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Effect of Socio-Economic Variables on Productivity of Rainfed Crops in Farmers' Fields under Semi-arid Alfisols in South India

M.S. Prasad*, G.R. Maruthi Sankar, K. Ravi Shankar, G. Nirmala, K. Nagasree, C.R. Thyagaraj, M. Osman and Ch. Srinivasa Rao

ICAR - Central Research Institute for Dryland Agriculture, Santoshnagar, Hyderabad-500 059, Telangana

Email: msprasad@crida.in

ABSTRACT: Based on a study conducted in 120 farmers' fields in Manchala and Chevella mandals in Ranga Reddy district in Telangana during 2006 to 2008, the effects of socio-economic variables on productivity of different rainfed crops have been assessed in this paper. The relationships of socio-economic variables and their effects on yield of crops attained by farmers were modeled based on multivariate regression analysis. The regression models gave a significant predictability of yield through socio-economic variables in both individual years and also when pooled over years. In Manchala, land holding, price situation and livestock possession contributed significantly to yield in sorghum. In pigeon pea, extension agency contact explained variation in yield significantly. In castor, land holding and price situation contributed to yield. In *kharif* rice, livestock possession was significant. In *rabi* rice, farm power, was significant. In Chevella, in maize, risk orientation, management orientation, mass media exposure, livestock possession, education, production orientation and planning orientation were found to be significant factors. In cotton, age, farming experience, credit orientation, extension agency contact and livestock possession explained yield variation significantly. In *kharif* rice, farm power and planning orientation, management orientation, education, extension agency contact and mass media exposure were emerged as significant factors. In tomato, price situation, market facility, land holding and credit orientation were found to be significant. In carrot, farm power, credit orientation, marketing orientation, labour availability and land holding were emerged as good predictors of yield. In beetroot, farming experience, education, risk orientation and price situation were found to be important factors. The models could be used to predict the yields of crops through the identified significant socio-economic variables under similar farming conditions in the region. Based on the findings of the study appropriate extension strategies are suggested.

Key words: Crop yield, socio-economic variables, correlation, regression, prediction, farm productivity, extension strategies

Agricultural production holds the key to progress and prosperity of a nation. Due to ever increasing population and demand for more food, increasing production per unit of land is crucial. However, the declining food production is causing a great concern. Apart from increasing cost of cultivation, declining soil health, erratic rainfall distribution, and several socio-economic and other variables would affect farmers' performance in farming and crop production. There is a need to maximize productivity and profitability by growing suitable rainfed crops along with respective sustainable rainfed practices developed for crops grown in different agro-ecological regions of India. Under All India Coordinated Research Project for Dryland Agriculture, the technologies developed under on-station research conditions at 22 research centers are being validated under farmers' field condition in on-farm situations at 8 Operational Research Project centers in different locations (AICRPDA Annual Report, 2010). The present study was initiated in 2006 with the objectives of identifying socio-economic and other factors influencing the production at individual farmer's level and to suggest extension strategies for increasing farm production on a sustained basis by utilizing the knowledge about different factors that exert influence on productivity of crops cultivated by rainfed farmers (CRIDA Annual Report, 2007, 2008, and 2009). The relationships between socio-economic variables were assessed and significant variables were used for development of suitable regression models for predicting yield of crops as discussed by Maruthi Sankar (1986). In a study by Maruthi Sankar *et al*. (1988), the authors described on pooling of experimental data for predicting fertilizer requirements of *rabi* sorghum for varying soil test values in vertisols. The present study was conducted in two mandals of Ranga Reddy district viz., Manchala and Chevella representing different rainfall conditions. The study was conducted during the years 2006 to 2008 with the objectives of (i) finding out the farm productivity of the crops cultivated by rainfed farmers, (ii) identifying the important socio-economic variables which are significantly influencing the yield of crops over years and (iii) to suggest extension strategies for increasing farm production on a sustained basis based on the findings of the study.

Materials and Methods

The study was conducted in Rangareddy district situated in Southern-Telangana agro-climatic Zone of Telangana state. The district was purposively selected because it is one of the most drought prone districts of the state and located nearer to the Central Research Institute for Dryland Agriculture (CRIDA), Hyderabad. Out of 37 mandals (reorganized blocks) of the district, two mandals were selected randomly* based on rainfall record for the last 30 years. These two mandals viz., Manchala and Chevella representing dry semi-arid (500-750 mm) and wet semi-arid (750 mm and above rainfall) were selected from East Rangareddy and Chevella revenue divisions of the district respectively. From Manchala mandal, five villages viz., Arutla, Tippaiguda, Japal, Chittapur and Nomula were selected randomly. Data were collected from a sample of 60 farmers randomly selected

