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SEEDLING ESTABLISHMENT AND CROP STANDS IN RABI SORGHUM

(1981-82)

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(Rabi 1981-82)

The production of sorghum in many parts of the SAT is thought to be adversely affected by poor crop stands. Some level of quantification of the problem in the farmers fields is found to be necessary at the planning stage of future experimental work on this problem.

A systematic survey was taken up in a village during the kharif 1981 season (already reported). On a similar line, information on seed and sowing practices and seedling and crop stands were collected from some villages which come within the rabi tract of Maharashtra state and Bijapur district.

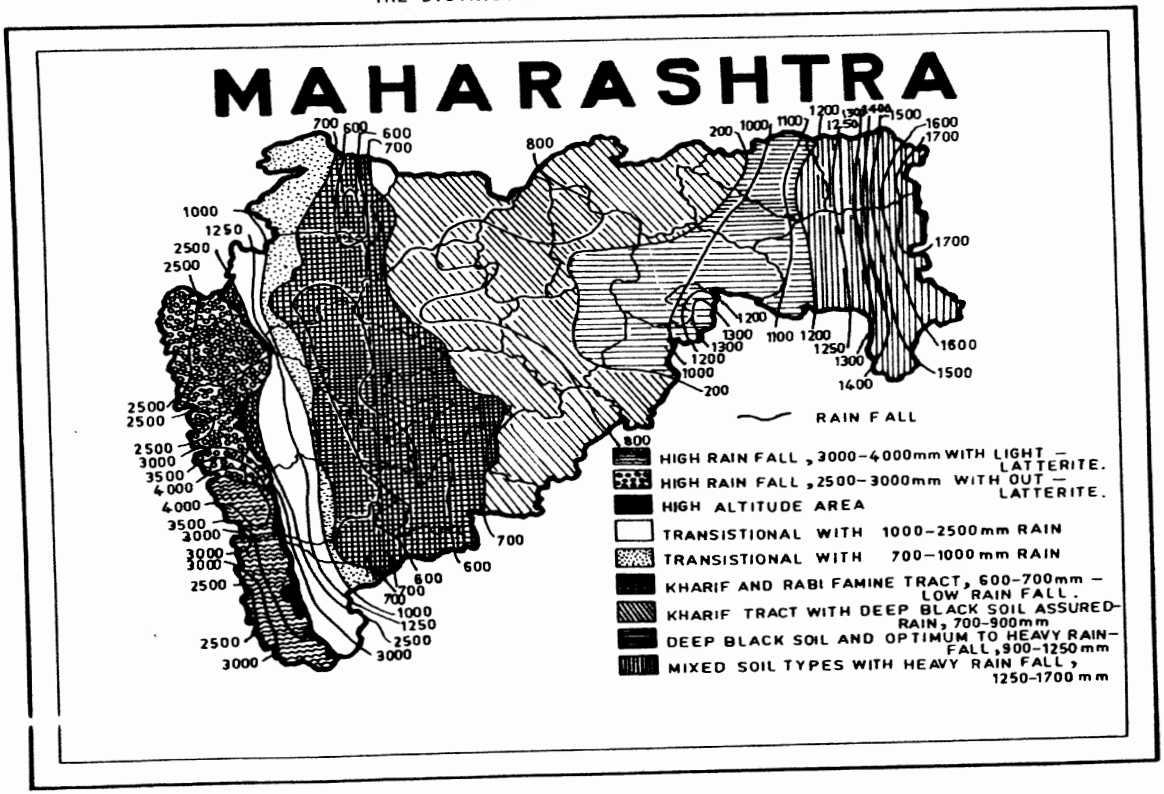
Soils in these villages are black with a high water holding capacity. Land preparation and sowing operations are carried out with traditional implements. Sorghum is mostly grown sole or 'intercropped' with safflower or linseed. Fertilizer application was almost nil. Fields were mostly free of weeds at the time of second entry which coincided with the boot stage.

Method of survey

Two sets of observations were made. Information on sowing practice and seed material were collected in early October and later, in December (21-12-81 to 31-12-81), the same fields were visited and stand counts were recorded.

THE ROUTE FOLLOWED IN THE TRIP

THE DISTRIBUTION OF SOIL TYPES AND RAINFALL



Seed material: Seed samples collected at the time of sowing were brought to the laboratory in polythene bags. Germinability* of these samples were tested in the laboratory.

Observations made at the time of sowing: Information on land preparation, depth of sowing, row width and seeding rate was collected at the time of sowing. Soil samples from the top 2-12 cm were collected for estimating the water content. These samples were brought to the laboratory in cans sealed with a water tight seal. Soil temperatures at the seed zone were also recorded.

Observations on crop stand: Stand counts were taken in December. All plants (damaged and healthy) were counted in 6 m lengths from 5 adjacent rows at 3 random locations in a field. The healthy plants (final stand) were then counted separately. The first count represents the seedling population (% emergence) and the second the potential final stand.

Results

Seed: Type M35-1 (Malthandi) was the most common variety grown in the rabi. It was sown in 74.5% fields. The traditional varieties 5-4-1 Muguthi and Dagadi were also found in Bijapur and Maharashtra respectively. A total absence of hybrids or any other high yielding (HYV) sorghum appear to be a point of special interest.

