

[SEVENTEENTH ISSUE]

DEPARTMENT OF STATISTICS, INDIA

ESTIMATES

OF

AREA AND YIELD

OF

Principal Crops in India

1914-15

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*Published by order of the Governor General in Council*

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## DEPARTMENT OF STATISTICS, INDIA

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## APPENDIX I

## METHOD OF FRAMING ESTIMATES OF CROPS

There are three factors necessary for framing an estimate of outturn, namely, the area, the standard normal outturn per acre, and the fraction representing the relation of the crop reported on to the normal crop per acre.

As regards area, there exists in the villages of most provinces an agency capable of reporting the acreage of crops with great accuracy, wherever the fields have been mapped and surveyed. The tracts for which statistics are ordinarily not obtainable are yearly diminishing in extent; but owing to the absence of maps or the non-existence of trained village establishments they still represent a considerable aggregate area. These tracts consist chiefly of permanently settled estates, lands held on privileged tenure, and unsurveyed areas. For these tracts the acreage as well as the outturn cannot be more than a rough estimate. Such estimates of areas, once framed, are liable to become stereotyped and repeated year after year without regard to the influence of exceptional seasons or changes in the economic condition of the tracts. In order to prevent this, provision has been made for the annual revision of these area estimates by careful comparison with the conditions prevailing in those adjoining areas of a similar character for which accurate information is available, and by means of such special enquiries as may be possible.

In dealing with the calculation of the areas under crops, two other matters demand consideration, namely, (1) whether the area returned should be the area sown or that successfully cropped, and (2) whether, when the forecast crop is sown mixed with other crops, it is preferable that the total area covered by the mixed crops should be exhibited, or that such area only should be shown as is estimated to represent the acreage covered by the forecast crop only. As regards (1) the general rule is that the returns should exhibit the areas actually sown whether the crop comes to maturity or not, the principle underlying this rule being that the failure of crop should affect not its area, but its outturn. An exception to this rule is, however, made when fields, owing to the failure of the first sowings, have been devoted to other crops. In this case the area first sown with the forecast crop may be omitted. As to (2) the areas covered by the several crops in a mixed field are estimated in various ways in the different provinces, and the estimates are based on formulae prescribed by the provincial authorities in individual cases, as it has not been found practicable to prescribe one uniform method of calculation. For purposes of the forecasts the area to be returned must be the area covered by the forecast crop, exclusive of the area covered by the other crops with which it is mixed.

Next with regard to the standard normal outturn. A normal crop may be defined as "that crop which past experience has shown to be the most generally recurring crop in a series of years; the typical crop of the local area; the crop which the cultivator has a right (as it were) to expect, and with which he is (or should be) content, while if he gets more he has reason to rejoice, and if less he has reason to complain." Briefly, it is stated to be the average yield on average soil in a year of average character. This normal or average yield will not necessarily correspond with the average of a series of years' figures, which is an arithmetical average. The Agricultural Department in each province maintains a statement of the normal or average yield per acre of land of average quality (under the two major heads of irrigated and unirrigated land) for the several crops in each district. In order to test the accuracy of these standards of normal or average yield and to revise them, if necessary, a system of crop-cutting experiments is in force in all the provinces. Under this system plots of land of average quality are selected and the crops grown on them are cut and weighed in the presence of responsible officers of the District staff or of the Provincial Agricultural Department. These experiments have to be carried out every year in respect of all the principal crops, and in accordance with rules specially framed by the several provincial authorities. The results of the experiments are reported to the head of the provincial Agricultural Department, who on a careful scrutiny of all the reports received by him, and after such further investigations as he may deem necessary, revises or verifies the standards previously adopted for the districts or the province. This revision is ordinarily made once in five years.