Table 1 : Independent variables selected for the study and their measurement

Variable	Measurement
Age	Refers to chronological age in completed years. Structured schedule
Education	Referes to number of years of formal schooling completed. Socio-economic status scale-Rural (Pareek and Trivedi 1964)
Farming experience	Refers to the number of years of experience in cultivation structured schedule.
Land holding	Refers to land owned farmer in standard acres. Structured schedule
Extension Agency contact	Refers to the frequency of contact of respondent with extension agencies like VEOs, AAOs, Extension specialists, scientists etc. to get information on farm technology. The quantification of extension agency contact was done accorindg to the procedure followed by Patil (1990)
Mass media exposure	Refers to the exposure o fthe respondents to different mass communication media and participation in the related activities such as listening to radio, viewing television and reading, viewing television and reading newspapers and farm magazines. The quantification of mass media exposure was done according to the procedure followed by patil (1990)
Farm Power	Refers to the extent of possession of various drought power items by the respondent. Farm power was measured by using the procedure as followed by Dharmadhikari (1991)
Risk Orientation	It was operationalized as the degree to which a farmer is oriented towards risk and uncertainity and has courage to face the problems in farming. It was measured with the help of risk orientation scale developed by Supe(1969)
Credit orientation	It was operationalized as the favourable and positive attitude of an individual farmer towards obtaining credit from institutional sources for agricultural purposes. It was measured by using the procedure as followed by Beal and Sibley (1967)
Management orientation, planning orientation, production orientation, marketing orientation	It was operationalized as the degree to which a farmer is oriented towards scientific farm management comprising planning, production and marketing functions of his farm. It was measured with the help of scale developed by R.K.Samanta (1977)
Price situation	It refers to market prices as perceived by a respondent of farm products and purchased inputs. It was measured by using the procedure as followed by I.S. Rao (1990)
Input accessibility	It refers to the availability of the requisite production inputs in the market to a respondent. It considered in two aspects i.e, proximity of supply sources and the ease of availability. It was measured by using the procedure as followed by I.S.Rao (1990)
Market facility	It refers to the proximity of the market centre and the facilities available there. It considered in two aspect viz.m distance to market cnetre and adequacy of market conveniences from the view point of the respondent. It was measured by using the procedure as followed by I.S.Rao (1990)
Labour availability	It refers to the availability of the requisite labour for the different operations in the cultivation to a respondent. It is considered in two aspects i.e. ease of availability and the wages of labour. It was measured by using the procedure as followed by I.S.Rao (1990)
Livestock Possession	It refers to the number of animals possessed by the individual. The livestock possession was measured by using the procedure as followed by Dharmadhikari (1991)

from these five villages @ 12 farmers (representing small, medium and large categories) from each village by using pre-tested interview schedule. Like wise from Chevella mandal, data were collected from a sample of 60 farmers randomly selected from five villages viz., Allawada, Jalaguda, Chenvelly, Pamena and Timmareddyguda. Thus, the data were collected from a total sample of 120 farmers @ 60 farmers selected randomly*` from each of the two mandals. Based on the experience of the team (KVK scientists) already working with farmers of the Rangareddy district, eighteen agro-economic and socio-personal, communicational, psychological and situational variables (independent) were included in the study after ascertaining their relevancy and in consultation with experts and literature (Table 1).

*Since random selection gives on equal opportunity for a given sample to be selected and it is a well established statistical procedure used in social science research studies, hence the procedure was followed in this study farm

Table 2(a) : Descriptive statistics of socio-economic variables and yields of crops in Manchala

Variables	Minimum	Maximum	Mean	SD	CV
Socio-economic variables(n=60)					
Age (XI)	25.0	75.0	49.7	12.5	25.3
Education (X2)	0.0	6.0	1.7	2.1	120.0
Farming experience (X3)	5.0	60.0	26.6	12.8	48.2
Land holding (X4)	0.2	6.4	2.4	1.4	58.7
Extension agency contact (X5)	0.0	4.0	1.9	0.9	45.7
Mass media exposure (X6)	0.0	13.0	3.7	2.5	68.3
Farm power (X7)	0.0	4.0	0.6	0.7	115.1
Risk orientation (X8)	8.0	16.0	13.7	1.3	9.8
Credit orientation (X9)	3.0	8.0	5.6	1.3	22.7
Planning orientation (X10A)	11.0	17.0	13.2	1.4	10.3
Production orientation (X10B)	9.0	15.0	12.6	1.4	10.8
Marketing orientation (X10C)	7.0	16.0	13.4	1.7	12.8
Management orientation (X10)	32.0	48.0	39.3	2.6	6.5
Price situation (X11)	2.0	6.0	3.0	0.9	31.8
Input accessibility (X12)	2.0	5.0	2.8	0.9	32.3
Market facility (X13)	2.0	5.0	2.7	0.9	33.6
Labour availability (X14)	4.0	10.0	6.5	1.1	16.8
Livestock possession (X15)	0.0	7.0	1.3	1.2	93.3
Crop yield (kg/ha)					
2006					
Sorghum (n=12)	180	1650	620	370	59.6
Pigeonpea (n=09)	40	250	90	60	69.3
Castor (n=25)	50	1000	600	210	35.1
Kharif rice (n=46)	2750	6000	4660	730	15.7
*Rabi r*ice (n=43)	3000	11000	4710	1210	25.7
2007					
Sorghum (n=14)	90	580	330	160	46.6
Pigeonpea (n=11)	30	750	180	210	121.1
Castor (n=27)	130	1500	670	300	44.4
Kharif rice (n=45)	2130	6500	4760	960	20.2
Rabi rice (n=30)	3000	6000	4480	720	16.0
2008					
Sorghum (n=06)	380	1500	690	430	62.5
Pigeonpea (n=)12	50	630	230	200	89.2
Castor(n=41)	80	1500	600	250	41.9
Kharif rice(n=46)	1750	6000	4820	930	19.4
Rabi rice (n=01)	4500				

