TECHNICAL EFFICIENCY OF ASSAM POTATO GROWERS
Arun Pandit, N.K. Pandey, Rajesh K. Rana and K.P. Chandran

ABSTRACT: The present study was conducted with the objective of assessing technical efficiency of the potato growers of Barpeta district of Assam. Barpeta is one of the major potato producing districts of Assam. Randomly selected thirty six farmers were interviewed in the three blocks during potato crop season of 2004-05. It was found that overall technical efficiency of the potato growers of the study area was 78%. Further, pure technical inefficiency was the primary cause of overall inefficiency. For further improvement of efficiency, government needs to provide irrigation facilities, marketing infrastructure and good quality seed at cheaper rate. Besides, extension efforts have to be strengthened to empower the farmers with knowledge of scientific potato production practices.

Potato is grown extensively in the state of Assam. With a national share of 6% in area and 2.8% to production (Average of 1990-'91 to 2004-'05) it stands first among the north-eastern states (DES, 2005). Bhattacharyya et al. (2001) reported that in Assam the potato acreage has increased by 222.65% from 1962-63 to 1997-98. However, the yield is very low (only 8 ton/ha against national average of 19 t/ha) in Assam. As a result it has to import potato from neighbouring states like West Bengal, Meghalaya and even U.P and Punjab every year owing to the huge gap between demand and supply. The present study was an endeavour towards estimating the efficiency of potato cultivation in Barpeta district of Assam.

The major potato producing districts of Assam are Barpeta, Kamrup and Darrang (Bist and Sharma, 1997). Among them Barpeta is the most important potato growing district not only in the state but also in the region. Hence it was purposively selected for the present study. Three blocks, namely Bhawanipur, Mandia and Sarukshetri were selected randomly and a total of thirty six randomly selected farmers were interviewed. The study was conducted during the crop season of 2004-05. Technical efficiency is the ability of a farm to achieve maximum possible output with the available resources. In this study, Data Envelopment Analysis (DEA), a nonparametric technique of technical efficiency estimation was employed. DEA analyzes farms separately while measuring its efficiency relative to all the observations in the sample. If X be the input matrix of order k x n and Y the output vector (k is the number of inputs and n is the number of farmers). For ith farm, Xi and Yi represent the respective inputs and output. A ratio measure \( \frac{\mu'Y_i}{\nu'X_i} \) (where \( \mu \) and \( \nu \) are the output and input weights, respectively) is obtained. Optimal weights are obtained by solving the following mathematical program:

\[
\begin{align*}
\text{Max} & \quad \mu'Y_i / \nu'X_i \\
\text{Subject to} & \quad \mu'Y_j / \nu'X_j \leq 1, \quad j = 1, \ldots, n, \text{ and } \mu, \nu \geq 0
\end{align*}
\]

In order to avoid infinite number of solutions, imposing a constraint \( v'X_i = 1 \), we get

\[
\begin{align*}
\text{Min} & \quad \theta, \lambda \quad \text{subject to} \\
& -y_j + \lambda \geq 0, \quad \theta x_i - \lambda \geq 0 \quad \text{and} \quad \lambda \geq 0
\end{align*}
\]

Here, \( \theta \) is a scalar and \( \lambda \) is an \( n \times 1 \) vector of optimal weights. The \( \theta \) represents the technical efficiency (TE) corresponding to constant return to scale (CRS). Imposing an additional constraint \( 1'\lambda = 1 \) gives the technical efficiency under variable return to scale (VRS). Efficiency measurements by the DEA model can be used to determine both pure technical and scale efficiencies (TE_{CRS} / TE_{VRS}). The product of these two gives the overall technical efficiency. Efficiency scores in this study were estimated using the computer program, DEAP Ver. 2.1, described in Coelli (1996).

Technical efficiency analysis revealed that overall 64% of the farms are less than 25% technically inefficient (Table 1). Further, majority of the farms were scale efficient and the number of highly inefficient farms were negligible. Overall technical efficiency was 78% whereas scale efficiency and pure technical efficiency were 94% and 83%, respectively. Therefore, the potato farmers in the district came out to be reasonably efficient.
methodology, the efficiency is measured by comparing all the farms with the best in the sample. Had the sample included observations from other good yielding states like West Bengal, the estimates of efficiency of Barpeta district would have been different (poor). However, the efficiency of potato farmers in this district could further be improved by operating at an optimal scale and by adoption of best practices. Further, average efficiency scores indicated that pure technical inefficiency (17%) was primarily responsible for the overall technical inefficiency (22%) as compared to scale inefficiency (6%). This implies that in the absence of environmental differences, pure technical inefficiency would reflect departures from the best practices.

Table 1. Efficiency measures of potato growing farms

<table>
<thead>
<tr>
<th>Efficiency</th>
<th>&lt; 25%</th>
<th>25 to 50%</th>
<th>50 to 75%</th>
<th>75% and above</th>
<th>Average</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure</td>
<td>1 (2.78)</td>
<td>1 (2.78)</td>
<td>7 (19.44)</td>
<td>27 (75.00)</td>
<td>0.83</td>
<td>0.219</td>
</tr>
<tr>
<td>Overall</td>
<td>2 (5.56)</td>
<td>2 (5.56)</td>
<td>9 (25.00)</td>
<td>23 (63.89)</td>
<td>0.78</td>
<td>0.084</td>
</tr>
<tr>
<td>Scale</td>
<td>1 (2.78)</td>
<td>0</td>
<td>0</td>
<td>35 (97.22)</td>
<td>0.94</td>
<td>0.084</td>
</tr>
</tbody>
</table>

Note: Figures in parentheses indicate percentage to the total farmers

The above analysis indicated that pure technical and overall inefficiencies were 17 and 22%, respectively. A socio-economic constraint analysis was carried out to look into the reasons behind this. It was found that getting quality seed was the major problem. Gogoi (2002) also found the same problem in Jorhat, another district of Assam. Potato seed mainly comes from West Bengal which is not a conventional seed potato producing state. In Assam, the average size of the operational holding is only 1.37 ha (Bhattacharyya et al., 2001) and majority of the farmers are marginal and small. These farmers can not afford to buy very expensive good quality seed. There is hardly any proper infrastructure for irrigation and the mighty Brahmaputra inundates the area almost every year. Hence, farmers use the mulching technique, which is one of the reasons for poor yield as no weeding operation and earthing up is done. Lack of scientific knowledge regarding potato production is also a reason for the low yield. Inadequate marketing infrastructure at the village level and poor transportation network are major marketing problems in the area (Bhattacharyya, 2001). In addition, it was found that 97% of the produce is sold just after harvest due to lack of cold storage facilities in the area. Hence, lack of surplus money prevents the farmers from further investment in the potato crop.

The study revealed that pure technical inefficiency makes the greatest contribution to overall inefficiency necessitating emulation of best practices of efficient farms. A number of constraints have been identified which may be some of the reasons for this inefficiency. Hence extension efforts should be made to educate the farmers regarding scientific potato production practices. Further, there is a need of government intervention in providing quality seed and establishing cold storage and irrigation facilities.

Literature cited:


