may in fact be assigned to areas where they can be more productive, i.e. where female farmers are predominant.

Table 11: Production Function Studies with Estimates of Male-Female Difference in Technical Efficiency: Gender Effects from Pooled Regressions

Study	Sample	Gender Variable	Coefficient	t-ratio	Dependent Variable Definition	Comments
Kenya Moock 1976	All farmers N=152 Males = 101 Females = 51	Female dummy x log of area planted in maize	0.090	1.29	Log of maize output per acre	Female dummy, though positive, was not significant by itself and was excluded.
		Female dummy x log of plant population per acre	-2.280*	-1.85		
		Female dummy x log of labor input per acre	0.108***	2.15		
		Female dummy x primary schooling dummy	0.167**	1.98		
		Female dummy x log of extension contact index	-0.028	-1.5		
Kenya Bindlish Evenson 1993	All farmers N=675 Male Heads = 434 Female Heads=241	Female head dummy	-0.031	(-1.25)	Log of aggregate farm production in 1990	Coefficients of age of head and primary education of head are negative but insignificant. The coefficient of field extension per farm was positive and significant
		Female head dummy	0.0451	0.26	Log of aggregate output per input in 1990	Coefficients of age of head and education were positive but insignificant. Coefficients of productivity in 1982 and field extension worker per farm household were positive and significant.
Kenya Saito et al. 1994	All plots No. of plots=494 Male plots=351 Female plots=143	Male plot user dummy	0.031	0.28	Gross value of output per hectare of maize, beans, and cowpeas at plot level	Coefficients of capital, male and female family labor, female hired labor, dummies for fertilizer use, and extension significant and positive. Formal education insignificant.

Table 11 (continued)

Study	Sample	Gender Variable	Coefficient	t-ratio	Dependent Variable Definition	Comments
Burkina Faso World Bank 1992	All farmers No. of plots - 14355 Male managed plots = 13402 Female managed plots=954 No. of plots in regression=13077	Female manager dummy Female manager dummy x prop. female extension workers in division	-0.081*** -0.099	-3.46 -1.27	Log of combined crop yield per acre by plot	The percent of farms covered by extension, farmers' predicted status as T&V farmers, age of head, capital stock, the number of households in village and the percentage of female extension workers have positive and significant effects on yields. Number of parcels, number of farms workers, and the crop cutting dummy were negative and significant.
Nigeria Saito et al. 1994	All farmers No. of farmers = 226 Male = 210 Females = 15 All plots Total no. of plots = 1174 Male plots = 885 Female plots = 289	Male farmer dummy Male farmer dummy	-0.130 0.559***	0.47 5.59	Log of total value of production at household level Log of total value of crop production at plot level	Coefficients of land, female family and hired labor, insecticide use dummy and age of household were positive and significant. Coefficients for land, capital, male and female family labor, male and female hired labor, insecticide use were positive and significant. Dummy for 1-8 years of education and age of head were negative and significant. The extension dummy was insignificant.

Table 11 (continued)

Study	Sample	Gender Variable	Coefficient	t-ratio	Dependent Variable Definition	Comments
Korea ^{a/} Jamison and Lau 1982	Mechanical farms = 1363 ^{a/} (90.2% male heads)	Male head dummy	0.95**	2.33	Log of value of agricultural crop output (won)	Education measured by the household average, excluding the household head, is significant and positive. Education of household average has stronger effect than education of household head. Land, labor animal and mechanical power, and fertilizer have significant and positive coefficients.
	Non-mechanical farms = 541 ^{a/} (87.6% male heads)	Male head dummy	0.059	0.87	Log of value of agricultural crop output (won)	Education measured by the household average, excluding the household head, is significant and positive. Education of household head insignificant and not included. Land, capital, labor, animal power, and fertilizer are positive and significant.

Table 11 (continued)

Study	Sample	Gender Variable	Coefficient	t-ratio	Dependent Variable Definition	Comments
Thailand Jamison and Lau 1982	Chemical farms = 91 ^{a/} (97.8% male heads)	Male head dummy	0.076	0.28	Log of output (kg)	In highest R ² regression (not reported here), maximum education of household head has a positive and statistically significant rate of return of 3%. Dummy variables for educational levels positive but not significant, extension negative but significant, labor and land coefficients positive and significant.
	Non-chemical farms = 184 ^{b/} (99.5% male heads)	Male head dummy	0.269	1.05	Log of output (kg)	In highest R ² regression (not reported here), maximum education of head has a positive and statistically significant rate of return of 2.4%. A dummy for 4 years of education is significant and positive; extension significant and positive; labor, land and coefficients positive and significant.

^{a/} Coefficients are reported from regressions with highest R²

^{b/} Coefficients are reported from regressions with highest R²

*** Significant at 1%

** Significant at 5%

* Significant at 10%

Table 12: Marginal Products of Male and Female Labor, Sex-Specific Wage Rates, and Indicators of Economic Efficiency.

Study	Crop	Male Labor Category	Marginal Product of Male Labor	Male Daily Wage		Female Labor Category	Marginal Product of Female Labor	Female Daily Wage		Ratio of Female to Male Marginal Product	Ratio of Female to Male Wages
			(A)	(B)	(A)÷(B)		(C)	(D)	(C)÷(D)	(C)÷(A)	(D)÷(B)
<u>Kenya</u> Saito et al. 1994	Maize, beans, and cowpeas, all plots	Male Family Labor	1.47 ^a	27.10	0.05	Female Family Labor	1.87 ^a	24.00	0.08	1.27	0.88
		Male Hired Labor	7.45 ^a	26.10	0.29	Female Hired Labor	76.93 ^a	23.70	3.24	10.33	0.90
<u>Nigeria</u> Saito et al. 1994	All crops, Household Level	Male Family Labor	0.29 ^a	19.58	0.01	Female Family Labor	0.17 ^b	10.76	0.02	0.58	0.55
		Male Hired Labor	2.35	19.58	0.12	Female Hired Labor	18.52	10.76	1.72	7.88	0.55
<u>Nepal</u> Kumar and Hotchkiss 1988	Wheat Early Paddy Paddy Blackgram Maize Ragi Mustard	Male Labor (days)	2.5	- ^c	- ^c	Female Labor (days)	7.4	- ^c	- ^c	2.96	- ^c
			7.3	-	-		1.7 ^b	-	-	0.23	-
			20.6	-	-		0.9 ^b	-	-	0.04	-
			0.9	-	-		0.8	-	-	0.89	-
			-0.7	-	-		2.4	-	-	3.42	-
			3.0	-	-		1.9	-	-	0.63	-
		0.2	-	-		0.5	-	-	2.5	-	

Table 12 (continued)

Study	Crop	Male Labor Category	Marginal Product of Male Labor	Male Daily Wage		Female Labor Category	Marginal Product of Female Labor	Female Daily Wage		Ratio of Female to Male Marginal Product	Ratio of Female to Male Wages
			(A)	(B)	(A)+(B)		(C)	(D)	(C)+(D)	(C)+(A)	(D)+(B)
<u>India</u>											
Laufer 1985	Sorghum ^d	Hours of men's labor	1.55	0.40	3.88	Hours of women's labor	0.84	0.22	3.82	0.54	0.55
	Legumes ^d		1.02	0.40	2.55		0.79	0.22	3.59	0.77	0.55
	Rice ^d		3.14	0.40	7.85		1.53	0.22	6.95	0.48	0.55
<u>Peru</u>											
Jacoby 1990	Total Output	Adult Male labor ^a	0.44	0.72	0.61	Adult Female labor ^a	0.28	0.52	0.53	0.64	0.72

a = Value of Marginal Product; calculated from basic data in Saito et al.(1994)

b = Calculated from insignificant parameter estimates

c = Not available or not reported

d = Marginal Products calculated from consistent estimators

e = Estimated from translog specification

3.07 Even in the rice-based "male" farming systems of Thailand and Korea, where agricultural decisionmaking is primarily vested in the male head, gender of the household head does not significantly affect output (Jamison and Lau 1982).¹² Men do have an advantage in mechanized Korean farms. This may be due to skill or strength requirements in the use of mechanical power, and may be specific to the type of mechanical traction used. In other East Asian countries (e.g. Japan), women have been able to make use of small-scale machines, especially in transplanting and harvesting.

3.08 The other exception which shows a negative female farmer dummy is Burkina Faso (World Bank 1992; Bindlish, Evenson, and Gbetibuou 1993). Yield regressions show that women farmers are significantly less productive than men in most crops and have yields which are about 8 percent lower. The negative female farmer dummy may be due to cultural, religious, and ethnic differences between Burkina Faso and Kenya, rather than to differences in the extension system. Although Burkina Faso has inherited French-style institutions where agricultural extension has been an activity of parastatal organizations, the extension service is now shifting over to the T & V system, similar to Kenya and many African countries. However, cultural differences may inhibit women from more active roles. Fewer farm households are headed by women in Burkina Faso. Moreover, a woman comes under the authority of another male family member when her husband is away. Nevertheless, a significant proportion of the plots farmed are managed by women. Women usually are plot managers of food crops, sorghum, and millet, even in households headed by men.

Differences in Labor Productivity

3.09 Table 12 presents estimates of the marginal products of male and female labor from production function studies which disaggregated labor inputs by gender. Labor productivity is affected by differences in the division of labor across crops and tasks, and differential availability of male and female hired labor. In countries where women are culturally constrained from participating in farm work, women tend to have lower marginal products of labor. In Peru (Jacoby 1992), for example, women's marginal productivity is two-thirds that of men's. Women in upland areas of Peru tend to be casual rather than regular farm workers, and to spend more time on average in household and nonfarm business activities than in farmwork. In India, Laufer (1985) found that the marginal product of men's labor was higher than women's in all crops. In both Peru and India, however, the ratios of marginal products were in line with ratios of relative wages, indicating that farmers do allocate male and female labor efficiently.

3.10 Limited access to complementary inputs also reduces women's labor productivity. In the Gambia (von Braun and Webb 1989), women in a centralized pump irrigation area exhibited lower average labor productivity than men in the same crops and broad technology groupings, because of reduced access to labor-saving implements and their time constraints which allowed them to cultivate only smaller pieces of land, leading to diseconomies of scale.

3.11 Labor scarcity seems to be more strongly linked to higher marginal products of labor than gender per se. In Nepal, Kumar and Hotchkiss (1988) found that the marginal product of women's labor was higher in dry season crops like wheat, maize, and mustard, when their traditional

¹²In contrast to the high percentage of female-headed households in Africa, only 10.5 percent of households in the Korean sample are headed by women, and an even smaller 1.1 percent in the Thai sample.

tasks of fetching wood reduce time away in agricultural production. Men's marginal products were higher in paddy cultivation, where male labor is a constraining factor.

3.12 The impact of labor scarcity can also be felt when male and female labor is differentially available during peak season. In Kenya and Nigeria (Saito et al. 1994), while marginal product ratios of male and female family labor are in line with relative wages, the marginal product of female hired labor is several times higher than the marginal product of male hired labor (Table 12). It can be expected that the marginal product of hired labor is higher than that of family labor, since families would tend to drive their own marginal products to zero and hire labor only in periods of peak demand when family labor is insufficient. Thus, labor shortages in peak season would not be inconsistent with a general labor-surplus situation. However, this does not explain why the additional female hired worker is more productive. If women were constrained from working in others' farms, due to cultural constraints or domestic responsibilities, hired female labor would be more scarce, and an additional unit, more productive.

3.13 Since relative marginal products depend on the gender division of labor, and, in general, farm managers do allocate labor according to ratios of relative wages, it may be more relevant to examine the determinants of rural wages. If wages reflect the marginal productivity of labor, an analysis of wage determinants could identify instruments for raising labor productivity and earnings.

Determinants of Rural Wages

3.14 Rural wages depend on individual characteristics (education, experience), family characteristics (number of male and female workers, landholding, farm equipment, housing indicators), and community characteristics (distance to the village, presence of rural industry, average wages and prices, seasonality, location). Since wealth and nonlabor income may also affect the probability that an individual will participate in the labor market, an analysis of wage determinants needs to correct for sample selection if participation in the labor market is not random (Heckman 1979). Studies on the determinants of rural wages also provide evidence on rates of return to education for men and women (Table 13).

3.15 In general, the studies find that whereas returns to schooling for both men and women are higher in nonagricultural occupations, they are significant in dynamic agricultural settings where modern technologies have been introduced. In traditional agricultural societies, wages may depend more on local market characteristics than on an individual's human capital. For example, in India during the early 1970s, Rosenzweig (1980) found that village level variables (weather, presence of factory and small-scale industries, village size, distance of residence from village, and presence of an agricultural development project) and the district-level average male wage were more important determinants of male wages than schooling. In fact, the rate of return to an additional year of male education is only 1 percent and is not significant. While the rate of return to an additional year of schooling for women is about 2 percent, neither is it significant. Rather, the size of the village, distance of the household to the village, and the average district-level female wage are significant determinants of female wages. The importance of local market conditions suggests that labor is not perfectly mobile geographically in rural India, and wage rates are not greatly affected by human capital attributes in nonsalaried, private sector occupations which characterize rural labor markets. In contrast, schooling is highly correlated with salaried or government jobs, whose computed mean wage rates are higher than those observed in rural areas.

3.16 A more recent study in West Bengal, India (Mukhopadhyay 1991) finds positive and significant returns to male and female schooling. Taking into account sample selection, daily wages of men and women are significantly affected by age (which captures returns to experience) and schooling. The returns to experience seem to be greater for men, while the private rate of return to female schooling (3.5 percent) is larger than the return to male schooling (1.6 percent). While men with larger cultivated areas tend to have lower wages, women with larger areas of land apparently are able to command higher wages as agricultural workers. Moreover, selection into wage employment does not appear to be random: low wage male workers are likely to work in wage employment while high wage female workers are more likely to work in agricultural wage labor.

3.17 The positive and significant returns to schooling from this study, based on a 1990 data set, are a contrast to the insignificant rate of return to both male and female schooling in the Rosenzweig (1980) study, based on a 1970-71 survey. It is possible that the diffusion of the "Green Revolution" technology in the 1970s and 1980s may have created an environment where returns to schooling can be significant, especially if extension is regarded as education. Control of the flow of irrigation water, and the timely application of fertilizer, insecticide, and other chemical inputs associated with the seed-fertilizer technology may have raised skill requirements for agricultural laborers, such that more educated laborers may receive higher wages.

