INTER-INDUSTRY DIFFERENCES IN EFFICIENCY OF AGRO PROCESSING INDUSTRIES IN INDIAN STATES

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ABSTRACT

Declining growth in agriculture vis-à-vis non agriculture sectors in India is a cause of concern. Although agriculture caters to the needs of more than half a billion population of the country (in terms of employment), yet the productivity of crops is low in relation to other countries. Not only this, there are inter-state variations too. Agro based industries are seen as an important link between agriculture and industry which can solve inherent problems prevailing in the Indian agriculture. But, to promote agro industries in an imprecise way to solve agricultural problems will not offer any solution. This study is carried out to find out the proximity of different agro based industries to different states in the country.

SECTION I

INTRODUCTION

An increase in Gross Domestic Product is directly related to an increase in the progress of a country. This progress leads to a shift in the economic activity away from agriculture towards services and manufacturing sectors, owing to higher elasticity of the latter two sectors in comparison to that of former sector (Fisher, 1939 and Clark, 1940). Economic growth entails the movement of resources from a low productivity sector of agriculture to a high productivity sector of industry (Chenery and Taylor, 1968). The structural shift away from agriculture to industry, which is the essence of the process of economic development, is termed as industrialization. Growth pattern of developed countries reveal one thing in common. The agriculture sector was developed first rather than industrial or tertiary sectors. In the initial stages of economic development, agriculture and/or primary sector has a greater importance and more than 60 percent of GDP originates from this sector, and to a large extent the population is engaged in this sector for earning their livelihood. However, as the economy develops some major structural changes take place in the economy and the importance of primary sector declines while the importance of manufacturing sector and of tertiary sector increase. This structural shift away from agriculture has taken place in industrially advanced countries and the developing countries are trying to tread this path. Furthermore, the agro-based industries were the first to be developed.

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The 2008 World Bank World Development Report (World Bank, 2007) states that in developing economies that are a hub of rural poor, rising inequalities lead to the unfulfilled expectations that create political tensions. It necessitates the growth in agriculture and the rural non-farm economy to reduce rural poverty and narrow down the prevailing inequality. It assumes greater importance in the context of Indian economy, where it is expected that the fragmented US$350 billion retail industry will double in size by 2015, and where modernization and liberalization of retail foreign direct investment (FDI) have given rise to heightened investment coupled with significant protest and policy push-back (Vorley, Lundy and Mac Gregor, 2009).

Planning Commission has defined agro-industries as the industries that are concerned with the processing of agricultural products, including animal husbandry, horticulture and poultry, and also those concerned with the manufacture of inputs required for agricultural production like agricultural implements (Government of India, 1993). India is a predominantly agricultural country and agricultural surplus if channelized properly can play an important role in the industrial development of the country. Indian economy has grown at a rate of around 6 percent per year since 1980 with an earlier average of 3.5 percent (Mukherji, 2006). However, during 2005 and 2010, the economy has grown at an average pace of 7.5 percent per annum. Of late the Indian economy has slowed down and the rate of growth is expected to remain between 5.5 to 6 percent per annum. But the state of processing sector is in a pal of gloom which processes only 8 percent of the total food production. Further, only 2 percent of horticulture products are estimated to be processed and more than 30 percent is wasted due to lack of storage and processing facilities (Arunajatesan and Balaji, 2004). Value addition of food products is expected to rise to 35 percent by the end of 2025. It is expected that fruit and vegetable processing which is currently around 2 percent of total production, will increase to 25 percent by 2025 (www.expresshospitality.com). Most possible reason seems to be an increase in the disposable income of the masses over time. An increase in disposable income increases the consumption pattern of the people who place a preference towards better varieties of commodities than before. People also tend to acquire better tastes, leading to an increased demand for processed agricultural products. In particular, the demand for refined sugar, fruit juices, jams, other food based products and instant coffee has and is likely to experience an increase in future. Not only, the agro-based industries help in improving the standard of living of the people, rather their growth is expected to generate employment, reduce post harvest losses, increase farm incomes, contribute substantially to the gross domestic product and reduce rural urban migration. On an average, 60 percent of the workers in the food and beverage industry in developing countries are employed in the informal economy (Asea and Kaija, 2000) But with the relocation of processing operations to developing and transition economies, there comes a decline in employment in food and beverage industry in many developed countries (Wilkinson and Rocha, 2009).

Though, India has emerged as a leader in food products yet, agro-industry in the country is in its infancy. There are large regional imbalances in the agro industrial development in the country. Growth of agro based industries is not based on any sound reasoning like cheap labour and capital availability, abundance of power availability, closer to the source of raw material etc. Infact, in majority of the cases, it is based on the whims and fancies of the policy makers. Present study intends to fill this void by

tracing out the suitability of various agro based industries in the major states of India on selected parameters. Specifically, it aims to fulfill the following objectives:

a) To assess the dominant agro based industries in the country in terms of relative labour, relative capital and relative efficiency.
b) To find out the states where agro based industries have performed better vis-à-vis other counterparts over a period of time
c) To trace the lagging agro based industries in the country which needs special attention

SECTION II

DATABASE AND METHODOLOGY

In order to fulfill the above mentioned objectives, secondary data from various issues of Annual Survey of Industries (ASI) published by the Central Statistical Organization has been used. To study the inter-state variation of agro-processing industries, disaggregated data at 3 - digit level have been used. The study identified a group of 18 agro processing industries for the years 2003-04 and 2007-08 for which an analysis has been made (based on NIC – 98). Further, the performance of each agro-processing industry and states is compared to the same industry in other states of India. In order to investigate the inter-industry differences in efficiency of selected agro industries, the study focuses on the Farrell's index. The study uses gross value added per employee as the measure of labor productivity and the ratio of gross value added to investment as the measure of capital productivity. For each industry, relative productivity of labor and capital (say, in the i^{th} industry) are obtained by dividing productivity of labor and of capital in the i^{th} industry by those in `all other industries' in the following manner.

$$RE^{\,i} = \left(\frac{LP^{\,i}}{LP^{\,A-i}} \right)^{w} \left(\frac{KP^{\,i}}{KP^{\,A-i}} \right)^{r}$$

where,

$$w = \frac{\left(w^{\,i} + w^{\,A-i}\right)}{2}$$

$$r = \frac{\left(r^{\,i} + r^{\,A-i}\right)}{2}$$

$$w + r = 1 \qquad \ldots\ldots \textit{(Farrell, 1957)}$$

The relative efficiency index is computed as weighted average of relative productivity of labor and of capital. Thus, where LP and KP denote productivity of labor and of capital respectively. Subscript i refer to the i^{th} industry and superscript A-i refer to all but the i^{th} industry. w and r are the income shares of labor and capital respectively. This measure of relative efficiency assumes that there are constant returns to scale (w + r = 1) and competitive equilibrium prevails in the market.

The efficiency measure described above is based on the Cobb-Douglas production function. Using the logarithmic transformation, it can be written as

$$InRE^{\,i} = wIn\left(\frac{LP^{\,i}}{LP^{\,A-i}} \right) + rIn\left(\frac{KP^{\,i}}{KP^{\,A-i}} \right)$$

The vintages of capital might vary widely across the industries but while computing relative productivity of capital, taking average over all the industries except the one for which relative productivity is being calculated has taken care of the effect of extreme cases. Similarly, there could be wide variations of hours worked among the states but even in this case, taking average has reduced the effect of extreme cases sufficiently. In order to estimate the economies of scale for the factors used Cobb Douglas production function has been used.

$$Y = A K^{\alpha} L^{\beta} e^{u}$$

Where Y is the output, L is the labour, K is the capital, u is stochastic term. For the present analysis we are making use of the Ordinary Least Squares (OLS) method because of its simplicity and big size of our sample. The estimates of α and β are obtained by regressing Log Y on log L and log K using principle of OLS. Coefficient of determination between log Y and joint effects of log L and log K has also been carried out and to check the overall significance F – test is used.

