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Gender Analysis of labour Contribution and Productivity for Popular Cropping Systems in Kaduna State of Northern Nigeria

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ABSTRACT

The economic role of women in agriculture is surrounded by numerous myths and misunderstandings. Significant changes have occurred in the agricultural sector over the past 25 years, both in the role played by women and in the understanding of this role, but the continued lack of appropriate policy and programme strategies means that women's contribution to agriculture remains invisible. In order to make the contribution visible, distinction between men's and women's role needs to be examined and clarified; especially, in terms of labour productivity. Towards this end, a study was conducted with 120 farm households in Kaduna State of northern Nigeria to examine the gender differentials in labour contribution and productivity in the farm sector. Women in the southern part of Kaduna State were observed to exhibit greater labour productivity than men; while in the northern part where men contributed labour more extensively for farm works, male labour was more productive.

Key words: Gender differences, cropping systems, labour productivity, Kaduna state, farm resources

INTRODUCTION

Over the past several decades, awareness of gender issues in development has steadily increased. According to Malena (1994), there are at least three different, but interrelated schools of thought as to why gender matters can be identified in current development studies. These might be referred to as the equity approach, the development approach and the efficiency approach. Women across the developing world are disadvantaged relative to men. Under male -dominated social structures and political systems, women are denied equal access to land, technology, education and resources. As a result, rate of poverty, illiteracy, malnutrition and premature death are significantly higher among women and girls than they are among men and boys (Horenstein, 1989). The equity approach argues that any meaningful development strategy must actively attempt to correct these gender inequalities.

Genuine and balanced development and growth will be achieved inequalities have dressed. Rather than focusing on the inequalities between women and men, the developmental approach merely asserts that if development is aimed at helping the

poor, and if a majority of the poor are women, the development means by definition, helping women. Despite the self-evidence of this fact, the reality has been that, either through ignorance or error, women have largely been excluded from the development process. A further point made by advocates of the developmental approach is that women may have a unique role to play in development. Because women tend to be responsible for the care of children, the aged and the infirm, attempts to improve the welfare of these 'vulnerable' groups must involve women.

In developing countries like Nigeria, women make a significant contribution to food production and exclusively responsible for food processing and meal preparation. Studies from several different countries show that women's working day is, on average, longer than that of men. Gabriel (1991) reports a 16-hours working day for African farming women at certain times of the year, while Whatmore, (1991) pointed out that no matter what the extent of women's agricultural activities, there is little variation in the extent to which domestic labour is shared by other members of the households. However, women still face formidable obstacles to their potential role as a major economic and social force in the development of agricultural sector (Rahman and Haruna, 1999). The overall feature of Nigeria women's status is essentially that of marginalization, which is best explained within the context of productive relative (Ekwachi, 1990). Women are more limited than men in their access to critical farm resources and services such as farmland, credit and improved input dues to cultural, traditional and sociological factors (Tanko, 1994).

One of rural women's greatest needs is time-saving technologies which will enlighten their excessive workloads and reduce the length of their working day; thereby increasing their productivity. As women are the backbone of the agricultural sector, accounting for 60 to 80 percent of agricultural labour and being responsible for 80 percent of food production (Ngur, 1987; Kabeer, 1994; Ingawa, 1999; Mgbada, 2000). It is important to try to close the gap between the actual and potential productivity levels of their labour on farms. The bridging of actual-potential productivity gap presents one of the most effective means of promoting agricultural productivity and enhancing the overall economic development in developing countries like Nigeria. Given the gender division of labour and differences in the access to land, labour, finance and education, the technological needs of women farmers are in many ways distinct from those of men. Agricultural technologies which require an increase in labour time or are not adapted to women's daily and seasonal time schedules are unlikely to be adopted. In addition to constraints on their own labour time, women cannot call on the labour of other household members in the way the men can (Malena, 1994). Gender influences the knowledge, perceptions and needs of farmers as well as their access to agricultural technologies, information and productive resources.

