

Quarter 4 Output indicator (OVI Report 3)

FARMERS PERCEPTIONS AND PERFORMANCE OF IMPROVED SORGHUM CULTIVARS IN PROJECT VILLAGES: *Kharif 2003*.

INTRODUCTION

India is the second largest producer of sorghum in the world, after USA, with around 11 million ha under its cultivation. Sorghum is grown in rainy season (June-October) and in post-rainy season (September – January). The rainy season crop accounts for 37% of the total crop area and contributes 65% of the total production. The demand for rainy season sorghum grain for food use has declined over the years primarily due to increased production of rice and wheat and public policies that make rice and wheat available at subsidized price to the poor and low-income consumers. Thus, farmers are unable to sell surplus sorghum grain at remunerative prices. Further the deterioration in the apparent and actual grain quality of rainy season sorghum due to grain molds leads to large fluctuations in price ranging from 1500 to 5000t⁻¹ compared to Rs. 6500 to 12000 t⁻¹ for post-rainy season sorghum grain.

Small-holder farmers with less than one-hectare land in the semi-arid regions grow sorghum, under subsistence farming. Sorghum production underpins their livelihood strategy to meet the twin objectives of food for humans and feed for livestock. However, after meeting their household demands, these farmers are unable to dispose off the marketable surplus due to lack of marketing networks to take advantage of the potential demand for sorghum in non-food uses. Rainy season sorghum is being used in poultry feed as a potential alternative to maize, whose production is not able to meet the present growing demand. In this context, enhancing the use of rainy-season sorghum in poultry feed rations and creation of sustainable marketing linkages between sorghum growers and poultry industry through innovative institutional systems assumes importance for ensuring sustainable supply to industry and assured incomes to poor sorghum growing farmers.

Traditionally, subsistence farmers grow local sorghum varieties that are low yielding. Under the DFID (CPHP – R8267) Project “ Exploring Marketing Opportunities through a Research, Industry and Users Coalition: Sorghum Poultry Feed”, high yielding improved sorghum cultivar seeds were distributed to farmers in selected villages. This report briefly highlights the findings from baseline surveys carried out in project villages on sorghum production, utilization and marketing. Cost of production of improved sorghum cultivars is then compared with the baseline data. Farmers’ perceptions on the performance of improved cultivars compared to local varieties are reported in subsequent sections.

SAMPLE DESIGN AND METHOD OF SURVEY

Selection of Study Area

The Mahaboobnagar and Ranga Reddy districts of Andhra Pradesh, India, where rainy sorghum cultivation is predominant were selected for project implementation at field level. After a thorough study of district profiles, four *mandals* (two from each district) were selected based on area under *kharif (rainy season)* sorghum cultivation. Based on the response from the farmers to participate in project activities, accessibility and nearness of village to regulated market yards, and existence of farmers’ clubs/associations, four villages (one from each mandal) were selected for the study.

District	Mandal	Village
Mahaboobnagar	Jadcherla	Gangapur
	Balanagar	Udityal
Ranga Reddy	Chevella	Kandwada
	Shabad	Manmarry

Sample Farmers

Eighty-three *kharif* sorghum growers from the four villages were selected randomly based on probability proportional to sorghum growing area, with the help of Federation of Farmers Associations (FFA), Andhra Pradesh, --one of the coalition partners in the project. Almost all the selected farmers are growing traditional local (yellow) sorghum varieties.

Seed Distribution

Four improved high yielding sorghum cultivars namely CSH 16, CSV 15, PSV 16 and S 35, suitable for the agro-climatic area and known to be less susceptible to grain mold attack were selected and seed supplied to the sample farmers for *kharif* 2003 sowings. The seed was treated with Endosufan dust and packed in cloth bags @ 3.5 Kg per bag, which is sufficient for sowing one acre (0.4 ha) as sole crop.

Leaflet

An information leaflet/ brochure printed in local language was supplied along with the seed bag to enable the farmers to follow the recommended package of practices.

Baseline Survey

Baseline survey of the selected respondents was conducted through structured schedules by direct interview method. The primary data on cropping patterns, product utilization, cost of cultivation of sorghum and its competing crops, livestock and fodder particulars, market surplus, asset structure, family economic profile, consumption pattern etc., were collected and analyzed for *Kharif* 2002 season. Farmers' ranking of preferred characteristics in a new improved sorghum cultivar, reasons for growing local varieties and factors responsible for decrease in sorghum consumption overtime were also assessed.

Post harvest Survey

In Oct/ Nov 2003, after harvest of the crop, surveys were conducted to know the sample farmers' perceptions regarding the performance of improved sorghum cultivars supplied under the project. Specifically, farmers were interviewed on production related problems, farmers preference to grow improved sorghum cultivars in *kharif* 2004, and costs and returns profile of improved as well as local sorghum varieties cultivated during *kharif* 2003. Farmers' perceptions on collective marketing of sorghum grain through farmers clubs, compared to the traditional marketing channels were ascertained.

