Thun.) and *C. flavipes* respectively. The intrinsic rates of increase were 0.166, 0.144, 0.131 and 0.176, while the population multiplied to 30.56 times in 19.10 days, 34.56 times in 24.60 days, 43.43 times in 28.78 days and 30.72 times in 19.46 days respectively in these parasitoids. In *T.pupivora* the intrinsic rates of increase varied from 0.288 to 0.308 depending on the various hosts used. The population multiplied to 118.31 times in a mean generation time of 15.55 days on *E.merione*

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RESOURCE USE EFFICIENCY IN RICE

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ABSTRACT

Resource use efficiency in rice was studied in Thanjavur district. Totally 90 respondents were interviewed personally for this study for three dominant varieties. It revealed that human labour contribution to rice yield and dummies used for regions like new and old delts was significant. Farmers were using higher seed rate. New delta performs better than old and coastal regions.

KEY WORDS : Rice, Resource, Use, Efficiency

India has to achieve a food grain production of 240 million t by 2000 AD to provide food security to about one billion people. The challenge is how to achieve this target in a short period from the existing net area sown of 145 million ha and with irrigation potential of 113 million ha. To meet the increased food demand and to enhance rice yields, we need to achieve a 5 per cent or higher growth rate in food production. We could meet this demand even from presently irrigated areas alone, because there still remains vast untapped yield potential.

With the advent of seed-fertilizer-water technologies, there has been substantial increase in rice productivity. However, when compared to some of the rice producing countries, the performance at India with regard to production per unit of land is far below its potential.

The major reason for low average yield which causes the yield gap in India is inter-and intra-regional variation in the yield of rice per ha. For example the average rice yield per hectare is 1.12 tones in Bihar. 2.34 tones in West Bengal. 3.2 tones in punjab and 4.19 tones in Haryana (WRS, 1987) Variation in productivity has pulled down the average, indicating greater opportunities to raise the rice production in states with poor performance.

METERIALS AND METHODS

Thanjavur district with its three agricultural divisions each one representing the old, new and coastal area was purposely selected. Based on area and production of paddy, one block was selected for each of old, new and coastal areas. In each block, two villages were randomly selected and in each village 15 sample respondents were randomly selected for this study. Thus totally, 90 respondents were interviewed personally during 1990-91.

Heady and Dhillon defined that, production function explains the relationship between the input of factor services and output. (Heady and Dhillon, 1961). To examine the individual factor's or inputs' contribution to the yield, linear production function was estimated. The linear type of yield gap function was used for sugarcane and the yield gap regressed with input gaps (Chandrasekaran, 1985). Yield was regressed for individual varieties. The yield was regressed with the use of inputs such as nitrogen, phosphorus, potash, manures, human labour, seed rate, technology index and miscellaneous cost in order to identify the contribution of each input to yield increase. The function used is

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9(D_1) + b_{10}(D_2)$$

Where = Yield in kg per hectare

X_1 = Nitrogen in Kg per hectare
X_2 = Phosphorus in Kg per hectare
X_3 = Potash in Kg per hectare
X_4 = Human labour in Mandays per hectare
X_5 = Seed rate in Kg per hectare
X_6 = Manure in quintaals per hectare
X_7 = Miscellaneous costs in Rs. per hectare
X_8 = Technological Index

D_1 = Dummy for old delta region
D_2 = Dummy for the new delta region

b_0 = Regression constant
$b_1, b_2, b_3, b_4, b_5, b_6, b_7, b_8, b_9, b_{10}$ -

Partial regression co-efficients

In case of inputs like fertilizers, the amount of fertilizers applied to rice crop is calculated by multiplying the total amount of each fertilizers with the actual content of the respective fertilizers and summed up the quantity.

Cost on tractor power, electric power, micro nutrients, herbicides and pesticides were considered as miscellaneous costs. Technological index was constructed to represent the level of adoption of recommended practices for each crop. The adopted practices such as fertilizers, pesticides cost and non-monetary inputs in the sample farms were expressed in percentage to the recommended level. summed up and the mean value to the number of practices was taken as technological index.