The third factor—the fraction representing the relation of the crop reported on to the normal crop per acre—is what is known as the "anna estimate" or the "percentage estimate." In many parts of India the cultivators estimate the crop outturn in annas or sixteenths, as there are sixteen annas in a rupee. They take a certain number of annas to represent the normal outturn, and estimate the outturn of the year of report as so many annas higher or lower than that normal. But in some tracts sixteen annas express a bumper crop, while in others the same term expresses a normal crop, and the number of annas taken to represent a normal outturn varies between 12 and 16. Consequently the anna estimate of one tract is not always amenable to comparison or combination with that of another tract. The percentage estimate is the American system under which 100 is taken to denote a normal crop and the estimated outturn of the year of report is stated as a percentage of that crop. In 1897 a question arose as to whether the anna notation or the American notation should be used in making crop estimates, and it was strongly urged upon the Government of India that as the cultivators and village officers entrusted with the duty of collecting data for crop reports were mostly accustomed to the Indian system, *i.e.*, the anna notation, the adoption of any other system

would tend to confuse the estimate. Local Governments and Administrations were permitted to adopt such scale of notation as might be suited to local conditions, the object being to secure that the returns should be in terms of a normal crop. But since the anna standard thus adopted would not possess any fixed or uniform value, it was laid down that in published forecasts the anna notation should not be used, the American notation being used in its stead, *i.e.*, 100 being taken to represent a normal crop and the estimated outturn being stated as a percentage of that crop, and the conversion of the anna estimate into the percentage estimate being made either by the district officer or by the provincial authorities.

When these three factors have been determined, they are multiplied into each other to arrive at the required quantitative estimate of outturn. Thus, if the area be 60,000 acres, the standard of normal outturn 500 lbs, and the percentage estimate 80, the required quantitative estimate would be  $60,000 \times 500 \times \frac{80}{100} = 24,000,000$  lbs.

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## APPENDIX II

## METHODS OF COLLECTING THE STATISTICS PROVINCE BY PROVINCE

The estimates prepared by the United Provinces include all the districts of the province, except Almora and Garhwal, for which the required particulars are not available as no regular village papers are kept up by patwaris (village accountants) in these two districts. The area is taken from the crop statements based on field-to-field inspections, which are compiled by patwaris and checked by higher revenue officers. The estimates of the standard yield are based on the results ascertained from crop-cutting experiments conducted annually in selected districts. The standards, which are separate for irrigated and unirrigated crops, are revised every five years on a consideration of the results of crop-cutting experiments, and are applied to the condition of the crops reported by district officers and selected land-holders whose number exceeds six hundred.

United Provinces.  
(Total cultivated area  
34,040,000 acres.)

In the Madras Presidency, the estimates relate to all districts in which the respective crops are grown. Approximately two-thirds of the cultivated land in the Presidency is Government or *raiyatwari* land, and has been carefully surveyed. All the village officers therein are appointed and controlled by Government officials. In the ordinary course of his work the village accountant sends every month to the Revenue Inspector (the officer in charge of a group of villages varying in number) a detailed statement of the sowings in his village. For those crops for which forecasts are prepared, the Revenue Inspector, who is himself a touring officer, reports to his Tahsildar, the area in his range under that crop, with his estimates of the average yield expressed in so many annas of the normal crop, when outturns are required. The Tahsildar consolidates all these figures and reports the total direct to the Director of Agriculture with, in the case of outturn, his estimated yield (also expressed in annas of the normal). The remaining third of the Presidency is *zamindari* (consisting of large proprietary estates), of which only a part has been accurately surveyed, and for which somewhat similar returns are prepared and dealt with accordingly. In other cases the Tahsildar or Deputy Tahsildar estimates the area and yield as well as he can from his own knowledge, and from reports of the estate officials. The figures for these zamindari areas are included but shown separately in the reports sent by the Tahsildars to the Provincial Director of Agriculture. The Native States of Pudukkottai and Banganapalle send similar reports direct to the Director for cotton only. No other Native State in the Presidency prepares any crop forecast. Thus for each forecast return 232 separate reports are received in the Director's office, where they are scrutinized and tabulated. More accurate figures of areas cultivated are obtainable at the end of the year after all the village accounts have been checked. These figures are published later in the provincial Season and Crop Report. The figures reported by Tahsildars in their final forecasts—particularly those from zamindari areas—are checked by a comparison with the forecast reports and the season and crop reports of previous years and the returns from neighbouring Government areas, and thus an attempt is made to rectify obviously inaccurate reporting. Standard rates of outturn have been determined for each crop on a consideration of the latest crop-cutting experiments and of the results on the Government farms. The Director checks the rate of yield reported by Tahsildars by estimates received from non-officials interested in a particular crop.