Source: 95% of the farmers used their own seed kept from the previous year.

Seed treatment: About 48% farmers treated the seeds before sowing. 29% used sulphur powder and the rest either bullock urine alone or in combination with sulphur.

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* Germinability refers to the percent germination

Table 1 Different factors related to the seed, environment and management observed in the rabi (Rabi 1981)

Srl. No.	Name of cultivar	Source	Treatment	Environment			Practice							Village/ District
				Soil type	Seedbed moisture %	Seedbed temperature °C	Land preparation	System	Sowing depth cm.	Row width cm.	Planting density Seeds/ha	Fertilizer use Kg/ha	Post sowing opera	
1	Local	Own	No	B	39.9	30	1 P	Sole	8.5	50	400,000	Nil	Blade Harrow	Afzalpur Gulbarga
2*	Local		No	B	27.5	29	1 P	Mixed	12.0	50	400,000	"	"	"
3	Local		Sulphur	B	44.1	32	No	Sole	11.0	50	300,000	"	"	Kurupathali Gulbarga
4*	M35-1	Foundation	Sulphur	BC	27.9	29	1 H	Sole	10.0	45	223,200	DAP+UREA 62.5 Kg/ha	"	Seed farm Bijapur
5	M35-1	Own	Sulphur	B	34.54	30	1 H	Sole	10.0	40	163,200	Nil	"	Etanalli Bijapur
6	5-4-1 Muguthi	"	No	B	32.0	29	3 H	6:1/S:L	9.0	45	163,200	DAP+UREA 62.5 Kg/ha	"	"
7	M35-1	"	No	B	27.8	29	1 P 3 H	6:1/S:L	12.0	40	183,300	Nil	"	"
8	M35-1	"	Sulphur	B	30.9	30	3 H	Sole	10.0	40	-	"	"	"
9	5-4-1 Muguthi	"	No	BC	27.9	29	1 P 3 H	Sole	8.0	40	178,100	DAP+UREA 62.5 Kg/ha	"	"
10	5-4-1 Muguthi	"	Sulphur	BC	27.3	31	4 H	6:1/S:L	9.0	40	133,000	Nil	"	"
11	M35-1	"	No	BC	30.2	29	1 P 3 H	6:1/S:L	9.0	40	135,900	"	"	"
12	M35-1	"	No	BS	26.2	34	No	6:1/S:L	10.0	37.5	175,600	"	"	"
13	5-4-1 Muguthi		Sulphur	BC	22.45	34	4 H	6:1/S:L	10.0	37.5	131,000	DAP+UREA 25 Kg/ha	"	"

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14	M35-1		Sulphur	BS	27.69	29	5 H	Sole	7.0	40	-	Nil	Blade Harrow	Etanalli Bijapur
15	M35-1		Sulphur	BC	17.21	30	1 P 2 H	Sole	8.0	40	144,100	Nil	"	Bagiwadi Bijapur
16	Local	Own	Sulphur	B	21.76	30	1 P 3 H	Sole	10.0	40	-	Nil	"	"
17	Local	Own	Sulphur	R	35.4	29	1 P 3 H	Sole	10.0	40	125,900	Nil	"	Bijapur
18	M35-1	Own	Sulphur	DB	32.3	31	3 H	Sole	7.0	37.5	145,350	Nil	"	Sarvada Bijapur
19	5-4-1 Muguthi	Own	Bullock urine	DB	13.4	29	No	5:1/S:L	10.0	40	203,800	Nil	"	"
20	M35-1	Own	Sulphur	DB	24.2	29	3 H	5:1/S:L	9.0	40	150,200	Nil	"	"
21*	Local	Own	No	BS	35.7	33	No	Sole	12.0	40	-	Nil	"	Mohol Sholapur
22*	M35-1	Own	No	BS	26.7	33	No	Sole	15.0	40	-	Nil	"	"
23*	M35-1	Own	No	BC	31.5	32	No	Sole	8.0	40	324,700	Nil	"	"
24	Local	Own	No	BD	35.9	31	No	Sole	13.0	40	-	Nil	"	"
25	M35-1	Own	No	Tr	19.6	32	No	Sole	5.0	30	155,300	Nil	"	Sholapur
26	M35-1	Market	Sulphur	BS	20.4	31	1 H	Sole	12.0	30	273,200	Nil	"	"
27	M35-1	Own	No	BS	27.3	29	1 H	Sole	6.0	45	108,700	Nil	"	Mulae/Sholapur
28	M35-1	Own	No	BD	36.4	30	3 H	Sole	12.0	40	116,100	Nil	"	"
29	M35-1	Own	Sulphur	BS	24.3	29	No	Sole	10.0	45	218,700	Urea 37.5	"	Dodi/Sholapur
30	M35-1	Own	Sulphur	B	41.1	29	-	Sole	10.0	45	218,700	Nil	"	"
31	M35-1	Own	No	B	32.5	30	2 P	Sole	11.0	30	109,300	Nil	"	"
32	M35-1	Own	Sulphur	B	28.9	30	No	6:6/S:Sa	10.0	30	183,000	Urea	"	"

