Measuring Agricultural Productivity Using the Average Productivity Index (API)[1]

Lal Mervin Dharmasiri *

Abstract

The concept of agricultural productivity has been extensively used to explain the spatial organization and pattern of agriculture. Several academics have been attempting to measure and identify the spatial pattern of agricultural productivity. This study attempts to formulate a different model for measuring agricultural productivity. It is named as 'Average Productivity Index' (API) which can identify the spatial distribution pattern of productivity of a state or a country. Major components of the API, are the average yield and the harvested area at the country or state level.

The API would be helpful for determining the suitability and productivity of agricultural crops and for identifying the spatial distribution pattern because of the components which are used for the calculation. Further, this model would be useful in demarcating and identifying agricultural regions. The planners and policy makers will be able to make decisions by considering the outcome of the API that would lead to better performance in the agricultural sector.

Key words : Agricultural Productivity - Average Productivity Index - Agricultural Regions - Spatial Organization - Spatial Pattern

1. This paper is based on the author's PhD thesis 'Land use, land tenure and agricultural productivity in Sri Lanka : A spatio-temporal analysis' submitted to the University of Pune, India in 2009.

* *Professor, Department of Geography, University of Kelaniya, Kelaniya, Sri Lanka*
e-mail : sisilel@yahoo.com

Introduction

'Agricultural Productivity' has been defined by several scholars with reference to their own views and disciplines. Agriculturalists, agronomists, economists and geographers have interpreted it in different ways. Agricultural productivity is defined in agricultural geography as well as in economics as "*output per unit of input*" or "*output per unit of land area*", and the improvement in agricultural productivity is generally considered to be the results of a more efficient use of the factors of production, viz. physical, socioeconomic, institutional and technological.

Singh and Dhillion (2000) suggested that the "*yield per unit*" should be considered to indicate agricultural productivity. Many scholars have criticized this suggestion pointing out that it considered only land as a factor of production, with no other factors of production. Therefore, other scholars have suggested that agricultural productivity should contain all the factors of production such as labor, farming experiences, fertilizers, availability and management of water and other biological factors. As they widely accept that the average return per unit does not represent the real picture, the use of marginal return per agricultural unit was suggested.

Agricultural productivity may be defined as the "ratio of index of local agricultural output to the index of total input used in farm production" (Shafi, 1984). It is, therefore, a measure of efficiency with which inputs are utilized in production, if other things being equal. Agricultural productivity here refers to the returns from arable land or cultivable land unit. Dewett and Singh (1966) defined "agricultural efficiency as productivity expressing the varying relationship between agricultural produce and one of the major inputs, like land, labor or capital, while other complementary factors remaining the same". This expression reveals that the productivity is a physical component rather than a broad concept. Saxon observed that productivity is a physical relationship between output and the input which gives rise to that output (Quoted in Saxon, 1965). Considering such different views, productivity of agriculture has been examined in this paper from different perspectives, such as productivity of land, labor and capital.

Productivity of land is a very important factor of agriculture because it is the most permanent and fixed factor among the three categories of input; land, labor and capital. Basically, land as a unit basis articulates yield of crop in terms of output to provide the foodstuff for the nation and secure employment opportunities for the rural community. Productivity of land may be raised by applying input packages consisting of improved seeds, fertilizers, agro-chemicals and labour intensive methods (Fladby, 1983). And also it could be raised by applying crop diversification/ multi cropping in a season on the same land as practised by the farmers of Mahaweli system 'H' area (Dharmasiri, 2008) and by adopting year round mix cropping system on the same land as done by vegetable farmers of Nuwaraeliya district (Dharmasiri, 2010). Another initiative that can have the effect of raising land productivity involves ruminants, such as cattle, sheep and goats. Although rangelands are being grazed to even exceeding the carrying capacity, there is a large unrealized potential for feeding agricultural residues to ruminants, which have a complex digestive system that enables them to convert roughage, which humans cannot digest into animal protein.