Madras.  
(Total cultivated area  
33,952,000 acres.)

The estimates for Bihar and Orissa relate to all the districts of the province where the respective crops are grown. Survey and settlement operations have been completed in all districts except five, and in these districts the settlement figures serve as a check on the estimates of acreage based on the information furnished by the police. In the absence of any Revenue agency in the province, the figures are based mainly on rough approximate estimates made by district officers, and are more or less conjectural. The district officers obtain information from the sub-divisional officers through the agency of the police. In the district of Sambalpur, the acreages under crops are revised annually by the Land Records staff by field-to-field inspection. The system of making crop-cutting tests, as in other provinces over a series of areas and seasons for the ascertainment of standards of yield has been in force in the districts of this province for some twenty-one years, but sufficiently trustworthy figures of yield have not yet been obtained from these tests to enable Government to accept them as standards. The estimates, therefore, of yield given in the forecasts are based on standards adopted provisionally by the provincial Department of Agriculture on the basis of information obtained from other sources.

Bihar and Orissa.  
(Total cultivated area  
26,875,000 acres.)

The estimates for the Bombay Presidency include all British districts and Native States where the respective crops are grown to any extent. In the British districts of the Presidency proper the area under different crops is ascertained in the first instance by village officers and recorded in village returns, which are checked by circle inspectors and other revenue officers, and compiled by the former for their circle and then for the taluka. The taluka figures are totalled up for each district in the office of the Director of Agriculture of the province. For Sind this work is done by local officers, and the Director receives district-by-district figures. The information received is for villages for which regular statistics are available, the proportion of reporting area being 91.4 per cent in the Presidency proper and 99.6 per cent in Sind. From 1909-10, however, estimates for the non-reporting areas have been made so far as possible and included in the table. In the case of Native States the acreage is estimated on the best local data available. The approximate numerical strength of the reporting agency is 188 in the Presidency proper, 60 in Sind, and 33 in the Native States. No standard of yield has yet been fixed. Local estimates of crop condition are converted to quantitative

Bombay and Sind  
(Total cultivated area  
28,241,000 acres.)

*N.B.*—The cultivated area shown in the margin represents the average area actually sown with all crops in each province.

figures on the basis of a formula showing the average yield of crops, which has been adopted provisionally. This formula is now being revised, the revision being based on the ascertainment of actual yield in different parts of the Presidency by careful local enquiry by officers of the provincial Agricultural Department, who are tabulating the results and comparing them for the purpose. The unit of area in the formula is the district, and dry and irrigated crops are separately dealt with. Each year's estimate of the condition of crops is prepared by the mamlatdars (or mahalkaris where the taluk is sub-divided) from notes which they make and from reports from village accountants and circle inspectors. The estimate is sent direct to the Director of Agriculture, who, in the light of the general prospects of the season, makes the quantitative calculations. A copy of the estimate is at the same time sent to the district officer through the sub-divisional officer, who sends his remarks, if any, to the district officer, forwarding a copy of the same to the Director. The district officer on receipt of these remarks forwards to the Director his opinion as regards the general condition of the whole district. For Sind there are no formulæ, and all the necessary information is obtained from the district officers in the form of estimates on the basis of twelve annas for a normal crop, together with quantitative equivalents gathered from general experience. For the Native States condition estimates are obtained, and the formulæ for adjoining British districts are applied.

