

**INSTITUTE OF AGRICULTURAL RESEARCH STATISTICS**

**NATIONAL INDEX**

**OF**

**AGRICULTURAL**

**FIELD**

**EXPERIMENTS**

**VOL. 8 PART 1**

**MAHARASHTRA**

**1948-53**



सत्यमेव जयते

**PUBLISHED BY**

**INDIAN COUNCIL OF AGRICULTURAL RESEARCH  
NEW DELHI**

## FOREWORD

It is a well recognized fact that the level of agricultural production in India is one of the lowest in the world and it is only by the exploitation of scientific methods of agriculture that we can hope to increase our agricultural production to the level necessary for providing a reasonable standard of living to the country's population. Properly planned and conducted field experiments provide a reliable basis for propagating improved agricultural techniques among farmers. A number of research institutes and other experimental centres are functioning under the Central Ministry of Agriculture, the Commodity Committees and the State Governments, in which research on agricultural problems is going on. The need for an integrated account of the researches done in these organisations and institutions in the country has been felt for a long time, particularly in the context of planning. The absence of such a unified account has often led to duplication of work and delay in the utilisation of the results for practical farming. The Institute of Agricultural Research Statistics of the Indian Council of Agricultural Research has, therefore, rendered a most timely service by preparing a compendium of all agricultural field experiments conducted in India upto 1953 and similar compendia are under preparation by the Institute for subsequent years.

The present compendium contains critical summaries of results of experiments bearing on important agronomic factors such as the responses of crops to fertilizers and manures, inter-relationship of fertilizers, varieties and cultivation practices and other information of value for giving sound advice to farmers in different regions. I am sure that these results will be fully utilised by agricultural institutions, research workers, planners and extension organisations. The chief merit of the present publication is that it brings together in one place the results of experimentation carried out under diverse soil, climatic and agricultural conditions obtaining in India. Workers in one State can thus supplement data for their own area by results from other regions where conditions may be similar and thereby re-inforce their own conclusions. For the same reason I hope that this publication will be of use to workers in other countries also.

A Standing Committee consisting of the Agricultural Commissioner with the Government of India, the Director, Indian Agricultural Research Institute and the Statistical Adviser, Indian Council of Agricultural Research, has been set up to provide general guidance to the work under this scheme. I congratulate the members of this Committee and in particular the Statistical Adviser and his associates at the Institute of Agricultural Research Statistics for bringing out this compendium. The preparation of this compendium has been made possible only by the whole hearted co-operation of the States and other organisations in making available the results of their experimental researches for this purpose. My thanks are due to the officers of the State Departments of Agriculture and other institutions for participating in this work. I hope that the present series will be followed by periodical publication of similar compendia for later years, in order that the availability, in a consolidated form, of results of scientific experiments in agriculture in India may be maintained up-to-date.

NEW DELHI,  
August 20, 1962.

A.D. PANDIT  
*Vice-President,*  
*Indian Council of Agricultural Research.*

## PREFACE

A large number of agricultural field experiments on different problems is being conducted in the country by Central and State Governments, Research Institutes, Commodity Committees and other organisations engaged in agricultural research. In addition, a number of schemes involving field experimentation is sponsored by the Indian Council of Agricultural Research in different States. The absence of a unified record of the results of these various experiments has considerably handicapped planning of further research and development and has often led to duplication of efforts.

Vaidyanathan brought out in 1933 a useful catalogue of manurial experiments conducted in India till then. Considering that Vaidyanathan's work was confined to manurial experiments and the fact that an enormous increase has taken place in the number and scope of agronomic experiments in recent years in India, the Indian Council of Agricultural Research launched the scheme of National Index of Field Experiments in 1954. The object of the scheme was two-fold :

- (i) the preparation of compendium of all the field experiments for the period 1935-53 and
- (ii) the preparation of index cards for individual experiments from 1954 onwards.