Productivity of labour is important as a determinant of the income of the population engaged in agriculture. In general, it may be expressed by the man hours or days of work needed to produce a unit of production. Shafi (1984) has mentioned that the labour productivity is measured by the total agricultural output per unit of labour. It relates to the single most important factor of production, is intuitively appealing and relatively easy to measure. On the other hand, labour productivity is a key determinant of living standards, measured as per capita income, and this perspective is of significant policy relevance. However, it only partially reflects the productivity of labour in terms of the personal capacities of workers or the intensity of their efforts (OECD, 2001). In agricultural geography, the labour productivity has two major important aspects. First, it profoundly affects national prosperity and secondly, it principally determines the standard of living of the agricultural population.

Capital, in terms of purchase of land, development of land, reclamation of land, drainage, irrigation purpose, livestock, feeds, seeds, agricultural implements, and machineries, crop production chemicals is being given priority as a factor for enhancing agricultural productivity. Jamison and Lau (1982) and Alderman *et al.* (1996) have examined the relationship between the level of education and wage with the crop productivity. A study conducted by Fafchamps and Quisumbing (1998) has also identified how various facets of human capital affects the crop productivity in Pakistan.

Spatial analysis of agricultural productivity is very important because it can highlight the structure and problems of production relations on which basis appropriate policies can be suggested by the policy framers. The concept of agricultural productivity has been extensively used to explain the spatial organization and pattern of agriculture. Productivity is generally considered from two directions; (a) productivity of land and (b) productivity of infrastructure engaged in agriculture. Productivity of land is closely linked with the productivity of infrastructure. So, attempts have been made to examine the spatial differences through the present approach.

Perspectives of Agricultural Productivity

Land is a permanent and fixed factor among other production factors such as labor and capital. Agricultural productivity of land is explained by production of crops in terms of output or yield per unit of land.

The productivity of labour has also taken an important place in agricultural economics. It is basically an important determinant of the labor force engaged in agriculture. The productivity of labor is somewhat a controversial concept than land productivity (Shafi, 1984). Labor input vs. agricultural output is an important parameter of determining productivity of labor. Total labor force, number of man hours scarified for farming and market value of labor are very important factors of labor productivity while considering monetary value added per man hour or man day. However, agricultural labor productivity may be enhanced through training, and increase of incentives or wages etc. Working capital may be utilized in the agricultural production process. It is generally utilized for the purchase of land, for land reclamation, drainage, irrigation process, livestock purchase, feeds, seeds, fertilizers, chemicals, agricultural implements and machinery (tangible goods) etc. Capital may be an important component for determining productivity of land, which further refers to enhancing efficiency of land. Efficiency refers to the properties and qualities of various inputs, the manner in which they are combined and utilized in production.

Increase of the tangible capital such as high yielding varieties, fertilizers, pesticides, herbicides, agricultural instruments and machinery etc., in a systematic manner would be able to enhance agricultural productivity in any unit of land. But farmer has to identify the optimum level to maximize farm productivity. Agricultural productivity is a measure of farming efficiency.

Agricultural productivity is frequently associated with the attitude towards work, thrift, industriousness and aspirations for a high standard of living, etc, (Singh and Dhillion, 2000). Some communities are much more efficient in maintaining a higher level of farm productivity by their own inherited special characteristics. In general, agricultural productivity is influenced by several factors, the major ones being physical, socio-economic and technological. Earlier the role played by physical factors attracted much interest. Nowadays, the importance of natural factors has been depleted while the dynamic factors like technology and socio-economic factors have come forward. Yet, people have minimal control over the physical environment such as rain, duration and intensity of sunlight, soil quality and timing of water availability. There is, therefore, no single goal that can be set for all situations in terms of highest productivity. However, attempts are being made to control some of the physical factors by using technology. Increasing soil quality by adding chemical fertilizers, farming by irrigable water, controlling pests by chemicals and increasing production by high yielding varieties (HYV) are some of the achievements of the present generation. In developing countries, using poor farm technology still results in low land productivity. As a result, difference between farmers using advanced farm technology and those not using it has today acquired a social significance. Yet, the climax of agricultural productivity of farmers is far off in the developing countries while some developed nations have gone far ahead in this context.