**Bengal.**  
(Total area acres.)  
cultivated 25,052,000

The estimates for Bengal relate to all the districts of the Presidency where the respective crops are grown. In the absence of any revenue agency in the province, the figures are based mainly on rough approximate estimates made by district officers, and are more or less conjectural. The district officers obtain information from the sub-divisional officers through the agency of the police. The system of making crop-cutting experiments, as in other provinces, over a series of areas and seasons for the ascertainment of standards of yield has been in force in Bengal for the last twenty years, but sufficiently trustworthy figures of yield have not yet been obtained from these cuttings to enable Government to accept them as standards. The quantitative estimates therefore of yield given in the forecasts are based on standards adopted provisionally on the basis of information obtained from other sources.

**Central Provinces and Berar.**  
(Total area acres.)  
cultivated 24,710,000

The estimates for the Central Provinces and Berar relate to all the British districts of the province in which the respective crops reported on are grown. As regards the Native States of the province, reports on wheat only are furnished by the two States of Khairagarh and Nandgaon. No information is available for any other State. The figures of acreage for cotton, sesamum, rice, and sugarcane are estimates based on reports furnished by the local officials of the Land Records staff. The figures for wheat and linseed represent the actual areas sown with these crops as disclosed by field-to-field inspection by patwaris. The reporting agency consists of 217 revenue inspectors with, on an average, 24 patwaris working under each inspector. Each tahsil has usually 4 revenue inspectors. Standards of outturn were framed for each crop from the results of crop-cutting experiments on selected fields under the supervision of responsible and selected officials during the years 1884-85 to 1887-88. These standards have been revised from time to time on the basis of the results of crop-cutting experiments since made, the last revision having been made in 1912. The yield expressed by the people in terms of annas in the rupee is converted into percentages, 13·3 annas, or a normal crop, being taken to be equal to 100. A full crop or 16 annas is denoted by 120, and a bumper crop or 20 annas by 150. All deductions based on the standards are made by the provincial Director of Land Records and Settlements from the year's figures furnished by the District officers, who are supposed to bear in mind the standards when estimating the yield of the season.

**Punjab.**  
(Total area acres.)  
cultivated 23,558,000

The estimates for the Punjab relate to all the British districts in which the respective crops are grown. As regards the Native States of the province, reports on wheat and cotton are furnished by all the States in which the two crops are grown to any considerable extent. No estimates for any other crop are prepared by any Native State. The figures of area for all the British districts up to 1912-13 were based on actual measurements by the village revenue staff. Estimates of yield were recorded by district officers after personal enquiry from tahsildars and leading agriculturists. The total number of agriculturists consulted by the district officers and tahsildars must amount to several thousands. From 1913-14, however, this method is followed only in districts in which the respective crops are grown to a considerable extent. For other districts the provincial Director of Land Records prepares conventional forecasts based on the actual average area figures for the previous five years, and an assumed average outturn is determined by him to meet the character of the harvest.

**Burma.**  
(Total area acres.)  
cultivated 13,870,000

The estimates for Burma relate to all the districts of the province in which the respective crops reported on are grown. The figures for the districts in which the crops are grown to a considerable extent are based on regular reports, furnished by district officers, while those for the remaining districts are based on rough estimates prepared by the Commissioner of Settlements and Land Records. For the districts from which regular reports are received, the figures of area are obtained from the assessment rolls prepared by revenue surveyors. The original information about the yield is obtained from township officers, inspectors of Land Records, and from the more important of the Land Revenue subordinate officers. In this way the estimate of each district is based on the information furnished by some thirty or more persons. The figures of both area and yield are tabulated by the Superintendent of Land Records and checked by the District officer. The Commissioner of Settlements and Land Records compares the estimated yield with a standard representing the normal yield, which was fixed after an extensive series of experimental crop-cuttings by settlement officers.