The study has been divided into five sections. Section I is introductory in nature. In section II database and methodology for the present study is discussed. Relative labour, Relative capital and Relative efficiency for the years 2003-04 and 2007-08 is discussed in section III. Estimates of frontier production function are discussed in section IV. Concluding remarks follow section V.

SECTION III

RELATIVE LABOUR EFFICIENCY

Table 1 shows the estimates of relative labour efficiency among 18 broad agro-based industries in the selected states of India during 2003-04 and 2007-08. It is quite evident from the table that the industries namely publishing industry (221), manufacture of tobacco products (160), manufacture of dairy products (152), manufacture of beverages (155), manufacture of paper and paper product (210) and dressing and dyeing of fur (182) depicted a high relative labour efficiency amongst all the 18 groups of industries in the year 2007-08. Similarly, an analysis for the highly relatively labour efficient industries for the year 2003-04 reveals that manufacture of tobacco products (160), manufacture of beverages (155), publishing industry (221), manufacture of dairy products (152) and manufacture of paper and paper product (210) have a high relative labour efficiency. A comparison of the relatively labour efficient agro industries in the time periods analyzed shows that four industries i.e. publishing industry (221), manufacture of tobacco products (160), manufacture of beverages (155) and manufacture of paper and paper products (210) are common. However, a look at the individual industries across the Indian states indicates moderate variation among Indian states in most of the agro industries. Further, majority of the industries showed a mean value closer to 1.0.

Manufacture of tobacco products industry (160) and Saw milling and planing of wood (201) industry showed very high level of variation across the Indian states. Over a period of time, the interstate variation in relative labour efficiency have increased in all the industries except spinning, weaving and finishing of textiles (171), tanning and dressing of leather, manufacture of luggage handbags, saddlery & harness (182), saw milling and planing of wood (201), manufacture of products of wood, cork, straw and plaiting materials (201) and manufacture of paper and paper product (210). This clearly shows that only a few states have shown a remarkable increase in relative labour efficiency whereas majority of the

states have shown a decrease in relative labour efficiency over a period of time. An in-depth analysis of the top relatively labour efficient industries is carried out in the following paragraphs.

In case of publishing industry (221) five dominant states for the year 2007-08 i.e. Delhi and Gujarat (1.53 each), West Bengal (1.32), Punjab (1.29), Tamil Nadu (1.28) and Assam (1.27) figured the list of five leading relatively labour efficient states. An inter comparison of these five leading labour efficient states with the five leading states in the year 2003-04 reveal none of the states any propinquity with the states identified in 2003-04. A comparison of the five least labour dominant states in the year 2007-08 with the states in the year 2003-04 show that only one state i.e. Chhattisgarh has not changed its stand with time.

In manufacture of tobacco products industry (160), relative labour efficiency for the year 2007-08 is found to be high in Kerala (8.42), Bihar (1.71), Jharkhand (1.66), Karnataka (1.63) and Uttar Pardesh (1.49) states vis-à-vis other states selected for study. If we compare this list of five labour efficient states with five labour dominant states in year 2003-04, we find that three out of five states i.e. Kerala, Uttar Pardesh and Bihar are the same. Similarly, an inter comparison of two periods (for the years 2003-04 and 2007-08 respectively) having five least labour efficient states in this industry show that three states are common to both the lists. These states are Orissa, Delhi and Rajasthan. Thus, we arrive at the conclusion that Kerala, Uttar Pardesh and Bihar are the best suited states for the development of tobacco industry in the country. However, the development of this industry needs to be carefully examined with respect to the economies in states of Orissa, Delhi and Rajasthan as in these states, the performance is quite poor and in the competitive environment, they cannot sustain in the long run.

Five states that are dominant in terms of labour productivity vis-à-vis other Indian states for the year 2007-08 are Rajasthan (3.87), Punjab (1.53), Tamil Nadu (1.49), Uttar Pardesh and Chhattisgarh (1.42 each) and Haryana (1.25) in manufacture of beverages industry (155). A comparison of these states with five labour efficient states in the year 2003-04 reveals that three states Punjab, Chhattisgarh and Rajasthan are common to both the lists. Thus, beverages industry is of paramount importance for these states. For the low labour efficient states, the results on same parameters indicate that Kerala, Uttaranchal and Himachal Pardesh have performed dismally in the time periods taken for study.

Orissa (1.80), Assam (1.48), Chhattisgarh (1.25), Jharkhand (1.24) and Haryana (1.19) turned out to be relatively labour efficient states in the year 2007-08 in manufacture of paper and paper products industry (210). When these labour efficient states are compared with the states in the year 2003-04, Orissa, Assam and Haryana turn out to be common in both the lists. Similarly, for the low labour efficient states, the results show that Rajasthan and Kerala have not changed their position with time.

Keeping in view the growing unemployment in the Indian economy, there is a need to set up more agro-based industries in those states where labour efficiency is high, while, in those states where labour productivity is low, these industries should be discouraged. Thus, on the basis of table 1, it can be said with some certainty that large disparities exist in labour productivity in 18 selected agro-based industries during the study period. Hence, efforts should be made either to increase labour productivity in under developed states or more strategically to further promote states with higher labour productivity

in agro-based industries. This is the need of the hour also. As a policy frame work, it is pertinent to absorb more and more labour atleast in those agro-based industries where the productivity is higher.

RELATIVE CAPITAL EFFICIENCY

Table 2 shows the estimates of Relative capital efficiency among 18 agro-based industries during the years 2003-04 and 2007-08. The results once again reflect that publishing (221) and manufacture of tobacco products (160) industry depicted high capital productivity in both the years taken for study. But a large variation among Indian states subsists, when we analyze each industry across the Indian states. Although, most of the industries showed a mean value closer to 1.0, a high coefficient of variation exist in most of the industries. Further, an average of the relative capital efficiency of the Indian states reveal, that as many as ten agro based industries have shown a decrease in capital efficiency over a period of time. Specifically, we will concentrate on the nature of top capital efficient industries in the following paragraphs.

In the publishing industry (221), dominant five states in terms of capital productivity for the year 2007-08 are Rajasthan (8.26), Andhra Pardesh (3.53), Kerala (2.66), Karnataka (2.56) and West Bengal (2.31). A comparison with five capital efficient states in the year 2003-04 also reveals that two states i.e. Rajasthan and West Bengal are common to both the lists. Further, when we compare the relatively capital efficient states in table 2 with the previously identified relatively labour efficient states (table 1) in the same industry, we find that West Bengal emerges as the most suitable state for the development of publishing industry on the selected parameters. For the low capital efficient states in this industry, the results reveal that that Chhattisgarh has performed dismally in the time periods taken for the study.

In case of manufacture of tobacco products industry (160), capital efficiency for the year 2007-08 is found to be high in Uttar Pardesh (6.08), Bihar (4.93), Karnataka (2.24), Gujarat (1.94), and Orissa (1.77) vis-à-vis other states selected for study. If we compare this list of five highly capital efficient states with five capital efficient states in year 2003-04, we find that three out of five states i.e. Uttar Pardesh, Bihar and Karnataka are the same. A comparison of table 2 with table 1 for this industry shows that Bihar and Uttar Pardesh are the most suitable states the development of tobacco industry on two parameters. Similarly, an inter comparison of two periods (for the years 2003-04 and 2007-08 respectively) having five least labour dominant states in this industry show that two states are common to both the lists. These states are Maharashtra and Kerala.

