Production and Marketing of Coarse Cereals in Andhra Pradesh

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Seasonal variations in arrivals and prices of sorghum at the regulated market in Narayanapet, Mahabubnagar district
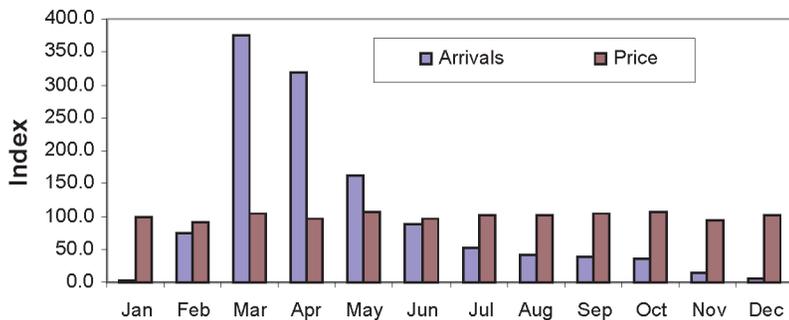
Seasonal variations in arrivals and prices of sorghum at the regulated market in Jadcherla, Mahabubnagar district
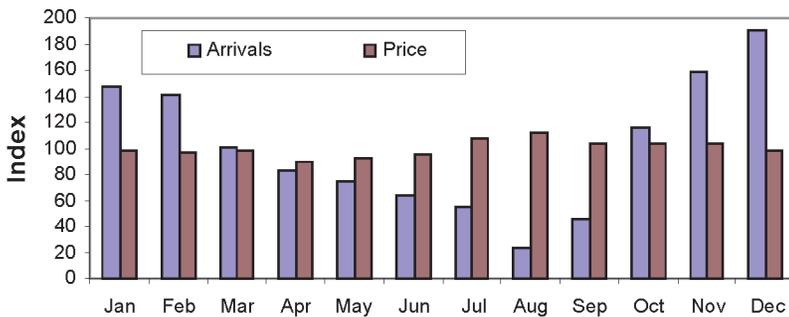
Seasonal variations in arrivals and prices of sorghum at the regulated market in Raichur
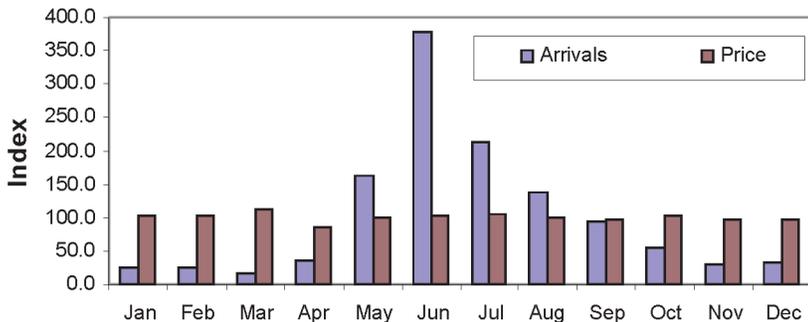
Fig 9. Seasonal variations in arrivals and prices of sorghum in different regulated markets in Mahabubnagar district

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1.0. Introduction

Coarse cereals, viz., sorghum, pearl millet and finger millet assume significance in the cropping pattern of dryland regions as they require little inputs and are most drought resistant. By providing grains and fodder, they support the food and fodder needs of the farm household and livestock. However, the last few decades saw these crops lose area on account of declining demand, change in food habits and erosion in relative profitability of these crops vis-à-vis other crops. Nevertheless, it is necessary to improve the profitability of these crops as they contribute to food security to the small and marginal farmers. The nutritional value of these crops offers much scope to development new health and packaged foods. Considering these issues, various issues related to production and marketing of coarse cereals were examined in the project "Studies on spatio-temporal variations in production and marketing of coarse cereals in Andhra Pradesh" financially supported by the Indian Council of Agricultural Research. This research bulletin puts together the findings of the project.

2.0. Study area and methods

The study was conducted using the primary and secondary data. The primary data was obtained from three districts – one district for each crop –which were leading in production of these crops. The primary data related to sorghum, pearl millet and finger millet were collected from Mahabubnagar, Prakasam and Visakhapatnam districts, respectively. From each district, five leading mandals in terms of area under the crop concerned were selected. Then, one village was selected in each mandal randomly. From each village, fifteen farmers were randomly selected making a total sample of seventy five farmers for each crop. Similarly, in order to study the marketing channels and marketing efficiency, primary data were collected from different market intermediaries. The secondary data on area, production and yield for the period 1975 onwards in different districts was obtained from the Directorate of Economics and Statistics, Government of Andhra Pradesh and the Centre for Monitoring Indian Economy, Mumbai. The primary data related to farmers and marketing was for the agricultural year 2005-06.

The temporal changes in area, production and productivity in different districts and the state as a whole were examined by computing annual rates of growth by fitting exponential time trend equations. Marketing efficiency was examined by computing the producer's share in the consumer's rupee and Composite and Shephered indices. Simple tabular analysis was done to derive meaningful inferences in case of other related analyses.

3.0. Findings

3.1. Spatio-temporal variations in production of coarse cereals

Table 1 and figure 1 indicate the area under cultivation of coarse cereals viz., sorghum, pearl millet and finger millet in AP. There was steady decline in the area under these crops and the rate of decline was more from nineties onwards. Among the three coarse cereals, the decline was sharper in pearl millet whose area came down to 86890 ha (2003) from 577880 ha (1975), almost a fall to one sixth. The other two coarse cereals were sown to an area in 2003 which was nearly one fourth of that sown in 1975. This decline in area under cultivation of coarse cereals in India and AP is due to the some of the plausible reasons like: cultivation on marginal lands, low profitability, falling demand, adverse agro-climatic conditions and unfavorable government policies. All these factors caused these crops being replaced by crops such as oilseeds (sunflower, groundnut, castor), pulses (pigeonpea) and other cereals (maize). The availability of rice at highly subsidized price through public distribution system has been the single most important factor for the falling demand for these crops.

Table 1. Trends in area under sorghum, pearl millet and finger millet in Andhra Pradesh, 1975-2003

Crop	Area (000 ha)						
	1975	**1980**	**1985**	**1990**	**1995**	**2000**	**2003**
Sorghum	2538.3	2399.9	1862.28	1310.7	944.40	735.93	623.85
Pearl millet	577.88	451.80	394.60	258.30	137.30	116.6	86.98
Finger millet	289.4	250.60	226.08	171.00	129.92	96.75	71.25

Fig 1. Trends in area under coarse cereals in AP
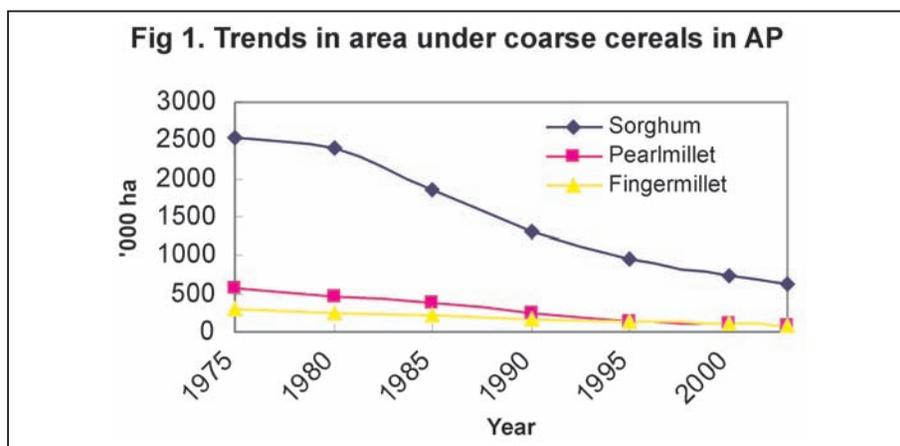
The spatial distribution of these crops in AP is depicted in figures 2-4. During the TE1983, sorghum was an important crop in ten districts with more than 100000 ha (Fig 2). The number of such districts with more than 100000 ha fell to five during TE1993 and to two during TE 2003. Similarly, in case of pearl millet, four districts were having an area of more than 50000 ha (Fig 3). However, during the 1990s and

2000, no district was having an area of more than 50000 ha under this crop. Finger millet was grown in more than 10000 ha in nine districts during TE 1983 (Fig 4). This number fell to seven in TE 1993 and just two in TE 2003.

