

# THE NATIONAL SAMPLE SURVEY

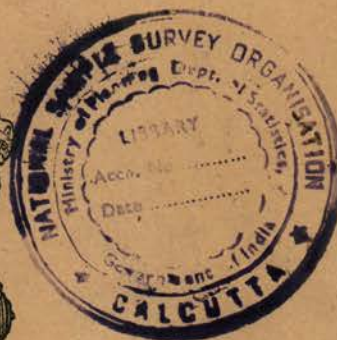
ELEVENTH ROUND : AUGUST 1956—FEBRUARY 1957

NUMBER 61

## NOTES ON THE RESULTS OF THE LAND UTILISATION SURVEY AND CROP- CUTTING EXPERIMENTS



सत्यमेव जयते



Issued by

The Cabinet Secretariat : Government of India

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This report was prepared by Ramaprasad Saha, V. Rajagopala Sarma, S. Bhaskaran Pillai and Sachchidananda Dutta Roy. The survey was planned by the Indian Statistical Institute (ISI). The field work was carried out by the Directorate of National Sample Survey (NSS), Government of India, in all the States excepting West Bengal where ISI carried out the field work. The processing of work was done under the supervision of Haribhajan Choudhury, Rajen Roy, Bibhuti Bhusan Chakraborty, Sukamal Das and Malay Kumar Chanda.

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*This report entitled 'Notes on the Results of the Land Utilisation Survey and Crop-cutting Experiments—eleventh round August 1956—February 1957' was prepared by the Indian Statistical Institute, Calcutta and is being published in the form in which it was submitted to the Government of India and Government are not responsible for the views contained therein.\**

### CHAPTER ONE

#### INTRODUCTION

1.1. In the eleventh round of the National Sample Survey (NSS) (August 1956—February 1957), the collection of data on acreage figures for important kharif crops was continued. Even though the scale of the survey was somewhat larger it was still exploratory in nature. Crop-cutting experiments were also conducted primarily for the purpose of training the field staff in the technique of collection of data for determination of yield of crops and also for studying the operational problems in the field. The land utilisation survey and crop-cutting experiments in the 11th round were planned in the light of the experiences gained in earlier rounds. The survey was started in the first week of August 1956 and continued till the end of February 1957; it thus covered the early and late kharif crops, and a part of rabi crops of the agricultural year 1956-57. The estimates of area and yield rates for some major kharif crops obtained from this exploratory survey are given in this report.

1.2. *Sample size* : In the eleventh round, a sample of 6336 villages was selected for land utilisation survey. Crop-cutting experiments were done in those villages where specified cereal and pulse crops in the selected plots were found to be mature and ready for harvesting at the time of visit of the investigator.

1.3. *Geographical coverage of the survey* : The survey was carried out in the whole of rural India excluding the Andaman and Nicobar Islands, the North East Frontier Agency, and Naga Hills in Assam. But it was not possible to build up any estimates for Bihar, Orissa, Assam, Manipur, Tripura, Madhya Pradesh, Madhya Bharat, and Bhopal as for these states, the effective sample size, i.e. the number of

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\* The draft report (No. D. 60) was submitted to the Government of India in March 1960.

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villages surveyed in proper time was found to be quite inadequate. Consequently these states have been omitted from the scope of this report.

1.4. *Scope of the report:* As mentioned earlier, the eleventh round of survey covered the early and late kharif seasons and a part of the rabi season of the agricultural year 1956-57. A brief discussion of the sampling design adopted for the survey and the concepts used is given in Chapter Two. Estimates of area have been obtained for the principal cereal kharif crops, viz. paddy, jowar, bajra, ragi, maize and millets, and are given in Chapter Three. The seasonal estimates of area are given in Chapter Four. The reliability of the estimates is discussed in Chapter Five. Some of the results of the crop-cutting experiments conducted in this round are presented in Chapter Six. The yield rates of important crops together with their coefficient of variation are given. As the crop-cutting experiments conducted were few in number, the sample size was not adequate for estimating production of any crop; therefore, only unweighted yield rates have been obtained. The method of estimation of area under any crop and its standard error is given in Appendix I. Some detailed tables are given in Appendix II. Appendix III gives the facsimile of the schedules of investigation.

1.5. It may be noted that the estimates presented in this report do not cover the States of Bihar, Orissa, Assam, Manipur and Tripura, Madhya Pradesh, Madhya Bharat and Bhopal. Though zonal estimates are given, they are generally subject to very large sampling errors.



## CHAPTER TWO

### SAMPLING DESIGN AND GENERAL ARRANGEMENTS

2.1. The sampling design for land utilisation survey in the eleventh round was a stratified two-stage design, with villages and clusters of two plots each, selected with probability proportional to area and with replacement as the first- and second-stage sampling units respectively. For crop-cutting experiments a multi-stage design was adopted with villages, clusters of plots, plots and sample cuts (circular area of radius 4' which was harvested for determination of yield) as the successive units of sampling.

2.2. There were altogether 128 strata in the whole of rural India. Either a single district or a group of districts, generally within the same Natural Division (Census 1951), formed a stratum.

2.3. The total number of sample villages (6336) was allocated to the different States on a joint consideration of the geographical area and proportion of area under kharif crops. The allocated number of sample villages in a State was distributed to different districts again on a joint consideration of geographical area and proportion of area under kharif crops. The strata, constituted either by a single district or a group of geographically contiguous districts, were so formed that the allocated number of sample villages in each stratum was either 48 or 96.

2.4. In a stratum, sample villages were selected in two instalments of 24 villages each when the allotted number of sample villages in the stratum was 48. In the case of strata to which 96 villages were allotted, the sample villages were selected in four instalments of 24 villages each. To ensure the even spread of sample villages in a stratum, tehsils from the stratum were selected with probability proportional to area following the procedure of systematic sampling. The sample villages from the selected tehsils were selected with probability proportional to area and with replacement, the number of villages selected being equal to the number of times that tehsil was selected. In some cases, as the village area figures were not available, the villages were selected with equal probability.

2.5. The sample villages were drawn in such a way as to form two independent sub-samples; villages of the instalment 1 (or instalments 1 and 3) constituted sub-sample 1 and those of instalment 2 (or 2 and 4), sub-sample 2.

2.6. There was a weekly sub-round programme of surveying the villages in a stratum. In a stratum the villages to be surveyed in any week were taken uniformly from the two sub-samples; that is, in strata with 48 sample villages, two villages were to be surveyed every week; one village was taken from sub-sample 1 and another from sub-sample 2 and two different investigators surveyed these two villages. In strata with 96 sample villages, 4 villages (2 from each sub-sample) were to be surveyed every week by four different investigators. The villages to be surveyed in different



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weeks were specified in the weekly sub-round programme. This weekly sub-round programme was imposed as it was not possible to ascertain beforehand the exact date of the completion of sowing and commencement of harvesting of different crops of the season.

2.7. The number of villages allotted and surveyed are given by States in Appendix table (A.2.1). Considering only those states for which estimates are given, it will be seen that out of 4464 villages planned, land utilisation survey could be conducted only in 3875 villages. But in obtaining the estimates of acreage under a crop, the villages surveyed not in proper time with respect to that crop, were excluded. Thus the number of villages analysed for obtaining the estimates for a crop was less than the number of villages actually surveyed.

2.8. *Selection of plots*: In villages, where the cadastral survey maps or records of plots or holdings were available, the second-stage sampling units consisted of distinct clusters of two plots each. A sample cluster of two plots was formed by selecting a plot (entry plot) with probability proportional to area and with replacement and coupling this with another plot. If the entry plot was an odd survey number the corresponding coupled plot would bear the next even survey number. If a plot bearing an even survey number was selected as the entry plot, the corresponding coupled plot would bear the preceding (odd) survey number. In villages where village maps or records could not be used for selection of plots, a number of households were selected with equal probability from all the households of the village possessing some land following the procedure of systematic sampling. The households possessing land only outside the sample village were also included in the frame for selection of sample households. All the plots possessed by a sample household formed one cluster.

2.9. Besides land utilisation survey, crop-cutting experiments were also to be done in each of the sample villages at the rate of 6 experiments per village. When 6 experiments were conducted in a village, 6 clusters of 2 plots each or all plots possessed by 4 households were selected for land utilisation. If in a village it was not possible to do all the 6 crop-cutting experiments, then work load for land utilisation was increased; the increase in work load was depending on the number of experiments. In a sample village when crop-cutting experiments could not be conducted, land utilisation survey was done in 15 clusters of 2 plots each or all plots possessed by eight households. Thus in a village the work load for land utilisation varied from 6 to 15 clusters of 2 plots each or all plots possessed by 4 to 8 households.

