CHAPTER THREE

Nature of Data and Problems of Interpretation

A study of the agrarian economy of Western and North Western India, spanning over seventy years and covering the transition from a colonial to a post-colonial state structure, confronts a mass of statistics. The British Government in India, in the course of some seventy years culminating in 1947, generated and published an impressive array of facts and figures, charts and graphs buttressed by volumes of written opinions of collectors and settlement officers, directors of Revenue and Agriculture, agricultural chemists or civil servants turned agricultural enthusiasts. The opinions of money-lenders and Rai Bahadurs, of indigenous bankers and captains of the still infantlike Indian industry were carefully entered into the hefty volumes of "Evidence" given to countless commissions of enquiry. The Administration of the Raj exhibited the paraphernalia of modern government, in the form of annual returns of virtually every kind of activity known, with great pride and satisfaction.

The Indian Government of India after 1947 launched into an era of so-called democratic socialism, which was to be achieved by increasing state participation in industry and radical land reform in the countryside. Impressive calculations tucked away in the various Five Year Plans and their supplementary volumes attempted to give both shape and credibility to the march towards a more egalitarian society. The fact that such a society seems even now further away than ever, and that something more than paper computation is necessary to achieve it, does not do away with the utility of such statistics and, of course, with the need to analyse them. As already explained
in the first chapter, the process of agrarian change is a complex phenomenon and can only be meaningfully studied over a relatively long period. Unfortunately, this entails sifting through an endless range of data, the reliability of which is never a matter of certainty, the comparability of which both over time and across regions is almost always subject to doubt, and which almost never was designed to answer the questions which one would most like to ask.

Yet we must take what we have, and use it with caution, and the checks offered by theoretical reasoning. The object of this chapter is to elucidate the dimensions of the "caution" which must be exercised with respect to various kinds of statistics and at different points in time. It is to this task that we now turn.

I Agricultural statistics before 1947

Before the mid-1950s estimates of both area and yield of crops grown in British India were furnished by revenue officials. Output of a particular crop was calculated by the simple formula:

\[ O_{it} = A_{it} \times Y_{it} \]

where \( O_{it} \) = output of crop \( i \) in year \( t \)
\( A_{it} \) = gross sown area of crop \( i \) in year \( t \)
\( Y_{it} \) = yield per acre of crop \( i \) in year \( t \)

\( Y_{it} \) in turn was not calculated directly using an "objective" crop cutting method but subjectively or by eye estimation, being in turn a product of the Standard or Average Yield and the seasonal condition factor. Thus:

\[ Y_{it} = SY_{it} \times SC_{it} \]

where \( SY_{it} \) = the Standard Yield for crop \( i \), taken to be the
average for the current quinquennium, and \( SCF_{it} = \) seasonal conditional factor for crop \( i \) in year \( t \). The SCF was therefore equal to the estimated or Revenue Yield divided by the Standard Normal or Average Yield in any given year.

The Standard Yield was defined as "the average yield on average soil in a year of average character", \(^1\) and was subject to revision every five years. It was fixed on the basis of crop cutting experiments (though not based on random sampling methods), the opinions of settlement officers and of well-off peasants and the gentry of the particular district. The seasonal condition factor was an index of the normality of the crop and was expressed as a fraction of the number of annas used to denote the normal crop. In Punjab sixteen annas was taken to be the normal crop; in Bombay it was generally taken to be twelve annas. Thus, given a SY of 1,000 lbs per acre, a SCF of eight annas would represent a revenue or estimated yield per acre of \( \frac{8}{16} \times 1,000 \) or 500 lbs in Punjab and \( \frac{8}{12} \times 1,000 \) or 667 lbs in Bombay. The area figures in Ryotwari or Temporary Settlement areas such as Punjab and Bombay, where the revenue settlement was revised every thirty years, \(^2\) were compiled on the basis of crop inspections - called Girdwari in Punjab - carried out at each harvest by revenue officials called Patwaris. Potentially, therefore, the output figures for crops were subject to all three factors entering into output estimation. In general, area statistics for Ryotwari areas were supposed to be quite

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\(^1\) Quoted in Blyn (1966), p. 46. A rather colourful description of the Standard Yield was given in the "Estimates of Area and Yield of Principal Crops in India" 1940-41, p. 46: as "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".

\(^2\) After 1928 revenue settlements in Punjab were revised every forty years - except in the case of new canal areas. See: Punjab (1938), "The Report of the Land Revenue Committee", Para. 12.
and Sivasubromonian (1957). In the view of nationalist historians, trend rates derived by Blyn provided yet more proof of economic decline during the British "Raj". Moreover, this evidence, unlike qualitative sources, was in statistical tables and graphs - all the more formidable for having passed through the rigour of a statistician's formulas.

Seven years after the publication of Blyn's celebrated work, the issue of the reliability of output and area statistics of British India was reopened by Heston (1973) and thereafter assumed the proportions of a minor controversy, as seen in Dewey (1974), Saith (1977), Desai (1978), Heston (1978) and Islam (1979). Since trend rates of output and productivity are rather crucial to a study of agrarian change, and since two of the major contributors to the current debate over Blyn's results use Bombay and Punjab as their focal areas, the nature of the present controversy merits further attention here. Let us take each province in turn.

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8/ Sivasubromonian, S. (1957), "Estimates of Gross Value of Output for Undivided India - 1900-1 to 1942-3".

II. Heston on Revenue Yields per acre in Bombay Presidency (1886-1947)

Heston (1973) has argued that in Bombay Presidency the Standard Yields per acre for most of the crops were virtually constant between 1897 and 1964. Hence a decline in the estimated or Revenue yields per acre could come about only as a consequence of declining condition factors over time. He does indeed find that there has been a "secular decline in the condition of crops relative to normal over the first fifty years of the century". Since this decline in condition factors, according to Heston's calculations, was not correlated with changes in rainfall, it must be generated by the method by which agricultural statistics were collected. Taking the entire period 1886-1947, Heston's paper argues that: "There were biases in the official yields per acre - particularly an upward bias from 1886-1897 and downward bias from about 1937 to 1946 - in several areas of India". The decline in yields per acre of major foodgrains confirmed

10/ Although Heston's reply to Desai was published a good five year after his initial article (1973), it adds little to the substance of his previous work. In Heston (1978) there is an attempt to generalise the conclusions of the earlier article to the all India level, and to test the degree of correlation between Revenue Yields and crop cutting yields during the post-independence period. On the question of movements in the trend of Revenue Yields, Heston has little to add to his earlier position. As he reiterates his 1973 conclusion:

"However, the reality remains that for reasons that are still to be explained, there was a secular decline in the condition factor in Bombay and other provinces for a number of important crops. This does not seem plausible if condition factor is to reflect the character of the seasons, which should not in the absence of secular climatic changes display any trend" (Heston, 1978: p. 208).

