

# Editorial

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Greetings from Sacred Heart College, Tirupattur. The editorial board is happy to publish another issue of the journal. As the year comes to a close, this is a moment of introspection and evaluation enabling us to venture into new resolutions for the year ahead. The dictum 'Publish or Perish' is catching up with the academia. We are glad that these authors have made it after being put through a strict selection by the review board members.

We are concluding the year of Mathematics. In the early 20th century, Srinivasa Ramanujam (1887-1920) stated results in Mathematics that were both original and highly unconventional, such as the Ramanujan prime and the Ramanujan theta function, which have inspired a vast amount of further research.. In 1930, Sir C. V. Raman was the first 'non-white', Asian and Indian to receive the Nobel prize in physics for his work on scattering of light and discovery of the Raman effect. These great scientists reached such heights with minimum facilities of the times, whereas in this modern technologically advanced era we need to raise the bar and set benchmarks to leave a legacy for posterity. It is imperative that we vibrate with the same passionate zeal of scientists of yesteryears.

I am happy to put on record my heartfelt gratitude to all the authors and reviewers of these articles. I would like to thank the committee members for their unstinted efforts to make this issue see the light of day. Best wishes for the new year 2013.

C. M. Varghese



# CONTENTS

## Part - A

ELECTRON TRANSFER REACTIONS: OXIDATION OF D-FRUCTOSE BY THE HETEROPOLY 9- MOLYBDOMANGANATE (IV)	1
T. Jeyabalan	
FORWARD DIFFERENCE OPERATOR OF THE SECOND KIND AND ITS APPLICATIONS IN NUMBER THEORY	11
G. Britto Antony Xavier, M. Maria Susai Manuel, V.Chandrasekar & S.U.Vasanthakumar	
PSEUDO MEAN LABELING	21
V. Balaji, D.S.T. Ramesh and V. Maheswari	
THE EFFECT OF THIOUREA PROPORTION ON THE PHYSICAL PROPERTIES OF THIOUREA CADMIUM SULPHATE CRYSTALS	29
A. Albert Irudayaraj, N. Madhavan and A. Dhayal Raj	
MOBILE TECHNOLOGY FOR M-LEARNING	40
A. Josephine Sahaya Mala	

## Part - B

A STUDY ON CONSUMER ORIENTED MARKETING AND BRAND PREFERENCE TOWARDS SELECT MULTINATIONAL COMPANIES (MNCS)	49
A. Jesu Kulandairaj	
INVESTMENT PATTERN OF SELECTED SCHEMES OF PUBLIC SECTOR MUTUAL FUNDS IN INDIA –A STUDY WITH SPECIAL REFERENCE TO SELECTION OF INSTRUMENTS	57
K.P. Sivakumar, K. Antony Baskaran, S. RajaMohan	
PERFORMANCE OF AGRICULTURE IN THE CHANGING STRUCTURE OF THE TAMIL NADU ECONOMY : ISSUES REVISITED	68
A. Xavier Susairaj & V. Siva Sankar	

VEGETABLE MARKETING OF CHITHORE [MGH] RYTHU BAZAR OF A.P A CASE STUDY	79
N. Maria Das & K. Krishna Mohan	
SOLID WASTE PRACTICES IN THUVAKUDI MUNICIPALITY, TAMIL NADU	91
A. Noorjahan, A. Royal Edward Williams & M. Ravichandran	
A STUDY ON DISCRIMINATORY SALES STRATEGIES OF RETAIL VEG- ETABLE SELLERS	96
J. Missiadoss	
ENHANCING EXTENT OF VOLUNTEERING AMONG NATIONAL SERVICE SCHEME VOLUNTEERS	105
J. Henry Rozario	
DIMENSIONS OF CLASS QUALITY CIRCLES AND DEVELOPMENT OF LIFE SKILLS – PERSPECTIVES OF CQC LEADERS	114
K. Arockia Raj & G. Kumar	
“வினையே ஆடவர்க்கு உயிரே” - சமூகவியல் நோக்கு	123
சு.மா.மாரியப்பன்	
சங்க காலத்துச் செங்கண்மா மூதூரின் சிறப்பும் கட்டமைப்பும்	132
க. மோகன்காந்தி	
RUSKIN BOND: THE SHORT STORY WRITER	141
Marie Raj and Maria C. Serrao	
NATIVE AMERICAN LITERATURE AND THE POLITICS OF REPRESENTA- TION : AN OVERVIEW	154
Sheena John	
CORRELATION OF ANCIENT HASTINAPUR AND THE PRE-INDEPENDENT INDIA THROUGH SHASHI THAROOR’S - THE GREAT INDIAN NOVEL	159
B. Samrajya Lakshmi	

## **ELECTRON TRANSFER REACTIONS: OXIDATION OF D-FRUCTOSE BY THE HETEROPOLY 9 - MOLYBDOMANGANATE (IV)**

T. Jeyabalan\*

**Abstract:** Rates of electron transfer reaction of D-fructose with the heteropolyanion,  $[\text{Mn}^{\text{IV}}\text{Mo}_9\text{O}_{32}]^{6-}$  in aqueous medium have been studied spectrophotometrically at different temperatures. The order of the reaction with respect to substrate and oxidant is unity. The activation parameters are evaluated from the data. The sodium perchlorate has no effect on the rate of the reaction. The formation of Mn(II) ions are identified using EPR spectral technique.

**Keywords:** Heteropolyanion, Manganese(IV), EPR, Kinetics.

### **Introduction**

Polyoxometalates have attracted much attention because of their structural versatility and use in different fields such as medicine, biology, catalysts and material science<sup>1-4</sup>. This is particularly so with heteropolyanions containing higher valent transition ion as a heteroatoms. In contrast, Mn (IV) is present in a number of biologically important compounds<sup>5</sup>. Especially, it plays a vital role in photosystem(II) to produce molecular oxygen. Due to its interesting role in biological systems<sup>6</sup>, we have attempted to study the oxidizing property of Mn(IV) in the heteropolyanion,  $[\text{Mn}^{\text{IV}}\text{Mo}_9\text{O}_{32}]^{6-}$ , hereafter referred to as PA1. D-Fructose has been selected as the reductant due to its importance in food supply and metabolism. There are several investigations on the oxidation of D-fructose by metal complexes, but there is no report on the oxidation of D-fructose by heteropolymanganate(IV). In this paper, the kinetics and mechanism of D-fructose by PA1 is presented.

### **Experimental**

The compound PA1 was synthesised according to the literature method<sup>7</sup>. Ammonium heptamolybdate, manganese sulphate, sodium peroxy disulphate, sodium perchlorate and D-fructose were obtained from Qualigens, fine chemicals, India. All the chemicals were of AR grade and used without further purification. Doubly distilled water was used for kinetic measurements. Sugar solutions were always used on the same day as made. Analar sodium perchlorate was used to study the effect of ionic strength.

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### **Analytical and physical measurements.**

Molybdenum was estimated gravimetrically as oxinates<sup>8</sup>. Manganese was estimated spectrophotometrically<sup>8</sup>. IR spectrum was recorded on Perkin Elmer 783 spectrometer as KBr disks. Raman spectrum was recorded using DILOR 24 Raman spectrometer with spectra physics 164 Argon Laser (488 nm, 300mw), by pressing the sample into a solid matrix. To ascertain the oxidation state of manganese in PA1, EPR spectrum was recorded on Varian E112 spectrometer. DPPH was used as an internal field marker.

### **Kinetic measurements**

The kinetic measurements were made using Hitachi model 200-20 UV-Vis spectrophotometer having thermostatically controlled cell compartment. The disappearance of UV maximum at 340nm was followed for PA1. pH measurements were made using Systronics 273pH meter. Several reaction mixtures with [PA]<sup>></sup>[Sugar] at fixed sulphuric acid concentration were prepared. After the completion of the reaction the unreacted manganese which existed in the form of Mn(II) in acid solution was estimated spectrophotometrically. In all cases the stoichiometry was found to be 2:1 [PA: Sugar].

### **Product analysis**

One of the organic products, arabinose was identified by thin layer chromatography. A solvent mixture of 1-Butanol-acetic acid- water (4:1:5) was used and the detection was carried out by using iodine crystals. The other product formic acid was identified by treating the product with Zn/HCl followed by the addition of chromotropic acid<sup>9</sup>. The oxidation state of manganese changes from (IV) to (II) as probed by EPR spectroscopy EPR of the reaction mixture recorded at various time intervals from the time of mixing of reactants, showed increase in the intensity of Mn(II) signal with time (Figure 1).

## **Results and Discussion**

### **Characterisation of PA1**

PA1, a heteropoly anion (Waugh type), has nine edge-sharing octahedra. In PA1, Mn(IV) is surrounded by six oxygen resulting in a MnO<sub>6</sub> octahedron<sup>10</sup>. The structure is further confirmed by using vibrational and EPR spectral techniques.

### **Vibrational spectroscopy**

IR spectrum of PA1 recorded is given in Figure 2. Vibrational spectroscopy is a promising technique, to identify even tiny changes arising from anion-cation interaction<sup>11</sup> in

polyoxometalates chemistry. It has been used to find out the group frequencies like X-O (X=hetero atom) in polyoxometalates. PA1 has *cis*-MoO<sub>2</sub> groups<sup>12</sup>. Generally the compounds having *cis*-MoO<sub>2</sub> groups exhibit doublet in the vibrational spectrum. PA1 exhibits strong bands at 900-950 cm<sup>-1</sup> which correspond to the stretching frequencies of *cis*-MoO<sub>2</sub> terminal bonds. The other bands at 700, 600, 550 and 400 cm<sup>-1</sup> correspond to the edge sharing MO<sub>6</sub> octahedra. In Raman spectrum also, PA1 exhibits (shown in Figure. 3) two bands at 959 and 925 cm<sup>-1</sup> and these bands may be assigned to *cis*-MoO<sub>2</sub> groups. The other bands at 890, 876, 850 and 816cm<sup>-1</sup> are due to the vibrations of edge-sharing MoO<sub>6</sub> octahedra.

### EPR spectroscopy

The EPR spectrum of PA1 (Figure 4) shows a weak signal at  $g = 4$  and a strong signal at  $g = 2$ . In a crystal field, d<sup>3</sup> ion with octahedral geometry has <sup>4</sup>A<sub>2g</sub> ground state, which gives an isotropic resonance at  $g = 2$ . Distortion and spin-orbit coupling split the ground quartet into two Kramer's doublets with the separation  $2(D^2 + 3E^2)^{1/2}$ , where D and E are axial and rhombic zero field splitting parameters<sup>13</sup>. Simplification occurs when the zero field tensor, D takes the limiting form  $2D \gg hv$  or  $2D \ll hv$ <sup>14</sup>. EPR spectrum of PA1 (Figure 4) reveals that the axial parameter D takes the limiting form  $2D \ll hv$ , as shown by weak signal at  $g = 4$  and a strong signal at  $g = 2$ .

