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SMALL SCALE IRRIGATION MANAGEMENT PRACTICES: A STUDY OF FADAMA FARMING IN KWARA STATE. NIGERIA

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ABSTRACT

The irrigation management practices of the fadama farmers along the Asa river in Ilorin was investigated in this study. The study revealed that the farmers are not making efficient use of their resources. There is therefore a need for adjustment to improve efficiency and farm net income. This is important because sustainability of fadama irrigation development depends to a large extent on the efficiency of the input and extension systems in terms of continuous provision of adequate and accessible inputs. In establishing an effective small scale irrigation system, pump provision at subsidized price should be given adequate consideration as an integral part of strategy aimed at increasing productivity.

INTRODUCTION

The pressure of survival and the need for additional supplies has necessitated a rapid expansion of irrigation throughout the world. Even though irrigation is more important in the more arid regions of the world, it has become increasingly important in humid regions, (Vaughn, 1980). In 1949, the estimated land irrigated the world over was 96.5 million hectares, by 1974 it has risen to 234 million hectares, and this is expected to increase to 420 million hectares by the end of year 2000 (UNESCO, 1978).

In Nigeria, irrigation activity takes place on areas ranging from less than a hectare to areas in excess of several thousand hectares, (Qamer et. al. 1994). Investment in large and medium scale irrigation projects by both the state and Federal Governments between 1970-1985 (post devastating drought of early 1970s) was in excess of S2 billion. However, there has been little to show for this huge investment. Experience has shown that the construction of large dams with concomitant large scale irrigation on the interfluves have resulted in some negative changes. The benefit of the erection of new fadama was argued to be far short of the losses. This has been attributed to poor planning and little or no concern for the implications to the environment.

Planners appear slow to recognize that projects/programs must not only be economically efficient, environmentally friendly and technologically feasible but also socio-economically relevant. Only programs in which the land users are sufficiently consulted have a chance of success (Kolawole et. al. 1999).

The planning process for selecting a farm irrigation system also requires an inventory of the resources available to the farmer or beneficiary community. This becomes necessary in order to identify the production potentials and the physical and operational constraints which affect the selection of viable alternative irrigation systems. It is against this background that this study focuses on small scale irrigation fadama farming being a socio-economically relevant irrigation method in the area.

Fadama is a Hausa word meaning the seasonally floodable or flooded floodplains along major savannah rivers and/or depression on the adjacent low terrace. This contrasts sharply with surrounding dry top land in terms of resources. The specific objectives of

this study are to:-(a) describe the existing irrigation management practices in the study area; (b) examine the costs and returns of the irrigated crops in the study area; (c) explore the resource use efficiency of the farmers; and (d) highlight the policy implications of the findings

METHODOLOGY

Area of Study

Asa river runs from south to North East and emerges 11.3km North of Ilorin to join the Awum river dividing Ilorin township into two (Olawale, 1988). The river is perennial with a dam located about 3.22 km south of Ilorin. The dam serves as water source both for domestic and industrial use. Owing to its nature people bath on the bank and large quantities of refuse are dumped inside the river, and thereby constituting source of pollution. Despite these forms of pollution, adjacent land attracts a lot of agricultural activities especially the growing of vegetables and maize during the dry season.

Data Source

With the aid of a structured questionnaire administered on irrigators, information on socio-economic characteristics of the respondents, irrigation methods, area under cultivation, input use and output were collected from randomly selected dry season farmers. Secondary data were also collected from various sources.

Analytical Techniques

Descriptive and inferential statistics were employed in analyzing the data. Use was also made of regression analysis to fit the production function of the irrigators. The output of the farmers was assumed to be a function of land, labor, value of purchased inputs, fertilizer and irrigation water.