SECTION I: Highlights from BASELINE SURVEY (*Kharif* 2002) in project villages.

Cropping Pattern

The cropping pattern during *kharif* 2002 of the selected farmers is presented in Table 1.1 (Mahabubnagar district) and Table 1.2 (Ranga Reddy district). Area allocated towards castor (84 acres) was highest followed by sorghum + pigeon pea (49 acres) and cotton (35 acres) in Mahabubnagar district. On an average, 1.44 acres out of total cultivable land (7.04 acres) was allocated by each farmer for sorghum indicating the sample farmers' need for the crop to meet the food and fodder requirements of the household. Almost similar trend of cropping pattern was noticed in Ranga Reddy district also, except that more area was allocated towards maize followed by sorghum. But still on an average 1.17 acres out of total land area (5.57 acres) was allocated to sorghum in Ranga Reddy district. The grain as well as fodder yields of sorghum in both the districts were low because sorghum is grown in poor marginal soils and low-yielding local varieties dominate. Improved varieties were cultivated in all the crops except sorghum.

Table 1.1 Cropping Pattern of Sample Farmers in Mahaboobnagar District, Andhra Pradesh, *kharif* 2002

Crop	Farmers	Variety	Soil type	Area (acres ³)	Main product (kg/ acre)	By- product ⁶ (kg/ acre)
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	No.	Percent to total					
Sorghum +pigeon pea	28	77.7	S ⁵ -Local yellow PP ⁶ -Local	Black -5 ² Dubba -10 Red -10 Sandy -1 Black -5	49	S ⁴ -324 PP ⁵ -36	1153
Pigeon pea	13	38.3	Local HYV-5 ¹	Red -6 Black -2 Barka -5	34	235	-
Maize	3	8.3	JK Puja-2 Bio-seed-1	Red -3	10	910	700
Castor	21	58.3	Kranti-14 Aruna-7	Dubba -2 Red -12 Black -7	84	259	-
Horsegram	2	5.5	Local	Red -2	8	143	475
Bengalgram	1	2.7	HYV	Red -1	4	300	-
Cotton	7	19.4	Bunny-6 Brahma-1	Black -7	35	530	-
Sunflower	2	5.5	JK-1 Local-1	Black -2	5	180	-
Paddy	25	69.4	BPT 5204-20 Tella hamsa-5	Black -16 Red -9	66.5	2320	1193
Turmeric	1	2.7	HYV	Black -1	4	375	-
Tomato	5	13.8	Annapurna-5	Black -3 Red-2	4	2875	-

¹Number of farmers growing the variety.

²No. of farmers growing the crop in that particular soil type

Chalka - red coloured with bigger pebbles and low fertility

Barka - light black in colour with low fertility and moisture retention capacity

Dubba - Light black or red coloured with sandy type of structure.

³1 Acre = 0.40 hectares

⁴Sorghum

⁵Pigeon-pea

⁶Straw/ fodder/ stover portion of the crop used as livestock feed

Table 1.2 Cropping Pattern of Sample Farmers in Ranga Reddy District, Andhra Pradesh, *kharif*2002

Crop	Farmers		Variety	Soil type	Area (acres ³)	Main Product (kg/acre)	By – Product ⁶ (kg/acre)
	No.	Percent to total					
Sorghum + Pigeon pea	27	71	S ⁴ -Local PP ⁵ -Vanapa mula seed	Black-9 ² Chalka-2 Barka-6 Red-10	41	S ⁴ -373 PP ⁵ -53	1219
Hybrid Maize	21	55	Kanchan Ganga -15 ¹	Red-9 Black-9 Barka-3	44.5	1339	758
Seed Maize	13	34	K.Ganga	Red-5 Black-8	23	858	891
Cotton	8	21	Bunny –6 Brahma -2	Black	31	593	-
Chillies	2	5	Agni – 1 JK -1	Black	4	762	-
Chillies (Wet)	2	5	Annapurna -2	Black	2	60	-
Safflower	6	15	Local Bhima	Black-4 Red -2	11	227	-
Bengalgram	3	7	Local	Black	11	177	-
Onion	1	2	Kurnool	Red	2	500	-
Paddy	3	7	BPT 5204 -3	Black	7	2471	1000
Tomato	5	39	Annapurna	Black-10 Red-5	20	2612	-
Carrot	5	13	B'lore Karoda	Black-4 Red-1	10	7100	-
Brinjal	2	5	Utkarsha	Black	6.5	5123	-
Beans	2	5	Annapurna	Black	2	1200	-
Coriander	5	13	HYV	Black	8.5	1160	-

¹Number of farmers growing the variety.