A shortcoming of many development projects has been to assume that when the income of a household is increased; all members of the household will gain equally. Evidence shows that, in fact, women and girls receive a smaller share of income, food, health care and leisure time than do men and boys (Lipton, 1989. Apart

from the significant contribution of labour by women for both farm and household production, higher proportion of their incomes is spent towards meeting basic household needs such as food, clothing and children's education (Lele, 1991). An increase in women's resources may therefore, bring about more direct and immediate developmental effects (Gabriel, 1991).

The absence of quantitative and qualitative data on gender-labour productivity has contributed to the inadequate recognition and support for women's role in agricultural production and development. This lack of data also prevented women from realizing their full potential. The contribution of women to agricultural development should be maximized through full integration of women into agricultural and rural development for the purpose of efficiency and sustainability. The recognition and promotion of women role in agriculture requires examining the productivity of their labour on farms; in order to clarify further on the benefits of women participation in agriculture. Women in northern Nigeria have been recognized to play a more active role in farm activities. By 1990, they accounted for 22 percent of the farm labour, either on their own farms or hire labour (Saito, 1992). This study, therefore, assessed the gender-labour contribution and productivity in farm production in two geographical locations (northern and southern parts) of Kaduna State in Nigeria.

METHODOLOGY

The study used mainly primary data. The relevant primary data were obtained through a survey of farm households. The main instrument for data collection was structured questionnaire administered on farm-families. Multi-stage random sampling techniques were employed in the selection of a sample of 120 farm households during the cropping season of year 2002.

First, the study area was stratified according to geographical locations: Northern and Southern Kaduna. In the second stage, two Local Government Area (LGAs) were randomly selected from each of the two geographical locations. In the third stage two villages were randomly selected per LGA. Finally, there was a random selection of sample farm households from the selected villages. In each of eight selected villages, twenty farm households were randomly selected giving a total of 160 sample households. But in the end only data from 120 farm-families were analyzed as others were discarded for inconsistency and incompleteness.

Data collected covered cropping systems and production variables (outputs and inputs). Labour input was disaggregated into male labour and female labour. Analysis of the data was done using descriptive and inferential statistics and through estimation of production function. The Cobb-Douglas production function which was employed is expressed as:

Where,

Y = Yield (kg-grain- equivalent/ha)

X_1 = Seed (kg-grain- equivalent/ha)

X_2 = Fertilizer (kg/ha)

X_3 = Male labour (hours/ha)

X_4 = Female labour (hours/ha)

a = Constant term

b_1, b_2, b_3 and b_4 = Regression coeffcients.

e = Error term.

For the Cobb-Douglas production to easily applied in a form amenable to practical purpose, it was linearized through conversion into double logarithmic function expressed as:

X_1 = Arithmetic mean value of labour input being considered

Y = Arithmetic mean value of output measured in grain-equivalent.

$$\text{Log}Y = \text{Log } a + b_1 \text{Log}X_1 + b_2 \text{Log}X_2 + b_3 \text{Log}X_3 + b_4 \text{Log}X_4 + \text{Log } e \ldots . \text{ii})$$

The yields and seeds quantities which were measured in kg were converted to kg-grain -equivalent as applied by Rahman and Lawal (2002) for homogeneity and aggregation to make the estimation of production function possible for the crop mixtures.

The values of marginal value product (MVP) of labour (for male and female) were estimated as follows:

$$MVP = MPP.\ Py \ldots\ldots\ldots\ldots (iii)$$

Where,

MPP= Marginal physical Product of labour

Py = Price of unit output

The expression used for estimating MPP for the labour based on the estimated Cobb -Douglas production function is:

$$MPP = \frac{dy}{dx} = \frac{b_1 Y}{X_1} \ldots\ldots\ldots\ldots (iv)$$

Where,

b_1 = The estimated regression coefficient of the corresponding labour input.