SD: Standard deviation (kg/ha) CV : Coefficient of variation (%)

Table 2(b) : Descriptive statistics of socio-economic variables and yields of crops in Chevella

Variable	Minimum	Maximum	Mean	SD	CV
Socio-economic variables (n=60)					
Age (XI)	23	75	47.1	14.5	30.8
Education (X2)	0	7	2.2	2.2	101.7
Farming experience (X3)	5	50	25.6	13.8	53.8
Land holding (X4)	0.4	7.0	2.2	1.5	66.2
Extension agency contact (X5)	1	8	3.0	1.8	61.4
Mass media exposure (X6)	0	10	4.9	2.6	52.8
Farm power (X7)	0	7	0.7	1.1	143.9
Risk orientation (X8)	9	16	13.3	1.5	11.4
Credit orientation (X9)	4	10	7.0	1.3	18.4
Planning orientation (X10A)	2	17	12.4	2.2	17.7
Production orientation (X10B)	8	17	12.3	1.7	14.0
Marketing orientation (X10C)	10	16	13.2	1.2	8.9
Management orientation (X10)	32	43	38.1	2.7	7.2
Price situation (X11)	2	6	3.5	0.9	27.3
Input accessibility (X12)	2	5	3.5	1.1	31.6
Market facility (X13)	2	4	2.6	0.6	21.7
Labour availability (X14)	4	10	7.0	1.5	20.8
Livestock possession (X15)	0	2	0.4	0.5	136.6
Crop yield (kg/ha)					
2006					
Maize (n = 23)	700	4370	2000	710	35.6
Cotton (n=36)	1750	6250	2580	780	30.0
Tomato (n=30)	6250	25000	13720	4340	31.6
Kharif rice (n=26)	3750	6750	5010	780	15.7
Carrot (n=20)	8750	20800	13790	3180	23.0
2007					
Maize (n = 26)	1130	3750	2400	780	32.6
Cotton (n=36)	1710	3000	2360	370	15.6
Tomato (n=20)	1250	18750	13000	4580	35.3
Kharif rice (n=32)	4000	9000	5190	1060	20.4
Carrot (n=25)	2000	18750	12620	3730	29.6
Beetroot (n=12)	5000	15000	11880	3520	29.6
2008					
Maize (n = 25)	250	6000	2120	1380	65.4
Cotton (n=39)	1000	3330	2580	2290	88.7
Tomato (n=28)	5000	25000	14710	5390	36.7
Kharif rice (n=16)	3500	7500	4940	1040	21.0
Carrot (n=25)	8750	27500	14980	4680	31.3

productivity of farmer is defined in terms of his output or yields of crops cultivated by him on his farm. Thus, the dependent variable was 'yield' of selected major crops cultivated by farmers in the study area. The average yield of crop obtained by farmer on his farm from one acre of land during the year of investigation was considered for the study. The data were collected from the respondents by using a structured interview schedule by personal interview method. For analysis of data, statistical tools viz., per cent, correlation, multiple linear regression analysis were applied to draw statistically valid inferences.

Results and discussion

Descriptive statistics of yield and socio-economic variables

Manchala

The descriptive statistics viz., range, mean, standard deviation and co-efficient of variation of 18 socio-economic variables considered in the study are given in tables 2(a) & 2(b). At Manchala, the farmers are more homogeneous with respect to their management orientation (planning, production and marketing) and risk orientation as indicated by the lower co-efficient of variation. However, they are found to be heterogeneous with respect to their educational status, farm power and livestock possession as indicated by high values of co-efficient of variation. The mean yields of crops obtained by farmers over years indicted that it was 4660 to 4820 kg/ha in kharif rice, 4480 to 4500 kg/ha in case of rabi rice, 600 to 670 kg/ha in castor, 620 to 690 kg/ha in sorghum and 90 to 230 kg/ha in case of pigeonpea. The co-efficient of variation of yield was found to be lowest in kharif rice (18.5%) followed by rabi rice (22.3%), castor (41.1%), sorghum (66.3%) and pigeonpea (106.1%).

Chevella

At Chevella, the farmers are more homogeneous with respect to orientation of management, marketing and risk as indicated by lower values of coefficient of variation. They were heterogeneous with respect to livestock possession, educational status and farm power. The mean yields of crops obtained by farmers over years indicated that it was 2000 to 2400 kg/ha in maize, 2360 to 2580 kg/ha in cotton, 13000 to 14710 kg/ha in tomato, 4940 to 5190 kg/ha in *kharif* rice, 12620 to 14980 kg/ha in carrot and 11880 kg/ha in beetroot. The variation in yield was lowest in *kharif* rice, followed by carrot, tomato, cotton and maize.

Classification of farmers based on socio-economic variables

Based on scores obtained for different independent variables, respondents were grouped into three categories *viz.,* low, medium and high taking mean and two standard deviations as a measure of check. The results are given in Table 3.

