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Measuring Market Efficiency of Regulated Markets for Effective Performance in Tamil Nadu

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SUMMARY

Rural and agricultural marketing involve, in its simplest form, buying and selling of rural and agricultural produces. In the process of development of marketing, many intermediaries also emerged between the farmers and the consumers which had consequently reduced the farmers' share of the price paid by the consumers. In this direction, the regulated markets were established to regulate effectively the sale and purchase of agricultural produce and establish market yards for marketing of agricultural produce so as to free the farmers from the clutches of middlemen.

An attempt has been made in the present study to analyze the efficiency of the regulated markets in Tamil Nadu to address the above questions and the issues raised. The maximization of arrivals could be optimized by data envelopment analysis, i.e. the deterministic frontier approach. The market efficiency of these rural markets can be increased by management of the markets and allocation of factors such as number of employees involved in publicity and propaganda work, number of traders participating in the sales and number of villages covered by the regulated markets. Improving the market efficiency of these rural markets is necessary to meet the requirements of the economy in the context of globalization.

Keywords: Regulated market, Market efficiency, Data envelopment analysis.

1. INTRODUCTION

Rural and agricultural marketing involve, in its simplest form, buying and selling of rural and agricultural produces (Acharya and Agarwal 1987). In the olden days when the village economy was more or less self-sufficient, the marketing of agricultural produce to the consumers did not face many problems since most of the trade was on barter basis (Badi and Badi 2004). Later on when economy developed and the trade became monopolized, different system of marketing has emerged. In the process many intermediaries also emerged between the farmers and the consumers which had consequently reduced the farmers' share of the price paid by the consumers. In this direction, the regulated markets were established to regulate effectively the sale and purchase of agricultural produce and establish market yards for marketing of agricultural produce so as to free the farmers from the clutches of middlemen and facilitating the consumers to get quality produce at reasonable prices.

Given the thrust on grading and storage facilities in the regulated market, more and more traders involved in export trade would enter into regulated markets for purchase of quality commodity. This would pave way for competitive prices for agricultural commodities inside the regulated market, which in turn get the farmer a fair price. Increased importance had been given for constructing more godowns in the regulated market yards to encourage the farmers to store and sell at a time when the prices are more remunerative to them. Besides this, the farmers are also encouraged to avail the pledge loan system and dispose their produce at a later date.

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In spite of all the above said measures taken by the government, the share of arrivals in the regulated markets to the total quantity marketed still remained dismally low. There are various factors that deter the farmers from selling their produce through regulated markets such as educational status of the decision maker of the household, farm size, nearness of the farm to the regulated market and the extension activities by the functionaries of the regulated markets.

Hence it is needless to say that the created infrastructure in the field of agricultural marketing is facing the daunting task of making the farmers to sell their entire marketed surplus through these institutions which were formed for the purpose. It is felt that there existed a lot of weaknesses and bottlenecks in the system which has to be addressed on war footing basis in the years to come. So it is high time for a thorough analysis of these institutions which would identify the shortcomings and put forth the corrective measures to be administered.

In this context an attempt has been made in the present study to analyse the efficiency of the regulated markets in Tamil Nadu to address the above questions and the issues raised.

2. OBJECTIVES

1. to estimate the market efficiency of the rural regulated markets to cope with changing needs of the economy and
2. to suggest policy options for further enhancing the efficiency of rural regulated markets in the context of globalization.

3. METHODOLOGY

A time series data on the decided variables was collected from the year 1992 to 2003 was used for the analysis. The criteria adopted for the selection was the annual arrivals of agricultural commodities. The market committees in the state where the arrivals have exceeded one lakh tones were considered and Erode district market committee was randomly selected to undertake the study. Eight regulated markets from the Erode market committee were selected randomly. The particulars regarding annual arrivals, capacity of storage godowns, number of employees involved in publicity and propaganda, number of farmers utilizing the regulated markets and traders participated and the number of villages covered were collected from the concerned regulated markets.