33	M35-1		Sulphur	B	35.4	30	-	Sole	13.0	45	133,000	Nil	Blade Harrow	Boramansi Sholapur
34	M35-1+Local	Own	No	B	39.2	31	No	Sole	10.0	30	109,000	Nil	"	"
35	Local	Own	No	Tr	19.3	32	No	Mixed	5.0	35	166,000	Nil	"	"
36	M35-1	Own	Sulphur	B	30.2	32	1 H	Sole	13.0	40	118,300	Nil	"	Hatbur Sholapur
37	Local	Market	No	B	27.51	30	No	Sole	10.0	40	203,300	Urea 62.5 Kg/ha	"	"
38	M35-1	Own	No	B	25.28	32	No	Sole	10.0	40	226,600	Nil	"	"
39	M35-1	Own	No	B	25.11	32	No	Sole	10.0	35	202,700	Nil	"	"
40*	M35-1	Own	Sulphur	BS	29.81	26	No	Sole	12.0	30	390,000	Nil	"	Jogeswari Ahmednagar
41*	M35-1	Own	No	B	34.27	27	No	Sole	4.0	30	349,100	Nil	"	"
42*	M35-1	Own	No	B	24.88	32	-	Sole	4.0	30	359,200	Nil	"	"
43*	M35-1	Own	Sulphur	B	23.34	28	No	Sole	10.0	30	359,200	Nil	"	Devalali Ahmednagar
44	SPV86	MPKV**	Sulphur	B	22.54	25	1 P 2 H	Sole	10.0	30	321,500	Nil	"	Khadambe Ahmednagar
45	M35-1	Own	Sulphur	B	-	-	-	Sole	10.0	30	-	Nil	"	"
46	M35-1	Own	Sulphur+ Urine	B	44.80	25	-	Sole	6.0	30	331,100	Nil	"	"
47*	M35-1	Own	-	B	19.7	26	No	Sole	3.0	30	-	Nil	"	"
48	M35-1	Own	-	B	-	-	-	Sole	3.0	30	405,500	Nil	"	"
49	M35-1	Own	-	B	29.46	27	-	Sole	7.0	30	-	Nil	"	"
50	M35-1	Own	-	B	26.27	-	1 H	Sole	7.0	30	-	Nil	"	"
51	M35-1	Own	No	B	27.32	28	1 H	Sole	5.0	30	284,900	Nil	"	Dhamori Ahmednagar

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52	M35-1	Own	No	B	33.99	29	1 H	Sole	8.0	30	-	Nil	Blade Harrow	Dhamori Ahmednagar
53	M35-1	Own	Sulphur+ Urine	B	26.39	27	1 P 1 H	Sole	10.0	30	375,400	Nil	"	Khadambe Ahmednagar
54	M35-1	Own	No	B	13.75	31	No	Sole	5.0	30	289,900	Nil	"	"
55	M35-1	Own	No	B	25.98	29	-	Sole	8.0	30	-	Nil	"	"
56	M35-1	Own	Sulphur	B	22.61	28	-	Sole	9.0	30	-	Nil	"	"
57	M35-1	Own	No	B	41.29	29	1 H	Sole	6.0	30	-	Nil	"	Vambhori
58	M35-1	Own	Sulphur	B	19.69	30	No	Sole	10.0	30	285,000	Nil	"	Khadambe
59	M35-1	Own	No	B	25.86	29	1 P 1 H	Sole	9.0	30	309,600	Nil	"	"
60	M35-1	Own	No	B	23.93	29	1 H	Sole	6.0	30	-	Nil	"	"
61	M35-1	Own	No	BS	22.17	31	No	Sole	6.0	30	-	Nil	"	"
62	M35-1	Own	No	B	20.39	28	-	Sole	5.0	30	292,400	Nil	"	"
63	M35-1	Own	Sulphur	B	28.83	29	1 P	Sole	10.0	30	111,300	Nil	"	Dorai/Aurangabad
64	M35-1	Own	Sulphur	B	20.27	28	-	Sole	10.0	30	135,100	Nil	"	Solay/Aurangabad
65	M35-1	Own	Sulphur	B	25.80	29	1 P	Sole	8.0	30	134,000	Nil	"	"
66	M35-1	Own	Sulphur	B	21.80	29	1 P	Sole	11.0	30	176,600	Nil	"	Pippalwadi Aurangabad
67	M35-1	Own	No	BS	35.54	29	No	Sole	6.0	30	368,700	Nil	"	"
68	M35-1	Own	Sulphur	B	35.54	30	1 P	Sole	8.0	30	111,600	Nil	"	Dorai/Aurangabad
69	M35-1	Own	Sulphur	B	21.01	30	-	Sole	12.0	30	-	Nil	"	"
70	M35-1	Own	No	B	24.52	31	1 P	Sole	9.0	30	191,100	Nil	"	"
71	Local	Own	Sulphur	B	21.20	32	-	Sole	7.0	30	129,200	Nil	"	"
72	Local	Own	No	BS	14.12	32	1 P	Sole	10.0	30	300,300	Nil	"	Hirsul Aurangabad