So far the non-performing industries in terms of capital productivity are concerned, it can be noticed that manufacture of products of wood, cork, saw and plaiting materials (202), saw milling and planing of wood (201), and manufacture of other food products (154) industries have performed miserably. Further, Uttar Pardesh, Assam and Bihar are the least performing states in case of manufacture of products of wood, cork, saw and plaiting materials industry. For the saw milling and planing of wood industry, Kerala has turned out to be in a pitiable state. Similarly, manufacture of other food products industry, Uttar Pardesh, Kerala and Bihar showed the miserable performance.

Summing up, need of the hour is to take concrete remedial steps either to increase capital efficiency in the poor performing states or to close down these industries for the sake of sustainable

development of these industries across India. But from the competitive business environment point of view, it is advisable to promote more and more industries in those states where we find labour and capital efficiency to be high.

RELATIVE EFFICIENCY

Table 3 shows the estimates of Relative efficiency among the agro-based industries during the years 2003-04 and 2007-08. The results show that manufacture of tobacco products (160), manufacture of beverages (155), publishing (221) and printing and service activities related to printing (222) industries has excelled in terms of relative efficiency. However, a large variation is found to subsist among the Indian states, when we analyze each industry. Although, most of the industries showed a mean value of greater than 1.0, a high coefficient of variation exists in most of the industries. Further, an average of the capital efficiency of the Indian states reveal, that as many as ten agro based industries have shown a decrease in capital efficiency over a period of time. The nature of relatively efficiency among leading industries is discussed in the following paragraphs.

In case of manufacture of tobacco products (160) industry, relative efficiency for the year 2007-08 is found to be high in Uttar Pardesh (9.04), Bihar (8.43), Kerala (4.84), Karnataka (3.66) and Gujarat (2.40) vis-à-vis other states selected. A comparison of the list of five highly efficient states with five such states in year 2003-04 shows that three out of five states i.e. Uttar Pardesh, Bihar and Karnataka are the same. The results clearly indicate that Bihar and Uttar Pardesh are the most suitable states the development of tobacco industry. Similarly, the least efficient states in this industry and those are also common to both the lists include Delhi, Orissa and Rajasthan.

In manufacture of beverages (155) industry, relative efficiency for the year 2007-08 is found to be highest in case of Punjab (17.20) followed by Rajasthan (4.02), Tamil Nadu (2.56), Uttar Pardesh (2.47) and Assam (2.14) vis-à-vis other states selected for study. Interestingly, Punjab ranked first among all the states in this industry in both the time periods taken. Besides Punjab, Rajasthan and Tamil Nadu have also figured in the list of leading states when a comparison is made with the year 2003-04. Similarly, an inter comparison of two periods (for the years 2003-04 and 2007-08 respectively) having five least efficient states in this industry show that two states are common to both the lists. These states are Himachal Pardesh and Kerala

Major states in terms of relative efficiency vis-à-vis other Indian states for the year 2007-08 in publishing (221) industry are Andhra Pardesh (4.01), Karnataka (3.31), Gujarat (3.09), West Bengal (3.04), and Kerala (3.00). A comparison with five relative efficient states in the year 2003-04 reveals that Andhra Pardesh has emerged as the most suitable states for the development of publishing industry. Other states where this industry has shown signs of development include Punjab, Madhya Pardesh and Assam. Among the inefficient states, the results indicate that Chhattisgarh tops the list in this industry. Performance of Delhi and Haryana has also deteriorated over time in this industry.

In printing and service activities related to printing (222) industry, dominant five states in terms of relative efficiency for the year 2007-08 are Rajasthan (4.13), Himachal Pardesh (1.91), Jharkhand (1.66), Madhya Pardesh (1.48) and Haryana (1.35). A comparison with five relatively efficient states in

the year 2003-04 reveals that two north Indian states i.e. Haryana and Himachal Pardesh has excelled in both the time periods. Other states that have performed reasonably well in this industry include Tamil Nadu, Kerala and Jammu and Kashmir. On the other hand, states whose performance has gone down in this industry consists of Assam, Chhattisgarh and Karnataka.

A comparison of the least five performing agro-based industries in terms of relative efficiency in the year 2003-04 with 2007-08 reveals that three agro industries i.e. manufacture of other food products (154), manufacture of knitted and crocheted fabrics and articles (173) and tanning and dressing of leather, manufacture of luggage handbags, saddlery & harness (191) figured in both the years. Further, a look at the five least performing states in the least performing agro industries reveals that not more than two states are common in both the years. It demonstrates that majority of the states have a potential to change their stature from non-performing to the minimal performing state. It may not be interpreted as that all the agro industries are best suited for all the states. Need is to identify and set up those agro industries where a particular state has a competitive advantage.

Summing up, the above discussion states that the development of agro based industries cannot be taken up in a slapdash manner. The development of agro industries vary in the Indian states owing to a presence or absence of large number of factories, public and private willingness to develop industry, congeniality of entrepreneurship environment, non-availability of natural minerals, existence of raw material in the state, being the border states and lacking the entrepreneurial environment too. Sometimes, even a lack of perspective of state policy is also responsible for the feeble development of agro industries. Despite these constraints, some states have shown an openness towards the development of agro based industries. Among these states, Haryana has notched the top slot followed by Tamil Nadu, Rajasthan, West Bengal, Uttaranchal and Delhi. Contrary to this, Madhya Pardesh, Maharashtra, Kerala and Assam have performed miserably in the parameters studied.

SECTION IV

Estimates of Frontier Production Function across Indian States

Table 4 shows the values of labour and capital coefficients for the years 2003-04 and 2007-08. It is evident that 70 percent of the variation in total output in the agro based industries is explained by the labour as well as capital. However, the labour coefficients in case of the seven states i.e. Delhi, Haryana, Himachal Pardesh, Jammu and Kashmir, Madhya Pardesh, Uttar Pardesh and West Bengal, are negative. It means that the labour has a negative impact on the output of the agro based industries in these states. An increase in labour is followed by a corresponding decrease in total output of the agro based industries. So far, the capital coefficient is concerned, there is a positive relationship found in all the states. In the states of Delhi, Himachal Pardesh, Jammu and Kashmir, Jharkhand, Madhya Pardesh and Uttar Pardesh capital coefficient is greater than one. It indicates that per unit increase in capital has given correspondingly more increase in value of output of agro based industries in these states. In other words, these states show relatively more capital intensive industries. However, in case of labour no states have more than one labour value which clearly shows that during 2003-04 the relative contribution of labour in increasing the value of output is much low. Further, in all the states (except Gujarat, Kerala, Orissa and Rajasthan) the value of R^2 is more that 80 percent which shows that labour

and capital together contribute more than 80 percent of the variation in the gross output of the agro based industries in the Indian states. An examination of the results of regression analysis during 2007-08 also does not reveal much difference. The regression estimates are significant in all the states which is evident from high F-values. Similarly, the contribution of labour and capital in explaining the variation in value of output in agro-based industries in all the states is more than 80 percent, except in case of Andhra Pardesh, Gujarat, Rajasthan and Uttar Pardesh. In the exceptional states too, two factors namely labour and capital could explain less than 80 percent but more than 70 percent variation. During the year 2007-08, capital coefficient was greater than one in the states of Delhi and Jammu and Kashmir while during 2003-04 it was high in six states namely Delhi, Himachal Pardesh, Jharkhand, Jammu and Kashmir, Madhya Pardesh and Uttar Pardesh.