Under the scheme, results of all agricultural field experiments other than purely varietal trials were to be consolidated. Subsequently at the time of the extension of the scheme in 1959 it was decided that the compendium would be prepared in the first instance for the period 1948-53 and a similar compendium would be prepared for the period 1954-59. The present series for the period 1948-53 has been prepared in pursuance of this decision.

The compendium is divided into 15 volumes one each for (1) Andhra Pradesh (2) Assam, Manipur and Tripura (3) Bihar (4) Gujarat (5) Kerala (6) Madhya Pradesh (7) Madras (8) Maharashtra (9) Mysore (10) Orissa (11) Punjab, Jammu & Kashmir and Himachal Pradesh (12) Rajasthan (13) Uttar Pradesh (14) West Bengal and (15) all Central Institutes. In each volume back-ground information of the respective State regarding its physical features, soils, rainfall and climate, agricultural production and area under different crops is given. A map showing different regions of the State, soils and agricultural research farms is also included. The experiments reported in each volume have been arranged cropwise for each State. All the experiments belonging to a particular crop at various research stations are grouped together. For a particular crop, experiments are arranged according to the following classification :

Manurial (M), Cultural (C), Irrigational (I), Diseases, Pests and Chemicals other than fertilisers (D), Rotational (R), Mixed Cropping (X) and combinations of these wherever they occur (e.g., CM as Cultural-cum-Manurial). Experiments in which crop varieties also form a factor are denoted by adding V to their symbol and are given together (e.g., MV as Manurial-cum-Varietal). The results of an experiment are given along with other basic information such as rotation of crops followed, cultural practices adopted, etc.

For making maximum use of the experimental data all the important tables giving the average yields of various treatments along with the appropriate standard errors have been presented. No attempt has, however, been made to summarise the data of groups of experiments on any particular item and to draw any general conclusions. This will be done for the period 1948-59 while publishing the compendium for the period 1954-59.

This publication is the result of the co-operative endeavour of a large number of persons both at the Centre and in the States. I should particularly mention in this connection, guidance and help rendered in the formulation of the scheme by Dr. D.J. Finney F.R.S. of Aberdeen University, Scotland, during his stay at the Institute of Agricultural Research Statistics as an F.A.O. Statistical Expert in 1952-53.

( ii )

At the Institute of Agricultural Research Statistics, the work under the scheme was carried out under the supervision and guidance of Shri T.P. Abraham, Assistant Statistical Adviser. Shri G.A. Kulkarni, Statistician, looked after the detailed working of the scheme. These officers have been largely responsible for the preparation of the manuscript of the compendium and it is a pleasure to thank them for the hard work they have put in for getting this compendium ready. Messrs O.P. Kathuria, B.V. Srikantiah, M.L. Sahni, B.P. Dyundi, S.D. Bal and P.K. Jain of the statistical staff of the Institute deserve special mention for their careful scrutiny of the data and preparation of the material for the compendium. Thanks are also due to Dr. Uttam Chand, Professor of Statistics, now with the Central Statistical Organisation, Shri K.S. Avadhany, Assistant Statistician, also now with the Central Statistical Organisation, and Shri K.C. Raut, Statistician in this office who were associated with the scheme in its initial stages.

The burden of collecting data from original records by visiting different research stations and the analysis of a large number of experiments, only the primary data for which had been recorded in the files, fell on the regional staff appointed by the Indian Council of Agricultural Research in different States. They deserve to be congratulated for the patient work they have put in. The State Departments of Agriculture, Central Institutes and Commodity Committees made data for the experiments conducted within their jurisdiction readily available. The Indian Council of Agricultural Research acknowledges this willing co-operation without which the consolidation of the results would not have been possible. Various State officers who helped the project by making the data accessible to the statistical staff of the project and worked as the regional supervisors for the scheme also deserve thanks by the Council for their active help. The list of names of the regional supervisors is given on the following page.

NEW DELHI,  
August 16, 1962.