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73	Local	Own	-	BS	37.20	31	1 P	Sole	10	30	300,300	Nil	BTade Harrow	Hirsul Aurangabad
74	Local	Own	No	B	48.20	33	-	Sole	6	30	211,900	Nil	"	"
75	Local	Own	No	BS	21.74	31	No	Sole	8	30	194,100	Nil	"	Sawangi Aurangabad
76	Dagadi	Own	No	BS	14.10	33	1 P	Sole	10	30	194,100	Nil	"	"
77	Dagadi	Market	No	BS	26.29	32	-	Sole	6	30	454,600	Nil	"	"
78	Dagadi	Market	No	BS	12.61	33	-	Sole	10	30	454,600	Nil	"	"
79	Dagadi	Own	No	Tr	16.32	32	-	Sole	11	30	384,600	Nil	"	"
80	M35-1	Own	No	B	29.71	38	1 P	Sole	7	30	378,860	Nil	"	Karad/Parbhani
81*	M35-1	Own	No	B	28.86	37	1 H 1 P	Mixed	10	30	-	Nil	"	"
82	M35-1	Own	Gobar	B	34.22	37	1 P	Sole	11	30	314,900	Nil	"	"
83	M35-1	Own	No	B	32.82	34	2 H	Sole	10	30	351,100	Nil	"	"
84	M35-1	Own	No	B	28.90	34	-	Sole	8	30	344,400	Nil	"	"
85	M35-1	Own	No	B	22.11	-	1 P	Sole	8	30	-	Sampurna 19-19-19 62.5 Kg/ha	"	Nanded/Parbhani
86	M35-1	Own	No	B	24.72	28	1 P 1 H	Sole	10	30	200,000	Nil	"	"
87*	M35-1	Own	No	B	30.65	30	1 H	Mixed	12	30	196,900	Nil	"	Allapur Pandri Parbhani
88*	M35-1	Own	Urine	B	30.36	29	-	Mixed	8	30	196,900	Nil	"	"
89	M35-1	Own	No	B	35.36	31	No	Sole	10	30	228,000	Nil	"	"
90	M35-1	Own	Urine	BS	31.27	33	No	Sole	5	30	192,800	Nil	"	"
91*	M35-1	Own	No	BS	34.98	31	No	Mixed	6	30	249,400	Nil	"	"
92*	M35-1	Own	No	B	40.26	32	No	Mixed	10	30	-	Nil	"	Rathi/Parbhani
93	Dagadi	Own	Urine	B	34.88	33	1 H	Sole	10	30	396,800	Nil	"	"
94	M35-1	Own	Urine	B	26.03	34	-	Sole	11	30	308,600	Nil	"	"

contd.

95	M35-1	Own	Urine	B	37.75	31	1 H	Sole	8	30	194,800	Nil	Blade Harrow	Hatta Parbhani
96*	M35-1	Own	No	B	37.92	33	No	Mixed	11	30		Nil	"	Yerandeswar Parbhani
97	M35-1	Own	Urine	B	22.17	33	-	Sole	12	30	234,400	Nil	"	Katheneswar Parbhani
98	M35-1	Own	Urine	B	24.12	35	No	Sole	8	30	200,000	18-18-10 62.5 Kg/ha	"	"
99	M35-1	Own	No	B	35.06	33	No	Sole	12	30	343,400	Nil	"	"
100	M35-1	Own	No	B	35.45	37	1 H	Sole	8	30	350,100	Nil	"	Azolla Parbhani
101	M35-1	Own	Urine	B	34.63	27	1 H	Sole	8	30	199,500	Nil	"	Yerandeswar Parbhani
102	M35-1	Own	Urine	B	42.41	27	No	Sole	10	30	355,100	Nil	"	Thel Parbhani

S = Sorghum
Sa = Safflower
L = Linseed

B = Black soil
BC = Black chelka
BS = Black Shallow
DB = Deep Black
Tr = Transistional

P = Plough
H = Harrow

MPKV = Mahatma Phule Krishi Vidyapeeth, Rahuri

FOOT NOTES

4* The field for foundation seed was included with a view to observe what goes on when recommendation is followed as against what happens in the real world.

21 22 23* These fields were at resowing when sampled; very poor seedling stand from the first sowing done in early September, made resowing necessary (Sholapur - Mohol).

40 41 42 43* These fields may receive irrigation a month after sowing. These are the only entries which get this exception in this survey (Ahmednagar - Rahuri).

2* Mixed - Sorghum and Safflower

81* Mixed - Sorghum and Linseed

87* Mixed - Sorghum and Chickpea

88* Mixed - Sorghum and Chickpea

91* Mixed - Sorghum and Chickpea

92* Mixed - Sorghum and Lathyrus

96* Mixed - Sorghum and Linseed

Unlike the situation in kharif, no seed damage was observed in the rabi.

Germinability: Germination percentages were generally high. Nonetheless, there were cases where the percentage fell below 50. The variability in germination percentage does not seem to be related to the cultivar variety or seed treatment. Once again, these germination percentages do not appear to have influenced the field emergence. In fact, there are instances where field emergence is relatively higher than the germination percentage (Table 2). This situation reiterates the futility of standard germination tests to predict field performance.