Fig 2. Sorghum growing districts in AP

TE 1983   TE 1993   TE 2003

- <10000 ha
- 10000-50000 ha
- 50000-100000 ha
- >100000 ha

Fig 3. Pearl millet growing districts in AP

TE1 983   TE 1993   TE 2003

- <10000 ha
- 10000-50000 ha
- 50000-100000 ha
- >100000 ha

Fig 4. Finger millet growing districts in AP

TE 1983   TE 1993   TE 2003

- <10000 ha
- 10000-50000 ha
- 50000-100000 ha
- >100000 ha
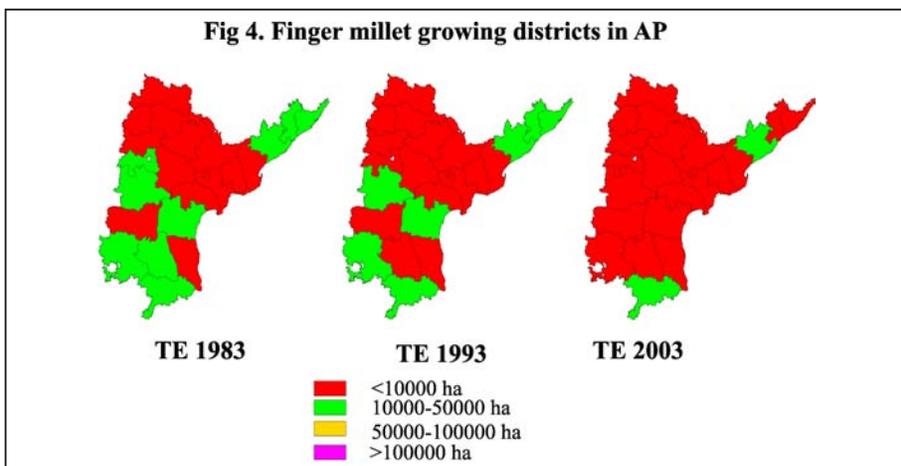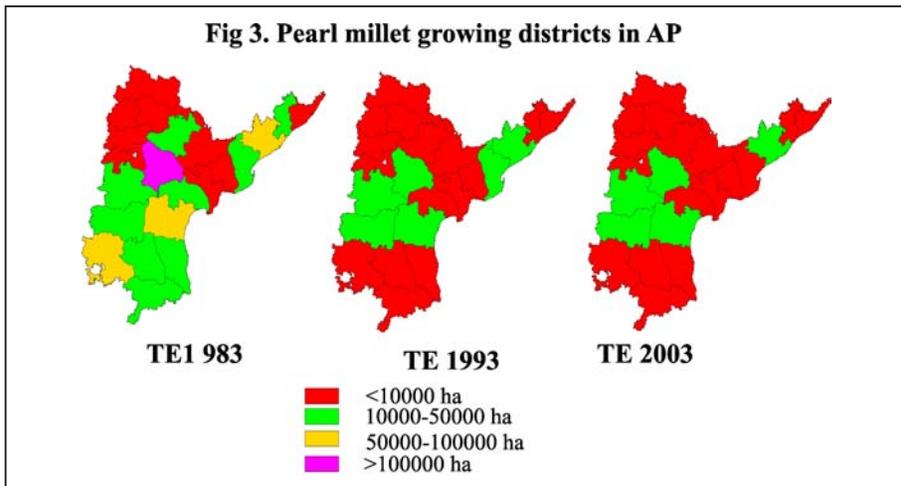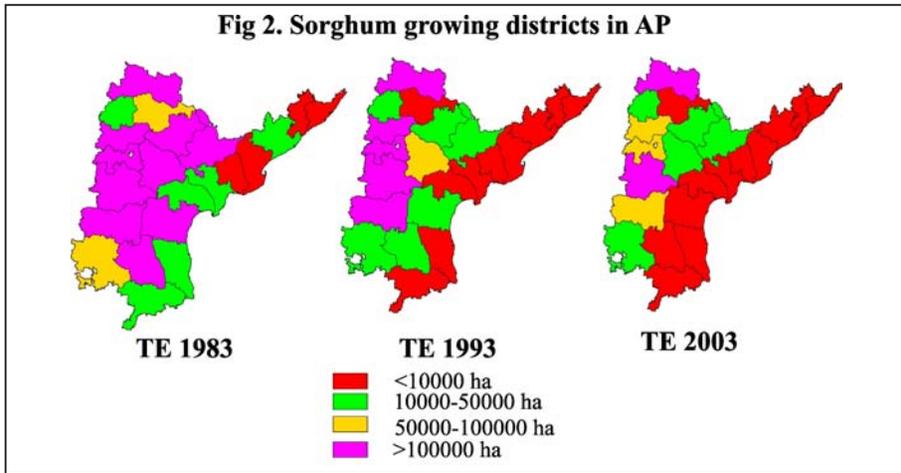
The temporal variations in the area sown to these crops in the selected districts are depicted in figure 5. It is clearly evident that the crops are losing their imporatnce in the selected districts. The rate of decline is more pronounced for sorghum in Mahabubnagar district.

Fig 5. Trends in area under target crops in the selected districts
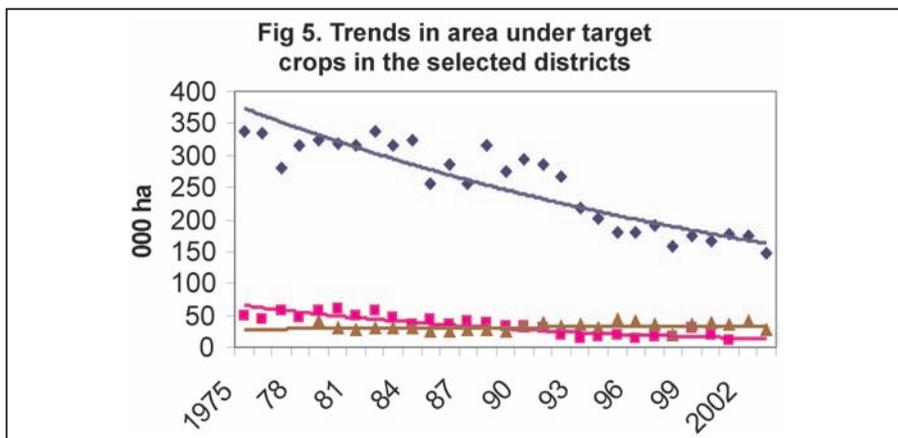
3.1.1. Sorghum

The estimated compound growth rates in area, production and productivity of sorghum in different districts of Andhra Pradesh during the period from 1980-90 to 2002-03 are presented in table 2. There was a conspicuous decline in area, production and productivity of sorghum in Andhra Pradesh. At the country level, the crop lost area at an annual rate of 0.9 per cent during the eighties, 3.7 per cent during the nineties and 2.7 per cent since 1995. The growth in yield was also not impressive; infact there was a discernible declining trend during the period after 1995. The crop lost area in all the districts of AP. In all the districts, the performance of sorghum was deteriorating during the reforms period of 1995-2003 compared to pre-reforms period. The growth pattern in sorghum is also depicted in figure 6.

3.1.2. Pearl millet

The growth performance of pearl millet is shown in table 3. Compound growth rates of area, production and productivity of pearl millet in Andhra Pradesh and country as a whole were negative, whereas at the country level, the growth rates in productivity were positive during 1980s and 1990s. During 1980-90 the area, production and productivity in AP showed negative growth rate and, the highest growth rate in this period was in the area (15.29% in Karimnagar) and fastest decline was observed in Guntur. During 1990-2000, the highest growth rate was in the area once again in Karimnagar (62.85) followed by Adilabad (11.74) and highest negative growth rate was in the district of Warangal (-23.73). The state as a whole witnessed a negative growth rate (-7.90) in area during 1990s and the country was also showing negative growth rate. During 1995-2003 also the trend was negative in AP as well as the country (–4.22 and –2.05, respectively). The highest growth rate in the area of pearl millet in AP during 1995-03 was seen in the districts of Krishna (46.78) followed by Guntur (30.79) and steepest fall was found in Visakhapatnam (-20.87).

Table 2. Compound growth rates (%) in area, production and productivity of sorghum in districts of Andhra Pradesh

District	Area			Production			Yield		
	1980-90	1990-00	1995-03	1980-90	1990-00	1995-03	1980-90	1990-00	1995-03
A P	-5.43	-5.50	-5.15	-5.83	-5.62	-0.46	-0.43	-0.12	4.95
Adilabad	-1.03	-3.66	-7.60	-3.16	-1.51	-2.79	-2.16	2.25	5.18
Anantapur	-8.22	-3.61	-9.95	-2.91	-3.74	-0.75	5.77	-0.16	10.22
Chittoor	-6.25	-15.64	-7.98	-2.18	-23.23	-8.75	4.34	-9.03	-0.84
East Godavari	-12.13	-7.52	-9.20	-14.61	-7.79	-13.57	-2.86	-22.39	-24.30
Guntur	-14.10	-8.08	6.90	-16.51	-3.25	7.51	-2.81	5.41	0.52
Kadapa	-9.05	-11.13	-6.69	-5.50	-14.12	-11.98	3.91	-3.35	-5.74
Karimnagar	-18.37	-10.28	-17.99	-18.78	-10.74	-16.68	-0.50	-0.53	1.60
Khammam	-11.15	-8.53	-13.66	-13.80	-8.42	-10.95	-2.99	0.12	3.12
Krishna	-29.63	-18.62	-4.46	-30.07	-22.27	-5.34	-0.61	-3.85	-21.04
Kurnool	-4.92	-3.87	-5.13	-3.37	-5.23	1.94	1.63	-1.39	7.44
Mahabubnagar	-1.53	-5.98	-1.69	-1.80	-6.64	1.07	-0.27	-0.72	2.86
Medak	-2.55	-2.54	-3.84	-5.16	-3.45	2.56	-2.67	-0.92	6.66
Nalgonda	-5.18	-9.32	-9.46	-4.77	-9.65	-8.42	0.43	-0.37	1.13
Nellore	-8.91	-36.38	-15.12	-2.09	-35.82	-11.21	7.48	1.03	4.53
Nizamabad	-5.34	-1.29	0.61	-6.16	2.25	7.52	-0.87	3.59	6.86
Prakasam	-6.09	-21.97	-10.32	-6.57	-20.70	-11.92	-0.51	1.67	-1.77
Rangareddy	-1.28	-3.25	-4.12	0.06	-5.83	-1.79	1.35	-2.67	2.44
Srikakulam	-1.70	-16.94	-18.14	-3.17	-22.08	-16.07	-1.47	-6.34	-18.58
Visakhapatnam	-4.63	-10.88	-8.71	-5.27	-15.79	-13.66	-0.68	-5.46	-5.42
Vizianagaram	-3.51	-10.32	-11.19	-3.66	-13.79	-15.79	-0.15	-3.97	-24.64
Warangal	-11.68	-7.47	-10.73	-16.11	-7.36	-10.69	-5.01	0.12	0.04
West Godavari	-12.64	-16.42	4.81	-12.27	-18.88	4.75	0.41	-2.98	-20.63
India	-0.94	-3.69	-2.74	-0.03	-3.57	-3.61	0.89	0.15	-0.92

Compound growth rate in productivity of pearl millet during the period 1980-90 was somewhat better in Kadapa (3.43) followed by Kurnool (2.94), East Godavari (2.71) and rest of the districts in AP were showing decreases in yield of pearl millet. During 1990-2000 slightly improved growth rate was observed in pearl millet yield except in East Godavari, Karimnagar Khammam, Krishna, Nellore and Warangal where yields fell sharply. While AP as a whole and India showed the positive sign in productivity growth i.e. 2.28 and 2.18 respectively during the period of globalization era, the growth trend in almost of all districts of AP was negative except in Guntur, Rangareddy, Nizamabad and Medak which are the major growers. The highest negative growth rate was seen in the district of Guntur (-45.21). The growth pattern in pearl millet in AP is also depicted in figure 7.