We have, therefore, focussed our attention on Heston (1973) since it is the key to his arguments on movements of yields per acre over time.

by Heston was caused not by deterioration in agricultural techniques or by other economic causes but could be "traced to administrative changes in the earlier periods, and linked to political pressures toward the end of the period". The upward bias at the start of the period, i.e. 1886-1896, resulted from Standard Yields considerably overestimating the actual yields. On the basis of a series of crop-cutting experiments, and other information, the Standard Yields were drastically reduced in 1897 - by some 38 per cent according to Heston. The end period downward bias was caused by the linking of the annawari estimates with the remissions and suspensions of revenue. Heston argues that district officials, for political reasons, were pressured to accept lower condition factors. Indeed, an upward bias at the initial period followed by a downward bias at the end period would be sufficient to lend a downward bias to the estimated trend - a possibility recognised quite explicitly by Blyn.

Unfortunately, Heston's rather bold claim that the results of his exercise could be generalised to other areas of British India founders on the numerous errors in his exercise with data. It is doubtful whether his exercise can have any significance even for Bombay Presidency.

Let us take the first period 1886-97. The most obvious point to note is that Blyn's series begins in 1890-91, a good five years after Heston's period begins. It is hardly likely that data for five years would seriously affect Blyn's trend estimates. Secondly, the choice

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12/ Ibid., p. 326.
13/ Heston (1973), p. 308: These experiments were discontinued by 1909.
14/ Ibid., p. 319.
of periods is dictated by the fact that Standard Yields were reduced by about 38 per cent between 1884 and 1897, and in 1897-98 "normal conditions" were represented by a twelve anna crop instead of sixteen annas. Given that a crop reported as eight annas would be entered as a condition factor of $8/16 \times 100$ or 50 per cent before 1897-98, and $8/12 \times 100 = 67$ per cent after 1897-98, with Standard Yields remaining fixed after 1897, one would expect a rise in the average condition factor after 1897-98. Heston notes that his

"contention that the effect of this change should raise the average condition factor, really is evident in comparing the period 1898-1906 with the period 1907-16, when rainfall went up slightly but the condition factor increased considerably." 17/

Desai 18/ rightly argues that there is no reason for the rise in the district condition factor to take twenty years. It is important to be clear that crop reporters at the village level, i.e. the Patwaris, went on reporting the crop as before - a ten anna crop was still reported as a ten anna crop. What was changed was the district condition factor which was calculated as a percentage on the normal yield per acre. Thus it was the conversion of the patwari reports into an aggregate district condition factor which may have been altered. Such a change would follow automatically if the district officials decided to treat twelve annas as the normal crop. 19/

In order to demonstrate his claim that a decline in condition factors in Bombay was the consequence of incorrect yield estimation

17/ ibid., p. 324.
19/ The village patwari was supposed to be ignorant of this change from sixteen to twelve annas as the normal crop since he would adjust his own estimates downwards.
by revenue authorities, Heston calculates correlation coefficients between average annual rainfall and condition factors. Given that the most important determinant of condition factors were climatic fluctuations - especially rainfall - Heston concludes that a weak correlation between rainfall and condition factors - especially towards the end of his period shows the influence of administrative changes in the estimation of the latter.

Since these correlations form the statistical core of Heston's argument and since, surprisingly, the results of this exercise are relegated to a lengthy footnote, we quote extensively from Heston to facilitate the clarity of the detailed criticism which follows. His comments refer to data contained in Table 3:1 (Heaton's Table 3), reproduced here. As he explains,

"If a district had all five crops, then five correlations would be available for that district - in fact of the potential 95 correlations (five crops and nineteen districts), only 74 were available. Summarising these results, there was a positive simple correlation of the condition factor and rainfall in 52 of the 74 cases. Because there were few observations underlying each estimate, very few of the relations were statistically significant; in addition, most of the relationships were weak. This, we suggest, is because the condition factor was subject to administrative influences that outweighed the influences of the season, thus producing weak correlations between the condition factor and rainfall. To test this explanation we examined the residuals of the equations relating rainfall and the condition factor with the following results. If the predicted value of the condition factor based on rainfall is greater than the actual value, the residual will be negative. It is our argument that the residuals in period 1 and period 6 (i.e. of Table 3:1), when we believe the condition factor is low, are negative" (Heston: 1973, p. 325).

In fact, the data contained in Table 3:1 - Heston's table - show several peculiarities which should be noted even before one looks at his regression equations.
### Table 3.1: Average Condition and Rainfall Factor for Major Crops in Bombay and Index of Average Total Rainfall for Each District, 1886-1947

