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ABSTRACT
Government expenditures are generally regarded as a major influence on the pace and pattern of the Agricultural development. Agricultural research, rural education, extension of technology to the farming community and development of a wide range of agricultural activities from fertilizer distribution to credit are commonly funded by the government. The public investment has its origin in the government plans for different sectors while private investment is carried out by the individual or groups of enterprises. In the present study we will focus only on the public investment for Agriculture in Hokkaido and assess its impact on the economy of Hokkaido in general and the productivity of the farmers in specific. The study was conducted between the period 1996-2000 in the northern part of the Sapporo region of Japan.

INTRODUCTION
The Public investment is important because of several reasons. Firstly, the Government expenditures has become a significant fraction of the national income. Secondly, public capital has a powerful impact on the productivity of private capital. Thirdly, the public investment is confined by and large to those goods and services that the private sector will not produce in optimal amounts. Fourthly, Public investment also could effect private capital formation indirectly by augmenting demand for goods and services produce by the private sector and influencing private investors profit and sales expectations. Barrow and Robert (1989) investigate the determination of economic growth in a cross section of countries. The growth rate is found to be negatively related to the government consumption and not significantly related to the Public investment. Investment means the commitment of resources to the formation of capital assets which in turn allows a stream of new resources to be generated in future. The value of the capital assets created in the form of plant or construction depends upon the capital flows. For the investment to be acceptable then the value of the assets must exceed its cost. Investment has got two different types which are public and private investment. Ahmed Shagil (1986) said that the government deficits are thought to have a variety of effects on the private economy, ranging from forcing up real interest rates and crowding out private investment in additional plant and equipment to raising wealth and stimulating household consumption demand. Arrow and Kurz (1970) were the first authors to formulate government expenditures as a form of investment. The public investment has their origin in the government plans for different sectors while private investment is carried out by the individual or groups of enterprises. In the present study we will focus only on the public investment for Agriculture in Hokkaido. There are many problems related to the public investment for agriculture in Hokkaido, Japan that is the investment made by central government and the provincial government. Some of the main problems related to the government and to the farmers regarding the public investment are as follows.

i. The government prepares the developmental projects in Hokkaido. The system of the investment is such that 80% of the cost is being paid by the government, 18% by the municipalities and the remaining 2% the government requests the beneficiaries or the farmers to pay from their side. Actually, the farmers are reluctant to pay the cost from their side due to which many of the projects failed to get implemented. Therefore, keeping in view the difficulty of the investment from the farmers side, the government has to prepare new projects which is not only time consuming but also requires a lot of capital.

ii. As environment is directly related to the economy. Therefore, the government should improve the environment. But unfortunately, the government does not have good theories for calculating the environmental cost for improving the environment.

iii. Maintenance of the projects from the farmer’s side is cited as one of the major problems faced by the Government. Once the projects are being implemented in joint co-operation of the farmers by the Government then it becomes entirely the responsibility of the farmers to maintain these projects. But unfortunately either because of the technical efficiency or the lack of the capital from the farmer’s side they are not properly maintained which means that the investment that the government made would be wasted.

Purpose and Significance of the Study
The main objectives of this study are to evaluate the public investment in the Agricultural sector in Hokkaido. The current study consists of two major parts.


ii. To undertake the analysis of the data using the
MATERIAL AND METHODS

Cost Function Model

The growth accounting approach uses index number measures to technology to quantify the components of productivity change. Alternatively, econometric methods can be used to estimate the components of the production cost and profit function. Each approach requires certain assumptions which must be considered in interpreting the findings of the productivity studies. Consider the production function as the output as a function of capital, labor, material and time. Then the equation is given by

\[ Y = F(K, L, T) \]

Where \( Y \) = output  \( F = \) function  \( K, L \) are the various inputs like seed, fertilizer etc and \( T \) shows the Public investment for Agriculture. The function should be linear homogenous and should be in the log form to calculate the shares of the inputs such as \( a_0, a_1, a_2 \). Econometric model will be applied to assess the effectiveness of the Government investment on the economy of Hokkaido in general and the productivity of the crops in specific. In order to obtain quantitatively the impacts of the public investment for Agriculture in Hokkaido. The following cobdouglas form is specified for the cost function equation.