3.18 Modern rice varieties accounted for 33 percent of rice area in Mukhopadhyay's study. In five Philippine rice villages where modern rice varieties were planted in 86.9 percent and 79.3 percent of rice area in the wet and dry seasons, respectively, Behrman and Lanzona (1989) also find substantial returns to education for men and women. Women's wages are 48 percent lower than men's in the wet season but are not significantly different in the dry season. After controlling for choice of hourly or piece-rate contracts, male rates of return to an additional year of schooling are between 8 to 10 percent, and female rates of return are about 7 percent, which is not significantly different from those of men. At the sample means, the estimates imply that an additional year of schooling increases the daily wage for men by about 0.33 pesos per day in the dry season (from a mean predicted wage of 10.36 pesos per day) and 0.42 pesos per day in the wet season (from 16.03 pesos per day), with similar increases for women of about 0.28 and 0.25 pesos per day (from means of 8.10 in the dry season and 10.05 in the wet season).

3.19 In Peru, Khandker (1990) finds that potential work experience is important for men, but not for women, as a determinant of rural wages. Schooling also has high rates of return for men in rural areas. The rate of return to an additional year of primary schooling is 6 percent; to an additional year of secondary schooling, 8.8 percent; increasing to 25.5 percent for an additional year of postsecondary schooling and 62 percent for vocational training. However, neither schooling nor experience significantly affects female rural wages. This could be because there are few women working in the wage sector in rural areas, and since most rural women in the wage sector work as teachers or clerks, the variation in wages is small.¹³ Working for wages depends significantly on individual characteristics: the most able men select nonwage employment in urban areas, while

¹³For all Peru, rates of return to female schooling are generally higher for women than for men. An additional year of primary schooling has a private rate of return of 9 percent for women (equal to that of men); the rate of return at the secondary level is 15 percent (in contrast to 9 percent for men); at the postsecondary level, 10 percent for girls, compared to 9 percent for men; and 22 percent for women's vocational education, compared to 17 percent for men.

most able men in rural regions--and most able women in all areas -- are likely to select wage employment.

3.20 After controlling for the effects of unobserved household characteristics, returns to male education increase at all levels but returns to women's education decrease at secondary and postsecondary levels. The fixed effects estimates yield an 11 percent rate of return to male schooling at the primary level (compared to 37 percent for females); 17 percent at the secondary level (compared to -2 percent for females); and 42 percent at postsecondary levels (and 26 percent for females). This disparity indicates that, in rural areas, parents may have reasons for investing less in daughters than in sons, although for the country as a whole, the private rate of return is higher for women.

3.21 Jacoby's (1988) study of the Peruvian Sierra uses marginal products of male and female labor obtained from an estimate of the agricultural production function as proxies for shadow wages. Education increases both male and female wages, although returns to experience are not significant. Private rates of return to schooling are 11 percent for males and 16 percent for females, evaluated at the sample mean levels of education of 3.5 and 1.7 years for males and females, respectively. The number of workers of the same sex decreases the return to an additional unit of male or female labor, while the presence of complementary inputs -- land, farm animals, and farm equipment -- increases it.

3.22 Alba (1992) estimates wage functions for rural Guatemala which include measures of innate ability, numeracy, and verbal aptitude in addition to schooling as alternative measures of human capital. After correcting for sample selectivity, the rate of return on schooling was 5.2 percent, but only almost significant at 10 percent. Female wages are about 65 percent less than male wages. While women enjoy equal access to wage paying jobs, they have limited opportunities to enter high paying jobs or else enter occupations where wages remain stagnant. When measures of innate ability and family background were incorporated, the rate of return to schooling increased to 6.1 percent and the differential between male and female wages decreased to 63 percent.

3.23 The results of the above studies confirm that returns to schooling are higher, and individual characteristics more important in determining wages, in areas where agriculture has benefitted from technological change. In contrast, in areas where labor market participation of women is limited or constrained by cultural factors, as in rural Peru and Guatemala, returns to female schooling are low, and women receive significantly lower wages than men. These generally lower returns for females in these settings may be one reason why parents invest less in their daughters' education.

Table 13: Estimates of Returns to Schooling for Rural Men and Women

Study	Estimation Method	Schooling Category	Males	Females	
<u>India</u> Rosenzweig 1980	Ordinary least squares	Years of Schooling	0.10 (0.83)	0.02 (1.30)	
<u>Mukhopadhyay</u> 1991	Semilog with selectivity correction for wage earner status	Years of Schooling	0.0161 ^{***} (3.39)	0.0352 ^{***} (3.21)	
<u>Philippines</u> Behrman and Lanza 1989	Semilog with selectivity correction for contractual and fixed wages	Years of Schooling Wet Season	0.084 ^{***} (6.2)	0.067 ^{***} (4.0)	
		Dry Season	0.105 ^{***} (6.4)	0.070 ^{***} (4.0)	
<u>Peru</u> Khandker 1990	Ordinary Least Squares	Primary	0.05 (1.56)	0.05 (0.63)	
		Secondary	0.06 ^{**} (2.26)	0.10 (1.11)	
		Postsecondary	0.21 ^{***} (2.29)	0.20 (1.30)	
	Maximum Likelihood	Primary	0.06 (1.63)	0.08 (0.83)	
		Secondary	0.09 ^{***} (2.60)	0.13 (1.11)	
		Postsecondary	0.26 ^{***} (3.51)	0.27 (1.02)	
	Household Fixed-Effects	Primary	0.11 ^{***} (3.20)	0.37 ^{***} (5.73)	
		Secondary	0.17 ^{***} (3.46)	-0.02 (0.26)	
		Postsecondary	0.42 ^{***} (3.27)	0.26 (1.66)	
	Jacoby 1988	Ordinary Least Squares	Years of Schooling ^a	.107	.155

^a Calculated at sample means. t-statistics were not reported

^{***} Significant at 1%

^{**} Significant at 5%

^{*} Significant at 10%

Gender Differences in Technological Adoption

3.24 In some countries, especially where new technologies are associated with "male" crops or activities, women may be less likely to adopt new crops or technologies. This may matter more in some cultures than others: female decisionmakers are less likely to adopt coffee in Kenya and livestock in Tanzania, but are equally likely to have cattle in Kenya and to grow coffee or cocoa in Cote d'Ivoire (Appleton et al. 1991). Female farmers in Zambia are less likely to use oxen in cultivation (Jha et al. 1991), plowing being traditionally a male activity. However, women may more readily adopt technologies related to tasks they perform, particularly if the extension agent is female. Evidence from Kenya suggests that female farmers are equally likely to apply technical advice from extension agents, and are even more likely to adopt relatively complex practices such as top dressing, chemical use, and stalk borer control (Bindlish and Evenson 1993). Another study from Kenya (Saito et al. 1994) indicates that female farmers are more likely to adopt improved seed and use agrochemicals. In Nigeria, while male farmers are more likely to use insecticide, male and female farmers are equally likely to use fertilizer.

3.25 Despite the mixed evidence on technological adoption by gender, most of the studies find that more educated farmers are more likely to adopt new technologies. More educated females, in particular, are also more likely to adopt coffee in Kenya. Increasing the educational level of female farmers by giving them universal primary education has higher marginal effects on the probabilities of adoption than increasing the educational level of all farmers, due to the generally lower levels of female education in Africa (Burger and Gunning, 1992, personal communication) (Table 14). A ten percent increase in the percentage of women having completed primary schooling leads to a 6 percent increase in early adoption, and a 14 percent increase in late adoption. Increasing female education also has higher impact on adoption than increasing land sizes – a ten percent increase in arable land increases early adoption only by 2 percent, and late adoption by 6 percent.

3.26 Providing universal primary education stimulates early adoption by female farmers, whom other women are more likely to imitate. Other simulations by Burger and Gunning suggest that female decisionmakers are unresponsive to increased earlier adoption by male farmers. This is consistent with other findings that previous awareness and adoption of the technology, particularly by farmers of the same sex, also increased the probability of adoption. The significance of gender-specific copying effects highlights the need not only for female extension agents to work with female farmers, but also for female contact farmers to be chosen. The importance of cooperatives and extension in many of these studies emphasizes the need for provision of support infrastructure to rural areas.

3.27 Most of the studies reviewed also suggest that farmers with larger areas cultivated and higher values of farm tools are more likely to adopt new technology. To the extent that women farmers may have less education, less access to land and own fewer tools, they may be less likely to adopt new technologies.

3.28 Differences of male and female farmers in technological adoption can not be ascertained in farming systems where men and women do not manage separate plots. In two studies of the differential adoption of high-yielding varieties in India and the Philippines, the suitability of land for high yielding varieties, the proportion of irrigated land, and male and female wages were significant determinants of the area planted to HYVs (Mukhopadhyay 1991; Behrman

and Lanzona 1989). A number of differences emerge in the two studies. In the West Bengal study, male and female schooling were not significant determinants of technological adoption, whereas adoption of modern varieties, tractor use, and use of direct seeding were positively related to male and female schooling in the Philippines. This may be because schooling exerts a more powerful impact on adoption in areas with more rapid technological change.¹⁴

3.29 In the Western Highlands of Guatemala, von Braun, Hotchkiss and Immink (1989) find that the probability of export crop production is positively related to farm size and negatively affected by the proportion of women in the household's labor force. Controlling for the total labor force of the household and the (male) head's human capital, the share of women's labor in the total significantly reduces the probability of growing export vegetables. This could be because adoption of the new crop is primarily a male decision, consistent with larger differentials between male and female education in Guatemalan Indian agricultural areas compared to the rest of mestizo Latin America.

Table 14. Effects of providing primary education and increasing arable land on coffee adoption, Kenya

	Actual Adoption	Base case simulation	Primary education for female heads	Primary education for all heads	10% more arable land
Male					
early	37	11	11	16	11
late	25	53	55	48	50
Female					
early	2	0	0	0	0
late	4	2	8	8	2
Male total	62	64	66	64	61
Female total	6	2	8	8	2
Total	68	66	74	72	63

Source: Berger and Gunning (1992) personal communication

¹⁴Only 33 percent of the rice area in the West Bengal study was planted to modern varieties, compared to an average of 83 percent in the Philippine sample. Education is more important in dynamic agricultural environments because of higher returns to farm managers' entrepreneurial ability in adjusting to new disequilibria associated with agricultural innovations (Welch 1970; Schultz 1964).

4. GENDER IMPACT OF AGRICULTURAL POLICIES

4.01 The constraints and barriers which women face may significantly affect the ultimate impact of agricultural policies on incomes and welfare. Although distributional effects vary across income groups, the same policy may have a different impact on men and women within a socioeconomic class due to initial differences in: (1) the nature and extent of their involvement in agricultural field work; (2) the nature and extent of their involvement in non-field work such as cattle raising, fetching wood and water, domestic work and child care; (3) the extent of their control over and the patterns of distribution of household earnings and expenditures; and (4) the extent of their direct access to productive resources, especially land (Agarwal 1988: 85).

Sectoral Policies

4.02 Agricultural development is associated with technological change and commercialization. Technological change, which increases aggregate factor productivity, means that the same output can be produced with fewer inputs, or more output can be produced with the same inputs, although the nature and composition of inputs may change (von Braun, Puetz and Webb 1989: 12). Commercialization, on the other hand, is a shift from subsistence to greater market orientation, either through an increase in the marketed surplus of a subsistence crop, or a change in crop mix. While increased commercialization may occur with or without technological change, the latter rarely occurs without commercialization, at least in the factor input side (modern seeds, fertilizers, hired labor), if not on the product-output side (von Braun, Puetz and Webb 1989).

Consequences of Technological Change

4.03 This section focuses on the impact of the adoption of irrigated rice and high-yielding or modern varieties (HYVs or MVs) in Asia and Africa. It draws heavily from research conducted at the International Rice Research Institute on Women in Rice Farming Systems, as well as later work on the differential impact of the new rice technology.¹⁵

4.04 Technological change involves not only the adoption of a specific type of innovation but also the adoption of other associated components. For example, the adoption of fertilizer-responsive, short growth duration high-yielding rice and wheat varieties has often been accompanied by tractorization and direct seeding. Since the diffusion of agricultural innovations is a long-run process, its impact cannot be measured in the period immediately following introduction. Some of these long-run adjustment effects may involve the movement of labor from agriculture to nonagriculture. Since majority of the poor -- and women -- in Africa and Asia derive incomes from labor on their own and others' farms, the employment effects of new technologies is important.

4.05 Whether or not a new technology increases employment depends on whether the adoption of the technology which improves women's labor productivity is accompanied by an increase in labor

¹⁵The International Rice Research Institute published a volume on women in rice farming systems (IRRI 1985), which examines detailed changes in incomes and employment of women in several countries in Asia and Africa. The differential impact study (DIS), a cross-country study examining differential adoption across regimes with differential water control, did not specifically focus on women, although specific papers sponsored by that study examine women's employment and time allocation (e.g. Otsuka, Cordova and David 1992; Mukhopadhyay 1991; Behrman and Lanzona 1989).

demand. When there is a growing supply of landless women's labor, women will only benefit from productivity increases that are accompanied by increased labor demand. In addition, whether technical change benefits women depends on their control over resources. Women in farm households who have some control over income from land will benefit from any type of technical change in agriculture. This is because they will reap the returns from increased productivity of both household labor and land (ignoring intrahousehold distribution). For women in landless households whose only resource is labor, neutral or labor-using technical change in agriculture will raise demand for their labor as well as their productivity, but labor-saving technical change will reduce their employment opportunities (Unnevehr and Stanford 1985).

Adoption of Modern Rice Varieties in Asia.

4.06 Early studies on the adoption of MVs have shown that these have been more rapidly adopted in irrigated and favorable rainfed environments, bypassing marginal environments where farmers have tended to be poorer (David and Otsuka 1990). In most of Asia, increased output due to multiple cropping increased the demand for labor in crop establishment (seedbed preparation and transplanting), crop care (weeding), harvesting and post-harvest processing. In most Asian countries, labor use of MVs was higher than those of TVs in terms of days per hectare, and labor productivity, measured by kilograms of paddy per day, has also been higher in MV cultivation (Barker and Herdt 1990). Where labor was scarce in the short run (e.g. the Muda Valley in Malaysia), increased demand for labor from the shift to double cropping increased wage rates, although interregional migration of landless workers from unfavorable to favorable production environments might have led to wage equalization in the long run (Otsuka, Cordova, and David 1990). However, the spread of MVs has often preceded the adoption of labor-saving technology such as tractors and direct seeding. Thus, while the MV technology is by itself either neutral or labor-using, the net effect may be labor-saving.