The functions implicitly expressed is

$Q_f = f(L_h, L_m, P_n, F_k, I_w, U)$

Where Q_f = value of output in Naira (to take care of the various types of crops grown),
L_h = Land cultivated in hectares,
L_m = Labor use man-days,
P_n =Purchased inputs in Naira,
F_x = Fertilizer used in kilogram,
I_w = Quantity of irrigation water used in ha-cm, and U = Stochastic error term

RESULTS AND DISCUSSION

Age of the farmers is an important factor that determines labor productivity in traditional agriculture. The average age of the farmers was 39 years. Over 80 percent of the farmers were below the age of 50 years. This is an indication that majority of the farmers are within the very active population age group.

The importance of farmers' literacy level to farm productivity is well documented in literature (Adeniyi, 1984). Only about 25 percent of farmers had either primary or

secondary education. Majority of the farmers (60 per cent) had only Arabic education. This possibly explains the poor or complete absence of farm records by the respondents.

The modal family size class of the farmers was between 6 and 10 with 45.7 per cent of respondents falling between this class. This was expected to encourage the cultivation of larger hectare of land at a reduced cost of hired labor. Since the majority of the irrigators are mostly illiterate who base their decision making on past experience, intuition, guesses, etc, the irrigation experience in years is expected to have a direct bearing on productivity. About 92 percent of the respondents have been irrigating their farms in the dry season in the study area for at least six years. The modal class of irrigation experience was 11-15 years with about 34 percent of the respondents falling in this class. It implies that the farmers are experienced dry season irrigators.

It was observed that the area cultivated by the farmers ranged between 0.01 and 1.20 hectares with a modal size of 0.0a – 0.40 hectares. About 69 per cent of the farmers were within this class.

A wide variety of crops grown in the irrigated fadamas include leafy vegetables such as *Amaranthus Celosia, Corchborus Olitotrious*, Indian Spinach, and bitter leaf. Some of the farmers also planted exotic vegetables like cabbage and lettuce. Maize was also grown either as a sole crop or inter-cropped with the vegetables with wide spacing. The most common crop enterprise-combination are inter-cropping pepper with cabbage and lettuce;
Okro, tomatoes and leafy vegetables. However, the fundamental draw back of mixed cropping in the study area, as elsewhere was the difficulty of applying crop-specific input requirements and their management.

The main production practices involved land preparation, weeding, pest control, irrigation and harvesting. Land preparation involving land clearing of crop residues of the last cropping season, leveling of the land are done using manual labour with the use of simple farm tools like hoe, and cutlass. Joint clearing with the use of tractor is a rare feature.

Vegetables are normally sown by broadcast. Crops like maize, okro are dibbled at specific distances while planting. While exotic vegetables like lettuce and cabbage are first planted in nursery beds before transplanting to the field.

Weeding is done many times before harvesting using hoes and sometimes hand pulling. Fertilizer is also applied by broadcast, spot or ring method. The farmers do not apply herbicides and even the few that applied pesticides complained of the high cost of the chemical.

The traditional form of surface irrigation (basin type) is mainly employed in the study area. The respondents irrigate an average of 2 to 3 times a week depending on weather and for an average period of twenty to twenty-four weeks. A total of 8839.68 ha-cm of irrigation water was applied by all the farmers with an average of 126.28 ha-cm per respondent. Labour input per production season ranges from 205.54 man-day/ha to 229 man-day. Table 1 presents the cost and returns of dry season crop production in N/ha in the study area. The average net return per hectare is N34,544.93.

From the regression analysis, the coefficient of determination (R^2) ranges from 0.74 to 0.84 which implies that the regression accounted for about 74 per cent to 84

percent of the variation in the values of output. The Durbin-Watson statistic obtained (1,91) shows that there was no auto correlation of error term for the fitted model. Based on the criteria for selection of lead equation, the Cob Douglas production function was selected (Table 2). From the lead equation, labour input in man-days, purchased input in naira and fertilizer used in Kilogram were not significant. However, based on the elementary knowledge of irrigation production process, there is no way any meaningful estimate can be done without these variables and as such they were used in estimation thereby committing type I error. The estimated coefficients, which, are the direct elasticity of production of the resources in the Cobb Douglas production function were positive except for labour and irrigation water (Table 3). The unexpected negative coefficients of labour and irrigation water may be due to inefficient use of these resources. Large doses of labour are usually employed in traditional agriculture relative to the size of land. Fertilizer use showed relatively more elastic relationship with coefficient of elasticity of 0.47. The return to scale of irrigation production in the study area was 0.66. This is an indication of decreasing returns to scale implying that production is in stage II of the generalized production function.

