

Factors Associated with Sorghum Cultivation under Rice Fallows

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ABSTRACT

*In rice-fallows of coastal Andhra Pradesh, sorghum (*Sorghum bicolor* L. Moench) cultivation is gaining popularity among farmers due to its high average productivity of the Guntur district of Andhra Pradesh (5.7 t/ha) in the country. It urged to study influence of various factors like socio-personal, agro-economical, assets possessions and family background on sorghum productivity and profitability in rice-fallows. Results showed that agro-economical variables such as, land holding, area under sorghum crop, fertilizers cost, total cost of inputs, labour cost, cost of irrigations and pesticides used and grain yield had significant correlation with profits obtained from the sorghum cultivation. Sorghum was a new crop to the farmers as most of them (54%) had up to five years experience in the sorghum cultivation. It is also found that the resourceful farmers who utilized maximum inputs were able to obtain high returns from the sorghum cultivation. It needs attention of the research and developmental agencies to educate and involve such farmers as a key agent to identify and standardize location-specific production technologies and especially for its effective dissemination to maximize profit margin of the farmers in rice-fallows.*

Keywords: Farmers' socio-personal profile; Agro-economical factors; Sorghum in rice-fallows;

Sorghum is the fourth most important cereal consumed in India, cultivated during both rainy (*kharif*) and post-rainy (*rabi*) seasons. Of late, the area under sorghum in India has declined drastically from 18.6 m ha in 1970 to 7.93 m ha in 2007-08. The total production also declined from 9.72 m t to 7.78 m t. and the national productivity (962 kg/ha) is quite low. However, the productivity of sorghum in Guntur district of Andhra Pradesh is very high (5.7 t/ha) in the country and the crop is exclusively cultivated in rice-fallows under zero-tillage conditions (Mishra *et. al.*, 2011). After the harvest of rainy (*kharif*) transplanted rice, sorghum is sown in the last week of December under zero-tillage condition to utilize the residual soil moisture. Sowing is done manually in rows (40x20cm) at 4-6 cm depth by making a hole with wooden stick. The crop is normally harvested at physiological maturity (110 days after sowing). Since, the crop is commercially grown, resource availability, possession of agricultural assets and ecological conditions are the major concerns for obtaining maximum sorghum yield. Socio-economic and agro-ecological factors are of paramount importance

as it regulates the decision making to cultivate new crop and adoption of innovative ideas. It was assumed that use of high inputs and irrigation were the main factors for the high productivity of sorghum. Practically, the sorghum growers in this area are inclined towards obtaining maximum monetary benefits from grain yields than other benefits. Their action to select the crop and its management is dependent on many factors like social, economical, physical, situational, cultural and markets. Therefore, the present investigation was undertaken to (i) study the socio-personal and agro-economical characteristics of the farmers and (ii) to study the relationship of certain independent variables related to socio-personal and agro-economical characteristics of the farmers with profitability of sorghum cultivation.

METHODOLOGY

The present study was conducted in seven villages namely, Athota, Kamathavaripalam, Dhanthuluru, Siripuram and Kunchavaram (Block-Kollipara), and Nandivelugu, and Ananthavaram (Block-Tenali) in Guntur district of Andhra Pradesh. The location was purposefully selected as the productivity of sorghum in

the district was the highest (5.7 t/ha) in the country. Total sample of 100 innovative and pro-active farmers was selected randomly from seven villages with different categories of the farmers for this study. Interview schedule was developed for data collection and pre-tested with sample of 10 farmers. The data pertaining to the crop season 2008 were collected on different factors related with the sorghum cultivation with the help of the semi-structured interview schedule by conducting personal interviews, group discussions and field and empirical observations. The data were analyzed by using descriptive statistics, frequencies, percentage and SPSS statistical tool.

RESULTS AND DISCUSSION

Socio- personal traits of the sorghum growers in rice-fallows: Socio-personal traits of the farmers were studied and results are presented hereunder with appropriate classifications (Table 1).

Age: Age was counted in view to the study effective involvement of an individual in sorghum cultivation. Most of the farmers (61%), who were engaged in sorghum cultivation, were of middle age group (30-50 years). However, very few farmers (7%) were of young age group (below 30 years). It implies that young generation doesn't have interest in sorghum cultivation and in agriculture. This finding was supported by *Ananthan and Jhamtani (2002)*, who reported that younger generation weaning itself away from the travails of agriculture.

Occupation: Only 19 per cent farmers had farming business as the primary occupation. Whereas, majority of the sorghum growers (81 %) were engaged in other businesses like service and dairy along with farming for their livelihood. It indicated that only farming could not satisfy the needs of the famers and therefore, needs subsidiary occupation.

Education: Education refers to formal schooling of individual farmers from school upto university degrees. It was found that most of the sorghum farmers (60 %) were illiterate who had no formal education. A few of them were educated up to middle school (14 %), higher secondary (12 %) and graduate (10 %) level. It showed that involvement of educated people was less in farming business. Thus, there is a need of attention of the policy

maker to organize more training and awareness campaign at grass-root levels to educate the farmers about improved agriculture.