4.07 In the long run, environmental conditions related to water control are more important than economic factors in explaining cross-sectional differences in MV adoption (David and Otsuka 1990). While MVs may have indirectly promoted tractorization by raising the profitability of irrigation investments, the increase in cropping intensities, even with tractorization, increases labor use per hectare per year. Relative factor prices seem to be a more important determinant of the adoption of labor-saving technologies, suggesting that government policies which artificially reduce the cost of machines and herbicides through the overvaluation of the domestic currency and credit subsidies promote technologies inconsistent with resource endowments in labor-surplus economies.

4.08 The impact of MV adoption on women depends on the gender division of labor in rice farming prior to the introduction of the new technology, nonagricultural earnings opportunities, and existing land tenure patterns. In the Philippines and Indonesia, and parts of India, the increased labor requirements for transplanting and weeding, which are traditionally women's tasks, were met by hired female laborers from landless households, as women in landed households have tended to move out of agricultural labor into more lucrative nonagricultural occupations (in the Philippines and Indonesia) and provide supervision rather than labor in farm production (Unnevehr and Stanford 1985). In West Bengal, where the new technology uses a higher proportion of male to female labor, women from land-owning households reduced time in agriculture and increased

time spent on domestic activities or leisure (Mukhopadhyay 1991).¹⁶

4.09 After the widespread adoption of MV technology, however, nonfarm income sources may contribute more to increases in rural incomes than rice income. Movement of men into nonagricultural enterprises on either a part-time or a full-time basis may increase women's contribution to agricultural production. In Japan, movement of men into non-agricultural enterprises has made rice farming predominantly a woman's activity (Kada and Kada 1985), while in Indonesia, female agricultural wage rates have increased in the 1980s due to increased demand for labor in the nonagricultural sector (Naylor 1991).

4.10 To a great extent, the benefits from HYV adoption have been captured by those with secure land rights (David and Otsuka 1990). Since labor is geographically mobile across regions, agricultural productivity growth tends to benefit owners of fixed factors, such as land. However, possible increases in income inequality have been mitigated in the Philippines and Taiwan by land reform programs in rice, the growth of nonfarm income sources, and the provision of support services which assured relatively egalitarian access to inputs, such as networks of effective farmers associations, as in Taiwan, and subsidized irrigation and availability of credit. In the Philippines, households have also reallocated resources to nonrice activities in unfavorable production environments, where women in landless households earn significantly more than male household heads (Otsuka, Cordova and David 1992).

4.11 Since wages in rice tend to be equalized across regions, the possibility that MV adoption will continue to raise incomes and wages for landless workers is limited. It is unlikely that the spread of MV technology will generate the upward pressure on real wages – and increased wages of women in the rice sector – similar to the early experience in East Asia. Population pressure on limited land, and slow absorption of surplus labor into nonagricultural enterprises, have tended to depress real wages. With the exception of Japan, South Korea, Malaysia, and Indonesia, where there has been strong growth in the industrial and nonagricultural sectors, agricultural wages in most of Asia have been stagnant in the 1970s (Barker and Herdt 1990).

4.12 Population pressure may also be exacerbated by the fertility-increasing effects of MV adoption. Both district-level and micro data suggest that the adoption of MVs has positive effects on fertility in India (Vosti and Lipton 1991; Mukhopadhyay 1991), although increases in female wages and female education depress fertility. In West Bengal, higher yields of MVs compared to traditional varieties are associated with higher fertility, perhaps because of the relatively lower use of women's labor in MVs and their withdrawal into home production activities that do not conflict with child bearing (Mukhopadhyay 1991). Thus, while the new agricultural technology may have increased the income of farm households in India, its impact on the status of women is

¹⁶The effects of increased male and female wages on MV adoption are not uniform across countries due to differences in the gender division of labor in rice farming. In the Philippines, where adoption of MVs increases demand for both male and female labor, MV adoption is negatively affected by both male and female wages (Behrman and Lanzona 1988). In West Bengal, on the other hand, where MVs use male labor more intensively, an increase in the female wage reduces area planted to traditional varieties and increases area planted to MVs (Mukhopadhyay 1991).

ambiguous.¹⁷ Raising female educational attainment and female wages (from an increase in labor demand) is therefore important to reduce fertility and increase child schooling. Given the limited labor absorptive capacity of agriculture, sustained increases in female wages will have to come from the expansion of nonagricultural employment opportunities.

Introduction of Irrigated Rice in Africa

4.13 Many agricultural development projects have also tried to introduce irrigated rice technologies in rice farming areas in Africa. However, Dey (1985) finds that the impact of these rice development projects on women is ambiguous, because of the unsuitability of agronomic and agroclimatic conditions, inadequate extension for women, loss of women's access to rice land, increase in women's labor input, and limited input supplies, marketing, and other support services for women. In many cases, the development programs repeatedly failed to take into account differences in social structure and the roles played by women in African rice cultivation. Many technologies introduced were inappropriate for existing conditions, and inadequate extension services meant that suitable technologies were not introduced to women. In many irrigated rice projects, sickles and threshing machines were introduced for men's irrigated rice, but were not available to women.

4.14 Many rice development projects deliberately handed over improved land to male household heads, even though women had previously been exclusively responsible for rice cultivation and often had independent rights to rice land. The possibility of double cropping also changed the traditional allocation of time across seasons, the dry season being customarily reserved for other activities like field maintenance and ceremonial activities. In addition, many of the new technologies increased demand for labor in situations where traditional tasks were being performed with very low-level, time-intensive, technologies. Where the introduction of the programs had detrimental effects on economic security of women, the success of the programs themselves were jeopardized.

4.15 Two classic cases are the introduction of irrigated rice in the Gambia (von Braun and Webb 1989) and Cameroon (Jones 1983). Technical difficulties and lack of understanding of farming systems led to unsuccessful early attempts to introduce irrigated rice in the Gambia (Box 3). In the IFAD-supported Jahally-Pacharr Smallholder Rice Project, attempts were made to preserve women's customary role in rice farming by giving women land titles (long-term leases) to irrigated rice areas. Nevertheless, the introduction of centralized pump irrigation transformed rice into a male-controlled crop. As yields per unit of land increased from 1.3 to 5.9 tons, the share of women's rice fields in the total dropped from 91% (of swamp rice fields) to 10% (of fully water-controlled rice fields). Less of the new rice crop was sold for cash than expected: the high-technology rice became a communal food crop under the control of the compound head, while traditional rice remained a mixed private (for cash sale) and communal food crop. This represents a shift from rice being a woman's individual crop to a communal crop under the authority of the male compound head. Moreover, the higher yielding technologies with higher variable costs became

¹⁷The contrast between India and the Philippines is interesting because the adoption of same technology has different effects on the status of women in landed households. While women in the Philippines have moved into nonagricultural occupations where they have greater control of their own incomes, landed women in rural West Bengal have increased time at home. Increases in income in West Bengal have been invested in larger families rather than in children's schooling.

the responsibility of men. As women's control of rice production declined, they reduced their labor input in rice and increased it in the cultivation of upland crops.

Box 3. Recognizing Women's Roles in Gambian Agriculture

Earlier attempts to develop irrigated rice in the Gambia by the British Colonial Development Corporation and Taiwanese and mainland Chinese projects suffered from problems of mechanical failures, flooding, and declining yields. Between 1972 and 1977, the Bank also sponsored a scheme to consolidate existing Taiwanese irrigation perimeters and to develop a further 1,200 hectares. Inputs were continuously provided on credit and farmers were required to follow a strict timetable for cultivation. Nevertheless, when the project was completed in 1977, less than two-thirds of the target area was developed and farmers were falling behind on loan repayments.

Lack of understanding of farming systems – and women's roles in agriculture – contributed to the lackluster performance of these projects. An impact evaluation study of the World Bank project revealed that:

- Double cropping was not widely practiced. At appraisal, it was assumed that the opportunity cost of labor was zero. However, there was competition for labor from other crops within the farming system. From the farmers' point of view, labor was scarce relative to land, so they chose cropping patterns which maximized the returns to labor. Wet season paddy provided relatively unattractive returns to labor compared to other rainfed upland crops.
- Traditional roles of men and women tended to discourage double cropping. Although it was recognized at appraisal that men and women grew different crops, it was assumed that the "family" would shift out of traditional crops into irrigated rice. Control of irrigated areas, mostly in swamps formerly cultivated by women, passed to men. While men have been keen to cultivate irrigated paddy in the dry season, many have retained the traditional practice of cultivating upland crops in the wet season, and have not been able to grow wet season paddy.
- The expected increase in marketed surplus did not occur. Farmers tended to retain increased output for home consumption. Since loans were meant to be repaid from sales of irrigated rice, loan repayment suffered. Furthermore, since no attempt was made to promote improved varieties of dry cereals (sorghum and millet), incremental increases in overall crop production were low.

Later Bank projects in the Gambia have learned from past mistakes. Project preparation documents for the Second Agricultural Development Project have highlighted the need to increase local involvement in the planning stage, to promote activities of women in rice agriculture, and ensure that both men and women would have equal access to credit.

Source: World Bank 1984.

4.16 Traditionally, women in Northern Cameroon spent most of their time on sorghum fields allocated to them by the head of the compound. However, in the SEMRY irrigated rice project, even when women were assigned rice plots, the proceeds were controlled by men (Box 4). The higher labor requirement for rice reduced time in sorghum production. Following the harvest, rice was retained for home consumption, and from sales of the surplus, men gave their wives a lump sum in cash to compensate them for their labor. Jones (1983) points out that women were willing to work more days in their husbands' rice fields only if they were compensated more. While wage rates for rice were higher than the returns from any alternative uses of the women's time, women apparently did not have the freedom to choose the option of wage labor, and had little incentive for labor input in rice work.

Box 4. Lack of Attention to Women's Roles in Cameroon Rice Project

The SEMRY irrigated rice project in northern Cameroon planned to give about 2,800 families already farming in the area an irrigated plot of 1.5 hectares to cultivate rice. It was assumed that the families would continue to farm lands with subsistence crops outside the project boundary.

Appraisal of the first SEMRY project in 1971 correctly identified the mix of crops being grown, but not the gender division of labor by crop and by plot. Despite the reduction in sorghum production, the project was successful in inducing the adoption of double cropping and realized yields were 50 percent higher than the appraisal estimate.

Appraisal of the second SEMRY project in 1977 paid attention to the need to increase subsistence crop yields, but did not consider the gender division of labor in the farming system. However, women were included in a project component designed to improve maternal and child health.

Source: World Bank 1971, 1977

4.17 As Boxes 3 and 4 illustrate, many agricultural projects have been designed and implemented without a sufficient understanding of women's roles in agriculture. The failure to consider women's roles in the design of rice development projects has had three detrimental consequences. First, there was a loss of adaptive efficiency from not taking women's operational knowledge into account. Second, there was a reduction of women's bargaining power within the household as well as an increase in work. Finally, adoption rates were lower due to women's lack of access to technology and training and to a failure by the proponents of the technology to address women's time constraints (Dey 1985).

Introduction of Other Crops in Africa

4.18 In other attempts to introduce new technologies in other African countries, where only men had direct access to the improved technologies, there was either loss of women's crop production role to men or an improvement in crops grown by men and not previously grown by women (Kumar 1987:142). While there may have been a short-run decrease in women's incomes and an increase in their labor input, long-run effects were not necessarily unfavorable. When cocoa was introduced in Western Nigeria, it became a men's crop and women's traditional obligation to provide labor was extended to cocoa, subject to bargaining and remuneration. However, much greater reliance was placed on male hired labor. Eventually, women decreased their time in food production, but increased it in food processing, cloth making and trade. While self-subsistence in food declined, food security did not.

4.19 In another case, women's independent incomes dropped when families migrated to a resettlement area devoted to improved cotton and sorghum in Burkina Faso. In the resettlement area, women did not have traditional rights to land, and their food crops were not included in the program rotation. Husbands did give their wives informal authority to cultivate part of the bush fields. After five years, however, families had paid off initial debts, family size had increased with the in-migration of additional family members, cash income was seven times higher, and grain yields were two to three times higher than in the home villages. Much of the increase in yields was used to guarantee consumption and to hire labor. The increase in hired labor enabled women to

decrease their labor inputs in common fields, expand their private grain fields, and become more involved in trading and livestock activities.

4.20 These two cases highlight the importance of relieving labor constraints either through the adoption of labor-saving technology in tasks which women traditionally perform (e.g. food processing, fetching fuel and water) or through the ability to hire labor. In both cases, the ability to hire labor enabled women to diversify into more profitable nonagricultural enterprises. Although much of the literature on Africa (e.g. Gladwin 1991) argues that the introduction of new technology only increases women's labor inputs, taking time away from her other responsibilities such as child care, this view does not recognize the women's tasks are time-intensive because of lack of tools and complementary inputs. Women can increase the efficiency of their time use if appropriate labor-saving technology is introduced.

Effects of Commercialization

4.21 There is some concern that increased commercialization reduces production of food for home consumption, with detrimental effects on nutrition.¹⁸ This has important implications for women due to their role as caregivers and their responsibility for subsistence in many societies. A number of recent studies, mostly by the International Food Policy Research Institute, have investigated the effects of commercialization on income, food expenditure, calorie consumption, and nutritional status in five countries with different farming systems and family structures (Gambia, Rwanda, Kenya, Guatemala, and the Philippines). Since it was possible to identify women's independent incomes in some areas, the findings also provide a way to evaluate the gender impact of commercialization.

4.22 Most of the studies (von Braun, Puetz and Webb 1989; von Braun, de Haen and Blanken 1991; von Braun, Hotchkiss and Immink 1989; Katz 1992; Kennedy 1991; Bouis and Haddad 1990) find that commercialization increases household incomes, although not all of the incremental income is spent on food. The IFPRI studies also conclude that commercialization does not have a detrimental effect on nutrition. However, actual impacts on women's income, women's and men's time allocation, women's access to land and off-farm employment opportunities vary widely, as the following studies illustrate.

4.23 Commercialization of Rice in the Gambia.¹⁹ The Gambian irrigated rice project discussed earlier was estimated to have increased income by 13 percent in the lowland villages, but the independent effect of project income on food expenditure was insignificant (Table 15). Moreover, the calorie response to increases in total expenditure per adult equivalent person (AEP) was inelastic (0.48 in the wet season, and 0.37 in the dry season). Calorie consumption in the wet season increases if women produce a larger share of cereals in a sinkiro (a cooking and consumption group within a compound) (Table 16), but not in the dry season when food supply is more abundant. Thus, the shifting of women's private crop and female-controlled communal crop

¹⁸See von Braun and Kennedy (1986) for a review of the literature.