V.G. PANSE  
*Statistical Adviser*  
*Institute of Agricultural Research Statistics*  
*(I.C.A.R.)*

**REGIONAL SUPERVISORS FOR THE SCHEME OF THE NATIONAL INDEX  
OF FIELD EXPERIMENTS**

<b>Region and headquarters</b>	<b>Regional Supervisors :</b>
1. ANDHRA PRADESH (HYDERABAD)	SHRI D.V.G. KRISHNAMOORTHY, Deputy Director of Food Production, Andhra Pradesh. SHRI JAGANNATH RAO, Joint Director of Agriculture (Research), Andhra Pradesh. DR. KHADRUDDIN KHAN, Joint Director of Agriculture (Research), Andhra Pradesh. DR. WAHIUDDIN, Headquarters Deputy Director of Agriculture (Research), Andhra Pradesh.
2. ASSAM, MANIPUR AND TRIPURA (SHILLONG)	SHRI L.K. HANDIQUE, Director of Agriculture, Assam. SHRI S. MAJID, Director of Agriculture, Assam. DR. S.R. BAROOHA, Director of Agriculture, Assam.
3. BIHAR (SABOUR)	DR. R. RICHARIA, Principal, Agriculture College, Sabour. SHRI R.S. ROY, Principal, Agriculture College, Sabour.
4. KERALA (TRIVANDRUM)	SHRI N. SHANKARA MENON, Director of Agriculture, Kerala. SHRI P.D. NAIR, Director of Agriculture, Kerala.
5. MADHYA PRADESH (GWALIOR)	DR. T.R. MEHTA, Principal, Agriculture College, Gwalior.
6. MADRAS (COIMBATORE)	SHRI C.R. SHESHADRI, Vice-Principal & Secretary, Research Council, Agriculture College, Coimbatore. SHRI P.A. VENKATESWARAN, Vice-Principal & Secretary, Research Council, Agriculture College, Coimbatore. LATE SHRI M. BHAVANI SANKARA RAO, Vice-Principal & Secretary, Research Council, Agriculture College, Coimbatore. SHRI T. NATARAJAN, Agronomist & Secretary, Research Council, Agriculture College, Coimbatore. SHRI A.H. SARMA, Extension Specialist & Secretary, Research Council, Agriculture College, Coimbatore.
7. MAHARASHTRA & GUJARAT (FORMER BOMBAY STATE) (POONA)	SHRI D.S. RANGA RAO, Statistician, Department of Agriculture, Poona.

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Owing to transfers and other changes more than one Regional Supervisor have been shown against several states as these officers have acted as Regional Supervisors during different periods from 1955 to 1962.

(iv)

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| 8. MYSORE<br>(BANGALORE)   | SHRI A. ANANT PADMANABHA RAU.<br>State Statistician, Mysore State.   |
| 9. ORISSA<br>(BHUBANESHWAR)  | DR. U.N. MOHANTY.<br>Dy. Director of Agriculture (H.Q.), Orissa.   |
| 10. PUNJAB, JAMMU &<br>KASHMIR AND HIMACHAL<br>PRADESH(CHANDIGARH) | SHRI P.S. SAHOTA,<br>Statistician, Department of Agriculture, Punjab.  |
| 11. RAJASTAN<br>(JAIPUR)   | SHRI. H.C. KOTHARI,<br>Statistician, Department of Agriculture, Rajasthan.   |
| 12. UTTAR PRADESH<br>(LUCKNOW)                                     | DR. K. KISHEN,<br>Chief Statistician to Govt. of U.P.<br>Department of Agriculture, U.P.   |
| 13. WEST BENGAL<br>(CALCUTTA)                                      | SHRI S.N. MUKHERJEE,<br>Statistical Officer,<br>Directorate of Agriculture,<br>West Bengal.<br>DR. S. BASU,<br>Statistical Officer,<br>Directorate of Agriculture,<br>West Bengal. |

**ABBREVIATIONS COMMON TO EXPERIMENTS ON ANNUAL AND  
PERENNIAL CROPS AND EXPERIMENTS ON CULTIVATORS'  
FIELDS**

**Crop :-** In the top left corner is given the name of the crop on which the experiment is conducted. Within brackets along side the crop is mentioned the season wherever the information is available.