An important inference that can be drawn from table 4 is that during 2003-04, increasing returns to scale accrued in case of seven states i.e. Delhi, Jharkhand, Himachal Pardesh, Madhya Pardesh, Rajasthan, Punjab and Tamil Nadu respectively. Returns to scale show the contribution of both the factors (labour and capital together) in increasing the level of output. However, the number of states experiencing increasing returns to scale during 2007-08 decreased to five i.e. Chhattisgarh, Delhi, Himachal Pardesh and Jammu and Kashmir and Orissa. This shows that labour and capital productivity have not a very significant contribution in increasing the output in agro based industries in majority of the Indian states. Not a very rosy picture comes out, when we analyze the individual regression coefficients of labour and capital as well as their
joint contribution. This calls for drastic policy measures to improve the labour and capital productivities in agro based industries across the Indian states.

Results from table 4 reflect high regression coefficient values for capital which clearly specify that the relative contribution of capital is quite high in comparison to labour. This is quite understandable also in view of the nature of products produced in agro based industries which are perishable in nature and require a high dose of capital to maintain their efficiency. In view of the above, top states that have shown remarkable labour and capital productivities in the years 2003-04 and 2007-08 constitutes Himachal Pardesh, Delhi, Jharkhand, Chhattisgarh, Tamil Nadu, Rajasthan and Punjab. On the other hand, in Kerala, Andhra Pardesh, Uttaranchal, Haryana, West Bengal and Gujarat, labour and capital productivity is found to be low. Hence, efforts should be made to further consolidate the functioning of agro industries in those states where they have relatively more advantage by asking the states to take adequate measures in their respective industrial policies to promote these very industries.

Further, from table 5 it can be concluded that majority of the agro based industries have shown an increasing returns to scale in the year 2007-08. Where, in 2003-04, six industries namely manufacture of dairy product (152), manufacture of wearing apparel, except fur apparel (181), dressing and dyeing of fur; manufacture of articles of fur (182), tanning and dressing of leather, manufacture of luggage handbags, saddlery & harness (191), manufacture of footwear (192) and saw milling and planning of wood (201) showed increasing returns, the number increased to eleven in 2007-08. These industries are production, processing and preservation of meat, fish, fruit, vegetables, oils and fats (151), manufacture of dairy product (152), manufacture of grain mill products, starches and starch products, and prepared

animal feeds (153), manufacture of beverages (155), manufacture of other textiles (172), dressing and dyeing of fur (182), tanning and dressing of leather, manufacture of luggage handbags, saddlery & harness. (191), manufacture of footwear (192), saw milling and planing of wood (201), publishing (221) and printing and service activities related to printing (222). Five agro industries that did not yield increasing returns to scale in the year 2003-04 but started yielding the same in 2007-08 comprises of processing and preservation of meat, fish, fruit, vegetables, oils and fats (151), manufacture of grain mill products, starches and starch products, and prepared animal feeds (153), manufacture of beverages (155), manufacture of other textiles (172), publishing (221) and printing and service activities related to printing (222). On the other hand, Manufacture of wearing apparel (181) industry ceases to yield increasing returns to scale in 2007-08. By and large, the table shows good prospects for the development of agro based industries in India. But a careful thought need to be given to the states that do not support the development of a particular agro industry. For example, if over a period of time, Kerala, Andhra Pardesh, Uttaranchal, Haryana, West Bengal and Gujarat (having a low labour and capital productivity) do not show any signs of development, then it is better to either think of their drastic overhauling or closing down of agro based industries in these states. Otherwise, a deep investigation is required to understand the availability of raw material for these industries in the respective states. One of the tentative reasons for the low contribution of labour in increasing the output value in agro-based industries at the state level can be attributed to the fact that agro based industries are capital intensive in nature and require highly skilled manpower or labour. This call for the training and retraining of labour, especially in those states, where the capital and labour productivities are lower and labour and capital coefficients are also low.

Similarly, due to the increased competition owing to market driven economy and need for the exports of agro based products, it is pertinent to further increase the labour productivities as well as the capital efficiencies in those agro based industries, where the labour productivity is although high, but relatively lower by international standards. Hence, Himachal Pardesh, Delhi, Jharkhand, Chhattisgarh, Tamil Nadu, Rajasthan and Punjab states where labour and capital is high, adequate policy measures must be undertaken in the form of extending subsidies, adequate infrastructure, availability of skilled labour and capital by setting up of training institutes for the workers where the skills can be enhanced and promoted in the agro or food processing industries. Similarly, there is an urgent need to set up engineering courses in food processing or agro processing areas respectively in those states where agro based industries needs to be promoted. Unfortunately, even in the so called food bowl states i.e. Punjab and Haryana have only few institutes which provide Diplomas/Degrees in agro-based industries. For example, traditionally, mechanical, electrical and civil engineering courses were in vogue. Later on, timely introduction of electronics, computer science and information and technology (IT) engineering courses in Bangalore and Hyderabad helped to give boost to IT industry in the states of Karnataka and Andhra Pardesh respectively. Unfortunately, technical education has not taken any steps to boost the course of food technology and more specifically the agro based engineering in India. This may be one of the important causes of unavailability of skilled and trained manpower which is required by the agro based industries in particular. This study does highlight the importance ofthe availability of skilled and

adequate manpower to strengthen the cause of agro-based industries across the Indian states. In the changed business scenario of market oriented environment, it is important to promote only efficient industries and say good bye to the inefficient industries in those states where their relative contribution is very low.

SECTION V

CONCLUSION

The present study identifies the promising agro-based industries and the most suitable states for their development in India. Conclusions can be drawn with the help of the following summary table.

Industry No.	Relative labour efficiency	Relative capital efficiency	Relative efficiency	Returns to scale	Most suitable states for development
151	Medium	High	High	Increasing	Maharashtra, Jammu and Kashmir, Delhi, Rajasthan, Haryana, Madhya Pardesh and Tamil Nadu
152	Medium	High	High	Increasing	Jharkhand, Orissa, Maharashtra, Karnataka, Gujarat, Uttar Pardesh Punjab and Madhya Pardesh
153	Medium	High	High	Increasing	Jharkhand, Kerala, Chhattisgarh, Jammu and Kashmir, Delhi, Haryana, Himachal Pardesh and Rajasthan
154	Low	Medium	Low	Decreasing	Chhattisgarh, Delhi, Maharashtra, Rajasthan and Jharkhand
155	High	High	High	Increasing	Punjab, Rajasthan, Tamil Nadu, Uttar Pardesh, Chhattisgarh, Haryana, Karnataka, Assam and West Bengal
160	High	High	High	Decreasing	Uttar Pardesh, Bihar, Kerala, Karnataka, Assam, Tamil Nadu and Gujarat
171	Medium	Low	Low	Decreasing	Rajasthan, Chhattisgarh, West Bengal, Tamil Nadu and Gujarat
172	Medium	Medium	Medium	Increasing	Rajasthan, Uttaranchal, Andhra Pardesh, Jammu and Kashmir, Gujarat, Haryana and Maharashtra
173	Medium	Medium	Medium	Decreasing	Rajasthan, Madhya Pardesh, Tamil Nadu, Gujarat, Haryana, Jammu and Kashmir and West Bengal
181	Low	High	High	Decreasing	Himachal Pardesh, Jammu and Kashmir, West Bengal, Gujarat, Punjab, Madhya Pardesh and Tamil Nadu
182	Medium	High	Medium	Increasing	Gujarat, Haryana, Tamil Nadu, Uttaranchal and Punjab
191	Medium	Medium	Medium	Increasing	Maharashtra, West Bengal, Haryana, Tamil Nadu, Delhi, Andhra Pardesh and Himachal Pardesh
192	Low	Medium	Low	Increasing	Himachal Pardesh, Gujarat, Madhya Pardesh, Uttaranchal and Haryana
201	Low	Low	Low	Increasing	Uttaranchal, Andhra Pardesh, Delhi, Gujarat, Haryana and Assam
202	Medium	Low	Low	Decreasing	Orissa, Karnataka, Andhra Pardesh, Tamil Nadu, Madhya Pardesh, Chhattisgarh and West Bengal
210	High	High	High	Decreasing	Assam, Haryana, Uttaranchal, Jammu and Kashmir and Chhattisgarh and Bihar
221	High	High	High	Increasing	Andhra Pardesh, Karnataka, Gujarat, West Bengal, Assam and Kerala
222	High	Medium	High	Increasing	Rajasthan, Himachal Pardesh, Jharkhand, Madhya Pardesh and Haryana