The estimates for Assam relate to all the districts in which the respective crops reported on are grown to any extent, excluding some of the unimportant hill districts in certain cases. The information is received from district officers, who in their turn obtain figures from mandals (headmen) in the case of the temporarily-settled areas and from zamindars in the case of the permanently-settled tracts. These figures are said to be checked by the sub-divisional and district officers, but, except where the district officer is himself able to do it, there is no valid check at all, and sometimes figures returned by the district officers are more or less inaccurate and inconsistent.

Assam,  
(Total  
area  
acres.)  
cultivated  
5,813,000

The estimates for the North-West Frontier Province relate to all the districts of the province in which the respective crops reported on are grown, including the Tochi agency in the case of wheat, cotton, and sugarcane, and the Kurram agency in the case of wheat and cotton. The figures of area are based on actual measurements made by the patwaris in their field-to-field inspection in each harvest. They are further checked by higher revenue officers. The estimates of the standard yield are based principally on data derived from a large number of crop-cutting experiments made during the progress of settlement operations. They were framed for each assessment circle, which is the unit of area, and separately for lands irrigated by canals, by wells, for alluvial (*sailab*) lands, and for lands entirely dependent on rain. The standards are applied to the estimates of condition of crops received from the district officers who frame their estimates in consultation with local agriculturists. The exact number of agriculturists consulted by the district officers is not available, but it must necessarily be several hundreds.

North-West Frontier  
Province. (Total  
cultivated  
area  
2,272,000 acres.)

The estimates for Ajmer-Merwara relate to the whole of the district. So far as *khalsa*\* *jagir* and minor *istamrari* villages are concerned, the patwari is responsible for making field-to-field inspections of every village in his circle at each harvest. These inspections commence on 1st September for the autumn harvest and on 1st February for the spring harvest. The patwari notes down the results of his local inquiries and inspections in his field book. A certain percentage of the entries made by the patwari is checked and corrected, when necessary, by the girdawar or kanungo, who also inspects the crops at each harvest. The tahsil officers further test a certain number of entries, and the sub-divisional officer also makes a general inspection of crops at each harvest. As soon as the inspection of the harvest is complete an abstract statement of area and outturn is compiled separately for each girdawar's circle and tahsil, and these statements are then consolidated for the three sub-divisions in the district office. An assumed normal outturn per acre for each crop has been fixed at settlement. Crop estimates are annually made by the revenue officers and the results recorded. These sets of figures give a useful check on the outturn estimates made by the patwaris. The exact area sown in the sub-divisions is obtained from the abstract statements. In the large *istamrari* estates the preparation of the field books is done by the estate officials. These field books contain fairly accurate information in regard to wheat, the outturn of which in maunds is generally appraised for the purpose of payment of the cultivators' rent; but as regards cotton and sesamum the figures are conjectural, as no crop-cutting experiments are made, the rents being charged in cash. The Government agency does not supervise the collection of figures in large *istamrari* estates.

Ajmer-Merwara.  
(Total  
area  
acres.)  
cultivated  
297,000

Estimates for wheat and cotton are received from the Native States in Central India; but they are in many cases imperfect. In the States of Indore, Gwalior, Rajgarh, Narsingarh, Kilechipur, Kurwai, Piploda, Bagli, Sitamau, Sailana, Jaora, Rutlam, Dewas, (Senior and Junior), Dhar, Barwani, and Jhabua, the figures of area are based on crop statements prepared by patwaris under the supervision of superior Revenue or Land Records officers. The returns include areas held revenue-free or on privileged tenure, but the figures for these areas are based on imperfect data in most cases and can be taken as rough estimates only. In the States of Pathari, Mahammadgarh, and Alirajpur the figures are based on rough estimates. As regards yield, the estimates are for the most part conjectural, no standard of average yield having been framed except in the States of Narsingarh, Dhar, Jhabua, Kurwai, Pathari, and Mahammadgarh.

Central India.

The estimates for wheat and cotton furnished by the States in Rajputana are generally defective in consequence of the absence of figures for unsurveyed areas and privileged tenures in many cases.