Table 3. Compound growth rates (%) in area, production and productivity of pearl millet in districts of Andhra Pradesh

District	Area			Production			Yield		
	1980-90	1990-00	1995-03	1980-90	1990-00	1995-03	1980-90	1990-00	1995-03
AP	-6.97	-7.90	-4.22	-7.74	-5.80	-5.61	-0.82	2.28	-1.44
Adilabad	-7.16	11.74	21.58	22.77	14.71	32.26	-20.63	3.62	-38.79
Anantapur	-13.94	-14.29	-9.64	-15.11	-11.99	-11.39	-1.35	2.65	-30.61
Chittoor	-13.80	-10.93	-2.99	-13.69	-10.83	-9.82	0.13	0.11	-34.12
East Godavari	-2.30	-15.42	-19.01	0.35	-17.63	-15.09	2.71	-2.62	-25.75
Guntur	-25.01	-18.90	30.79	-22.94	-13.16	28.24	2.72	7.40	-45.21
Kadapa	-14.55	-7.86	3.07	-11.62	-9.08	-7.85	3.43	-1.33	-36.71
Karimnagar	15.29	62.85	7.85	-5.15	37.88	17.68	-20.69	-16.21	-22.97
Khammam	-9.32	-9.89	-5.19	-19.67	-2.72	3.14	-11.38	-16.00	-38.80
Krishna	-24.18	9.72	46.78	-24.15	9.72	46.78	-0.15	-39.53	-43.64
Kurnool	-2.59	-4.66	-14.32	0.28	-2.36	-13.58	2.94	2.41	-28.61
Mahabubnagar	-6.15	-5.31	-9.70	-5.49	-2.91	-3.95	0.71	2.55	-24.72
Medak	-9.13	-6.00	-15.65	-10.09	-1.01	-8.17	-1.02	5.30	-22.96
Nalgonda	-5.43	-10.89	-17.51	-6.47	-4.13	-10.91	-1.09	7.62	-23.58
Nellore	-10.43	-8.94	-10.84	-10.66	-14.51	-10.50	-0.25	-6.18	-28.92
Nizamabad	11.15	5.73	-3.77	7.60	12.46	3.36	-3.07	6.40	-23.99
Prakasam	-4.31	-9.25	-13.81	-4.76	-7.59	-16.00	-0.47	1.82	-31.01
Rangareddy	-12.39	-8.12	-6.86	-14.58	-0.85	1.43	-2.55	7.99	-22.97
Srikakulam	-2.18	-2.54	-8.36	-5.82	-1.57	-9.57	-3.72	1.00	-30.12
Visakhapatnam	-4.32	-7.34	-20.87	-7.33	-5.36	-22.01	-3.15	2.11	-30.23
Vizianagaram	-4.98	-5.02	-13.00	-4.08	-4.72	-14.77	0.96	0.33	-30.61
Warangal	-14.89	-23.73	-11.62	-18.03	-27.45	-9.96	-3.70	-5.21	-41.92
West Godavari	10.55	0.00	0.00	10.04	0.00	0.00	-44.66	0.00	0.00
India	**-0.60**	**-1.60**	**-2.05**	**1.42**	**0.60**	**-1.72**	**2.09**	**2.18**	**0.33**

3.1.3. Finger millet

An examination of growth pattern of area, production and productivity of finger millet during the periods of 1980-90, 1990-00 and 1995-03 also revealed that the area was declining in all the districts and the country as a whole (Table 4). During the period of 1980-90, except Warangal (40.93) and Krishna (9.84), all other districts were losing area under finger millet. The highest negative growth rate can be seen in West Godavari (-24.45). The crop acreage continued to decline in the periods of 1990-00 and 1995-03 in all the districts except in Guntur, Khammam, Krishna, Kurnool, Nalgonda, Warangal and West Godavari. Negative trends were also observed in production and productivity of the finger millet in the state as a whole and at the country level (Fig 8). In case of productivity, there was a general decline in all the districts except in Mahabubnagar, Prakasam and Rangareddy.

Table 4. Compound growth rates (%) in area, production and productivity of finger millet in districts of Andhra Pradesh

District	Area			Production			Yield		
	1980-90	1990-00	1995-03	1980-90	1990-00	1995-03	1980-90	1990-00	1995-03
AP	-4.89	-5.64	-6.61	-4.43	-5.99	-7.23	0.48	-0.38	-0.67
Adilabad	0.00	0.00	-11.14	0.00	0.00	-10.17	15.72	-29.21	60.16
Anantapur	-8.93	-5.82	-6.15	-7.13	-5.26	-7.22	1.98	0.59	-1.14
Chittoor	-8.84	-5.41	-3.24	-8.65	-7.15	-6.25	0.21	-1.84	-3.09
East Godavari	-21.57	-3.71	-6.01	-19.45	-4.47	-6.94	2.73	-0.77	-21.28
Guntur	-8.65	8.47	-35.53	-6.32	-6.65	-32.49	2.59	-23.69	27.70
Kadapa	-14.01	-11.56	-2.12	-13.71	-13.31	-5.69	0.34	-1.98	-3.64
Karimnagar	0.00	0.00	0.00	1.91	0.00	0.00	23.38	-26.95	0.00
Khammam	-1.94	2.60	-3.26	-3.19	16.57	-3.26	-12.65	-23.71	-17.75
Krishna	9.84	19.46	-1.55	6.43	19.46	-1.55	-36.63	2.92	3.43
Kurnool	-8.55	16.88	-3.48	-7.37	10.48	-11.76	-21.73	-33.18	-2.46
Mahabubnagar	-1.65	-9.96	-9.90	0.08	-8.77	-6.30	1.76	1.33	4.01
Medak	-14.01	-23.08	-24.18	-16.25	-22.81	-18.40	-2.59	0.34	-16.00
Nalgonda	0.89	7.37	25.89	-1.52	9.87	46.78	-21.67	-42.32	-18.61
Nellore	-7.27	-15.02	-14.81	-6.87	-15.58	-18.04	0.43	-22.75	-3.77
Nizamabad	-18.40	-13.50	-6.60	-17.81	-4.62	-13.50	0.75	-29.03	4.26
Prakasam	-5.62	-11.16	-8.21	-3.88	-10.21	-6.82	1.84	1.06	1.49
Rangareddy	-3.26	0.67	-13.37	-0.52	1.87	-11.76	2.83	1.20	1.84
Srikakulam	-3.26	-13.26	-16.51	-3.34	-14.04	-17.97	-0.08	-0.90	-1.72
Visakhapatnam	0.01	-0.82	-2.93	-0.50	-0.65	-2.55	-0.52	0.16	0.40
Vizianagaram	-1.53	-4.74	-7.93	2.49	-5.17	-12.11	4.08	-0.46	-4.53
Warangal	40.93	17.81	0.00	44.82	18.70	0.00	-43.91	-34.87	0.00
West Godavari	-24.45	34.05	59.05	-24.76	23.28	81.91	-21.30	-27.65	-65.96
India	**-1.26**	**-3.21**	**-39.61**	**-0.35**	**-1.21**	**-3.01**	**0.92**	**2.05**	**-37.64**

Fig 6. Growth pattern in area under sorghum in AP(%)

1980-1990   1990-2000   1995-2003

- -1 to -5
- -5 to -10
- >-10
- 0
- >0
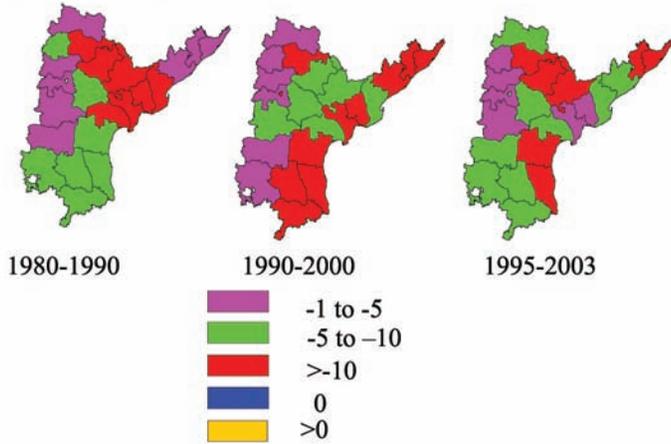
Fig 7. Growth pattern in area under pearlmillet in AP(%)

1980-1990   1990-2000   1995-2003

- -1 to -5
- -5 to -10
- >-10
- 0
- >0
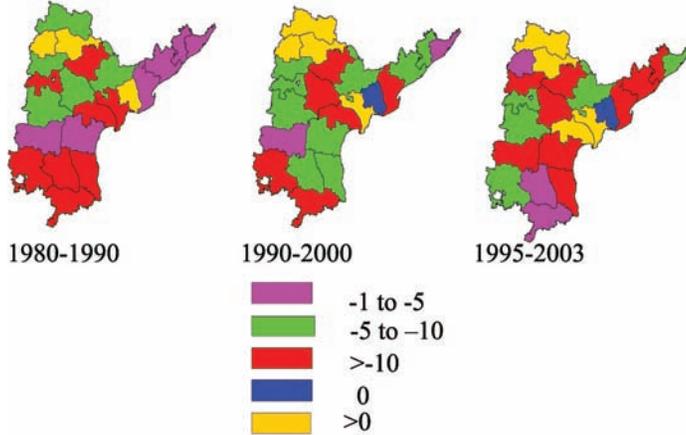
Fig 8. Growth pattern in area under finger millet in AP(%)

1980-1990   1990-2000   1995-2003

- -1 to -5
- -5 to -10
- >-10
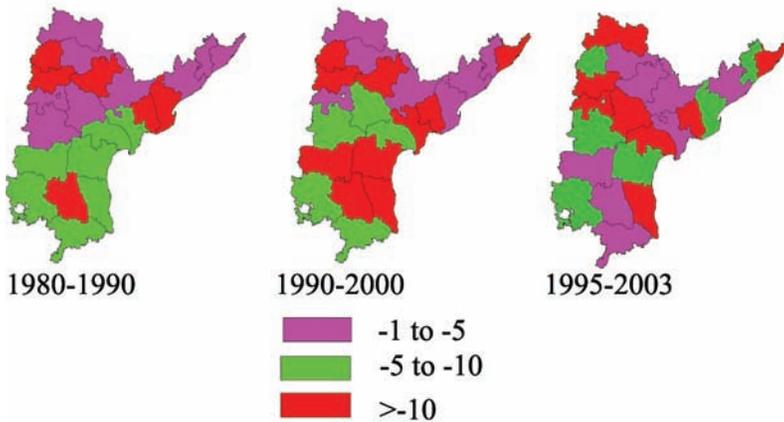
3.2. Marketing behaviour, Marketing channels and marketing efficiency

3.2.1 Sorghum

Marketing behaviour

Table 5 gives an outline of marketing behaviour of sorghum producers in Mahabubnagar district. As can be seen from the table, about 53 per cent of farmers sold the produce in the regulated market and 33 per cent sold in unregulated markets such as the local traders, traders in the proximity of the regulated market, commission agents. About 13 per cent of the farmers who grew sorghum did not sell their produce at all. However, inter-village differences were observed in the proportion of farmers selling their produce in regulated and unregulated markets. For example, the proportion of farmers selling in the regulated market was the highest (80%) in Gangapur and Jalalpur and the lowest (20%) in Chagadona as the latter was situated far away from the market. It is evident that regulated markets are attracting the farmers to sell their produce. It was observed that farmers would be paid immediately for their produce when sold in a regulated market. On the other hand, they had to wait for at least 15 days if they sold in the unregulated markets. Proximity to the market is another reason for the observed difference in the proportion of farmers selling the produce in the regulated markets.