The D value computed by using the equation

$$D = \sqrt{3/2 [(g\beta B_0)^2 - (2 g\beta B_{\min})^2]}^{1/2}$$

is 0.004 cm<sup>-1</sup> for PA1. For this calculation  $g$  (2.01) value of PA1 was used. The D value thus obtained is indicative of the almost perfect MnO<sub>6</sub> octahedron in PA1. The EPR spectrum of PA1 also shows hyperfine splitting at the region  $g = 2$ , with the splitting constant  $A_{Mn} = 79.7 \times 10^{-4}$  cm<sup>-1</sup>.

### Oxidation of D-fructose by PA1

Kinetic measurements were carried out under pseudo-first order conditions,  $[PA] \ll [D\text{-fructose}]$ , in aqueous medium by spectrophotometric method. All the reactions followed first order kinetics as judged by the linearity of plots of log (absorbance) versus time.

### Dependence on substrate concentration

The dependence of rate on substrate concentration was studied for PA1 at 30°C with  $[\text{oxidant}] = 4.86 \times 10^{-4}$  mol dm<sup>-3</sup>,  $[H^+] = 0.3$  mol dm<sup>-3</sup> and  $[\text{substrate}]$  ranging from  $4.86 \times 10^{-3}$

mol dm<sup>-3</sup> to 8.39 x 10<sup>-3</sup> mol dm<sup>-3</sup>. Plot of k versus [substrate] was linear with a slope of unity (shown in figure 5), showing first order dependence on the concentration of D-fructose (Table 1) in the reaction with PA1.

### Dependence on oxidant concentration

Mn(IV) species in acidic medium undergoes rapid protonation and becomes Mn(III)<sup>15</sup>. In the present case the colour of the Mn(IV) solution changed from reddish brown to light yellow, when sulphuric was added. In addition, the absorbance value was appreciably reduced and stood constant, when sulphuric acid was added to the PA1 solution. However, no appreciable shift in  $\lambda$ -max was observed. The decrease in the absorbance value showed with increase concentration of the sulphuric acid. This shows that the Mn(IV) species in acidic solution gets protonated and become Mn(III) species. The dependence of rate on oxidant was studied for PA1 at 30°C with [D-fructose] = 4.86 x 10<sup>-3</sup> mol dm<sup>-3</sup>, [H<sup>+</sup>] = 0.2 mol dm<sup>-3</sup> (Table 2). Oxidation of D-fructose by PA1 shows a first order dependence on [PA1]. The rate constants show an initial increase followed by a decrease as the concentration of the oxidant is increased. This may be due to the formation of the complex between the complex between the substrate and the polyanion containing the trivalent manganese (PA-Mn(III)). The concentration of the active species gets reduced by the complex formation. Similar behavior has been observed in the oxidation of formaldehyde by Mn(III) pyrophosphate, maleic acid by Mn(III) sulphate and citric acid by Mn(III) acetate<sup>16,17</sup>. The possible reactive species in sulphuric acid are Mn(OH)<sup>2+</sup>, Mn(HSO<sub>4</sub>)<sup>2+</sup>, Mn(SO<sub>4</sub>)<sup>+</sup>, Mn(SO<sub>4</sub>)<sup>2-</sup> and Mn(OH)<sub>3</sub>(HSO<sub>4</sub>)<sub>3</sub><sup>3-</sup> and their presence depends on experimental conditions<sup>17</sup>.

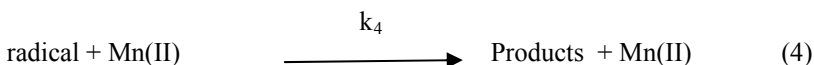
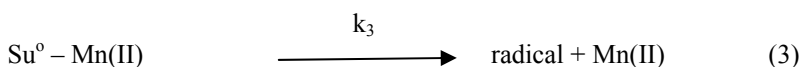
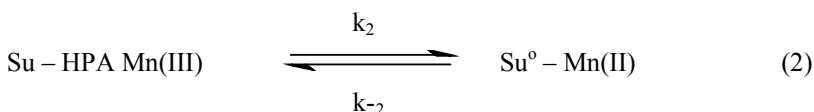
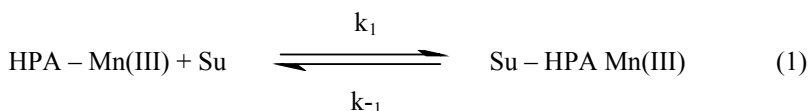
But in the present case, since Mn(III) ion is encircled by other MoO<sub>6</sub> moieties, the formation of above mentioned reactive species may not be possible. The formation of PA-Mn(III) substrate complex seems to be the probable reason for decrease in the rate as the concentration of the oxidant is increased. Added Mn(II) salt had no effect on the rate of oxidation, suggesting that PA having Mn(III) was not in equilibrium with Mn(II) species in the oxidation. However the reaction was found to go through free radical intermediate as confirmed by the polymerization of acrylonitrile in the system.

### Dependence on [H<sup>+</sup>]

Acid dependence was carried out for PA1 with [oxidant] = 4.86 x 10<sup>-4</sup> mol dm<sup>-3</sup>, [D-fructose] = 4.86 x 10<sup>-4</sup> mol dm<sup>-3</sup> and [H<sup>+</sup>] = 0.2 – 1.5 mol dm<sup>-3</sup> at 30°C. The increase in the rate of oxidation of fructose with increase in [H<sup>+</sup>] in the reactions may be due to the formation of PA-Mn(III) species. The plot of k versus [acid] for PA1 is given in the Figure



6. When the pH of the solution is above 4, the anion (PA1) is completely deprotonated. On the contrary, if the pH of the solution is below 4, the anion exists as two forms in the aqueous solution, viz  $[H_mMnMo_9O_{32}]^{(6-m)-}$  and  $[(M)_nH_pMnMo_9O_{32}]^{(6-p-n)-}$ . The highly protonated species acts as active species in the aqueous solution. Since at higher acid concentration, the formation of protonated species increases, this increases the rate of a reaction for PA1. Although the Mn(III) species in aqueous solution is not stable at neutral pH, it is stabilized in sulphuric acid. So the formation of stable PA-Mn(III) is favoured as the concentration of sulphuric acid is increased. The same trend is observed in the oxidation of phenacyl bromides by manganese (III) acetate. Added sodium perchlorate has no effect on the rate of the reaction. Based on the experimental evidences, a possible mechanism may be proposed.



### Scheme 1

The step I may be rate- determining for PA1.

### Activation parameters

The effect of temperature on the rate of the reaction was studied at 30, 35 and 40 °C and  $\Delta H^\ddagger$  and  $\Delta S^\ddagger$  were evaluated from the data (Table 4). Increase of temperature accelerates the rate of the reaction indicating the formation of a stable activated complex. The negative value of  $\Delta S^\ddagger$  indicates the orderliness of the reaction and the formation of more rigid activated complex. The low value of  $\Delta H^\ddagger$  indicates the formation activated complex is easier in PA1.

## Conclusion

The heteropolyanion,  $[\text{Mn}^{\text{IV}}\text{Mo}_9\text{O}_{32}]^{6-}$  undergoes one electron reduction with D-fructose in aqueous medium at different temperatures. The one electron transfer proceeds through free radical mechanism. For the reduction of 2 moles of HPA, 1 mole of D-fructose is consumed. The organic products are arabinose and formic acid. Order with respect to [HPA] is one and order with respect to [D-fructose] is also one.

## Acknowledgements

The author thanks SAIC, IIT, Chennai for EPR, Raman spectral measurements and also UGC, New Delhi for financial support.

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Table 1. Effect of [Reductant] variation on rate of the reaction.

[Oxidant] =  $4.86 \times 10^{-4}$  mol dm<sup>-3</sup>, [H<sup>+</sup>] = 0.3 M, T = 30° C.

[Reductant] x 10 <sup>3</sup> /mol dm <sup>-3</sup>	K <sub>1</sub> x 10 <sup>3</sup> /s <sup>-1</sup> for PA1
4.86	1.17
5.74	1.32
6.62	1.55
7.51	1.79
8.39	1.95
8.92	2.12
9.65	2.35

Table 2. Effect of [Oxidant] variation on rate of the reaction.

[Reductant] =  $4.86 \times 10^{-3}$  mol dm<sup>-3</sup>, [H<sup>+</sup>] = 0.3 M, T = 30° C

[PA1] x 10 <sup>4</sup> /mol dm <sup>-3</sup>	K <sub>1</sub> x 10 <sup>5</sup> s <sup>-1</sup>
4.86	9.69
5.13	9.94
5.50	11.14
5.92	10.50
6.72	9.58
7.22	9.25
8.0	8.65

Table 3. Effect of varying acid strength on rate of the reaction.

[Oxidant] =  $4.86 \times 10^{-4}$  mol dm<sup>-3</sup>, [Reductant] =  $4.86 \times 10^{-3}$  mol dm<sup>-3</sup>, T = 30° C

[H <sup>+</sup> ] /mol dm <sup>-3</sup>	K <sub>1</sub> x 10 <sup>3</sup> /s <sup>-1</sup> for PA1
0.2	1.2
0.3	1.4
0.4	2.1
0.5	3.0
0.7	4.5
0.9	5.7

Table 4. Effect of temperature on the rate of the reaction and activation parameters. [Oxidant] =  $4.86 \times 10^{-4} \text{ mol dm}^{-3}$ , [Reductant] =  $4.86 \times 10^{-3} \text{ mol dm}^{-3}$ ,  $[\text{H}^+] = 0.3\text{M}$ .

Temp K	$k_1 \times 10^4/\text{s}^{-1}$ (PA1)	$\Delta H^\ddagger/\text{kJ mol}^{-1}$ (PA1)	$\Delta S^\ddagger/\text{JK}^{-1} \text{mol}^{-1}$ (PA1)
303	8.06	46.4	172.1
308	11.70	46.4	172.2
313	20.90	46.3	169.2

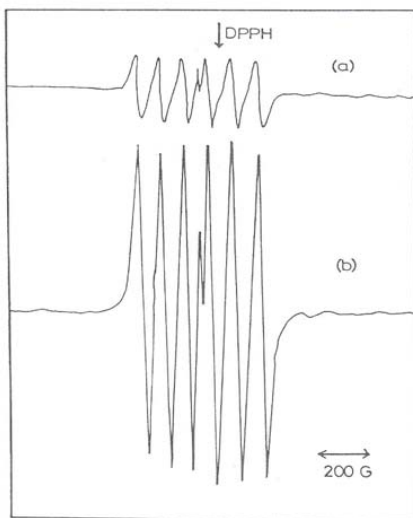


Figure 1. X-band EPR solution spectra of the product Mn(II), as a function of time (a) after 5 minutes and (b) after 10 minutes

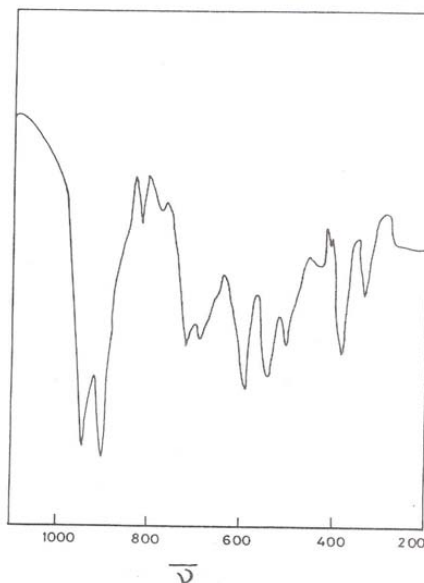


Figure 2. IR spectrum of the heteropoly anion,  $[\text{Mn}^{\text{IV}}\text{Mo}_9\text{O}_{32}]^{6-}$  as KBr disks. Ammonium is the counter cation for this anion.