Low = Less than Mean - 2 SD
Medium = Between Mean - 2 SD to Mean + 2 SD
High = More than Mean + 2 SD

Manchala

As per the data analysed from Manchala, the findings indicated that majority (66.7%) of respondents were middle aged followed by 31.7% in old age category. Majority (65%) of respondents had low education status followed by 31.7% in medium category. The results found that majority (98.3%) had medium farming experience and medium land holding (96.7%). Findings indicated that majority (98.3%) of the farmers are in low farm power category status. Cent per cent of the farmers are in medium category of risk orientation and credit orientation. Majority (98.3%) of the respondents are in medium category of planning, production and marketing orientation. Majority (96.7%) of the respondents are in medium level of price situation and 98.3% of them are in medium level of input accessibility and market facility. Majority (95%) of them had medium level of labour availability while 76.7% of them are in medium category of having livestock possession. (Table 3)

The analysis of data from Chevella indicated that majority (50%) of respondents were young, followed by 31.7% in old age category. Majority (53.3%) of respondents had low education status, followed by 45% in medium category. All respondents had medium level of farm experience. Majority (61.7%) of respondents were in medium level of land holding category, followed by 30% in high category. Majority (91.7%) of respondents had a medium level of extension agency contact; while 96.7% had medium level of mass media exposure as well as low farm power category. Majority (98.3%) of respondents had medium risk orientation and 91.7% had medium level of credit orientation. Majority (96.7%) of respondents had medium level of planning and production orientation. Majority (98.3%) had medium level of marketing orientation, while 100% had medium level of management orientation. Majority (96.7%) had medium level of orientation towards price situation and market facility. All respondents were in medium category of orientation to input accessibility and labour availability. Majority (65%) had low livestock possession, while 35% had medium level of livestock possession (Table 4).

Levels of farm productivity of farmers

Classification of farmers based on farm productivity

Respondents were grouped into three categories based on farm productivity i.e mean yield (kg/ha) of crops during 2006 to 2008.

Manchala

The information collected from Manchala farmers indicated that around 96% farmers were in 'medium' level of farm productivity for different crops. However 73 and 25 percent of the farmers of pigeonpea were found to be in low category of farm productivity during 2007 & 2008 respectively indicating a wide yield variation in pigeonpea (Table 5).

Chevella

The findings farm the data analysed for Chevella indicated that majority of respondents were uniformly in 'medium'

Table 3 : Classification of farmers according to socioeconomic variables (Manchala)

Variables	Categories	Respondents	
		Frequency	%
Age (XI)	Young (< 30 years)	01	1.7
	Middle (31-55 years)	40	66.7
	Old (>55 years)	19	31.7
Education (X2)	Low (< 2.5 scores)	39	65
	Medium (2.5- 5.9 scores)	19	31.7
	High (> 5.9 scores)	02	3.3
Farming experience (X3)	Low (<1 scores)	-*	-
	Medium (1to 52.2 scores)	59	98.3
	High (> 52.2 scores)	01	1.7
Land holding (X4)	Low (<0.4 scores)	5	8.3
	Medium (0.4 to 5.2 scores)	58	96.7
	High (> 5.2 scores)	01	1.7
Extension agency contact (X5)	Low (<0.1 scores)	02	3.3
	Medium (0.1 to 3.7 scores)	57	95
	High (> 3.7 scores)	01	1.7
Mass media exposure (X6)	Low (< 1.3 scores)	12	20.0
	Medium (1.3 to 8 .7 scores)	46	76.7
	High (> 8.7 scores)	02	3.3
Farm power (X7)	Low (< 2 scores)	59	98.3
	Medium (2 to 2.8 scores)	-	-
	High (> 2.8 scores)	01	1.7
Risk orientation (X8)	Low (< 11.1 scores)	-	-
	Medium (11.1 to 16.3 scores)	60	100.0
	High (> 16.3 scores)	-	-
Credit orientation (X9)	Low (< 3.0 scores)	-	-
	Medium (3.0 to 8.2 scores)	60	100.0
	High (> 8.2 scores)	-	-
Planning orientation (X10A)	Low (< 10.4 scores)	0	-
	Medium (10.4 to 16 scores)	59	98.3
	High (> 16 scores)	01	1.7
Production orientation (X10B)	Low (<9.8 scores)	01	1.7
	Medium (9.8 to 15.4 scores)	59	98.3
	High (> 15.4 scores)	-	-
Marketing orientation (X10C)	Low (<10 scores)	01	1.7
	Medium (10 to 16.8 scores)	59	98.3
	High (> 16.8 scores)	-	-
Management orientation (X10)	Low (<34.1 scores)	01	1.7
	Medium (34.1 to 44.5 scores)	58	96.7
	High (> 44.5 scores)	01	1.7
Price situation (X11)	Low (<1.2 scores)	0	-
	Medium (1.2 to 4.8 scores)	58	96.7
	High (> 4.8 scores)	02	3.3
Input accessibility (X12)	Low (<1 score)	-	-
	Medium (1 to 4.6 scores)	59	98.3
	High (> 4.6 scores)	01	1.7
Market facility (X13)	Low (<0.9 scores)	-	-
	Medium (0.9 to 4.5 scores)	59	98.3
	High (> 4.5 scores)	01	1.7
Labour availability (X14)	Low (<4.3 scores)	-	-
	Medium (4.3 to 8.7 scores)	57	95.0
	High (> 8.7 scores)	03	5.0
Livestock possession (X15)	Low (<1.1 scores)	09	15.0
	Medium (31 to 3.7 scores)	46	76.7
	High (> 3.7 scores)	05	8.3