2.10. Out of the 6336 villages selected for land utilisation, crop-cutting experiments were to be conducted on paddy, jowar, bajra, ragi and maize in those villages which were having these crops ready for harvesting in the 6 clusters of 10 plots each formed with the first 6 entry plots (or in the plots possessed by the first 4 sample households). Six crop-cutting experiments were planned per village. All the plots which were having the specified crops ready for harvesting at the time of investigator's

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visit to the 6 clusters of 10 plots each obtained from the first 6 entry plots (or in the possession of the first four sample households) in a village formed the frame for selection of plots for crop-cutting. Plots (sub-plots) selected with probability proportional to crop area from all the plots in the frame, constituted the third-stage unit. The ultimate sampling unit was a circular area of radius 4 feet randomly located in the selected plot or sub-plot which was actually harvested for estimation of yield rate.



### CHAPTER THREE

#### RESULTS OF THE SURVEY

3.1. In this chapter the estimates of area under principal cereal crops namely, paddy, jowar, bajra, ragi, maize and millets of the kharif season 1956-57 are given for each of the six zones. The States (as existed prior to Re-organisation of States) covered in the different population zones are given below :

<i>Population zone</i>	<i>States covered</i>
1. North India	Uttar Pradesh
2. East India	West Bengal
3. South India	Andhra, Madras, Mysore, Travancore-Cochin, Coorg.
4. West India	Bombay, Saurashtra, Kutch
5. Central India	Hyderabad, Vindhya Pradesh
6. North-West India	Rajasthan, Punjab, PEPSU, Jammu and Kashmir, Ajmer, Delhi, Himachal Pradesh.

3.2. It may be mentioned here that the estimates of area under any crop are based on the villages surveyed in 'proper time' that is, after completion of sowing and before the commencement of harvesting of the crop. Besides, villages surveyed within a period of one month after the commencement of harvesting of the crop were also included in the analysis. Table (3.1) gives the number of villages analysed with respect to each crop for each of the two seasons, autumn and winter.

TABLE (3.1) : NUMBER OF VILLAGES ANALYSED\*

population zone	paddy		jowar		bajra		ragi		maize		millets	
	autu- mn	win- ter	autu- mn	win- ter	autu- mn	win- ter	autu- mn	win- ter	autu- mn	win- ter	autu- mn	win- ter
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1. North India	325	436	342	436	342	436	342	436	311	436	311	436
2. East India <sup>1</sup>	200	416	196	420	196	419	196	419	196	419	196	419
3. South India	394	773	587	830	629	779	629	788	629	827	629	758
4. West India	327	415	263	439	321	450	331	444	301	443	321	443
5. Central India <sup>2</sup>	204	318	277	348	263	343	257	342	236	348	251	348
6. North-West India	482	658	482	674	482	669	482	617	482	617	482	619
7. total	1932	3016	2147	3147	2233	3096	2237	3046	2155	3090	2190	3023

\* Gives number of villages on which estimates are based.

<sup>1</sup>: Includes only West Bengal.

<sup>2</sup>: Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

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3.3. It may be recalled that in villages where cadastrally surveyed village maps or records of plots or holdings were available, 6 to 15 clusters of two plots each were selected for physical observation of the utilisation. However, information from the entry plots only (that is, plots through which the clusters were selected) were taken into account in obtaining the estimates. In the remaining villages, information on all the plots possessed by sample households were taken into account for obtaining the estimates.

3.4. The estimates given in this report relate to (i) gross area under each crop and (ii) allocated area under each crop. A crop may be grown either singly or in mixture with other crops. The gross area under a crop is obtained by adding to the area under the crop grown pure (singly), the geographical area under all mixed crops having the crop as a component. The 'allocated area' under a crop is obtained by adding to the area under the crop grown pure, the apportioned area under it from the area under all mixed crops having the crop as a component. For the purpose of the survey the area under mixed crops was apportioned to the different components on the basis of the relative intensity of plants (ratio of number of plants of the component crops). The apportionment of gross area under mixed crops was done by eye estimation at the plot level.

3.4.1. It may be noted that estimates of area (gross or allocated) have been obtained for each crop separately for autumn and winter seasons. The total of the two seasonal estimates is given as the estimate for kharif season.

3.5. *Gross area under major cereal crops*: Table (3.2) gives the estimated gross area under each of the major cereal crops of the kharif season 1956-57 for each population zone.

TABLE (3.2): ESTIMATED GROSS AREA UNDER MAJOR KHARIF CROPS: 1956-57

population zone	gross area (000 acres)						total
	paddy	jowar	bajra	ragi	maize	millets	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. North India	7769	2745	2333	18	1516	210	14591
2. East India <sup>1</sup>	10407	1	—	—	43	225	10676
3. South India	12257	4775	2736	4484	21	3725	27998
4. West India	4224	6229	7809	561	222	759	19804
5. Central India <sup>2</sup>	4211	9982	2515	256	805	1058	18827
6. North-West India	1672	2997	14388	—	4197	169	23423
7. total	40540	26729	29781	5319	6804	6146	115319

<sup>1</sup>. Includes only West Bengal.

<sup>2</sup>. Excludes Madhya Pradesh, Madhya Bharat and Bhopal.



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3.5.1. The estimated gross area was maximum for paddy (40.5 million acres), followed by bajra (29.8 million acres), jowar (26.7 million acres), maize (6.8 million acres), millets (6.1 million acres) and ragi (5.3 million acres).

3.6. *Allocated area under crops*: Table (3.3) gives the allocated area under kharif crops for each population zone.

TABLE (3.3): ESTIMATED ALLOCATED AREA UNDER MAJOR KHARIF CROPS: 1956-57

population zone	allocated area (000 acres)						total
	paddy	jowar	bajra	ragi	maize	millets	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. North India	7707	1525	1931	18	1430	161	12772
2. East India <sup>1</sup>	10367	—	—	—	43	225	10635
3. South India	12227	3569	2071	3789	16	3298	24970
4. West India	4170	4851	7347	561	201	561	17691
5. Central India <sup>2</sup>	4029	6628	1982	152	751	749	14291
6. North-West India	1672	2814	12117	—	4172	169	20944
7. total	40172	19387	25448	4520	6613	5163	101303

<sup>1</sup>. Includes only West Bengal.

<sup>2</sup>. Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

3.6.1. Out of a total estimate of 101.3 million acres of allocated area, paddy accounted for 40.2 million acres; bajra, 25.4 million acres and jowar, 19.4 million acres.

3.7. *Composition of gross area*: The gross area under a crop, consists of two parts, namely, the area under the crop grown singly and the area under the crop grown in mixture. These two components for the cereal crops under discussion are shown in columns (2) and (5) in Table (3.4). The area under a crop grown in mixture had been apportioned to the crop and shown in column (3) and the apportioned area under the other component crops is shown in column (4). The total gross area which is the sum of columns (2) and (5) is shown under column (7). The area under pure crop and mixed crops expressed as percentage of gross area are shown in columns (8) and (9) respectively. The apportionment factor which is the ratio of the apportioned area under the crop from mixed crops, i.e. column (3) to the gross area under the crop grown in mixture i.e. column (5) is given in column (11).

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TABLE (3.4): COMPOSITION OF GROSS AREA UNDER EACH MAJOR KHARIF CROP : 1956-57

TABLE (3.4) : COMPOSITION OF GROSS AREA UNDER EACH CROP										
population zone	total area under the crop (000 acres)			total allocated area under the crop (000 acres) col (2) + col (3)	total gross area under the crop (000 acres) col(2) + col(5)	percentage to total gross area as in col. (7)			apportionment factor	
	singly (pure)	in mixture				of pure crop as in col. (2)	of total mixed crop as in col.(5)	of total allocated area as in col(6)		
		apportioned to the crop from mixed crops	apportioned to other crops							total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1. paddy										
1. North India	7596	111	62	173	7707	7769	97.77	2.23	99.20	0.6416
2. East India <sup>1</sup>	10299	68	40	108	10367	10407	98.96	1.04	99.62	0.6296
3. South India	12137	90	30	120	12227	12257	99.02	0.98	99.76	0.7500
4. West India	4014	156	54	210	4170	4224	95.03	4.97	98.72	0.7429
5. Central India <sup>2</sup>	3987	42	182	224	4029	4211	94.68	5.32	95.68	0.1875
6. North-West India	1672	—	—	—	1672	1672	100.00	—	100.00	—
7. total	39705	467	368	835	40172	40540	97.94	2.06	99.09	0.5593
2. jowar										
1. North India	424	1101	1220	2321	1525	2745	15.45	84.55	55.56	0.4744
2. East India <sup>1</sup>	—	—	1	1	—	1	—	100.00	—	—
3. South India	1486	2083	1206	3289	3569	4775	31.12	68.88	74.74	0.6333
4. West India	2784	2067	1378	3445	4851	6229	44.69	55.31	77.88	0.6000
5. Central India <sup>2</sup>	2100	4528	3354	7882	6628	9982	21.04	78.96	66.40	0.5745
6. North-West India	2344	470	183	653	2814	2997	78.21	21.79	93.89	0.7198
7. total	9138	10249	7342	17591	19387	26729	33.93	66.07	71.99	0.5761
3. bajra										
1. North India	1120	802	402	1204	1931	2333	48.39	51.61	82.77	0.6661
2. East India <sup>1</sup>	—	—	—	—	—	—	—	—	—	—
3. South India	1031	1040	665	1705	2071	2736	37.68	62.32	75.69	0.6100
4. West India	3150	4197	462	4659	7347	7809	40.34	59.66	94.08	0.9008
5. Central India <sup>2</sup>	642	1340	533	1873	1982	2515	25.53	74.47	78.81	0.7154
6. North-West India	7493	4624	2271	6895	12117	14388	52.08	47.92	84.22	0.6706
7. total	13445	12003	4333	16336	25448	29781	45.15	54.85	85.45	0.7348

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.