<table>
<thead>
<tr>
<th>Crop/District</th>
<th>1886-97</th>
<th>1898-1906</th>
<th>1907-16</th>
<th>1917-26</th>
<th>1927-36</th>
<th>1937-46 Total or Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
</tr>
<tr>
<td>CROP</td>
<td></td>
<td>A. CONDITION FACTOR</td>
<td></td>
<td></td>
<td></td>
<td>ACREAGE</td>
</tr>
<tr>
<td>Rice</td>
<td>72</td>
<td>72</td>
<td>82</td>
<td>79</td>
<td>86</td>
<td>74</td>
</tr>
<tr>
<td>Wheat</td>
<td>67</td>
<td>55</td>
<td>68</td>
<td>74</td>
<td>60</td>
<td>63</td>
</tr>
<tr>
<td>Jowar</td>
<td>63</td>
<td>56</td>
<td>66</td>
<td>63</td>
<td>71</td>
<td>58</td>
</tr>
<tr>
<td>Bajira</td>
<td>64</td>
<td>59</td>
<td>65</td>
<td>63</td>
<td>71</td>
<td>62</td>
</tr>
<tr>
<td>Cereals</td>
<td>65</td>
<td>59</td>
<td>68</td>
<td>66</td>
<td>73</td>
<td>62</td>
</tr>
<tr>
<td>Cotton</td>
<td>61</td>
<td>62</td>
<td>73</td>
<td>70</td>
<td>65</td>
<td>62</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>59</td>
<td>69</td>
<td>67</td>
<td>71</td>
<td>62</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DISTRICT</th>
<th>A. RAINFALL (1886-1896 = 100) BASE RAINFALL IN INCHES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ahmedabad</td>
<td>100 76 94 86 127 102 31.6</td>
</tr>
<tr>
<td>Kaira</td>
<td>100 74 77 71 93 80 38.9</td>
</tr>
<tr>
<td>Panch Mahals</td>
<td>100 78 96 87 129 97 41.1</td>
</tr>
<tr>
<td>Brood</td>
<td>100 74 85 74 75 84 42.8</td>
</tr>
<tr>
<td>Surat</td>
<td>100 64 87 82 120 104 47.0</td>
</tr>
<tr>
<td>Dhulia</td>
<td>100 77 77 93 46 93 26.0</td>
</tr>
<tr>
<td>Jalgaon</td>
<td>100 83 106 89 123 110 28.8</td>
</tr>
<tr>
<td>Nasik</td>
<td>100 76 97 78 103 83 31.7</td>
</tr>
<tr>
<td>Ahmednagar</td>
<td>100 75 91 91 108 93 25.5</td>
</tr>
<tr>
<td>Poona</td>
<td>100 78 103 82 98 99 27.0</td>
</tr>
<tr>
<td>Sholapur</td>
<td>100 82 83 86 92 82 30.1</td>
</tr>
<tr>
<td>Sara</td>
<td>100 76 94 75 101 96 44.2</td>
</tr>
<tr>
<td>Belgaum</td>
<td>100 93 106 94 101 104 50.8</td>
</tr>
<tr>
<td>Bijapur</td>
<td>100 80 76 74 90 88 26.2</td>
</tr>
<tr>
<td>Dharwar</td>
<td>100 105 132 135 144 112 24.2</td>
</tr>
<tr>
<td>Thana</td>
<td>100 89 89 85 97 102 105.7</td>
</tr>
<tr>
<td>Kolaba</td>
<td>100 84 86 83 94 83 94.7</td>
</tr>
<tr>
<td>Ratnagiri</td>
<td>100 92 95 113 97 99 100.5</td>
</tr>
<tr>
<td>Kanara</td>
<td>100 93 90 93 103 97 123.9</td>
</tr>
<tr>
<td>Average</td>
<td>100 82 93 88 104 95</td>
</tr>
</tbody>
</table>
i) In fourteen of the nineteen districts selected by Heston, the index of rainfall remains below 100 (1896-1896 is the base average). Thus rainfall over a fifty year period, i.e. 1897-98 to 1946-47 for the bulk of the Presidency remains in Heston's table low.

ii) Since Standard Yields throughout the period were too high, in the sense that they overestimated actual yields per acre, it follows from the definition of the condition factor, i.e. $CF = \frac{RY}{SY}$ that the condition factor was too low. There is therefore nothing surprising about the fact that the condition factor was always too low - a tendency to which Heston lends the importance of a discovery.  

iii) The condition factors in Table 3 are weighted averages for all the nineteen districts and are therefore averages for the Presidency as a whole. Yet the rainfall data are not only unrepresentative - since the index is usually below 100 - but also district averages. It is not clear why Heston should regress provincial condition factors with district rainfall indices.

iv) The neat division of periods in Heston's table ignores a very fundamental fact of agricultural life in Bombay - the influence

20/ Heston (1973), p. 317. It is difficult to know what Heston means when he says: "The fact that the condition factor was always 'too low during the 1906-20 period does not mean that estimated yields are necessarily too low because, as we have shown, the standard yields were too high. But - and this is the second point - even if the below average condition factors in fact tended to offset the excessive standard yields, it was a spurious result because officials responsible for the judgment on the nature of the crop in a particular year were not necessarily aware of the standard yield assumed for a normal year" (pp. 317-318). He seems to forget that "district" Revenue Yields and condition factors were evolved in the offices of the District Revenue authorities. In such a case, i.e) given $CF = \frac{RY}{SY}$, if SYs are too high CFs would be too low.

21/ See Saith (1978) where a similar point is made.
of famines. It is well known that severe famines cause great cattle mortality and thus a reduction in the major item of capital stock. Such a replenishment of capital stock takes many years. Data arranged with overlapping periods, à la Blyn, would therefore be the correct procedure.

With only four degrees of freedom in his regression analysis, it is not surprising that Heston's results are non-significant. Since Heston has omitted to give us the standard errors or \( R^2 \), it is difficult to say much more about his results. However, there seems to be little doubt that his equations suffer from misspecification. The negative residuals which he observes in his equations could be as easily the result of misspecification as anything else. I shall mention only the most important reasons for suspecting incorrect specification of Heston's equations.

Firstly, although he is aware of the importance of the timing of rainfall, he chooses to ignore it because "total rainfall is the most easily measured seasonal influence, sufficient for this analysis". In fact, Mann\(^{22/}\) chose to use constant figures for maximum "effective" rainfall for parts of the Bombay Deccan, but Heston clearly did not see the necessity of conducting a regression using Mann's data, or constructing a similar index for even one district. It is impossible to overemphasise the importance of taking the distribution of rainfall into account, simply because the same total rainfall can lead to very different average condition factors if distribution across regions, or even in time, varies. In fact, for the first five years of Heston's last period, i.e. 1936-37 to 1945-46, the Season and Crop

\(^{22/}\) Mann, H.H. (1955), Rainfall and Famine in the Bombay Deccan
Reports of Bombay Presidency present rather good reasons why rainfall was high but condition factors were low.

In 1936-37, the Season and Crop Report tells us, the rainfall was "adequate" but the long breaks in rain had adverse effects on agricultural operations. In the following year rainfall was again adequate but uneven. In 1938-39 Bombay had an early monsoon but field operations were hampered because of "inopportune and heavy" rainfall. The season 1939-40 also saw adequate rainfall but an early cessation in the monsoon and prolonged breaks in rain. In fact, for the last year for which I could get data, i.e. 1940-41, the Season and Crop Report notes an adequate and fair rainfall and high condition factors.\(^{23/}\)

Secondly, Heston has chosen 1886-1896 as the base for his rainfall indices.\(^{24/}\) As already noted, rainfall seems to be abnormally high in the base period. If we look at indices of total rainfall with a longer - and therefore a more suitable - base for measuring weather changes (see Table 3:2), it is immediately obvious that Heston's starting period is abnormal. If rainfall is taken to be too high in Heston's period 1, and the condition factor too low, either because of maldistribution of rainfall or because the SYs were gross over-estimates of the actual yield, negative residuals would not be a surprising result.

