

## INCOME SOURCES AND RESOURCE USE IN CROP PRODUCTION ON DIFFERENT LAND FORMS IN THE UPPER LUNI BASIN

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### ABSTRACT

Income sources and resource use in crop production were studied in different land form units of Raipur Guhia catchment of Upper Luni basin in western Rajasthan. Crop production was the principal source of household income followed by animal husbandry and subsidiary sources. Fertilizers were more critical than either mechanical or labour inputs. Increased use of manures and fertilizers are suggested for increasing the crop production in various land form units.

### INTRODUCTION

Income sources and resource use by farmers are important considerations for developmental planning in arid regions. Studies on how farmers use resources and obtain income from different sources are lacking, particularly for Raipur Guhya catchment of Upper Luni basin in arid western Rajasthan. This study is an attempt to analyse sources of income of farmers in different land form units and to appraise resource use in crop production in Raipur Guhya catchment of Upper Luni basin of arid western Rajasthan.

### MATERIAL AND METHODS

#### *Study area :*

Guhiya and Sukri are the major streams in the catchment, ephemeral in nature, with sandy and sometimes gravelly beds. The annual rainfall over the catchment varied from more than 400 mm in the south eastern sector to less than 300 mm in the western and north-western part. The land form units (Table 1) were hilly and rocky (LFU 1), burried pediments (LFU 2), river bed and flood plains (LFU 3) and flat alluvial plains (LFU 4). The drainage pattern in the catchment consisted of trellis, rectangular and dendritic network and radial pattern around the hills.

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Table 1 : Selection of villages and respondents in different land form units in the Upper Luni basin

Land form units	Number of villages		Number of respondents
	Total	Selected	
LFU 1 (Rocky and Hilly)	56	5	38
LFU 2 (Buried pediments)	3	3	17
LFU 3 (River bed and flood plains)	5	3	19
LFU 4 (Flat alluvial plains)	142	6	57

*Data base :*

A two-stage stratified random sampling technique was adopted for sampling the villages broadly classified on the basis of topographical features (Table 2). Villages were further classified according to the population as small (<500), medium (500 to 2000) and large (> 2000). From each topographical category, at least one village was selected randomly. A minimum of 4 respondents in small, 5 to 10 in medium and 10 to 15 in large villages were randomly selected and interviewed personally with pre-tested schedules. Information relating to rabi 1979 and kharif 1980 cropping seasons were collected. Data on sources of income, values of inputs and outputs in crop production were recorded on per farm basis.

Table 2 : Source of farm household income in different land form units in the Upper Luni basin (Per/form)

Land form units	Av. farm size (ha)	Income (Rs.)			
		Crop	Subsidiary	Animal	Total
LFU 1 (Rocky and hilly)	1.6	2824	704	1878	5406
LFU 2 (Buried pediments)	2.8	4793	564	1800	7135
LFU 3 (River bed and flood plains)	4.4	4128	494	2393	7015
LEU 4 (Flat alluvial plains)	5.3	8403	1363	1469	11255

*The variables :*

Sources of farm household income are given in table 2. Crop income was obtained by multiplying the output (main and byproduct) of different crops with the ruling market prices at the villages at the time of harvest as reported by the respondents. Sum total of the value of all form grown crops for the period under study was taken as the dependent variable (Y).

Subsidiary income included total gross annual income of the family by working in the mines, factory, village crafts, trade, government service etc. during the study period.

Animal income related to the value of different animal outputs such as milk, wool, hair etc., valued at local prices as reported by respondents during the study period.

Labour input ( $X_1$ , Table 3) was counted as half a man day for a child, and woman labour as equal to man labour. Man days used round the year for all the crops were totalled.

Mechanical input ( $X_2$ , Table 3) included the value of all farm implements, machinery used for tilling, watering, transportation etc. The values of these were assessed as existing on the date of visit and as estimated by farmer.

Table 3 : Crop production functions (Cobb-Douglas)\* for different land form units ( $R^2$  = coefficient of multiple determination).

Land form units	Intercept (a)	Regression coefficients			$R^2$ (%)	F***
		Labour ( $X_1$ )	Machinery ( $X_2$ )	Fertilizer*** ( $X_3$ )		
Rocky and hilly	0.6511	0.1165	0.078	0.8867	48	16.52
Burried pediments	1.4179	1.3434***	0.0291	0.5020	71	17.54
River bed and flood plains	0.8942	0.4214	0.0944	0.7414	80	31.80
Flat alluvial plains	0.9981	0.1821	0.1352**	0.7267	69	60.36

\*The equation fitted was  $Y = a X_1^{b_1} X_2^{b_2} X_3^{b_3}$  where  $Y$  = gross income from different crops (Rs./farm/year)  $X_1$  = man-days/farm/year for crop production.  $X_2$  = value of farm machinery (Rs./farm/year) and  $X_3$  = value of manures. \*\*Significant at 5 per cent level. \*\*\*Significant at 10 per cent level.

Manures and fertilizers ( $X_3$ , Table 3) included the assessed value (as per respondents) of the total manures and fertilizers used in the production of all crops.

#### Analysis :

Mean differences in the income variables on different land form units were statistically tested with the help of 't' test (Snedecor and Cochran, 1967).

Resource use productivity appraisal in crop production was attempted by fitting Cobb-Douglas type production functions (Heady and Dillon, 1961).

## RESULTS AND DISCUSSION

*Sources of income :*

The total household income ranged from Rs. 5406/- in rocky and hilly areas to Rs. 11255/- in flat alluvial plains (Table 2). The major source of income was from crops. It ranged from about 50 per cent (in rocky and hilly areas, buried pediments, river bed and flood plains) to 75 per cent (in flat alluvial plains) of the total household income. Crop income per cultivated hectare was also examined and it varied from Rs. 1800 to 1900 in land form units 1, 2 and 4. Crop income was significantly lower in LFU 3 (Rs. 850/-) than in all other land form units on account of sandy soils and lower percentage of irrigation. Areas in land form units 1 to 3 are naturally suitable for animal husbandry and in LFU 4 for crop production as explained by their contribution in total income (Table 2). Income from subsidiary sources such as wage earning elsewhere, petty business, government service etc. was also one of the important sources particularly on rocky and hilly areas (LFU 1) and flat alluvial plains (LFU 4).

*Resource use in crop production :*

For the appraisal of resource use in crop production, the major source of income in the study area, Cobb-Douglas type crop production functions gave better fit on all the land form units (Table 3). The regression equations were highly significant in all the cases. The coefficients of determination ( $R^2$ ) indicated that 47, 71, 80 and 69 per cent of variations in total crop income were explained by labour, machinery and manures and fertilizer inputs in land form units 1 to 4, respectively.

All the regression (output elasticity) coefficients with respect to fertilizers were positive, less than one and highly significant, indicating decreasing marginal returns to fertilizer application. These results imply that fertilizer application should be stepped up. Decreasing marginal returns to machinery on LFU 4 and increasing marginal returns to labour in LFU 2 were obtained. Labour use on buried pediments can thus be increased. This may call for careful planning of subsidiary occupations so that there will be adequate supply of labour for crop production.

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