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TABLE (3.4) (Contd.): COMPOSITION OF GROSS AREA UNDER EACH MAJOR KHARIF CROP :  
1956-57

population zone	total area under the crop (000 acres)				total allocated area under the crop (000 acres) col (2) + col (3)	total gross area under the crop (000 acres) col (2) + col (5)	percentage to total gross area as in col. (7)			
	singly (pure)	in mixture		total			of pure crop as in col. (2)	of total mixed crop as in col. (5)	of total allocated area as in col. (6)	apportionment factor
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
4. ragi										
1. North India	8	10	—	10	18	18	44.44	55.56	100.00	1.0000
2. East India <sup>1</sup>	—	—	—	—	—	—	—	—	—	—
3. South India	1294	2495	695	3190	3789	4484	28.86	71.14	84.50	0.7821
4. West India	557	4	—	4	561	561	99.29	0.71	100.00	1.0000
5. Central India <sup>2</sup>	152	—	104	104	152	256	59.38	40.62	59.38	—
6. North-West India	—	—	—	—	—	—	—	—	—	—
7. total	2011	2509	799	3308	4520	5319	37.81	62.19	84.98	0.7585
5. maize										
1. North India	1257	173	86	259	1430	1516	82.92	17.08	94.33	0.6680
2. East India <sup>1</sup>	43	—	—	—	43	43	100.00	—	100.00	—
3. South India	16	—	5	5	16	21	76.19	23.81	76.19	—
4. West India	200	1	21	22	201	222	90.09	9.91	90.54	0.0455
5. Central India <sup>2</sup>	733	18	54	72	751	805	91.66	8.34	93.29	0.2500
6. North-West India	3947	225	25	250	4172	4197	94.84	5.16	99.40	0.9000
7. total	6196	417	191	608	6613	6804	91.66	8.34	97.19	0.6859
6. millets										
1. North India	98	63	49	112	161	210	46.67	53.33	76.67	0.5625
2. East India <sup>1</sup>	223	2	—	2	225	225	99.11	0.89	100.00	1.0000
3. South India	1692	1606	427	2033	3298	3725	45.42	54.58	88.54	0.7900
4. West India	389	172	198	370	561	759	51.25	48.75	73.91	0.4649
5. Central India <sup>2</sup>	594	155	309	464	749	1058	56.14	43.86	70.79	0.3341
6. North-West India	169	—	—	—	169	169	100.00	—	100.00	—
7. total	3165	1998	983	2981	5163	6146	51.50	48.50	84.01	0.6702
7. total (six crops)										
1. North India	10512	2260	1819	4079	12772	14591	72.04	27.96	87.53	0.5541
2. East India <sup>1</sup>	10565	70	41	111	10635	10676	98.96	1.04	99.62	0.6306
3. South India	17656	7314	3028	10342	24970	27998	63.06	36.94	89.18	0.7072
4. West India	11094	6597	2113	8710	17691	19804	56.02	43.98	89.33	0.7574
5. Central India <sup>2</sup>	8208	6083	4536	10619	14291	18827	43.60	56.40	75.91	0.5728
6. North-West India	15625	5319	2479	7798	20944	23423	66.71	33.29	89.42	0.6821
7. total	73660	27643	14016	41659	101303	115319	63.87	36.13	87.85	0.6636

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

*Land Utilisation Survey and Crop-Cutting Experiments*

3.7.1. It will be seen that paddy was mostly grown as pure crop. The contribution of mixed crops to gross area under paddy was negligible, whereas for jowar, bajra, ragi and millets it was substantial. About 66 per cent of total gross area under jowar was accounted for by jowar grown mixed with other crops. The corresponding percentage figures for bajra, ragi and millets were 55, 62 and 48 respectively. For maize the contribution of mixed crop to gross area was only 9 per cent.

3.8. *Composition of allocated area* : The allocated area consists of the area under the crop, grown singly and the apportioned area under the crop from mixed crops. These figures have already been given in columns (2) and (3) of Table (3.4). The area under each crop grown singly and the apportioned area under it from mixed crops expressed as percentage of total allocated area under the crop is given in Table (3.5).

TABLE (3.5) : COMPOSITION OF ALLOCATED AREA UNDER EACH MAJOR KHARIF CROP :  
1956-57

population zone	total allocated area (000 acres)	percentage to total allocated area	
		pure	mixed
(1)	(2)	(3)	(4)
1. paddy			
1. North India	7707	98.56	1.44
2. East India <sup>1</sup>	10367	99.34	0.66
3. South India	12227	99.26	0.74
4. West India	4170	96.26	3.74
5. Central India <sup>2</sup>	4029	98.96	1.04
6. North-West India	1672	100.00	0.00
7. total	40172	98.84	1.16
2. jowar			
1. North India	1525	27.60	72.20
2. East India <sup>1</sup>	—	—	—
3. South India	3569	41.64	58.36
4. West India	4851	57.39	42.61
5. Central India <sup>2</sup>	6628	31.68	68.32
6. North-West India	2814	83.30	16.70
7. total	19387	47.13	52.87
3. bajra			
1. North India	1931	58.47	41.53
2. East India <sup>1</sup>	—	—	—
3. South India	2071	49.78	50.22
4. West India	7347	42.87	57.13
5. Central India <sup>2</sup>	1982	32.39	67.61
6. North-West India	12117	61.84	38.16
7. total	25448	52.83	47.17

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.



*National Sample Survey*

TABLE (3.5) (Contd.): COMPOSITION OF ALLOCATED AREA UNDER EACH MAJOR KHARIF CROP : 1956-57

population zone	total allocated area (000 acres)	percentage to total allocated area	
		pure	mixed
(1)	(2)	(3)	(4)
4. ragi			
1. North India	18	44.44	55.56
2. East India <sup>1</sup>	—	—	—
3. South India	3789	34.15	65.85
4. West India	561	99.29	0.71
5. Central India <sup>2</sup>	152	100.00	0.00
6. North-West India	—	—	—
7. total	4520	44.49	55.51
5. maize			
1. North India	1430	87.90	12.10
2. East India <sup>1</sup>	43	100.00	0.00
3. South India	16	100.00	0.00
4. West India	201	99.50	0.50
5. Central India <sup>2</sup>	751	97.60	2.40
6. North-West India	4172	94.61	5.39
7. total	6613	93.69	6.31
6. millets			
1. North India	161	60.87	39.13
2. East India <sup>1</sup>	225	99.11	0.89
3. South India	3298	51.30	48.70
4. West India	561	69.34	30.66
5. Central India <sup>2</sup>	749	79.31	20.69
6. North-West India	169	100.00	0.00
7. total	5163	61.30	38.70

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

*Land Utilisation Survey and Crop-Cutting Experiments*

TABLE (3.5) (Contd.): COMPOSITION OF ALLOCATED AREA UNDER EACH MAJOR KHARIF CROP : 1956-57

population zone	total allocated area (000 acres)	percentage to total allocated area	
		pure	mixed
(1)	(2)	(3)	(4)
7. total (six crops)			
1. North India	12772	82.31	17.69
2. East India <sup>1</sup>	10635	99.34	0.66
3. South India	24970	70.71	29.29
4. West India	17691	62.71	37.29
5. Central India <sup>2</sup>	14291	57.43	42.57
6. North-West India	20944	74.60	25.40
7. total	101303	72.71	27.29

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

3.8.1. The percentage shares of apportioned area to total allocated area for jowar, bajra, ragi and millets were 53, 47, 56 and 39 respectively. About 6 per cent of total allocated area under maize was from mixed crops.