¹⁹This draws from von Braun, Puetz, and Webb (1989).

to male control leads to reduced calorie consumption once income levels are controlled for.²⁰ The relative share of women in a sinkiro also contributes positively to calorie consumption, possibly because of availability of female labor for food preparation, and the higher energy expenditure of women in agricultural tasks. Increased access of women to new rice land reduced mother's weight loss, but may have contributed to child morbidity since mothers tended to take children with them to the rice fields.

4.24 Important lessons can be learned from this project's experience. The selection of a "woman's crop" for promotion does not necessarily mean it will benefit women, especially if women do not have access to cash inputs required to take advantage of the new technology. Neither can projects guarantee protection of traditional production arrangements while fundamentally changing the nature of production. Project experience also suggests that women are more involved in independent cash crop production than generally acknowledged and would benefit from increased access to inputs. Finally, it may be important to promote not only a single crop but also rice and upland crops to reduce competition between men and women in rice production.

4.25 Tea and Potato Production in Rwanda. Commercialization of subsistence agriculture in northwestern Rwanda is driven by the introduction of tea production, expansion of potato production for the market, agricultural off-farm employment, and home production, usually brewing of sorghum beer (von Braun et al. 1990). This area is characterized by a highly segmented rural labor market in which women provide 71 percent of agricultural family labor, and men participate mostly in off-farm employment. The introduction of tea has not substantially increased income because of competition with other crops and high fixed costs per unit of output in existing tea factories with excess capacity. However, tea production has increased women's employment, since they are employed mostly in plucking tea leaves. Despite women's heavy involvement in agriculture, there is a tendency for men to take over modern potato production, especially in the application of fungicides.

²⁰Von Braun et al. (1989) estimate that a drop of women's share in cereal production from 30 percent (the sample mean) to 10 percent (the share in many sinkiros with pump-irrigated rice) would reduce per capita calorie consumption by 2.2 percent in the wet season. To compensate this with a higher income would require an increase of 4.6 percent, which is less than the 13 percent increase due to the new technology. Thus, the new technology has a net favorable effect on calorie consumption.

Table 15. Selected coefficients, effects of commercialization and female control of income on household food expenditures, various studies

Country and Study	Dependent Variable	Income Variable		Female income, headship, or human capital variables		Commercialization or subsistence variables		Demographic variables		Price Variables		Comments
Gambia (von Braun, Puetz and Webb 1989)	Expenditure on food in <u>Sinkiro</u> ^b during wet and dry seasons per AEP ^c	Ln total expenditure	-8096.71 ^{***} (-9.83)			Income earned in new rice project over total income in <u>Sinkiro</u>	-53.33 (-1.19)	Household size	-12.64 ^{***} (-6.11)			Ordinary least squares
		Ln total expenditure squared	615.28 ^{***} (11.00)									
Rwanda (von Braun, de Haen, and Blanken 1991)	Expenditure on all food per capita per year	Ln total expenditure per capita	8605.52 ^{***} (19.52)	Female head dummy	1,295.17 ^{**} (2.28)	Consumed own produced food as share of total expenditures	37.70 ^{***} (3.4)	Share of children under 5 to persons in household	1,125.52 (1.23)			Ordinary least squares
								Ln household size	-129.49 (-0.3)			
Guatemala (Katz 1992)	Weekly cash food expenditures	Log of weekly household income	2.57 (0.56)	Weekly income of female head	0.11 (0.71)	Log of weekly value of subsistence production	-0.92 (0.53)	No. of AEP	3.55 ^{***} (3.38)			Heckman two-step estimation controlling for endogeneity of nontraditional export crop adoption and food allowance
		Adopter dummy x log weekly household income	-2.96 (0.62)	Predicted food allowance from husband	1.46 [*] (1.78)	Adopter dummy x subsistence production	-2.79 (0.80)					

a t- statistics in parentheses

b A Sinkiro is a cooking and consumption group within a compound

c Adult equivalent person

*** Significant at $\alpha = .01$

** Significant at $\alpha = .05$

* Significant at $\alpha = .10$

Table 15. Selected coefficients, effects of commercialization and female control of income on household food expenditures, various studies (cont)...

Country and Study	Dependent Variable	Income Variable		Female income, headship, or human capital variables		Commercialization or subsistence variables		Demographic variables		Price Variables		Comments
Guatemala (cont).				Adopter dummy x female head income	0.40** (2.14)	Adopter dummy	11.98 (0.67)					
				Adopter dummy x food allowance	0.09 (0.17)							
				Female head dummy	14.08 (1.26)							
Philippines (Bouis and Haddad 1990)	Food expenditures per capita per week	Predicted In income	20.39*** (16.9)	Mother's education	0.92*** (5.08)	Percent of food expenditures from own-farm production	0.002 (0.15)	No. of AEP	-0.40 (-1.48)	Price of Corn	0.83 (1.14)	Father's education exerted a negative and significant effect on food expenditures per capita
										Price of rice	-1.38** (2.41)	
				Mother's nutritional knowledge	-0.43*** (-3.02)							
				Mother's age	-0.33*** (-3.25)							

*** Significant at $\alpha = .01$

** Significant at $\alpha = .05$

Table 16. Selected coefficients, effects of commercialization and female control of income on household calorie consumption, various studies^a

Country and Study	Dependent Variable	Income Variable		Female income, headship, or human capital variables		Commercialization or subsistence variables		Demographic variables		Price Variables		Comments
Gambia (von Braun, Puetz and Webb 1989)	Calorie consumption per AEP ^b per day in wet season	Total expenditure per AEP	1.59 ^{***} (7.22)	Share of cereals in Sinkiro ^c under women's control	321.84 ^{**} (2.09)	Share of cash income to total income	67.74 (0.44)	Size of Sinkiro in AEP	-16.59 [*] (-1.95)	Rice price	-572.39 (-1.59)	Variables regarding the shares of children under 5, from 5-10, and 10-14 in AEPs were not significant
		Total expenditure per AEP squared	-2.07x10 ⁻⁴ ^{***} (-5.32)					Share of women in AEP	817.09 [*] (1.82)			
	Calorie consumption per AEP per day in dry season	Total expenditures per AEP	0.95 ^{**} (3.34)	Share of cereals in Sinkiro under women's control	-57.30 (-0.26)	Share of cash income to total income	556.30 [*] (1.71)	Size of Sinkiro in AEP	-36.76 ^{***} (-3.37)	Rice price	-635.95 ^{**} (-2.03)	Only the share of children ages 10-14 in AEPs was positive and significant
		Total expenditure AEP squared	-4.43x10 ⁻⁵ (-0.85)					Share of women in AEPs	1,478.37 ^{***} (3.54)			
Kenya (Kennedy 1989)	Total daily household calorie intake	Income per capita	2.2 ^{***} (6.2)	Percent women's income	18.6 ^{***} (2.69)	Percent nonfarm income	-31.4 ^{***} (2.89)	No. of AEPs	2,278 ^{***} (46.1)			
		Income per capita squared	-1.43x10 ⁻⁴ ^{***} (-4.20)									
Rwanda (von Braun, de Haen and Blacken 1989)	Calories per day per AEP	Ln total expenditure per capita	1,243.08 ^{***} (20.91)	Share of female income to total income	5.122 ^{***} (3.60)	Consumed own produced calories as percent of total calories	5.22 ^{***} (3.71)	Household size	-84.95 ^{***} (-6.12)	Price of potatoes	-24.52 ^{**} (-2.44)	
								Share of children under 5 years	1,323.01 ^{***} (8.66)			

^a t- statistics in parentheses

^b Adult equivalent person

^c Sinkiro is a cooking and consumption group within a compound

^{***} Significant at $\alpha = .01$

^{**} Significant at $\alpha = .05$

^{*} Significant at $\alpha = .10$

Table 16. Selected coefficients, effects of commercialization and female control of income on household calorie consumption, various studies (cont)...

Country and Study	Dependent Variable	Income Variable		Female income, headship, or human capital variables		Commercialization or subsistence variables		Demographic variables		Price Variables		Comments
Guatemala (von Braun, Hotchkiss and Immink (1989))	Calories available for consumption per day in the household	Ln total expenditures per capita	20446.41 ^{***} (2.66)	Ratio of female off farm income to total expenditure	-1.685.12 (-0.97)	Ratio of income from new cash crop to total income	57.25 (0.08)	Household size	1,747.34 ^{***} (13.02)	Maize price	-82,424.88 ^{***} (-5.77)	
		Ln expenditures squared	-1,328.33 ^{**} (-2.07)					Share of children under 5	-6,627.55 ^{***} (-3.11)	Beef price	505.48 (1.02)	

^{a/} Adult equivalent person

^{b/} Sinkiro is a cooking and consumption group within a compound

^{***} Significant at $\alpha = .01$

^{**} Significant at $\alpha = .05$

4.26 Food expenditures respond positively to increases in income (proxied by total expenditure in Table 15) and to the share of own-produced food as a share of total expenditures.²¹ On average, female-headed households spend 16 percent more than other families of the same income level and demographic composition. Calorie consumption also responds positively to income, to the share of calories which are own-produced, and the share of income controlled by women (Table 16).²² Future attempts to promote commercialization should therefore try to preserve women's income shares through the promotion of employment opportunities and through removing constraints to the adoption of improved technologies for subsistence production.

4.27 Non-traditional Vegetable Production in Guatemala. Two studies on the adoption of nontraditional export vegetables in the highlands of Guatemala have found that smallholder export agriculture increases farm household incomes substantially, has favorable distributional effects, and does not have detrimental effects on either subsistence production or nutrition (von Braun, Hotchkiss and Immink 1989; Katz 1992). If land is sufficient, adoption of nontraditional export crops may have important spillover effects on subsistence crops through the nitrogen-fixing properties of snow peas, increased availability of chemical inputs (Katz 1992:13), and more intensive cultivation of subsistence plots. While most of the labor is provided by men, and adoption of export crops is primarily a male decision, nontraditional export crop cultivation has strong employment effects, with the substantial share of increases in family labor provided by women.

4.28 Although both studies have similar conclusions, Katz's study also analyzes for its analysis the intrahousehold effects of nontraditional export crop adoption, particularly on household food expenditures.²³ In rural Guatemala, food purchases are usually a woman's decision, financed from their own income, income transfers from their husbands, and contributions from older children and other adults who are part of the household. The weekly food allowance from the husband (called el gasto) accounts for a little over half of total food expenditures. To the extent that export crop adoption increases male bargaining power, it may affect intrahousehold transfers, particularly the food allowance.

4.29 The study finds that nonadopters, though poorer than adopters, provided wives with slightly higher mean weekly allowances for food expenditures, although women had to sacrifice a portion of their transfers if they earned an independent income. In adopting households, which have higher incomes, the weekly food allowance is less responsive to changes in both husband's and wife's incomes, making women's earnings potentially more important in the overall determination of food expenditure levels. Indeed, in a regression of weekly cash food expenditures, the independent positive contribution of female income to food expenditures is much stronger in export crop adopting households than among non-adopters (Table 15). That is, in adopting households, female income has a contribution over and above the total household income effect (which is positive but insignificant) but no such independent effect is found among nonadopters.

²¹Since this is a cross-sectional survey, the study does not provide a real benchmark for the comparison of incomes before and after commercialization.

²²However, it can be argued that the share of income controlled by women and the share of calories which are own produced are both endogenous, since they reflect current household (or individual) resource allocation decisions.

²³This study also considers adoption of export crops as endogenous, and uses predicted adoption in subsequent regressions, unlike the IFPRI studies which stratifies adopters and non-adopters exogenously.

4.30 Simulations on the effects of the net effect of the profit from an additional cuerda of land planted to nontraditional export crops showed generally positive impacts on food expenditures. Although increases in household income had a slightly negative effect on food expenditures of adopting households, and husbands in adopting households had a lower marginal propensity to transfer income gains to their wives, the absolute income increases from export agriculture, combined with spillover effects on in-kind consumption and female income, were generally sufficient to increase food expenditures.

4.31 Despite the absence of detrimental effects on nutrition or women's ability to generate an independent income, Katz (1992: 23) expresses caveats regarding the intrahousehold impact of export crop adoption. It is possible that women may absorb the costs of adopting export crops by reducing time in non-remunerated activities (home production or leisure), and by compensating for marginal reductions in food allowances by sacrificing other forms of female expenditures. In order to enhance women's bargaining power within the household, she suggests that women should be able to enter into export contracts in their own names, to join agricultural cooperatives, and to receive technical assistance needed for growing export vegetables.

4.32 Shifts from Maize to Sugarcane in Kenya and the Philippines. There were major differences in the gender impact of shifts from maize to sugarcane production in Kenya (Kennedy 1989) and the Philippines (Bouis and Haddad 1990). Although incomes of smallholder sugarcane farmers substantially increased in both areas, the effects on women's involvement in agricultural production and nutritional status were markedly different, due to fundamental differences in the gender division of labor in agriculture in both farming systems and relative resource scarcities.

4.33 Kennedy's (1991) longitudinal study of smallholder sugar farmers in South Nyanza, Kenya tracked new entrants into sugarcane production up to and following the first harvest, and included a group of households relocated as a result of the sugar growing scheme and households employed by and living on the sugar estate of the South Nyanza Sugar Factory. The study found that real income per capita of new entrants was much higher than nonsugar farmers by 1,129 KSh, with 38 percent of the incremental income coming from market production, and 41 percent from production for home consumption. The increases in income had a significant effect on household food security but only a modest one on calorie consumption per capita, since the income elasticity of calorie consumption is only 0.15.

4.34 Different income sources had differential effects on calorie consumption (Table 16). The share of nonfarm income and sugarcane income had negative impacts on calorie consumption, while the share of women's income had a positive and significant effect on calorie intake. The nonfarm income and sugarcane income effects offset the positive effects of higher household income, and may be due to the nature of the income stream, and as well as male control of that income. Sugarcane payments are usually lumpy, and lump-sum payments tend to be spent on nonfood expenditures such as house improvements, school fees, and acquisition of capital. Moreover, nonfarm income and sugarcane income are usually controlled by men, whose traditional responsibilities are in the provision of the nonfood expenditures listed above. In contrast, much of the agricultural production used for home consumption are from female plots – 60 percent of food plots are controlled by women – and thus women's income has a positive effect on calorie consumption.