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\(^{23/}\) Since Heston places great emphasis on the negative residuals for the periods 1886-97 and 1936-37 and 1945-46, he should have checked whether rainfall maldistribution could have caused these low condition factors for these years. Moreover, in 1942 the Government launched its "Grow More Food Campaign", which aimed at extending cultivation to fallow land and the reduction of non-food crop cultivation. In Bombay-Sind the acreage under cotton fell from 4,976,000 in 1940-41 to 1,991,000 by the end of the war: a decline of 60 per cent in five years. Such a major dislocation would itself create a diversion of CFs from rainfall. See: India (1945), Final Report of the Famine Inquiry Commission, Chapter 11, pp. 11-26.

\(^{24/}\) Heston (1973), p. 322.
Table 3:2: **Rainfall in Bombay Presidency** (1861 to 1895 = 100)

<table>
<thead>
<tr>
<th>Year</th>
<th>Index</th>
<th>Year</th>
<th>Index</th>
</tr>
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<tbody>
<tr>
<td>1861</td>
<td>121</td>
<td>1886</td>
<td>110</td>
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<tr>
<td>1862</td>
<td>103</td>
<td>1887</td>
<td>110</td>
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<td>1863</td>
<td>105</td>
<td>1888</td>
<td>106</td>
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<td>1864</td>
<td>92</td>
<td>1889</td>
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<td>99</td>
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<td>1872</td>
<td>102</td>
<td>1897</td>
<td>107</td>
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<tr>
<td>1873</td>
<td>90</td>
<td>1898</td>
<td>96</td>
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<tr>
<td>1874</td>
<td>121</td>
<td>1899</td>
<td>52</td>
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<td>1875</td>
<td>111</td>
<td>1900</td>
<td>106</td>
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<td>1876</td>
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<td>1877</td>
<td>76</td>
<td>1902</td>
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<td>1878</td>
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<td>1879</td>
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<td>1904</td>
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<td>1908</td>
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<td>1884</td>
<td>100</td>
<td></td>
<td></td>
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<tr>
<td>1885</td>
<td>94</td>
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</tbody>
</table>

**Source:** B.M. Bhatia (1963), *Famines in India*, pp. 344-346.

Heston also seems to ignore the fact that his own analysis of yields per acre stretches over a period of sixty years— a long enough time for other extraneous features besides rainfall to affect yields.
per acre. Normally, long term changes in the average yield per acre would be accounted for in the quinquennial revisions of the Standard Yield. But, as Heston tells us, such revisions never took place in Bombay. As we shall see in Chapter 5, there are very good reasons to believe that a decline in yields per acre took place in Pre-Independence Bombay.25/ A declining trend in the condition factor leading to declining revenue yields per acre in Bombay would seem to be the correct assumption on the basis of evidence relating to changes in soil fertility, techniques of cultivation, changes in cropping pattern, etc. Yet Heston seems to be unaware of such a possibility.26/

Between 1937 and 1946, Heston tells us, a downward trend in the condition factor was the result of political pressure to grant remissions of revenue. Yet, as Desai has pointed out, remissions and suspensions of revenue were granted, not after careful examination of the economic condition of an individual peasant, but for an entire tract where crops had failed, either partially or totally.27/ For village officials to request the collector to grant suspension or remission of revenue would require "the collusion of a large number of his counterparts in contiguous villages since climatic conditions could not vary drastically from village to village, and he could not have understated the crop to a substantial degree since it was there for all to see, including the collector who had himself to make local enquiries before granting remissions".28/ In any event, evidence for such a downward political

25/ See both Chapters 4 and 5 of this dissertation.
26/ Blyn in fact devoted an entire chapter to the determinants of yield per acre - see Blyn (1966), pp. 179-212.
28/ ibid., p. 11.
bias in condition factors is rather hazy since the bias could so easily have worked the other way: lower revenue officials could have inflated the anna estimates to please superiors. Moreover, as Saith (1978) cogently points out, revenue remissions could not have affected no rent campaigns since remissions were not passed on to the tenants. In addition, rising prices had already reduced the real incidence of land revenue. When prices fell, e.g. during the depression, remissions were granted on the basis of falling prices and incomes rather than on output.

Heston's attack on Blyn, therefore, falls considerably short of target and, as we have seen, his exercises with Bombay data are at best a guide to what not to do in the course of a regression analysis, and at worst an attempt to advocate the kind of historiography which relies solely on the opinions of the bureaucrat and the gentry for its picture of the agrarian economy. Moreover, Heston has relatively little to say about the "trend" of errors over time. Since this happens to be the crux of the matter, and since Blyn realised the effect which different assumptions about the temporal distribution of errors would have on his trend rates, we shall consider it in detail towards the end of this chapter. But first we must turn to Dewey and the reliability of agricultural statistics in Punjab.

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29/ Saith (1978), p. 338. As Saith writes: "The central politico economic issue in these decades was not the alienation of the state's land revenue in favour of the Zamindars, but rather the alienation of the Zamindars' rights in favour of the tenants under them".
III. Dewey on the Agricultural Statistics of the Punjab (1867-1947)

Dewey's (1974) attack on Blyn is at once more comprehensive and less technical than Heston's. It is more comprehensive because Dewey raises the possibility of errors in both area and yield estimates in pre-Independence Agricultural Statistics. It is less technical because, unlike Heston, he does not go into the trend of condition factors or Standard Yields, basing his arguments on the competence of the subordinate revenue officials: the patwaris and the kanungos in Punjab. The basic flavour of his arguments can be demonstrated by a quotation. The effect of the hereditary connexions of patwaris, writes Dewey:

"made it possible for the patwaris to ignore the instructions regarding their collection painstakingly promulgated by the directors of land records. Where patwaris were so indisciplined that they flagrantly defied the British revenue officers by moneylending, or forged the entries relating to mortgages in their records of rights so that they or their relatives could use them as evidence in civil suits expropriating their peasant debtors, it was clearly impossible to compel them to keep up reliable registers of agricultural output."