Table 5. Proportion of farmers selling sorghum grain in regulated and unregulated markets in Mahabubnagar district

Particulars	Village					Total
	Boyapalle	Chagadona	Gangapur	Jalalpur	Venkeshwaram	
Regulated market	9(60.0)	3(20.0)	12(80.0)	12(80.0)	4(26.7)	**40(53.4)**
Unregulated market	3(20.0)	9(60.0)	3(20.0)	1(6.7)	9(60.0)	**25(33.3)**
No sale	3(20.0)	3(20.0)	0	2(13.3)	2(13.3)	**10(13.3)**
Total	**15 (100)**	**15 (100)**	**15 (100)**	**15 (100)**	**15 (100)**	**75 (100)**

Note: Figures in parentheses show percentage of total

Marketing channels

Based on interactions with farmers and market functionaries, the following channels were identified with reference to sorghum marketing in the study area.

Yellow (kharif) sorghum

Channel-I   :   Producers – Wholesalers – Consumers

Channel-II   :   Producers – Commission Agents - Wholesalers – Poultry units

Channel- III :   Producers – Middlemen/petty traders – Wholesalers – Poultry units

Channel-IV   :   Producers – Commission Agents – Wholesalers – Retailers – Consumers

Channel-V : Producers – Commission Agents - Wholesalers - Broker – Poultry units

White (rabi) sorghum

Channel-I : Producers – Wholesalers - Broker – Poultry units (white sorghum)

Channel-II : Producers - Commission Agents - Wholesalers – Retailers - Consumers

Out of the seven channels identified, two were found to deal with white sorghum grain, largely produced during post-rainy (*rabi*) season. The remaining five channels are dealing with yellow sorghum grain produced during the rainy (*kharif*) season. The white grain has a better consumer preference and receives a higher price premium. This is one of the reasons for the relatively better performance of *rabi* sorghum in terms of area sown over time. It was however also observed that some poultry units are also buying the white grain as a feed. The proportion of such use was not very high.

Price spread

The marketing costs, profit margins of producer–seller as well as other market functionaries were worked out and the details about the price spread per quintal of sorghum marketed through different channels are presented in Table 6.

It can be observed that the channel I was the shortest with least number of intermediary actors. Out of five channels existing for yellow sorghum, three channels are observed to reach livestock enterprises wherein the poultry firms and livestock units are the final consumers of the sorghum grain. Other two channels are catering to human consumption needs. The lowest consumer price (Rs.520.55/q) was observed for yellow grain when used as poultry feed (channel II). The net price received by the producer varied between Rs.385.90 to 490.5/q in different channels. The difference between the farmers' price and the consumers, price was found to be least in the shortest channel I (Rs.96/q) and highest in channel IV for yellow grain. The producer's share in consumers, rupee was highest in channel I (83.48%). The share of marketing costs in the consumers' rupee was highest in channel II (10.86%) and least in channel I (6.2%). The marketing margins accounted for as high as 28.28 per cent in channel IV, which amounted to Rs.221/q indicating the scope to enhance the farmers' price.

Unlike with yellow grain, only two marketing channels were found to exist for white sorghum, one catering to the needs of the livestock and the other to the human consumption. As expected, the consumer price was found to be lower (Rs. 832/q) in channel I which is serving the needs of poultry units as it is the low quality grain that is fed to poultry. The normal white grain is generally used for human consumption. Both marketing costs and margins were found to be high in channel II in absolute as well as relative terms.

Table 6 . Marketing costs, margins and price spread of sorghum grain in Mahabubnagar district (Rs/q)

Particulars	Channels						
	Yellow sorghum					White sorghum	
	I	II	III	IV	V	I	II
1 Price received by producer	500 (86.06)	455 (87.41)	465 (78.37)	525 (67.03)	420 (82.00)	720 (86.52)	750 (70.72)
Transport cost	15 (2.58)	13(2.50)	15(2.53)	15(1.92)	18(3.51)	15(1.80)	20(1.89)
2 CA's commission		18.2(3.50)		16.5(2.11)	12.6(2.46)		30(2.83)
Labour charges(cleaning, weighing, stitching, etc)		3(0.58)		3(0.38)	3.5(0.68)		3(0.28)
Net price received by producer	485 (83.48)	420.8 (80.84)	450 (75.84)	490.5 (62.62)	385.9 (75.34)	705 (84.75)	697 (65.72)
3 Petty traders/village merchants purchasing price			465 (78.37)				
Transport cost			16 (2.70)				
Gunny bag			15 (2.53)				
Labour charges			4 (0.67)				
Margin			35 (5.90)				
4 WS purchasing price	500 (86.06)	455 (87.41)	535 (90.17)	525 (67.03)	420 (82.00)	720 (86.52)	750 (70.72)
Transport cost		20(3.84)	20(3.37)	20(2.55)	30(5.86)	35(4.21)	40(3.77)
Labour charges	3 (0.52)	2 (0.38)	3(0.51)	3(0.38)	3(0.59)	4(0.48)	3(0.28)
Market cess	5(0.86)	4.55(0.87)	5.35(0.90)	5.25(0.67)	4.2(0.82)	7.2(0.87)	7.5(0.71)
Gunny bag	13(2.24)	14(2.69)	15(1.92)	15(2.93)	16(1.92)	15(1.41)	
Margin of WS	60(10.33)	25(4.80)	30(5.06)	30(3.83)	25(4.88)	30(3.60)	35(3.30)
5 Broker purchasing price					497.2 (97.07)	812.2 (97.60)	
Margin					15 (2.93)	20 (2.40)	
6 Retailer purchasing price				598.25 (76.38)			850.5 (80.20)
Transport cost				10(1.28)			10(0.94)
Margin				175(22.34)			200(18.86)
7 Consumer / Poultry units purchasing price	581 (100)	520.55 (100)	593.35 (100)	783.25 (100)	512.2 (100)	832.2 (100)	1060.5 (100)
8 Producer's share in consumer price (%)	83.48	80.84	75.84	62.62	75.34	84.72	65.72
9 Total marketing costs and margins	96 (16.52)	99.75 (19.16)	127.35 (21.46)	292.75 (37.38)	126.30 (24.66)	127.20 (15.28)	363.5 (34.28)
10 Marketing margins	60 (10.33)	43.2 (8.30)	65 (10.95)	221.5 (28.28)	52.6 (10.27)	50 (6.01)	265 (24.99)
11 Marketing costs	36.00 (6.20)	56.55 (10.86)	62.35 (10.51)	71.25 (9.10)	73.70 (14.39)	77.20 (9.27)	98.50 (9.28)

Therefore, it could be concluded that linking producer to wholesaler directly without commission agents / middlemen would be most beneficiary to producers as there is no processing or value addition involved in the supply chain. Purchase of grain from the farmers was most beneficial to wholesalers followed by direct purchase from commission agents/middlemen.

Marketing Efficiency

The efficiency of the different marketing channels was analyzed by estimating the composite index and Shepherd's index. The results of the same are presented in Table 7. Comparison of price spread of different channels indicated that the price spread was lowest in channels I of both yellow (Rs.96/q) and white grain (Rs. 127/q). Comparison of Composite index of different channels revealed that channel I (1.67) was found to be most efficient since it reflects linking producers directly to wholesalers without intermediaries. Comparison of Shepherd's index also indicated that channel I (6.05) was most efficient followed by channels II and III. In case of rabi (white) sorghum, channel I was found to be more efficient based on both the criteria.

Table 7. Marketing efficiency in different marketing channels for sorghum grain, Mahabubnagar district

Particulars	Channels						
	Yellow sorghum					White sorghum	
	I	II	III	IV	V	I	II
1 Composite Index							
Price Spread (Rs.)	96	99.75	127.35	292.75	126.3	127.2	363.5
Rank	1	2	5	6	3	4	7
Producer's share in consumer's rupee (%)	83.48	80.84	75.84	62.62	75.34	84.72	65.72
Rank	2	3	4	7	5	1	6
Share of total marketing cost(%)	16.52	19.16	21.46	37.38	24.66	15.28	34.28
Rank	2	3	4	7	5	1	6
Total score	5	8	13	20	13	6	19
Mean score	1.67	2.67	4.33	6.67	4.33	2.00	6.33
Rank	**1**	**2**	**3**	**4**	**3**	**1**	**2**
2 Shepherd's Index Method							
Consumer's price (Rs.)	581	520.55	593.35	783.25	512.2	832.2	1060.5
Price Spread (Rs.)	96	99.75	127.35	292.75	126.3	127.2	363.5
Shepherd's index	6.05	5.22	4.66	2.68	4.06	6.54	2.92
Rank	**1**	**2**	**3**	**5**	**4**	**1**	**2**

3.2.2 Pearl millet

Marketing behaviour

Table 8 indicates that about 34 per cent of the farmers sold their produce in village to consumers, who were not cultivating pearl millet for livestock feed. Nearly 39 and 24 per cent of the farmers sold their produce directly to wholesalers and village merchants, respectively. Only about 3 per cent farmers who had less market surplus sold the produce to retailers for their home consumption. It was observed that very few landless households were taking pearl millet in their daily diet.

Table 8. Number of farmers selling pearlmillet grain to different agencies in Prakasam district

Agencies	Villages selected					
	Chakirala	Idupur	Mallavaram	Thurimella	Y.O.Palli	Total
1 Non-growing farmers	5 (35.71)	3(23.08)	7(46.67)	5(35.71)	4(28.57)	**24(34.29)**
2 Traders/wholesalers	3(21.43)	5(38.46)	8(53.33)	5(35.71)	6(42.86)	**27(38.57)**
3 Village merchants / middlemen	6(42.86)	3(23.08)	0	4(28.57)	4(28.57)	**17(24.29)**
4 Retailers in Village / *Kirana* shops	0	2(15.38)	0	0	0	**2(2.86)**
Total	**14(100)**	**13(100)**	**15(100)**	**14(100)**	**14(100)**	**70(100)**

Marketing channels

Based on the interactions with farmers and market functionaries, the following channels were identified in marketing of pearl millet in Prakasam district.