4.35 The Philippine case study was undertaken in 1984-85 in an area engaged in semi-subsistence maize production in Bukidnon, Mindanao, before the establishment of a sugar mill in 1977.²⁴ The introduction of sugarcane in this maize-producing area led to a serious deterioration in tenancy patterns. While landless households accounted for less than 5 percent of households engaged primarily in maize production, nearly 50 percent of households employed in sugar production had no access to land. Many former maize tenants lost access to land when landlords shifted to sugarcane using hired labor. However, for those smallholder sugar landowners and tenants who kept their land, sugarcane production was substantially more profitable than maize production, partly due to declining productivity in maize cultivation. All sugar households also continued to plant maize. Sugar households had higher incomes due to higher profits and partly due to larger landholdings, although income sources were diversified. With high income elasticities of food expenditures of 0.65, these increases in income were associated with higher food expenditures (Table 15), although these may not have been translated into higher calorie intakes due to a shift to more expensive foods.

4.36 Because it was not possible to identify independent sources of women's income in the Philippines, an exact comparison with the Kenya case study is not possible. However, in the two settings, there are large differences in the pattern of female labor use as a result of the switch to sugarcane, and in nutritional impacts on women. Maize employs considerably more family than hired labor per hectare in both Kenya and the Philippines, but sugar cultivation depends mostly on hired labor in the Philippines. Moreover, agricultural production in Kenya is more intensive in female labor. In Kenya, female adult labor accounts for one-half of family labor in maize, while in the Philippines, female family labor accounts for less than 15 percent of family labor. Child participation in maize cultivation, however, is higher in the Philippines. On a per hectare basis, women contribute less labor in sugarcane in both Kenya and the Philippines.

4.37 In absolute terms, the effects of the shift from maize to sugarcane cultivation were profoundly affected by relative resource scarcities. In the Philippines, where land is a constraint and sugar replaced maize, there was an absolute decrease in the demand for female labor in agriculture. In Kenya, where labor is a binding constraint and sugarcane production took place on previously fallow land, there was a marginal increase in the demand for female labor in agriculture. Thus, in the Philippines, higher-income women in sugarcane households were able to increase calorie intakes and reduce activity levels, and so improve their nutritional status. In contrast, in the labor-constrained environment of Kenya, improved calorie intake was used by women to increase the energy intensity of their activities rather than improve nutritional status.

Target-Group Oriented Policies

4.38 Many agricultural policies affect households and individuals through prices and markets, and are not directly targeted towards a particular group. Other policies, however, particularly those that attempt to change the distribution of resources are frequently oriented towards specific groups. Among these, many projects designed with households as the target beneficiaries often have differential impacts on men and women.

²⁴Although most of the sugar produced in the Philippines is produced in large plantations (haciendas), the Bukidnon area is one of smallholder sugar production.

Reform of land rights

4.39 Governments have attempted to change the distribution of property rights to land through agrarian reform programs, resettlement schemes, or land development schemes.²⁵ It has been previously argued that rural women have more limited access to land than men. This section examines the extent to which land policies -- agrarian reform, reform of land legislation, government allocations--have either worsened or improved women's property rights to land.

4.40 In some African countries, government interventions have reinforced, rather than remedied, traditional biases against women in land rights. In Kenya, Saito et al. (1994: 62-63) find that more men than women have received land from government allocations.²⁶ Thirty-two percent of male household heads reported receiving land by government allocation, in contrast to 12 percent of female heads (Table 17). Twenty-five percent of male household members also reported receiving land allocations from the government, compared to only 2 percent of female household members. Land allocated by the village seems to be more equitably distributed between men and women in both Kenya and Nigeria, possibly because these involved the distribution of usufruct rights.

4.41 Formalization of customary rights may have unintended consequences on women's traditional rights to land. In matrilineal areas of Malawi, where women have inheritance rights to customary land, the restriction, until recently, of burley tobacco-growing to leasehold land has led to the registration of tribal lands in the name of the husband, with no protection for the woman in the event of divorce. A recent survey of estates counted roughly 500 estates out of 15,000 registered being held in the name of women, 3 percent of the total (Mkandawire, Jaffee and Bertoli 1990 in Ariza-Nino 1991). In Zambia, the new Intestate Succession Act attempted to eliminate unfair practices against surviving female spouses and children and to equalize rights of succession for males and females (Saito et al. 1994). However, the land 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 family of the deceased. Although the law allows the widow to retain farm implements, it provides no guarantee of her rights to the land she has farmed.

²⁵"Land reform" refers to government policies that intend to redistribute the whole, or a part, of the bundle of property rights on land, while "agrarian reform" refers more broadly to the reform of agrarian institutions, including credit and marketing institutions and to the redistribution of land property rights.

²⁶Unfortunately, there is no information on the distribution of land area by mode of acquisition (rather than by number of responses).

Table 17. Land Acquisition by Gender in Households Surveyed in Kenya and Nigeria

	Nigeria		Kenya	
	Male	Female	Male	Female
<u>Heads of households</u> % who obtained land by				
Purchase	8	12	24	27
Inheritance	56	50	30	45
Given by family	5	4	4	13
Allocated by village	14	13	4	2
Allocated by government	-	-	32	12
Rented	15	19	3	1
<u>Members of households (excl. heads)</u> % who obtained land by				
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: Saito et al. (1994)

4.42 Resettlement projects and irrigation schemes may have also altered the distribution of land rights. Two examples mentioned above are the Jahally-Pacharr irrigated rice project in the Gambia and the SEMRY irrigated rice scheme in Cameroon. In Burkina Faso, planned settlement areas managed by the Volta Valley Authority vested all title to land in the male household head, such that women had to clear land outside the settlement to establish individual plots (Saito et al. 1994).²⁷

4.43 Much of the unintended results of land policies arose from planners' lack of attention to traditional roles and obligations and non-pooling of incomes in African families, as well as women's important role in agriculture. Neither were women's land rights considered in the majority of land reforms in Latin America. Deere's (1985) review of thirteen Latin American agrarian reforms finds that the majority have not produced significant numbers of female beneficiaries, or even given attention to gender as a beneficiary category (Table 18). The exceptions are Cuba and Nicaragua, where it was an explicit objective of state policy to include women. In Cuba, 26 percent of 78,000 members of 1,400 production cooperatives are women; in Nicaragua, as of 1982, 20 percent of the production cooperatives and 60 percent of the credit and service cooperatives have at least one woman member. However, in 1982, women represented only 6 percent of the total

²⁷Current proposals to develop village land management plans do consider the issue of women's land rights.

cooperative membership of 64,891 (Deere 1985: 1040).

4.44 Legal, structural, and ideological mechanisms have excluded women from Latin American agrarian reform programs. Since social custom dictates that if both an adult man and an adult woman reside in a household, the man is considered its head (Deere 1985: 1041), the only women who could possibly benefit from an agrarian reform program would be widows or single mothers without an adult male in the household. Structural characteristics of the agricultural labor force also mitigate against the inclusion of women. Many agrarian reforms have benefitted only the permanent agricultural wage workers employed on estates at the moment of expropriation, excluding the often large seasonal labor force from membership, of which women make up a large proportion. The use of point systems which give priority to peasants with more education, larger family size, and farming experience, as in Colombia, also discriminates against rural women, who have less education than men, and whose farming experience is likely to be downplayed due to cultural stereotypes. Ideological norms governing the proper sexual division of labor – the man's place is in the fields, the woman's place is in the home– are also a barrier to women's benefiting from agrarian reform in Latin America. Only in Mexico, Bolivia, and Honduras are female heads of households explicitly included as potential beneficiaries. In contrast, in Cuba and Nicaragua, not only female household heads, but also wives and daughters can qualify as agrarian reform cooperative members. Lastly, agrarian reform may introduce changes in traditional patterns of land rights which were formerly more equitable to women, such as the bilateral pattern of land inheritance in the Andean highlands. Whereas women would have had independent rights to land under traditional inheritance customs, these are replaced by agrarian reform laws in which only men have succession rights.

4.45 Even if men and women were deemed equal beneficiaries of land reform, differences usually exist between formal and real land rights, as the experience of China suggests (Wazir 1987). Although the Marriage Law guaranteed equal rights of men and women, it was not forcefully implemented. Neither did formal equality of land ownership under the land reform loosen the hold of traditional values, although having land rights increased the bargaining power of peasant women within their households. When agriculture was collectivized, women were discriminated against since they received lower workpoints than men, and their pay was usually added to the husband's pay packet. The unequal allocations under collectivization affected the reallocation of collective land after the 1978 agricultural sector reforms. Under the production responsibility system, land for individual cultivation was allocated according to the size of the household labor force and number of workpoints -- restoring the bias against women in land rights.

Table 18. Women in the Latin American agrarian reforms

Country	Women beneficiaries (%)	Beneficiary criteria
Mexico	n.d.*	Individuals over 16; any age if have dependent; men or women farmers
Bolivia	n.d.	Individuals over 18 if <u>feudatario</u> ; over 14 if married; widows with children may receive land
Cuba	26 (1983)	Individuals; state policy goal to incorporate women
Venezuela	n.d.	Individuals over 18; preference to household heads with most dependents and most efficient farmers
Colombia	n.d.	Individuals; point system favored farming experience, education
Costa Rica	n.d.	Individuals over 18; preference to household heads with most dependents and farming experience
Honduras	3.8 (1979)	If single male, 16; any age if married male; single or widowed women with children may apply
Dominican Republic	n.d.	Heads of household
Ecuador	n.d.	Individuals
Peru	n.d.	Heads of household with dependent children, agriculturalists over 18
Chile	n.d.	Married or effective heads of household; point system, favored "aptitude" for agriculture
Nicaragua	6 (1982)	Individuals; an objective of agrarian reform to incorporate women
El Salvador	n.d.	Individuals

n.d. = no data available

Source: Deere (1985)

Irrigation Projects

4.46 Irrigation projects may have a significant local level effect through their impact on the allocation of water rights, the distribution of irrigated and non-irrigated land, and the control of the increased output. These projects may also change the distribution of land rights and control of output between men and women, or introduce changes in social institutions. These schemes are generally of two types: (1) irrigation settlement schemes; and (2) irrigation with full or partial water control alongside existing rainfed farming systems (Dey 1990: 7).

4.47 In settlement schemes, often associated with the promotion of a particular cash crop, women's status was not always protected. Since only male household heads were recognized as official tenants or settlers, women had no direct access to irrigated land and new technologies. Rainfed land made available to women was usually insufficient, and high-yielding technologies were not available for rainfed crops. Finally, male control of incomes increased because the resettlement schemes usually required that irrigated crops be marketed by the household head, often through a scheme-managed marketing company.

4.48 In schemes involving the construction or expansion of irrigation facilities alongside a rainfed area, the distribution of land rights prior to irrigation usually took one of three forms: (1) women had use rights and controlled both the production process and the crops; (2) men had use rights, cultivating (and controlling) either personal crops or household food crops; and (3) both men and women had prior use rights which were subsequently maintained. The two cases cited above, in the Gambia and Cameroon, represent the first two types, respectively. In Madagascar and Zanzibar, where both men and women have land rights, and intrahousehold responsibilities for production and consumption are not so strongly differentiated, both men and women were able to share the benefits from irrigation projects.²⁸

4.49 In Madagascar, control of income from sales lies with the person who goes to the market to sell, while decisionmaking lies with the one who goes to market to buy (Raparson 1989, cited in Dey 1990). Women accounted for over 40 percent of market transactions, women and men jointly accounted for another 40 percent, and about 10 percent were made by men alone. Since women played an important role in the allocation of family income, and since they had the right to hold land in their own name, they appeared to benefit equally with men from increased family income resulting from the new irrigation technologies. Women were also initially active in general assemblies for irrigation scheme management, although they were eventually discouraged by the lack of attention to women's concerns by the all-male extension staff.

4.50 In Zanzibar, where just over 50 percent of tenants in an irrigated rice scheme were women, there was little competition from men over the control of irrigated land (Dey 1990). This was due to poor incentives in rice, unwillingness of farmers to experiment in irrigated rice production, given higher returns from upland crops, and rice being considered a crop for home consumption, which would fall under the woman's responsibility for subsistence. Since men generally marketed surplus crops (even if produced by the wife) and controlled any incremental income in the household, they would not have to compete with women for land rights.

²⁸In these two countries, the social organization of production has been influenced by Asian or Near East farming and cultural systems.

4.51 Similar to the experience in Madagascar, men's and women's independent land rights, sharing of social responsibilities by men and women, social acceptance of women in leadership roles, and female community organizers contributed to the success of two irrigation projects in Southern Luzon which formed part of the Philippine National Irrigation Authority's (NIA) communal irrigation systems (Illo 1985). Drawing from lessons learned from the pilot project, and with World Bank support, NIA extended the participatory approach to the development of communal irrigation systems throughout the country (Box 5).

Box 5. Involving the Community in Irrigation System Design and Operation

Under the Communal Irrigation Development Project supported by the World Bank and IFAD, the National Irrigation Authority (NIA) of the Philippines undertook a national program which involved farmers in the planning, construction, and operation of communal irrigation systems (CIS).

Through this project, NIA was able to upgrade, extend, or build 144 small, scattered and irrigator-owned rice systems. Despite rebellions, typhoons, cost over-estimates, shortages of government funds, and implementation delays, the results of the project were very good. The project even surpassed some of the physical development targets set at appraisal, and while agricultural impact was slow, increases in irrigation intensities and paddy yields were higher than appraisal estimates. The project also increased farm incomes of about 37,000 farm families.

The success of the program at the grassroots level can be attributed to the full participation of farmer-beneficiaries in the CIS. This, in turn, can be traced to the project's clear conceptual foundation, based on the participatory approach developed by NIA since 1976, under a Special Communal Irrigation Pilot Project, implemented with assistance from the Ford Foundation. Through this project, NIA shifted its orientation from the construction of large-scale schemes with minimal farmer involvement, to the delivery of services through small, farmer-designed and managed CIS.

The Philippine CIS project drew from an indigenous tradition of farmer-built irrigation and was responsive to cultural contexts in which women could exercise independent land rights and leadership roles within the community. It also undertook key organizational changes which utilized both social-organizational and technical data in site selection, fielded community organizers eight to nine months prior to construction to develop the irrigators' associations, and developed the local associations' implementation capabilities by providing financial and water management courses and developing association committees for specific tasks.

Source: Korten (1982), World Bank (1992b).