## CHAPTER FOUR

### SEASONAL ESTIMATES OF AREA UNDER KHARIF CROPS

4.1. It may be recalled that the 11th round of survey mainly covered the kharif season of the agricultural year 1956-57. The kharif season roughly covers two harvesting seasons, namely autumn and winter. Crops normally harvested in the months of August, September and October were taken as autumn crops, and those harvested in November, December and January as winter crops. In this chapter, the estimates of gross and allocated area under crops for each of these two seasons, autumn and winter are given. Table (4.1) gives the estimated gross area and allocated area under each crop for the two seasons, autumn and winter.

TABLE (4.1): ESTIMATED GROSS AREA AND ALLOCATED AREA UNDER EACH CROP  
FOR AUTUMN AND WINTER SEASONS: 1956-57

population zone	gross area (000 acres)			allocated area (000 acres)		
	autumn	winter	total	autumn	winter	total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. paddy						
1. North India	4571	3198	7769	4513	3194	7707
2. East India <sup>1</sup>	851	9556	10407	836	9531	10367
3. South India	1702	10535	12237	1687	10540	12227
4. West India	3462	762	4224	3408	762	4170
5. Central India <sup>2</sup>	1617	2594	4211	1615	2414	4029
6. North-West India	1573	99	1672	1573	99	1672
7. total	13776	26764	40540	13632	26540	40172
2. jowar						
1. North India	489	2256	2745	311	1214	1525
2. East India <sup>1</sup>	—	1	1	—	—	—
3. South India	583	4192	4775	463	3106	3569
4. West India	1828	4401	6229	1578	3273	4851
5. Central India <sup>2</sup>	1666	8316	9982	1368	5260	6628
6. North-West India	941	2056	2997	882	1932	2814
7. total	5507	21222	26729	4602	14785	19387

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

*Land Utilisation Survey and Crop-Cutting Experiments*

TABLE (4.1) (Contd.): ESTIMATED GROSS AREA AND ALLOCATED AREA UNDER  
EACH CROP FOR AUTUMN AND WINTER SEASONS: 1956-57

population zone	gross area (000 acres)			allocated area (000 acres)		
	autumn	winter	total	autumn	winter	total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
3. bajra						
1. North India	1188	1145	2333	933	998	1931
2. East India <sup>1</sup>	—	—	—	—	1146	2071
3. South India	1055	1681	2736	925	1558	7347
4. West India	5983	1826	7809	5789	656	1982
5. Central India <sup>2</sup>	1653	862	2515	1326	—	12117
6. North-West India	10746	3642	14388	9175	2942	—
7. total	20625	9156	29781	18148	7300	25448
4. ragi						
1. North India	8	10	18	8	10	18
2. East India <sup>1</sup>	—	—	—	—	—	—
3. South India	565	3919	4484	420	3369	3789
4. West India	172	389	561	172	389	561
5. Central India <sup>2</sup>	204	52	256	100	52	152
6. North-West India	—	—	—	—	—	—
7. total	949	4370	5319	700	3820	4520
5. maize						
1. North India	1484	32	1516	1409	21	1430
2. East India <sup>1</sup>	43	—	43	43	—	43
3. South India	12	9	21	12	4	16
4. West India	166	56	222	166	35	201
5. Central India <sup>2</sup>	712	93	805	658	93	751
6. North-West India	3948	249	4197	3923	249	4172
7. total	6365	439	6804	6211	402	6613
6. millets						
1. North India	188	22	210	141	20	161
2. East India <sup>1</sup>	170	55	225	170	55	225
3. South India	369	3356	3725	351	2947	3298
4. West India	478	281	759	403	158	561
5. Central India <sup>2</sup>	270	788	1058	251	498	749
6. North-West India	155	14	169	155	14	169
7. total	1630	4516	6146	1471	3692	5163
7. total (six crops)						
1. North India	7928	6663	14591	7315	5457	12772
2. East India <sup>1</sup>	1064	9612	10676	1049	9586	10635
3. South India	4286	23712	27998	3858	21112	24970
4. West India	12089	7715	19804	11516	6175	17691
5. Central India <sup>2</sup>	6122	12705	18827	5318	8973	14291
6. North-West India	17363	6060	23423	15708	5236	20944
7. total	48852	66467	115319	44764	56539	101303

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.



# CHAPTER FIVE

## RELIABILITY OF THE RESULTS

5.1. This chapter deals with the reliability of the acreage estimates given in Chapter Three. It has already been mentioned that the sampling design for the 11th round provided two interpenetrating network of sub-samples (IPNS) of villages. Thus it was possible to obtain two independent and equally valid estimates for any character. The two sets of estimates of gross area and allocated area under each crop are presented in this chapter. A comparison of these sub-sample estimates would provide a measure of the reliability of the estimates. Also the sub-sample estimates at the stratum level were used to obtain estimates of standard errors for the acreage estimates. The standard errors are also presented here. The method of estimation of standard error is given in Appendix I.

5.2. *Sub-sample estimates:* Tables (5.1) and (5.2) give the estimates of the gross and allocated areas respectively, under each crop by sub-samples for each zone.

TABLE (5.1): ESTIMATED GROSS AREA UNDER EACH MAJOR KHARIF CROP BY SUB-SAMPLES: 1956-57

population zone	gross area (000 acres)			percentage difference	
	sub-sample 1	sub-sample 2	combined	difference col (2) — col. (3)	col. (5) × 100
(1)	(2)	(3)	(4)	(5)	(6)
1. paddy					
1. North India	7143	8385	7769	-1252	-16.12
2. East India <sup>1</sup>	9974	10839	10407	-865	-8.31
3. South India	12664	12008	12257	656	5.35
4. West India	4598	3803	4224	795	18.82
5. Central India <sup>2</sup>	4422	3987	4211	435	10.33
6. North-West India	1701	1644	1672	57	3.41
7. total	40502	40676	40540	-174	-0.04
2. jowar					
1. North India	2341	3013	2745	-672	-24.48
2. East India <sup>1</sup>	2	—	1	2	200.00
3. South India	4692	4811	4775	-119	-2.49
4. West India	6436	6086	6229	350	5.62
5. Central India <sup>2</sup>	13165	6262	9982	6903	69.15
6. North-West India	4090	2063	2997	2027	67.63
7. total	30726	22235	26729	8491	31.77

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

*Land Utilisation Survey and Crop-Cutting Experiments*

TABLE (5.1) (Contd.): ESTIMATED GROSS AREA UNDER EACH MAJOR KHARIF CROP BY  
SUB-SAMPLES: 1956-57

population zone	gross area (000 acres)			percentage difference	
	sub-sample 1	sub-sample 2	combined	difference col.(2) — col. (3)	col.(5) × 100 col. (4)
(1)	(2)	(3)	(4)	(5)	(6)
3. bajra					
1. North India	2099	2368	2333	-269	-11.53
2. East India <sup>1</sup>	—	—	—	—	—
3. South India	3393	2974	2736	1319	48.21
4. West India	7691	7929	7809	-238	-3.05
5. Central India <sup>2</sup>	2552	2111	2515	741	29.46
6. North-West India	15520	12880	14388	2640	18.35
7. total	31555	27362	29781	4193	18.35
4. ragi					
1. North India	39	—	18	21	110.53
2. East India <sup>1</sup>	—	—	—	—	—
3. South India	4715	4160	4484	555	12.38
4. West India	668	461	561	207	37.00
5. Central India <sup>2</sup>	142	368	256	-226	-88.28
6. North-West India	—	—	—	—	—
7. total	5564	4989	5319	575	10.81
5. maize					
1. North India	1722	1348	1516	374	24.67
2. East India <sup>1</sup>	56	32	43	24	55.81
3. South India	38	6	21	32	152.38
4. West India	205	232	222	-27	-12.16
5. Central India <sup>2</sup>	821	872	805	-51	-6.34
6. North-West India	3899	4597	4197	-698	-16.63
7. total	6741	7087	6804	-346	-5.09
6. millets					
1. North India	175	242	210	-67	-31.90
2. East India <sup>1</sup>	175	278	225	-103	-45.78
3. South India	3503	3860	3725	-357	-9.58
4. West India	801	774	759	27	3.56
5. Central India <sup>2</sup>	860	1173	1058	-313	-29.58
6. North-West India	260	57	169	243	143.79
7. total	5814	6384	6146	-570	-9.27
7. total (six crops)					
1. North India	13519	15366	14591	-1847	-12.66
2. East India <sup>1</sup>	10207	11149	10676	-942	-8.82
3. South India	29005	26919	27998	2086	7.45
4. West India	26399	19285	19804	1114	5.63
5. Central India <sup>2</sup>	22262	14773	18827	7489	39.79
6. North-West India	25510	21241	23423	4269	18.23
7. total	120902	108733	115319	12169	10.55