I.   Farmer – Wholesaler – Broker – Poultry Firms

II.   Farmer – Middleman – Wholesaler – Retailer – Consumer

III.   Farmer – Wholesaler – Poultry Firms

IV.   Farmer – Middleman – Wholesaler – Poultry Firms

V.   Farmer – Retailer – Consumer

VI.   Farmer – Consumer

Out of the six channels identified, channels I, III and IV were found to be feeding to poultry units and remaining three channels catering to human consumption. The relative importance of these channels as represented by the number and proportion of farmers is given in table 9. It can be observed from the table that only a few farmers were selling their produce to village merchants and retailers operating in the selected villages. Most of the intermediaries were selling the produce in coastal districts in Andhra Pradesh where the demand for the pearl millet grain for poultry feed was high. Discussions with various players in the market led to an observation that nearly 90 per cent of pearl millet grain was used as poultry feed and the remaining 10 per cent as cattle feed. The grain was also being exported to Tamilnadu.

Table 9. Number of farmers selling pearl millet grain in different channels

Ch No.	Channels	Villages selected					Total
		Chakirala	Idupur	Mallavaram	Thurimella	Y.O.palli	
I.	Farmer-Wholesaler Broker-Poultry Firms	0	1(7.69)	5(33.33)	3(21.43)	3(21.43)	12(17.14)
II	Farmer -Village Merchants Middleman - Wholesaler Retailer – Consumer	1(7.14)	0	0	4(28.57)	0	5(7.14)
III	Farmer -Wholesaler - Retailer – Consumer	3(21.43)	4(30.77)	3(20.00)	2(14.29)	3(21.43)	15(21.43)
IV	Farmer - Middleman - Wholesalers - Poultry Firms	4(28.57)	4(30.77)	0	0	4(28.57)	12(17.14)
V	Farmer-Retailer-Consumer	1(7.14)	1(7.69)	0	0	0	2(2.86)
VI	Farmer-Non-growing Farmers	5(35.71)	3(23.08)	7(46.67)	5(35.71)	4(28.57)	24(34.29
	Total	14(100)	13 (100)	15 (100)	14(100)	14(100)	70(100)

Price spread

Price spread refers to the difference between the price paid by the consumer and the price received by the producer for an equivalent quantity of the product. This spread consists of market cost and commission as profit for traders. In order to have clear picture of marketing, price spread, producer's share in consumer's rupee and marketing efficiency of different channels were worked out for pearl millet in Prakasam district and presented in the table 10.

As can be observed from the table, channel VI was the shortest as the producers were selling to the consumers directly. Channels II and IV were found to be more lengthy with relatively larger number of functionaries involved before the grain reaches the final consumers. As far as the producer is concerned, channel V was found to be more remunerative with highest net price (Rs.485/q). The producer's share in consumers' rupee was least in channel II (69.3%) and highest in channel VI (100%). The price spread, the sum of marketing margins and marketing costs, was found to be highest in channel II (Rs.194.5/q) out of which marketing margins were as high as Rs.105/q. Involvement of a larger number of intermediaries without commensurate value addition was the main reason for the higher marketing costs and margins. Most of the marketing costs were towards transport and labour charges rather than for any processing. Such high price spreads if avoided can translate into better profits for farmers without adding cost to the consumers.

Table 10. Marketing costs and margins in different channels of pearl millet marketing in Prakasam district (Rs/q)

S. No.	Particulars	Channel					
		I	II	III	IV	V	VI
1	Price received by producer	455 (82.80)	440 (69.33)	460 (81.47)	460 (79.32)	500 (78.74)	450 (100)
	Transport cost, etc.	15 (2.73)				15 (2.36)	
	Net price received by producer	440 (80.07)	440 (69.33)	460 (81.47)	460 (79.32)	485 (76.38)	450 (100)
2	Middleman/village merchant purchasing price		440 (69.33)		460 (79.32)		
	Labour charges (cleaning, weighing, stitching, etc)		10 (1.58)		10 (1.72)		
	Margin/commission		15 (2.36)		20 (3.45)		
3	Wholesaler purchasing price	455 (82.80)	465 (73.27)	460 (81.47)	490 (84.50)		
	Transport cost	35 (6.37)	40 (6.30)	45 (7.97)	40 (6.90)		
	Labour charges (cleaning, weighing, stitching, etc)	5 (0.91)	5 (0.79)	10 (1.77)	5 (0.86)		
	Market cess (1%)	4.55 (0.83)	4.65 (0.73)	4.6 (0.81)	4.9 (0.84)		
	Gunny bag	20 (3.64)	20 (3.15)	20 (3.54)	20 (3.45)		
	Margin of Wholesaler	20 (3.64)	15 (2.36)	25 (4.43)	20 (3.45)		
4	Broker purchasing price	539.55 (98.19)					
	Margin	10 (1.82)					
5	Retailer purchasing price		549.65 (86.61)		500 (78.74)		
	Transport cost		10 (1.58)				
	Gunny bag					15 (2.36)	
	Margin		75 (11.82)			120 (18.90)	
6	Consumer / Poultry firms purchasing price	549.50 (100)	635.65 (100)	564.6 (100)	579.9 (100)	635 (100)	450 (100)
7	Market efficiency (%)	401.64	226.05	439.77	383.65	323.33	0
8	Producer's share in consumer price	80.07	69.33	81.47	79.32	76.38	100.00
9	Total marketing cost	79.55 (14.48)	89.65 (14.13)	79.6 (14.10)	79.9 (13.78)	30 (4.72)	0.00
10	Total margins	30 (5.46)	105 (16.54)	25 (4.43)	40 (6.90)	120 (18.90)	0.00
11	Total marketing costs and margins (9+10)	109.55 (19.94)	194.65 (30.67)	104.6 (18.53)	119.9 (20.68)	150 (23.62)	0

Marketing efficiency

Marketing efficiency is directly related to the cost involved to move goods from producer to consumer and nature of services provided as desired by the consumers. Composite Index and Shepherd's Index were used to estimate the marketing efficiency in different marketing channels and one given in the table11.

It can be observed from table11 that the channel III (Rank 1) has the highest marketing efficiency among the all channel bored on both composite and sphepherd indies. For assessing the marketing efficiency, channel VI was excluded as it involved no intermediaries and no other marketing activities. The price spread was low (18.53%) compared to other channels because of elimination of intermediaries. It was observed that the channel III to be shortest channel where producer sold his produce directly to the wholesaler.

Table 11. Market efficiency in different marketing channels for pearl millet grain in Prakasam district

	Particulars	I	II	III	IV	V
1	**Composite Index**					
	Price Spread (Rs.)	109.55	194.65	104.6	119.9	150
	Rank	2	5	1	3	4
	Producer's share in consumer's rupee	80.07	69.33	81.47	79.32	76.38
	Rank	2	5	1	3	4
	Share of total marketing cost (%)	19.94	30.67	18.53	20.68	23.62
	Rank	2	5	1	3	4
	Total score	6	15	3	9	12
	Mean score	2.00	5.00	1.00	3.00	4.00
	Rank	**2**	**5**	**1**	**3**	**4**
2	**Shepherd's Index Method**					
	Consumer's price (Rs.)	549.5	634.65	564.6	579.9	635
	Price Spread (Rs.)	109.55	194.65	104.6	119.9	150
	Shepherd's Index	5.02	3.26	5.40	4.84	4.23
	Rank	**2**	**5**	**1**	**3**	**4**

3.2.3 Finger millet

Marketing behaviour

A look into the marketing behaviour of finger millet farmers indicates that about 64 per cent of farmers sold their produce in the weekly market (shandy) through middlemen (Table 12). Nearly 19 per cent of the producers sold in village to non-growers of finger millet or landless consumers. Remaining 17 per cent of producers sold at retail shops for their home needs whenever they wanted. Selling in regulated markets was completely absent in selected villages.

Table 12. Proportion of producers selling finger millet grain to different agencies in Visakhapatnam district

Co de.	Buyers	Villages					
		Chompi	Jarrela	K.Valasa	Aradakota	Minumulur	**Total**
1	Middlemen in weekly market/ Petty traders	7 (63.64)	8 (72.73)	6 (66.67)	7 (58.33)	6 (60.00)	**34 (64.15)**
2	Non-growing farmers/ Consumer	2 (18.18)	1 (9.09)	3 (33.33)	3 (25.00)	1 (10.00)	10 **(18.87)**
3	Retailers / *Kirana* shops in village	2 (18.18)	2 (18.18)	0	2 (16.67)	3 (30.00)	9 **(16.98)**
	Total	11 (100)	11 (100)	9 (100)	12 (00)	10 (100)	53 **(100)**

Marketing channels

The following channels were identified for disposal of finger millet in the study area.

1. Producer – Middlemen / Petty traders - Wholesalers - Retailer – Consumer
2. Producer – Middlemen / Petty traders - Wholesalers - Broker - Poultry firms
3. Producer – Retailer – Consumer
4. Producer – Middlemen / Petty traders - Wholesalers – Poultry firms
5. Producer – Wholesaler – Poultry firms
6. Producer – Consumer

Out of six channels, three channels were identified for poultry feed and remaining dealing with human consumption purpose. It was observed that most of the intermediaries were selling the produce outside the district and coastal states like Orissa and West Bengal. Price spread and marketing efficiency were not analysed in those cases.

Price spread

The marketing costs and margins were worked out and details about the price spread for one quintal of finger millet marketed through different channels are presented in table 13.

It can be observed that the channels II, IV and V were reaching poultry firms as the final consumers of the finger millet. The other three channels were catering to human consumption needs. The analysis presented in table 13 reveals that the channels VI and IV had lowest consumer price of Rs.420 and Rs.539.73 respectively. The producer's share in the consumer's rupee was 100 per cent and 79.45 per cent in channels VI and V respectively whereas the producer's share was least in channel I (57.51%) and Channel III (68.64%) because of high transport cost and margins involved in channels III and I.