²No. of farmers growing the crop in that particular soil type

Chalka - red coloured with bigger pebbles and low fertility

Barka - light black in colour with low fertility and moisture retention capacity

Dubba - Light black or red coloured with sandy type of structure.

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⁴Sorghum

⁵Pigeon-pea

⁶Straw/ fodder/ stover portion of the crop used as livestock feed

Utilization and Market Surplus

Among all the crops sorghum is the crop with lowest market surplus in both the districts, that reflects the subsistence nature of this food crop. Sorghum was marketed through regulated market, weekly market at the mandal head quarters, and village sales indicating the poor market demand for the crop in both districts.

Table 1.3 reveals that sample farmers in Mahabubnagar and Ranga Reddy districts marketed 37% and 32% of local sorghum grain produced respectively. In contrast, about 70% of paddy was marketed in both the districts. For most other crops 100% produce was marketed due to non-consumption of those crops at the household level.

Table 1.3. District-wise Product Utilization during Kharif 2002

Crop	No. of Farmers.		Main Product (100 kg)						By-Product (100 kg)			
	Not Mark eted	Mark eted	Producti on	Consum ption	Marke ted	Mark eted quan tity (%)	Price (Rs.100/ kg)	Type of market ¹	Produc tion	Utiliz ation	Sold	Price (Rs/100 kg)
Mahabubnagar District												
Sorghum	14	14	159	100	59	37	463.5	RM-5 ² WM-3 VS-5	565	565	-	-
Redgram	5	13	97	21	76	78	1518.5	RM-10 VS3	-	-	-	-
Maize	-	3	91	-	91	100	485.0	RM-3	70	70	-	-
Castor	-	21	218	-	218	100	1501.5	RM-21	-	-	-	-
Bengalgram	-	1	12	-	12	100	1500.0	VT-1	-	-	-	-
Cotton	-	7	185	-	185	100	2158.3	VT-7	-	-	-	-
Sunflower	-	2	9	-	9	100	1350.0	VT-2	-	-	-	-
Paddy	-	25	1543	428	1115	72	628.3	RM-19 WM-3 VT-3	794	673	121	73
Horsegram	-	2	11	4	7	65	750.0	VT-2	38	38	-	-
Turmeric	-	1	15	-	15	100	1200.0	VT-1	-	-	-	-
Tomato	-	4	115	-	115	100	266.6	RM-4	-	-	-	-
Ranga Reddy District												
Sorghum	14	13	153	104	48	32	585.8	RM-7 VS-4 WM- 2	500	464	36	32
Pigeon pea	27	4	21	17	4	21	1575.0	VS-4	-	-	-	-
Hybrid Maize	-	21	596	-	596	100	522.3	RM-13 VT-8	337.5	10	327	5
Seed Maize	-	13	197	-	197	100	1583.3	CF	205	13	192	5
Safflower	6	-	25	25	-	-	-	-	-	-	-	-
Bengalgram	-	3	19	25	17	87	1550.0	VT-3	-	-	-	-

Cotton	-	8	184	-	184	100	2250.0	VT-8	-	-	-	-
Chillies-Dry	-	2	30	-	30	100	2000.0	VT-2	-	-	-	-
Chillies-Wet	-	2	120	-	120	100	375.0	RM-2	-	-	-	-
Paddy	-	3	173	55	118	68	627.5	VT-3	70	70	-	-
Brinjal	-	2	51	-	51	100	202.0	RM-2	-	-	-	-
Carrot	-	5	7	-	7	100	437.0	RM-5	-	-	-	-
Tomato	-	15	522	-	522	100	281.3	RM-15	-	-	-	-
Beans	-	2	24	-	24	100	475.0	RM-2	-	-	-	-
Coriander	-	5	9	-	99	100	440.0	RM-5	-	-	-	-

¹No. of farmers marketing through that particular channel

²Type of marketing channel

RM- Regulated Market

VS- Village Sale

WM- Weekly market

CF- Contract Farming

Cost of Cultivation/ Production of Selected Crops

The cost of cultivation of sorghum (local yellow variety) and its competing crops in Mahaboobnagar district during *kharif* 2002 revealed that the net returns were highest in cotton followed by castor and sorghum (Table 1.4.) The inter-cropping systems of sorghum and castor with pigeon pea and sole maize registered negative net returns. In contrast, in Ranga Reddy district all the crops resulted in positive net returns (Table 1.5.) with output-input ratio >1 for all crops. Cotton emerged as the most profitable crop followed by local sorghum and maize. Inter-cropping systems with pigeon pea were less profitable in both the districts due to cultivation of local long duration pigeon pea varieties and scanty rainfall in these semi-arid regions. Also, *Helicoverpa*, an insect pest, damaged pigeon pea severely resulting in negligible returns. The productivity of grain as well as fodder of local sorghum was marginally higher in Ranga Reddy district, compared to Mahaboobnagar, which is a drier district.