Measuring Agricultural Productivity

Agricultural development of a country or region is closely related with production of the crops. From time to time, considerable efforts have been made to increase the production and productivity level. The measurement of agricultural productivity helps in knowing the areas that are performing rather less or higher efficiency in comparison with the nearby areas. By considering the facts, agricultural development plans may be formulated to overcome the regional inequalities. It also provides an opportunity to ascertain the ground reality, the real cause of agricultural backwardness of an area.

Several scholars have attempted to quantify the agricultural productivity. Kendall introduced *Ranking coefficient* for measuring agricultural productivity in 1939. Stamp (1958) also used Kendall's ranking coefficient for international comparisons. In 1964, Enyedi devised new techniques for determining an *Index of productivity coefficient of agriculture*. J.L. Buck developed a new technique, which related to grain equivalents per head of production. The index was known as *Grain equivalents index*. It was further modified by E.de Vries in 1967 (Quoted in Singh and Dhillion, 2000). Bhatia introduced a *Productivity evaluation index* in 1967. He considered that all physical and human factors join in to produce the agricultural crops. Sapre and Deshpande (1964) have introduced a *Weighted rank index* for measuring agricultural productivity. *Agricultural productivity coefficient index* was introduced by Shafi in 1984 by using calorie values relating to each crop. In 1972, Jasbir Singh attempted to introduce a new technique for calculating agricultural efficiency by expressing the per unit area carrying capacity. Hussain also developed a technique to measure agricultural productivity in 1976 (Hussain, 1976). He converted agricultural production into monetary values of a regional unit in production. Kawagoe and others have used a method of *Production function approach* for measuring agricultural productivity among different countries (Kawagoe *et al*. 1985). In 2005, Vanloon, Patil and Hugar developed an indicator for measuring crop productivity by using primary product yield or conventional yield. Dharmasiri (2009) has attempted to measure the agricultural productivity in Sri Lanka by using Cobb-Douglas Function. These are some of the methods for measuring agricultural productivity. They have devised different formulae with different components. Each model has different data requirements and is suitable for addressing different questions and has strengths and weaknesses.

Apart from these methodologies, there are three different types of economic models that have been used for measuring agricultural productivity: (1) growth accounting technique, (2) econometric estimation of production relationships and (3) nonparametric models. Each model can be used to measure aggregate agricultural output. Each model has different data requirements and is suitable for addressing different questions and has strengths and weaknesses. Growth accounting technique involves compiling detailed accounts of inputs and outputs, aggregating them into input and output indices to calculate a Total Factor Productivity (TFP) index. Goksel and Ozden (2007) have applied the TFP with Cobb-Douglas production function in agriculture to analyze the agricultural productivity in Turkey. The Cobb-Douglas production function (Cobb and Douglas, 1928) which will be utilized in this analysis is widely used to represent the relationship of an output to inputs i.e. input-output relationship.

Nonparametric models use linear programming techniques to calculate TFP. An advantage of the nonparametric approach is that it does not impose restrictive assumptions on production technology. The major disadvantage is that since the models are not statistical, they cannot be statistically tested or validated.

The econometric estimation of production relationships, which will be applied in this analysis is based on either the "production function" or the "cost function". An advantage of this model is that it permits quantifying the marginal contribution of each input to aggregate production. For example, one can determine the impact of one-percent increase in fertilizer use on overall agricultural production, holding all other inputs constant. Many researchers use the Cobb-Douglas production function, despite some of its limitations. Jorgenson *et al.* (1987) used a cost function approach for each major sector of the US economy to estimate rates of sectoral productivity growth and concluded that productivity growth has been more rapid in agriculture than in other sectors. Lewis *et al.* (1988) used a production-function approach to calculate productivity growth rates for agriculture and for the reminder of the Australian economy (industry plus service) and concluded that the rate of productivity growth in agriculture had been higher than for the reminder of the economy.