In order to obtain Py for each of the crop mixtures, the expression from Rahman and Lawal (2002) was adopted as follows:

$$PY = \frac{\text{Average revenue from mixture per hectare}}{\text{Average output in grain-equivalent per hectare}}$$

RESULTS AND DISCUSSION

Division of Labour by Gender

The time budget analysis presented in Table 1 indicated that women carry the major responsibility for both farm production and domestic work. This implied that women spent more hours per day than men in both productive and reproductive activities. It was observed that in northern Kaduna, women were mainly responsible for cooking, cleaning house and child caring; spending on the average 3.0, 3.0 and 2.5 hours perday respectively. The farm work was mainly the reasonability of men (5 hrs/day). In southern Kaduna, both men and women participated fairly equally in

farm works (4.5 and 4.2 hrs/day respectively). Women were also responsible for food preparation (3.5 hrs/day), fetching water (1hr/day) and gathering firewood (1hr/day).Generally, in Kaduna State, women contributed the majority of the labour for the farm household activities. However, the decision-making at the household level continued to be male-dominated in all farming-related activities.

Table 1: Average number of hours spent on farm and domestic activities by male and female in a day in northern and southern Kaduna.

	Northern Kaduna		Southern Kaduna	
Chore	Male	Female	Male	Female
Farm work	5.00	0.50	4.50	4.20
Cooking	0.00	3.00	0.50	3.50
Fetching water	1.00	0.50	1.00	1.00
Fetching firewood	1.00	0.50	0.75	1.00
Cleaning house	0.00	3.00	0.75	1.25
Child care	0.20	2.50	0.50	1.50
Processing of farm products	0.20	1.50	0.50	1.00
Total	7.40	11.50	8.50	13.45

Gender-Labour for Selected Cropping Systems

In northern Kaduna, men still play a dominant role in agricultural production, in terms of labour force and farm decision-making. As presented in Table 2, for every cropping system investigated, labour input by men was higher than that contributed by the women. For instance, men contributed 241.77 hrs/ha under the maize/ cowpea mixture while 70.46 hrs/ha were recorded for women. The difference in labour contribution between men and women for every cropping system was statistically significant at 5 percent level. The phenomenon of this nature has for long resulted into widespread assumptions that men and not women make the key farm management decision. As a result, agricultural extension services have traditionally been focused on men to meet their farm production needs, while neglecting the women. Most extension messages targeted at women usually emphasized their domestic role with topics on child care and family nutrition.

However, in the southern Kaduna, women and men played an equally important role in terms of their labour contribution to farm production. the gender-labour differ entials for all the cropping systems investigated were not significant statistically (Table 2). Despite the indifferent labour contribution, women have not been given due recognition in agricultural sector of the study area.Women need greater opportunities to make decisions on and off the field efficiently.

Gender Relative Involvement in Crop Production.

The study observed that women in southern Kaduna were more involved in farm work than those in northern Kaduna. The women in northern Kaduna participated extensively in the threshing operation where they contributed about 91 percent of labour for the threshing activity. The gender-labour difference for the threshing op-

Table 2: Test of significance for Gender-labour differentials (hours/ha) for selected cropping systems in the northern and southern Kaduna

	Northern Kaduna					Southern Kaduna				
Cropping System	Male	Female				Male	Female			
	Labour	Labour	GLD*	SE	t-value	Labour	Labour	GLD	SE	t-value
Sole maize	196.12	61.22	134.90	42.29	3.19	141.22	138.31	2.91	2.15	1.44
Sole sorghum	203.45	58.05	145.40	53.40	2.73	160.18	149.93	10.25	9.23	1.11
Maize/cowpea	241.77	70.46	171.31	41.68	4.11	168.24	175.29	7.05	6.65	1.06
Maize/groundnut	211.34	45.92	165.42	83.55	1.98	146.15	152.13	5.98	4.56	1.31
Maize/soybean	222.18	54.27	167.91	46.58	3.60	159.21	184.26	25.05	17.28	1.45
Sorghum/cowpea	250.06	65.39	184.66	72.42	2.55	184.05	203.00	18.95	15.66	1.21
Sorghum/groundnut	228.79	35.28	193.51	49.75	3.89	138.20	141.34	2.14	2.30	1.31
Sorghum/soybean	243.52	49.11	194.41	71.21	2.73	143.11	158.98	15.87	9.98	1.59
Millet/cowpea	251.44	69.23	182.21	35.24	5.17	171.51	169.55	1.96	1.37	1.43
Millet/groundnut	236.04	45.95	190.09	41.06	4.63	153.06	150.87	2.19	1.87	1.17
Millet/soybean	242.33	41.33	201.00	69.55	2.89	183.24	206.47	23.47	20.77	1.13