**Ref :-** Against the sub-title 'reference' is mentioned the name of the State, the year in which the experiment is conducted and the serial number of the experiment for that year given in brackets.

Abbreviations adopted for States are as follows :-

A.P.	Andhra Pradesh	Mn.	Manipur
As.	Assam	Mh.	Maharashtra
Bh.	Bihar	Ms.	Mysore
Di.	Delhi	M.P.	Madhya Pradesh
Gj.	Gujarat	Or.	Orissa
H.P.	Himachal Pradesh	Pb.	Punjab
J.K.	Jammu & Kashmir	Rj.	Rajasthan
K.	Kerala	Tr.	Tripura
M.	Madras	U.P.	Uttar Pradesh
		W.B.	West Bengal

Repetition of the experiment in other years is indicated in the same line against 'reference' by stating the year and serial number for each repetition side by side e.g. U.P. 53(19)/52(42)/51(20) etc.

**Site :-** Name of the Research Station is mentioned along with the place where it is located, e.g. Agri. Res. Stn. for Agricultural Research Station.

For Central Institutes, the corresponding standard abbreviations have been adopted e.g. I.A.R.I. for Indian Agricultural Research Institute.

**Type :-** Abbreviations used against this item are one or more than one of the following :-

C—Cultural ; D—Control of Diseases and Pests ; I—Irrigational ; M—Manurial ; R—Rotational ; V—Varietal and X—Mixed cropping e.g. CM is to be read as Cultural-cum-Manurial.

**Results :-** Information under this heading should be read against the following items :-

(i) General mean. (ii) S.E. per plot. (iii) Result of test of significance. (iv) Summary table (s) with S.E. of comparison (s).

**Abbreviations used in the text of the experiments :-**

ac.—acre.	C.L.—Cart load.
Ammo. Phos.—Ammonium Phosphate.	C.M.—Cattle Manure.
A/N—Ammonium Nitrate.	C/N—Chilean Nitrate.
A/S—Ammonium Sulphate.	C/S—Copper Sulphate.
B.D.—Basal Dressing.	F.M.—Fish Meal or Fish Manure.
B.M.—Bone Meal.	F.W.C.—Farm Waste Compost.

F.Y.M.—Farm Yard Manure.	N—Nitrogen.
G.M.—Green Manure.	Nitro phos—Nitro phosphate.
G.N.C.—Groundnut cake.	P—Phosphate.
K—Potash.	Pot. Sul.—Potassium Sulphate.
lb.—Pounds.	Super—Super Phosphate.
M.C.—Municipal Compost.	T.C.—Town compost.
Mur. Pot.—Muriate of Potash.	Zn. Sul.—Zinc Sulphate.

### BASAL CONDITIONS

Information under the above heading to be read against the following items :

#### A. For annual crops :

(i) (a) Crop rotation if any. (b) Previous crop. (c) Manuring of previous crop. (State amount and kind). (ii) (a) Soil type. (b) Soil analysis. (iii) Date of sowing/planting. (iv) Cultural practices. (a) Preparatory cultivation. (b) Method of sowing/planting. (c) Seed-rate. (d) Spacing. (e) No. of seedlings per hole. (v) Basal manuring with time and method of application. (vi) Variety. (vii) Irrigated or Unirrigated. (viii) Post-sowing/planting cultural operations. (ix) Rainfall during crop season (State name of the season along with the month). (x) Date of harvest.

#### B. For perennial crops :

(i) History of site including manuring and other operations. (ii) (a) Soil type. (b) Soil analysis. (iii) Method of propagation of plants. (iv) Variety. (v) Date and method of sowing/planting. (vi) Age of seedling at the time of planting. (vii) Basal dressing with time and method of application. (viii) Cultural operations during the year. (ix) Inter cropping if any. (x) Irrigated or Unirrigated. (xi) Rainfall during crop season. (xii) Date of harvest.