Table 1.4. Cost of Cultivation of Sorghum and Selected Crops in Mahaboobnagar District of Andhra Pradesh: Kharif 2002.

Cost Item	Local Sorghum+ Pigeonpea	Local Sorghum	Maize	Cotton	Castor + Pigeonpea	Castor
A. Variable Costs (Rs./ acre)						
Human labour ¹	815.9	620.8	767.9	1533.9	2215.5	942.6
Bullock labour	504.2	557.7	682.3	625.9	1197.5	955.4
Machine labour	101.4	128.3	522.3	285.5	100.0	311.1
FYM	281.1	93.8	752.8	401.9	975.0	334.12
Seed: Main crop	39.3	30.1	468.5	1039.5	334.1	353.7
Seed: Inter crop	52.3	-	-	-	26.2	-
Fertilizer	173.7	251.0	605.3	794.6	562.5	399.1
Pesticides	38.8	-	-	2015.3	832.5	613.3
Weedicides	-	-	-	-	-	-
Transport	12.9	7.7	86.7	-	63.75	33.48
Interest on working cost	68.00	57.3	143.2	303.03	210.23	164.28
Subtotal	2087.6	1747.0	4029.1	6999.9	6517.3	4107.1
B. Fixed Costs (Rs./ acre)						
Land rent	436.8	436.8	794.5	794.5	871.6	677.2
Land revenues	0.5	0.5	0.5	0.5	0.5	0.5
Depreciation	25.4	15.8	71.6	71.9	60.0	62.0
Interest on Fixed Capital	1.9	1.9	4.6	4.6	4.2	4.4
Subtotal	464.6	455.1	871.2	871.5	936.3	744.1
Total Cost A+B	2552.2	2202.1	4900.3	7871.5	7453.7	4851.3
Grain Yield (100 kg/acre):	3.2	3.9	9.1	5.3	4.2	3.1
Main crop						
Price (Rs./100 kg): Main crop	463.6	463.6	485	2158.3	1375	1586.1
Grain Yield (100 kg/acre):	0.4	-	-	-	0.50	-
Inter crop						
Price (Rs./100 kg): Inter crop	1518.1	-	-	-	1550	-
Fodder Yield (100 kg/acre): Main crop	11.5	12.00	7.0	-	-	-
Price (Rs./100 kg): Main crop	41.5	41.5	5.0	-	-	-
Gross returns	2526.7	2342.8	4448.5	11439.1	6618.8	5049.8
Net returns	-25.5	140.6	-451.8	3567.7	-834.9	198.5
Output/ Input ratio	0.9	1.1	0.9	1.5	0.9	1.0

Total sample farmers surveyed: 36

Study area: two villages of Mahaboobnagar district of Andhra Pradesh.

¹ includes the wages paid for the hired casual labor and family labor

1 Acre = 0.40 ha.

Source: Survey data from Project villages

Table 1.5 Cost of Cultivation of Sorghum and Selected Crops in Ranga Reddy District of Andhra Pradesh: *Kharif* 2002.

Cost Item	Local Sorghum+Pigeonpea	Local Sorghum	Maize + Pigeonpea	Maize	Cotton
A. Variable Costs (Rs./ acre)					
Human labour ¹	91.2	720.4	845.0	912.7	1708.2
Bullock labour	549.6	456.2	812.5	790.0	655.6
Machine labour	52.6	53.6	125.0	429.8	202.5
FYM	195.6	58.5	350.0	624.9	235.3
Seed : Main crop	36.4	28.3	490.0	444.6	950.4
Seed: Inter crop	31.1	-	27.50	-	-
Fertilizer	286.0	388.6	714.0	816.6	747.6
Pesticides	71.4	-	-	61.3	2410.9
Weedicides	-	-	75.2	153.8	-
Transport	15.1	13.1	30.0	121.5	-
Interest on Working cost	82.5	68.01	101.1	167.8	263.9
Subtotal	2231.5	1786.9	3570.1	4523.5	6910.5
B. Fixed Costs (Rs./ acre)					
Land rent	514.4	514.4	685.3	852.4	852.4
Land revenues	0.5	0.5	0.5	0.5	0.5
Depreciation	31.2	23.1	53.3	81.4	81.2
Interest on Fixed cost	2.15	2.15	3.77	6.2	6.2
Subtotal	548.3	542.1	742.9	940.4	940.2
Total Cost A+B	2779.7	2327.1	4313.2	5463.9	7850.7
Grain Yield (100 kg/acre): Main crop	3.7	4.63	8.01	13.4	5.9
Price (Rs./100 kg): Main crop	585.8	585.8	480.0	522.3	2250
Grain Yield (100 kg/acre): Inter crop	0.5	-	0.3	-	-
Price (Rs./100 kg): Inter crop	1575	-	1500.0	-	-
Fodder Yield (100 kg/acre): Main crop	12.2	13.8	9.0	7.6	-
Price (Rs./100 kg): Main crop	32.8	32.8	17.5	5.0	-
Gross returns	3419.4	3166.5	4372.5	6993.9	13342.0
Net returns	639.6	839.5	59.4	1530.0	5491.8
Output / Input ratio	1.2	1.4	1.0	1.3	1.7