GLD = Gender-Labour Difference

SE = Statistical Error

* = The GLD for every cropping system is statistically significant at 5 percent level.

eration in northern Kaduna was statistically significant at 5 percent level (Table 3).

In southern Kaduna, both men and women participated fairly equally in land clearing, planting, fertilizer application and weeding activities. Women also carried the greater responsibility (contributing over 60 percent of the total labour) for harvesting, transporting and threshing of farm produce. The men were observed to have played major role in only the ridging operation. Therefore, the gender-labour difference was statistically significant for ridging, harvesting, transporting and threshing activities. The farm labour force participation rate of women in southern Kaduna was greater than 50 percent on the average. In general, women in southern Kaduna, enjoy more decision-making power than women in northern Kaduna

Table 3: Average gender-labour contribution by operation in man-hours per hectare in northern and southern Kaduna

	Northern Kaduna					Southern Kaduna				
	Male	Female				Male	Female			
Operation	Labour	Labour	GLD	SE	t-value	Labour	Labour	GLD	SE	t-value
Land clearing	25.13	0.00	25.13	NA	NA	17.11	9.34	7.77	5.95	1.31
	(100.00)					(64.69)	(35.31)			
Ridging	30.0	0.00	30.35	NA	NA	24.63	11.48	13.15*	5.67	2.32
	(100.00)					(68.21)	(31.79)			
Planting	20.14	4.19	15.95*	5.10	3.3.13	18.93	16.77	2.16	1.74	1.24
	(82.78)	(17.22)				(53.03)	(46.97)			
Fertilizer application	16.23	2.66	13.57*	2.88	4.71	9.03	8.62	0.41	0.29	1.42
	(85.92)	(14.08)				(51.16)	(48.84			
Weeding	78.49	0.00	78.49	NA	NA	41.25	45.03)	3.78	3.20	1.18
	(100.00)					(47.81)	(52.19)			
Remoulding	27.21	0.00	27.21	NA	NA	19.67	15.88	3.79	2.53	1.50
	(100.00)					(55.33)	(44.67)			
Harvesting	65.04	6.22	58.82*	9.28	6.34	25.55	49.34	23.79*	7.41	3.21
	(91.27)	(8.73)				(34.12)	(65.88)			
Transporting	17.33	8.05	8.28*	3.10	2.99	11.06	25.25	14.19*	5.24	2.71
	(68.28)	(31.72)				(30.46)	(69.54)			
Threshing	3.11	32.92	29.80*	9.09	3.28	13.09	28.14	15.05*	5.74	2.62
	(8.63)	(91.37)				(31.75)	(68.25)			

Figures in parentheses are the percentagesof the total labour for the corresponding operation.
NA = Not applicable. * = Significant at 5 percent level.

because of their greater labour contribution to the farm production and they have access to land to some extent for their own farming. However, women's work is getting harder and more time-consuming due to ecological degradation, changing agricultural technologies and lack of access to extension services.

Estimated Production Function for the Crop Enterprises

The estimated Cobb-Douglas production function revealed that in the northern part of Kaduna State, the percentage of variation in yields explained by variable inputs included in the production model ranged from 54 to 73 percent for the investigated crop enterprises (Table 4). But, in southern pat of the State, the coefficient of multiple determinations (R^2) ranged from 53 to 76 percent. The regression coefficient for male labour in the northern Kaduna; under maize/cowpea, sorghum/cowpea, sorghum/groundnut and millet/cowpea enterprises were significant at 5 percent. The female labour did not show any significant impact on the farm production in the northern Kaduna. Female labour in southern Kaduna had significant influence on crop yields in six out of eleven enterprises. This could be attributed to substantial amount of labour contributed by the women to the farm sector in the southern part of Kaduna State.