*Indicates that under a given category either medium r high, there are no respondents falling in it

Chevella

Table 4 : Classification of farmers according to socio-economic variables (Chevella)

Variables	Categories	Respondents	
		Frequency	%
Age (XI)	Young (<30 years)	30	50
	Middle (31-55 years)	11	18.3
	Old (>55 years)	19	31.7
Education (X2)	Low (<2.2 score)	32	53.3
	Medium (2.2-6.6 score)	27	45
	High (>6.6 score)	1	1.67
Farm experience (X3)	Low (<2 score)	-	-
	Medium (2-53 score)	60	100
	High (>53 score)	-	-
Land holding (X4)	Low (<2.6 score)	5	8.3
	Medium (2.6-3.4 score)	37	61.7
	High (>3.4 score)	18	30.0
Extension agency contact (X5)	Low (<0.6 score)	-	-
	Medium (0.6-6.6 score)	55	91.7
	High (>6.6 score)	05	8.3
Mass media exposure (X6)	Low (<0.3 scores)	02	3.3
	Medium (0.3-10.1 score)	58	96.7
	High (>10.1 score)	-	-
Farm power (X7)	Low (<1.5 score)	58	96.7
	Medium (1.5-2.9 score)	-	-
	High (>2.9 score)	02	3.3
Risk orientation (X8)	Low (<10.3 score)	01	1.7
	Medium (10.3-16.3 score)	59	98.3
	High (>16.3 score)	-	-
Credit orientation (X9)	Low (<4.4 score)	03	5.0
	Medium (4.4-9.6 score)	55	91.7
	High (>9.6 score)	02	3.3
Planning orientation (X10A)	Low (<8 score)	01	1.67
	Medium (8-16.8 score)	58	96.66
	High (>16.8 score)	01	1.67
Production orientation (X10B)	Low (<8.9 score)	01	1.67
	Medium (8.9-15.7 score)	58	96.66
	High (>15.7 score)	01	1.67
Marketing orientation (X10C)	Low (<10.8 score)	-	-
	Medium (10.8-15.6 score)	59	98.33
	High (>15.6 score)	01	1.67
Management orientation (X10)	Low (<32.7 score)	-	-
	Medium (32.7-43.5 score)	60	100
	High (>43.5 score)	-	-
Price situation (X11)	Low (<1.7 score)	-	-
	Medium (1.7-5.3 score)	58	96.66
	High (>5.3 score)	02	3.34
Input accessibility (X12)	Low (<1.3 score)	-	-
	Medium (1.3-5.7 score)	60	100
	High (>5.7 score)	-	-
Market facility (X13)	Low (<1.4 score)	-	-
	Medium (1.4-3.8 score)	58	96.66
	High (>3.8 score)	02	3.34
Labour availability (X14)	Low (<4 score)	-	-
	Medium (4-10 score)	60	100
	High (>10 score)	-	-
Livestock possession (X15)	Low (<0.6 score)	39	65.0
	Medium (0.6-1.4 score)	21	35.0
	High (>1.4 score)	-	-

level of farm productivity for tomato, *kharif* rice, maize, cotton, carrot and beetroot. The data indicated that during 2008, 12% of respondents were in high category in maize and 17.9% of them were in low category in cotton. However, majority of farmers in medium level category attained 'moderate' level of yield of different crops during 2006 to 2008 (Table 6).

Contribution of socio-economic variables to crop productivity

In order to determine the influence of socio-economic variables for explaining the variation in yield and identifying the variables which contributed significantly towards the variation in yield, multiple regression model for each crop was developed for Manchala and Chevella. Based on the correlation values measured between variables, a multivariate regression model of yield through significant socio-economic variables could be developed for each crop (Maruthi Sankar, 1986). This model could be used to assess the coefficient of determination (R^2) and error in prediction for each crop and identify significant variables for yield prediction in each year and also pooled over years (Draper and Smith, 1998).The pooled regression model of yield through socio-economic variables over years were also calibrated which could be used for yield prediction over years.

Table 5 : Classification of farmers based on yield attained in Manchala

Year	Crop	Low	Medium	High
Farm productivity (Frequency)				
2006	Rice (Kharif) (N=46)	1(2.2)	45(97.8)	-
	Rice(Rabi) (N=43)	-	42(97.7)	1(2.3)
	Sorghum (N=12)	-	11(91.7)	1(8.3)
	Castor (N=25)	1(4.0)	24(96.0)	-
	pigeonpea (N=9)	-	9(100.0)	-
2007	Rice (Kharif) (N=45)	2(4.4)	43(95.5)	-
	Rice (Rabi) (N=30)	-	28(93.3)	2(6.7)
	Sorghum (N=14)	1(7.1)	13(92.9)	-
	Castor (N=27)	-	26(96.3)	1(3.7)
	Pigeon pea (N=11)	8(72.73)	2(18.2)	1(9.1)
2008	Rice (Kharif) (N=46)	2(4.3)	44(95.6)	-
	Rice (Rabi) (N=1)	-	1(100.0)	-
	Sorghum (N=6)	-	6(100.0)	-
	Castor (N=41)	1(2.4)	39(95.2)	1(2.4)
	Pigeon pea (N=12)	3(25.0)	9(75.0)	-
Yield range(kg/ha)				
2006	Rice (Kharif)	<3200	3200-6120	>6126
	Rice (Rabi)	<2200	2290-7130	>7130
	Sorghum	<120	120-1360	>1360
	Castor	<180	180-1020	>1020
	Pigeon pea	<30	30-210	>210
2007	Rice (Kharif)	<2840	2840-6680	6680
	Rice (Rabi)	<3040	3040-5920	5920
	Sorghum	<10	10-650	650
	Castor	<70	70-1270	1270
	Pigeon pea	<240	240-600	600
2008	Rice (Kharif)	<2960	2960-6680	>6680
	Rice (Rabi)	-	-	-
	Sorghum	<170	170-1550	>1550
	Castor	<100	100-1100	>1100
	Pigeonpea	< 170	170-630	>630