Total sample farmers surveyed: 38

Study area: two villages of Ranaga Reddy district of Andhra Pradesh

¹includes the wages paid for the hired casual labour and family labour

1 Acre = 0.40 ha.

Source: Survey data from Project villages

Sorghum Cultivar Traits Preferred by Sample Farmers

The farmers preferred characteristics in new improved sorghum cultivars were ascertained during baseline survey. The higher grain productivity was ranked first followed by fodder yield (Table 1.6). Superior grains as well as fodder were also considered important traits. Farmers want more marketable surplus of grain and fodder with superior quality to augment their incomes.

Table 1.6. Farmers Ranking of Preferred Characteristics in New Improved Sorghum Cultivars: *Kharif* 2002

Characteristics	Rank assigned by farmers
High grain yield	I
Higher fodder yield	II
Higher grain and fodder yield	III
Superior quality of grain (bold, lustrous, taste, color, roti or bath making quality etc)	IV
Superior quality of fodder (leafy, slender, smooth, sweeter and palatable)	V
Pest/ disease resistant	VI
Drought resistant	VII
Suitability of soil & climatic conditions	VIII
More flour output (solid grains)	IX

Study area: Four villages of Mahaboobnagar and Ranga Reddy districts in Andhra Pradesh
Total number of farmer surveyed: 74
Source: Survey data from project villages.

Changes in Food Use of Sorghum

There has been a continuous decline in the consumption of sorghum as food over the last two decades. This in turn led to decline in sorghum price in the market. The reasons for decrease in consumption level are shown in Table 1.7. Increase in availability of rice due to higher production and availability of subsidized rice through PDS, change in food habits, Govt. programmes supplying rice or rice based products under various schemes were the main reasons revealed by farmers for decline in sorghum consumption.

Table 1.7. Reasons for Decrease in Sorghum Consumption Over time

	Reason(s)	Farmers	
		Number	Percent to total farmers
1	Availability of more rice through expanded irrigation facilities & at subsidized prices through Public Distribution System (PDS).	57	77
2	Change in food habits of the people	53	71.6
3	Sorghum roti or <i>bath</i> preparation is more time consuming	41	55.4
4	Government programmes like mid-day meal to schoolchildren, Antyodaya scheme; Old age pension, Annapurna, Public fair price shops etc. are more oriented towards rice and rice products.	34	45.9
5	More fuel requirement to prepare sorghum roti than rice	20	27.0
6	Younger generation do not know the preparation of sorghum foods	16	21.6
7	Sometimes availability of cheaper rice than traditional sorghum in the open market	16	21.6
8	Periodic grain mold problem in sorghum	11	14.9
9	Decreased in area and production under sorghum cultivation	7	9.5
10	Decrease in the family size	7	9.5

Study area: Two villages each in Mahaboobnagar and Ranga Reddy districts of Andhra Pradesh

Total number of farmers or households surveyed: 74

Source: Survey data from project villages

SECTION II: Highlights of POST HARVEST SURVEY (*Kharif 2003*) in project villages.

During *kharif 2003*, the sowings were delayed due to late onset of monsoon and were taken up between the last week of June to mid July (usually, first to second week of June in normal rainfall years) depending on the rainfall received in respective villages. The fields were regularly monitored for gypsum application, sowings, germination, timely fertilizer application, intercultivation, weeding and harvesting. While monitoring, control measures for shoot fly and stem borer damage, basal and topdressing of fertilizer, physiological maturity of crop to help in harvesting and other recommended package of practices were explained to the farmers. During the meetings/ field visits in the selected villages, ICRISAT scientists illustrated proper harvesting stage of crop to avoid the grain mold problem, which otherwise leads to low market price

Table 2.1 indicates that the area and performance of improved sorghum cultivars supplied under the project. The performance of improved cultivars was superior compared to local varieties. The grain yield realized was around 2-3 times higher than the local cultivars.