Table 13. Marketing efficiency, costs, margins and price spread in finger millet marketing in Visakhapatnam district (Rs/q)

S. No.	Particulars	Channel					
		I	II	III	IV	V	VI
1.	Price received by producer	410 (58.95)	425 (75.13)	415 (70.34)	430 (79.67)	450 (82.19)	420 (100.0)
	Transport cost	10 (1.44)	15 (2.65)	10 (1.69)	10 (1.85)	15 (2.74)	
	Net price received by producer	400 (57.51)	410 (72.48)	405 (68.64)	420 (77.82)	435 (79.45)	420 (100.0)
2.	Weekly market/Petty traders purchasing price	410 (58.95)	425 (75.13)		430 (79.67)		
	Labour charges (cleaning, weighing, stitching etc.)	2 (0.29)	2(0.35)		3 (0.56)		
	Transport cost	10 (1.44)	15 (2.65)		10 (1.85)		
	Margin / commission	30 (4.31)	25(4.42)		30(5.56)		
3.	Wholesaler purchasing price	452 (64.99)	467 (82.56)		473 (87.64)	450 (82.19)	
	Transport cost	40 (5.75)	30 (5.30)		20 (3.71)	40 (7.31)	
	Labour charges	2 (0.29)	3 (0.53)		2 (0.37)	3 (0.55)	
	Market cess	4.52 (0.65)	4.67 (0.83)		4.73 (0.88)	4.5 (0.82)	
	Gunny bag	15 (2.16)	16 (2.83)		15 (2.78)	15 (2.74)	
	Margin of WS	25 (3.59)	30 (5.30)		25 (4.63)	35 (6.39)	
4.	Brokerage		15 (2.65)				
5	Retailer purchasing price	538.52 (77.43)	415 (70.34)				
	Transport cost	5 (0.72)					
	Gunny bag			15 (2.54)			
	Labour charges	2 (0.29)					
	Margin	150 (21.57)		160 (27.12)			
6	Consumer / Poultry firms purchasing price	695.52 (100.0)	565.67 (100.0)	590.0 (100.0)	539.73 (100.0)	547.5 (100.00)	420 (100.0)
7	Total market cost and margins	295.52 (42.49)	155.67 (27.52)	185.0 (31.36)	119.73 (21.18)	112.5 (20.55)	0
8	Market efficiency (%)	135.35	263.38	218.92	350.79	386.67	0
9	Producer's share in consumer price	57.51	72.48	68.64	77.82	79.45	100
10	Total marketing costs	90.52 (13.01)	85.67 (15.14)	25 (4.24)	64.73 (11.99)	77.50 (14.16)	0.00
11	Total marketing margins	205 (29.47)	70 (12.37)	160 (27.12)	55 (10.19)	35 (6.39)	0.00

The lowest consumer price (Rs.539.7) for finger millet grain was observed when used as poultry feed and the higher consumer prices were Rs.695.52 and Rs.590 as consumption because the retailers earned more margins. Retailers' margins were as high as Rs.150 and Rs.160/q in channel III and I, respectively. The difference between the farmer's price and the consumer's was observed to be least in the shortest channel V (Rs.112.5/q) and highest in channel I (Rs.295.52). The price spread was higher in Channel I (42.49%) as compared to Channel V (20.55%) due to elimination of middlemen in the latter channel. The total marketing margins ranged from 6.39 per cent (Channel V) to 29.47 per cent (Channel I) and 27.12 per cent (Channel III) because retailers earned more margins in consumer rupee in channels I and III.

Marketing efficiency

Comparison of marketing efficiency of different channels indicated that the efficiency was highest in channels V (386.67%) and IV (350.79%) and lowest in channels channel I (135.35%) (Table 13). Channel V was found to be most efficient since it reflects linking producers directly to wholesalers to consumer without intermediaries. So it indicated that channel V was most efficient followed by channels I and III where intermediaries and high margins were involved.

3.3. Determinants of area under coarse cereals

A number of factors influence the farmers' decision to grow different crops and the extent to which those crops are grown. Profitability is one of the most important factors that determine the cropping pattern and investment behaviour of the farmers. Since the crops under consideration are food crops, the family size and livestock endowments will also have a bearing on farmers' cropping decisions. Access to irrigation, farm size and human capital related variables such as age, education are some of the important factors. Biophysical factors such as rainfall, soil type are also relevant as they limit or expand the cropping choices. These factors are analysed here.

3.3.1 Relative profitability

In the selected villages the area under sorghum ranged from 10 to 15 per cent of the cropped area. In one of the villages where the black soils are more dominant, *rabi* sorghum is more popular. In all the four other villages kharif sorghum dependent on monsoon rains is more popular. The *rabi* sorghum is grown on stored moisture and is generally sown as the south-west monsoon withdraws. The net returns expressed as gross margin, from sorghum cultivation on an average were found to be about Rs.3375/ha and were found to be lower than those of groundnut, maize and castor, which were found to be replacing sorghum (Table 14). Castor is also one of the important crops that compete with sorghum, especially when the monsoon rains are delayed. A number of farmers also rotate sorghum with castor on a given piece of land. Farmers are also growing cotton as a cash crop in spite of its highly variable performance. During the year of study, the net returns from cotton were found to be as low as Rs. 884/ha.

It can be further observed from the table that the investment made on sorghum is the lowest among all the crops. Groundnut, maize, sunflower and rice maize were found to be more profitable crops in terms of size and rate of return. Both the net returns and the benefit-cost ratio were higher for the crops. Cotton is the most input-intensive crop as shown by the highest cost of cultivation (Rs. 22408/ha) and is as such a risky crop.

Table 14 : Profitability of sorghum and other crops in Mahabubnagar district, 2005-06 (Rs/ha)

Crops	Gross returns	Cost of cultivation	Net returns	BCR
Sorghum	12158	8783	3375	1.38
Groundnut	23700	14170	9530	1.67
Maize	23025	13695	9333	1.68
Castor	13212	9237	3974	1.40
Cotton	22408	21520	888	1.04
Rice	26533	14566	11967	1.82
Pigeonpea	13089	7778	5311	1.68
Sunflower	20585	11433	9152	1.80

In Prakasam district, pearl millet is the least profitable crop as is evident from the lowest net returns to variable costs (Table 15). In this district, chillies and rice were found to be most profitable crops followed by sunflower and tobacco. However, growing restrictions on tobacco were yielding place for other crops such as sunflower and pigeonpea. The strong demand for pearl millet grain for poultry feed is an important reason for the significance of pearl millet in the cropping pattern in these selected villages.

Table 15. Profitability of pearl millet and other crops in Prakasam district, 2005-06 (Rs/ha)

Crops	Gross returns	Cost of cultivation	Net returns	BCR
Pearl millet	10541	9466	1075	1.11
Rice	34054	16576	17478	2.05
Pigeon pea	12797	11025	1772	1.16
Chillies	39987	16689	23303	2.40
Sunflower	15463	8907	6556	1.73
Tobacco	28348	22434	5914	1.26

In contrast to the situation of sorghum and pearl millet, the profitability of finger millet is not as bad (Table 16). It is the most profitable crop with net returns of Rs. 2623/ha after rice (Rs.4497/ha) and pigeonpea (Rs.3802/ha). The profitability of other important crops like dry rice and *samai* is much less and farmers are growing these crops just for subsistence reasons or because of other bio-physical constraints.

Table 16. Profitability of finger millet and other crops in Visakhapatnam district, 2005-06 (Rs/ha)

Crops	Gross returns	Cost of cultivation	Net returns	BCR
Finger millet	6276	3653	2623	1.72
Rice	9753	5257	4497	1.86
Dry rice	6528	4973	1555	1.31
Samai	1695	1558	136	1.09
Niger	5750	3852	1898	1.49
Pigeonpea	6930	3128	3802	2.22

3.3.2 Area determinants – regression analysis

In order to examine the factors that influence production of coarse cereals , the area under the crop was regressed on a set of independent variables that are expected to influence the farmer's decision to grow sorghum. The variables included in the regression were family size (expressed in terms of male adult units), farm size in ha, bovine population (expressed in terms of adult cattle units), percent area under irrigation, and farmer's age and years of schooling. Further, dummy variables for the villages are also included to capture the village-specific environment that might influence the area put to these crops. The estimated regression equation is presented in table 17.

Table 17. Regression analysis of factors affecting area under coarse cereals

Variable	Sorghum (n=75)	Pearl millet (n=75)	Finger millet (n=75)
Constant	2.143	0.478	0.234
Age	-0.056	0.015	0.021*
Education	-0.200*	0.033	0.025
Family size	0.323*	0.107	0.284*
Secondary occupation	-0.260*	-0.171	-0.222
Farm size	0.237**	0.024	0.274**
Irrigated area %	-0.006*	-0.017*	-0.007*
Livestock	0.011*	0.067	-0.095*
Dummy for village 1	1.853**	2.604**	-0.550*
Dummy for village 2	0.995*	1.571**	-0.669**
R^2	0.57	0.57	0.55

As can be seen from the table, the variables included in the model collectively explained about 57% of variation in the area put to sorghum. It was hypothesized that the area sown to sorghum by a household would be determined by the family size, consumption needs (family size), fodder requirements (number of livestock owned) and the rainfall pattern and the soil parameters.The soil and climatic parameters were represented through dummy variables for each village. Since the

sample included data from five villages, four village dummies were included. The results showed that farm size had a significantly positive effect on the area sown to sorghum. Similarly, the as the family size gets bigger and bigger, the area under sorghum increased as shown by a positive coefficient. The number of bovines was found to exert a positive influence on the sorghum area. As the number of bovines increased by one, the area under sorghum increased by 0.01 ha. Among other variables included in the model, education of the farmer was found to have a significantly negative impact on the area under sorghum. The importance of rainfall behaviour and soil parameters in determining the area under sorghum was also well reflected in the significant coefficients for two villages (village 3 and 4). In one of these villages, black soils dominate and rabi sorghum is popular. Thus, the area under sorghum is more determined by the family consumption needs and livestock needs and the existing soil and monsoon conditions rather than any profit motivation. It was also observed that crops such as maize, castor and cotton are replacing sorghum. When the monsoon rains are delayed, the area under castor tends to increase drawing area away from sorghum as the latter suffers from heavy pest infestation if sown late.

The regression analysis for area under pearl millet showed that only the village specific biophysical characteristics and the extent of irrigated area had a significant influence on the area under pearl millet. Farmers with access to irrigation grew less of this coarse cereal as they could grow more of rice and chillies which help them meet both their food and cash needs. The endowment of livestock resources was found to have a positive but non-significant relationship. The variables included in the study explained about 57% of variation indicating the goodness of fit.