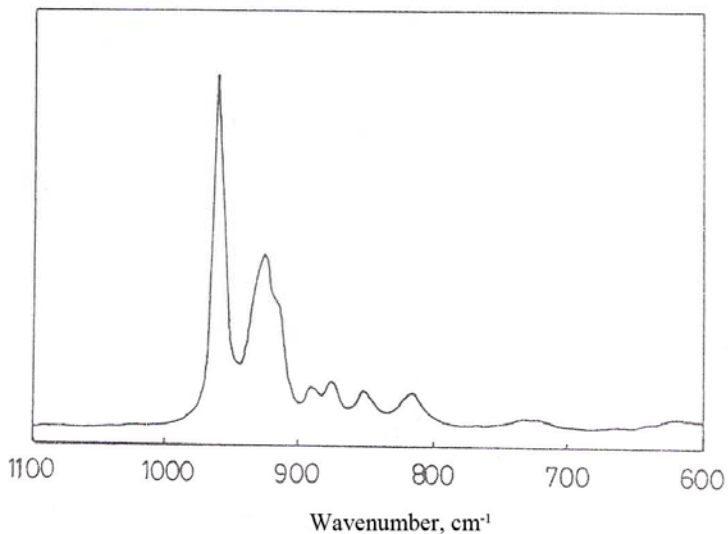


Figure.3. Raman spectrum of the heteropoly anion,  $[\text{Mn}^{\text{IV}}\text{Mo}_9\text{O}_{32}]^{6-}$ . Recorded by pressing the sample in the solid matrix. Ammonium is the counter cation for this anion.

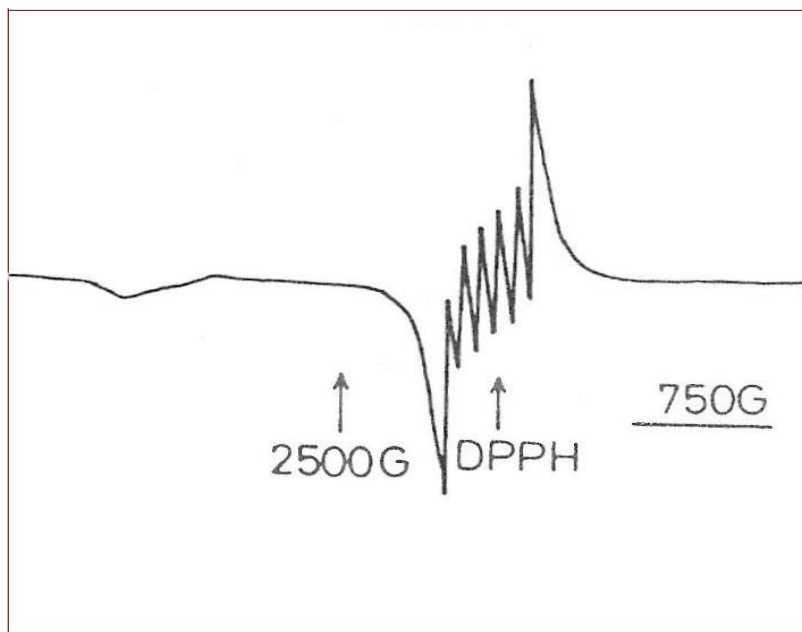


Figure.4. X- Band Polycrystalline EPR spectrum of Mn(IV) in HPA at 300 K

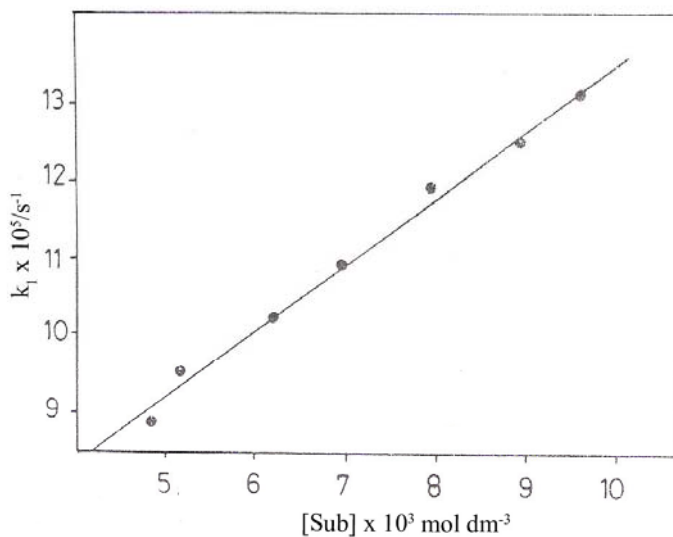


Figure.5. Plot of K versus substrate concentration for  $[\text{Mn}^{\text{IV}}\text{Mo}_9\text{O}_{32}]^{6-}$ . Other conditions :  $[\text{reductant}] = 4.86 \times 10^{-3} \text{ mol dm}^{-3}$ ,  $[\text{H}^+] = 0.3 \text{ mol dm}^{-3}$  and  $T = 30^\circ$

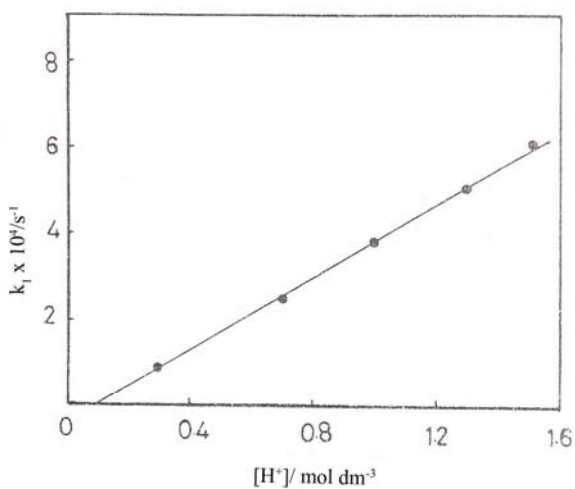


Figure.6. Plot of k versus acid strength concentration for  $[\text{Mn}^{\text{IV}}\text{Mo}_9\text{O}_{32}]^{6-}$ . Other conditions:  $[\text{reductant}] = 4.86 \times 10^{-3} \text{ mol dm}^{-3}$ ,  $[\text{oxidant}] = 4.86 \times 10^{-4} \text{ mol dm}^{-3}$  and  $T = 30^\circ \text{C}$

## FORWARD DIFFERENCE OPERATOR OF THE SECOND KIND AND ITS APPLICATIONS IN NUMBER THEORY

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### Abstract

In this paper, the authors extend the theory of the generalized difference operator  $\Delta_\ell$  to the forward difference operator of the second kind  $\Delta_{\ell_1, \ell_2}$  and provide suitable examples to illustrate the main results.

**Key words:** Forward difference operator, regular partial sums, irregular partial sums

**AMS Subject Classification [2000]:** 39A12, 39A70, 47B39, 39B60.

### 1. INTRODUCTION

The difference equation describe the evolution of a certain phenomena over a period of time. The theory of difference equations is based on the operator  $\Delta$  defined as

$$\Delta u(k) = u(k+1) - u(k), \quad k \in [0, \infty).$$

which allows the recursive computation of the solutions. Later, the following definition was suggested for  $\Delta_\ell$  by [1,13,14] and [15],

$$\Delta_\ell u(k) = u(k+\ell) - u(k), \quad \ell \in (0, \infty),$$

however no significant progress took place on applications of (2) in Number Theory. But recently, reconsidering the equation (2) and its inverse  $\Delta_\ell^{-1}$ , and many interesting results like a formula for the sum of the  $n^{\text{th}}$  powers of an arithmetic progression, the sum of the products of  $n$  consecutive terms of an arithmetic progression and the sum of an arithmetic-geometric progression etc., in applications such as in number theory ([2,4]) as well as rotatory, expanding and shrinking, spiral and weblike for the solutions of difference equations involving  $\Delta_\ell$  in Fluid Dynamics were obtained, see for example ([6,8]).

By extending theory and applications of  $\Delta_\ell$  to  $\Delta_{\ell_1, \ell_2}$ , the generalized version of Leibnitz, Binomial, Montmorte's theorems, Newton's formula and formula for the sum of partial sums of higher powers of an arithmetic progression, sum of partial sums of consecutive terms of an arithmetic progression and sum of partial sums of an arithmetic-geometric progression in number theory are also derived using  $\Delta_{\ell, \ell}^{-1}$  ([10,11,12]). In this paper, we establish  $\Delta_{\ell_1, \ell_2}^{-1}$  and derive the sum of regular and irregular partial sums of sums of higher powers of an arithmetic progression, sum of regular and irregular partial sums of an arithmetic - geometric progression in number theory.

Throughout this paper, we make use of the following assumptions.

(i)  $[x]$  means integer part of  $x$

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$$(ii) N(a) = \{a, a+1, a+2, \dots\}, N_\ell(j) = \{j, j+\ell, j+2\ell, \dots\},$$

(iii)  $\ell, \ell_1, \ell_2$  are positive reals and

## 2. PRELIMINARIES

In this section, we present some definition and preliminary results which will be used in subsequent discussions.

**Definition 2.1.** [12]1 For any real or complex valued function  $u(k)$  on  $[0, \infty)$ , the forward difference operator of the second kind, denoted by  $\Delta_{\ell_1, \ell_2}$  is defined as

$$\Delta_{\ell_1, \ell_2} u(k) = u(k + \ell_1 + \ell_2) - (u(k + \ell_1) + u(k + \ell_2)) + u(k). \quad (3)$$

The following are easy consequences of (2) and Definition 2.1.