The efficiency of the individual regulated markets lies in the market arrivals or quantity transacted in the yard (Balakrishnan and Nasrudeen 1998) and (Khodiar *et al*. 2002). A number of attributes such as area of the yard, capacity of storage godowns, number of employees involved in publicity and propaganda, number of farmers utilizing the regulated markets and traders participated and the number of villages covered by the regulated markets would help in maximizing the arrivals into the regulated market. Improving the above infrastructures in the rural markets will improve the market efficiency (Banakar and Murthy 1995) and (Jain 1998). The maximization of arrivals could be optimized by data envelopment analysis, i.e. the deterministic frontier approach. The functional form would be

$$Y_i = \sum_{i=1}^{n} \beta_i X_{it} + e_t \qquad (1)$$

where, $t = 1, 2, 3, ..., m$ number of regulated markets,

$i = 0, 1, 2, ..., n$ are the number identified variables.

(0 is intercept and 1, 2 up to n are slopes.)

The estimable form of the function can be written as $Y_i = \hat{Y} + e_t$, where the first column of X_i ($i = 0$) denotes the intercept. If all error terms are constrained to one side of the estimated surface, the resulting function would be an envelope. To be an efficient frontier, equation (1) can be estimated such that

$$\sum_{i=1}^{n} \beta_i X_{it} = \hat{Y} \geq Y_t \qquad (2)$$

The efficient markets will satisfy the equality condition of $e_t = 0$ or $\hat{Y} \geq Y_t$. All other markets have a smaller arrival than would be achieved if they too were efficient. To force estimated frontier to lie as closely as possible to the actual set of arrival points, minimizing constraints should be placed on the sum of the resulting error terms.

The problem then is to minimize $\sum e_t$

Subject to the constraint that the estimated

$$\hat{Y} \geq Y_t \quad (3)$$

$t = 1, 2, ..., m$ is the number of regulated markets.

This leads to a linear programming problem. The frontier in the equation (3) can be transformed into a probabilistic frontier with the deletion of outliers one by one, until all coefficients are stabilized. Stabilization may be obtained if there has been an insignificant change in coefficients in the last iteration compared with changes noted in the previous iteration.

By setting all $e_t \geq 0$, the equation (2) can be written as an equality

$$\Sigma \beta_i X_{it} - e_t = Y_t \quad (4)$$

Summing both the sides

$$\sum_{t=1}^{m} \sum_{t=0}^{n} \beta_i X_{it} - \sum_{t=1}^{m} e_t = \sum_{t=1}^{m} Y_t$$

The objective is to minimize Σe_t subject to the constraints $\Sigma \beta_i X_{it} \geq Y_t$ and $\beta_i \geq 0$. In order to solve this problem, using linear programming, Σe_t should be expressed as a linear function of β_i and X_{it}. For that purpose, equation (4) can be summed and solved for $\Sigma e_t\ \beta_i$

$$\sum_{t=1}^{m} e_t = \sum_{t=1}^{m} \sum_{i=0}^{n} \beta_i X_{it} - \sum_{t=1}^{m} Y_t \quad (5)$$

where n = number of variables ($i = 0, 1, 2, \ldots, n$),

m = number of regulated markets ($t = 0, 1, 2, \ldots, m$)

For any data set, the last term in the equation (5) ($-\Sigma Y_t$) is a constant. Any set of β_i that minimizes the Σe_t for one value of ($-\Sigma Y_t$) will minimize for any other value including zero. Hence the last term ($-\Sigma Y_t$) can be dropped from equation (5) without any consequence. Minimization of the sum of e_t over all the regulated markets can be written as under:

$$Min \sum e_t \cong Min \sum \ \sum \beta_i X_{it} \quad (6)$$

For computational purpose, it is desirable to divide equation (6) by m number of regulated markets. Thus the arithmetic mean of observations of the i^{th} variable is used instead of the total. Therefore the objective function in equation (3) is changed.

In expansion terms, the objective function is of the form as follows.