As in case of other two coarse cereals, the regression equation for finger millet area accounted for about 55% of variation. A combination of farmer specific socioeconomic, farm-related and village specific variables were found to significantly influence the area under finger millet in Visakhapatnam district. As is evident, older farmers tended to grow more of this crop indicating the preference for food security. Similarly, the family size was found to have a positive coefficient indicating the effect of food requirements of a bigger family behind the larger area sown to finger millet. The negative coefficient for the livestock endowment reflects the fact that farmers would not use this as fodder and farmers with livestock prefer to grow more of rice and other cereals. In two of these villages, commercial crops such as tapioca and cashew are popular because of the terrain and climate which is reflected in the negative coefficient for these villages.

3.3.3 Why do farmers grow coarse cereals?

These results are further complemented by the feed back from the farmers as to why they were growing these coarse cereals. In case of sorghum, a large number of farmers mentioned rainfall behaviour as the most important reason for growing the crop (Table 18). Other two important reasons were the livestock and family consumption needs with 11 and 5 farmers raking these factors most important. Sorghum was not considered as a more profitable crop as is evident from the fact that no farmer gave this first two ranks. The results are not much different for other two crops as well (Tables 19 and 20). Thus, rainfall pattern and consumption needs of family and fodder requirements of livestock are the most important factors that determine the production of coarse cereals.

Table 18. Reasons for cultivating of sorghum as expressed by farmers (n=75)

Reason	Rank frequency								
	1	2	3	4	5	6	7	8	9
Soil suitability	2 (2.67)	1 (1.33)	4 (5.33)	3 (4.0)	10 (13.33)	15 (20.0)	20 (26.67)	18 (24.0)	2 (2.67)
Demand for product	0	1 (1.33)	4 (5.33)	13 (17.33)	17 (22.67)	22 (29.33)	12 (16.0)	6 (8.0)	0
Suitable environment	0	0	1 (1.33)	6 (8.0)	9 (12.0)	13 (17.33)	18 (24)	22 (29.33)	6 (8.0)
High local consumption	0	2 (2.67)	12 (16.0)	23 (30.67)	26 (34.67)	8 (10.67)	4 (5.33)	0	0
Profitable crop	0	0	1 (1.33)	2 (2.67)	5 (6.67)	11 (14.67)	17 (22.67)	22 (29.33)	17 (22.67)
For fodder purpose	11 (14.67)	19 (25.33)	25 (33.33)	9 (12.0)	0	2 (2.67)	2 (2.67)	5 (6.67)	2 (2.67)
Home consumption only	5 (6.67)	4 (5.33)	4 (5.33)	9 (12.0)	5 (6.67)	2 (2.67)	0	0	46 (61.33)
Rainfall	25 (33.33)	26 (34.67)	14 (18.67)	6 (8.0)	2 (2.67)	1 (1.33)	1 (1.33)	0	0
Home consumption+ sale	32 (42.67)	22 (29.33)	10 (13.33)	4 (5.33)	1 (1.33)	1 (1.33)	1 (1.33)	2 (2.67)	2 (2.67)

Table 19. Reasons for cultivating of pearl millet as expressed by farmers (n=75)

Reason	Rank frequency								
	1	2	3	4	5	6	7	8	9
Soil suitablility	0	4 (5.33)	7 (9.33)	21 (28.0)	10 (13.33)	14 (18.67)	11 (14.67)	5 (6.67)	3 (4.0)
Demand for product	0	1 (1.33)	10 (13.33)	10 (13.33)	22 (29.33)	15 (20.00)	8 (10.67)	8 (10.67)	1 (1.33)
Suitable environment	0	0	13 (17.33)	9 (12.00)	10 (13.33)	12 (16.0)	11 (14.67)	11 (14.67)	9 (12.0)
High local consumption	0	1 (1.33)	5 (6.67)	9 (12.0)	7 (9.33)	17 (22.67)	17 (22.67)	11 (14.67)	8 (10.67)
Profitable crop	0	0	0	2 (2.67)	5 (6.67)	6 (8.0)	13 (17.33)	29 (38.67)	0 (26.67)
For fodder purpose	1 (1.33)	3 (4.0)	5 (6.67)	8 (10.67)	8 (10.67)	6 (8.0)	13 (17.33)	10 (13.33)	21 (28.0)
Home consumption + Sale	17 (22.67)	23 (30.67)	15 (20.0)	8 (10.67)	4 (5.33)	3 (4.0)	0 0	1 (1.33)	4 (5.33)
Rainfall	47 (62.67)	27 (36.0)	0	1 (1.33)	0	0	0	0	0
Livestock purpose	10 (13.33)	16 (21.33)	20 (26.67)	7 (9.33)	9 (12.0)	2 (2.67)	2 (2.67)	0 0	9 (12.0)

Table 20. Reasons for cultivating of finger millet as expressed by farmers (n=75)

Reason	Rank frequency									
	1	2	3	4	5	6	7	8	9	Total
Soil suitability	0	0	0	10 (13.33)	13 (17.33)	21 (28)	20 (26.67)	7 (9.33)	4 (5.33)	75 100
Demand for product	0	1 (1.33)	1 (1.33)	19 (25.33)	27 (36)	21 (28)	4 (5.33)	2 (2.67)	0	75 100
Suitable environment	0	0	4 (5.33)	6 (8)	13 (17.33)	19 (25.33)	18 (24)	10 (13.33)	5 (6.67)	75 100
High local consumption	0	2 (2.67)	23 (30.67)	28 (37.33)	13 (17.33)	3 (4)	4 (5.33)	2 (2.67)	0	75 100
Profitable crop	0	0	0	5 (6.67)	5 (6.67)	9 (12)	14 (18.67)	36 (48)	6 (8)	75 100
For fodder purpose	0	0	4 (5.33)	1 (1.33)	1 (1.33)	1 (1.33)	7 (9.33)	7 (9.33)	54 (72)	75 100
Sale purpose	15 (20)	13 (17.33)	18 (24)	5 (6.67)	1 (1.33)	1 (1.33)	8 (10.67)	10 (13.33)	4 (5.33)	75 100
Rainfall	42 (56)	31 (41.33)	2 (2.67)	0	0	0	0	0	0	75 100
Home consumption only	17 (22.67)	29 (38.67)	27 (36)	2 (2.67)	0	0	0	0	0	75 100

Figures in parentheses indicate percent to total

3.4. Long term growth in yield and prices of coarse cereals – policy effects

Two important areas of policy that influence production are technology generation enhancing productivity and the prices determining relative profitability. On both these counts, the coarse cereals appeared to suffer as evident from the slower rates of growth in productivity as well as farm harvest prices.

The long term growth in farm harvest prices (FHP) and yield of coarse cereals in AP was examined with a view to look at the trends in gross income from these crops (Fig 9-13). The growth rates were estimated for the period 1975-2003. It was observed that the yield and FHP of sorghum increased at an annual rate of 1.7 and 7.2%, respectively during this period, which meant that the gross income from sorghum increased at a rate of about 8.9%. The gross income from pearl millet increased at a rate of 9.1%, which was also largely driven, by the increases in FHP (7.4%). The rate of growth was particularly low in the yields of finger millet, which was only 0.5%. During this period, the yield and FHP of rice increased at 2.1 and 7.5%, respectively.

