Indian Journal of Agronomy **46** (2) : 368–371 (June 2001)

Resource productivity in ginger *(Zingiber officinale)* cultivation in paddy fields and upland situations in Karnataka

V.S. KORIKANTHIMATH AND GOVARDHAN RAO

Cardamom Research Centre, Indian Institute of Spices Research, Appangala, Madkieri Kodagu, Karnataka 571 201

Received: March 2000

ABSTRACT

To compare the resources productivity in ginger (*Zingiber officinale* Rosc.) cultivation in paddy fields and upland situatons, the data pertaining to the 1998–99 croppping season was collected from 15 farmers from each of the 2 situations, accounting for a total sample size of 30 farmers in Coorg, Kodagu, Karnataka. Cobb-Douglas type of production function was employed to determine the extent to which the resources influence on the returns/yield. The coefficient of determination (R^2) was highly significant in paddy fields (0.99), whereas it was just significant in upland situations (0.85). There existed almost a constant returns to scale in both conditions. The ginger yields were more in paddy fields than in uplands due to retentivity of soil moisture in the farmer situation.

Key words : Ginger, Resources productivity

Though ginger cultivation was confined mostly to Kerala state in South India, in recent years, it is making fast inroads in the paddy fields of Karnataka for the last 8–10 years (Korikanthimath *et al.*,1995). It can be successfully cultivated on the uplands (locally called bane areas – open and vacant areas) where, there is adequate natural drainage specially on hills and hill slopes. Its cultivation in paddy fields needs a perfect drainage system. Korikanthimath *et al.* (1995) reported that nearly 4,000 ha of paddy land was converted for cultivation of ginger in Coorg, Kodagu district of Karnataka and was found to with economically profitable compared to cultivation of paddy. As there is no published information available on the comparative study of ginger cultivation with respect to resource productivities, an attempt was made to compare the same on 2 different situations, viz. on paddy fields and uplands.

MATERIALS AND METHODS

To compare the resource productivities in ginger cultivation on paddy fields and upland areas, the data pertaining to 1998–99 cropping season were collected from 15 farmers from each of the 2 situations,

accounting for a total sample size of 30 farmers to carry out the ecomomic analysis in Coorg, Kodagu, Karnataka.

All these farmers were interviewed randomly with the help of well-structured schedules to elicit the information on cash inputs in ginger cultivation with respect to yield, extent of resource use and price realised etc. for the agricultural year 1998–99. For evaluating the resource productivities, Cobb-Douglas type of production function was employed to the farm level data with a view to determine the extent to which the resources explains the variability in its yields/returns.

The production function fitted for the system was specified as below:

$$Y = A.\ X_1^{B_1}\ X_2^{B_2}\ X_3^{B_3}\ X_4^{B_4}\ X_5^{B_5}\ X_6^{B_6}\ X_7^{B_7}\ E$$

The function was converted into linear form by making logarithmic transformations of all the variables.

$$\text{Log } Y = \text{Log } a + b_1 \text{Log } X_1 + b_2 \text{Log } X_2 + b_3 \text{Log } X_3 + b_4 \text{Log } X_4 + b_5 \text{Log } X_5 + b_6 \text{Log } X_6 + b_7 \text{Log } X_7 + \text{Log } e$$

where, Y=gross returns (Rs), a= intercept term, X_1= seed value (Rs), X_2= manure (Rs), X_3= fertilizers value (Rs), X_4= plant protection measures value (Rs), X_5= irrigation (Rs), X_6=mulching (Rs), X_7= labour value(Rs), m=error term, bi=the regression coefficients of the independent variables (I= 1 to 7), and Σbi = returns to scale.

The coefficient of multiple determination (R^2) was worked out to test the goodness of fit of the model.

Marginal value product with reference to Xi resource cash inputs

$$= bi\ \frac{\overline{Y}}{\overline{Xi}};$$

where $\overline{Y}$ = geometric mean of gross returns, $\overline{Xi}$ = geometric mean of i^{th} indendent variable, bi= the regression coefficient i^{th} independent variable

After estimating the marginal value product (MVP) of each cash input, it was compared with its marginal factor cost (MFC). Marginal factor cost (MFC) for all the inputs has been considered as 1 rupee, since the regression function was run for the farm level data in the value terms, to arrive at a decision of an comparative view on the extent to which various resources used in the production explains the variability in its yields/returns.