Objective function

$$\beta_0(1) + \beta_1 \bar{X}_1 + \beta_2 \bar{X}_2 + \ldots + \beta_n \bar{X}_n$$

Subject to

$$\beta_0(1) + \beta_1 X_{11} + \beta_2 X_{21} + \ldots + \beta_n X_{n1} \geq Y_1$$

$$\beta_0(1) + \beta_1 X_{12} + \beta_2 X_{22} + \ldots + \beta_n X_{n2} \geq Y_2$$

$$\ldots + \ldots + \ldots + \ldots + \ldots$$

$$\beta_0(1) + \beta_1 X_{1m} + \beta_2 X_{2m} + \ldots + \beta_n X_{nm} \geq Y_m$$

and $\beta_i \geq 0$ which can be solved by solver package in MS excel.

The vector $Y_t / \hat{Y}_t$ is the index of the managerial efficiency with a separate measure for each market. These measures can be averaged over a number of observations to reach a single value of the managerial efficiency. The measure would vary from zero to one. The allocative efficiency was estimated to be $AE = Y_t / \overset{\bullet}{Y}_t$ where $\overset{\bullet}{Y}_t$ was the maximum possible arrival at optimum level all resources. This could be well explained by Fig. 1.

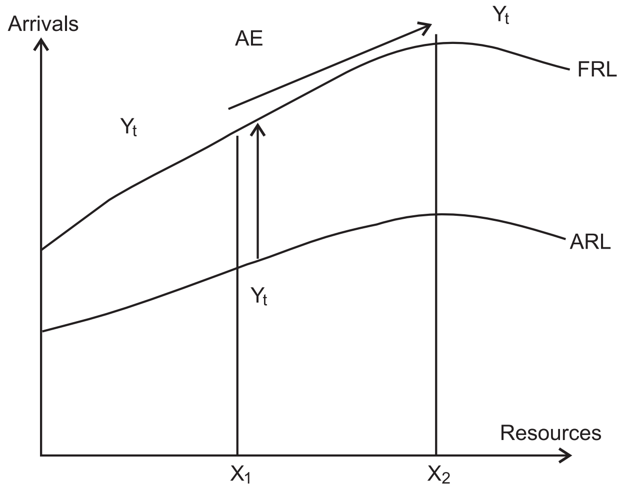

Fig. 1. Market Efficiency of Regulated Markets

where,

X axis	=	Resources Region
Y axis	=	Arrivals Region
X_1	=	Present level of resource
X_2	=	Optimum level of Resource
Y_t	=	Present level of arrival
Y_t	=	Arrival at managerially efficient level
$\overset{\bullet}{Y}_t$	=	Arrival at market efficient level
FRL	=	Frontier Regression Line
ARL	=	Average Regression Line

Empirical Model of the problem is as follows

The estimated Cobb–Douglas market arrival function is specified as

$$Ln\,(mar) = \beta_0 + \beta_1 \ln(amy) + \beta_2 \ln(asg) + \beta_3 \ln(lab) + \beta_4 \ln(far) + \beta_5 \ln(tra) + \beta_6 \ln(vil) \quad (7)$$

where, *mar* = Market arrivals in the regulated market in qtls

amy = Area of the market yard in sqm

asg = Area of the storage godowns in cum

lab = No. of employees in the regulated market

far = No. of farmers utilizing the regulated market

tra = No. of traders participating in the sales

vil = No. of villages covered by the regulated market jurisdiction

The market arrival function in equation (7) was estimated by OLS method. It will be transformed into a deterministic frontier function as follows.

The objective function is

$$\beta_0(1) + \beta_1 \ln(\overline{amy}) + \beta_2 \ln(\overline{asg}) + \beta_3 \ln(\overline{lab}) + \beta_4 \ln(\overline{far}) + \beta_5 \ln(\overline{tra}) + \beta_6 \ln(\overline{vil}) \quad (8)$$