#### C. For experiments on cultivators' fields :

(i) (a) Crop rotation, if any. (b) Previous crop. (c) Manuring of previous crop. (ii) Soil type in general. (iii) Basal manuring with time and method of application. (iv) Variety. (v) Cultural practices. (a) Preparatory cultivation. (b) Method of sowing. (c) Seed-rate. (d) Spacing. (e) No. of seedlings per hole. (vi) Period of sowing/planting per hold. (vii) Irrigated or Unirrigated. (viii) Post-sowing/planting cultural operations. (ix) Rainfall during crop season. (x) Period of harvesting.

### DESIGN

Information under this heading to be read against the following items :

#### A. For annual crops :

(i) Abbreviations for designs : C.R.D.—Completely Randomised Design ; R.B.D.—Randomised Block Design ; L. Sq.—Latin Square ; Confd.—Confounded ; Fact.—Factorial. (other designs and modifications of the above to be indicated in full). (ii) (a) No. of plots per block. (b) Block dimensions (iii) No. of replications. (iv) Plot size. (a) Gross. (b) Net. (v) Border or guard rows kept. (vi) Whether treatments are randomised (separately in each block).

#### B. For perennial crops :

(i) Abbreviations for designs : C.R.D.—Completely Randomised Design ; R.B.D.—Randomised Block Design ; L. Sq.—Latin Square ; Confd.—Confounded. (other designs and modifications of the above indicated in full). (ii) (a) No. of plots per block. (b) Block dimensions. (iii) No. of replications. (iv) No. of trees/plot. (v) Border or guard rows kept. (vi) Are treatments randomised.

#### C. For experiments on cultivators' fields :

(i) Method of selection of experimental sites. (ii) No. and distribution of experiments. (iii) Plot size. (a) Gross. (b) Net. (iv) Whether treatments are randomised.



( vii )

GENERAL

Information under this heading to be read against the following items :—

**A. For annual crops :**

(i) Crop conditions during growth with date of lodging, if any. (ii) Incidence of pests and diseases with control measures taken. (iii) Quantitative observations taken (iv) In case of repetition in successive years—(a) from what year to what year, (b) whether treatments were assigned to the same plots in the same manner every year, (c) reference to combined analysis, if any. (v) In case of repetition in other places, (a) names of the places along with reference. (b) reference to combined analysis, if any. (vi) Abnormal occurrences like heavy rains, frost, storm etc., if any. (vii) Any other important information.

**B. For perennial crops :**

(i) Crop condition during the year. (ii) Incidence of pests and diseases with control measures taken. (iii) Quantitative observations taken. (iv) In case of repetition in successive years—(a) from what year to what year, (b) reference to combined analysis, if any. (v) Abnormal occurrences like heavy rains, frost, storm etc., if any. (vi) Any other important information.

**C. For experiments on cultivators' fields :**

(i) Crop condition during growth. (ii) Incidence of pests and diseases with control measures taken. (iii) Quantitative observations taken. (iv) In case of repetition in successive years, (a) from what year to what year, (b) whether treatments were assigned to the same plots in the same manner every year, (c) reference to combined analysis, if any. (v) In case of repetition in other places names of places along with reference. (vi) Abnormal occurrences, like heavy rains, frost, storm etc., if any. (vii) Any other important information.