All these three models have strengths and weaknesses. The use of growth accounting technique imposes several strong assumptions about technology. A disadvantage is that the statistical methods cannot be used to evaluate their reliability.

The econometric model e.g. Cobb-Douglas function has the advantage of permitting hypothesis testing and calculation of confidence intervals to test the reliability of the estimations. This model clearly measures the marginal contribution of each input to aggregate agricultural output. If the functional form is more flexible, a further advantage is that fewer restrictive assumptions about technology are imposed. A disadvantage of the econometric model is that it requires more data than the other models.

By considering the given facts, different methodologies for measuring agricultural productivity give dissimilar results. Each and every formula has inherited weaknesses. Therefore, the attempts have been made in this paper to apply a different methodology for measuring agricultural productivity.

Methodology and Justification

The present study attempts to formulate a different model for measuring agricultural productivity. It is named as *Average Productivity Index (API)* which can identify the spatial distribution pattern of productivity of a state or a country. Major components of the API, are the average yield and the harvested area at the country or state level. Productivity is determined by several physical and non-physical factors. The researcher has used two variables i.e. yield and harvested area of the selected crops which are the major components of productivity of the present study. To calculate API the following formula is used.

First, deviations of selected yields of the crop/ harvested areas are calculated. Then, the deviations of each crop/ harvested area should be divided by the standard deviations of each crop/ harvested area and powered the calculated values for getting positive figures. Since the productivity is a spatial phenomenon, the standard deviation gives a clear spatial productivity pattern of the land. Thirdly, coefficient should be calculated by adding all values of each crop/ harvested area together. Finally, the API can be calculated by multiplying the yield coefficient and the harvested coefficients.

For the proceeding analysis, ten food crops including staple food and other types of crops such as paddy, kurakkan (type of millet), maize, manioc, green gram, sweet potatoes, potatoes, green chilies and onions were selected. Selection criteria of the crops are (i) the total annual production exceeding 10,000 metric tones (MT) per season and (ii) plantations were avoided due to non-availability of district level data. For the analysis, the district level data on yield and cultivated area in selected principle food crops for three decades were obtained from the Statistical Abstract of the Department of Census and Statistics in 2002/2003.

$$API=\left\{\sum_{i=1}^{n}\left(\frac{x_1 j-X_1 j}{SD(x_1 j)}\right)^2+\left(\frac{x_2 j-X_2 j}{SD(x_2 j)}\right)^2+\ldots+\left(\frac{xin-Xin}{SD(xin)}\right)^2\right.$$

$$\times$$

$$\left.\sum_{i=1}^{n}\left(\frac{y_1 j-Y_1 j}{SD(y_1 j)}\right)^2+\left(\frac{y_2 j-Y_2 j}{SD(y_2 j)}\right)^2+\ldots+\left(\frac{yin-Yin}{SD(yin)}\right)^2\right\}$$

$$\text{API}=\left\{\sum_{i=1}^{n}\left(\frac{x_1 j-\bar{x}_1 j}{SD(x1j)}\right)^2 \text{X} \sum_{i=1}^{n}\left(\frac{y_1 j-\bar{y}_1 j}{SD(y1j)}\right)^2\right\} i=1\ldots n$$