Gender-Labour Productivity Differentials

Agricultural productivity referred to the ratio of farm output to farm inputs used. Marginal Productivity measures the extra output produced as a result of a unit increase in the farm input. Productivity could be assessed in physical or monetary terms; that is, marginal physical products and marginal value products respectively. In northern Kaduna, where men contributed labour for farm work more extensively than women, both the marginal physical and value products of male labour were greater in values than that of female labour (Table 5). In the southern part of Kaduna State, the marginal productivity of female labour was greater than that of male labour with exception under sole maize, also sorghum and millet/groundnut enterprises. For the fact that women and men in the southern Kaduna participated in farm work fairly equally, the marginal productivity difference of their labour was not substantial as that of the northern Kaduna.

CONCLUSION

The recognition of the role played by women in agriculture is fundamental to agricultural development. More importantly, recognizing and supporting this role is crucial for the development of women and the fulfilment of their economic potential. The objective of the paper has been to examine the levels of labour contribution and productivity by gender for the purpose of making societies to realize the economic potential of women in the farm sector.

In southern part of Kaduna State of Nigeria, women make a significant contribution to farm production; by playing fairly equally important role with men in farm operation such as land clearing, planting, weeding, harvesting and so on.

Table 4: Results of the estimated Cobb-Douglass production function showing gender labour implicationsfor the crop enterprises in the northern and southern Kaduna

	Northern Kaduna						Southern Kaduna					
	Regression Coefficient				Other Parame-ters		Regression Coefficient				Other Parame-ters	
			Male	Female					Male	Female		
Enterprise	Seed	Fertil-izer	Labour	Labour	Constant	R^2	Seed	Fertil-izer	Labour	Labour	Con-stant	R^2
Sole maize	0.122	0.643*	0.141	(0.189)	2.410*	0.57	0.911	0.222	0.233*	0.149	4.325	0.71
	(0.516)	(3.115)	(1.112)	0.003	(4.111)		(0.643)	(0.081)	(3.008)	(1.226)	(1.113)	
Sole sorghum	0.045	0.218	0.201	0.008	1.245	0.62	0.181	0.184	0.413	0.295	2.142	0.69
	(0.931)	(0.903)	(0.353)	(0.254)	(1.365		(0.034)	(0.365)	(1.116)	(0.967)	(3.111)	
Maize/cowpea	0.009	0.113	0.627*	0.244	3.112	0.55	0.284*	0.007	0.330	0.619*	2.225	0.69
	(0.832)	(1.241)	(3.181)	(1.218)	(342)		(2.916)	(0.113)	(1.200)	(2.933)	(1.432)	
Maize/groundnut	0.351	0.571*	0.085	0.005	1.444*	0.68	0.116	0.387	0.181	0.420*	1.218*	0.53
	(1.002)	(2.784)	(.0642)	(0.185)	(4.618)		(1.112)	(0.250)	(0.340)	(3.111)	(2.987)	
Maize/soybean	0.131	0.033	0.127	0.084	2.252*	0.61	0.634	0.114	0.510	0.418*	3.564	0.60
	(1.312)	(0.271)	(0.331)	(0.026)	4.141)		(1.341)	(1.111)	(1.467)	(4.107)	(1.544)	
Sorghum/cowpea	0.332	0.014	0.333*	0.168	4.816	0.57	0.625*	0.416	0.811*	0.617*	5.815*	0.65
	(1.014)	(0.811)	(2.951)	(0.110)	(1.243)		(3115)	(0.293)	(5.153)	(4.777)	(3.223)	
Sor-ghum/groundnut	0.089	0.666	0.816*	0.032	3.635*	0.69	0.014	0.982*	0.223	0.428	3.453*	0.55
	(0.874)	(1.121)	(3.114)	(0.163)	(6.325)		(0.064)	(3.171)	(1.108)	(0.975)	(4.681)	
Sor-ghum/soybean	0.431*	0.012	0.142	0.108	5.308*	0.73	0.211	0.112	0.416	0.117	2.222	0.63
	(2.817)	(0.040)	(0.348)	(0.264)	(2.943)		(1.303)	0.419)	(1.000)	(1.211)	(1.357)	
Millet/cowpea	0.016	0.305*	0.574*	0.189	3.850	0.54	0.182	0.444	0.675*	0.532*	4.122*	0.53
	(0.643)	(2.918)	(3.240)	(1.321)	(1.321)		(0.666)	(0.730)	(2.996)	(3.418)	(3.518)	
Millet/groundnut	0.782	0.016	0.113*	0.082	2.311	0.68	0.511	0.317	0.215	0.114	1.817	0.76
	(0.135)	(0.003)	(2.811)	(0.713)	(4.593)		(1.011)	(0.555)	(1.333)	(1.298)	(1.430)	
Millet/soybean	0.034	0.914	0.334	0.314	1.917	0.63	0.417	0.211	0.816	0.713*	2.761	0.66
	(0.218)	(0.217)	(1.231)	(0.978)	(1.346)		(0.782)	(0.830)	(1.308)	(3.855)	(1.333)	