Table 2.1 District-wise area under sorghum, Sample farmers

District	Crop	No of Farmers	Variety	Soil type	Area ³ (acres)	Main product (kg/ acre)	By-product ⁶ (kg/ acre)
Mahaboo- bnahgar	Improved sorghum + Pigeon pea	34	CSH 16-9 ¹ CSV 15-10 PSV 16- 4 S 35- 7 And PP ³ - Local	Black- 4 ² Chalka- 12 Red- 6 Barka- 9 Dubba- 3	30.5	S ⁴ - 491 PP ⁵ - 209	938
	Local sorghum + Pigeon Pea	13	S ² -Yellow variety and PP ³ ocal	Chalka-6 Red-2 Dubba- 4 Black-1	15.7	S ⁴ - 111 PP ⁵ -154	774
Ranga Reddy	Improved sorghum + Pigeon pea	35	CSH 16-17 CSV 15-8 PSV 16- 6 S 35- 4 And PP ³ Local	Black- 3 Chalka- 12 Red- 8 Barka- 12	34	S ⁴ -218 PP ⁵ 135	632
	Local sorghum + Pigeon Pea	5	S ² Yellow variety and PP ³ - Local	Red-2 Barka- 3	4.5	S ⁴ - 50 PP ⁵ - 102	511

¹Number of farmers growing the variety.

²No. of farmers growing the crop in that particular soil type

Chalka - red coloured with bigger pebbles and low fertility

Barka - light black in colour with low fertility and moisture retention capacity

Dubba - Light black or red coloured with sandy type of structure.

³1 Acre = 0.40 hectares

⁴Sorghum

⁵Pigeon-pea

⁶Straw/ fodder/ stover portion of the crop used as livestock feed

Product utilization and marketing

Only few sample farmers realized good productivity of improved sorghum during *kharif* 2003, primarily due to unfavorable climatic conditions (late onset of monsoon, prolonged dry spells and continuous heavy rains during ear head emergence to grain development stages). Although the performance of improved cultivars was better than local varieties. Only small quantities of sorghum were marketed by sample farmers in both the districts since the farmers retained the crop for home consumption to meet food needs (Table 2.2). Households in both districts utilized almost the entire stover production to feed their animals.

Table 2.2 District-wise Sorghum Utilization by sample farmers during *kharif* 2003

District	Crop	No of farmers		Main Product (kg)							By-product (100kg)			
		Not marketed	Marketed	Production	Consumption	Other uses ¹	Marketed	Quantity marketed (%)	Price (Rs./100 kg)	Type of market ²	Production	Utilized	Sold	Price (Rs./100 kg)
Mahabubnagar	Sorghum	34	4	175	118	3	26	22	419	RM-4 ³	406	406	-	-
Ranga Reddy	Sorghum	35	1	60	42	14	4	9	463	WM	238	210	28	15

¹ The kind payment made to the casual labor by the farmers (for harvesting and threshing operations)

² No. of farmers marketing through that particular channel

³ Type of marketing channel

RM- Regulated Market

VS- Village Sale

WM- Weekly market

CF- Contract Farming

Cost of cultivation/ production

In addition to the ICRISAT supplied improved sorghum, around 26 per cent of farmers who were part of the project had grown the local (yellow) variety of sorghum during *kharif* 2003. The sorghum crop was harvested during last week of November to first week of December. The grain development stage of the crop coincided with continuous rains, which resulted in grain mold attack and lower yields than expected for both improved and local varieties in both the project districts.

Tables 2.3 and 2.4. indicates the better performance of improved sorghum cultivars supplied under the project over local sorghum cultivars. The net returns obtained were more in improved sorghum + pigeonpea inter cropping in both the districts. For local sorghum in Ranga Reddy district the net returns were negative both for sole crop as well as inter crop with pigeon pea. Contrary to the expectation, this is due to severe *Heliothis* attack on pigeonpea, which reduced the yields of pigeon pea drastically affecting the monetary returns. Even though the climate was unfavorable, the performance of improved sorghum cultivars over local varieties is good in all project villages. The per acre grain as well as fodder yields obtained were higher in Mahabubnagar district than in Ranga Reddy district. The output-input ratio realized was highest in improved sorghum cultivars indicating more returns per rupee investment in both districts.