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal



*National Sample Survey*

TABLE (5.2) : ESTIMATED ALLOCATED AREA UNDER EACH MAJOR KHARIF CROP BY  
SUB-SAMPLES : 1956-57

population zone	allocated area (000 acres)			percentage difference col.(5) × 100	
	sub- sample 1	sub- sample 2	com- bined	difference col. (2) — col. (3)	col. (4)
(1)	(2)	(3)	(4)	(5)	(6)
1. paddy					
1. North India	7074	8348	7707	-1274	-16.53
2. East India <sup>1</sup>	9960	10784	10367	-824	-7.95
3. South India	12634	11978	12227	656	5.37
4. West India	4591	3690	4170	901	21.61
5. Central India <sup>2</sup>	4060	3987	4029	73	1.81
6. North-West India	1701	1644	1672	57	3.41
7. total	40020	40431	40172	-411	-1.02
2. jowar					
1. North India	1248	1906	1525	- 658	-43.15
2. East India <sup>1</sup>	1	—	—	1	—
3. South India	3247	3877	3569	- 630	-17.65
4. West India	4855	4916	4851	- 61	- 1.26
5. Central India <sup>2</sup>	8448	4828	6628	3620	54.62
6. North-West India	3820	1994	2814	1826	64.89
7. total	21619	17521	19387	4098	21.14
3. bajra					
1. North India	1714	2161	1931	- 447	-23.15
2. East India <sup>1</sup>	—	—	—	—	—
3. South India	2621	1478	2071	1143	55.19
4. West India	7163	7571	7347	- 408	- 5.55
5. Central India <sup>2</sup>	2184	1738	1982	446	22.50
6. North-West India	12691	11693	12117	998	8.24
7. total	26373	24641	25448	1732	6.81
4. ragi					
1. North India	39	—	18	39	216.67
2. East India <sup>1</sup>	—	—	—	—	—
3. South India	3881	3680	3789	201	5.30
4. West India	668	461	561	207	36.90
5. Central India <sup>2</sup>	142	146	152	- 4	- 2.63
6. North-West India	—	—	—	—	—
7. total	4730	4287	4520	443	9.80

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

*Land Utilisation Survey and Crop-Cutting Experiments*

TABLE (5.2) (Contd.): ESTIMATED ALLOCATED AREA UNDER EACH MAJOR KHARIF CROP  
BY SUB-SAMPLES: 1956-57

population zone	allocated area (000 acres)			difference col. (2)— col. (3)	percentage difference col.(5) × 100 col. (4)
	sub- sample 1	sub- sample 2	com- bined		
(1)	(2)	(3)	(4)	(5)	(6)
5. maize					
1. North India	1593	1311	1430	282	19.72
2. East India <sup>1</sup>	56	32	43	24	55.81
3. South India	27	6	16	21	131.25
4. West India	164	232	201	— 68	—33.83
5. Central India <sup>2</sup>	821	741	751	80	10.65
6. North-West India	3893	4556	4172	— 663	—15.89
7. total	6554	6878	6613	— 324	— 4.90
6. millets					
1. North India	128	189	161	— 61	—37.89
2. East India <sup>1</sup>	175	277	225	— 102	—45.33
3. South India	3057	3469	3298	— 412	—12.49
4. West India	556	593	561	— 37	— 6.60
5. Central India <sup>2</sup>	799	778	749	— 69	— 9.21
6. North-West India	300	57	169	243	143.79
7. total	4925	5363	5163	— 438	—8.48
7. total (six crops)					
1. North India	11796	13915	12772	—2119	—16.59
2. East India <sup>1</sup>	10192	11093	10635	— 901	— 8.47
3. South India	25467	24488	24970	979	3.92
4. West India	17997	17463	17691	534	3.02
5. Central India <sup>2</sup>	16364	12218	14291	4146	29.01
6. North-West India	22405	19944	20944	2461	11.75
7. total	104221	99121	101303	5100	5.03

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.



*National Sample Survey*

5.2.1. It will be seen from the above tables that the agreement between the two sub-sample estimates of total gross area was good for all the crops except jowar and bajra. In the case of total allocated area, the agreement between the two sub-sample estimates was good for all crops except jowar. The zonal estimates were subject to larger divergence.

5.3. Table (5.3) gives the estimates of gross area under each kharif crop and their standard errors for each zone and all-India.

TABLE (5.3): ESTIMATES OF GROSS AREA UNDER EACH MAJOR KHARIF CROP AND THEIR STANDARD ERRORS: 1956-57

population zone	estimated gross area (000 acres)	standard error (000 acres)	percentage error col. (3) col. (2) $\times 100$
(1)	(2)	(3)	(4)
1. paddy			
1. North India	7769	696	8.96
2. East India <sup>1</sup>	10407	523	5.03
3. South India	12257	953	7.78
4. West India	4224	362	8.57
5. Central India <sup>2</sup>	4211	532	12.63
6. North-West India	1672	322	19.26
7. total	40540	1477	3.64
2. jowar			
1. North India	2745	450	16.39
2. East India <sup>1</sup>	1	1	100.00
3. South India	4775	442	9.26
4. West India	6229	468	7.51
5. Central India <sup>2</sup>	9982	2014	20.18
6. North-West India	2997	471	15.72
7. total	26729	2213	8.28
3. bajra			
1. North India	2333	315	13.50
2. East India <sup>1</sup>	—	—	—
3. South India	2736	338	12.35
4. West India	7809	599	7.67
5. Central India <sup>2</sup>	2515	280	11.13
6. North-West India	14388	3332	23.16
7. total	29781	3428	11.51

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

*Land Utilisation Survey and Crop-Cutting Experiments*

TABLE (5.3) (Contd.): ESTIMATES OF GROSS AREA UNDER EACH MAJOR KHARIF CROP  
AND THEIR STANDARD ERRORS: 1956-57

population zone	estimated gross area (000 acres)	standard error (000 acres)	percentage error $\frac{\text{col. (3)}}{\text{col. (2)}} \times 100$
(1)	(2)	(3)	(4)
4. ragi			
1. North India	18	14	77.78
2. East India <sup>1</sup>	—	—	—
3. South India	4484	256	5.71
4. West India	561	124	22.10
5. Central India <sup>2</sup>	256	125	48.83
6. North-West India	—	—	—
7. total	5319	311	5.85
5. maize			
1. North India	1516	202	13.32
2. East India <sup>1</sup>	43	1	2.33
3. South India	21	10	47.62
4. West India	222	47	21.17
5. Central India <sup>2</sup>	805	296	36.77
6. North-West India	4197	405	9.65
7. total	6504	543	7.98
6. millets			
1. North India	210	39	18.57
2. East India <sup>1</sup>	225	104	46.22
3. South India	3725	256	6.87
4. West India	759	155	20.42
5. Central India <sup>2</sup>	1658	283	26.75
6. North-West India	169	107	63.31
7. total	6146	440	7.16

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

5.3.1. The standard error of the estimated area under paddy (40540 thousand acres) was 1477 thousand acres, i.e. about 4% of the estimate. The standard errors of the estimates for other crops were higher. Zonal estimates were generally subject to larger margin of errors.



## CHAPTER SIX

### RESULTS OF CROP-CUTTING EXPERIMENTS

6.1. In the 11th round of NSS, crop-cutting experiments were continued mainly to train the field staff in the collection of data for the determination of yield rate. Crop-cutting experiments were conducted on paddy, jowar, bajra, ragi and maize in only those sample villages where these crops were found ready for harvesting in the 6 clusters of 10 plots each (or in the plots possessed by the first 4 sample households). Since a large number of villages were surveyed when the crops were not ready for harvesting, crop-cutting experiments could be done only in a small number of villages. As the total number of crop-cutting experiments was found to be not adequate for estimating production, only unweighted yield rates were obtained.

6.2. As already mentioned, the ultimate sampling unit was a circular area of radius 4 feet. Actually two concentric circular areas of radii 2' 3" and 4' respectively were marked and the crops were harvested for determination of yield. The weight of the green crop was taken separately for the circle of radius 2' 3" and for the annular portion. Besides, the dry weight of crop from the cut of radius 2' 3" was also taken after getting the crop dried. The dry weight was taken a few days after the cut was taken when the weight became steady and moisture was completely removed. The yield rates presented here are based on the cuts of radius 4'. The data from the sample cut of radius 2' 3" were used to get the conversion factor to get the yield rate of dry crop from that of green crop.

6.3. Table (6.1) gives the unweighted yield rate of each kharif crop in maunds per acre of gross area. The standard error of the estimate and coefficient of variation are also given. The yield rate pertains to dry grains. For rice the yield rate relates to clean rice. The factor 0.662 has been used to convert the yield of dry paddy to that of clean rice. The number of experiments conducted on each crop is also given.