\[
\begin{align*}
\ln P &= a_0 + a_1 \ln P_L + a_2 \ln P_M + a_3 \\
L &= a_0 + a_1 \ln Q + a_3 \ln S + a_4 \ln I + a_5 + a_6 \ln P_L + a_7 \ln I + a_8 \ln P_M + a_9 \ln I + a_{10} \ln P_L + a_{11} \ln I + a_{12} \\
\text{Where } C \text{ is the Cost, } P_L \text{ is the labor, } I, \text{is the investment, } Q \text{ is the Agricultural product and } S \text{ is the land.} \\
\text{lnLnC}_t &= a_0 + a_1 \ln P_{L_t} + a_2 \ln P_{M_t} + a_3 \\
\text{lnLnI}_t &= a_0 + a_1 \ln Q_t + a_3 \ln S_t + a_4 \ln I + a_5 + a_6 \ln P_{L_t} + a_7 \ln I + a_8 \ln P_{M_t} + a_9 \ln I + a_{10} \ln P_{L_t} + a_{11} \ln I + a_{12} \\
\text{The equation 2 and 3 shows the share of the cost, labor, intermediate inputs and product etc.}
\end{align*}
\]

Data Collection

The data on the Public investment was collected from the office of the Hokkaido Development Agency whose office is located in Sapporo Japan. This data was related to the investment being made by the central and the provincial government in various developmental projects. The data related to the investment made by the government is between the periods 1963 to 1995 The researcher wanted to use the data before 1963 also. However, the data before 1972 was not available. Therefore, using the regression equation the data before 1972 was made available. However, the values before 1972 comes out to be in negative, which is not natural due to which the values in parallel were taken. The researcher visited the office personally and collected the data from there whereas the data on the production or the output was obtained from the office of the Bureau of the Statistics, Sapporo. The data obtained from the office of the Bureau of Statistics is related to the output or the production of various crops between the periods 1963 to 1995.

RESULTS AND DISCUSSION

The statistical trends related to the Agricultural management of Hokkaido were based on the data from 1963 to 1993. However, the impact assessment of the Public investment for Agriculture is from the period 1972 to 1993. This is because of the fact that the project life for each project is different and also because of the fact that we used lag in our study and the average lag that came out was nine. Different parameters were used to estimate the data of the public investment for Agriculture which is given in table 3.1. These parameters are \( \partial s, \beta_M \) and \( \gamma \) etc. It is quite clear from this table that when the results obtained were negative it means that the inputs were saved in Agriculture and when it is positive it means that the inputs were used in Agriculture. It was also found that the parameters \( \partial S, m, m_t \) were not statistically insignificant and the remaining parameters were found to be statistically insignificant at 5% level. The parameters \( \partial S, \beta_M \) were found to be statistically significant at 5% level. The parameters \( \partial S, B_M \) were found to be statistically insignificant means that their performance was not satisfactory and the other parameters which were found to be statistically significant shows that their performance was satisfactory. There were also three different R\(^2\) values in Table 1 because of the fact that we used different equations in our study.

Analysis of the Effect on Agriculture Expenditures of the Agricultural Infra-structure construction and Improvement Programmes

The cost reducing effect of the improvement project of Agriculture and Agricultural village expenditures is shown in figure 1. The figure clearly shows that the elasticity is positive and the value of the average elasticity is 0.97. Berndt and Khaled (1979) found that the apparent presence of the substantial economies of scale and relatively little technological progress is important for policy decisions. For example when promoting an industry, the government must decide how subsidies should be divided between the promotion of scale economies and the promotion of the technical progress.
Analysis of the Total Factor Productivity of Agriculture in Hokkaido (1972-1993)

The figure 3.2 shows the trend of the total factor productivity between the period 1972 to 1993 in our study. We have assessed the impact from the period 1972 to 1993 as the effect or the impact of the project status after a few years after the project is implemented. However, the original data used in this study is between the periods 1963 to 1993. Barro et al. (1981) said that it is conceivable that the relationship between the public and productivity is merely evidence of a reverse causation from productivity, proxying for per capita income to the demand for the public (Barro and Sala-i-Martin 1981). The following general equation which shows the total factor productivity was used in our analysis.