Table 2.3. Cost Of Cultivation of Local and Improved Sorghum Cultivars in Mahabubnagar District: Kharif 2003

Cost Items	Improved Sorghum	Improved Sorghum+ Pigeonpea	Local Sorghum+ Pigeonpea
A. Variable Costs (Rs./Acre)			
Human labour ¹	420.0	818.5	501.3
Bullock	346.0	461.1	537.3
Machine	109.4	185.7	-
FYM	87.4	195.0	166.1
Seed: Main crop	51.0	51.0	23.4
Seed: Inter crop	-	48.6	31.0
Fertilizer	189.2	312.6	288.3
Pesticides	-	73.8	131.1
Weedicides	-	-	-
Transport	-	-	-
Interest on working expenses	40.1	69.3	56.4
Subtotal	1243.3	2216.0	1735.1
B. Fixed Costs (Rs./Acre)			
Land rent	318.0	500.0	502.0
Land revenues	0.5	0.5	0.5
Depreciation	22.5	35.5	36.2
Interest on Fixed cost	1.6	2.9	2.9
Subtotal	342.6	539.0	541.7
Total Cost A+B	1586.0	2755.0	2276.8
Grain Yield (100 kg/acre):	4.6	4.9	1.1
Main crop			
Price (Rs./100 kg): Main crop	457.0	419.2	428.0
Grain Yield (100 kg/acre):	-	2.0	1.5
Inter crop			
Price (Rs./100 kg): Inter crop	-	1585.0	1585.0
Fodder Yield (100 kg/acre):	11.2	9.3	7.7
Main crop			
Price (Rs./100 kg): Main crop	20.0	21.1	16.3
Gross returns	2331.3	5577.3	3042.5
Net returns	745.2	2822.2	765.7
Output/ Input ratio	1.47	2.02	1.33

Total sample farmers surveyed: 38

Study area: two villages of Ranaga Reddy district of Andhra Pradesh

¹Includes the wages paid for the hired casual labour and family labour

1 Acre = 0.40 ha.

Source: Survey data from Project villages

Table 2.4. Cost Of Cultivation of Local and Improved Sorghum Cultivars in Ranga Reddy District: Kharif 2003

Cost Items	Improved Sorghum+ Pigeonpea	Local Sorghum	Local Sorghum+ Pigeonpea
A. Variable Costs (Rs./Acre)			
Human labour ¹	633.1	283.5	374.4
Bullock	414.9	274.0	523.1
Machine	70.9	76.0	-
FYM	81.4	-	74.4
Seed: Main crop	52.0	25.2	21.3
Seed: Inter crop	16.7	-	33.0
Fertilizer	215.7	137.2	205.7
Pesticides	-	-	105.5
Weedicides	-	-	-
Transport	-	-	-
Interest on working expenses	45.3	25.0	44.1
Subtotal	1530.3	776.0	1381.7
B. Fixed Costs (Rs./Acre)			
Land rent	450.0	318.0	444.0
Land revenues	0.5	0.5	0.5
Depreciation	26.9	22.5	26.2
Interest on Fixed cost	1.4	1.6	1.4
Subtotal	478.9	324.6	472.2
Total Cost A+B	2009.2	1118.7	1854.0
Grain Yield (100 kg/acre): Main crop	2.0	1.3	0.5
Price (Rs./100 kg): Main crop	428.0	420.0	412.0
Grain Yield (100 kg/acre): Inter crop	1.3	-	1.0
Price (Rs./100 kg): Inter crop	1493.0	-	1493.0
Fodder Yield (100 kg/acre): Main crop	6.3	6.8	5.1
Price (Rs./100 kg): Main crop	20.1	15.0	13.6
Gross returns	3075.8	677.8	1798.6
Net returns	1066.6	-440.8	-55.4
Output/ Input ratio	1.530	0.605	0.970
Total sample farmers surveyed: 38			
Study area: two villages of Ranaga Reddy district of Andhra Pradesh			
¹ Includes the wages paid for the hired casual labour and family labour			
1 Acre = 0.40 ha.			
Source: Survey data from Project villages			

Performance of Improved Sorghum Cultivars

The cultivar-wise performance of improved sorghum cultivars as perceived by the sample farmers under the project during *kharif* 2003 are presented in Table 2.5.

Table 2.5. **Performance of Improved Sorghums by Cultivar compared to Traditional Varieties: *Kharif* 2003.**

Characteristics	Number of farmers			Total no.	Percent of farmers to total
	CSH 16	CSV 15	PSV 16		
Higher grain yield than traditional varieties.	37	25	2	64	92.7
Superior grain quality than traditional varieties (<i>roti</i> is tastier and good)	28	21	2	51	73.9
Higher fodder yield than traditional	3	23	1	27	39.1
Superior fodder quality	5	17	1	23	33.3
Can't say because this year the climate is not suitable for growing sorghum.	4	6	3	13	18.8
All improved cultivars performance is below average due to unfavourable climatic conditions, but performed better than traditional sorghum	4	4	-	8	11.5

Total number of farmers or household surveys: 69

Source: Survey data from the project villages

Study area: Two villages each in Mahaboobnagar and Ranga Reddy districts of Andhra Pradesh.