Where, $\overline{X}_{(xi1)}$ = average yield of each crop in a district/ unit,

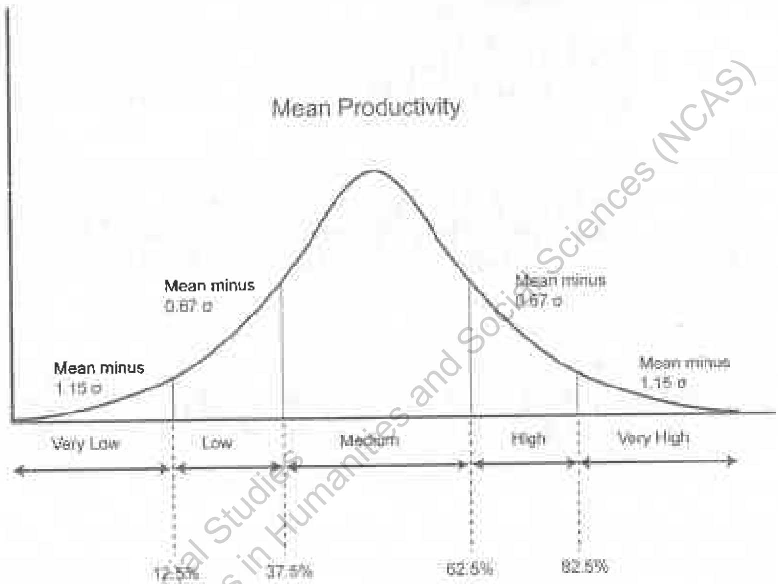
$SD_{(xi1)}$ = standard deviation of each crop yield in a district/ unit

y_{1j} = average harvested extent of each crop in the district/ unit

$SD_{(yi1)}$ = standard deviation of harvested extent of each crop in a district/ unit

$\overline{Y}_{ij}$ = average harvested extent of each crop in a country/state

Figure 1: Agricultural Productivity Ranks



On the basis of the properties of the normal curve relating to the proportion of the area lying at several magnitudes of distribution for agricultural productivity were decided (Figure 1). In order to classify districts into five classes i.e. very high (VH), high (H), medium (M), low (L) and very low (VL) on the basis of variation of districts around the mean value of the productivity index, the following method was applied. The process was able to sustain a uniformity of all the values of parameters.

This procedure for identifying the levels of productivity is followed by API methods for the year in 2002/ 2003 seasons separately. In order to classify districts according to the magnitude of spatial variation, a uniform method of regional demarcation is worked out which is based on the API. In order to classify districts/ areas into five classes on the basis of variation of districts around the mean value of the productivity index, a method was applied as shown in Table 1.

Table 1 : Range of Classes According to Probability Percentage

Probability Percentage	Range of Index	Grade
87.5% and above	Mean + (1.15 SD) and above	Very High (VH)
62.5% to 87.5%	Mean + (1.15 SD) to Mean + (0.67SD)	High (H)
37.5% to 62.5%	Mean +(0.67 SD) to Mean - (0.67SD)	Medium (M)
12.5% to 37.5%	Mean - (0.67 SD) to Mean - (1.15 SD)	Low (L)
Below 12.5%	Mean - (1.15 SD) and less	Very Low (VL)

Source: Compiled by the Author

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Table 2 was compiled from the harvested extent and average yield of the selected crops in Yala and Maha seasons in 2002. According to the Table, there were 3 districts with very high productivity category i.e. Jaffna, Mannar and Mahaweli 'H' area in the yala season. The major reason for the very high productivity of these areas is the higher average yield values of major crops in Table 4 shows the levels of agricultural productivity during the maha season in 2002/2003 in Sri Lanka. Figure 3, illustrates the changing spatial productivity pattern in Maha season. Numbers of very high, high and moderate level districts have increased from 18 to 20. Monaragala and Anuradhapura districts have recorded very high level of productivity for Maha Season. In 2002, Jaffna district has reported the highest average yield of sweet potato and higher yield of kurakkan and manioc while Mannar district reported the highest average yield of manioc and green chilies. Due to the increase of market price of chilies in early 2000, many farmers cultivated green chilies to get higher income. As a result, cultivated area of green chilies has gone up. The Mahaweli 'H' area which is a good example of this process has recorded the highest productivity.