In case of number of agro-based industries relative labour, capital and efficiency clearly and consistently indicates bright prospects and a good scope of their development. In case of many other agro-based industries evidence is equally clear about bleak prospects of further development. However, available evidence is not consistent in case of a number of agro-based industries and about these no straight mechanical conclusions can be drawn. In such situations one has to draw conclusions by exercising own informed judgment. On the basis of these evidences, we can say with some confidence that the following agro-based industries have a very good scope of development in India.

1. Production, processing and preservation of meat, fish, fruit, vegetables, oils and fats (151)
2. Manufacture of dairy products (152)
3. Manufacture of grain mill products, starches and starch products, and prepared animal feeds (153)
4. Manufacture of beverages (155)
5. Publishing (221)
6. Printing and service activities related to printing (222)

Other agro industries which have shown a good scope for development include

1. Manufacture of tobacco products (160)
2. Manufacture of other textiles (172)
3. Manufacture of knitted and crocheted fabrics and articles (173)
4. Manufacture of wearing apparel, except fur apparel (181)
5. Dressing and dyeing of fur; manufacture of articles of fur (182)
6. Tanning and dressing of leather, manufacture of luggage handbags, saddlery & harness (191)
7. Manufacture of footwear (192)
8. Manufacture of paper and paper product (210)

The non-performance of four agro-industries viz. manufacture of other food products (154), spinning, weaving, finishing of textiles (171), sawing and planing of wood (201) and manufacture of products of wood (202) can be understood from the following discussion. As far as the food products industry is concerned, the dismal performance can be attributed to the failure of the market giants like Subhiksha, Reliance, Six Ten etc. High rate of failure in the processed food category has rendered this industry unattractive for investors. Moreover, the processed foods market taps the urban consumers only. Indian consumers still have traditional food habits and they prefer to cook food in an established way. Still, increasing urbanization, improving standards of living and the increasing engagement of women in jobs leading to enhanced family incomes impart a potentiality to the food products sector to grow faster. Similarly, the spinning, weaving and finishing of textiles industry is marred by the existence of old fashioned technology and the industrial sickness. Though, all varieties of forest growth are found in India, yet the continuous depletion of the natural forest resources of the country due to the consumption of solid wood necessitated the need to conserve the natural resources.

However, a major effort is required from the government as well as the private sector to provide critical infrastructure in order to bring a new revolution, which is agro-industrial centric in nature. The present study is a modest attempt to identify the promising agro industries in the country.

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APPENDIX

Industry No.	NAME OF THE INDUSTRY
151	Production, processing and preservation of meat, fish, fruit, vegetables, oils and fats.
152	Manufacture of dairy product
153	Manufacture of grain mill products, starches and starch products, and prepared animal feeds
154	Manufacture of other food products
155	Manufacture of beverages
160	Manufacture of tobacco products
171	Spinning, weaving and finishing of textiles.
172	Manufacture of other textiles

173	Manufacture of knitted and crocheted fabrics and articles
181	Manufacture of wearing apparel, except fur apparel
182	Dressing and dyeing of fur; manufacture of articles of fur
191	Tanning and dressing of leather, manufacture of luggage handbags, saddlery & harness.
192	Manufacture of footwear.
201	Saw milling and planing of wood
202	Manufacture of products of wood, cork, straw and plaiting materials
210	Manufacture of paper and paper product
221	Publishing
222	Printing and service activities related to printing

Table 1

Estimates of relative labour efficiency among the agro-based industries in India

	173		**181**		**182**		**191**		**192**		**201**		**202**		**210**		**221**		**222**	
	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08
AP	0.93	0.32	0.72	0.72			0.02	1.00	0.78	0.42	0.32	1.66	0.80	1.08	1.48	0.70	1.94	1.14	1.24	1.11
ASSAM											0.35	0.52	0.55	0.94	1.15	1.48	0.56	1.27	0.89	0.76
BIHAR								0.76	1.08		0.43	0.70	0.33	1.19	1.63	1.11	1.09	1.23	0.02	1.08
CHATTISGARH									0.55	0.57	0.56	0.32	0.87	0.74	1.15	1.25	0.81	0.54	1.40	0.13
DELHI	0.94	0.61	0.88	0.89			1.02	0.87	0.85	0.85		1.04	0.15		0.86	0.86	1.23	1.53	0.95	1.02
GUJARAT	0.98	1.13	0.87	0.87		0.75	0.46	0.71	1.03	1.01	0.60	0.80	0.92	0.82	1.03	1.08	1.44	1.53	0.90	1.07
HARYANA	0.93	0.99	0.88	0.77	1.05	0.80	1.01	1.01	1.20	0.91	0.79	0.66	0.90	0.79	1.16	1.19	1.22	1.08	1.18	1.19
HP	0.96		1.07	1.34			0.82	1.06		1.17	0.48	0.41	0.80	0.57	0.79	1.06			1.20	1.23
J&K	0.16	0.83		1.29							1.03	1.01	1.24	0.84	1.13	1.01	0.84			1.21
JHARKHAND											0.77	1.05	0.74	0.91	0.71	1.24	0.88		0.93	1.04
KARNATAKA	0.69	0.47	1.30	0.55			0.80	0.43	0.95	0.58	0.68	0.53	1.07	0.96	0.90	0.88	1.18	1.29	0.98	0.79
KERALA	0.36	1.01	1.00	0.53			0.68	0.67	0.78	0.71	0.83	0.71	0.48	0.48	0.60	0.76	1.14	1.13	1.08	1.09
MAHARASHTRA	0.84	0.95	0.93	0.44			0.36	1.30	1.52	0.92	3.14	1.15	0.72	0.91	0.79	1.15	1.50	1.26	1.03	0.87
MP	0.65	1.06	0.81	1.11			1.36	0.74	0.74	1.42	0.59	0.84	0.85	1.00	0.83	0.95	1.45	1.05	0.78	1.05
ORISSA											0.65	0.76	1.23	1.54	1.53	1.80	1.49	0.87	0.90	1.01
PUNJAB		0.87	0.70	1.04		0.95	0.86	0.69	0.78	0.78	0.73	0.94	0.69	0.79	1.01	0.71		1.29	0.81	1.03
RAJASTHAN	0.94	1.59	1.01	0.15					0.85	0.80	0.58	0.71	1.06		0.40	0.69	1.40	0.00	0.36	3.99
TAMIL NADU	1.07	0.90	1.25	0.76		0.97	0.82	0.91	0.97	0.73	1.09	0.59	0.87	0.99	0.90	0.99	1.38	1.28	1.07	1.04
UP	0.94	0.87	0.74	0.65	0.93	1.01	0.73	0.61	0.75	0.72	0.59	0.62	0.68	0.71	1.04	1.06	1.38	1.13	0.89	0.90
UTTARANCHAL			0.84	0.74		0.94				1.01	1.30	1.69	0.57	0.79	0.76	0.86	1.61	1.21		0.79
WEST BENGAL	0.78	0.95	1.09	1.29			0.79	0.92	0.88	0.93	0.69	0.77	0.80	1.01	0.90	0.81	1.25	1.32	1.19	1.11
Mean	0.80	0.90	0.94	0.82	0.99	0.90	0.75	0.83	0.91	0.85	0.81	0.83	0.78	0.90	0.99	1.03	1.25	1.12	0.94	1.12
STDDEV	0.26	0.30	0.18	0.33	0.08	0.10	0.33	0.22	0.23	0.24	0.60	0.35	0.27	0.23	0.30	0.27	0.32	0.36	0.31	0.70
CV	32.30	33.78	19.27	40.43	8.57	11.45	44.19	26.43	25.28	28.77	73.98	42.27	34.56	25.65	30.56	26.36	25.79	32.01	33.46	62.38