Soil types and land preparation: The soils were mostly black and varied much in depth. Many of the shallow soils were also very stoney (chelka) in nature. Only a few fields were ploughed before sowing (23%). A common practice was to use a wooden harrow prior to sowing. Land preparation did not influence emergence (r^2 = 0.0001 when regressed on 'plough' and 'no plough' situation). As these implements are light they do not alter the soil profile very much. In many places the previous season's residue had not been removed from the fields. Most of the fields (80%) were kharif fallows.

Sowing: Sowings were done by bullock drawn drills. Only two farmers used seed-cum-fertilizer drill. Depth of sowing varied from 3 to 15 cm. This variability did not depend on the equipment used or the cultivar variety sown. In any case sowing depth does not seem to have influenced percentage emergence (r^2 = 0.09).

Physical conditions at sowing: The soil water content (% of dry weight) at the time of sowing ranged from 20 - 40% and seed bed temperature from 25 to 37 ^{o}C. The soil moisture and temperature, observed in this rabi promised a good emergence performance. Again, there seemed to be no incidence of soil crusting as there were not any rains to 'seal of' the soil after sowing.

Populations: Seeding rate and seedling population and final stand are given in Tables 1 and 2 respectively.

160,000 plants/ha is the recommended population for rabi (AICRPDA). However, as shown in Table 1, 56% of the farmers planted to densities well above this figure. 32% planted more than twice the recommended rate. In a rabi environment one might consider populations of the order of 250,000 or more as exceedingly high. However, the plant populations realising more often from such high seeding rates were less than 60% (see Table 2).

As for seedling population, 58% of the fields had above 100,000 and of the rest 60% of the fields had above 70,000. In fact, only two fields had very low populations; field # 47 with 33,000 and field # 58 with 29,000. These findings markedly contrast those observed in the kharif (Aurepalle village study) where only a few fields had seedling populations above 100,000. Seedling emergence in 35% of the fields was above 50% and only 14% showed less than 30% emergence. In kharif, on the contrary, the emergence percentages were very low, often less than 30 (83% of the fields). No specific relation of emergence percentage with cultivar variety was evident. For instance M35-1 the most common cultivar, itself varied from 0% to 98% in emergence performance across fields.

Figure 1

DISTRIBUTION OF RABI SORGHUM SEED AND SEEDLING POPULATIONS AMONG THE FIELDS SAMPLED

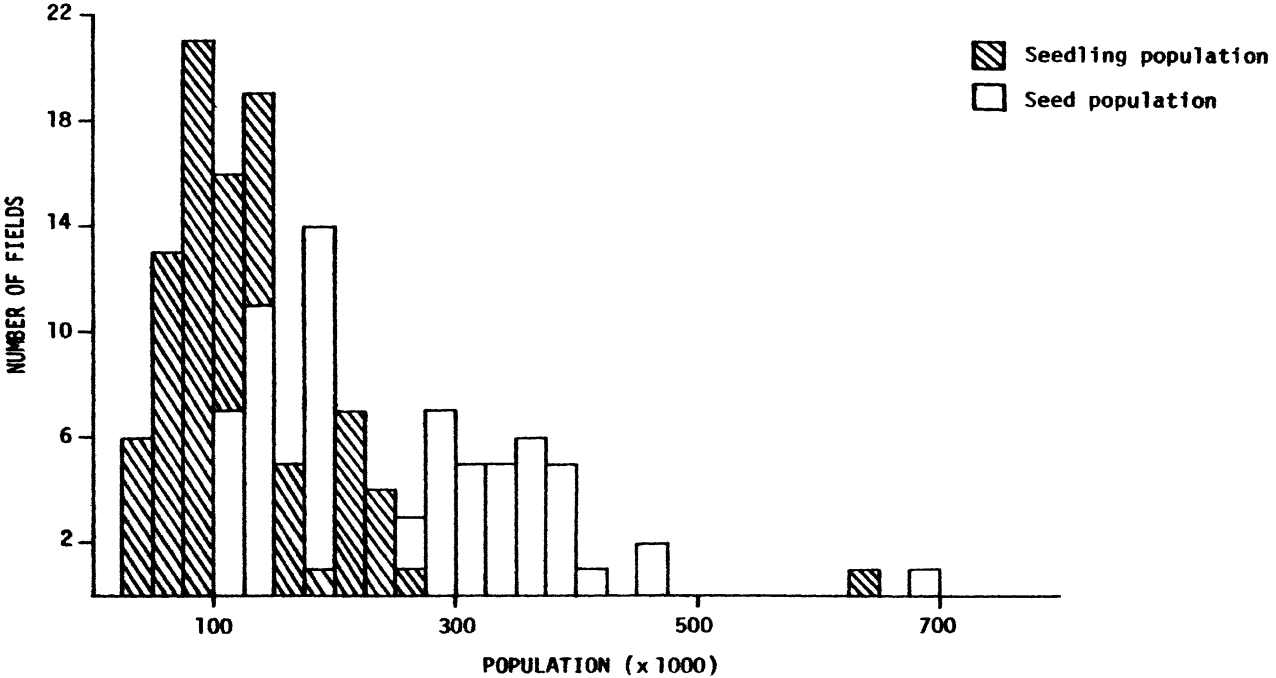

Table 2. Seed, seedling, and final populations (stand) of sorghum in farmers' fields in Bijapur, Sholapur, Ahmednagar, Aurangabad and Parbhani (Rabi 1981-82).