The brunt of Dewey's invective is borne by the patwari agency, which he finds to be highly defective for several reasons:

a) in many parts of the Province there was no effective patwari agency, e.g. in N.W. Frontier Province;


\[32/\] ibid., pp. 4-7.
b) there was no system of training patwaris - old patwaris could not fill up new returns of agricultural statistics introduced in the mid-1880s;33/
c) even superior officers such as kanungos and tahsildars were in league with the patwaris - who could fill up fraudulent crop returns without fear of punishment;34/
d) patwaris hardly ever lived in their circles;35/
e) the work of the patwa\iri hardly ever received any supervision;36/
f) although crop inspections were more closely supervised in areas of fluctuating assessment - e.g. in the Canal Colonies - these were also the areas of rampant corruption.37/

These defects made even the crop areas reported by the revenue officials unreliable, let alone the estimates of yield. Although it makes eloquent reading, much of Dewey's criticism of the patwari agency is riddled with inaccuracies. The problem lies not so much in the reading of the material which Dewey uses as in the nature of his sources itself. In fact, going through many of the Survey and Settlement Reports of Punjab or the Reports of the Director of Land Records, one can with suitable editing prove almost any point which one cares to make.

For instance, Dewey quotes the sharp criticism of patwaris by E.B. Francis, the Settlement Officer for Northern Ferozepur in 1884-1899. Yet his fellow officer, E.L. Brandreth, Settlement

\[33/\text{ibid.}, \text{pp. } 4-7.\]
\[34/\text{ibid.}, \text{pp. } 4-7.\]
\[35/\text{ibid.}, \text{pp. } 4-7.\]
\[36/\text{ibid.}, \text{pp. } 4-7.\]
\[37/\text{ibid.}, \text{pp. } 4-7.\]
Officer for the Cis-Sutlej States in Ferozepur in 1859, writes:

"The Putwarees were as far as possible selected on account of their being residents of one or other of the villages over which they were appointed, and it was only when a resident neither was nor could be made competent for the office that a stranger was appointed."

In nearby Lahore the settlement officers in 1860 observed that "Intelligent natives of the District, competently educated, and able to read and write Persian were found willing to take the office of Putwarr ... In the larger villages, which paid higher land revenue and were more intricately subdivided, the Putwari was a man of high stamp ... After a good deal of practical experience the Putwarrees have become very efficient ... I have found them a very tractable and hard working set of men." In case it is objected that most of these reports were before the start of Dewey's period of analysis, let me quote from the 1910-1914 S.R. of Ferozepur: "Generally speaking, the district staff was efficient ... I think the patwari staff will now be found to be a very fairly efficient body of men." Or - to quote C.M. King from Sirsa and Fazilka Tahsils of the very same Ferozepur:

"All the patwaris in both Sirsa and Fazilka have been employed to prepare the various papers filled with the standing record. They have therefore gained a thorough knowledge of surveying on the square system and also of the method of compiling the various registers and records with which they are entrusted. At the present moment, the patwari and kanungo staffs in both tahsils are thoroughly efficient."

38/ Report on Revised Settlement of Ferozepur in the Cis-Sutlej States (1859), para. 195.


40/ Revised Settlement of Ferozepur District (1910-1914), p. 33.

Perhaps a closer look at the reports of the Land Records Department would provide more support for Dewey. But here again we note an opposing view - sympathetic and appreciative of the lower revenue official. M.F. O'Dwyer wrote in his 1896 report:

"As regards patwaris, there can be no doubt that this class is daily improving. This is due to a variety of causes, inter alia, to improvement in education, better supervision, and better prospects of promotions."

In 1902 the hereditary principle in the appointment of patwaris was abolished. In 1903 we find the patwaris returning the annual papers with "commendable punctuality". In 1922 the Director of Land Records finds the conduct of patwaris to be good; and even as late as 1939 we find that out of 9,155 patwaris the work of 6,439 of them was checked by superior officers.

This does not imply that the patwari agency could not be faulted. But it seems clear that no conclusion can stand securely on the basis of such mixed and partial evidence. What is rather disturbing is that Dewey does not even hint at the existence of evidence in the official reports which would tend to go against his line of reasoning, even though he must surely have been aware of it.

Dewey rightly points out that in districts where land revenue assessment was "fluctuating", the crop inspections or Girdwari were more closely supervised. This was especially so in the Canal Colonies. But, says Dewey, the Canal Colonies were nests of

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43/ Punjab (1903), R.L.R.A., para. 9.
44/ Punjab (1939), R.L.R.A., para. 8, p. 6.
corruption. So much so that the 1907 Punjab Canal Colony disturbances were "in large measure a peasant protest against the corruption of the subordinate officials with whom they came into contact".46/ Barrier (1967), to whom Dewey refers and uses as the basis for this conclusion, although noting the corruption among subordinate revenue officials, offers several explanations for the Canal Colony disturbances. Among the more prominent of these reasons were: the dictatorship of the Colonisation Officer,47/ the shortage of good land which could be distributed by the Irrigation Department,48/ fragmentation of land holdings,49/ informal system of fines which promoted corruption, the retroactive clauses contained in the Punjab Land Colonisation Bill,50/ the rapid increase in the occupier rate (i.e. charge for water from the Irrigation Department), and finally a sharp rise in labour costs which eroded the prosperity of the Zamindar.51/ All these features led to a decline in the prosperity of peasants in the Canal Colonies and frustrated the high expectations with which they came to the colonies. It is difficult to see how the corruption of lower revenue officials, especially the patwaris, could be more than a symptom of deeper and more serious causes. Moreover, corruption was more prominent where changes in the record of rights were involved, and it is not at all clear why subordinate revenue officials should have neglected other aspects of their work in which a financial gain was not forthcoming.

46/ ibid., p. 5.
48/ ibid., p. 358.
49/ ibid., pp. 359-363.
50/ ibid., pp. 359-363.
51/ ibid., pp. 359-363.
Even if one accepts, for the sake of argument, that "matured" areas were understated by the lower revenue officials in the Canal Colonies, this did not affect the returns for gross sown area. It was the latter which was published in the Season and Crop Reports beginning with the crop year 1906-7. In fact, the Season and Crop Report 1907-8 made a point of emphasising the change which had taken place. As the official "Estimates" of 1944 clearly put it:

"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 a crop should affect not its area but outturn."