***Source**: Supplement to Annual Survey of Industries, issues 2003-04 and 2007-08*

Table 2

Estimates of relative capital efficiency among the agro-based industries in India

	151		**152**		**153**		**154**		**155**		**160**		**171**		**172**	
	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08
AP	0.83	1.00	1.31	0.91	0.96	0.97	0.78	0.84	0.77	1.18	1.46	0.54	0.84	1.00	1.13	0.85
ASSAM	0.66	0.55	0.57	0.51	0.58	0.82	0.49	0.77	0.45	1.59	4.36	1.15	0.67	0.76		
BIHAR	0.29	0.46	0.96	0.63	0.53	0.57	0.41	0.68	0.54	1.41	2.84	4.93	5.63	0.60	0.65	0.37
CHATTISGARH	0.75	0.90			0.40	1.30	1.34	1.06	0.61	1.24	1.71	1.37	0.46	0.97	0.85	0.80
DELHI	0.88	0.94	1.13		0.73	0.92	1.37	0.92	0.80	0.92	0.84	0.96	2.49	0.93	1.00	0.93
GUJARAT	0.73	0.67	1.39	1.03	0.97	0.73	0.55	0.77	0.79	0.66	1.45	1.94	0.83	0.83	0.98	0.95
HARYANA	0.71	1.34	0.86	0.67	0.66	0.64	1.12	0.84	1.45	1.15	0.97	0.88	0.95	0.91	1.20	1.03
HP	0.49	0.52			0.66	0.98	0.70	0.78	0.45	0.74	2.00	0.73	0.35	0.54	0.71	0.53
J&K	0.82	2.09	0.74	0.98	0.91	1.65	0.74	0.85	1.24	1.38			0.95	0.91		1.78
JHARKHAND	0.89	0.69	1.54	1.61	0.70	3.90	1.26	0.92	0.74	1.08	1.28	0.53	1.01	0.72	1.29	0.91
KARNATAKA	0.79	0.53	0.95	1.46	0.90	0.74	0.73	0.48	1.73	0.89	5.66	2.24	0.80	0.60	0.66	0.99
KERALA	1.71	1.05	1.28	1.36	1.10	1.29	0.54	0.59	1.17	0.90	0.57	0.58	0.87	0.88	0.90	0.97
MAHARASHTRA	1.00	3.68	0.96	1.34	0.88	0.68	0.82	1.01	2.15	1.33	0.53	0.56	0.91	1.33	1.14	0.68
MP	0.59	1.65	1.16	1.17	0.78	1.06	1.15	0.86	0.69	1.26	1.20	0.54	0.98	0.82	1.15	0.85
ORISSA	0.64	0.68	1.27	1.68	0.66	0.74	0.60	1.60	0.87	0.76	1.77	1.77	0.88	0.89	0.75	0.80
PUNJAB	0.67	0.63	4.65	0.69	0.68	0.34	0.66	0.64	1.81	11.25	0.77		0.85	0.66		0.55
RAJASTHAN	1.21	1.00	1.17		0.97	1.00	1.01	1.00	1.25	1.04	0.96	1.04	0.87	1.00	1.13	1.02
TAMIL NADU	0.97	1.07	1.37	1.05	0.74	0.95	0.85	0.85	1.58	1.71	0.90	1.01	0.98	0.83	0.82	0.79
UP	0.59	0.47	0.84	1.05	0.57	0.66	0.53	0.52	1.01	1.74	4.74	6.08	0.56	0.58	0.97	1.04
UTTARANCHAL	1.03	0.63	0.88	0.62	0.58	0.65	0.82	1.28	1.25	0.54	0.66		2.47	0.92		2.29
WEST BENGAL	1.04	1.31	1.12	1.04	0.68	0.66	0.79	0.64	1.30	1.35	1.70	0.67	0.85	0.72	0.79	0.67
Mean	0.82	1.04	1.27	1.05	0.74	1.01	0.82	0.85	1.08	1.62	1.82	1.53	1.20	0.83	0.95	0.94
STDDEV	0.29	0.73	0.85	0.36	0.18	0.72	0.28	0.25	0.47	2.23	1.46	1.55	1.14	0.18	0.20	0.42
CV	35.43	70.59	67.27	33.98	23.77	71.48	34.63	29.88	44.02	137.26	80.49	101.08	95.37	22.17	21.25	45.14

Table 2 Contd…….

Table 2 Contd…….