GLOSSARY OF VERNACULAR NAMES OF CROPS

S. No.	Name of Crop	Botanical name	Assamese	Bengali	Oriya	Telugu	Tamil	Malayalam	Kannada	Marathi	Gujarati	Hindi	Punjabi & Kashmiri
1.	Paddy	<i>Oryza sativa L.</i>	Dhan	Dhan	Dhano	Vadlu, Biyyamu	Nel	Nellu	Bhatta	Bhat	Dangar	Dhan ; Chawal	Chaul ; Dhan
2.	Wheat	<i>Triticum Sativum Lamk ; Triticum aestivum L.</i>	Gaum ; Ghehu	Gam	Gaham	Godumalu	Kothumai	Gothambu	Godhi	Gahu	Ghahu	Gehun	Kanak
3.	Jowar	<i>Andropogon sorghum Brot ; Sorghum vulgare Pers.</i>	—	Jowar	Juara	Jonna	Cholam	Cholam	Jola	Jowari ; Jondhla	Jowari ; Juar	Jowar ; Juar	Jowar
4.	Bajra	<i>Pennisetum typhoides stapf Ex Hubbard</i>	—	Bajra	Bajra	Sajja	Kambu	Kambu	Sajje	Bajri	Bajri	Bajra	Bajra
5.	Nagli	<i>Eleusine caracana Gaertn.</i>	—	Marwa	Mandia	Ragi, chodi	Keppai ; ragi	Muthari ; Ragi	Ragi	Nagli ; achni	Nagli ; Bavto	Ragi ; Mandika ; Marwah	Mandhuka ; Mandhal
6.	Gram	<i>Cicer arietinum L.</i>	Butmah	Chola	Boot	Sanagalu	Kadalai ; Sundal Kadalai	Kadala	Kadale	Harbara	Chana	Chana	Chhole ; Chana
7.	Chinamug (Green Gram)	<i>Phascolus aureus Roxb.</i>	Magumah	Sonamug	Mung	Pachapesalu	Pachaipayaru ; Pasipayaru	Cerupayaru ; Payaru	Hesaru	Mug ; Chinamug	Mag	Moong	Moong ; Mug
8.	Wal (Indian bean)	<i>Dolichos lablab L.</i>	Desi Urahi	Deshi shim	Jhata Simba	Anapa	Mochchai	Ramacha	Avare	Wal	Wal	Sem	Lobia desi
9.	Tur (Pigeon Pea)	<i>Cajanus cajan Milsp ; Cajanus indicus sprengl.</i>	Arhar	Arhar	Harad	Kandulu	Thuvarai	Thuvaran payaru	Thogari	Tur	Tuvar	Arhar	Harhar ; Arhar
10.	Lentil	<i>Lens esculenta Moench.</i>	Masurmah	Masuri	Masur	Chiruse-naga	Masur paruppu	—	Masooru bele	Masur	Masur	Masur	Massar
11.	Pea	<i>Pisum arvense L.</i>	Motor	Chota ; Pyaramatar	Bada-china	Desaval Batni	Pattaani	—	Holada bataani	Vatana ; Matar	Vatana	Muttar	Muttar
12.	Sweet Potato	<i>Ipomoea batatas Lam.</i>	Mitha Alu	Mishti Alu	Kandamula	Chilagadadumpa	Seeni kilangu	Cheeni kizangu	Genasu'	Ratalu	Shakaria	Shakar-kandi	Shakar-kandi
13.	Tapioca	<i>Manihot utilissima ; Manihot esculenta Crantz.</i>	Simolu Alu	Simul Alu	—	Karra Penda-lamu	Maravalli Kizhangu ; Kuchi Kizhangu	Mara cheeni	Mara genasu	Tapioca	—	Tapioca	Tapioca

GLOSSARY OF VERNACULAR NAMES OF CROPS (Contd)