4.52 Although male engineers and technicians formerly dominated the staffing of NIA, in 1981 the NIA started to develop a new staff charged with preparing farmers for participation in the construction of physical irrigated facilities and with organizing water users into irrigators' associations. The institutional staff, called community organizers, was composed of college graduates, two-thirds of which were women.²⁹

4.53 With the encouragement of the female community organizers and the farmers' own

²⁹The sex ratio compares favorably with that of the Ministry of Agriculture and Food: in 1983, MAF fielded a total of 4,063 farm management technicians, about 48 percent of whom were women.

initiative, women farmers undertook important leadership roles in the irrigation associations. In the Aslong project, 16 out of 165 members were women. Members had the opportunity to contribute to equity by donating land through which the system would pass, or by contributing labor. Female farmers often asked their spouses or adult sons to contribute labor in their name, while male farmers often asked their spouses to attend meetings in their behalf, although proxies did not have voting rights. Sending adult males to contribute labor to the project distributed the time demands among the men and women of member farming households. In the Lower Lalo project, women accounted for 20 percent of association members. Women participated in the association as independent farmers (if they were directly involved in farm management), if the woman held the title to land and her husband acknowledged her to be the appropriate member, and if both spouses had joint membership. Female leaders were chosen based on their educational background (comparable to males) and good record in organizational participation.

4.54 Despite the success of both projects in incorporating women, such attempts to involve women are vulnerable to assumptions, particularly by project planners, that women's sphere of influence is only in the home. Government planners' assumptions were often in contrast to those of project beneficiaries, including men, who encouraged women to join the organizations as well as participate in leadership roles. The project experience also highlights the importance of membership recruitment strategy. In contrast to "one household, one member" rules, participation increased when dual or multiple membership was allowed, especially when membership fees were kept low. The presence of wives also facilitated the payment of fees, since women traditionally control family finances in the Philippines. Lastly, the deployment of female community organizers was crucial to women's involvement in the communal irrigation associations.

Agricultural Extension³⁰

4.55 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).

4.56 Although the evidence that productivity gains from targeting extension to women farmers exists, women tend to receive less extension advice than men (Saito and Spurling 1992; Saito et al. 1994).³¹ In order to address this problem, a number of recent projects have adopted innovative ways of reaching women farmers, as the women in agriculture program in Nigeria illustrates (Box 6).³² Some of these have involved using recruiting more female extension agents, redeploying home economists and other agents by retraining them in agricultural subjects, using para-extension agents in their own localities, and using female agents as subject matter specialists and supervisors.

³⁰This section draws heavily from Saito et al. (1992) and Saito and Spurling (1992).

³¹See the sections on gender differences in agricultural productivity and access to resources.

³²Implementation aspects of this project will be discussed in Section 5.

4.57 Recruitment of female agents can be improved by increasing female enrollment in agricultural colleges, abolishing unnecessary entry qualifications based on age and civil status, providing separate boarding facilities where needed, and improving public relations to encourage agricultural careers. To improve recruitment in rural areas, agricultural colleges could be located there and agents recruited from specific geographical areas. The extension system could also recruit women with agricultural degrees and diplomas, as has been done in India and Nepal, and which is being tried in Turkey. Increasing the supply of female entrants into agricultural colleges depends greatly on the pool of secondary school graduates, emphasizing the importance of female secondary education.

4.58 Other rural agents (e.g. home economic and community workers) and less academically qualified agents can also receive a short training on agricultural skills and subsequently be integrated into a unified extension system with equal status and incentives for male and female agents. In countries where mobility of women is limited, women can be assigned in pairs, provided with appropriate transport, or recruited from the same area.

Box 6. The Women in Agriculture (WIA) program in 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.

Source: Saito et al. (1994)

4.59 Despite these efforts, the number of female extension staff will not be sufficient to reach female farmers in the short run. Thus, male agents must be trained to work with female farmers using: (1) socially acceptable institutions as women's groups; (2) gender targeting, whereby a female agent initially establishes contact with the group, and then turns it over to the male extension agent; and (3) incentives integrated into the reward structure of the extension system.

4.60 The communication of extension messages to women can be improved in innovative ways. These include using traditional women's groups (a cost-effective way of increasing the farmer-agent ratio); using women as contact farmers, chosen by merit, farming experience, or

representativeness of local conditions rather than political connections; and using methods of communication appropriate to the target group's education and literacy levels as well as their access to communication facilities.

5. PROMISING APPROACHES FOR INCREASING RURAL WOMEN'S INCOMES AND WELFARE³³

5.01 This section discusses Bank experience in implementing gender-sensitive agricultural projects, based on a review of selected Bank projects which have been identified as having significant gender-specific discussion, analysis, or recommendations. Drawing from project documents and interviews with task managers, this section highlights: (1) gender-specific constraints addressed by the project; (2) necessary modifications in project design that were instituted; and (3) measures taken by the Bank and the country governments to improve implementation effectiveness. The review attempts to be representative across regions, but cannot make a true ex post evaluation of project impact since most of the projects with women-in-development (WID) components or gender-specific objectives are relatively new. Finally, it proposes guidelines for the design and implementation of gender-sensitive programs and projects in agriculture.

An Overview of Gender-Sensitive Agriculture Projects

5.02 The Bank's lending program in agriculture is increasingly addressing gender issues. The percentage of Staff Appraisal Reports (SARs) in agriculture with significant gender-specific discussion, analysis, and/or recommendations increased from 16 percent in fiscal 1988 to 58 percent in fiscal 1992.³⁴ Across regions, 88 percent of agriculture projects in East Asia, 67 percent in South Asia, and 60 percent in Africa contained analysis and specific actions to help women in fiscal 1992. Preliminary results for fiscal 1993 suggest an increased emphasis on gender issues, with a sectoral aggregate of 63 percent, and all SARs (100 percent) in East Asia, South Asia, and Europe and Central Asia Regions, and 75 percent in Africa, significantly addressing gender issues in proposed projects.³⁵

5.03 A review of Bank agricultural projects in Asia (Molnar and Naqvi 1992) found that gender-specific design measures in Bank agricultural projects generally aim to achieve the following objectives: (1) to increase women's income, and indirectly, the family's standard of living; (2) to broaden the range of productive opportunities available to women; and (3) to better meet project objectives by incorporating women who were key actors in the subsector into the project, or to target the poor, many of whom are women. Although some projects also aim to increase women's well-being, e.g. through better health and nutrition, increasing the status of women is not mentioned as a project objective.

³³This section was written with contributions from Janet Owens and Benjamin Crow.

³⁴These figures are taken from the WID Monitoring Report for FY93 SARs and the WID Update for 1992.

³⁵The percentage of Economic and Sector Work in agriculture which addresses gender issues has remained the same from FY88 to FY 92, at 38 percent.

5.04 Six common strategies have been employed to achieve the above objectives: (1) identifying women in the project documentation as one set of target beneficiaries (Box 7); (2) designing particular measures to alleviate perceived constraints in women's participation in a main project component; (3) designing interventions to increase women's access to information and extension services available in the project (Box 8); (4) designing interventions to increase women's earnings from existing activities or to create new opportunities/expanded opportunities for earning (Box 9); (5) providing women more access to capital and inputs or securing their property rights; and (6) improving the quality of gender analysis in design and implementation (Molnar and Naqvi 1992).

Box 7. Targeting Food Security Programs to Women

Burkina Faso: Food Security and Nutrition Project (fiscal 1992). The project aims to improve national food security by reducing the Government's response time for reacting to national food emergencies, improving targeting of food security programs to the poor in drought-prone areas, and providing for a data base and logistic frame for national decisionmaking on food security. Targeting of the project would be by region (four of the eight most vulnerable provinces), by season (focus on the lean season in food-for-work and cash-for-work programs) and by gender (income generating activities of women).

At the household level, the project aims to institute labor intensive (cash/food-for-work) rural public works programs, diversify household income sources, and carry out a nutrition education programs. Recognizing that mother's income positively influences child nutrition, the project targets a minimum of 50 percent female participation in the labor-intensive public works program, and is directing income-generating activities and nutrition education towards women.

Source: World Bank (1992c)

Box 8. Reaching Women through Agricultural Projects

Brazil: Agricultural Extension Project II (fiscal 1986) A follow-up to the Agricultural Extension I Project, this project aims to increase the scope, efficiency, and effectiveness of the National Agricultural Extension System. It plans to change the extension methodology from the traditional individual contact approach to a group approach, identify essential farmer/extension/research linkages, provide training, technical assistance and required studies, and expand social and community services. It will provide production-related extension to women, specifically for home gardens and orchards, promote nonagricultural income generating activities, encourage the formation of producer groups, and integrate social extension activities with agricultural extension.

Chile: Small Farmer Services Project (fiscal 1992) The project aims to improve the productivity and incomes of small farmers through technology transfer, credit provision, land titling, rural communications systems, and institutional strengthening. The technology transfer program would involve farm-oriented extension as well as home-centered assistance on family kitchen gardens, water treatment, and improved health and nutrition services. Through formal agreements between INDAP (Agricultural Development Institute) and the Ministry of National Property, female heads of household would be priority beneficiaries of land titling efforts, and collaboration between INDAP and the National Women's Service would improve the delivery of agricultural extension to women farmers.

Box 8. (continued)

Cote d'Ivoire: Women in Development Pilot Support Project (fiscal 1991) Although the T&V system has been adopted in Cote d'Ivoire, the existing extension system is organized mainly by crops and is staffed predominantly by male agents. Conceived as the pilot phase of a medium term program, this project would increase the productivity of rural women's farming systems and their access to markets, upgrade urban women's marketable and employable skills, and improve household welfare through training women in literacy, numeracy, health, and nutrition. The project would also develop the institutional capacity of the Ministry of the Advancement of Women to coordinate and promote activities related to women, and to establish a more systematic approach to the provision of support services to rural and urban women in the pilot project regions. About 12,000 women are expected to benefit from the pilot project; in the main phase, some 60,000 rural women would benefit from better access to extension agents from the line ministries.

Nigeria: Multistate Agricultural Development Project II (fiscal 1989). The project will provide agricultural services directly to women in three states, with programs tailored to specific zones. As part of the regular extension service, retrained experts in home economics will address the technical needs of female farmers, and the number of female extension agents will be increased. Agricultural processing will receive special attention, to increase value added, generate income for women, improve nutrition, reduce drudgery, and free female labor for other tasks. Improved tools and implements will be sold through government outlets and retailers, and credit will be provided through the Cooperative Financing Agencies.

Turkey: Second Agricultural Extension and Applied Research Project (fiscal 1990) At present, extension services are not provided to female farmers, except for handicrafts, nutrition, and home economics. The project includes a pilot program to train women in improved methods of agricultural production. It will evaluate alternative training methods for women in agriculture, such as the training and placement of female village group technicians (VGTs), training of qualified and interested wives of VGT's to carry out extension functions on a part-time basis, and the development of video cassettes and other training materials to enhance the role of women in the farm community.

Yemen: Southern Regional Agricultural Development Project (fiscal 1987) In order to increase agricultural productivity and incomes of about 120,000 farm units, the project will improve the operation and maintenance of irrigation schemes, provide special assistance to women farmers, and provide services for rural women to raise the health and nutrition standards of their families. The project establishes a pilot agricultural extension system for women farmers, with separate facilities. The project would provide for a gradual increase in the number of female extension agents from 12 to 27, of which two-thirds would specialize in agricultural topics. Three agents would operate out of nine extension centers which would be established, and the agriculture agents would be assigned to specific territories covering 500 to 600 women farmers per agent.

Source: World Bank 1992d; 1990a; 1990b; 1988; 1987

Addressing Barriers and Constraints of Rural Women

5.05 Many projects aim to increase women's incomes and productivity by relieving one or more constraints which may be especially binding for women. Although many barriers are common to women across cultures, the particular form they take may be specific to local conditions, making design flexibility and cultural sensitivity necessary.

Increasing access to land and property

5.06 Innovative approaches to giving women land rights have been attempted in two Bank projects. In the India sericulture project, participating states have adopted measures to give women

Box 9. Income Earning Opportunities for Women in Agricultural Specialties

China: Shandong Agricultural Development Project (fiscal 1989). This project seeks to increase rural incomes through the development of irrigation systems, livestock production, and mariculture. One-third of the project – the upgrading of small livestock production and processing – is targeted mainly to women. Rearing of small livestock is widespread and mainly a female occupation (almost 100,000 women in the target area maintain small animals), but levels of technology and investment are low. The project will involve training and deploying 245 female extension workers and 20,000 female village technicians to improve access to veterinary and extension services for women. About 3,200 women will find jobs in new agricultural processing activities and about 3,800 in processing maricultural products.

India: National Sericulture Project (fiscal 1989). Women provide about 60 percent of the total labor input in mulberry cultivation, silkworm rearing, and raw silk production, and they dominate two critical aspects of sericulture: silkworm rearing and cocoon reeling. The project includes a variety of measures to improve women's working conditions, reduce health hazards, and improve their ability to earn and control income from sericulture; it will affect women in some 5 million households. It emphasizes extension advice for women and provides for more female subject matter specialists and extension agents. It promotes women's access to cocoon markets, credit, advanced technology, and technical training, and it will increase the employment of women in sericulture agencies. The project also provides direct support to nongovernment organizations and women's groups promoting the participation of women and other underprivileged groups in sericulture.

Source: World Bank 1989a; 1989b

sericulturists access to land. In Jammu and Kashmir, efforts are being made for women to obtain joint titleship to the mulberry garden if they have a "no objection letter" from the husband or landowner. In Andhra Pradesh, women's access to land is being promoted under state land grant schemes. In Karnataka, project funds were used to lease (not purchase) lands for women's groups. Moreover, the local Departments of Sericulture have attempted to overcome attitudinal and structural difficulties in strengthening women's land rights by preparing proposals to support land development under the one-time assistance program for women's groups. Wherever men are willing to transfer land to women, the registration costs for changes in deeds were included as part of the support for women's group formation.

5.07 Obtaining land titles for female heads of households is a priority in the Chile Small Farmer Services Project (SFSP). Chile's experience that farmers with secure land tenure more readily accept new technology has motivated the targeting of rural land titling efforts to the most difficult and neediest cases. Under a formal agreement between the Ministry of National Property and the National Women's Service, the project would facilitate titling for female household heads, using simplified legal procedures (World Bank 1992d).