\[
\frac{\Delta TFP}{TPF} = \frac{\partial \ln C / \partial t + (\partial \ln Qt + \partial \ln C / \partial \ln Qs) / Q}{Q}
\]

In the above equation, TFP is the total factor productivity, \( \ln C \) is the cost, \( \ln Q \) shows the product. The land important law was made in the year 1949 due to which the investment initially started in Hokkaido in this year. Clearly and Chaivi (1973) reported that the relative productivity of the public and the private investments in less developed countries is obviously important and topical. The trend clearly shows that it is increasing with the passage of time that is between the periods 1949 to 1993. It is quite clear from the figure for the total factor productivity between the periods 1972 to 1976. From 1976 onwards, the trend of the total production again increases for three more years from 1976 to 1979. The situation changed after 1979 and it showed a little downward movement and declined for two more years from 1979 to 1981. From 1981 onwards again it increased for one year from 1981 to 1982 and then again declined from one year from 1982 to 1983. The trend of the total factor productivity again showed an upward movement from 1983 to 1985. The situation changed after 1987 and the trend of the total production showed an upward movement for five years from 1987 to 1992 and then it again showed a downward movement and declined for one year from 1992 to 1993. The trend showed a downward movement because of the fact that the weather conditions were extremely bad in Japan in the year 1993. Denison (1974) among others concluded that the economics of scale are significant reason for the TFP growth in the United States. (See Denison 1974).

CONCLUSION AND RECOMMENDATIONS

It is quite clear from the results of our analysis that the elasticity of the cost reducing effect of the investment is positive until 2033 and the value of the average elasticity is 0.97. Moreover, the absolute value of the elasticity is decreasing with the passage of time. Therefore, it can be concluded from this study that the cost reducing effect of the Agricultural expenditures in Hokkaido is positive between the period 1972 to 2033 and it will become negative in 2034. Therefore, if the Government would like that the cost reducing effect of the agricultural expenditure should be negative much earlier than 2034, then it is recommended that the Government should increase the investment. Moreover, based on all the data presented, it can also be concluded from this study that in order to improve the economy of Hokkaido in general and to increase the productivity of the various crops in specific, the Government should continue to invest. This investment will not only improve the economic and the social conditions of the people of Hokkaido. Public investment expenditures had a positive and significant effect on the output growth, while much of the literature attribute weak growth to the public investment and social expenditures. For the Hokkaido’s Agricultural productivity to improve, Government and donors must invest in programmes and policies that will improve the incentives and capacity of the farmers to make investments that increase farm productivity and soil fertility while protecting the environment. With rapid population growth, agriculture must rapidly intensify if Hokkaido farmers are to meet the rapid growth in demand for food and fibre.
Table-I Analysis of the data of the public investment for agriculture using the cost function analysis

<table>
<thead>
<tr>
<th>Variables</th>
<th>Estimated Value</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>α Farm land</td>
<td>0.334</td>
<td>(1.356)</td>
</tr>
<tr>
<td>α Labor</td>
<td>0.099</td>
<td>27.531*</td>
</tr>
<tr>
<td>α Agricultural product</td>
<td>-0.449</td>
<td>5.7206*</td>
</tr>
<tr>
<td>α Intermediate input</td>
<td>0.429</td>
<td>68.41*</td>
</tr>
<tr>
<td>a Capital input</td>
<td>0.472</td>
<td>66.561*</td>
</tr>
<tr>
<td>α Agricultural production structure</td>
<td>0.901</td>
<td>4.8188*</td>
</tr>
<tr>
<td>β Labour * Agricultural production structure</td>
<td>-0.071</td>
<td>7.2513*</td>
</tr>
<tr>
<td>β Agricultural products * Agricultural production structure</td>
<td>-0.467</td>
<td>3.957*</td>
</tr>
<tr>
<td>β01 (Intermediate input*Agricultural production structure</td>
<td>-0.001</td>
<td>(-0.059)</td>
</tr>
<tr>
<td>β Capital input* Agricultural production structure</td>
<td>0.072</td>
<td>3.7258*</td>
</tr>
</tbody>
</table>

REFERENCES


Brendt, E.R and M.S. Khaled. 1979 “Partner productivity measurement and choice among flexible functional forms J. of Political Econ. 87, 1220-1245.