Source: Estimated from survey data, 2002. * Significant at 5 percent level of probability. Figures in parentheses are t-value.

Table 5: Male and female marginal productivity of labour in the northern and southern Kaduna

	Northern Kaduna						Southern Kaduna					
	MPP (kg-grain-equivalent)			MVP (N)			MPP (kg-grain-equivalent)			MVP (N)		
	Male	Female		Male	Female		Male	Female		Male	Female	
Enterprises	Labour	Labour	Differ-ence	Labour	Labour	Differ-ence	La-bour	Labour	Differ-ence	Labour	Labour	Differ-ence
Sole maize	1.210	0.718	0.492	48.400	28.720	19.680	0.964	0.885	0.079	38.560	35.400	03.160
Sole sorghum	1.011	0.494	0.517	30.330	14.820	15.510	1.121	0.945	0.176	33.630	28.350	05.280
Maize/cowpea	0.934	0.302	0.632	42.030	13.590	28.440	8.857	1.211	0.345	38.565	54.495	15.930
Maize/groundnut	0.768	0.517	0.251	36.864	24.816	12.048	0.642	0.913	0.271	30.816	43.824	13.008
Maize/soybean	0.831	0.214	0.617	38.226	09.844	28.382	0.946	1.128	0.182	43.516	51.888	08.372
Sorghum/cowpea	0.734	0.321	0.413	26.424	11.556	14.868	1.052	1.414	0.362	37.872	50.904	13.032
Sor-ghum/groundnut	0.649	0.114	0.535	24.662	04.332	20.330	0.823	0.859	0.036	31.274	32.642	01.368
Sorghum/soybean	0.498	0.090	0.408	18.426	03.330	15.096	0.538	0.924	0.386	19.906	34.188	14.282
Millet/cowpea	0.511	0.366	0.145	16.352	11.712	04.640	1.002	0.987	0.015	32.064	31.584	00.480
Millet/groundnut	0.648	0.215	0.433	22.032	07.310	14.722	1.013	1.004	0.009	34.442	34.136	00.306
Millet/soybean	0.582	0.410	0.172	20.952	14.760	06.192	1.240	1.385	0.145	44.640	49.860	05.220

Source: Computed from survey data, 2002.

MPP = Marginal physical product.

MVP = Marginal value product

But in northern Kaduna, women play dominant role in processing of agricultural produce, especially the foodstuff. Women exhibit greater labour productivity in southern Kaduna as men do in northern Kaduna.

In order to encourage capacity building for rural women and improve their access to productive resources, there should be enough investments in education, training and literacy programmes for girls and women. Gender perspective should be incorporated in educational curriculum. Researchers and extension workers should be properly sensitise on gender issues so that technologies appropriate to rural women are developed to effectively promote production, post-harvest and marketing activities.

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