5.08 It must be noted, however, that any projects which attempt to change the distribution of land rights in favor of women may be met with resistance. For example, a suggestion that new allocations of irrigated land in Mauritania be in joint names or split between the couple was not generally thought to be acceptable, and would require much preparation and sensitization by very good agents before allocation of the land (Spurling 1993:28).

Disseminating new technologies and income-earning opportunities

5.09 Technology transfer to women farmers and agricultural workers opens doors to new

income-earning opportunities. In Chile, the technology transfer program proposed under the SFSP comprises both farm-oriented extension as well as home-centered assistance (family kitchen gardens, water treatment, improved diets and cooking methods). Efforts would also be taken to include young married couples in the pilot program for the 18-30 age cohort, which has not reached single women due to cultural perceptions about appropriate group activities for unmarried females.

5.10 The India sericulture project focuses on improved input supply, especially facilities for the production of silkworm eggs and young silkworms. For women, who make up an estimated 60 percent of the sericulture and reeling sector work force, cocoon rearing offers light but regular work (World Bank 1989b). By 1993, female participation in mulberry cultivation, silkworm rearing, and silk reeling had increased substantially in Karnataka, Tamil Nadu, and Andhra Pradesh. Similarly, the livestock component of the Shandong Agricultural Development Project aims to increase women's employment in breeding farms, processing activities, and processing and packing of mariculture products, and assist some 97,000 women in "specialized households" who would have control of small animal-raising enterprises.

Improving access to agricultural extension services

5.11 The majority of projects reviewed include interventions to improve the delivery of extension services to rural women. Three basic interventions in the projects are: (1) improving the delivery of appropriate extension messages to women as a separate clientele; (2) increasing the number of female agents and supervisors in the extension system; and (3) providing separate facilities, transportation, and other resources for extension to women farmers.

5.12 The delivery of appropriate extension messages to women may entail revising the content and orientation of extension to be more relevant to women farmers' needs. Women in the Cote d'Ivoire pilot project, for example, eagerly approached female extension agents for advice on farming practices, but were less enthusiastic regarding home economics courses. In extension systems staffed mostly by men, or where it is difficult to recruit qualified females, male extension agents may also need to be trained to work with female clients, with a concomitant revision of extension methodology. Technical training in Chile, for example, has traditionally been directed to men under the assumption that they are the valid subject for such training. However, research has shown that women have good knowledge of agronomic practices, participate actively in farm decisionmaking, and even have higher literacy rates than males in rural areas, suggesting the potential for disseminating more complex technical messages (World Bank 1992d). Thus, under the Chile SFSP, a team of private female consultants (agronomists, sociologists) will train technology transfer teams at the regional level to reorient extension methodology and practice to better serve rural women.

5.13 In some projects, emphasis is given to providing appropriate extension messages to women without necessarily hiring female extension workers. In the Brazil agricultural extension project, for example, a component to improve the delivery of agricultural and horticultural extension messages to women does not explicitly mention the increased hiring of female extension agents.

5.14 In countries where social norms restrict interaction between male agents and female farmers, gender-sensitive agricultural extension projects have deliberate provisions to increase the number of female agents. The increased number of female agents would either be part of a unified extension system, as in Nigeria, or an independent extension system, with separate facilities, under

the overall extension service (Yemen), with the possibility of mainstreaming into the regular extension service in the future. Special provisions may be made to facilitate the delivery of extension messages by female agents to women farmers, such as the training and placement of female village group technicians to train women's groups, and training qualified and interested wives of male agents to carry out extension functions on a part-time basis, as in the Turkey extension project.

5.15 It is often difficult to recruit female agents for rural assignments. To improve work conditions and mobility of female staff, most projects recruit in the local area, recruit in pairs, and provide special allocations for transportation (e.g. a car and driver for every two female technicians) and housing. To increase the pool of potential agents, programs have urged relaxing academic qualifications and focused on retraining, not just home economics agents but also local community leaders.

Improving access to credit and financial services

5.16 Limited ownership of assets which are acceptable as collateral and limited information on past borrowing behavior -- in large part due to non-participation in the formal credit market--make it difficult for women to obtain credit on their own. Some promising approaches have been tried to improve women's access to financial services.

5.17 In the India sericulture project, various states have adopted innovative ways of giving women credit on their own. In Tamil Nadu, credit is being provided to women in their own names, while in Karnataka, small loans are being granted to women without collateral. In Jammu and Kashmir, women project participants are being allowed to use family lands as collateral. Throughout the project area, DOS-supported women's self-help groups are also undertaking voluntary saving (thrift) activities, and DOS technical support is helping women who would not otherwise be considered creditworthy. To relieve the information constraint to lenders, in Andhra Pradesh, the DOS is preparing separate reports on repayment records of women's loans. In the Nigeria project, state Agricultural Development Projects (ADPs) have also assisted women's groups in acquiring credit by preparing the commercial documentation and submitting applications on the groups' behalf.

5.18 In Chile, the project includes complementary credit for working capital (seeds, fertilizers) and investment (fencing, reproductive and draft animals, orchard establishment, implements, on-farm storage) consistent with technology transfer initiatives. Credit is also being provided to women in line with microenterprise development. The project would assist in conducting feasibility assessments of women's proposals for credit assistance in fields like small animal husbandry, fruit drying and packaging, and high value fruit and vegetable production. Following credit approval, specialized technical assistance on technology and marketing would be provided. Efforts are also being taken to liberalize women's access to INDAP (Agricultural Development Institute) credit through the design of mechanisms which surmount collateral and head of household constraints (passbook savings accounts, family borrowing with designated recipients) and the use of flexible criteria for eligible productive activities. While the project would not target credit specifically to women, lending to women would be mainstreamed within INDAP's regular lending activities.

Improving access to employment opportunities, especially for the poor

5.19 Wages in cash or in kind are an important source of income for asset-poor women in rural economies. In slack agricultural periods, non-farm work may represent an additional income source. Various projects have attempted to create employment opportunities in the context of safety net programs, designed to protect the poor from transitory income shocks, as well as programs which aim to increase long-run productivity in rural areas, such as public works and infrastructure.

5.20 Rural public works programs may be successful in providing employment to poor women (Box 10). The Employment Guarantee Scheme (EGS), a rural public works scheme in the state of Maharashtra, India, guarantees that every adult who wants a job in rural areas will be given one, provided that the person is willing to do unskilled manual work on a piece-rate basis. Due to parity in wage rates between men and women and convenient location of work sites, the scheme is attractive to rural women. A longitudinal survey of households in the semi-arid region of Central India between 1979/80 and 1984/85 found that the EGS is indeed effectively targeted to young, less-educated, landless female heads of households (Deolalikar and Gaiha 1992).

5.21 Similarly, the employment opportunities offered by the Bangladesh Food-for-Work Program (FFWP) are important to poor rural women. Case studies of FFWP sites found that fifty-seven percent of women respondents came from households where women are chief income earners, and 47 percent of the women workers were heads of households themselves. Contrary to assumptions that women in South Asia would not participate in public works programs, the actual number of FFW opportunities available or offered to women was the major constraint to women's employment (Chen and Ghuznavi 1977).³⁶ Although women do the same work as men, lack of equipment, domestic responsibilities, and lack of physical capacity prevented women from fulfilling the work norm (70 cubic feet of earth per day) to guarantee the nutritional requirement of three seers of wheat per day. A modified work norm based on female nutritional standards which takes into account women workers' dependency burden has been suggested.

5.22 Given women's key role in food production in sub-Saharan Africa, African women do not face severe cultural constraints on participating in public works programs (with few regional exceptions). Despite this, women are not always explicitly included in African food-for-work programs. In some Sahelian countries, the unavailability of male labor has been an oft-cited reason for not doing public works programs. In Niger and Burkina Faso, it is widely stated that massive out-migration of men during the season when public works can be implemented leaves behind a major labor force of only women and children. However, women do contribute actively to public works schemes. They are involved in the CARE "Galmi" project on soil conservation and irrigation development in Niger, and in Ethiopia and Zimbabwe, are important participants in food-for-work projects (von Braun, Teklu, and Webb 1991).

5.23 A recent food security and nutrition project in Burkina Faso aims for a minimum of 50 percent female participation in its labor-intensive (food/cash-for work) public works component. Designed to provide employment opportunities to poor households in periods of low labor demand, the program includes communal road building and maintenance, the construction of schools, village health posts and day care centers, and wells or micro dams to provide potable or

³⁶At times, attitudes of male local officials motivated them to offer jobs to women outside their own villages, since they did not want women in their own villages to be perceived as "needy."

irrigation water. It aims to include 8,000 people in a typical year, or a total of 200,000 workdays (25 days of work per person per year).

Box 10. Rural Public Works Programs in South Asia

The Maharashtra Employment Guarantee Scheme (EGS) is the single largest poverty alleviation scheme of any state in India. Starting from a small base in 1965, the program gathered momentum in 1975, with average annual attendance of about 750,000 persons over the period 1977 to 1983. For 1984/85, gross employment amounted to nearly 180 million person days, or 3 percent of total rural employment. Funded by payroll taxes and state government allocations, the scheme provides unskilled manual labor on small scale rural public works projects, such as roads, irrigation facilities, and reforestation.

Self-selection of the poor is built into the program by offering no choice of work, by keeping the wage rate below the prevailing agricultural wage rate, and by effectively guaranteeing employment at the block level, which may sometimes require a person to travel a long distance for a few days of temporary work. The high rates of participation of rural women in EGS are attributed to parity in wage rates for male and female participants, convenient location of project sites, and community creches, which are mandatory on EGS sites.

The Food for Work Program (FFWP) in Bangladesh, introduced after the 1974 famine, has been successful in distributing at least 70 percent of food grains to low-income families in rural areas. Providing about 100 million days of labor in 1977/78, it accounts for at least 17 days of additional employment for every landless worker in Bangladesh. The scheme organizes and pays (in kind) for construction and maintenance of irrigation, drainage, and embankment projects. An evaluation of the FFWP has found that the direct and indirect effects of the FFWP has increased agricultural production by an average of 27 percent and per capita household income by 10 percent.

During the 1975/76 project year, limited numbers of women, without formal encouragement, availed of employment opportunities offered through the FFWP. In 1976, the Ministry of Relief and Rehabilitation (MRR) announced a policy to deliberately recruit women for FFW operations, and to pay attention to conditions of female participation.

Sources: Deolalikar and Gaha (1992), Ravallion (1990), BIDS-IFPRI (1985), Chen and Ghuznavi (1977)

Relieving domestic and cultural constraints to women's participation

5.24 Domestic responsibilities – such as child care, food preparation, and fetching fuel and water – are competing uses for women's time. Some projects have therefore included components to increase women's participation by relieving women's time constraints, although these measures may not be directly related to the main project activity.

5.25 For example, women have cited the mandatory provision of community creches in the Maharashtra EGS as a factor which facilitated their participation. Conversely, in the Bangladesh FFWP, women have been unable to satisfy the standard work norm of 70 cubic feet of earth per day because they have to perform child care and domestic tasks in addition to earthwork. Not all attempts to relieve time constraints have been successful. For example, while the introduction of low-cost technologies and time and fuel-saving devices were part of early project interventions, these have been phased out due to faulty choice of technology or faulty dissemination of technology (Molnar and Naqvi 1992). Suitability to local needs is crucial to efforts to introduce

low-cost technology. For example, woodstove programs tend to be successful in areas where woodfuel prices or collection times are high, and where design of the stoves is refined through interaction between the designers, producers, and users (Barnes et al. 1993).

5.26 In societies where interaction between men and women is proscribed, the provision of separate facilities for women may increase their participation in more remunerative employment. The India sericulture program, for example, provides separate spaces for women in cocoon markets and separate facilities in public spaces. Separate training centers for women were also built for the Yemen agricultural extension program.

Designing Gender-Sensitive Agricultural Projects

5.27 There are various ways to ensure that gender perspectives are taken into account in agricultural project design. One classification of approaches to gender-sensitive design distinguishes among "women-only" projects, women's components, and integrated projects in which gender issues are mainstreamed (Carloni 1987). It has been argued that "women-only" projects have high visibility, but have minimal impact due to low budget allocations, low government priority, and lack of leverage. Sustainability of "women-only" projects is also questionable, and may depend on the commitment of influential individuals. Projects with women's components, on the other hand, usually cater to women's traditional roles, e.g. health and nutrition components of agricultural development projects. Integrated projects, in which gender issues are mainstreamed, may be more effective in addressing women's multiple roles, but require gender-sensitive design. It has been suggested that "mainstream projects that ensure women's participation in proportion to their roles and responsibilities within the project's baseline situation are more likely to achieve their immediate purposes and broader socioeconomic goals than are projects that do not" (Carloni 1987).

5.28 Projects seem to follow an evolutionary process in incorporating gender objectives. Pilot projects are usually set up as independent entities focusing on a limited number of constraints, usually access to information (e.g. pilot programs for extension to women farmers). Projects which are extensions of previous projects may contain women's components which are better integrated into the entire project. These projects may address a broader range of issues than the pilot projects and focus on improving women's access to resources. The India sericulture project, for example, included interventions to address land titling constraints. While women's access to credit was not initially targeted, the project developed initiatives to address this constraint. Although it is too soon to evaluate the Chile SFSP, the design also addresses both credit and land titling issues for women.

Simple but well-defined objectives

5.29 Projects with simple but well-defined objectives may be easier to implement. It is tempting to try to accomplish too many objectives with one project, but unless commensurate resources are available, task managers may be overwhelmed by multiplicity of objectives. A simple pilot project, with the potential for expansion or integration into existing government programs, offers opportunities for "learning-by-doing." Moreover, setting up a simple pilot project is useful to ensure that WID issues are institutionally grounded.

Modifying the design of mainstream projects

5.30 There are various ways to modify agricultural project design to better serve the needs of rural women. These include: changing the focus of project activities; changing the number of women in the pool of eligible participants; adapting credit components to account for absence of collateral or credit records; expanding the outreach of extension systems; making the location of project activities more accessible; changing the timing and duration of activities; providing facilities for sleeping and child care; and choosing appropriate language and communications networks (Carloni 1987). A key feature common to these design modifications, as illustrated by the abovementioned projects, is their awareness of the specific constraints which women face. Knowledge of women's agricultural and domestic tasks also aids in the design of interventions to improve their productivity in existing tasks, rather than increasing their work burden.