Field #	Seed population/ha	Seedling population/ha	Final plant population/ha	% germination in the lab	% seedling population [1/]	% final plant population [2/]	Final plant stand Rating [3/]
1	400,000	53,000	46,000	-	13	12	V. Poor
2	400,000	87,000	57,000	83	22	14	V. Poor
3	300,000	57,300	50,000	80	19	17	V. Poor
4	220,000	-	-	40	-	-	-
5	163,000	56,000	46,000	75	34	27	Poor
6	163,000	50,000	40,000	15	31	24	Poor
7	183,000	49,000	36,000	-	27	20	V. Poor
8	-	125,000	100,000	80	-	-	-
9	178,000	112,000	75,000	75	63	42	Good
10	133,000	57,000	50,000	65	43	38	Poor
11	136,000	80,000	72,000	65	59	53	Good
12	176,000	82,000	70,000	63	46	40	Poor
13	131,000	87,000	79,000	58	66	61	V. Good
14	-	100,000	75,000	78	-	-	-
15	144,000	117,000	97,000	70	81	68	V. Good
16	-	74,000	50,000	-	-	-	-
17	126,000	79,000	57,000	83	63	45	Good
18	145,000	116,000	108,000	35	80	74	V. Good
19	204,000	79,000	60,000	58	39	29	Poor
20	150,000	44,000	40,000	40	42	38	Poor
21	-	438,000	388,000	55	-	-	-
22	-	159,000	150,000	90	-	-	-
23	325,000	110,000	83,000	-	34	25	Poor
24	-	75,000	50,000	73	-	-	-
25	155,000	120,000	64,000	80	77	41	Good
26	273,000	152,000	120,000	70	56	44	Good
27	109,000	96,000	59,000	55	88	54	Good
28	116,000	53,000	39,000	75	45	34	Poor
29	219,000	139,000	93,000	60	63	42	Good
30	219,000	102,000	79,000	-	47	36	Poor
31	109,000	107,000	103,000	63	98	94	Excellent
32	183,000	139,000	105,000	80	76	57	Good
33	133,000	40,000	26,000	83	30	19	V. Poor
34	109,000	107,000	103,000	95	98	94	Excellent
35	166,000	135,000	121,000	58	81	73	V. Good
36	118,000	88,000	84,000	85	75	71	V. Good
37	203,000	158,000	135,000	98	78	66	V. Good
38	226,000	75,000	60,000	35	33	26	Poor
39	203,000	81,000	71,000	85	40	35	Poor
40	700,000	633,000	527,000	53	90	75	V. Good

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41	349,000	137,000	109,000	85	39	31	Poor
42	359,000	141,000	109,000	43	39	30	Poor
43	359,000	108,000	90,000	48	30	25	Poor
44	322,000	100,000	71,000	100	31	22	Poor
45	-	200,000	133,000	-	-	-	-
46	331,000	155,000	95,000	60	47	29	Poor
47	-	33,000	33,000	-	-	-	-
48	406,000	135,000	103,000	58	33	25	Poor
49	-	133,000	100,000	-	-	-	-
50	-	133,000	133,000	-	-	-	-
51	285,000	66,000	53,000	33	23	19	V. Poor
52	-	100,000	66,000	-	-	-	-
53	375,000	143,000	109,000	75	38	29	Poor
54	290,000	74,000	52,000	65	26	18	V. Poor
55	-	550,000	447,000	-	-	-	-
56	-	100,000	77,000	80	-	-	-
57	-	610,000	436,000	-	-	-	-
58	285,000	29,000	27,000	35	10	9	V. Poor
59	310,000	159,000	141,000	-	51	45	Good
60	-	100,000	90,000	-	-	-	-
61	-	100,000	75,000	-	-	-	-
62	292,000	82,000	60,000	55	28	20	V. Poor
63	111,100	87,000	60,000	75	78	54	Good
64	155,000	76,000	63,000	70	57	47	Good
65	134,000	79,000	68,000	58	59	51	Good
66	177,000	101,000	86,000	68	57	49	Good
67	369,000	93,000	81,000	73	25	22	Poor
68	112,000	57,000	54,000	83	51	48	Good
69	-	67,000	54,000	-	-	-	-
70	191,000	61,000	59,000	88	33	27	Poor
71	129,000	41,000	40,000	53	32	31	Poor
72	300,000	147,000	129,000	33	49	43	Good
73	300,000	137,000	116,000	-	45	39	Poor
74	212,000	141,000	122,000	98	67	57	Good
75	194,000	99,000	74,000	50	51	38	Poor
76	194,000	112,000	97,000	-	58	50	Good
77	455,000	150,000	119,000	-	33	26	Poor
78	455,000	112,000	73,000	-	25	16	V. Poor
79	385,000	144,000	121,000	45	51	31	Poor
80	379,000	84,000	69,000	13	22	18	V. Poor
81	-	-	-	-	-	-	-
82	315,000	187,000	160,000	35	59	51	Good
83	351,000	131,000	101,000	23	37	32	Poor
84	344,000	115,000	94,000	43	33	27	Poor
85	-	100,000	60,000	-	-	-	-
86	200,000	140,000	123,000	60	70	62	V. Good
87	197,000	118,000	62,000	-	60	32	Poor
88	197,000	138,000	110,000	48	70	56	Good
89	228,000	119,000	97,000	35	52	42	Good
90	1[illegible],000	83,000	64,000	13	43	32	Poor