Land holding: Majority of the farmers (58 %) had small land holdings up to 2 ha while, 30 per cent farmers had medium land holding between 2 and 4 ha. Only 12 farmers had above 4 ha. Being rich soil type and irrigation facilities, small land holdings had weightage in socio-economic status of the farmers in this area. It indicated that there is need of to formulate small farmers oriented sorghum development strategy.

Annual income: Annual income refers to total income of the farmer from all the sources, which was found to be low. A few of the farmers (17%) had annual income above Rs.40,000/- per annum while 41 per cent were in the range of range of Rs.20,001 - Rs.40,000/-. Over all, annual income of the farmers in rice-fallows is found to be higher than those of dry land areas where sorghum is grown in larger scale.

Family size: Majority of the famers (68 %) had 3 to 4 members in their family. However, a few of them (8 %) had more than 4 members. It showed that the family size of these farmers is small.

Working members: Only 2 per cent farmers were having more than 4 members while most of the farmers (58 %) had only 2 working members in their family, who were of 18 years. It implied that they had less family laboures to work in the field. It has an impact on labour scarcity and high wages for agricultural work.

Experience in sorghum cultivation: Most of the farmers (54%) were having experience in sorghum cultivation up to 5 years, while only 31 per cent farmers had more than 5 years experience in sorghum cultivation in rice-fallows. It implies that sorghum cultivation in rice-fallows was started recently unlike other major crops such as, paddy and maize. Thus, there is urgent need to educate and train the farmers about new production technologies of sorghum and appropriate use of inputs.

Information sources: The farmers' contacts were exclusively found personal-localite in nature for using information on sorghum cultivation. All the respondents used local agro-centres and village farmers as information sources. There was not much variation in use of their communication sources. It may be due to fact that sorghum is a new crop in that area. It is inferred

Table 1 Socio- personal traits of the sorghum growers in rice-fallows

Variable	Classification	Frequency (%)
Age	Young (below 30 years)	07
	Middle (30-50 years)	61
	Old (above 50 years)	32
	Mean	46
	Standard deviation (SD)	11.17
Occupation	Farming only	19
	Service + farming + other business	81
	Mean	1.8
	SD	0.40
Education	No formal education	60
	Primary education (up to 4th standard)	04
	Middle school (up to 7th standard)	14
	Higher secondary (up to 12th standard)	12
	Graduate and above	10
	Mean	3.7
	SD	5.25
Land holding	Below 2 ha	58
	Between 2 and 4 ha	30
	Above 4 ha	12
	Mean	6.60
	SD	5.34
Annual income	Below Rs. 20,000/-	42
	Rs.20,001 to Rs.40,000/-	41
	Above Rs.40,000/-	17
	Mean	33240
	SD	24235
Family size	Up to 2 members	24
	3 to 4 members	68
	More than 4 members	08
	Mean	3.3
	SD	0.94
Working members	Up to 2 members	58
	3 to 4 members	40
	More than 4 members	02
	Mean	2.6
Experience in sorghum cultivation	Up to 2 years	15
	3-5 years	54
	More than 5 years	31
	Mean	4.3
	SD	1.65

that farmers preferred eminent local sources of information and use them more frequently. Similar finding was reported by Ghosh et. al., (2002).

Agro-economical factors related with sorghum cultivation: On perusal of Table 2, the following

Table 2 Agro-economical factors related with sorghum cultivation in rice-fallows

Variable	Classification	Frequency (%)
Crops per year	Rice-sorghum or no third crop sequence	48
	Rice-rice or maize sequence	52
	Mean	2.5
	SD	0.50
	Animals	No animal
Animals	Up to 2 animals	21
	3 to 4 animals	43
	More than 4 numbers	17
	Mean	3.0
Area under sorghum crop	SD	2.71
	Below 1.0 ha	39
	1 to 2 ha	44
	Above 2 ha	17
Cost of inputs	Mean	4.4
	SD	2.74
	Below Rs. 4,000/-	03
	Rs. 8000 to Rs.10,000/-	47
	Rs.10,001 to Rs.12,000/-	50
Grain yield	Mean	9809
	SD	1543
	4.8 to 5.5 t/ha	19
	5.6 to 6.2 t/ha	17
	6.3 to 7.0 t/ha	63
Gross returns	7.1 to 7.5 t/ha	01
	Mean	60
	SD	4.89
	Rs. 35,000/- to Rs.45,000/-	31
	Rs.45,001 to Rs.50,000/-	43
Gross returns	Rs.50,001 to Rs.60,000/-	26
	Mean	46009
	SD	4791

observations are recorded regarding influence of agro-economical factors on profitability of sorghum obtained by the farmers in rice-fallows.

Crops per year: It is found that 52 per cent farmers grown two crops. rice-rice sequence was mainly followed, where irrigation water was released from Kaveri river sufficiently. In case of limited water supply, rice-maize or sorghum or no second crop sequence was adopted by 48 per cent farmers. This situation made sorghum is more popular recently which requires limited irrigations (2 irrigations) in humid weather conditions of this coastal area.