Collecting baseline data

5.31 Baseline data are important both for establishing the extent of gender differences in the pre-project situation, as well as for providing a benchmark against which to evaluate project performance. More effective agricultural projects pay adequate attention to the collection of baseline data, e.g. the India sericulture project. In this project, benchmark surveys to assess project impact at the beginning, middle, and end of the project are scheduled. Collection of baseline data is also planned in the Burkina Faso, Turkey, Yemen, and Chile projects. In the Burkina Faso Food Security Project, the baseline survey in one province will also include villages which will not benefit from project support to serve as a control group.

5.32 Other extension projects do not employ specially designed baseline surveys, but utilize existing farm inventory surveys (Nigeria) or surveys of different groups of farmers, some of which will serve as "control" groups to provide benchmarks for evaluating project impact (Brazil).

5.33 It must be emphasized that baseline data should be disaggregated by gender. Otherwise, it will be difficult to measure the gender-differentiated impact of the project. For example, it is relatively easy to obtain data on the number of female extension agents hired, and the number of women in farmers' groups, but unless separate records are kept on women's income and production, it will not be possible to attribute increases in women's yields to the changes brought about by the project.

5.34 Baseline data should also draw on anthropological and ethnographic studies. Differences in customs and traditions -- even within the same country -- may be crucial to project acceptability. In Yemen, it is easier to implement initiatives for women farmers in the South, where women are more active in rainfed, mixed-crop agriculture, than in the North, which is more conservative. In the design of rural public works projects, the tasks must be suited to the available labor. For example, pastoralists in Niger, who ride horses or camels, rarely participate wholeheartedly in building roads across the desert. and farmers in Burkina Faso, most concerned with water availability are not likely to tend trees (von Braun, Teklu and Webb 1991:49).

Learning from economic and sector work

5.35 Economic and sector work (ESW) provides the analytical and empirical foundation for informed project design. For example, the Women in Agriculture component of the Nigeria Multistate Agricultural Development project (MSADP) drew on a report from a consultant who had analyzed women's agricultural and off-farms activities for a related project. It also benefited from

on going survey research in three states conducted by the Bank's Women in Development Division. Much of the rationale for targeting women in the Cote d'Ivoire pilot project drew from findings of the detailed household surveys conducted under the Cote d'Ivoire Living Standards Measurement Study.

Learning from past project experience

5.36 Many projects adopt successful components of past projects, or modify project design to better accomplish gender objectives. For example, agricultural extension projects in Brazil, Nigeria, and Turkey are extensions or continuations of agricultural extension project. In Nigeria, the deployment of retrained female extension agents into a unified extension system can be viewed as a modification of T&V, while in Brazil, the shift from individual to group extension is in line with the Bank experience in T&V extension in many countries.

5.37 Lessons learned from the Cote d'Ivoire pilot project are inputs into the design of a national Women in Development Project, such as: the use of targeted approaches in the short run, the project as an interface between women and technical services, the multisectoral approach to agricultural extension, and the importance of providing credit and financial services. The success of the independent women's extension service under the Ministry for the Advancement of Women justifies its continuation in the national project, although in the long run, this service would be incorporated into a unified extension system. Conversely, the lackluster performance of Bank and other organizations' projects which did not adequately take into account women's role in agriculture -- such as previous irrigation projects in the Gambia -- also provide valuable lessons for the design of the current generation of gender-sensitive projects.

5.38 Second generation projects also pay greater attention to issues of the sustainability of project investments and institutions after completion. Project simplicity may increase the probability of its being integrated into the government set-up, especially in countries with limited institutional capacity. As mentioned above, setting up a pilot project is one way to ensure that gender-sensitive projects have an institutional foundation.

Improving Implementation

Ensuring proper coordination between government agencies

5.39 Due to the multisectoral nature of women's concerns, it is likely that different government agencies deal with different aspects related to women's productivity and welfare. In this situation, it is important to have good coordination between the "umbrella" organization with a special mandate for women's issues (e.g. Cote d'Ivoire's Ministry for the Promotion of Women) and line agencies. Government agencies at the central, regional, and local levels also need to coordinate the implementation of WID programs. This may pose a problem if different states under a federal system have different laws. For example, communication between central and regional officials in the India sericulture project regarding the change of bank laws that facilitate access to credit for women has been poor. Central and regional offices may also have different priorities in project implementation, with WID components falling behind at the local level. In Brazil, lack of counterpart financing at the state level stopped the hiring of additional extensionists for the social extension program, which the state extension agencies viewed as having a lower priority than agricultural production activities. Changes in national and local staffing due to

political changes and staff turnover also have effects on project performance.

Improving disbursement of project funds for WID projects

5.40 While delays in disbursement are common to many projects, WID projects may be especially vulnerable if implementing agencies are not committed to gender objectives. In this case, the availability of specially earmarked funds can be useful. While the MSADP in Nigeria suffered from slow project procurement and inadequate counterpart funding, implementation of the women's component continued due to the availability of funding from UNDP. The use of a WID fund, with simplified disbursement procedures, may also be useful for funding smaller-scale expenditures on supplies, transportation, and facilities. Delays in establishing the special fund may delay the implementation of women's components. The rural WID component of the Yemen project experienced delays because no separate account was established for the women's component, even if counterpart funding was available from IFAD.

Appointing WID specialists in the field

5.41 The presence of a committed and well-trained WID specialist (or sector specialist trained in gender analysis) at the resident mission or working at a senior level within the project contributes greatly to effective implementation of gender-sensitive projects in the field. This was the experience in the Nigeria and Yemen projects. The WID specialist may also be able to address issues which were not foreseen during project preparation, and modify implementation accordingly. For example, in the Yemen project, women were not formally mentioned in the credit component. With the advice of the WID specialist, IFAD added a small targeted credit component to the project. Country nationals, or women within the region, may also have greater sensitivity to local culture and familiarity with local conditions than expatriate consultants.

Special allocation of resources to women's projects

5.42 Special allocations to women's projects, stipulated by donors, may help overcome low priority in allocations by government agencies if a competitive and male-dominated bureaucracy prevails. For example, difficulty encountered in securing transportation by women's units in agricultural extension programs has been mitigated by donor-provided vehicles and earmarked funds.

Improving monitoring and evaluation

5.43 Although monitoring and evaluation (M&E) are important to successful implementation, M&E of WID components or on the impact of women participants tends to be weak. Some difficulties can be traced to the absence of benchmarks from baseline data, but some can also be due to the absence of gender specific monitorable indicators. These are not necessarily output or outcome indicators (e.g. number of women farmers served) but also input or process indicators, such as the number of female extension workers hired, government actions relaxing quotas on women in agricultural courses, or changes in bank laws to relax collateral requirements.

5.44 Projects that have been able to monitor the impact on women more effectively have included WID thematic reviews as part of the supervision missions. The National Sericulture Project in India has included a number of WID thematic reviews by state which have played an

important role in ensuring that women's components are implemented. Likewise, the person who reviewed M&E in one supervision mission of the Yemen project was also a WID specialist who did a thorough review of the project's women's component. The Chile SFSP included progress in service oriented towards women as part of its set of criteria for moving from Phase I to Phase II of the project.

Ensuring adequate supervision

5.45 Lastly, adequate supervision is essential to ascertain that project implementation is going smoothly at the organizational and field levels. It often happens that Bank staff devote more time to procurement procedures during supervision missions with less time allocated for substantive monitoring of project implementation in the field. If task managers cannot perform this task, consultants with good local-level knowledge, or with training in gender issues, could substitute for Bank staff time. Adequate supervision is a signal of commitment to gender issues. In the Asia region, for example, a rating on WID aspects is included as one of the criteria for evaluating project performance in supervision reports.

Guidelines for Designing and Implementing Projects in Agriculture: A Summary

5.46 This section suggest guidelines for project design and implementation of gender-sensitive projects in agriculture, organized by subsector or area of project intervention.

Setting the Policy Environment in Agriculture

5.47 Increasing productivity and incomes in agriculture will be essential to reducing poverty in the rural sector of the developing world. Distortions imposed by dualistic agricultural policies, implicit taxation of smallholder crops, differential factor prices for large-and small-scale agriculture have had their efficiency costs. To the extent that these distortions induce the adoption of technologies inconsistent with a country's resource endowments, they could have potentially adverse impacts on the poor.

5.48 The introduction of technology may change the nature of cropping arrangements and division of labor, and detrimental impacts may be exacerbated by constraints in access to credit and hired labor (in labor scarce societies). The full range of constraints under which women operate needs to be understood when targeting by gender is attempted, and policymakers need to consider ex ante implications of untargeted new technology in rural areas (Binswanger and von Braun 1991).

5.49 Some of these constraints are dictated by the country's relative resource scarcities: in a labor-scarce economy, the introduction of technologies which increase the demand for labor in agriculture may have adverse impacts on time spent on other tasks, bargaining within the household, and women's nutritional status. On the other hand, in a labor-surplus economy, the concern is that technological change which increases labor productivity should be matched by an increase in demand for labor to avoid unemployment. It is important that relative factor prices reflect the true cost of technologies adopted, since distorted prices may promote technologies inconsistent with a country's resource endowments. Policy makers also need to recognize that in surplus-labor situations, potential increases in income and wages due to technical change will be limited by population pressure and the availability of nonagricultural employment opportunities. Such sustained increases in female wages (accompanied by increases in female education) would

reduce fertility and ease population pressure on limited land.

Policies affecting land rights

5.50 Women's access to fixed factors, especially land, is an important determinant of the distribution of the benefits of technical change. Women's independent land rights have been crucial to their capturing the gains from technological adoption and irrigation expansion. Loss of traditional land rights may have been the unintended result of land policies which did not pay attention to women's primary role in agriculture, traditional roles and obligations and non-pooling of incomes in African families, nor recognize that women contributed to agricultural production as part of the family labor force (as in Latin America and Asia).

5.51 Future development projects with a potential impact on the distribution of land rights between men and women should:

- Employ nondiscriminatory registration and titling, so as to preserve women's traditional land rights;
- Provide access to credit and new technology to women, so they may reap the benefits of technical changes;
- Promote the inclusion of women as sole or co-beneficiaries in land reform and settlement programs;
- Explore ways to give women rights to family land or conjugal land, with their names listed as co-owners;
- Purchase or lease land for the use of women's groups where it is difficult for individual women to obtain access to land.

Irrigation Development

5.52 The possibility that the gains from irrigation expansion may be inequitably distributed between men and women requires that gender considerations be made an important part of irrigation design and implementation.³⁷ In order to achieve these, irrigation projects should:

- Promote a range of male and female crops within the farming system;
- Develop technologies for rainfed areas;
- Create opportunities for both men and women to have access to irrigation project assets and benefits;
- Pay attention to asymmetries in influence and access to resources between women and men in different classes of households as well as senior and junior women within households;
- Involve the community, including both men and women, in the design, construction, and operation of irrigation schemes;
- Give women a chance to serve on irrigation committees through liberal membership recruitment procedures and the use of female community organizers or extension agents;
- Develop, test, and disseminate productivity-enhancing equipment adapted to women farmer's physical and financial requirements as part of irrigation project design.

³⁷This draws on guidelines prepared by Dey (1990) for irrigation project design.

Extension and education

5.53 To improve the productivity of women farmers, there is a need to improve their access to technology and information. The strengthening of existing extension systems and their reorientation to focus on the needs of women farmers is a key step in these process. To improve the delivery of extension services to female farmers:

- Recruit more female extension agents;
- Redeploy home economists and other agents by retraining them in agricultural subjects;
- Use para-extension agents in their own localities;
- Use female agents as subject matter specialists and supervisors. Efforts must also be made to train male agents to work with female farmers:
- Train male agents to use socially acceptable institutions as women's groups as a venue for interacting with women farmers;
- Employ gender targeting, whereby a female agent initially establishes contact with the group, and then turns it over to the male extension agent;
- Use incentives integrated into the reward structure of the extension system to reward male agents who are effective in working with female farmers.

The communication of extension messages to women can also be improved by:

- using traditional women's groups;
- using women as contact farmers, chosen by merit, farming experience, or representativeness of local conditions rather than political connections; and
- using methods of communication appropriate to the target group's education and literacy levels as well as their access to communication facilities.

Finally, there must be increased efforts to improve female education in rural areas. Not only will this benefit female farmers who make production decisions, it will also ease the transition of landless female workers into nonagricultural employment, which will absorb increasing numbers of the rural labor force.

Improving the design of gender-sensitive projects

5.54 The review of Bank agricultural projects offers suggestions for modifying the design of agricultural projects to consider gender issues:

- Have simple but well-defined objectives in project design; an easy test is to identify what gender-specific constraint is being addressed, and how;
- Modify the design of mainstream projects by ensuring that project participants are included in proportion to their roles and responsibilities in the baseline situation, and addressing constraints faced by women. These modifications include:
 - changing the focus of project activities;
 - changing the number of women in the pool of eligible participants;
 - designing interventions to improve their productivity in existing tasks, rather than increasing their work burden;
 - adapting credit components to account for absence of collateral or credit

- records;
 - expanding the outreach of extension systems;
 - making the location of project activities more accessible;
 - changing the timing and duration of activities;
 - providing facilities for sleeping and child care; and
 - choosing appropriate language and communications networks.
- Collect baseline data to establish the extent of gender differences in the pre-project situation, and to provide a benchmark against which to evaluate project performance. Ideally, baseline data should be gender-disaggregated, and should cover input, process, and output indicators. Where baseline data is not collected, utilize existing monitoring systems or other data sources.
 - Use the findings from economic and sector work, as well as past project experience, in modifying project design, paying attention to issues of the sustainability of project investments and institutions after completion.
 - In countries with limited institutional capacity, project simplicity may increase the probability of its being integrated into the government set-up, especially in countries with limited institutional capacity.
 - Pilot projects may be one way to test new approaches as well as ensure that gender-sensitive projects are institutionally grounded.

Improving implementation

5.55 To improve implementation of projects in the field, it is important to:

- Ensure proper coordination between government agencies. This may be a function of the extent of institutional commitment to gender issues, as well as the country's institutional capacity.
- Improve the speed of disbursement through simplified procedures for small amounts and the use of WID funds for greater flexibility.
- Employ WID specialists with sound sectoral expertise, familiarity with local conditions, and commitment to gender issues, in the field. Country nationals or persons from the region may be more culturally sensitive than expatriate consultants.
- Use special allocations of resources to WID projects to avoid biases in traditional, male-oriented bureaucracies.
- Improve monitoring and evaluation of WID projects; develop indicators of progress in addressing women's issues or delivering services to women.
- Provide adequate supervision of the substantive aspects of project implementation; include a rating on gender components as part of regular supervision reports.

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