**Lemma 2.2.** 2 If  $E$  is the usual shift operator, then

$$(i) \quad \Delta_{\ell_1, \ell_2} = E^{\ell_1 + \ell_2} - (E^{\ell_1} + E^{\ell_2}) + 1$$

$$(ii) \quad \Delta_{\ell_1, \ell_2} = \Delta_{\ell_1 + \ell_2} - (\Delta_{\ell_1} + \Delta_{\ell_2})$$

$$(iii) \quad \Delta_{\ell_1, \ell_2} = \Delta_{\ell_1} \Delta_{\ell_2}$$

(iv) If  $\ell_j$ 's are positive integers, then

$$\Delta_{\ell_1, \ell_2} = \left( \sum_{i=1}^{\ell_1} \ell_1 C_i \Delta^i \right) \left( \sum_{j=1}^{\ell_2} \ell_2 C_j \Delta^j \right).$$

(v) If  $p$  and  $q$  are any two positive integers and  $\ell = \prod_{i=1}^2 \ell_i$ , then

$$\Delta_{\ell_1, \ell_2}^p k^q = \begin{cases} 0 & \text{if } q < np \\ q! \ell & \text{if } q = np. \end{cases}$$

**Definition 2.3.** [12] 3 If  $t$  is a positive integer, then the generalized polynomial factorial of the second kind is defined by

$$k_{\ell_1, \ell_2}^{(n)} = (k + \ell_1)_{\ell_2}^{(n)} + (k + \ell_2)_{\ell_1}^{(n)} - (k_{\ell_2}^{(n)} + k_{\ell_1}^{(n)})$$

where  $k_\ell^{(t)} = k(k - \ell)(k - 2\ell) \dots (k - (t-1)\ell)$ .



**Definition 2.4.** 4 The inverse of the forward difference operator of the second kind denoted by  $\Delta_{\ell_1, \ell_2}^{-1}$  is defined as below. If  $\Delta_{\ell_1} v(k) = u(k)$ , then  $\Delta_{\ell_1}^{-1} u(k) = v(k) + c_{0j}$ , where  $c_{0j}$  is obtained by substituting particular value for  $k$ , say  $\ell_1 + j_1$ ,  $j_1 = k - \left\lfloor \frac{k}{\ell_1} \right\rfloor \ell_1$  and from which in the second kind as

$$\Delta_{\ell_1, \ell_2}^{-1} u(k) = \Delta_{\ell_2}^{-1} \left( \Delta_{\ell_1}^{-1} u(k) \right).$$

### 3. MAIN RESULTS

Using the Stirling numbers of the first kind  $s_r^n$  ([13]) and the principle of induction, the following can be easily obtained.

**Lemma 3.1.** 5 If  $s_r^n$  's are the stirling numbers of the first kind, then

$$\sum_{r=1}^n s_r^n t^{n-r} \Delta_{\ell_1, \ell_2} k^r = \Delta_{\ell_1, \ell_2} k_t^{(n)}.$$

**Lemma 3.2.** 6 Let  $m$  be a positive integer and  $m \geq n$ . Then for each  $\ell_i \in L$

$$\Delta_{\ell_1, \ell_2} k_t^{(n)} = \begin{cases} n\ell_1 [(k + \ell_2)_{\ell_1}^{(n-1)} - k_{\ell_1}^{(n-1)}] & \text{if } t = \ell_1 \\ n\ell_2 [(k + \ell_2)_{\ell_2}^{(n-1)} - k_{\ell_2}^{(n-1)}] & \text{if } t = \ell_2. \end{cases} \tag{11}$$

*Proof.* The proof follows from (3), (9) and the relation

$$k_t^{(n-1)} = k(k-t)(k-2t) \cdots (k+2t-nt).$$

**Lemma 3.3.** 7 If  $m$  is a positive integer and  $(n-1)(L) = \{ \{ \ell_1, \ell_2, \dots, \ell_{n-1} \},$

$\{ \ell_1, \ell_2, \dots, \ell_{n-2}, \ell_n \}, \dots, \{ \ell_2, \ell_3, \dots, \ell_n \} \}$ , then

$$\Delta_{\ell_1, \ell_2} k_{\ell_1, \ell_2}^{(n)} = n\ell_2 \Delta_{\ell_1, \ell_2} k_{\ell_2}^{(n-1)} + n\ell_1 \Delta_{\ell_1, \ell_2} k_{\ell_1}^{(n-1)}.$$

*Proof.* The proof follows from (6) and  $\Delta_{\ell} k_{\ell}^{(m)} = m\ell k_{\ell}^{(m-1)}$ .

**Theorem 3.4.** [2] *If  $\ell$  is positive real and  $j = k - \left\lfloor \frac{k}{\ell} \right\rfloor \ell$ , then*

$$\Delta_{\ell}^{-1} u(k) = \sum_{r=1}^{\left\lfloor \frac{k}{\ell} \right\rfloor} u(k - r\ell) + c_j,$$

where  $c_j$  is constant for all  $k \in \mathbb{N}_{\ell}(j)$ .

The following theorem is the formula for general partial sums.

**Theorem 3.5.** 9 *Let  $k \in [2\ell_2, \infty)$ ,  $\ell_2 \geq \ell_1$ ,  $u_2(k) = \Delta_{\ell_2}^{-1}(u_1(k) - u_1(j_1))$  and*

*$u_1(k) = \Delta_{\ell_1}^{-1} u(k)$  with  $j_i = k - \left\lfloor \frac{k}{\ell_i} \right\rfloor \ell_i$ , for  $i = 1, 2$ . Then*

$$\sum_{r_2=1}^{r_2^*} \sum_{r_1=1}^{r_1^*} u(k - r_2\ell_2 - r_1\ell_1) = u_2(k) - u_2(j_2) - U_{12},$$

where  $r_2^* = \left\lfloor \frac{k}{\ell_2} \right\rfloor$ ,  $r_1^* = \left\lfloor \frac{k - r_2\ell_2}{\ell_1} \right\rfloor$ ,  $u_2(k) = \Delta_{\ell_1}^{-1}(\Delta_{\ell_2}^{-1} u(k))$ ,  $j_{1r_2} = (k - r_2\ell_2) - \left\lfloor \frac{k - r_2\ell_2}{\ell_1} \right\rfloor \ell_1$

and  $U_{12} = \sum_{r_2=1}^{\left\lfloor \frac{k}{\ell_2} \right\rfloor} u_1(j_{1r_2})$ .

*Proof.* From the equation (13) and replacing  $k$  by  $j_1$ , we get

$$z_1(k) = \Delta_{\ell_1}^{-1} u(k) \Big|_{j_1}^k = \sum_{r_1=1}^{\left\lfloor \frac{k}{\ell_1} \right\rfloor} u(k - r_1\ell_1) = u_1(k) - u_1(j_1),$$

where  $u_1(k) = \Delta_{\ell_1}^{-1} u(k)$ . The proof follows by taking  $\Delta_{\ell_2}^{-1}$  on both sides and substituting  $k$  by  $j_2$  and the equation (15).

**Example 3.6.** 10 *Taking  $u(k) = k$  in (14), we obtain*

$$\sum_{r_2=1}^{\left\lfloor \frac{k}{\ell_2} \right\rfloor} \sum_{r_1=1}^{\left\lfloor \frac{k - r_2\ell_2}{\ell_1} \right\rfloor} (k - r_2\ell_2 - r_1\ell_1) = u_2(k) - u_2(j_2) - U_{12},$$

where  $u_2(k) = \frac{k_{\ell_2}^{(3)}}{6\ell_1\ell_2} + \frac{(\ell_2 - \ell_1)k_{\ell_2}^{(2)}}{4\ell_1\ell_2} - \frac{(j_1)_{\ell_1}^{(2)}k_{\ell_2}^{(1)}}{2\ell_1\ell_2}$  is obtained from

$$u_1(k) = \frac{k_{\ell_1}^{(2)}}{2\ell_1} - \frac{(j_1)_{\ell_1}^{(2)}}{2\ell_1}, U_{12} = \sum_{r_2=1}^{\lfloor \frac{k}{\ell_2} \rfloor} u_1(j_{1r_2}) \text{ and } j_{1r_2} = (k - r_2\ell_2) - \left\lfloor \frac{k-r_2\ell_2}{\ell_1} \right\rfloor \ell_1.$$

In particular when  $k = 13, \ell_1 = 2, \ell_2 = 3$  and  $j_1 = 1, j_2 = 1$  in (16), we get

$$\sum_{r_2=1}^{\lfloor \frac{13}{3} \rfloor} \sum_{r_1=1}^{\lfloor \frac{13-3r_2}{2} \rfloor} (13 - 3r_2 - 2r_1) = u_2(13) - u_2(4) - U_{12},$$

where

$$u_2(13) = \frac{13_3^{(3)}}{(6)(2)(3)} + \frac{(3-2)13_3^{(2)}}{(4)(2)(3)} - \frac{(1)_2^{(2)}13_2^{(1)}}{(2)(2)(3)} = \frac{1144}{36},$$

$$u_2(1) = \frac{(1)_3^{(3)}}{(6)(2)(3)} + \frac{(3-2)(1)_3^{(2)}}{(4)(2)(3)} - \frac{(1)_2^{(2)}(1)_2^{(1)}}{(2)(2)(3)} = \frac{10}{36},$$

$$U_{12} = \sum_{r_2=1}^{\lfloor \frac{13}{3} \rfloor} u_1(j_{1r_2}) = u_1(j_{11}) + u_1(j_{12}) + u_1(j_{13}) + u_1(j_{14}) = \frac{1}{2}$$

$$u_1(k) = \frac{k_{\ell_1}^{(2)}}{2\ell_1} - \frac{(j_1)_{\ell_1}^{(2)}}{2\ell_1} \text{ and } j_{11}, j_{12}, j_{13} \text{ and } j_{14} \text{ obtained from } j_{1r_2} \text{ by putting } k = 13$$

and hence

$$\sum_{r_2=1}^{\lfloor \frac{13}{3} \rfloor} \sum_{r_1=1}^{\lfloor \frac{13-3r_2}{2} \rfloor} (13 - 3r_2 - 2r_1) = \frac{1144}{36} - \frac{10}{36} - \frac{1}{2} = 31.$$

**Theorem 3.7. 11** Let  $\ell \in (0, \infty)$ , and  $u(k)$  be real valued function defined on  $[0, \infty]$ . If  $k \in [3\ell, \infty)$  then

$$\sum_{r=2}^{\lfloor \frac{k}{\ell} \rfloor} \binom{r-1}{m-1} u(k - r\ell) = u_2(k) - u_2(j)$$

where  $j = k - \left\lfloor \frac{k}{\ell} \right\rfloor \ell$ ,  $u_2(k) = \Delta_\ell^{-1}[u_1(k) - u_1(j)]$  and  $u_1(k) = \Delta_\ell^{-1}u(k)$ .