*Land Utilisation Survey and Crop-Cutting Experiments*

TABLE (6.1): GROSS YIELD RATES OF MAJOR KHAMIF CROPS AND THEIR STANDARD ERRORS

All India

crop	number of villages	number of cuts	ratio of dry weight to green weight (pure and mixed crop together)	yield rate (maunds per acre of gross area)	standard error (maunds per acre of gross area)	coeffi- cient of variation
(1)	(2)	(3)	(4)	(5)	(6)	(7)
rice : pure	172	583	0.5831*	12.15	0.25	50.29
Jowar : pure	26	65	0.7109	7.81	0.79	81.69
mixed	23	71		7.72	0.67	73.57
bajra : pure	13	25	0.6077	7.02	0.98	69.94
mixed	16	49		3.46	0.49	89.60
ragi : pure	18	37	0.5608	10.70	1.02	57.85
mixed	6	17		11.09	2.15	79.80
maize : pure	14	57	0.3266	18.52	1.62	65.77

\* Gives the ratio of clean rice to green paddy.

6.3.1. The unweighted gross yield rate of rice grown singly was 12.15 maunds per acre with a standard error of 0.25 maunds per acre. The gross yield rate of jowar grown in mixture was almost the same as that of the crop grown singly. It may be noted that the coefficients of variation of yield rate of different crops showed some variation; it was highest for bajra grown in mixture and lowest for rice.

6.4. As the number of experiments conducted on all the crops were very few, the zonal yield rates are not given in this report.



## APPENDIX I

### THE METHOD OF ESTIMATION OF AREA UNDER ANY ITEM OF UTILISATION AND ITS STANDARD ERROR

1. The design for land utilisation survey was a stratified two-stage one with villages as the first-stage sampling units and clusters of plots, the second-stage sampling units.

2. Let the estimate of area under any item of utilisation in the  $j$ th sample village in the  $i$ th stratum be  $x_{ij}$ . The estimate for the character for the  $i$ th stratum from the  $j$ th sample village would be equal to  $\frac{x_{ij}}{m_{ij}}$  where  $m_{ij}$  is the probability of selection of the  $j$ th village. If ' $n_i$ ' villages have been surveyed in that stratum, the mean stratum estimate  $x_i$  would be given by

$$x_i = \frac{1}{n_i} \sum_{j=1}^{n_i} \frac{x_{ij}}{m_{ij}}$$

These mean strata estimates added over all strata in a State would give the State estimate for that character.

3. In a sample village ( $ij$ th village, say) where clusters of two plots each were selected with probability proportional to area and with replacement, an estimate of proportion of area under an item of utilisation, ' $p_{ij}$ ' based on only the entry plots would be given by

$$p_{ij} = \frac{1}{n_{ij}} \sum_{k=1}^{n_{ij}} p_{ijk}$$

where  $p_{ijk}$  is the proportion of area under that item in the  $k$ th sample plot (entry plot) in the  $j$ th sample village in the  $i$ th stratum and ' $n_{ij}$ ' is the number of entry plots surveyed in that village.

An estimate of area under the item for the  $ij$ th village is therefore given by

$$x_{ij} = a_{ij} \times p_{ij} \text{ where } a_{ij} \text{ is the area of the village.}$$

3.1. If in a village ( $ij$ th village, say) plots were selected through the intermediate selection of households, the estimated area under an item of utilisation for the village ( $x_{ij}$ ) is given by

$$x_{ij} = \frac{N_{ij}}{n_{ij}} \sum_{k=1}^{n_{ij}} \sum_{l=1}^{n_{ijk}} a_{ijkl} \times p_{ijkl}$$

where  $N_{ij}$  = total number of households in the  $ij$ th sample village, possessing land;

$n_{ij}$  = number of households surveyed in the  $ij$ th sample village;

$a_{ijkl}$  = area of the  $l$ th sample plot possessed by the  $k$ th sample household residing in the  $j$ th sample village in the  $i$ th stratum.

$p_{ijkl}$  = proportion of area under the utilisation in the  $l$ th sample plot possessed by the  $k$ th sample household residing in the  $j$ th sample village in the  $i$ th stratum.

$n_{ijk}$  = number of plots (including those lying outside the sample village) possessed by the  $k$ th sample household residing in the  $j$ th sample village in the  $i$ th stratum.

4. The eleventh round of survey covered the early and late kharif seasons and also a part of rabi season. For estimating the area under a crop of kharif season, data from only those villages surveyed after the completion of sowing and within a period of one month after the commencement of harvesting of the crop were taken into account. In the case of a village where a particular crop was not grown, the 'proper time' for the crop was worked out for that stratum as a whole taking into account all sample villages in that stratum growing the crop. If such a village was surveyed in 'proper time', the estimate from that village was taken to be zero; if it was not surveyed in 'proper time', the village was excluded from analysis for that crop.

5. *Method of estimation of standard error*: As mentioned earlier there were two independent subsamples of villages in each stratum and hence two independent estimates of area were obtained for each stratum for each crop. The standard error of the acreage estimate was estimated from these two sub-sample estimates. Let  $Z_{i1}$  and  $Z_{i2}$  be the two sub-sample estimates of area under a crop for the  $i$ th stratum. Then the estimate from the combined sample is, as mentioned in para 2,  $\frac{m_{i1}Z_{i1} + m_{i2}Z_{i2}}{m_{i1} + m_{i2}}$  where  $m_{i1}$  and  $m_{i2}$  are the number of villages surveyed in the two sub-samples respectively. Another valid estimate for the stratum is  $\bar{Z}_i$  which is the simple average of the two sub-sample estimates, viz.  $\frac{Z_{i1} + Z_{i2}}{2}$ . An estimate of the standard error ( $s_i$ ) of this estimate  $\bar{Z}_i$  for the  $i$ th stratum is given by

$$s_i^2 = \left( \frac{Z_{i1} - Z_{i2}}{2} \right)^2$$

The standard error ( $s$ ) of the corresponding estimate for the State, zone, or all-India is given by

$s = \sqrt{\sum \delta_i^2}$  where  $\Sigma$  indicates summation over all strata in the state, zone or all-India as the case may be. The standard errors given in this report were estimated in this way.

6. It may be noted that strictly speaking the standard error estimates as given above do not relate to the estimates of area (from the combined sample) as presented in the earlier chapters of this report, as the latter are not mean estimates of the form  $\sum_i \bar{Z}_i$ . However this can be taken as a fairly good approximation to the error of the combined estimate when  $m_{i1}$  and  $m_{i2}$  are nearly equal.



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*Land Utilisation Survey and Crop-Cutting Experiments*

TABLE (A.2.1): NUMBER OF SAMPLE VILLAGES ALLOTTED AND SURVEYED BY STATES

population zone and states	number of villages allotted	number of villages surveyed*
(1)	(2)	(3)
(1) <i>North India</i>		
1. Uttar Pradesh	672	610
North India : total	672	610
(2) <i>East India</i>		
1. Bihar	480	293
2. Orissa	336	131
3. West Bengal	480	472
4. Assam	186	84
5. Manipur	25	4
6. Tripura	29	7
East India : total	1536	991
(3) <i>South India</i>		
1. Andhra Pradesh	288	275
2. Madras	576	542
3. Mysore	184	172
4. Travancore-Cochin	96	75
5. Coorg	8	8
South India : total	1152	1072
(4) <i>West India</i>		
1. Bombay	624	473
2. Saurashtra	70	34
3. Kutch	26	9
West India : total	720	516
(5) <i>Central India</i>		
1. Madhya Pradesh	576	371
2. Madhya Bharat	210	84
3. Hyderabad	384	296
4. Bhopal	30	21
5. Vindhya Pradesh	96	86
Central India : total	1296	858
(6) <i>North-West India</i>		
1. Rajasthan	376	293
2. Punjab	167	158
3. PEPSU	96	96
4. Jammu and Kashmir	288	255
5. Ajmer	8	8
6. Delhi	2	2
7. Himachal Pradesh	23	11
North-West India : total	960	823
all India : total	6336	4870

\* This is the total number of sample villages actually surveyed and hence this includes even those villages which were surveyed not in proper time.



*National Sample Survey*

TABLE (A.2.2) : ESTIMATED GROSS AND ALLOCATED AREAS UNDER PADDY : AUTUMN SEASON, 1956-57

population zone	number of villages analysed*			gross area (000 acres)			allocated area (000 acres)		
	sub-sample 1	sub-sample 2	total	sub-sample 1	sub-sample 2	com-bined	sub-sample 1	sub-sample 2	com-bined
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. North India	164	161	325	4540	4673	4571	4481	4626	4513
2. East India <sup>1</sup>	100	100	200	946	745	851	941	733	836
3. South India	200	194	394	1440	2095	1702	1412	2095	1687
4. West India	169	158	327	3714	3186	3462	3797	3073	3408
5. Central India <sup>2</sup>	100	104	204	1821	1379	1617	1821	1379	1615
6. North-West India	233	249	482	1656	1476	1573	1656	1476	1573
7. total	966	966	1932	14117	13554	13776	14018	13382	13632

\* Gives number of villages on which estimates are based.