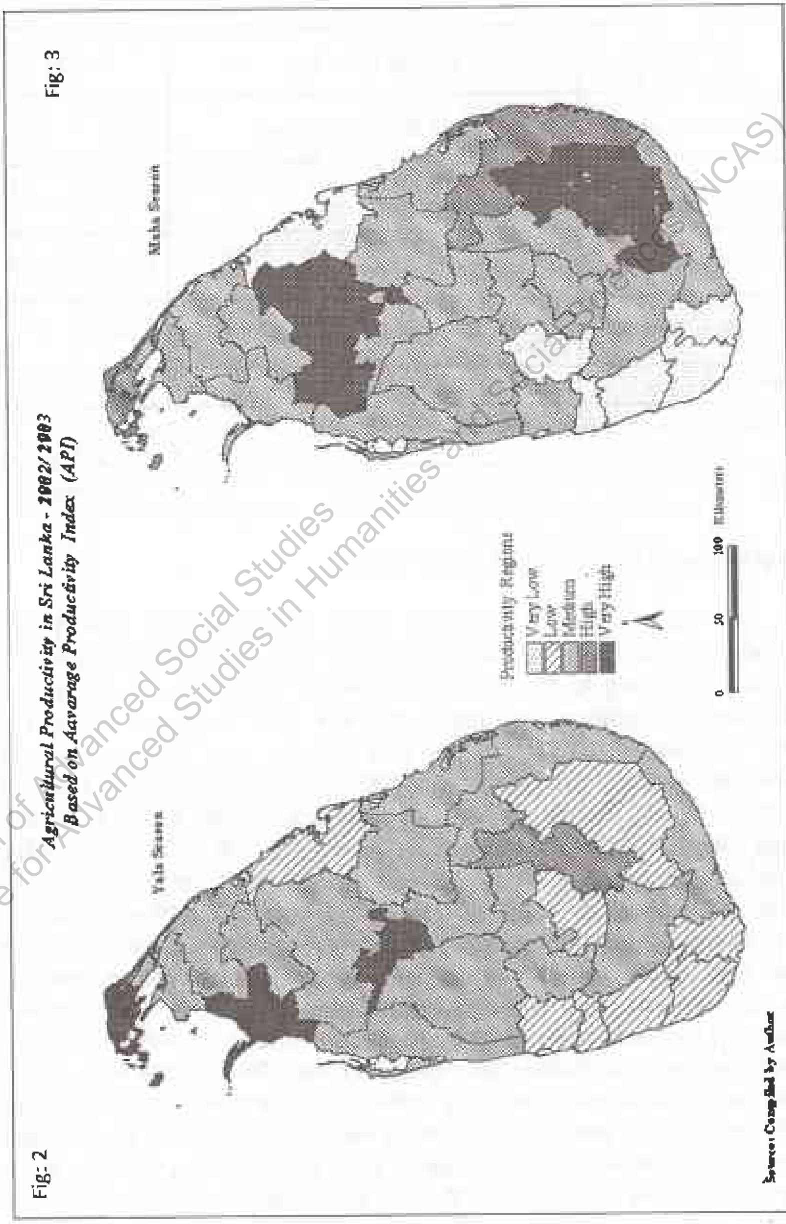
Fig: 3
Maha Season
Agricultural Productivity in Sri Lanka - 2002/2003
Based on Aavarage Productivity Index (API)
Productivity Regions
Very Low
Low
Medium
High
Very High
0
50
100
Kilometers
Yala Season
Fig: 2
Source: Compiled by Author

Table 2: *Average Productivity Index (API) and Ranking of Districts Yala and Maha Seasons 2002/2003*