In determining the resource use efficiency of the respondents, the marginal value product (MVP) of each resource was compared to its unit factor cost.(Table 4). A particular resource is efficiently utilized when the ratio of its MVP to its UFC is not significantly different from unitary. The MVP of land could not be compared with its UFC because the land was not bought or actually rented in the area. However, the land should be used more intensively to permit better management efficiency and increase income.

To improve efficiency, there is the need to use less labour since its efficiency ration was less than unitary in absolute term. More of purchased inputs should be used in order to equate its MVP to UFC. More fertilizer is required to equate its MVP to UFC. This is also confirmed by its elasticity. Organic fertilizer could be used to supplement the chemical fertilizer. More of irrigation water could also be used for better efficiency.

The farmers in the study area are not making efficient use of their resources. There is therefore a need for adjustment in order to improve the efficiency of these resources. This is important because the sustainability of fadama irrigation development depends to a large extent on the efficiency of the input and extension systems in terms of continuous provision of adequate and accessible inputs and extension services to fadama irrigation farmers (Rayar, 1994). If the irrigators are better educated, it will assist them in employing business and financial management methods based on well kept farm records and rational decision making on resource allocation efficiency. Subsidizing inputs such as chemicals and fertilizer can make farmers to be more accessible to these inputs. In establishing an effective small-scale irrigation system, pump provision should be given adequate consideration as an
integral part of strategy to increase productivity.

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Table 1 Cost and Returns to Dry Season Crop Production

Farm Size	No of Farmers	AFC N/ha	AVC N/ha	ATC N/dha	ATR N/ha	ANR N/ha
0.01 – 0.40	48	9307.34	44233.35	53540.69	89970.38	46429.69
0.41 – 0.80	18	7138.81	30601.53	37740.34	67034.20	29293.86
0.81 – 1.20	4	5451.25	24345.83	29797.08	57708.33	27911.25
	70	7299.13	33060.24	40359.37	74904.30	34544.93

Source: Field survey 1998

Table 2 Result of Regression Analysis

Form of Equation	Constant Term	L_n	L_m	P_n	F_k	I_w	R^2
Linear	7606.60	11528.86 (617.43)	5.99 (71.30)	3.80* (1.60)	67.73* (9.55)	-55.94 (35.54)	0.84
Semi-Log	-55217.6	18944.30* (2.40)	1813.34 (0.04)	9715.26 (1.30)	32822.27* (4.30)	8205.41 (-0.61)	0.74
Double-Log	3.41	0.22* (2,77)	-0.04 (-0.08)	0.08 (1.12)	0.47* (6.14)*	-0.07 (-0.50)	0.83

Figures in parenthesis are the standard error of the estimates.
*Significant at 5%

Table 3 Elasticity of Production

Resource	Elasticity Coefficient
Land (L_n)	0.22
Labour (L_m)	-0.04
Purchased inputs (P_n)	0.08
Fertilizer (F_k)	0.47
Irrigation Water (I_w)	-0.07

Source – Computer Print.

Table 4 Measures of Productivity of Resources Used

Resource	MVP	UFC	MVP/UFC
Land (L_n)	18993.65	-	-
Labour (L_m)	-6147	150	-0.04
Purchased Inputs (P_m)	2.004	1.25	1.603
Fertilizer (F_k)	49.04	28	7.005
Irrigation Water (I_w)	-17.85	77.19	-0.23