Rajputana.

The estimates for wheat, cotton, and oilseeds furnished by the Hyderabad State excluded until 1902-03 *jagir* and other revenue-free lands or privileged tenures; since then estimates for these areas have been procured as far as possible and included in the statement.

Hyderabad.

The estimates furnished by the Mysore State relate to all the districts of the State in which the respective crops are grown. As regards area the information is based on the entries made by the *shambog* (village accountant) in his crop inspection book and checked by the higher revenue officers. The outturn is noted by the *shambog* in terms of annas (16 annas being taken for a normal or 100 per cent crop) from which the total yield is determined by reference to the standard normal outturn per acre fixed for each taluk. The figures are finally scrutinized and consolidated in the Revenue Commissioner's office.

Mysore.  
(Total  
area  
acres.)  
cultivated  
6,161,000

\* *Khalsa* villages are those which pay full revenue to Government



## APPENDIX III

## NORMAL YIELD PER ACRE OF CROPS FOR WHICH FORECASTS ARE PREPARED

Province	Rice	Wheat	Sugar-cane	Cotton	Jute	Linseed	Rape and Mustard	Sesamum	Ground-nut	Indigo
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Bengal . . . . .	{ (a) 987 (b) 823 (c) 1,111 }	{ 864	{ 2,921	{ 155	{ 1,271	{ 494	{ 494	{ 350	{ ...	{ ...
Bihar and Orissa . . . . .	{ (a) 1,234 (b) 823 (c) 823 }	{ (d) 984 (e) 451 (f) 861 }	{ 2,464	{ 155	{ 1,200	{ 494	{ 494	{ 350	{ ...	{ ...
Assam . . . . .	{ (a) 1,008 (b) 672 (c) 1,012 }	{ ...	{ 1,904	{ 154	{ 1,320	{ ...	{ 504	{ ...	{ ...	{ ...
United Provinces . . . . .	{ 900	{ 1,050	{ 2,600	{ 160	{ ...	{ 500	{ 600	{ 280	{ ...	{ ...
Madras . . . . .	{ (h) 1,193 (i) 887 }	{ ...	{ 5,040	{ (h) 67 (i) 55 }	{ ...	{ ...	{ ...	{ (h) 373 (i) 238 }	{ 1,120	{ ...
Bombay . . . . .	{ 1,230	{ 575	{ 6,950	{ 100	{ ...	{ 360	{ 625	{ 400	{ 3,000	{ ...
Sind . . . . .	{ ...	{ 1,340	{ 4,233	{ 360	{ ...	{ ...	{ 602	{ 394	{ ...	{ ...
Punjab . . . . .	{ ...	{ 726	{ 1,666	{ 118	{ ...	{ ...	{ 396	{ ...	{ ...	{ ...
Central Provinces and Berar . . . . .	{ 624	{ 600	{ 2,569	{ 86	{ ...	{ 226	{ ...	{ 224	{ ...	{ ...
North West Frontier Province . . . . .	{ ...	{ 638	{ 2,430	{ 160	{ ...	{ ...	{ 418	{ ...	{ ...	{ ...
Burma . . . . .	{ (g) 1,070	{ ...	{ ...	{ 122	{ ...	{ ...	{ ...	{ ...	{ ...	{ ...
Ajmer-Merwara . . . . .	{ ...	{ ...	{ ...	{ 170	{ ...	{ ...	{ ...	{ ...	{ ...	{ ...
Coorg . . . . .	{ 1,483	{ ...	{ ...	{ ...	{ ...	{ ...	{ ...	{ ...	{ ...	{ ...

\* Not available

(a) Winter Rice (b) Autumn Rice (c) Summer Rice

(d) Bihar (e) Chota Nagpur (f) Orissa

(g) 997 lbs. for Upper Burma and 1,140 lbs. for Lower Burma (h) Irrigated (i) Unirrigated.

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