91	249,000	129,000	98,000	30	51	47	Good
92	-	133,000	110,000	-	-	-	-
93	397,000	104,000	84,000	73	26	21	Poor
94	309,000	168,000	126,000	68	54	41	Good
95	195,000	80,000	51,000	83	41	26	Poor
96	-	-	-	-	-	-	-
97	234,000	51,000	43,000	33	22	18	V. Poor
98	200,000	138,000	47,000	40	69	24	Poor
99	343,000	96,000	67,000	-	28	19	V. Poor
100	350,000	135,000	106,000	80	39	30	Poor
101	200,000	69,000	53,000	35	34	27	Poor
102	355,000	70,000	53,000	40	20	15	V. Poor

1/ & 2/ The percentages are based upon the seed populations

3/ Rating of the final stand is done as follows:

Less than 20%	Very poor
21 - 40%	Poor
41 - 60%	Good
61 - 80%	Very good
81 - 100%	Excellent

Final stand: The final population was above 100,000 in 31% of the fields. Of this there was a small fraction (4 fields) with populations above 250,000. More than 50% of the fields had populations between 50 and 100 thousand. This amounts to only half that recommended but seems to be a better situation than observed in the kharif.

The change of stand from the seedling stage to harvest is not substantial. This shift was less than 10% in 76% of the fields sampled (Table 2) which might indicate that the pressure from diseases, insects and early season drought are very low. Nevertheless, there were many fields which showed symptoms of a late season drought (These plants are counted in the final stand, as drought symptoms were only starting to set in). A high incidence of striga, 64,000 per hectare were also noted among these fields sampled, though field to field variability was well evident.

Figure 1 shows the distribution of seed and seedling populations among the fields sampled. Compared to the situation in the kharif where these distributions are shifted apart, in the rabi they are intermixed which also shows that the extent of seedling emergence as a problem is less severe in the rabi conditions. However, as in the kharif there exists no significant correlation between the seed and seedling population (r^2 = 0.12) i.e., a high seeding rate does not guarantee high seedling emergence. The emergence percentage when regressed on % germination, % soil water content (w/w), seed bed temperature (^{o}C) and sowing depth did not show any significant correlation (r^2 = 0.04). Table 3 shows the regression coefficients and their test of significance. It appears that these factors could not explain the variability in emergence. This situation provided a parallel with what was found from the kharif survey.

Table 3. The regression coefficients from a multiple regression of emergence percentage for sorghum on % germinability, % soil water content (w/w), seed bed temperature ^{0}C and sowing depth (cm)

Independent variables	Regression coefficient	t test for the regression coefficients
% germinability	0.23	1.93^{NS}
% water content of soil	-0.19	0.64^{NS}
Seed bed temperature	-0.43	0.45^{NS}
Sowing depth	-0.41	0.39^{NS}

NS = Not significant

Conclusion

In the rabi the problem of seedling establishment does not seem to be as severe as in the kharif. In both situations, however, the extent of emergence did not relate to the factors related to seed, environment and management.