Fig. 9. Farm Harvest Prices of different crops in Mahabubnagar district, 1980-2004
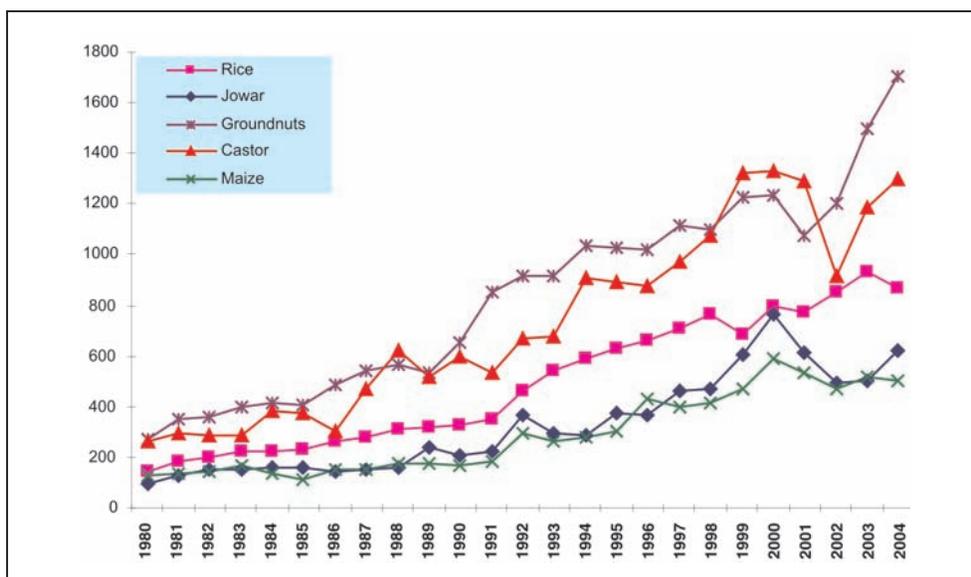
Fig. 10. Farm Harvest Prices of different crops in Prakasam district, 1980-2004
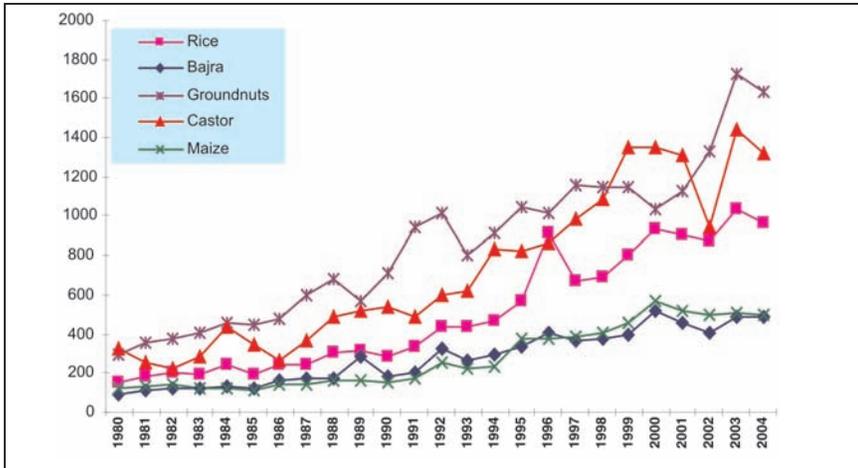
Fig. 11. Farm Harvest Prices of different crops in Visakhapatnam district, 1980-2004
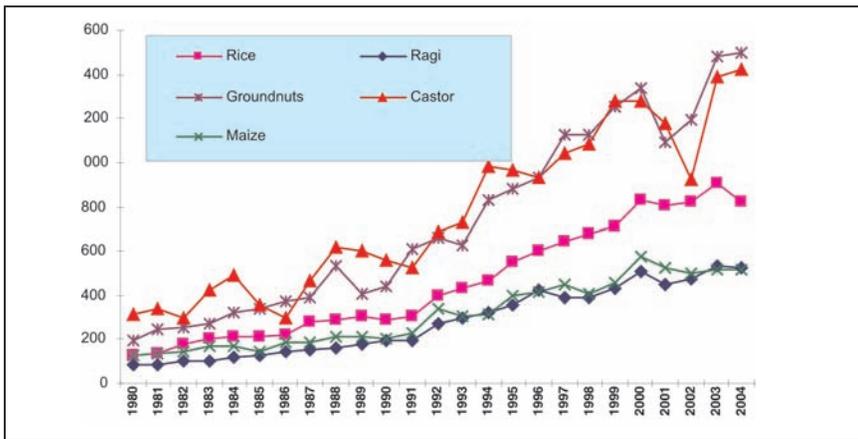
Fig. 12. Trends in farm harvest prices of cereals in Andhra Pradesh, 1975-2004
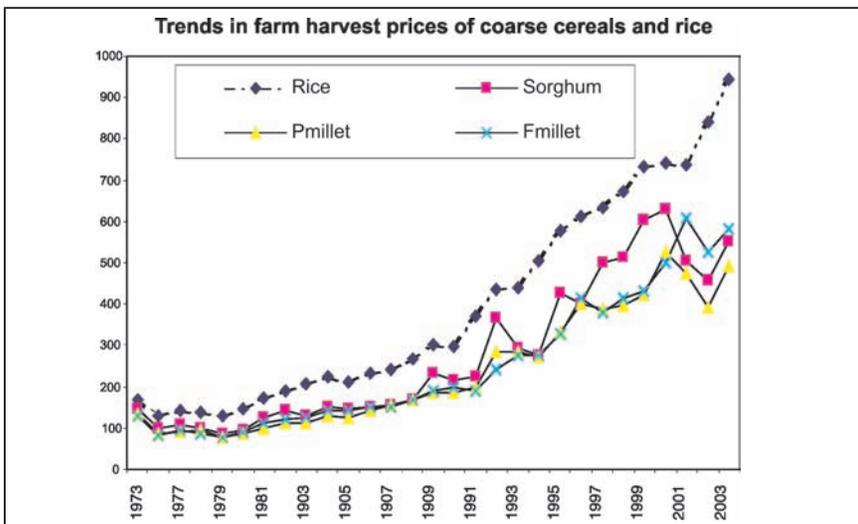
Fig. 13. Productivity trends of coarse cereals in Andhra Pradesh, 1975-2004
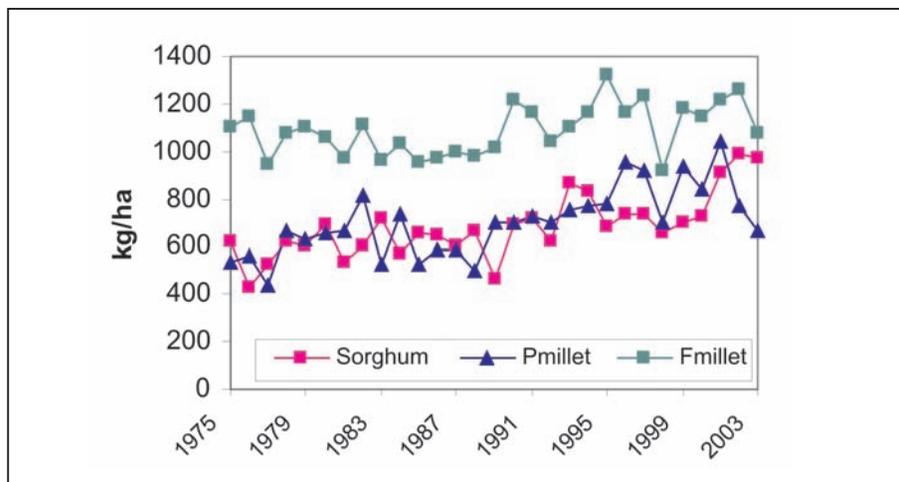
A look into the recent past (1995-2003) showed that the FHP of sorghum, pearl millet and finger millet increased at a rate of 5.5, 2.7 and 3.6%, respectively as against 6.9% in case of rice. The yield of pearl millet and finger millet declined at a rate of 1.4 and 0.7% respectively during this period. Thus, the profitability of the coarse cereals as shown by the trends in gross income declined over time. The relative performance of these cereals vis-à-vis rice also declined over time. Thus, cultivation of the coarse cereals became even less attractive in the new economic environment that characterizes the recent past.

Another policy that adversely affected the demand for coarse cereals is that regarding the public distribution system. With the supply of rice through PDS at highly subsidized prices, the consumption demand for these coarse cereals declined drastically which was very well reflected in the consumption patterns observed by NSSO. It was observed that the per capita real expenditure on cereal consumption declined since 1970 with the rate of decline faster during the 1990. What is more alarming is that even the rate of growth in non-cereal consumption slowed down during the period after 1990. The rate of decline in consumption of coarse cereals was expected to be even steeper. This situation is more pronounced since the mid 1980s in Andhra Pradesh when the government started to supply rice at Rs2/kg through the PDS.

During the mid 1980s, the Technology Mission on Oilseeds was launched with a view to boost the oilseed production in the country. This mission resulted in transfer of large acreage to oilseed crops such as sunflower in Andhra Pradesh as the relative profitability of these crops improved vis-à-vis the coarse cereals. Further, this period also marked a significant growth in the irrigation, especially bore well irrigation, spurred by the favourable credit flow and electricity pricing policies. All this contributed to the production and productivity growth of rice (That this growth could not be sustained beyond the mid 1990s is a different matter). Thus, the coarse cereals lost significant area. The loss of area at the household level was reflected in smaller marketed surplus which makes the transaction costs of marketing (in a

regulated market) unattractive which is reflected in the arrivals at different regulated markets.

4.0 Summary and conclusions

An analysis of spatio-temporal changes in production of coarse cereals, viz., sorghum, pearl millet and finger millet, showed that the crops lost area significantly in all the districts during 1980-05 with an occasional exception. There was some growth in area sown to pearl millet in Krishna and Prakasam in the recent period. The productivity growth also slowed down in the recent past (1995-03). The producers and consumers of coarse cereals are connected through a variety of marketing channels and there were significant price spreads between the net farmers' price and the consumers' price. A significant portion of the marketed grain is reaching the livestock units, particularly poultry units, indicating the consumption demand as feed rather than as food. There was no commensurate value addition during the marketing course which indicates that farmers' share in the consumer rupee can be maximized by minimizing the presence of middlemen. Because of a variety of reasons such as low marketed surplus, long distance, exploitation by the middlemen and agents, etc. not all the farmers were selling their produce in the APMCs set up by the government. Selling in APMC is least in case of pearl millet and finger millet. Non-price factors such as family size, farm size, fodder requirement, rainfall seemed to be more important in determining the area sown to these crops. The cultivation of these crops is not as profitable as that of other crops and hence are replaced by crops like sunflower, maize, groundnut, castor, cotton, etc. Declining consumption demand for these grains, partly due to supply of rice through PDS at cheaper prices, is the most important impediment to the investment in production of these crops. Since declining consumption demand is a major impediment to realizing higher prices, it is necessary to explored. Similarly inclusion of these grains in the public distribution system for a short duration in a year can enhance the demand. The low productivity levels also resulted in low marketed surpluses at household level making the transaction costs high which was reflected in the marketing behaviour of farmers. The performance of coarse cereals is relatively poor in terms of growth in productivity and farm harvest prices in relation to those of rice indicating the eroding profitability and policy bias against these crops.

Seasonal variations in arrivals and prices of pearlmillet at the regulated market in Kanigiri, Prakasam district

Seasonal variations in arrivals and prices of pearlmillet at the regulated market in Darsi, Prakasam district

Fig 10. Seasonal variations in arrivals and prices of pearl millet in different regulated markets in Prakasam district

Seasonal variations in arrivals and prices of finger millet at the regulated market in Vizianagaram

Seasonal variations in arrivals and prices of finger millet at the regulated market in Paderu, Visakhapatnam district
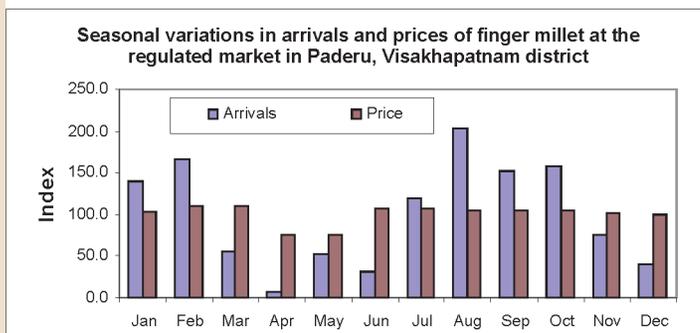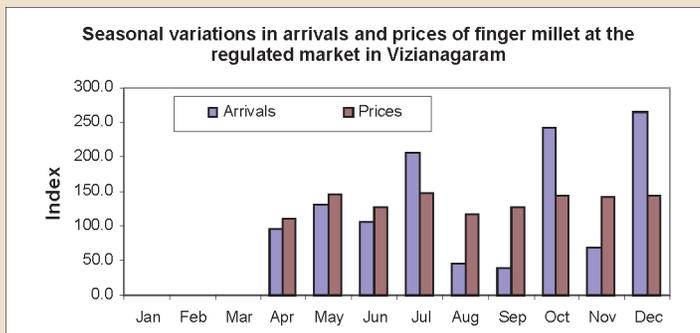
Fig 11. Seasonal variations in arrivals and prices of finger millet in different regulated markets in Visakhapatnam district

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