The performance of two cultivars i.e. CSV 15 and CSH 16 (out of four supplied) were more appreciated by the farmers due to higher yield and superior quality grain as well as fodder when compared to traditional varieties of sorghum.

Overall Performance of Improved Sorghum Cultivars

The perceptions of farmers regarding the overall performance of improved sorghum cultivars supplied under project in their villages are compiled in Table 2.6.

Table 2.6. Farmers Perception on the Overall Performance of Improved Sorghum Cultivars supplied under the Project: *Kharif* 2003

Characteristics	Rank assigned by farmers
High grain yield	1
Superior grain quality (bold/ lustrous/ tasty/ color etc	2
Grain suitability for roti/ bath preparations	3
Drought resistant	4
High fodder yield	5
Superior fodder quality (sweeter/ palatable/ smooth/ more girth etc	6
Fodder suitability for animal feed/ fodder intake by animals	7
Suitability to the soil	8
Resistant to pests and diseases	9
Impact on milk productivity	10

Study area: Two villages each in Mahabubnagar and Ranga Reddy districts of Andhra Pradesh
Total number of farmers: 69
Source: Survey data from project villages.

Production related Problems

Farmers revealed a few production related problems in the cultivation of improved sorghum cultivars as well as general farming problems (Table 2.7)

Untimely rains at seed setting and grain development stage, leading to grain mold attack was a major problem in growing (both local and improved) sorghum. About 35% of the farmers did not follow the recommended package of practices for improved varieties. Poor quality of soil was another problem mentioned by one-fourth of the framers.

Table 2.7. Production related problems of Improved Sorghum Cultivars.

Problem(s)	No. of Farmers
Grain mold attack (a periodic problem for sorghum cultivation)	20 (29.0) ¹
Labour shortage in the peak agricultural operations period.	32 (46.3)
Did not follow the recommended package of practices Suggested under the project (weeding, thinning, fertilization etc.)	24 (34.8)
Untimely rains affected the flowering, seed setting and grain development leading to lower yields than expected.	47 (68.1)
Threshability is lower than traditional varieties (grain attached to ear head is very tight)	8 (11.6)
Brittleness of fodder compared to fodder from traditional varieties	11 (15.9)
Soil related problems	18 (26.1)

Total number of farmers or household surveys: 69
Source: Survey data from the project villages
Study area: Two villages each in Mahabubnagar and Ranga Reddy districts of AndhraPradesh.
¹Figures in parentheses indicate percent of farmers to total surveyed.

Collective marketing of sorghum grain

Farmers were asked about the current marketing channels for sorghum and their willingness to participate in collective/ group marketing of surplus sorghum production. A majority of farmers expressed interest to participate in collective marketing. Farmers felt that they can obtain higher prices through collective marketing and save on marketing and transport cost (Table 2.8). Currently, the project is exploring to link groups of farmers with surplus sorghum to poultry feed manufacturer who is willing to buy bulk quantities from a few sources. This will be the important factor to develop innovative marketing link proposed in the project.

Table 2.8. **Farmers Response on Collective Marketing of Sorghum Grain**

Factors	No. of Farmers	Percentage to total
Better price through bargaining.	38	55.1
Collective marketing will always be better than individual marketing in terms of price bargaining, marketing costs and time.	36	52.2
Saving of marketing costs and transport charges	31	44.9
Time saving (travel, waiting in the market yards etc.	27	39.1
Better than present marketing through village trader.	21	30.4
Collective marketing will grow with more farmers joining the group leading to a better marketing channel for sorghum	5	7.2

Total number of farmers or household surveys: 69
Source: Survey data from the project villages
Study area: Two villages each in Mahaboobnagar and Ranga Reddy districts of Andhra Pradesh.

Conclusion

Sorghum production underpins the livelihood of poor farmers, though not the most profitable crop. It meets their twin objectives of food and fodder requirements for household and livestock. It can be grown in poor and marginal soils where other crops cannot perform, particularly in low rainfall conditions. The utilization of sorghum for food use has been declining over time due to technological and policy induced factors. But at the same time alternative uses are on the increase, although from a low initial base. New high-yielding sorghum cultivars, with 2-3 times higher yield potential than traditional varieties were introduced in the farmers' fields in *kharif* 2003 season. Farmers selected 2 out of 4 improved cultivars that performed better than traditional sorghums and met their criteria for food and fodder. The current market channels are not geared to meet the requirements of non-food uses of the crop. Hence, an innovative method of linking sorghum producers to the end user (in this case poultry feed industry) under this project assumes importance. Farmers engaged in the project and growing improved sorghum varieties are enthusiastic and keen to participate in collective marketing dealing directly with poultry feed manufacturers.