*Proof.* From (13) and replacing  $k$  by  $j$ , we get

$$\sum_{r=1}^{\left\lfloor \frac{k}{\ell} \right\rfloor} u(k - r\ell) = \Delta_\ell^{-1}u(k) - \Delta_\ell^{-1}u(j).$$

Taking  $\Delta_\ell^{-1}u(k) = u_1(k)$ , (18) becomes

$$\sum_{r=1}^{\left\lfloor \frac{k}{\ell} \right\rfloor} u(k - r\ell) = u_1(k) - u_1(j).$$

The proof follows from (13) and (18).

**Corollary 3.8.** 12 If  $\ell_2 \geq \ell_1$  and  $k \in [2\ell_2, \infty)$ , then

$$\sum_{r_2=1}^{\left\lfloor \frac{k}{\ell_2} \right\rfloor} \sum_{r_1=1}^{\left\lfloor \frac{k-r_2\ell_2}{\ell_1} \right\rfloor} (k - r_2\ell_2 - r_1\ell_1) a^{(k-r_2\ell_2-r_1\ell_1)} = u_2(k) - u_2(j_2) - U_{12}, \quad (20)$$

$$\begin{aligned} \text{where } u_2(k) &= \frac{1}{a^{\ell_1} - 1} \left( \frac{a^k}{a^{\ell_2} - 1} \left( k - \frac{\ell_2 a^{\ell_2}}{a^{\ell_2} - 1} \right) \right) - \frac{\ell_1 a^{\ell_1}}{(a^{\ell_1} - 1)^2} \left( \frac{a^k}{a^{\ell_2} - 1} \right) \\ &\quad - \frac{a^{j_1}}{a^{\ell_1} - 1} \left( (j_1) - \frac{\ell_1 a^{\ell_1}}{a^{\ell_1} - 1} \right) \frac{k_{\ell_2}^{(1)}}{\ell_2}, \end{aligned}$$

is obtained from  $u_1(k) = \frac{1}{(a^{\ell_1} - 1)} (ka^k - j_1 a^{j_1}) - \frac{\ell_1 a^{\ell_1}}{(a^{\ell_1} - 1)^2} (a^k - a^{j-1})$ ,

$$U_{12} = \sum_{r_2=1}^{\left\lfloor \frac{k}{\ell_2} \right\rfloor} u_1(j_{1r_2}) \text{ and } j_{1r_2} = (k - r_2\ell_2) - \left\lfloor \frac{k-r_2\ell_2}{\ell_1} \right\rfloor \ell_1.$$

**Example 3.9.** 13 Taking  $k = 9, \ell_1 = 2, \ell_2 = 3, a = 2$  and  $j_1 = 1, j_2 = 0$  in (20), we find

$$\sum_{r_2=1}^{\left\lfloor \frac{9}{3} \right\rfloor} \sum_{r_1=1}^{\left\lfloor \frac{9-3r_2}{2} \right\rfloor} (9 - 3r_2 - 2r_1) 2^{(9-3r_2-2r_1)} = u_2(9) - u_2(0) - U_{12},$$

where

$$u_2(9) = \frac{1}{2^2-1} \left( \frac{2^9}{2^3-1} \left( 9 - \frac{3(2)^3}{2^3-1} \right) \right) - \frac{2(2)^2}{(2^2-1)^2} \left( \frac{2^9}{2^3-1} \right) - \frac{2^1}{2^2-1} \left( (1) - \frac{2(2)^2}{2^2-1} \right) \frac{9_3^{(1)}}{3} = \frac{32702}{441}$$

$$u_2(3) = \frac{1}{2^2-1} \left( \frac{2^3}{2^3-1} \left( 3 - \frac{3(2)^3}{2^3-1} \right) \right) - \frac{2(2)^2}{(2^2-1)^2} \left( \frac{2^3}{2^3-1} \right) - \frac{2^1}{2^2-1} \left( (1) - \frac{2(2)^2}{2^2-1} \right) \frac{3_3^{(1)}}{3} = -\frac{128}{441}$$

$$U_{12} = \sum_{r_2=1}^{\lfloor \frac{9}{3} \rfloor} u_1(j_{1r_2}) = 2u_1(0) + u_1(1) = \frac{4}{9}$$

and hence

$$\sum_{r_2=1}^{\lfloor \frac{9}{3} \rfloor} \sum_{r_1=1}^{\lfloor \frac{9-3r_2}{2} \rfloor} (9-3r_2-2r_1)2^{(9-3r_2-2r_1)} = 74.$$

**Theorem 3.10. 14** Let  $\ell = \sum_{i=1}^2 \ell_i$  and  $k \in [\ell, \infty)$ . If  $\ell_2 = m(\ell_1)$  (multiple of  $\ell_1$ ), then

$$\sum_{r_2=1}^{\lfloor \frac{k}{\ell_2} \rfloor} \sum_{r_1=1}^{\lfloor \frac{k-r_2\ell_2}{\ell_1} \rfloor} u(k-r_2\ell_2-r_1\ell_1) = u_2(k) - u_2(j_2)$$

where  $u_2(k) = \Delta_{\ell_2}^{-1}(u_1(k) - u_1(j_1))$  and  $u_1(k) = \Delta_{\ell_1}^{-1}u(k)$ .

The following corollary illustrates Theorem 3.10.

**Corollary 3.11. 15** Let  $u(k) = k^m$ ,  $k \in [\ell, \infty)$  and  $\ell = \sum_{i=1}^n \ell_i$ . Then

$$\sum_{r_2=1}^{\lfloor \frac{k}{\ell_2} \rfloor} \sum_{r_1=1}^{\lfloor \frac{k-r_2\ell_2}{\ell_1} \rfloor} (k-r_2\ell_2-r_1\ell_1)^m = u_2(k) - u_2(j_2),$$

where  $u_2(k) = \Delta_{\ell_2}^{-1}(u_1(k) - u_1(j_1))$  and  $u_1(k) = \Delta_{\ell_1}^{-1}u(k)$ .

**Example 3.12. 16** Taking  $n = 1$ ,  $m = 1$ ,  $k = 1500$ ,  $\ell_1 = 3$  and hence  $j_1 = 0$  in (22), we obtain

$$\sum_{r_1=1}^{\left\lfloor \frac{1500}{3} \right\rfloor} (1500 - 3r_1) = \frac{1500^{(2)}_3}{2(3)} = 374250.$$

**Corollary 3.13. 17** If  $k \in N_{\ell_n}(j_n)$ , then

$$\sum_{r_2=1}^{\left\lfloor \frac{k}{\ell_2} \right\rfloor} \sum_{r_1=1}^{\left\lfloor \frac{k-r_2\ell_2}{\ell_1} \right\rfloor} (k - r_2\ell_2 - r_1\ell_1) a^{(k-r_2\ell_2-r_1\ell_1)} = u_2(k) - u_2(j_2),$$

where  $u_2(k) = \Delta_{\ell_2}^{-1}(u_1(k) - u_1(j_1))$  and  $u_1(k) = \frac{k^{(2)}_{\ell_1}}{2\ell_1} - \frac{(j_1)^{(2)}_{\ell_1}}{2\ell_1}$  generates the value of (23).

**Example 3.14. 18** Taking  $n = 2$ ,  $k = 17$ ,  $\ell_1 = 2$ ,  $\ell_2 = 4$ ,  $a = 2$  and hence  $j_1 = 1$ ,  $j_2 = 1$  in (23), we find

$$\sum_{r_2=1}^{\left\lfloor \frac{17}{4} \right\rfloor} \sum_{r_1=1}^{\left\lfloor \frac{17-4r_2}{2} \right\rfloor} (17 - 4r_2 - 2r_1) 2^{(17-4r_2-2r_1)} = u_2(17) - u_2(1),$$

where

$$\begin{aligned} u_2(17) &= \frac{1}{2^2 - 1} \left( \frac{2^{17}}{2^4 - 1} \left( 17 - \frac{4 \times 2^4}{2^4 - 1} \right) \right) - \frac{2 \times 2^2}{(2^2 - 1)^2} \left( \frac{2^{17}}{2^4 - 1} \right) \\ &\quad - \frac{2^1}{2^2 - 1} \left( (1) - \frac{2 \times 2^2}{2^2 - 1} \right) \frac{17^{(1)}_4}{4} = 29326.014 \\ u_2(1) &= \frac{1}{2^2 - 1} \left( \frac{2^1}{2^4 - 1} \left( 1 - \frac{4 \times 2^4}{2^4 - 1} \right) \right) - \frac{2 \times 2^2}{(2^2 - 1)^2} \left( \frac{2^1}{2^4 - 1} \right) \\ &\quad - \frac{2^1}{2^2 - 1} \left( (1) - \frac{2 \times 2^2}{2^2 - 1} \right) \frac{(1)^{(1)}_4}{4} = 0.014 \end{aligned}$$

and hence

$$\sum_{r_2=1}^{\left\lfloor \frac{17}{4} \right\rfloor} \sum_{r_1=1}^{\left\lfloor \frac{17-4r_2}{2} \right\rfloor} (17-4r_2-2r_1)2^{(17-4r_2-2r_1)} = 29326.$$

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## PSEUDO MEAN LABELING

V. Balaji\*, D.S.T. Ramesh and V. Maheswari

### Abstract

In 2003, Somasundaram and Ponraj introduced the mean labeling of a graph. On similar lines, we define pseudo mean labeling. In this paper we investigate pseudo mean labeling of some standard graphs. We prove any path is a pseudo mean graph; if  $m \geq 5$ ,  $K_{1,m}$  is not a pseudo mean graph; we prove the bistar  $B_{m,n}$  is a pseudo mean graph if  $|m - n| \leq 3$ . Also, we prove that combs are pseudo mean graphs and  $C_3 \cup P_n$  is a pseudo mean graph for  $n > 2$

**Keywords:** Pseudo mean graph; mean graph; path; star; bistar and comb.

**2010 Mathematical Subject Classification Number:** 05C78.

### Introduction

All graphs in this paper are finite, simple and undirected. Terms not defined here are used in the sense of Harary [2]. In 1966, Rosa[3] introduced  $\beta$ -valuation of graph. Golomb subsequently called such a labeling graceful. In 1980, Graham and Sloane introduced the harmonious labeling of a graph. Also, in 2003, Somasundaram and Ponraj[4] and [5] introduced the mean labeling of a graph. On similar lines, we define pseudo mean labeling. In [4] and [5], mean labeling was focused an assignment of label to the vertices  $x \in V$  with distinct elements  $f(x)$  from  $0, 1, 2, \dots, q$  in such a way that when each edge  $e = uv$  is labeled with  $\frac{f(u) + f(v)}{2}$  if  $f(u) + f(v)$  is even and  $\frac{f(u) + f(v) + 1}{2}$  if  $f(u) + f(v)$  is odd then the resulting edge labels of  $\{1, 2, 3, \dots, q\}$  are distinct and it was proved that any path is a mean graph; if  $m \geq 4$ ,  $K_{1,m}$  is not a mean graph; the bistar  $B_{m,n}$  is a mean graph if and only if  $|m - n| \leq 2$ ;  $C_m \cup P_n$  is a mean graph for  $m \geq 3$  and  $n \geq 2$ ; the combs are mean graphs and the subdivision of central edge of  $B_{n,n}$  is a mean graph. Also, if  $p > q + 1$  then the graph  $G$  is not a mean graph. In the section 2, the concept of pseudo mean labeling is introduced. We investigate the pseudo mean labeling of some classes of trees like path, star, bistar and comb etc. The condition for a graph to be pseudo mean is that  $p = q + 1$  in [1].