Table 6 : Classification of farmers based on yield attained in Chevella

Year	Crop	Low	Medium	High
Farm productivity (Frequency)				
2006	Tomato (n=30)	--	29 (96.7)	1 (3.3)
	Rice (Kharif) (n=26)	--	26 (100.0)	--
	Maize (n=23)	--	22 (95.6)	1 (4.4)
	Cotton (n=36)	--	35 (97.2)	1 (2.8)
	Carrot (n=20)	--	19 (95.0)	1 (5.0)
2007	Maize (n=26)	--	26 (100.0)	--
	Cotton (n=36)	1 (2.8)	35 (97.2)	--
	Tomato (n=20)	1 (5.0)	19 (95.0)	--
	Rice (Kharif) (n=32)	--	30 (93.8)	2 (6.2)
	Carrot (n=25)	2 (8.0))	23 (92.0)	--
	Beetroot (n=12)	--	12 (100.0)	--
2008	Maize (n=25)	2 (8.0)	20 (80.0)	3 (12.0)
	Rice (Kharif) (n=16)	--	15 (93.8)	1 (6.2)
	Cotton (n=39)	7 (17.9)	32 (82.1)	--
	Tomato (n=28)	--	28 (100.0)	--
	Carrot (n=26)	--	24 (92.3)	2 (7.7)
Yield range (kg/ha)				
2006	Tomato	< 5040	5040 to 22400	>22400
	Rice (Kharif)	<3450	3450 to 6570	> 6570
	Maize	<580	580 to 3420	>3420
	Cotton	<1020	1020 to 4140	>4140
	Carrot	<7430	7430 to 20150	>20150
2007	Tomato	< 3840	3840 to 22160	>22160
	Rice(Kharif)	<3070	3070 to 7310	>7310
	Maize	<840	840 to 3960	>3960
	Cotton	<1620	1620 to 3100	>3100
	Carrot	<5160	5160 to 20080	>3100
2008	Tomato	< 3920	3920 to 25490	>25490
	Rice (Kharif)	<2860	2860 to 7020	>7020
	Maize	<640	640 to 4880	>4880
	Cotton	<2000	2000 to 7160	>7160
	Carrot	<5620	5620 to 24340	>24340

n = Number of respondents Figures in parentheses indicate percentage

Table 7 : Regression models of yield of crops through socio-economic variables in Manchala

Crop	Year	N	Regression model	R^2	Error (kg/ha)
Sorghum	2006	11	Y = 8.18 + 0.619 * (X2) + 1.360 (X5) + 0.094 (X6) - 0.550 (X10C	0.64	1.43
	2007	14	Y = -4.09 * + 0.427 * (X2) + 0.026 (X3) + 0.533 * (X4) + 0.407 * (X10B)	0.84**	0.75
	2008	6	Y = 55.22 - 3.478 (X108) - 0.349 (X15)	0.86*	2.11
	Pooled	31	Y = 0.65 + 0.551 * (X4) + 0.583 * (X11) + 0.859 ** (X15)	0.50**	1.99
Pigeonpea	2006	9	Y = -3.26 + 0.104 (X2) + 0.069 (X10B) + 0.199 (X12) + 0.384 (X14)	0.74	0.46
	2007	11	Y = -20.85 " + 0.264 (X4) + 1.278 * (X10B) - 0.239 (X11) + 2.065 • (X12) + 0.069 (X13)	0.83*	1.24
	2008	11	Y = 10.53 ** - 0.174 (X2) - 0.791 ** (X5) - 0.326 (X9) - 1.574 ** (X12) + 0.094 (X15)	0.95**	0.65
	Pooled	31	Y = 1.30 + 0.009 (X3) + 0.020 (X4) - 0.866 * (X5) + 0.439 (X11) + 0.366 (X15)	0.35*	1.63
Castor	2006	24	Y = -15.69 * + 0.665 * (X8) + 0.264 (X10) + 0.243 (X10A)	0.50**	1.37
	2007	26	Y = 2.96 - 0.040 (X1) - 0.161 (X10B) + 1.089 * (X11) + 0.612 (X14)	0.32*	2.27
	2008	39	Y = 12.37 ** - 0.565 * (X4) + 0.305 (X11) - 0.865 * (X14)	0.26*	2.18
	Pooled	89	Y = 6.41 ** - 0.010 (X1) - 0.014 (X3) - 0.316 * (X4) + 0.498 * (X11)	0.10*	2.21
Rice (*Kharif*)	2006	42	Y = 11.19 + 0.543 ** (X1) - 0.399 * (X3) + 1.121 * (X10) + 0.749 (X11) + 0.677 (X15)	0.25*	5.69
	2007	40	Y = 46.10* + 1.872 (X5) - 0.877 (X8) + 2.335 * (X9) + 0.246 (X10B) - 2.432 (X12) + 0.158 (X13)	0.40**	6.43
	2008	42	Y = 54.61 ** +0.901 (X5)-0.808(X8) + 2.334 ** (X15)	0.24*	6.56
	Pooled	124	Y = 57.54 - 0.254 (X2) + 0.803 (X5) - 0.602 (X8) - 1.358 (X12) - 0.318 (X13) + 1.425 ** (X15)	0.19**	6.53
Rice (*Rabi*)	2006	41	Y = 135.06 ** - 0.280 ** (X3) + 10.386 ** (X7) - 1.591 * (X8) - 1.174 (X10B) - 2.661 * (X10C) - 1.219 * (X10) - 4.703 II (X12) + 4.831 * (X13)	0.69**	7.55
	2007	28	Y = 43.16 ** + 2.513 * (X5) - 0.194 (X8) + 2.398 ** (X11) - 3.117 * (X13)	0.47**	4.96
	2008	1	NIL		
	Pooled	70	Y = 61.07 ** - 0.087 (X3) + 5.285 ** (X7) - 0.837 (X8) - 0.377 (X10A)	0.23**	9.14