Most of Dewey's quotations from the S.R.s are taken from before the beginning of Blyn's period. Nevertheless, Dewey is convinced that the situation became even worse after the First World War. The reasons for this were the reduction in the pitch of land revenue to one fourth of net assets, the fixing of the settlement for forty years, and the introduction of income tax and custom duties after 1916. The result was that Land Revenue "lost its importance as the dominant source of Government Revenue". In fact, even as late as 1935-36 income tax fetched only Rs. 70 lakhs (Rs. 7 millions) in revenue, compared to roughly Rs. 470 lakhs from land revenue. By the same year, receipts from irrigation were roughly 39 per cent of total Government revenue in Punjab. Income tax could never be dominant or even an important

52/ See Season and Crop Report, Punjab 1907-8, p. 4.


54/ Punjab (1938), Report of the Land Revenue Committee, p. 14 and p. 54

source of Government Revenue because "all purely agricultural income was 'exempt'\textsuperscript{56/} from it. The Land Revenue Committee, moreover, after a careful scrutiny of the system of revenue assessment in Punjab recommended the continuation of the then existing system of land revenue. Even if one believes that the increasing importance of irrigation receipts as a source of revenue in Punjab did have an adverse effect on the department of Land Records, it is not at all clear why Dewey did not examine the estimates of output contained in the Irrigation Administration Reports - since following Dewey's logic, the Irrigation Department should have become more efficient. It is a curious logic indeed which relates the efficiency of lower revenue officials to the share of land revenue in total receipts.

Turning to estimation of Normal Yields, Dewey puts undue importance on the lack of supervision of the crop cutting experiments. He says that officers had to be present immediately at harvest in order to oversee crop cuts, and that this was not always done. In fact, many senior officials were aware of the need to supervise crop experiments carefully. Douie's Settlement Manual for Punjab recommended that:

"No experiment should as a rule be accepted unless its selection has been approved after inspection by an officer not below the rank of tahsildar. The Settlement Officer and the Extra Assistant Settlement Officer should themselves see and approve of as many of the plots as possible.\textsuperscript{57/}

Even S.R. Dunlop-Smith, whom Dewey quotes as saying that the Average Yields contained in the quinquennial reports were "too much a matter

\textsuperscript{56/} Punjab (1938), \textit{Land Revenue Committee}, p. 15.

\textsuperscript{57/} Douie, J.H. (1915), \textit{Punjab Settlement Manual}, 3rd Edition, p. 165. Also see: \textit{Report of the Department of Land Records and Agriculture, Punjab}, 1896-7, para. 13, p. 9 - where we read: "The experiments are always supervised by an officer of gazetted rank - European, when possible. Some experiments in particular made in the Ferozepur district last year were very carefully supervised and reported on by the Assistant Commissioner."
of opinion", 58/ does go on to say that he expected considerable improvement in the estimates of average yield in future.

It is certainly true that crop cutting surveys in Punjab were not based on random sampling. Hence, there was always a problem of deciding what constituted an "average" yield. It was a commonly accepted fact that the official estimates of average yield were lower than the crop cutting yields largely because officials recognised the latter to be overestimates.

Dewey is unhappy with the annawari system for yet another reason. Since the following lines are full of inaccuracies, it is necessary to quote them:

"The patwaris were called upon to appraise the harvest at so many annas in the rupee, taking a 'normal' harvest as twelve annas. In theory the crop could be appraised to within one anna (three to four per cent); in practice the operative units in which the patwaris thought tended to be much larger. Estimates grouped themselves around the nought, four, eight and twelve anna marks, so that the maximum margin of error due to the size of the reporting units alone was over 12 per cent."

As a matter of fact, Punjab never took twelve annas to represent a normal crop. The normal crop was always sixteen annas, 60/ and the condition factor for the district fluctuated from below 100 per cent to above it with great regularity. On a sixteen anna crop, the percentage error to the nearest anna would be roughly 6 ½ per cent; over 8 per cent on a twelve anna crop. In Punjab the Season and Crop Reports frequently talk of a condition factor of eleven annas or seventeen annas, etc. - so that no evidence of the type of bunching

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58/ Report of Department of Land Records and Agriculture (1897-98), para. 11, p. 96.


60/ See: Punjab, Season and Crop Reports - various issues, especially 1903-4, 1904-5, 1907-8 and 1940-41.
disliked by Dewey is present. \[61/\]

Dewey's attack on Blyn therefore rests to a great extent on a one-sided and biased view of the historical material on hand. Unlike Blyn, he does not even recognise the existence of an opposite and contradictory picture. Moreover, the crux of the issue is the question of movement of errors over time - in particular of the direction of errors. Both Heston and Dewey pay rather scant attention to this question, with the consequence that much of their ammunition is wasted. Heston also believes in the general validity of his results for other provinces in British India. This belief is strongly refuted in the case of Punjab since there was neither a constancy of Standard Yields or a secular decline in the condition factor which he tries to establish for Bombay.

IV. Trend Distribution of Errors

Surprising though it may appear, from a reading of both Heston and Dewey, Blyn himself was fully aware of the possibility of errors occurring because of possible biases in the data estimation procedure. The question was whether such errors were likely to render any attempt at fitting a trend completely futile. Blyn could not have been clearer on the subject when he wrote:

"Whatever the error, however, it is possible that the measured trend rates represented the actual change with perfect reliability. Three cases of this are conceivable: the first would be if the percentage of error or underestimation remained constant over the period, as was believed by Professor Thomas."

\[61/\] Blyn (1966) realised the possibility of error because of units of measurement in annawari but ignored it because he felt that such an error would be averaged out in the district or Provincial office - see p. 48.
In this case the height of the trend line would be affected, but not the rate of change. The second would be the case where both upward and downward actual fluctuations were moderated to leave trend unaffected by the reported statistics. A third case would be where the percentage error fluctuated over time in a random fashion above and below the trend line, again leaving trend unaffected.

It is also possible, however, that the fluctuation in error was not self-cancelling over time, and in this case the extent of error may have an appreciable effect on the trends. If the range of error was 20 per cent, then an overestimate of 10 per cent, followed by an underestimate of 10 per cent at opposite ends of the period, would give the measured trend a downward bias. Over a half century period an error distribution of this type appears quite unlikely. In a given ten year period this type of bias in trend could be large, but in an average of ten short periods the effect can be expected to be much reduced.**

Thus Blyn quite openly anticipated the Heston type argument of an upward beginning period bias and a downward end period bias. Heston himself does not even explain why the biases he has in mind, even if they could be proved to have existed, should have more than a marginal influence on the estimated trend.