Districts	Coefficient of Yield Yala Seoson	A	B	Rank	Coefficient of Yield Maha Seoson	A	B	Rank
Ampara	6.30	18.46	116.27	M	6.98	18.77	79.031	H
Anuradhapura	6.52	5.86	38.24	M	5.54	43.96	243.36	VH
Badulla	7.58	18.75	142.17	H	6.92	13.65	94.38	M
Balticaloa	13.08	2.68	35.01	M	10.98	3.11	34.20	M
Colombo	2.98	2.17	6.46	L	0.83	2.32	1.93	VL
Galle	3.24	1.02	3.32	L	1.98	0.51	1.00	VL
Gampaha	2.68	3.27	8.77	L	7.30	3.25	23.74	M
Hambanthota	2.82	3.44	9.71	M	4.32	13.17	56.92	M
Jaffna	17.23	9.50	163.72	VH	12.06	8.49	102.42	H
Kalutara	6.16	0.78	4.83	L	8.21	0.44	3.58	VL
Kandy	9.64	3.88	37.39	M	9.77	2.32	22.70	M
Kegalle	5.53	4.22	23.34	M	4.34	2.33	10.11	VL
Kilinochchi	5.97	2.66	15.87	M	7.11	3.49	24.79	M
Kurunegala	2.46	35.58	87.68	M	5.25	18.37	96.48	M

cont'd

Districts	Coefficient of Yield Yala Seoson	A	B	Rank	Coefficient of Yield Maha Seoson	A	B	Rank
Mannar	21.08	7.47	157.45	VH	8.47	5.87	49.69	M
Matale	5.55	9.47	52.56	M	8.08	7.94	64.15	M
Matara	3.87	3.11	12.03	L	5.08	2.13	10.81	VL
Monaragala	4.51	11.22	50.58	L	8.99	25.28	227.32	VH
Mullaitivu	6.77	4.36	29.48	M	14.38	2.77	39.80	M
Nuwaraeliya	4.94	2.23	11.01	L	8.45	2.67	22.52	M
Polonnaruwa	11.21	6.27	70.26	M	13.03	3.54	46.15	M
Puttalam	7.62	7.10	54.06	M	6.12	7.38	45.16	M
Ratnapura	5.66	10.48	59.32	M	6.21	3.63	22.54	M
Trincomalee	3.38	3.82	12.90	L	2.17	5.01	10.90	VL
Vavniya	10.23	3.86	39.49	M	16.87	4.74	80.01	M
'H' area	19.00	19.07	362.31	VH	20.53	4.91	100.70	M

A= Coefficients of Harvested Area, B= API Rank (Level of Productivity): VL= Very Low, L=Low, M=Medium,

H= High and VH=Very High

Source: Compiled by the Author

There was only one district with high productivity figures and there were 18 districts with medium level of productivity in the Yala season. Interestingly, all these districts are spatially located in the Dry zone (see; Figure 2). Inadequate rainfall in the Dry zone may be the cause for the medium level of productivity during the season. However, many farmers cultivate other field crops such as kurakkan, maize and cowpea etc, mainly with the water supply from small tanks in the Dry zone of the country. Another seven districts reported low level of productivity in this season. Most of these districts are located in the Western part of the country which do not have better agricultural prospects.

There were eight districts or 30 per cent of the districts which have reported lower level of agricultural productivity during the Yala, 2002. They are Colombo, Galle, Gampaha, Kalutara, Matara, Monaragala, Tricomalee and Nuwaraeliya. Genarally, Nuwaraeliya district records better agricultural productivity in both seasons. But in Yala, 2002 it recorded of lower average yield of many crops such as kurakkan, maize, cowpea and green chilies.