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

TABLE (A.2.3) : ESTIMATED GROSS AND ALLOCATED AREAS UNDER PADDY : WINTER SEASON, 1956-57

population zone	number of villages analyses*			gross area (000 acres)			allocated area (000 acres)		
	sub-sample 1	sub-sample 2	total	sub-sample 1	sub-sample 2	com-bined	sub-sample 1	sub-sample 2	com-bined
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. North India	220	216	436	2603	3722	3198	2593	3722	3194
2. East India <sup>1</sup>	208	208	416	9028	10094	9556	9019	10051	9531
3. South India	391	382	773	11224	9913	10555	11222	9883	10540
4. West India	211	204	415	884	617	762	884	617	762
5. Central India <sup>2</sup>	164	154	318	2601	2608	2594	2239	2608	2414
6. North-West India	328	330	658	45	168	99	45	168	99
7. total	1522	1494	3016	26385	27122	26764	26002	27049	26540

\* Gives number of villages on which estimates are based.

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

*Land Utilisation Survey and Crop-Cutting Experiments*

TABLE (A.2.4): ESTIMATED GROSS AND ALLOCATED AREAS UNDER JOWAR : AUTUMN  
SEASON, 1956-57

population zone	number of villages analysed*			gross area (000 acres)			allocated area (000 acres)		
	sub-sample 1	sub-sample 2	total	sub-sample 1	sub-sample 2	combined	sub-sample 1	sub-sample 2	combined
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. North India	173	169	342	431	570	489	270	359	311
2. East India <sup>1</sup>	98	98	196	—	—	—	—	—	—
3. South India	298	289	587	417	746	583	367	564	463
4. West India	138	125	263	1425	2256	1828	1102	2084	1578
5. Central India <sup>2</sup>	143	134	277	1826	1512	1666	1565	1165	1368
6. North-West India	233	249	482	1678	937	941	1004	889	882
7. total	1083	1064	2147	5177	6021	5507	4308	5061	4602

\* Gives number of villages on which estimates are based.

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

TABLE (A.2.5): ESTIMATED GROSS AND ALLOCATED AREAS UNDER JOWAR : WINTER  
SEASON, 1956-57

population zone	number of villages analysed*			gross area (000 acres)			allocated area (000 acres)		
	sub-sample 1	sub-sample 2	total	sub-sample 1	sub-sample 2	combined	sub-sample 1	sub-sample 2	combined
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. North India	220	216	436	1910	2443	2256	978	1547	1214
2. East India <sup>1</sup>	210	210	420	2	—	1	1	—	—
3. South India	421	409	830	4275	4065	4192	2880	3313	3106
4. West India	223	216	439	5011	3830	4401	3753	2832	3273
5. Central India <sup>2</sup>	178	170	348	11339	4750	8316	6883	3663	5260
6. North-West India	334	340	674	3012	1126	2056	2816	1105	1932
7. total	1586	1561	3147	25549	16214	21222	17311	12460	14785

\* Gives the number of villages on which estimates are based.

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.



*National Sample Survey*

TABLE (A.2.6) : ESTIMATED GROSS AND ALLOCATED AREAS UNDER RAJRA : AUTUMN SEASON, 1956-57

population zone	number of villages analysed*			gross area (000 acres)			allocated area (000 acres)		
	sub-sample 1	sub-sample 2	total	sub-sample 1	sub-sample 2	combined	sub-sample 1	sub-sample 2	combined
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. North India	173	169	342	955	1192	1188	798	1066	933
2. East India <sup>1</sup>	98	98	196	—	—	—	—	—	—
3. South India	320	309	629	1143	954	1055	1116	729	925
4. West India	161	160	321	5809	6155	5983	5531	6098	5789
5. Central India <sup>2</sup>	135	128	263	1858	1421	1653	1389	1257	1326
6. North-West India	233	249	482	10426	10399	10746	8494	9984	9175
7. total	1120	1113	2233	20191	20121	20625	17328	19134	18148

\* Gives the number of villages on which estimates are based.

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

TABLE (A.2.7) : ESTIMATED GROSS AND ALLOCATED AREAS UNDER RAJRA : WINTER SEASON, 1956-57

population zone	number of villages analysed*			gross area (000 acres)			allocated area (000 acres)		
	sub-sample 1	sub-sample 2	total	sub-sample 1	sub-sample 2	combined	sub-sample 1	sub-sample 2	combined
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. North India	220	216	436	1144	1176	1145	916	1095	998
2. East India <sup>1</sup>	209	210	419	—	—	—	—	—	—
3. South India	393	386	779	2250	1120	1681	1505	749	1146
4. West India	225	225	450	1882	1774	1826	1632	1473	1558
5. Central India <sup>2</sup>	177	166	343	994	690	862	795	481	656
6. North-West India	334	335	669	5094	2481	3642	4197	1709	2942
7. total	1558	1538	3096	11364	7241	9156	9045	5507	7300

\* Gives the number of villages on which estimates are based.

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

*Land Utilisation Survey and Crop-Cutting Experiments*

TABLE (A.2.8) : ESTIMATED GROSS AND ALLOCATED AREAS UNDER RAGI : AUTUMN  
SEASON, 1956-57

population zone	number of villages analysed*			gross area (000 acres)			allocated area (000 acres)		
	sub-sample 1	sub-sample 2	total	sub-sample 1	sub-sample 2	com-bined	sub-sample 1	sub-sample 2	com-bined
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. North India	173	169	342	18	—	8	18	—	8
2. East India <sup>1</sup>	98	98	196	—	—	—	—	—	—
3. South India	320	309	629	527	608	565	433	404	420
4. West India	168	163	331	174	180	172	174	180	172
5. Central India <sup>2</sup>	132	125	257	49	365	204	49	143	100
6. North-West India	233	249	482	—	—	—	—	—	—
7. total	1124	1113	2237	768	1153	949	674	727	700

\* Gives the number of villages on which estimates are based.

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

TABLE (A.2.9) : ESTIMATED GROSS AND ALLOCATED AREAS UNDER RAGI : WINTER  
SEASON, 1956-57

population zone	number of villages analysed*			gross area (000 acres)			allocated area (000 acres)		
	sub-sample 1	sub-sample 2	total	sub-sample 1	sub-sample 2	com-bined	sub-sample 1	sub-sample 2	com-bined
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. North India	220	216	436	21	—	10	21	—	10
2. East India <sup>1</sup>	209	210	419	—	—	—	—	—	—
3. South India	399	389	788	4188	3552	3919	3448	3276	3369
4. West India	224	220	444	494	281	389	494	281	389
5. Central India <sup>2</sup>	176	166	342	93	3	52	93	3	52
6. North-West India	306	311	617	—	—	—	—	—	—
7. total	1534	1512	3046	4796	3836	4370	4056	3560	3820

\* Gives the number of villages on which estimates are based.

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.



*National Sample Survey*

TABLE (A.2.10) : ESTIMATED GROSS AND ALLOCATED AREAS UNDER MAIZE : AUTUMN SEASON, 1956-57

population zone	number of villages analysed*			gross area (000 acres)			allocated area (000 acres)		
	sub-sample 1	sub-sample 2	total	sub-sample 1	sub-sample 2	combined	sub-sample 1	sub-sample 2	combined
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. North India	155	156	311	1722	1289	1484	1593	1269	1409
2. East India <sup>1</sup>	98	98	196	56	32	43	56	32	43
3. South India	320	309	629	20	4	12	20	4	12
4. West India	153	148	301	135	192	166	135	192	166
5. Central India <sup>2</sup>	122	114	236	672	847	712	672	716	658
6. North-West India	233	249	482	3830	4181	3948	3824	4140	3923
7. total	1081	1074	2155	6435	6545	6365	6300	6353	6211

\* Gives number of villages on which estimates are based.

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

TABLE (A.2.11) : ESTIMATED GROSS AND ALLOCATED AREAS UNDER MAIZE : WINTER SEASON, 1956-57

population zone	number of villages analysed*			gross area (000 acres)			allocated area (000 acres)		
	sub-sample 1	sub-sample 2	total	sub-sample 1	sub-sample 2	combined	sub-sample 1	sub-sample 2	combined
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. North India	220	216	436	—	59	32	—	42	21
2. East India <sup>1</sup>	209	210	419	—	—	—	—	—	—
3. South India	420	407	827	18	2	9	7	2	4
4. West India	223	220	443	70	40	56	29	40	35
5. Central India <sup>2</sup>	182	166	348	149	25	93	149	25	93
6. North-West India	306	311	617	69	416	249	69	416	249
7. total	1560	1530	3090	306	542	439	254	525	402

\* Gives number of villages on which estimates are based.