* and ** indicate significance at $p < 0.05$ and $p < 0.01$ levels, respectively

Table 8 : Regression models yield of crops through socio-economic variables in Chevella

Crop	Year	N	Regression	R^2	Error (kg/ha)
Maize	2006	16	Y = 18.209** + 0.838 (X4) + 0.762 (X6) + 2.306 (X11) -1.657* (X14) + 0.541 (X15)	0.57*	3.54
	2007	20	Y = 33.630** + 0.759** (X1) - 0.623* (X3) - 1.405* (X8) - 2.242** (X9) + 1.383 (X12)	0.73**	4.23
	2008	20	Y = 51.791** + 1.217 (X2) + 1.238 (X5) + 0.490 (X6) - 3.144** (X8)	0.46*	7.69
	Pooled	56	Y = -5204-0.246(X8)+1.588"(X10) + 0.45(X6) 0.17 6.71 -4.367' (X15)+0.351(X2)-1.833(X108)-0.969(X10A)	0.17	6.71
Cotton	2006	32	Y = 33.082** + 0.179 (X1) +0.020 (X3) – 0.008 (X4) - 0.775 (X5) + 0.369 (X6) - 1.539 (X9) – 1.276 (X11)	0.52**	3.56
	2007	23	Y = 6.663 + 0. 604** (X2) +1.067** (X4) + 0.978* (X10C)	0.67**	1.86
	2008	31	Y = 22.287** - 0.080 (X2) - 0.044 (X4) - 0.867* (X5) + 0.154 (X7) - 0.331 (X14)	0.22	2.79
	Pooled	76	Y=33.07**0.117**(X1)+0.117**(X3)+0.066(X6) 0.60" 1.34 -1.312**(X9) +0.56**(X5)+1.263**(X15)	0.60**	1.34
Kharif Rice	2006	15	Y = 5.782 + 0.911 (X7) +0.548 (X10A) +1.471 (X10C)+0.729 (X10)	0.53**	4.94
	2007	26	Y = 44.757** - 2.510** (X4) + 2.579** (X7) + 0.855 (X10A)	0.46**	5.33
	2008	12	Y = 53.315** + 0.654(X2)+0.053 (X4) + 3.065* (X7)+0.752(X10A)-6.11(X13)	0.87**	4.78
	Pooled	74	Y = 4.57**+3.049**(x7)+0.747**(X10A)+0.122(X10) +0.286(X2)+0.078(X5)-0.537(X6)	0.60*	4.66
Tomato	2006	21	Y = 167.782** + 1.174** (X1) - 14.922** (X11) - 10.694 (X13)	0.67**	18.76
	2007	15	Y = 151.390** + 1.126* (X3) + 8.354* (X4) – 1.145 (X9) – 19.333** (X11)	0.76**	19.79
	2008	19	Y = 87.452* + 1.497** (X3) -3.278 (X9) – 0.883 (X11)	0.46*	24.65
	Pooled	78	Y = 187.16**-0.552(X1)+1.305(X3)-20.102** (X11) 0.64"**22.92 -23.122**(X13)+5.629**(X4)+8.879**(X9)-1.402(X12)	0.64**	22.92
Carrot	2006	15	Y = 168.991 + 5.554 (X14)+4.120(X10c) - 0.622 (X5) + 6.883 (X7) - 10.366* (X9*) – 0.257 (X10)	0.88**	14.95
	2007	18	Y = 221.531** - 2.790 (X9) -12.536** (X11) – 3.079 (X14) - 15.242* (X15)	0.66**	13.61
	2008	18	Y = 233.691** + 7.920** (X2) + 10.443* (X4) – 2.609 (X5) + 2.572 (X7) - 17.932** (X14)	0.82**	24.41
	Pooled	70	Y = 148.98*•+3.650+(X5)+5.603**(X7) - 7.134**(X9) 0.80** 19.08 +8.846**(X10c)-8.085**(X14)+0.169(X6)-0.0652(X10) -5.248**(X4)	0.80**	19.08
Beetroot	2006	--	--	--	--
	2007	11	Y = 270.995** + 12.791** (X2) + 1.370** (X3) – 0.285 (X4) – 14.904** (X8) – 4.266*(X11)	0.99**	4.60
	2008	--	--	--	--
	Pooled	12	--	--	--