RESULTS AND DISCUSSION

The inputs like seed material and plant-protection measures had significant and positive influences on the ginger yield, bringing in Rs 1.49; Re 0.28 and Rs 2.33; Rs 1.61 from every rupee invested on these respective inputs in the 2 respective paddy fields and upland situations which represented by the ratios of marginal value product to marginal factor costs (MVP/MFC).

This stresses the need for increased use of the same resources. It was noticed that manures were excessively used which had negative influence on the output in both the situations. Whereas irrigation was in excess for only paddy field conditions with – 0.55 as regression coefficient bearing a negatively significant influence while labour input was found to be over-used in spite of no positive influence on the output in upland situations. However, the coefficient of determination

(R^2) was highly significant in paddy fields conditions (0.85). This shows that, only 1 % of the variation in output in paddy field conditions and about 15% of the variation in the ginger yield was due to other variables which were not included in this function.

This stresses the need for taking up the other variables very seriously in case of upland situations and increase the use of the same resources to augment the ginger yield. In case of both situations, there almost exists a constant returns to scale with summation of regression coefficients being nearly 1.0, i.e. 0.94 (paddy fields) and 1.06 (upland situations). Hence it shows that there is still considerable scope for going in an increased use of resources till the maximum returns is reached.

Germination of rhizomes is not likely to be enhanced by the added nutrients, since

Table 1. Production elasticities and marginal value product (MVP) to marginal factor costs(MFC) ratios in ginger cultivation in lowlying (paddy fields) and upland areas

Item	Particulars			
	Paddy fields		Upland areas	
n	15		15	
Intercept	1.10		3.89	
Inputs	Production elasticities		MVP/MFC	
	Paddy fields	Upland areas	Paddy fields	Upland areas
Seed material	1.22** (0.06)	2.01** (0.67)	1.49	6.41
Manures	–0.09 (0.06)	1.27* (0.61)	–0.12	–4.85
Fertilizers	0.07 (0.07)	–0.50 (1.87)	–0.15	–2.74
Plant-protection measures	0.18** (0.06)	1.07* (0.52)	0.28	4.80
Irrigation	–055** (0.07)	0.59 (0.71)	–1.14	4.27
Mulching	0.14 (0.11)	0.59 (0.71)	0.26	1.46
Labour	0.11 (0.10)	1.07 (0.76)	0.13	–3.28
R^2	0.99**		0.85**	
$\sum bi$	0.94		1.06	

*P = 0.05; ** P = 0.01

R^2, Coefficient of multiple determination

Student `t' test was employed to test the significance of regression coefficients; `F' test was employed to test the significance of coefficient of multiple determination; Values in the parentheses indicate corresponding standard errors

they do not require any exogenous source of nutrition for germination. Obviously, the improved germination in the paddy field conditions for getting higher yield levels when compared to that in upland situations with the increased bulk of materials added was due to the improvement in the physical status of the soil. This factor induces favourable influence on the germination. If this bulk of use of inputs does not favour the germination then it would be possibly due to the adverse effect of decomposition of inputs on the rhizomes. The results of present study corroborate the findings of Rajan and Singh (1973).

Thankamma *et al.* (1978) reported that ginger is a sterile plant, hence there is no fruit or seed set. It appears from the findings that, there exists a contrasting features in the status of the soil moisture retentivity and physiological developments in the ginger cultivarion in different situations which leads to differential outputs in spite of similar rate of application of nutrients.

REFERENCES

Korikanthimath, V. S., Hegde, Rajendra and Sivaraman, K. 1995. Integrated input management in coffee based spices multistoreyed cropping system. *Indian Coffee* **59** (2) : 3–6.

Rajan, K. M. and Singh, R. S. 1973. Effect of organic amendments of soil on plant growth yield and incidence of soft rot of ginger. *(In) Proceedings of First National Symposium on Plantation Crops.* pp. 102–106.

Thankamma, P. K., Pillai, G., Vijaykumar and Nambiar, M. C. 1978. Flowering behaviour, cytology and pollen germination in ginger (*Zingiber officinale* Rosc.). *Journal of Plantation Crops* **6**(1) : 12–13.

Thomas, T.A. 1982. Genetic resources of ginger in India. *(In) Proceedings of the Fourth National Seminar on Ginger and Turmeric,* held at *Calicut,* 9 April 1980, pp. 50–54.