### 2 Main Results

**Definition 2.1.** A graph  $G = (v, E)$  with  $p$  vertices and  $q$  edges is said to be a pseudo mean graph if there exists a function  $f$  from the vertex set of  $G$  to  $\{0, 1, 2, 3, \dots, q - 1, q + 1\}$  such that in the induced map  $f^*$  from the edge set of  $G$  to  $\{1, 2, 3, \dots, q\}$  defined by

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$$f^*(e = uv) = \begin{cases} \frac{f(u) + f(v)}{2} & \text{if } f(u) + f(v) \text{ is even} \\ \frac{f(u) + f(v) + 1}{2} & \text{if } f(u) + f(v) \text{ is odd,} \end{cases}$$

the resulting edge labels are distinct.

**Note 2.2.** The condition for a graph to be pseudo mean is that  $p = q + 1$ .

**Theorem 2.3.** Any path is a pseudo mean graph.

**Proof.** Let  $P_n$  be the path with distinct vertices  $u_1, u_2, \dots, u_n$ .

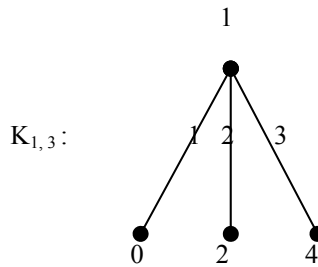
**Define**  $f : V(P_n) \rightarrow \{0, 1, 2, 3, \dots, q - 1, q + 1\}$  by

$$f(u_i) = i - 1 \text{ for } 1 \leq i \leq n - 1 \text{ and } f(u_n) = n.$$

The label of the edge  $u_{i-1}u_i$  is  $i - 1$  for  $2 \leq i \leq n$ . Hence  $P_n$  is a pseudo mean graph.

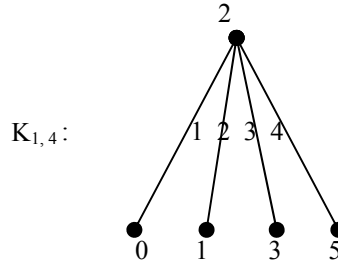
Next our aim is to prove that  $K_{1,m}$  is as pseudo mean graph. As the star  $K_{1,1}$  is  $P_2$  and  $K_{1,2}$  is  $P_3$  are pseudo mean graphs by Theorem 2.3 and we give the pseudo mean labeling for  $K_{1,3}$  and  $K_{1,4}$  below:

Let  $G(V, E) = K_{1,3}$ . Then  $|V| = p = 4$  and  $|E| = q = 3$ .



**Figure 2.1**

Let  $G(V, E) = K_{1,4}$ . Then  $|V| = p = 5$  and  $|E| = q = 4$ .



**Figure 2.2**

**Result 2.4.**  $K_{1,4}$  is a pseudo mean graph but not a mean graph.

**Proof.** By figure 2.2,  $K_{1,4}$  is a pseudo mean graph. By [5],  $K_{1,m}$  is not a mean graph for  $m \geq 4$ . Hence  $K_{1,4}$  is a pseudo mean graph but not a mean graph.

**Theorem 2.5.** If  $m \geq 5$ ,  $K_{1,m}$  is not a pseudo mean graph.

**Proof.** Suppose that  $G = K_{1,m}$  is a pseudo mean graph. Then the distinct edge labels are  $\{1,2,3,\dots,m\}$ . Let  $(V_1, V_2)$  be the bipartition of  $K_{1,m}$  with  $V_1 = \{u\}$ . To get the edge label  $m$ , we must have  $m - 1$  and  $m + 1$  or  $m - 2$  and  $m + 1$  as the vertex labels of adjacent vertices. Clearly one of  $m - 2$ ,  $m - 1$  and  $m + 1$  must be the label of  $u$ . In both cases, since  $m \geq 5$ , there will be no edge whose label is 1. This contradiction proves that  $K_{1,m}$  is not a pseudo mean graph. Hence the theorem.

**Corollary 2.6.** If  $m \geq 5$ ,  $K_{1,m}$  is neither a pseudo mean graph and nor a mean graph.

**Proof.** By Corollary 2.4,  $K_{1,m}$  is not a mean graph for  $m \geq 4$ . By Theorem 2.5,  $K_{1,m}$  is not a pseudo mean graph for  $m \geq 5$ . Hence  $m \geq 5$ ,  $K_{1,m}$  is neither a pseudo mean graph and nor a mean graph.

Now we investigate the pseudo mean labeling of the bistar  $B_{m,n}$ .

**Definition 2.7.** The bistar  $B_{m,n}$  is the graph obtained from  $K_2$  by join in  $m$  pendant edges to one end of  $K_2$  and  $n$  pendant edges to other end of  $K_2$ . The edge of  $K_2$  is called the central edge of  $B_{m,n}$  and the vertices of  $K_2$  are called the central vertices of  $B_{m,n}$ .

**Theorem 2.8.** The bistar  $B_{m,n}$  is a pseudo mean graph if and only if  $|m - n| \leq 3$ .

**Proof.** Without loss of generality, we assume that  $m \geq n$ . Let us first take the case that  $|m - n| \leq 3$ . There are four cases viz.  $m = n$ ,  $m = n + 1$ ,  $m = n + 2$  and  $m = n + 3$ . In each case we have to prove that to prove that  $B_{m,n}$  is a pseudo mean graph.

**Case 1.** Let  $m = n$

Consider the graph  $G = B_{m,n} = B_{n,n}$ . We have  $V(G) = \{u, v\} \cup \{u_i, v_i : 1 \leq i \leq n\}$ . The required vertex labeling  $f : V(G) \rightarrow \{0, 1, 2, 3, \dots, q-1, q+1 = 2n+1\}$  is defined as follows:

$$f(u) = 2n+2; f(u_i) = 2i \text{ for } 1 \leq i \leq n; f(v) = 0 \text{ and } f(v_i) = 2i-1 \text{ for } 1 \leq i \leq n.$$

The corresponding edge labels are as follows:

The edge label of  $uu_i$  is  $n+i+1$  for  $1 \leq i \leq n$  and  $vv_i$  is  $i$  for  $1 \leq i \leq n$ . Also, the edge label of  $uv$  is  $n+1$ . Therefore, the induced edge labels of  $G$  are distinct. Hence the graph  $G$  is pseudo mean graph.

**Case 2.** Let  $m = n+1$ .

Consider the graph  $G = B_{m,n} = B_{n+1,n}$ . We have  $V(G) = \{u, v\} \cup \{u_i : 1 \leq i \leq n+1\} \cup \{v_j : 1 \leq j \leq n\}$ . The required vertex labeling  $f : V(G) \rightarrow \{0, 1, 2, 3, \dots, q-1, q+1 = 2n+2\}$  is defined as follows:

$$f(u) = 2n+1; f(u_i) = 2i \text{ for } 1 \leq i \leq n; f(u_{n+1}) = 2n+3; f(v) = 0 \text{ and } f(v_j) = 2j-1 \text{ for } 1 \leq j \leq n.$$

The corresponding edge labels are as follows:

The edge label of  $uu_i$  is  $n+i+1$  for  $1 \leq i \leq n$  and  $vv_j$  is  $j$   $1 \leq j \leq n$ . Also, the edge label of  $uv$  is  $n+1$  and  $uu_{n+1}$  is  $2n+2$ . Therefore, the induced edge labels of  $G$  are distinct. Hence the graph  $G$  is a pseudo mean graph.

**Case 3.** Let  $m = n+2$ .

Consider the graph  $G = B_{m,n} = B_{n+2,n}$ . We have  $V(G) = \{u, v\} \cup \{u_i : 1 \leq i \leq n+2\} \cup \{v_j : 1 \leq j \leq n\}$ . The required vertex labeling  $f : V(G) \rightarrow \{0, 1, 2, 3, \dots, q-1, q+1 = 2n+3\}$  is defined as follows:

$$f(u) = 2n+2; f(u_i) = 2i-1 \text{ for } 1 \leq i \leq n+1; f(u_{n+2}) = 2n+4; f(v) = 0 \text{ and } f(v_j) = 2j \text{ for } 1 \leq j \leq n.$$

The corresponding edge labels are as follows:

The edge label of  $uu_i$  is  $n+i+1$  for  $1 \leq i \leq n+1$  and  $vv_j$  is  $j$  for  $1 \leq j \leq n$ . Also, the edge label of  $uv$  is  $n+1$  and  $uu_{n+2}$  is  $2n+3$ . Therefore, the induced edge labels of  $G$  are distinct. Hence the graph is a pseudo mean graph.

**Case 4.** Let  $m = n + 3$ .

Consider the graph  $G = B_{m,n} = B_{n+3,n}$ . We have  $V(G) = \{u, v\} \cup \{u_i : 1 \leq i \leq n + 3\} \cup \{v_j : 1 \leq j \leq n\}$ .

The corresponding edge labels are as follows:

The edge label of  $uu_i$  is  $n + 1 + i$  for  $1 \leq i \leq n + 3$  and  $vv_j$  is  $j$  for  $1 \leq j \leq n$ . Also, the edge labels of  $uv$  is  $n + 1$ . Therefore, the induced edge labels of  $G$  are distinct. Therefore, the graph  $G$  is a pseudo mean graph. Hence the graph  $G$  is a pseudo mean graph if  $|m - n| \leq 3$ . Conversely, let us take the case that  $|m - n| > 3$ . Suppose that  $B_{m,n}$  for  $m > n + 3$  is a pseudo mean graph with pseudo mean labeling  $f$ .

Let  $\{u\} \cup \{u_i : 1 \leq i \leq m\}$  and  $\{v\} \cup \{v_j : 1 \leq j \leq n\}$  be the vertex set of  $B_{m,n}$ . Then  $G$  has  $m + n + 2$  vertices and  $m + n + 1$  edges.