	173		**181**		**182**		**191**		**192**		**201**		**202**		**210**		**221**		**222**	
	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08
AP	0.69	0.86	1.07	0.74			3.63	0.69	0.79	0.85	0.98	0.76	0.98	1.08	0.84	1.36	1.68	3.53	1.20	0.86
ASSAM											1.36	1.46	0.41	0.76	0.66	1.13	0.87	1.58	1.68	0.95
BIHAR								0.82	1.70		0.68	0.36	0.52	0.32	1.33	1.22	1.07	0.97	1.07	0.97
CHATTISGARH									1.00	1.03	0.71	0.94	0.54	0.91	0.78	1.09	1.09	0.79	2.10	0.87
DELHI	1.13	0.94	0.94	0.93			0.90	0.92	0.84	0.92		0.91	1.18		0.82	0.93	1.46	0.93	0.92	0.92
GUJARAT	0.71	0.90	1.65	1.37		1.64	0.87	0.93	1.15	1.39	0.75	1.02	1.44	0.91	0.69	0.69	1.19	2.02	1.31	0.94
HARYANA	1.26	1.06	1.17	1.11	1.50	1.01	0.87	1.03	1.58	1.04	1.13	1.24	0.89	0.95	0.97	1.29	1.12	1.10	1.17	1.14
HP	1.23		0.90	5.50			0.49	0.75		1.25	2.32	1.00	1.20	0.32	0.56			0.67	4.02	1.54
J&K	1.45	1.25									1.17	0.32	1.04	0.56	1.06		1.70	1.36		0.93
JHARKHAND											0.64	0.66	0.76	0.88	1.20		0.89	0.96	0.99	1.60
KARNATAKA	0.57	0.91	0.52	1.18			0.57	0.75	0.62	0.82	0.40	0.85	0.79	1.25	0.87	0.73	1.13	2.56	0.81	0.68
KERALA	0.83	0.79	0.72	0.83			0.71	0.94	1.44	0.92	0.57	0.62	0.81	0.79	1.27	1.23	1.67	2.66	0.97	1.06
MAHARASHTRA	0.96	0.58	0.81	0.69			0.84	1.94	0.96	0.60	2.35	0.51	0.83	0.78	1.17	0.82	1.98	0.82	1.01	0.65
MP	1.20	1.13	0.89	0.90			1.03	0.63	0.94	0.86	0.86	0.60	1.02	0.89	1.00	1.22	1.66	1.66	1.09	1.42
ORISSA											1.04	0.91	0.94	1.05	0.60	0.73	1.33	1.01	1.13	0.77
PUNJAB	1.04	0.57	0.92	0.60		0.43	0.65	0.46	0.83	0.46	0.72	0.29	0.74	0.40	0.80	0.71		1.91	1.59	0.55
RAJASTHAN	0.43	0.99	1.01	1.01			1.31			0.99	0.63	1.01	0.76		0.70	1.01	2.17	8.26	0.84	1.03
TAMIL NADU	0.83	1.15	0.71	1.32		1.14	0.79	0.91	0.70	1.03	0.48	1.25	1.08	1.07	1.40	1.01	2.28	1.09	0.87	1.14
UP	1.01	0.77	0.81	1.21	0.52	0.61	0.68	0.69	1.19	1.22	0.66	0.63	0.69	0.68	0.68	0.60	1.75	0.87	1.21	0.96
UTTARANCHAL			0.81	0.61		1.49				1.10	0.63	1.15	0.49	0.85	1.50	1.67	2.18	1.08		1.02
WEST BENGAL	0.94	1.00	1.05	1.03			1.12	1.18	1.25	0.90	0.71	0.98	0.83	0.87	0.95	0.81	1.87	2.31	0.96	0.90
Mean	0.95	0.92	0.93	1.27	1.01	1.05	1.03	0.90	1.07	0.96	0.94	0.83	0.85	0.81	0.95	1.01	1.53	5.24	1.31	1.00
STDDEV	0.28	0.20	0.26	1.20	0.69	0.48	0.78	0.35	0.33	0.23	0.53	0.32	0.26	0.26	0.28	0.29	0.45	17.20	0.73	0.27
CV	29.4	21.6	27.5	94.2	68.6	45.1	75.3	38.6	30.7	24.0	56.9	38.3	29.9	31.7	29.2	28.2	29.1	328.	55.6	26.76

	4	8	5	5	1	2	8	9	5	5	3	4	8	4	2	4	6	04	7	

***Source**: Supplement to Annual Survey of Industries, issues 2003-04 and 2007-08*

Table 3

Estimates of relative efficiency among the agro-based industries in India

	151		**152**		**153**		**154**		**155**		**160**		**171**		**172**	
	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08
AP	0.89	0.86	1.59	0.84	0.77	0.93	0.85	0.48	0.91	1.05	0.61	0.74	0.86	0.73	0.77	1.96
ASSAM	0.51	0.43	0.47	0.40	0.50	0.64	0.27	0.58	0.53	2.14	7.69	1.33	0.16	0.47		
BIHAR	0.28	0.27	1.02	0.49	0.43	0.43	0.32	0.17	0.69	1.34	4.70	8.43	0.05	0.55	0.47	0.20
CHATTISGARH	0.91	1.42			0.21	1.71	1.31	1.37	0.78	1.76	1.44	0.80	0.50	1.27	1.15	0.36
DELHI	0.93	1.15	1.14		0.89	1.25	1.79	1.26	0.82	0.96	0.34	0.63	3.60	0.57	0.97	0.78
GUJARAT	0.71	0.72	1.61	1.21	0.99	0.66	0.52	0.81	0.90	0.48	1.69	2.40	0.79	0.84	0.88	0.91
HARYANA	0.67	1.92	0.87	0.65	0.57	0.70	1.49	0.76	1.75	1.43	0.98	0.98	0.93	0.53	1.27	0.89
HP	0.47	0.22			0.57	1.04	0.78	0.58	0.37	0.48	2.22	0.80	0.32	0.55	0.68	0.56
J&K	0.80	2.10	1.02	0.97	1.10	1.65	0.94	0.73	0.67	1.33			1.23	0.81		1.48
JHARKHAND	1.03	0.30	2.66	2.30	0.60	4.47	1.34	1.16	1.06	0.62	0.54	0.88	0.30	0.79	1.48	0.36
KARNATAKA	0.76	0.31	1.11	1.47	0.86	0.64	0.49	0.41	1.75	1.02	7.95	3.66	0.65	0.50	0.52	0.72
KERALA	1.37	0.49	1.49	0.94	0.74	0.74	0.48	0.43	0.63	0.15	2.46	4.84	0.44	0.28	0.66	0.54
MAHARASHTRA	0.81	3.96	1.01	1.51	0.77	0.39	0.38	1.13	2.22	1.31	0.71	0.44	0.63	1.35	1.13	0.78
MP	0.70	1.72	1.30	1.33	0.77	1.02	1.27	0.62	0.72	1.13	0.72	0.68	1.21	0.61	0.99	0.80
ORISSA	0.66	0.56	1.46	2.24	0.48	0.57	0.49	0.42	1.26	1.05	0.62	0.65	0.33	0.70	0.44	0.30
PUNJAB	0.64	0.46	7.21	0.63	0.40	0.23	0.65	0.27	2.40	17.20			0.77	0.47	0.81	0.47
RAJASTHAN	1.61	1.24	1.20	0.17	1.01	1.19	0.78	0.69	1.66	4.02	0.56	0.51	0.73	1.27	1.38	2.75
TAMIL NADU	0.74	1.60	1.99	0.88	0.68	0.77	0.70	0.80	1.31	2.56	0.91	0.65	0.84	0.88	0.80	0.76
UP	0.58	0.41	0.93	1.25	0.36	0.53	0.42	0.26	1.25	2.47	6.88	9.04	0.36	0.39	0.82	0.83
UTTARANCHAL	0.81	0.45	0.30	0.51	0.36	0.54	0.44	1.11	1.01	0.32			0.43	0.68	3.51	2.05
WEST BENGAL	0.75	1.13	0.79	0.91	0.60	0.61	0.34	0.59	0.97	1.50	3.18	0.81	1.12	1.09	0.58	0.57
Mean	0.79	1.03	1.54	1.04	0.65	0.99	0.76	0.70	1.13	2.11	2.46	2.13	0.77	0.73	1.02	0.90
STDDEV	0.29	0.89	1.47	0.58	0.24	0.89	0.44	0.34	0.55	3.57	2.58	2.68	0.73	0.30	0.67	0.66
CV	36.48	86.13	95.91	56.02	36.76	89.88	57.06	49.14	48.78	169.12	105.24	126.08	94.01	41.05	66.32	73.03

Table 3 contd…..

Table 3 contd…..