Trend rates of agricultural output have been calculated by other economists, too - with various assumptions concerning the time distribution of errors. Thus Thomas and Sastry (1939), 63/ believed errors to be more or less systematic over time. Panse (1952) noted a tendency for official estimates to overestimate production in bad

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64/ Panse, V.G. (1952), "Trends of Areas and Yields of Principal Crops in India", Agricultural Situation in India, Vol. VII.
seasons and underestimate in good ones. Mukherji (1965) after a scrutiny of the data, agreed that over a fifty year period errors were likely to be greatly reduced. Even if errors are not random but are known to have a bias in any one direction, as Subromoniam (1945) pointed out, this would affect the height of the trend but not its slope. Islam (1978), in a detailed study of Bengal agriculture, accepted Subromoniam's argument for data up to 1940-41, and Thomas and Sastry's assumptions for individual crops in Bengal.

It is by now commonplace that eye estimation of output by patwaris resulted in a general toning down of fluctuations in output. "Pessimism" of patwaris was a commonly observed phenomenon throughout British India. In some areas, such as Bombay, this was deliberately offset by taking twelve annas as the normal crop. However, for pessimism of patwaris to bring about a downward trend over a relatively long period of time, what is needed is an increasing degree of pessimism - or, to come back to modern terminology, an increasing downward bias in the trend distribution of errors.

Few independent checks are available on the official estimates of output. An enquiry into official cotton estimates between 1934-5

65/ Mukherji, K. (1965), Levels of Economic Activity and Public Expenditure in India.


68/ India (1954), Final Report of the National Income Committee, p. 27.

and 1936-7 by the All India Cotton Committee produced the following results.70/

<table>
<thead>
<tr>
<th>Province</th>
<th>Year</th>
<th>I.C.C.C. Estimate (in thousand bales)</th>
<th>Official Forecast (in thousand bales)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1934-35</td>
<td>(1) 1,338</td>
<td>(2) 1,245</td>
</tr>
<tr>
<td></td>
<td>1935-36</td>
<td>1,758</td>
<td>1,600</td>
</tr>
<tr>
<td></td>
<td>1936-37</td>
<td>2,191</td>
<td>1,925</td>
</tr>
<tr>
<td>Punjab (including Punjab states except Khairpur)</td>
<td>1934-35</td>
<td>1,216</td>
<td>1,169</td>
</tr>
<tr>
<td></td>
<td>1935-36</td>
<td>1,775</td>
<td>1,518</td>
</tr>
<tr>
<td></td>
<td>1936-37</td>
<td>1,522</td>
<td>1,282</td>
</tr>
<tr>
<td>Bombay (including Indian states within the Presidency)</td>
<td>1934-35</td>
<td>1,216</td>
<td>1,169</td>
</tr>
<tr>
<td></td>
<td>1935-36</td>
<td>1,775</td>
<td>1,518</td>
</tr>
<tr>
<td></td>
<td>1936-37</td>
<td>1,522</td>
<td>1,282</td>
</tr>
</tbody>
</table>

Since the A.I.C.C. estimates included the Indian states, a part of the error can be attributed to the presence of non-reporting states in the official estimates. Both Desai71/ and Blyn72/ argue that for British Indian Provinces taken together the underestimation contained in the official forecasts is likely to be much lower. Unfortunately, such cross sectional comparisons between official estimates and others, although valuable, do not throw much light on the behaviour of errors over time. Although one can reduce the extent of the errors (e.g. those caused by aggregation over crops using relative prices as weights) by taking individual crops over as homogenous regions as possible, the most important test on the broad accuracy of trend rates of crop output can only be provided by a priori theoretical reasoning. Growth rates

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72/ Blyn (1966), pp. 53-54.
of crop output must be checked against changes in the determinants of area and yield. This by itself does not allow us to correct percent growth rates, but it does ensure that we do not place complete reliance on totally spurious results.

In Chapters 5 and 6 we have therefore used trend rates of all crops and individual crops in Bombay and Punjab along with other factors such as broad trends in population, rural fixed capital stock, etc., to build up our understanding of important changes in the agrarian economy. Our purpose here has been to argue against the most important critics of Blyn, not because we believe Blyn's work to be without its limitations, but because any attempt at writing quantitative history

73/ In our view these limitations stem from three aspects of Blyn's work - method of tackling widening coverage of crops, excessive aggregation, and the use of appropriate price indices to estimate total agricultural output. Blyn notes the widening coverage of the "Estimates of Area and Yield of Principal Crops in India" to include a larger number of crops, and devises several methods of estimating yields per acre of these crops for earlier years. For instance, the major foodgrains in Bombay, bajra, jowar and rice, were not included in the "Estimates" for Bombay till 1911 - in the case of the first two and till 1912 in the case of rice. Since Blyn's series begins in 1891, it was necessary to generate estimates of yield per acre for the period 1891-1911 - a long span of twenty years. He began by analysing simple linear regressions between several determinants of yield per acre - rainfall, acreage, price, exports and yield per acre of other crops (Blyn, 1966, p. 65) - to see "how yields per acre predicted by simple linear regression compared with actual yields per acre for years in which the latter were available in Estimates" (Blyn, 1966, p. 66). He found that the best results were given by the yields per acre of "a related crop in the same region" but that in "some cases it was necessary to use the related crop of a nearby region". Unfortunately, while this method is quite ingenious, it does introduce an element of uncertainty even greater than that already inherent in the year to year estimation of revenue yields. Moreover, different regions are affected differently. The extensions of coverage at the beginning of the second decade of the century were quite substantial. To quote Blyn again:

"The percentage for each region (i.e. the annual percentage of all-crop output in series included as a result of using these estimated yields per acre) in 1891/92 was: 73% Bombay-Sind, 64% United
must take whatever data we have and use it as intelligently as possible. In the case of deriving broad long run trend rates for agricultural output, official output and area statistics with all their ambiguity and biases do provide a starting point.

As a general rule, we have pointed out problems in interpreting quantitative data whenever we have used them. It has been necessary to devote an entire chapter to the discussion of pre-independence agricultural output figures because of the controversial nature of the subject and because the two major contributors have used Bombay and Punjab respectively as their case studies.

Footnote 73 continued

Provinces, about 54% in Greater Punjab and Central Provinces, 45% Madras and 18% in Greater Bengal.

The trend for yield per acre of the all-crop aggregate was influenced by each crop to the extent of the above percentages. However, since output was dependent on acreage as well as yields per acre, the influence of the estimated yield per acre trends might roughly be said to equal half the respective percentages cited above" (Blyn, 1966, p. 70).