**Case (a)** Consider the case  $m = n + 4$ . We have  $p = 2n + 6$  and  $q = 2n + 5$ .

(i) The required vertex labeling  $f : V(G) \rightarrow \{0, 1, 2, 3, \dots, q = 2n + 5\}$  is defined as follows:

Let  $f(v) = 0$  and  $f(v_j) = 2j$  for  $1 \leq j \leq n$ . Then the edge labels of  $vv_j$  is  $j$  for  $1 \leq j \leq n$ . Let  $f(u) = 2n + 2$  and  $f(u_i) = 2i - 1$  for  $1 \leq i \leq n + 2$ ;  $f(u_{n+3}) = 2n + 4$ ;  $f(u_{n+4}) = 2n + 6$ . Then the edge labels of  $uu_i$  is  $n + i + 1$  for  $1 \leq i \leq n + 2$ ;  $uu_{n+3}$  is  $2n + 3$  and  $uu_{n+4}$  is  $2n + 4$ . But, the edge label of  $uu_{n+2}$  is  $2n + 3$  and  $uu_{n+3}$  is  $2n + 3$  are the same. Therefore, the induced edge labels of  $G$  are not distinct. Hence the graph  $G$  is not a pseudo mean graph.

ii) The required vertex labeling  $f : V(G) \rightarrow \{0, 1, 2, \dots, q = 2n + 5\}$  is defined as follows:

Let  $f(v) = 0$  and  $f(v_j) = 2j - 1$  for  $1 \leq j \leq n$ . Then the edge labels of  $vv_j$  is  $j$  for  $1 \leq j \leq n$ . If  $f(u) = k$  and if three of the  $u_i$ 's have consecutive integers as labels then the corresponding induced edge labels are two of them will be equal. Without loss of generality, let us assume that  $f(u_1) = a$ ,  $f(u_2) = a + 1$  and  $f(u_3) = a + 2$ . If  $k$  is odd and  $a$  is even then the edge labels  $f(uu_1) = \frac{k+a+1}{2}$ ,  $f(uu_2) = \frac{k+a+1}{2}$  and  $f(uu_3) = \frac{k+a+3}{2}$  are not distinct. Hence the graph  $G$  is not a pseudo mean graph.

**Case (b)** Consider the case  $m \geq n + 5$ . We have  $p \geq 2n + 7$  and  $q \geq 2n + 6$ .

(i) The required vertex labeling  $f : V(G) \rightarrow \{0, 1, 2, \dots, q \geq 2n + 6\}$  is defined as follows:

Let  $f(v) = 0$  and  $f(v_j) = 2j$  for  $1 \leq j \leq n$ . Then the edge labels of  $vv_j$  is  $j$  for  $1 \leq j \leq n$ .

If  $f(u) = k$  and if three of the  $u_i$ 's have consecutive integers as labels then the corresponding induced edge labels are two of them will be equal. Without loss of generality, let us assume

that  $f(u_1) = a$ ,  $f(u_2) = a + 1$  and  $f(u_3) = a + 2$ . If  $k$  is even and  $a$  is odd then the edge labels  $f(uu_1) = \frac{k+a+1}{2}$ ,  $f(uu_2) = \frac{k+a+1}{2}$  and  $f(uu_3) = \frac{k+a+3}{2}$  are not distinct. Hence the graph  $G$  is not a pseudo mean graph.

(ii) The required vertex labeling  $f : V(G) \rightarrow \{0, 1, 2, \dots, q \geq 2n + 6\}$  is defined as follows:

Let  $f(v) = 0$  and  $f(v_j) = 2j - 1$  for  $1 \leq j \leq n$ . Then the edge labels of  $vv_j$  is  $j$  for  $1 \leq j \leq n$ . If  $f(u) = k$  and if three of the  $u_i$ 's have consecutive integers as labels then the corresponding induced edge labels are two of them will be equal. Without loss of generality, let us assume that  $f(u_1) = a$ ,  $f(u_2) = a + 1$  and  $f(u_3) = a + 2$ . If  $k$  is odd and  $a$  is even then the edge labels  $f(uu_1) = \frac{k+a+1}{2}$ ,  $f(uu_2) = \frac{k+a+1}{2}$  and  $f(uu_3) = \frac{k+a+3}{2}$  are not distinct. Hence the graph  $G$  is not a pseudo mean graph. This is a contradiction. Therefore, the graph  $B_{m,n}$  for  $m > n + 3$  is not a pseudo mean graph. Hence the graph  $G$  is not a pseudo mean graph. Hence the graph  $G$  is not a pseudo mean graph for  $|m - n| \geq 4$ .

**Corollary 2.9.** If  $|m - n| \geq 4$ , the bistar  $B_{m,n}$  is neither a pseudo mean graph and nor a mean graph.

**Proof.** By Theorem 2.8, the bistar  $B_{m,n}$  is not a pseudo mean graph for  $|m - n| \geq 4$ . By [5], the bistar  $B_{m,n}$  is not a mean graph for  $|m - n| \geq 3$ . Hence for  $|m - n| \geq 4$ , the bistar  $B_{m,n}$  is neither a pseudo mean graph and nor a mean graph.

**Theorem 2.11.** The graph obtained by the subdivision of the central edge of  $B_{n,n}$  is a mean graph but not a pseudo mean graph.

**Proof.**

**Case 1.** The subdivision of the central edge  $B_{n,n}$  is a mean graph. Consider the graph  $G = B_{m,n} = B_{n,n} = V(K_2) = \{u\} \cup \{u_i : 1 \leq i \leq n\}$  and  $\{v\} \cup \{v_i : 1 \leq i \leq n\}$ . We have  $V(G) = \{u, v\} \cup \{u_i, v_i : 1 \leq i \leq n\}$ . Let  $w$  be the vertex which subdivide the edge  $uv$  and label of the vertex  $w$  by  $2n + 2$  and other vertices are as follows:

$$f(u) = 2n + 1; f(u_i) = 2i \text{ for } 1 \leq i \leq n;$$

$$f(v) = 0 \text{ and } f(v_i) = 2i - 1 \text{ for } 1 \leq i \leq n.$$

The corresponding edge labels are as follows:

The edge label of  $uu_i$  is  $n + i + 1$  for  $1 \leq i \leq n$  and  $vv_i$  is  $i$  for  $1 \leq i \leq n$ . Also, the edge label of  $uw$  is  $2n + 2$  and  $vw$  is  $n + 1$ . Therefore, the induced edge labels of  $G$  are distinct. Hence the subdivision of the graph  $G$  is a mean graph.

**Case 2.** The subdivision of the central edge of  $B_{n,n}$  is not a pseudo mean graph. Consider the graph  $B_{m,n} = B_{n,n} = V(K_2) = \{u\} \cup \{u_i : 1 \leq i \leq n\}$  and  $\{v\} \cup \{v_i : 1 \leq i \leq n\}$ . We have  $V(G) = \{u, v\} \cup \{u_i, v_i : 1 \leq i \leq n\}$ . Let  $w$  be the vertex which subdivide the edge  $uv$  and label of the vertex  $w$  by  $2n+3$  and other vertices are as follows:

$$f(u) = 2n + 1, f(u_i) = 2i \text{ for } 1 \leq i \leq n;$$

$$f(v) = 0 \text{ and } f(v_i) = 2i - 1 \text{ for } 1 \leq i \leq n.$$

The corresponding edge labels are as follows:

The edge label of  $uu_i$  is  $n + i + 1$  for  $1 \leq i \leq n$  and  $vv_i$  is  $i$  for  $1 \leq i \leq n$ . Also, the edge label of  $uw$  is  $2n + 2$  and  $vw$  is  $n + 2$ . But, the edge label of  $uu_1$  is  $n + 2$  and  $uw$  is  $n + 2$  are the same.

Therefore, the induced edge labels of  $G$  are not distinct. Therefore, the subdivision of the graph  $G$  is not a pseudo mean graph.

**Definition 2.12.** The graph obtained by joining a single pendant edge to each vertex a path is called a comb.

**Theorem 2.13.** Combs are pseudo mean graphs.

**Proof.** Let  $G$  be a comb obtained from a path  $P_n = v_1, v_2, \dots, v_n$  by joining a vertex  $u_i$  to  $v_i$  for  $1 \leq i \leq n$ .

Define  $f : V(G) \rightarrow \{0, 1, 2, 3, \dots, q-1, q+1 = 2n+1\}$  is defined as follows:

$$f(v_1) = 0; f(v_i) = 2i - 1 \text{ for } 2 \leq i \leq n - 1; f(v_n) = 2n - 2;$$

$$f(u_1) = 1; f(u_i) = 2i - 2 \text{ for } 2 \leq i \leq n - 1 \text{ and } f(u_n) = 2n.$$

The Corresponding edge labels are as follows:

The edge label of  $v_{i-1}v_i$  is  $2i - 2$  for  $2 \leq i \leq n - 1$  and  $v_{n-1}v_n$  is  $2n - 2$ . Also, the edge label of  $u_i v_i$  is  $2i - 1$  for  $2 \leq i \leq n - 1$ ;  $u_n v_n$  is  $2n - 1$  and  $u_1 v_1$  is  $1$ . Therefore, the induced edge labels of  $G$  are distinct. Hence the graph  $G$  is a pseudo mean graph.

**Theorem 2.14.**  $C_m \cup P_n$  is a pseudo mean graph for  $m = 3$  and  $n \geq 2$ .

**Proof.** Consider the graph  $G = C_m \cup P_n$  for  $m = 3$  and  $n \geq 2$ . Let  $C_m$  be the cycle  $u_1, u_2, \dots, u_m, u_1$  and  $P_n$  be the path  $v_1, v_2, \dots, v_n$ . Then  $m$  be odd and  $m = 2k + 1$ .

The required vertex labeling  $f : V(G) \rightarrow \{0, 1, 2, 3, \dots, q-1, q+1 = m+n-1\}$  is defined as follows:

$$f(v_i) = i - 1 \text{ for } 1 \leq i \leq n - 1; f(v_n) = n;$$

$$f(u_i) = n + 2i - 3 \text{ for } 1 \leq i \leq k + 1 \text{ and}$$

$$f(u_{k+1+j}) = m + n - j + 1 \text{ for } 1 \leq j \leq k.$$

Then the set of labels of the edges of  $P_n$  is  $\{1, 2, 3, \dots, n - 1\}$  and the set of labels of the edges of  $C_m$  is  $\{n, n + 1, \dots, m + n - 1\}$ . Therefore, the induced edge labels of  $G$  are distinct. Hence the graph  $G$  is pseudo mean graph.

**Theorem 2.15.** Let  $A$  be the collection of paths  $P_n^i$  where  $n$  is odd and  $P_n^i = u_1^i u_2^i, \dots, u_n^i$  for  $1 \leq i \leq m$ . Let  $G$  be the graph obtained from  $A$  with  $V(G) = \bigcup_{i=1}^m V(P_n^i)$  and  $\bigcup_{i=1}^m E(G) = E(P_n^i) \cup \left\{ \frac{u_{n+1}^i}{2} \frac{u_{n+1}^{i+1}}{2} : 1 \leq i \leq m - 1 \right\}$ . Then  $G$  is a pseudo mean graph.