Acknowledgement

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Figure 2

SORGHUM SEEDLING AND FINAL STANDS FIELD # 35

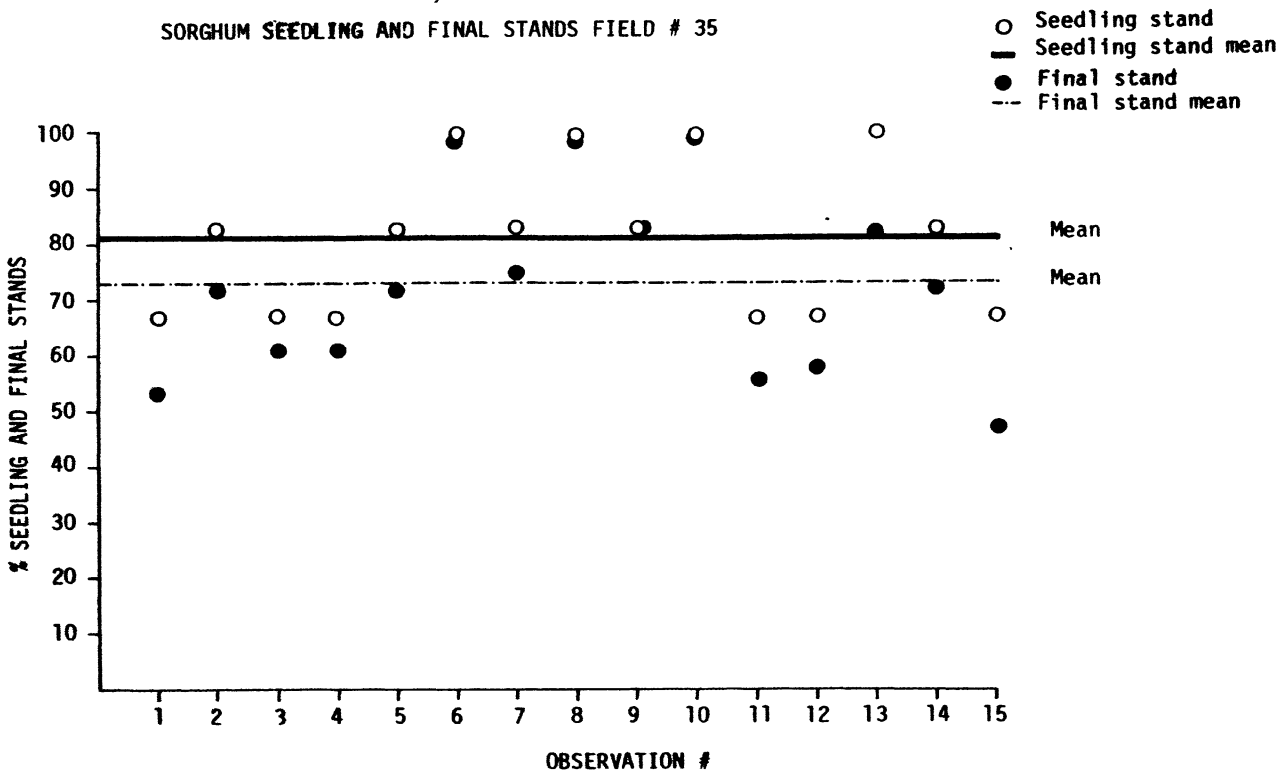

Figure 3

SORGHUM SEEDLING AND FINAL STANDS FIELD # 59

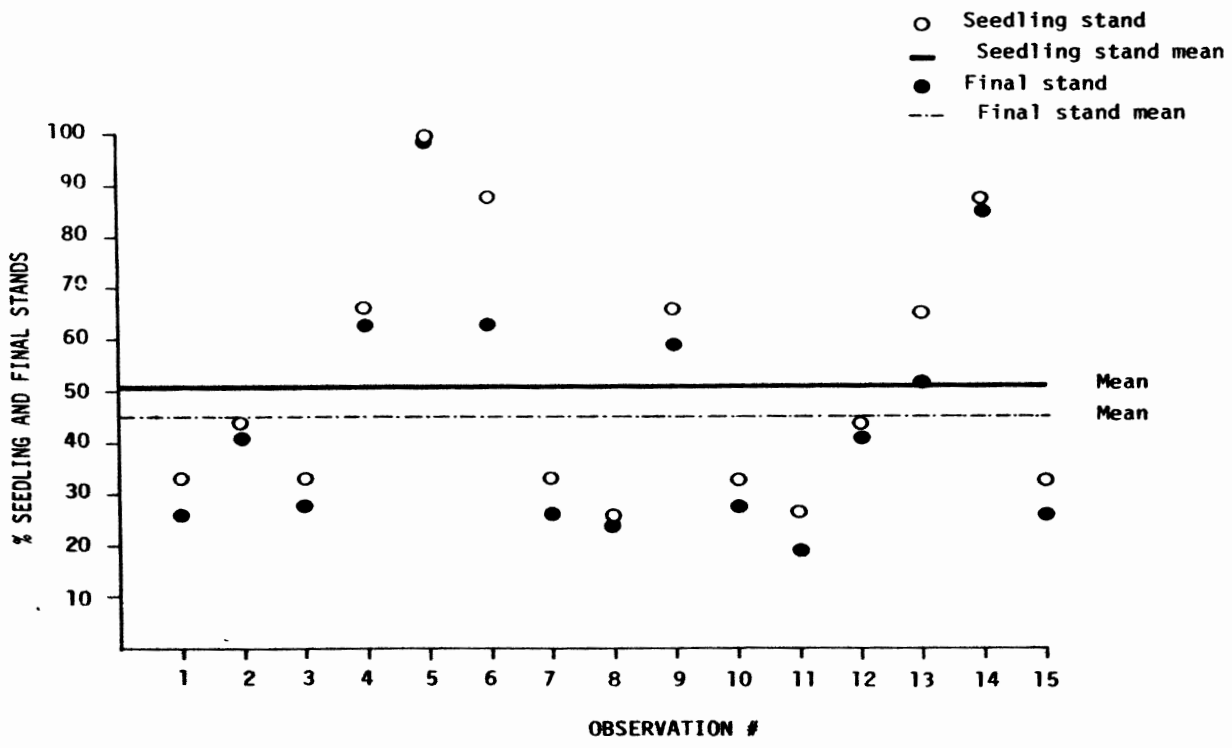

Figure 4

SORGHUM SEEDLING AND FINAL STANDS FIELD # 47