AN ECONOMIC ANALYSIS OF TOTAL FACTOR PRODUCTIVITY (TFP) OF POTATO IN WEST BENGAL

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ABSTRACT: The total factor productivity growth (TFPG) analysis of potato for the state of West Bengal during 1980-81 to 2001-02 showed that the state recorded 6.19% growth of output index, 3.17% growth of input index and 2.92% growth in TFP index. The technological advancement in potato has occurred in West Bengal during the entire period.

Potato is the second most important cash crop grown in the rabi-season in West Bengal. Its coverage is mainly concentrated in the alluvium tract of the state. The crop covers 6.52% of net cropped area in West Bengal (on the basis of 2002-03 figure), which is well ahead of 5.20% of area coverage in 1997-98. Dholakia and Dholakia (1993) opined that technical progress as measured through total factor productivity growth (TFPG) has not been directly determined by capital, labour or capital per worker.

For measuring the extent of adoption, the concept of total factor productivity was used for the period 1980-81 to 2001-02. For calculating total output index, total input index and total factor productivity index, data on area, production and harvest price was obtained from the Bureau of Applied Economics and Statistics, Ministry of Agriculture, Govt. of West Bengal and input data was used from comprehensive scheme, cost of cultivation, Govt. of India at B.C.K.V., Kalyani, Nadia, West Bengal.

Divisia Tornqvist-Theil index model was used to calculate total output index, total input index and total factor productivity index.

Total Output Index (TOI):
\[
TOI_{t-1} = \prod_j \left( \frac{Q_{jt}}{Q_{jt-1}} \right)^{S_{jt}} + \frac{S_{jt-1}}{2}
\]

Total Input Index (TII):
\[
TII_{t-1} = \prod_i \left( \frac{X_{it}}{X_{it-1}} \right)^{S_{it}} + \frac{S_{it-1}}{2}
\]

Tornqvist Aggregate Output Index is given by:
\[
\text{Tornqvist}\ln \left( \frac{Q_{jt}}{Q_{jt-1}} \right) = \frac{1}{2} \sum \left( P_{jt} Q_{jt} / \sum P_{jt} Q_{jt} + P_{jt-1} Q_{jt-1} / \sum P_{jt-1} Q_{jt-1} \right) \ln \left( \frac{Q_{jt}}{Q_{jt-1}} \right)
\]

Similarly, Tornqvist Aggregate Input Index is given by:
\[
\text{Tornqvist}\ln \left( \frac{X_{it}}{X_{it-1}} \right) = \frac{1}{2} \sum \left( C_{it} X_{it} / \sum C_{it} X_{it} + C_{it-1} X_{it-1} / \sum C_{it-1} X_{it-1} \right) \ln \left( \frac{X_{it}}{X_{it-1}} \right)
\]

For the productivity measurement over a long period of time, “Chain Base Index” was calculated for two successive period’s t and (t-1) over the whole period t₀ to T, (sample from t₀ to t=T) and the separate indexes were then multiplied together:
\[
\text{TOI* (t)} = \text{TOI (1)} \times \text{TOI (2)} \times \ldots \times \text{TOI (t-1)}, \quad \text{TII* (t)} = \text{TII (1)} \times \text{TII (2)} \times \ldots \times \text{TII (t-1)}
\]

Total Factor Productivity Index (TFPI):
\[
\text{TFPI}_t = \frac{\text{TOI* (t)}}{\text{TII* (t)}}
\]

Temporal growth of total output index, total input index and total factor productivity index has been measured by fitting exponential growth curve of this form:
\[
Y = ae^{bx}\text{ where the dependent Y-value is a function of the independent x-values}
\]

The results in Fig. 1 clearly reveal that the state of West Bengal recorded 6.19% growth of output index, 3.17% growth of input index and 2.92% growth in TFP index for potato during the period 1980-81 to 2001-02. The growth rates were best fitted in exponential curve with high value of R-square. This means that during the entire study
period, the rate of change of output moves at a faster rate than the rate of change of input. It emphasizes that the technological advancement in potato in West Bengal has occurred during the entire period. The interest of growing potato in West Bengal has increased widely resulting in area expansion, which was well proportionate to the change in cost of cultivation of potato over the year. Adoption of modern techniques and new inputs by the farmers may have resulted in significant growth rate of TFP for potato in West Bengal. Kumar and Rosegrant (1994) reported that the TFP in traditional rice based cropping system in eastern region tends to drag down. As a consequence the farmers in West Bengal probably have shifted from traditional rice-based cropping to cultivation of high value cash crops like potato.

![Graphs showing total output index, total input index, and total factor productivity index of potato during 1980-81 to 2001-02 in state of West Bengal.](image)

It is concluded that the importance of potato cultivation has increased day by day and the farmers have shifted from traditional rice-based cropping system to high value cash crops like potato in the *rabi* season. The area under potato has been found to be increasing and farmers are well acquainted with the adoption of new techniques and use of modern inputs for the cultivation of potato in the state of West Bengal.

**Literature cited:**