	173		**181**		**182**		**191**		**192**		**201**		**202**		**210**		**221**		**222**	
	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08	2003-04	2007-08
AP	0.64	0.28	0.77	0.53			0.07	0.69	0.61	0.35	0.31	1.26	0.78	1.16	1.25	0.95	3.25	4.01	1.48	0.96
ASSAM											0.48	0.75	0.22	0.72	0.76	1.68	0.49	1.99	1.50	0.72
Bihar								0.62	1.84		0.29	0.25	0.18	0.38	2.18	1.36	1.16	1.19	0.02	1.06
Chattisgarh									0.55	0.59	0.40	0.30	0.47	0.67	0.89	1.37	0.89	0.43	2.94	0.11
Delhi	1.06	0.57	0.83	0.82			0.92	0.80	0.71	0.78		0.95	0.17		0.70	0.80	1.80	1.41	0.87	0.94
Gujarat	0.69	1.02	1.43	1.19		1.23	0.40	0.66	1.18	1.40	0.46	0.82	1.33	0.74	0.72	0.74	1.71	3.09	1.17	1.00
Haryana	1.17	1.04	1.02	0.85	1.57	0.81	0.89	1.04	1.89	0.95	0.89	0.82	0.80	0.75	1.12	1.54	1.36	1.19	1.37	1.35
HP	1.18		0.97	7.35			0.40	0.80		1.46	1.13	0.41	0.96	0.18	0.44	0.71			4.83	1.91
J&K	0.24			1.62							1.20	0.32	1.30	0.47	1.20	1.37	1.42			1.12
Jharkhand											0.50	0.69	0.57	0.81	0.85	1.19	0.78		0.92	1.66
Karnataka	0.39	0.43	0.68	0.65			0.45	0.32	0.59	0.47	0.27	0.45	0.85	1.20	0.78	0.65	1.33	3.31	0.80	0.54
Kerala	0.30	0.79	0.72	0.44			0.48	0.63	1.13	0.66	0.47	0.44	0.39	0.38	0.76	0.94	1.90	3.00	1.05	1.15
Maharashtra	0.80	0.55	0.75	0.30			0.30	2.53	1.46	0.55	7.36	0.58	0.60	0.71	0.93	0.94	2.97	1.03	1.03	0.57
MP	0.78	1.21	0.73	1.00			1.40	0.47	0.69	1.22	0.51	0.51	0.87	0.89	0.82	1.15	2.41	1.74	0.85	1.48
Orissa											0.68	0.70	1.16	1.62	0.92	1.30	1.98	0.88	1.02	0.78
Punjab	0.89	0.50	0.65	0.62		0.41	0.56	0.32	0.64	0.35	0.53	0.28	0.51	0.31	0.81	0.50		2.46	1.29	0.57
rajasthan	0.40	1.58	1.02	0.15					1.11	0.79	0.36	0.72	0.81		0.28	0.69	3.03	0.02	0.30	4.13
Tamil Nadu	0.88	1.04	0.89	1.00		1.11	0.65	0.83	0.68	0.75	0.52	0.74	0.94	1.07	1.26	1.00	3.14	1.40	0.93	1.19
UP	0.94	0.68	0.60	0.79	0.49	0.61	0.50	0.43	0.89	0.88	0.39	0.39	0.47	0.48	0.71	0.64	2.41	0.99	1.07	0.86
Uttaranchal			0.67	0.45		1.40				1.12	0.82	1.95	0.28	0.68	1.14	1.43	3.51	1.31		0.81
West Bengal	0.74	0.95	1.15	1.32			0.88	1.09	1.10	0.84	0.49	0.75	0.67	0.88	0.85	0.65	2.34	3.04	1.14	1.00
Mean	0.74	0.82	0.86	1.19	1.03	0.93	0.61	0.80	1.00	0.82	0.90	0.67	0.68	0.74	0.92	1.03	1.99	1.81	1.29	1.14
STDDEV	0.30	0.36	0.23	1.69	0.76	0.38	0.34	0.55	0.44	0.34	1.54	0.39	0.35	0.35	0.38	0.35	0.90	1.10	1.03	0.80
CV	40.58	44.41	26.24	141.43	74.14	41.17	56.33	68.59	43.93	41.41	170.74	57.77	50.67	47.39	40.96	33.65	45.22	61.16	79.61	69.85

***Source**: Supplement to Annual Survey of Industries, issues 2003-04 and 2007-08*

Table 4
Estimates of the Cobb Douglas production function among agro- based industries in different states in India

YEAR / STATE	2003-04				2007-08			
Variable	α	**B**	**F**	R^2	α	**B**	**F**	R^2
AP	0.32	0.62	37.22	0.84	0.23	0.44	17.17	0.71
ASSAM	0.11	0.80	19.44	0.81	0.06	0.93	37.23	0.88
BIHAR	0.11	0.78	29.37	0.83	0.34	0.58	42.34	0.88
CHATTISGARH	0.50	0.48	25.21	0.83	0.28	0.83	46.89	0.90
DELHI	- 0.22	1.23	42.90	0.86	0.15	1.13	64.77	0.91
GUJARAT	0.19	0.66	20.49	0.74	0.09	0.79	12.59	0.62
HARYANA	- 0.006	0.82	46.27	0.86	0.05	0.84	76.43	0.91
HP	0.18	1.07	89.70	0.92	0.76	0.47	87.55	0.94
J&K	- 0.17	1.00	34.40	0.89	-0.07	1.07	53.57	0.91
JHARKHAND	0.13	1.02	21.47	0.79	0.23	0.74	20.70	0.80
KARNATAKA	0.14	0.75	35.57	0.83	0.31	0.62	50.00	0.87
KERALA	0.35	0.50	24.30	0.77	0.10	0.64	62.39	0.89
MAHARASHTRA	0.19	0.68	36.61	0.84	0.14	0.70	30.26	0.81
MP	- 0.16	1.16	64.90	0.90	0.30	0.67	31.80	0.82
ORISSA	0.18	0.52	16.73	0.77	0.57	0.44	26.52	0.84
PUNJAB	0.57	0.61	16.70	0.72	0.35	0.47	21.91	0.77
RAJASTHAN	0.16	0.85	63.75	0.90	0.33	0.62	66.27	0.90
TAMIL NADU	0.28	0.75	38.02	0.84	0.21	0.61	28.93	0.79
UP	- 0.13	1.05	30.96	0.80	0.13	0.80	26.44	0.77
UTTARANCHAL	0.11	0.60	18.08	0.80	0.45	0.46	48.91	0.89
WEST BENGAL	- 0.07	0.89	40.14	0.85	0.00	0.88	35.93	0.83

Source: Supplement to Annual Survey of Industries, issues 2003-04 and 2007-08

Table 5

Estimates of the Cobb Douglas production function among agro- based industries in India

YEAR / STATE	2003-04				2007-08			
Variable	α	**B**	**F**	$\mathbf{R^2}$	α	**B**	**F**	$\mathbf{R^2}$
151	0.07	0.72	17.54	0.66	0.24	0.83	27.60	0.75
152	0.77	0.38	67.92	0.89	1.04	0.18	85.83	0.92
153	0.67	0.27	24.49	0.73	0.48	0.60	61.60	0.87
154	0.65	0.11	44.96	0.83	0.50	0.36	64.42	0.87
155	0.35	0.57	34.16	0.79	0.29	0.97	22.83	0.71
160	0.29	0.64	37.37	0.83	0.14	0.67	63.91	0.89
171	0.06	0.62	18.53	0.67	0.31	0.63	218.04	0.96
172	0.08	0.69	31.46	0.79	0.49	0.56	73.64	0.89
173	0.56	0.23	31.48	0.84	0.33	0.55	47.23	0.90
181	0.15	0.95	23.13	0.79	0.63	0.16	8.81	0.57
182	-0.19	1.59	-	1.00	0.25	1.00	10.93	0.84
191	-0.002	1.09	89.78	0.94	0.30	0.84	38.03	0.87
192	0.22	0.94	68.08	0.91	0.88	0.17	77.90	0.92
201	0.52	0.77	42.15	0.83	0.64	0.91	49.97	0.85
202	0.18	0.77	43.21	0.82	0.50	0.41	47.98	0.50
210	0.45	0.40	183.60	0.95	0.33	0.51	235.58	0.96
221	0.28	0.65	170.94	0.95	0.58	0.43	39.96	0.82
222	0.32	0.62	41.47	0.83	0.52	0.48	88.97	0.90

Source: Supplement to Annual Survey of Industries, issues 2003-04 and 2007-08