Subject to

$$\beta_0(1) + \beta_1 \ln(amy_1) + \beta_2 \ln(asg_1) + \beta_3 \ln(lab_1) + \beta_4 \ln(far_1) + \beta_5 \ln(tra_1) + \beta_6 \ln(vil_6) \geq Y_1 \quad (9)$$

$$\beta_0(1) + \beta_1 \ln(amy_2) + \beta_2 \ln(asg_2) + \beta_3 \ln(lab_2) + \beta_4 \ln(far_2) + \beta_5 \ln(tra_2) + \beta_6 \ln(vil_2) \geq Y_2$$

$$\vdots \quad \vdots \quad \vdots$$

$$\beta_0\,(1) + \beta_1 \ln(amy_8) + \beta_2 \ln(asg_8) + \beta_3 \ln(lab_8) + \beta_4 \ln(far_8) + \beta_5 \ln(tra_8) + \beta_6 \ln(vil_8) \geq Y_8$$

amy, *asg*, *lab*, *far*, *tra* and *vil* are the mean values of the respective attributes for that particular regulated market. The coefficients used in estimating the efficiencies were obtained from equation (8) after deleting the outliers. (Jha *et al.* 2002) and (Shanmugam and Palanisami 2003). Thus the efficiency for all the regulated markets in a particular region / district will be estimated.

4. RESULTS AND DISCUSSIONS

The arrival of commodities in the regulated markets had been the indicator of performance for the district market committees. In turn the efficiency of regulated markets was influenced by a number of attributes such as area of selling yard, capacity of storage godowns, number of employees involved in publicity and propaganda, number of farmers utilizing the regulated markets, number of traders participating in the sales and number of villages covered by the regulated markets. It was hypothesized that the market arrivals would be greatly influenced by the above mentioned factors. Hence an attempt was made to study the performance of the regulated markets using deterministic frontier approach (Data envelopment analysis). The estimated results are presented in Table 1. It could be seen from the table that the factors like number of employees involved in publicity and propaganda, number of traders participating in the sales and number of villages covered by the regulated markets were important in influencing the arrivals in regulated markets of Erode Market Committee.

Table 1. Performance of regulated markets in Erode Market Committee

Variables	Erode	
	Elasticities	Shadow values
Constant	3.3533	
Area of selling yard	0.1009	0.4992
Area of storage godowns	0.0922	0.6097
No. of employees involved in publicity and propaganda	1.2450	995.74
No. of farmers selling thru' RM	0.0829	0.0830
No. of traders participating in the sales	0.3823	2.0402
No. of villages covered by the RM	0.5142	179.06

Based on the elasticities of the variables, the maximum possible arrival and the expected arrivals were estimated. Further, they were used to find out the managerial efficiency, allocative (resource) efficiency and the efficiency for the individual market as a whole. The results of Erode market committees are presented in Table 2. It could be seen from the table that with the given resource levels the market efficiency, comprising of managerial and allocative efficiency in Erode regulated market was the best among the selected markets. In Aval Poonthurai and Sivagiri, the managerial efficiency was found to be better while the

Table 2. Market efficiency of regulated markets in Erode Market Committee

Name of the RM	Actual Arrival*	Estimated Arrival*	Max. Possible Arrival*	Managerial Efficiency	Allocative Efficiency	Market Efficiency
Erode	23548	24787	25778	0.95	0.96	0.91
Puliyampatti	8245	11295	25778	0.73	0.44	0.32
Sathyamangalam	2619	5820	25778	0.45	0.23	0.10
Gobichettipalayam	4455	6275	25778	0.71	0.24	0.17
Anthiyur	3709	10507	25778	0.35	0.41	0.14
Perundurai	5138	10704	25778	0.48	0.42	0.20
Aval Poonthurai	12467	14975	25778	0.83	0.58	0.48
Sivagiri	6193	8762	25778	0.71	0.34	0.24

* denotes arrivals in tonnes

values of allocative efficiency had indicated that the available resources were underutilized.

5. CONCLUSIONS AND RECOMMENDATIONS

The study concluded that the efficiency of rural regulated markets could be vastly improved by market efficiency. In the data envelopment analysis market efficiency is the product of managerial and allocative efficiencies. The market efficiency of these rural markets can be increased by management of the markets and allocation of factors such as number of employees involved in publicity and propaganda work, number of traders participating in the sales and number of villages covered by the regulated markets. Improving the market efficiency of these rural markets is necessary to meet the requirements of the economy in the context of globalization.

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