The ordinary least square method was used for estimating parameters associated with the difference in independent variables. In the linear yield functions, the parameters associated with independent variables straight away give the marginal yield for respective input gaps. Marginal yield was the change in yield resulting from unit change in its input, keeping all other inputs constant. The marginal value productivity of factors were estimated.

RESULTS AND DISCUSSION

The relationship between yield and applied inputs was studied by fitting linear regression for three rice varieties *viz.*, CR 1009, ADT 39 and Co.43.

CO.43

The results of the yield function for Co.43, CR 1009 and ADT 39 are given in Table 1. The co-efficient of multiple determination was 0.8009 indicating that 80.09 percentage of the variation in yield was explained by the inputs applied. The coefficients of nitrogen, human labour, technological index and dummy for new delta were found to be significant indicating the physical and and economic possibility of increasing yield using higher level of inputs. The coefficients of regional dummies for new delta found to be significant. Since the coastal area represents the control dummy, the physical condition and other regional characteristics existing in new delta significantly contributed for increase in the rice yield. This underscores the need for developing suitable technologies for coastal belt to improve the performance of rice crop.

Table 1. Extimated yield function for dominant rice varieties

Variables	Co 43		CR 1009		ADT 39	
	Co-efficient	t value	Co-efficient	t value	Co-efficient	t value
Intercept	-367.566		-301.3800		-202.749	
Nitrogen m (kg)	20.2655*	2.8215	33.7026**	1.7124	9.9176**	2.2643
Phosphorus (kg)	24.3873	1.4634	0.9638	0.6780	-0.7597	-0.1041
Potassium (kg)	-9.9125	-0.7590	1.9039	1.1680	28.1960*	3.4203
Manures (Q)	12.7553	1.1231	16.7160**	1.8790	3.7844	1.2510
Seed rate (kg)	-2.0754	-1.0766	-5.4766**	-1.4281	-1.4281	-1.0625
Human labour (mandays)	35.4724*	6.0016	23.6846	0.1630	0.5505**	1.6930
Technological index	0.7240**	1.7190	12.9969	1.0800	20.0110**	6.7075
Miscellaneous cost (Rs.)	0.69007	0.7310	0.7751	0.5156	1.9039	1.1680
Dummy for old delta	121.0155	0.8780	106.2390	1.1250	-58.9408*	-1.9970
Dummy for new delta	271.975*	1.9780	230.672*	2.663	-	-
R^2 =	0.8009	R^2 =	0.7993		R^2 =	0.7726
R^{-2} =	0.7691	R^{-2} =	0.76144		R^{-2} =	0.7175
R =	25.1468	R =	21.1084		R =	14.6145
N =	62	N =	64		N =	45

CR 1009

The co-efficient of multiple determination obtained was 0.7993 for CR 1009 indicating that 79.93 percentage of the variation in yield was explained by the inputs applied. The coefficient of nitrogen, seed rate and dummy for new delta were significant with values of 33.7026, 18.7160, -5.4766 and 230.672 respectively. There exists potentialities for increasing the yield of CR 1009 by increasing the application of manures and nitrogen and reducing the seed rate. Here also, co-efficient of new delta was found to be significant and dummies for old delta and new delta were positive. This indicated that there was higher yield in old and new delta over that of coastal area.

ADT 39

The co-efficient of multiple determination was 0.7726 indicating that the 77.26 per cent variation in yield was explained by the inputs applied. The coefficients of nitrogen, potassium, technological index and human labour were significant. Here dummy for new delta is the control dummy. The co-efficient was negative and significant. Thus, the new delta performs in a superior way because of its better water control and well drained soils.

In general, nitrogen, human labour and technological index were found significant. Seed rate was negative and found to be significant for CR 1009. This indicated that farmers had used excess seed rate which calls for rationalization. The co-efficient of regional dummies indicated that physical conditions and other regional characteristics existing in new delta significantly contributed for increase in the rice yield than old delta and coastal regions. The study revealed that the resource use efficiency in the study area could be increased through better utilization of available resources and there is scope for increasing production in old and new delta than coastal region.

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