*and ** indicate significance at $P < 0.05$ and $P < 0.01$ levels, respectively

Prediction of yield through socio-economic variables

Manchala

Based on pooled regression model, land holding, price situation and livestock possession contributed significantly and explained variation in sorghum yield to an extent of 50% (Table 7). Hence, these variables with their significant contribution could be termed as good predictors of sorghum yield. In pigeon pea, only extension agency contact significantly contributed and explained 35% of variation in yield. In castor, land holding and price situation explained 10% variability in yield. However, only 'price situation' was significant and could be termed as good predictor of yield. In *kharif* rice, only livestock possession was significant and explained 19% variability in yield. In *rabi* rice, only farm power, was significant and explained 23% variability in yield.

Chevella

Based on pooled regression model in Maize, risk orientation, management orientation, mass media exposure, livestock possession, education, production orientation and planning orientation were found to be significant variables, out of which management orientation and livestock possession could be termed as good predictors of yield (Table 8). In cotton, age, farming experience, credit orientation, extension agency contact and livestock possession explained yield variation significantly. In K*harif* rice, farm power, planning orientation, management orientation, education, extension agency contact and mass media exposure were emerged as significant factors. However, farm power and planning orientation were found to be good predictors of yield. In Tomato, age, farming experience, price situation, market facility, land holding, credit orientation and input accessibility were significant. However, price situation, market facility, land holding and credit orientation were emerged as good predictors of yield. In Carrot, farm power, credit orientation, marketing orientation, labour availability and land holding were emerged as good predictors of yield. In Beet root, education, farming, experience, risk orientation and price situation were found to be good predictors of yield.

Extension strategies

As the results indicated that majority of farmers had low education status, use of extension teaching methods like result demonstrations and more frequent use of TV, Radio are more appropriate. In order to uplift the knowledge levels of farmers, frequent exposure to extension training and demonstration will be more useful. Since majority of cultivators had low levels of risk orientation, more exposure to improved methods of farming is beneficial to increase their adoption levels. Farmers had medium level of perception towards commodity prices, input and labour accessibility / and market facilities, they should be encouraged to organize themselves into commodity/self-help groups and trained in group dynamics so as to take active part in market committees for getting increased facilities. Farmers should be encouraged to opt for Custom Hiring Centres for improved farm machinery. Use of dual purpose sorghum cultivars (for grain and fodder), more emphasis on cultivation of pulses like pigeonpea, castor seed production by young farmers should be given prominence in extension planning. Rice cultivars should be trained in optimum utilization resources like irrigation water and farm power, since these factors are playing vital role in increasing output. Increasing cold storage facilities and information of daily market prices is for tomato cultivators. Training and demonstration in weed control and crop planning should be more beneficial to farmers cultivating vegetables like carrot, beetroot, etc.

Conclusions

The study was conducted in two mandals (blocks) of Ranga Reddy district of Telangana State. Data were collected from 120 respondents of 10 villages using pre-tested interview schedule. Data were analyzed by using statistical methods viz., correlation and regression. Findings revealed that majority of the farmers are in medium level of farm productivity for different crops viz., Sorghum, castor, pigeon pea, rice, maize, cotton etc. cultivated by them. Results pertaining to Manchala mandal (Regression models) indicated that variables viz., land holding and livestock possession (Sorghum), farm power (Rice) were found to be significantly contributing to yield prediction. Results of pooled analysis of data (Regression models) from Chevella indicated that variables viz., management orientation and livestock possession(Maize), age, farming experience, credit orientation and livestock possession (cotton), farm power and planning orienatation in case of Rice, price situation, market facility, land holding and credit orientation in case of Tomato while farm power, credit and market orientation and labour availability in case of carrot were found to be significantly contributing to yield prediction. The findings revealed that the extent of contribution of correlated variables varied from 60 percent in Cotton and rice, 64 percent in Tomato and 80 percent in Carrot. It can also be concluded from the study that more number of socio-economic factors are significantly contributing to crop yields in Chevella which is endowed with better basic resources like more quantum of rainfall, quality soils etc, compared to Manchala thereby influencing the productivity levels of rainfed farmers.

Based on the findings of the study, appropriate extension strategies are suggested. Exposure of farmer to intensive extension training and demonstration in improved crop production technologies is needed. This will improve their risk taking capacity, scientific management of crop cultivation and results in higher farm productivity. Farmers are required to be organized into strong commodity groups to get remunerative prices for their produce and improved facilities in the existing market yards. Likewise, they should be motivated to adopt improved implements and machinery to solve problem of shortage of labour. Strong extension support is needed in guiding farmers in optimum utilization of farm resources (NRM) by improving their knowledge and skills in planning, production and marketing of their produce.

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