Animals: Sixty per cent farmers had more than 3 dairy animals (buffalo and cow) whereas, only 19 per cent farmers of them had no animal. They didn't use sorghum stalk as fodder for their animals. It may be due to availability of sufficient green grasses and paddy straw, and also lack of awareness regarding high nutritive value of the sorghum fodder than paddy straw. There is need to make aware the farmers regarding high nutritive value of the sorghum fodder than paddy straw and its demands in dry land areas.

Area under sorghum crop: A few farmers (17%) cultivated sorghum crop on more than 2 ha area. However, 83 per cent farmers apportioned 1-2 ha area for sorghum crop. This allotment of lands out of their small holdings up to 2 ha indicates favorable attitude of the farmers towards cultivation of sorghum.

Inputs cost : The input cost of majority famers (97%) ranged between Rs. 8000 and Rs.12,000/- per ha on growing sorghum which is around 50 per cent higher than those in the traditional sorghum areas. It indicated that the farmers used high inputs for the sorghum cultivation unlike the other areas in the state due to their high profit orientations. Similar findings were also reported by *Chapke et. al., (2011)*, who stated that the inputs were used indiscriminately by the sorghum farmers in rice-fallows.

Grain yield : As mentioned earlier, the average grain yield of sorghum of Guntur district was 5.7 t/ha. It is interesting to note that majority of the famers (63%) produced sorghum grains in the range of 6.3-7.5 t/ha. It was 11-32 per cent higher than the average district productivity. High yielding hybrids along with high input use, and high fertility of soils, residual nutrients and moisture of previous paddy crop, and agro-climatic conditions of the region contributed to high average yield in this area. The farmers generally sell grains after harvest in the local market which, is directly related to the gross income obtained by them. The farmers could earn up to Rs. 60,000/- per ha as gross income which is substantially a higher returns from sorghum.

The fodder was mostly burnt in the fields or incorporated in the soil as the farmers were not aware about nutritional and market importance as mentioned earlier. Poor information sources and marketing exposure warrant the development agencies to be active

and stimulate the farmers to make viable use of the fodder. Similar finding was reported by *Ghosh et. al., (2002)*.

Correlates of gross returns from sorghum cultivation in rice-fallows: With assumption that gross returns obtained from the sorghum cultivation is influenced by various socio-personal traits of the respondents and agro-economical factors. The relationship of nineteen such variables with gross income was computed with the help of correlation coefficient.

Table 3. Correlations between socio-personal traits of the farmers, components of sorghum cultivation with respect to gross income obtained

Code	Variables	Coefficient of correlation (r)
X1	Age	-0.103
X2	Experience in sorghum cultivation	0.164
X3	Occupation	0.115
X4	Education	0.005
X5	Land holding	0.275**
X6	Annual income	0.050
X7	Animals	-0.007
X8	Family size	-0.092
X9	Working members	-0.043
X10	Crops per year	-0.004
X11	Area under sorghum crop	0.467**
X12	Seed cost	-0.030
X13	Fertilizers cost	0.664**
X14	Irrigation cost	0.210*
X15	Herbicide cost	0.062
X16	Pesticide cost	0.245*
X17	Cost of inputs	0.429**
X18	Labour cost	0.403**
X19	Grain yield	0.955**

*Significant at 5 per cent level,

**Significant at 1 per cent level

Results revealed (Table 3) that correlation between gross profits obtained and six dependant variables namely, land holding, area under sorghum crop, fertilizers cost, total cost of inputs, labour cost and grain yield were highly significant at 0.01 level of probability (P=0.01). Besides, agro-economical variables, only cost of irrigation and pesticides were found to be correlated significantly at 0.05 level of probability (P=0.05). However, the socio-personal traits of the farmers like age, experience in sorghum, occupation, education, annual income,

possession of animals, family size including working members and crop intensity were non-significant with gross returns.

It is inferred from the results that agro-economical variables played significant role in obtaining gross profits from sorghum cultivation. This strong association suggested that the farmers who had sizable land holdings and utilized maximum inputs irrespective of their annual income and education levels were able to obtain maximum returns from the sorghum cultivation. This might be the probable reason for this positive relationship. Similar findings was also reported *Subashini et. al., (2002)*. It needs attention of the crop scientists to identify and standardize production technologies for maximizing returns from the sorghum cultivation. The promising technologies need to be transferred at large scale by involving such farmers, who possess the above characteristics.

CONCLUSION

Results revealed that agro-economical variables

viz., land holding, area under sorghum crop, cost of fertilizers, cost of inputs, labour cost, cost of irrigations and pesticides and grain yield had positive and significant role in obtaining profits from sorghum cultivation in rice-fallows, whereas the socio-personal traits of the farmers were found to have no relationship. It is also revealed that the farmers who were spending 50 per cent higher than the traditional sorghum farmers towards inputs were getting higher grain yield up to 32 per cent than the average district productivity. It is implied that the farmers were highly profit oriented who utilized maximum inputs were able to obtain high returns from the sorghum cultivation. Keeping these characteristics of the farmers in view, they should be educated and involved to identify and standardize location-specific production technologies on their fields and its use for maximizing profit margin from the sorghum cultivation. These farmers would be able to educate and transfer the suitable identified technologies more effectively among the other sorghum growers at large scale.

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