Table 3: Agricultural Productivity Categories Based on the API Yala Season 2002

Ranking Coefficient	Productivity Grade	Number of Districts	Percentage of Total Number of Districts in the Country
Over 150.77	Very High	3	11.53
113.59 – 150.76	High	1	3.86
9.71 – 113.58	Medium	14	53.85
-23.37– 9.70	Low	8	30.77
Below -23.36	Very Low	–	–

Source: Compiled by the Author

Table 4: Agricultural Productivity Categories Based on the API 2002/03, Maha Season

Ranking Coefficient	Productivity Grade	Number of Districts	Percentage of Total Number of Districts in the Country
Over 132.51	Very High	2	7.69
102.34 – 132.50	High	2	7.69
18.13 – 102.33	Medium	16	61.54
12.03 – 18.12	Low	–	–
Below 12.03	Very Low	6	23.08

Source: Compiled by the Author

Table 4 shows the levels of agricultural productivity during the maha season in 2002/2003 in Sri Lanka. Figure 3, illustrates the changing spatial productivity pattern in maha season. Numbers of very high, high and moderate level districts have increased from 18 to 20. Monaragala and Anuradhapura districts have recorded the highest level of productivity because of very high extent of harvest. On the other hand, the number of districts in low productivity category has shown a decrease due to the low extent of harvest due to inadequate rainfall during the period. The high standard deviations (62.85) of the average yield values and harvested extent (60.24) have been responsible for low productivity in the maha season.

Figures 2 and 3 clearly indicate that most areas of Sri Lanka have a good potential for developing agriculture. The districts which recorded the high and moderate level of productivity under the API have a better prospect for cultivating other field crops to increase the production and productivity of the country. Increase of agricultural production would help to meet the food demand of the nation and will save foreign exchange required for imports.

Conclusions

The forgoing section of this article has analyzed the spatial difference of all the administrative districts in Sri Lanka for the year of 2002 by the API. Although the productivity differentiation cannot be precisely demarcated by administrative boundaries, the results of applying the API provide with a general picture of the spatial differentiation in agricultural productivity. It can also be assumed that the border areas of districts represent a mix up picture of agricultural productivity. The integration of productivity variation maps for Yala and Maha seasons provides that, over 70 percent of the Dry zone areas of the country have achieved a moderate level of productivity during the Yala season while it reached to higher level in Maha season. Besides a larger area of agricultural lands are being cultivated during the Maha season and could reap a huge volume of production, particularly in paddy. The resulting pattern of agricultural productivity shows some correlation with the major geographical factors when compared with the soil and rainfall distribution map of Sri Lanka.

In spite of this pattern, there are some deviations of productivity due to availability of irrigation facilities. Moderate level of agricultural productivity can be identified where the small and medium size irrigation systems are being operated. It is peculiar to see that the South-Western quadrant of the country does not show better prospects in terms of agricultural productivity depending on the variables applied for this study. However, the situation may be different if cash crops such as cinnamon and rubber were considered. The North Eastern parts of the country do not show a potential for high level of agricultural productivity due to failure of retaining adequate groundwater for successful cultivation to meet crop water requirements.

However, this situation has been overcome by some farmers who have applied tapped deep water. The potential of increasing agricultural production in the South Eastern part of the country seems to be a very high due ample land area available for further extension of cultivation. Besides a vast land area in the region has been demarcated as reserved forest. The Central highland of the county does not demonstrate a high level of productivity based on the grain yield per unit as applied in this study. The productivity picture may be different if the variable of plantation crops like tea and rubber were applied. The resultant pattern of spatial distribution of the country thus gives some guidance in identification of potential agricultural development regions of the country that enable the policy makers to decide on future scenarios of agricultural growth.

Discussion

The API attempted to examine the productivity by considering two major components of the productivity namely, the average yield and the harvested area related to the selected crops. The level of productivity is identified according to the calculated coefficient values of the components. Average production of any crop in any given area is determined by several geographical and non-geographical factors. However, mainly the geographical factors influence on the cultivated and harvested extent. The API would be helpful for determining the suitability and productivity of agricultural crops and for identifying the spatial distribution pattern because of the components which are used for the calculation. It is an important fact that the API deals with the average and standard deviation. The standard deviation helps to understand the variation from the mean that can be used to generalize the agricultural performance.

This method may be useful in demarcating and identifying agricultural regions. Further, the planners and policy makers will be able to make decisions that would lead to better performance in agricultural sector.

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