S. No.	Name of Crop	Botanical name	Assamese	Bengali	Oriya	Telugu	Tamil	Malayam	Kannada	Marathi	Gujarati	Hindi	Punjabi & Kashmiri
14.	Onion	<i>Allium Capa L.</i>	Piyaz	Piaj	Peas ; Ulli	Ulli	Vengayam	Ulli	Eerulli	Kanda	Dungli ; Kando	Piaz	Ganda ; Payaz
15.	Tomato	<i>Lycopersicum esculentum</i> Mill.	Belahi	Belati begun	Bilati ba'gan	Tomato	Thakkali	Thakkali	Tomato	Welwangi ; Tambata	Vilaiti wagan ; Tomato	Tamatter	Tamatar
16.	Sugarcane	<i>Saccharum officinarum L.</i>	Kuhiar	Akh	—	Cheruku	Karumbu	Karimbu	Kabbu	Oos	Sherdi	Ganna ; Kamad ; Naishakar	Kamad ; Ganna ; Eakh
17.	Cotton	<i>Gossypium spp.</i>	Kapah	Karpas ; Tula	Kapa	Pratti	Paruthi	Paruthi	Hatti	Kapus	Kapas	Kapas	Kapah
18.	Groundnut	<i>Arachis hypogaea L.</i>	China Badam	Cheena badam	China badam	Nelash- anga	Nilkadalai	Nilakk- adla	Kadale kayi	Bhuimug	Magafali	Mung- phali	Mungfali
19.	Chillies	<i>Capsicum frutescens L.</i>	Jalakiya	Lanka ; Marich	Lanka	Mirapak- aya	Milakai	Mulaku	Menasina kayi	Mirchi	Marcha	Lalmirch	Lalmirch
20.	Garlic	<i>Allium sativum L.</i>	Nohoyu	Rashun	Rasun	Vellulli	Poodu ; Vella podu Tinji	Vellu- thuli	Bellulli	Lasun	Lasan	Lehsoon	Thom ; Lassan
21.	Ginger	<i>Zingiber officinale</i> Rosc.	Ada	Ada	Ada	Allam		Inchi	Shunti ; Alla	Ale	Adu	Adrakh	Adrak
22.	Turmeric	<i>Curcuma longa ; Curcuma domestica</i> Val.	Halodhi	Halud ; Haldi	Haldi	Pasupu	Manjal	Manjal	Arisina	Halad	Halдар	Haldi	Haldi
23.	Guar (Cluster bean)	<i>Cyamopsis psoraloides</i> Dc.	Thupi Urahi	Guar	Gunar ; chhuin	Goruchi- kkudu	Kotha- varnkai	Kothavara	Gori kayi	Guwar	Gavar	Guar	Guara
24.	Lucerne	<i>Medicago sativa L.</i>	Lucerne ghah	Lucern	Lusarna	Garam Masal	Kuthirai- masal	Lucerne	Kudure masale	Lasun ghas ; Vilaiti ghavat Barsim gavat	Gadab Rajko	—	Lustan
25.	Barseem	<i>Trifolium alexandrinum L.</i>	—	Barseem	Gini ghasa	—	—	—	—	—	Barsim	Barseem	Barseem

## CONTENTS

	PAGE
FOREWORD	
PREFACE	... (i)
LIST OF ABBREVIATIONS	... (v)
GLOSSARY OF VERNACULAR NAMES OF CROPS	... (viii)
MAHARASHTRA STATE	... 1
STATEMENT SHOWING DETAILS OF EXPERIMENTAL STATIONS	... 8
EXPERIMENTAL RESULTS (CROP-WISE)	
Paddy	... 37
✓ Wheat	... 207
✓ Jowar	... 305
/ Bajra	... 472
Nagli	... 502
✓ Pulses ( <i>Gram, Chinamug, Wal, Tur, Lentils &amp; Peas</i> )	... 516
Sweet Potato	... 566
Tapioca	... 568
Onion	... 569
Tomato	... 571
Sugarcane	... 572
✓ Cotton	... 675
✓ Groundnut	... 767
Spices ( <i>Chillies, Garlic, Ginger and Turmeric</i> )	... 811
Fodder crops ( <i>Guar, Lucerne &amp; Berseem</i> )	... 819
/ Mixed cropping	... 822
/ Rotational Experiments	... 829
Fruit crops ( <i>Banana and Grapes</i> )	... 873
Addendum	... 879