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

*Land Utilisation Survey and Crop-Cutting Experiments*

TABLE (A.2.12): ESTIMATED GROSS AND ALLOCATED AREAS UNDER MILLETS:  
AUTUMN SEASON, 1956-57

population zone	number of villages analysed*			gross area (000 acres)			allocated area (000 acres)		
	sub-sample 1	sub-sample 2	total	sub-sample 1	sub-sample 2	combined	sub-sample 1	sub-sample 2	combined
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. North India	155	156	311	164	211	188	117	160	141
2. East India <sup>1</sup>	98	98	196	118	224	170	118	223	170
3. South India	320	309	629	422	237	369	406	227	351
4. West India	161	160	321	481	527	478	436	402	403
5. Central India <sup>2</sup>	129	122	251	89	444	270	51	444	251
6. North-West India	233	249	482	278	50	155	278	50	155
7. total	1096	1094	2190	1552	1693	1630	1406	1506	1471

\* Gives number of villages on which estimates are based.

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

TABLE (A.2.13): ESTIMATED GROSS AND ALLOCATED AREAS UNDER MILLETS:  
WINTER SEASON, 1956-57

population zone	number of villages analysed*			gross area (000 acres)			allocated area (000 acres)		
	sub-sample 1	sub-sample 2	total	sub-sample 1	sub-sample 2	combined	sub-sample 1	sub-sample 2	combined
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. North India	220	216	436	11	31	22	11	29	20
2. East India <sup>1</sup>	209	210	419	57	54	55	57	54	55
3. South India	383	375	758	3081	3623	3356	2651	3242	2947
4. West India	223	220	443	320	247	281	120	191	158
5. Central India <sup>2</sup>	182	166	348	771	729	788	658	334	498
6. North-West India	307	312	619	22	7	14	22	7	14
7. total	1524	1499	3023	4262	4691	4516	3519	3857	3692

\* Gives number of villages on which estimates are based.

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.



*National Sample Survey*

TABLE (A.2.14): ESTIMATED GROSS AND ALLOCATED AREAS UNDER ALL SIX-CROPS :  
AUTUMN SEASON, 1956-57

population zone	gross area (000 acres)			allocated area (000 acres)		
	sub-sample 1	sub-sample 2	combined	sub-sample 1	sub-sample 2	combined
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. North India	7830	7935	7928	7277	7480	7315
2. East India <sup>1</sup>	1120	1001	1064	1115	988	1049
3. South India	3969	4644	4286	3754	4023	3858
4. West India	11738	12496	12089	11085	12029	11516
5. Central India <sup>2</sup>	6315	5968	6122	5547	5104	5318
6. North-West India	17268	17043	17363	15256	16539	15708
7. total	48240	49087	48852	44034	46163	44764

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

TABLE (A.2.15): ESTIMATED GROSS AND ALLOCATED AREAS UNDER ALL SIX-CROPS :  
WINTER SEASON, 1956-57

population zone	gross area (000 acres)			allocated area (000 acres)		
	sub-sample 1	sub-sample 2	combined	sub-sample 1	sub-sample 2	combined
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. North India	5689	7431	6663	4519	6435	5457
2. East India <sup>1</sup>	9087	10148	9612	9077	10105	9586
3. South India	25036	22275	23712	21713	20465	21112
4. West India	8661	6789	7715	6912	5434	6175
5. Central India <sup>2</sup>	15947	8805	12705	10817	7114	8973
6. North-West India	8242	4198	6060	7149	3405	5236
7. total	72662	59646	66467	60187	52958	56539

<sup>1</sup> Includes only West Bengal.

<sup>2</sup> Excludes Madhya Pradesh, Madhya Bharat and Bhopal.

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Schedule 5.0: Land Utilization

RURAL

(Eleventh Round)

[illegible]

- delete whichever is inapplicable.

\* delete whichever is inapplicable.  
 \*\* G.P.A. classification: not in the CPA-4; in NEA Block-1, in Community Project Block-2, in Community Development Block-3



cluster number			[7] utilisation particulars of entry/coupled* plots															
survey number of plot			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	total
area of plot (00.00 acres)																		
utilisation	season code	season code	area-proportion under utilisation															
			rice	autumn	1													
	winter	2																
wheat		3																
barley		4																
jowar	kharif	5																
	rabi	6																
bajra		7																
ragi		8																
maize		9																
milleta		10																
tapiona		11																
others		12																
sub-total		13	x															
Bengal gram		14																
arhar (fry)		15																
others		16																
sub-total		17	x															
rape & mustard		18																
gingelly		19																
ground nut		20																
castor seed		21																
linseed		22																
others		23																
sub-total		24	x															
vegetables		25	x															

\* delete whichever is inapplicable.

[7] utilisation particulars of entry/coupled* plots (contd.)																	
cluster number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	total
survey number of plot																	
utilization		area code/entry	area-proportion under utilization														
forest & wood-lands	timber	36															
	gum	37															
	gum	38															
	pepper	39															
	chillies	40															
	others	41															
	sub-total	42 X															
orchards & gardens	fruit trees	43															
	flowers	44															
	coconut	45															
	arecanut, betel nut	46															
	cashew nut	47															
	others	48															
	sub-total	49 X															
drugs & narcotics	tea	49															
	coffee	50															
	tobacco	51															
	Indian hemp (ganja)	52															
	others	53															
	sub-total	54 X															
sugar	sugar cane	55															
	palmyra	56 X															
	others	57 X															
	sub-total	58 X															
remarks :																	

never is impossible.



			[7] utilisation particulars of entry/coupled* plots (contd.)															
cluster number			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
survey number of plot																		total
utilization		item code	area proportion under utilization															
fodder	cereals used as fodder	50																
	other fodder	51																
	sub-total	52	x															
fibre	jute	53																
	cotton	54																
	hemp	55																
	others	56																
	sub-total	57	x															
non-agricul tural uses	forest	58	x															
	absolutely barren and uncultivable	59	x															
	house-site	60	x															
	other non-agricultural uses	61	x															
	sub-total	62	x															
fallow	cultivable waste	63	x															
	permanent pastures & grazing grounds	64	x															
	miscellaneous tree crops excluding or chards	65	x															
	ready for sowing	66																
	current fallow	67																
fallow	other fallow	68																
	seedling	69																
	sub-total	70	x															
total-1		x	x															

\* delete whichever is inapplicable

\* Delete whichever is inapplicable

\* delete whichever is inappropriate



\* Block 9-codes: 1-unfavourable weather-2, want of labour-2, want of seed-3, financial difficulty-4, unsuitable for cultivation of (a) kharif crops-5, (b) rabi crops-6, others (specify)-7.  
 † entries in this block will be in terms of area-proportion.

## sch. 5.0—7

- months of harvesting of crops (wheat)

season	season code
autumn	1
winter	2
spring	3
summer	4
perennial	5

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## National Sample Survey

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GOVERNMENT OF INDIA NATIONAL SAMPLE SURVEY : 1956-57.  
Schedule 5.1 : Crop-cutting Experiments

RURAL

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[1] identification particulars of village

1. serial number.....		5. village(s.u.I).....		8. State.....	9. District.....
2. zone-State-n. division.....		6. echomo.....		10. scheduled status.....	
3. stratum.....		7. method code.....		11. village.....	12. village area (acres).....
4. sub-sample.....				13. entry plots.....	

[2] investigation particulars

1. investigator's name.....	8. scrutiniser's name.....
2. roll number.....	9. date of: (i) receipt.....
3. (i) period of survey.....	(ii) scrutiny.....
(ii) date of despatch.....	4. signature.....
	10. signature.....
5. inspector's name.....	11. supervising officer's name.....
6. date of (i) inspection.....	12. date of inspection.....
(ii) scrutiny.....	(iii) despatch.....
7. signature.....	13. signature.....

[3] remarks by investigator :

[4] comments by inspector :

\* delete whichever is inapplicable

\* delete whichever is inapplicable † to be recorded after appropriate stages of work

#### Land Utilization Survey and Crop-Cutting Experiments

 $\text{anh. 5.1--2}$ [illegible]

- codes for crop modules: not up 2, only for harvesting 2, just harvested 2

[illegible]

\* code for crop condition: not ripe-1, ready for harvesting-2, just harvested-3  
† codes for cause of rejection— not permitted by the cultivator-1, others-2.



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GOVERNMENT OF INDIA NATIONAL SAMPLE SURVEY : 1956-57

Land Utilisation Survey

### 5.01 : List of Plots

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[illegible]