In the case of Bombay, sesamum, a minor crop, was used to estimate the yields per acre of three major crops, rice, bajra and jowar - a procedure which lends itself to considerable scepticism.

To a large extent, major "adjustments" to data were made necessary by the high level of aggregation which Blyn's estimates exhibit. For comparison between Provinces - and between crops in several regions - more detailed studies using both statistical and qualitative information are appropriate.

Finally, one may criticise the use of Blyn's price indices to generate all crop output. He chose the average of 1924/25 to 1928/29 provincial Harvest prices to aggregate crop output - an unusually high average when compared to the alternative 1934/35 to 1938/39 prices. For instance, the price for rice was Rs.170.96 per ton against Rs.94.43 for the latter period. Other crops followed the same pattern. The choice of prices would not affect the trend but would give an inflated picture of the level of output. One may also choose to judge the appropriateness of price indices from the view of their regional spread, methods of checking the reliability of price data by different Provincial governments and so on - a procedure which Blyn does not follow.
APPENDIX: TABLE 3.1

Sources of Revenue (except Land Revenue and Irrigation Receipts) in British India

<table>
<thead>
<tr>
<th>Year</th>
<th>Customs (in million rupees)</th>
<th>Income Tax</th>
<th>Salt</th>
<th>Excise</th>
</tr>
</thead>
<tbody>
<tr>
<td>1911-12</td>
<td>97.0</td>
<td>24.8</td>
<td>50.8</td>
<td>114.1</td>
</tr>
<tr>
<td>1912-13</td>
<td>107.9</td>
<td>26.1</td>
<td>50.0</td>
<td>124.1</td>
</tr>
<tr>
<td>1913-14</td>
<td>113.4</td>
<td>29.2</td>
<td>51.7</td>
<td>133.4</td>
</tr>
<tr>
<td>1914-15</td>
<td>95.2</td>
<td>30.3</td>
<td>58.7</td>
<td>132.9</td>
</tr>
<tr>
<td>1915-16</td>
<td>88.1</td>
<td>31.3</td>
<td>54.7</td>
<td>129.5</td>
</tr>
<tr>
<td>1916-17</td>
<td>129.9</td>
<td>56.6</td>
<td>72.3</td>
<td>138.2</td>
</tr>
<tr>
<td>1917-18</td>
<td>165.5</td>
<td>94.6</td>
<td>82.4</td>
<td>152.4</td>
</tr>
<tr>
<td>1918-19</td>
<td>181.8</td>
<td>116.4</td>
<td>64.1</td>
<td>173.4</td>
</tr>
<tr>
<td>1919-20</td>
<td>224.8</td>
<td>232.0</td>
<td>57.4</td>
<td>192.6</td>
</tr>
<tr>
<td>1920-21</td>
<td>319.0</td>
<td>221.9</td>
<td>67.6</td>
<td>204.4</td>
</tr>
<tr>
<td>1921-22</td>
<td>344.0</td>
<td>221.7</td>
<td>63.4</td>
<td>171.8</td>
</tr>
<tr>
<td>1922-23</td>
<td>413.4</td>
<td>181.4</td>
<td>68.2</td>
<td>135.5</td>
</tr>
<tr>
<td>1923-24</td>
<td>396.9</td>
<td>184.9</td>
<td>100.1</td>
<td>194.0</td>
</tr>
<tr>
<td>1924-25</td>
<td>457.5</td>
<td>162.1</td>
<td>73.9</td>
<td>195.2</td>
</tr>
<tr>
<td>1925-26</td>
<td>477.8</td>
<td>161.2</td>
<td>63.2</td>
<td>199.0</td>
</tr>
<tr>
<td>1926-27</td>
<td>473.8</td>
<td>159.8</td>
<td>67.0</td>
<td>198.3</td>
</tr>
<tr>
<td>1927-28</td>
<td>482.1</td>
<td>154.2</td>
<td>60.3</td>
<td>198.2</td>
</tr>
<tr>
<td>1928-29</td>
<td>492.8</td>
<td>170.5</td>
<td>75.9</td>
<td>199.8</td>
</tr>
<tr>
<td>1929-30</td>
<td>512.7</td>
<td>170.6</td>
<td>67.6</td>
<td>204.1</td>
</tr>
<tr>
<td>1930-31</td>
<td>468.1</td>
<td>163.1</td>
<td>68.3</td>
<td>167.7</td>
</tr>
<tr>
<td>1931-32</td>
<td>464.4</td>
<td>174.9</td>
<td>85.7</td>
<td>-</td>
</tr>
<tr>
<td>1932-33</td>
<td>519.5</td>
<td>179.7</td>
<td>100.7</td>
<td>-</td>
</tr>
<tr>
<td>1933-34</td>
<td>512.4</td>
<td>180.6</td>
<td>87.5</td>
<td>-</td>
</tr>
<tr>
<td>1934-35</td>
<td>484.9</td>
<td>172.5</td>
<td>87.3</td>
<td>-</td>
</tr>
</tbody>
</table>

On page 59 of Chapter 3, we looked briefly at Dewey's contention that the importance of land revenue declined substantially after the First World War. Table 3.1 shows the movements in revenue from Customs, Income Tax, Salt and Excise for British India as a whole between 1911-12 and 1934-35.

We can notice from Table 3.1 that:

a) revenue from Income Tax actually declined during the inter-war years;
b) revenue from Customs failed to increase substantially after 1924-25;
c) revenue from Salt, and Excise remained virtually stagnant during the inter-war years.

Thus Dewey's statements on the decline of Land Revenue after the First World War when new taxes were levied can certainly not be generalised to other areas. Moreover, even in the case of Punjab, as late as 1935-36, total revenue receipts were Rs.102.4 millions, out of which Land Revenue accounted for Rs.49.5 millions, Irrigation Rs.39.9 millions and the rest some Rs.13 millions. In other words, all other sources of revenue besides Land Revenue and Irrigation fetched some 12.7 per cent by the end of the inter-war years. In 1921-22, when Income Tax reached its peak, in Punjab land revenue contributed roughly 56.6 per cent of total revenue, while Irrigation contributed 38 per cent. Thus between 1921-22 and 1935-36 the share of land revenue in total revenue of Punjab declined from 56.6 per cent to 48.3 per cent - hardly enough to bring about a deterioration in the functioning of the department.