**Proof.** Define  $f : V(G) \rightarrow \{0, 1, 2, 3, \dots, q - 1, q + 1 = mn - 1\}$  by  $f(u_i^1) = i - 1$  for  $1 \leq i \leq n$ ;

$$f(u_i^t) = f(u_n^{t-1}) + (j - 1) \text{ for } 2 \leq t \leq m - 1 \text{ and } 1 \leq j \leq n;$$

$$f(u_k^m) = f(u_n^{m-1}) + (k - 1) \text{ for } 1 \leq k \leq n - 1 \text{ and}$$

$$f(u_n^m) = mn.$$

Therefore, the induced edge labels of  $G$  are distinct. Hence the graph  $G$  is a pseudo mean graph.

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## THE EFFECT OF THIOUREA PROPORTION ON THE PHYSICAL PROPERTIES OF THIOUREA CADMIUM SULPHATE CRYSTALS

A. Albert Irudayaraj\*, N. Madhavan and A. Dhayal RAJ

### Abstract

Semiorganic materials possess high non-linear coefficient and mechanical strength which makes them more suitable for device fabrication. Bisthiourea Cadmium Sulphate (BTCS) and Tristhiourea Cadmium Sulphate (TTCS) are good semiorganic materials which find applications in the fields of telecommunications and optoelectronics. Crystals of BTCS and TTCS have been successfully grown by slow evaporation technique using water as solvent with predetermined solubility data. The powder X-ray diffractogram of the crystal has been recorded and the various planes of reflection are identified. The presence of functional groups and the coordination of metal ions to thiourea were confirmed by FTIR analysis. Transmission spectra reveals that the crystals have a low UV cut off of 265 nm and have good transmittance in the entire Visible region enabling its use in optical applications. The thermal behavior of the crystals has been investigated using thermogravimetric analysis (TGA) and differential thermal analysis (DTA), which indicates that the material does not decompose before melting. Vibrational spectra are recorded to determine the symmetries of molecular vibrations. The optical transmission study was carried out to test the transmitting ability of the crystal. The second harmonic generation test of BTCS and TTCS reveal the non-linear nature of the crystals. The higher proportion of thiourea in TTCS seems to influence the Unit cell volume, hardness, percentage of optical transmittance and thermal stability.

**Keywords:** - Slow evaporation, BTCS and TTCS crystals, microhardness.

### 1. Introduction

NLO materials play a major role in applications such as telecommunications, optical data storage and optical information processing [1, 2]. There has been increasing need for cheap and easily processable NLO materials with appropriate large non-linear susceptibility for electro optical modulators and photonics applications. In addition to large second order susceptibilities, good transmission in UV and Visible region and Stable Physico thermal performance are needed for these applications and for laser processing [3]. In recent years several studies dealing with organic, inorganic and semiorganic molecules and materials for non-linear optics are been reported. Inorganic NLO materials have large mechanical strength, thermal stability and good transmittance, good modest optical non-linearity due to

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the lack of extended  $\pi$ -electron delocalization [4]. Purely organic NLO materials have large non-linearity compared to inorganic materials but low optical transparency, poor mechanical and thermal strength and low laser damage threshold [5]. Thus the research is focused on semi-organic NLO material crystals in order to obtain superior NLO crystals by combining the advantages of organic and inorganic materials. The semi-organic NLO materials have been attracting much attention due to high non-linearity, chemical flexibility and inertness, high mechanical and thermal stability and good transmittance [6]. These materials are formed by combining organic molecules of high polarizability with thermally stable and mechanically robust inorganic materials. Two types of semiorganic materials include organic and inorganic salts and metal organic coordination complexes.[7] Metal complexes of polarisable organic ligands are currently being explored for their non-linear optical properties. Ligands like thiourea and thiocyanate with S and N donors are capable of combining with metal to form stable complexes through co-ordinated bonds. These complexes show ligand to metal charge transfer (LMCT) by an electron movement from ligand to metal and metal to ligand (MLCT) in addition to  $\pi$ - $\pi^*$  conjugation. Thiourea molecule is an interesting inorganic matrix modifier due to its large dipole moment and its ability to form an extensive network of hydrogen bonds [8-10]. Metals with  $d^{10}$  configuration like zinc, cadmium, mercury readily combine with thiourea resulting in stable compounds.

With high optical non-linearity and good physicochemical behavior. Thiourea based organometallic optical crystals like BTCS and TTCS are good examples for engineering of materials with high non-linearity out of an organic ligand with vanishing macroscopic dipole moment (Thiourea) by metal complexation, which exhibit very high NLO properties. BTCS and TTCS are metal organic coordination complex type semiorganic materials. The Centrosymmetric thiourea molecule, when combined with inorganic salt yield non-centrosymmetric complexes, which have the non-linear optical property. [7]

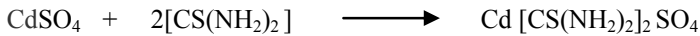
Many metal complexes of thiourea and thiourea analogs have been investigated and reported by several groups [5-11]. The non-linear optical properties of some of the complexes of thiourea have gained significant attention in the last few years, because both organic and inorganic components in them contribute specifically to the process of second harmonic generation. BTCS and TTCS are important metal complexes of thiourea. They have high laser damage threshold, low angular sensitivity, wide range of transparency and low dielectric constant at high frequencies. There are only very few reports on the growth and properties of BTCS and only one report on the structure of TTCS [12] in the literature. There are no reports on the properties of TTCS. Also, there are no comparative study reports on the properties of BTCS and TTCS. In our present work, the growth of crystals of BTCS and

TTCS by slow evaporation method and their characterization by powder X-Ray diffraction, Fourier Transform Infrared (FTIR), UV-Visible, TGA/ DTA and microhardness studies are reported. The effect of thiourea proportion on the physical properties of Thiourea Cadmium Sulphate crystals have been studied and reported for the first time.

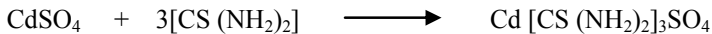
## 2. Experimental procedure

### 2.1 Preparation of BTCS and TTCS materials

BTCS material was synthesized by mixing Cadmium sulphate and Thiourea in the ratio of 1:2. in deionised water at room temperature.



TTCS material was synthesized by mixing Cadmium sulphate and Thiourea in the ratio of 1:3. in deionised water at room temperature.



### 2. Solubility studies of BTCS and TTCS

The solubility of BTCS and TTCS were determined at four different temperatures 30, 35, 40 and 45°C. The solute was dissolved in deionized water in an air tight container maintained at a constant temperature with stirring. After attaining saturation, the equilibrium concentration of the solute was analyzed gravimetrically. The same process was repeated at different temperatures and the solubility curves of BTCS (Fig. 1(a)) and TTCS (Fig. 1(b)) are drawn. BTCS has a reasonably moderate solubility in water, while TTCS has a comparatively lower solubility as revealed from the slope of the solubility curves.

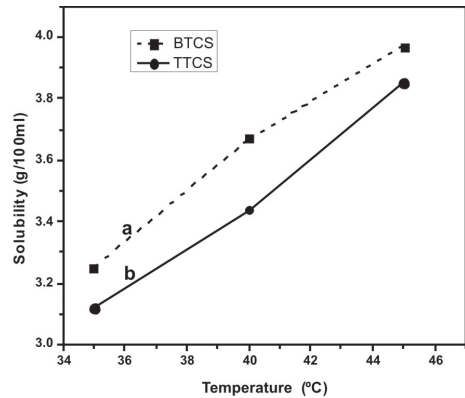


Fig.1 Solubility curve of (a) BTCS and (b) TTCS

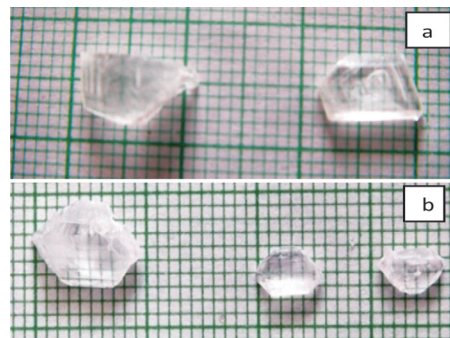


Fig.2. The photographs of (a) BTCS and (b) TTCS crystals

### 2.3. Growth of BTCS and TTCS crystals

The super saturated solutions of BTCS and TTCS were prepared by dissolving them in deionized water by constant stirring up to 5 to 6 hrs and then filtering by Wattmann filter paper. The pure solutions were poured in petri dishes

and covered with polythene papers. Few holes were made in the polythene papers for slow evaporation and the solutions were left undisturbed. After few days good quality transparent seed crystals of BTCS and TTCS, free from macro-defects were obtained. Recrystallizations were carried out few times and transparent crystals of BTCS and TTCS with good morphology were harvested. The photograph of the grown crystals of BTCS and TTCS are shown in Fig. 2(a and b).

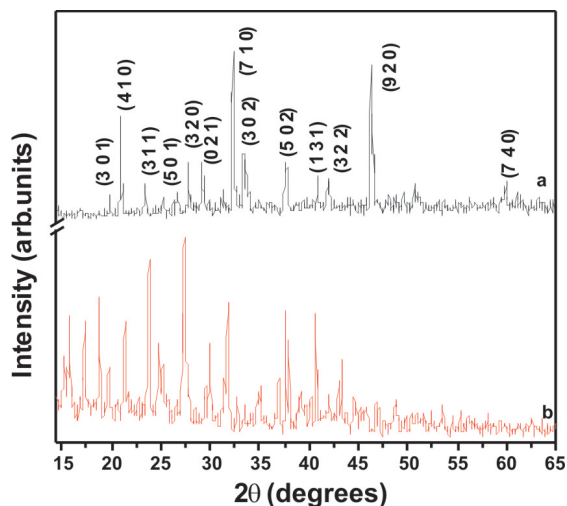


Fig. 3. Powder XRD pattern of (a) BTCS and (b) TTCS crystals

### 3. Characterization of BTCS and TTCS crystals

#### 3.1. Structural analysis

Powder XRD patterns of the grown crystals were recorded using  $\text{CuK}\alpha$  radiation of wavelength  $1.5406 \text{ \AA}$ . The powder X-ray diffraction patterns of BTCS and TTCS crystals are shown in Fig.3 (a and b) respectively. The X-ray diffractogram shows many diffraction peaks. The well defined sharp bragg's peaks at specific  $2\theta$  angles confirms that the synthesized material has crystalline nature. All the observed diffraction peaks were indexed using Treor software. The lattice parameters of both the crystals were calculated using the same software. The calculated lattice parameter values are tabulated in table 1. The studies revealed that both BTCS and TTCS crystals belong to Orthorhombic system.

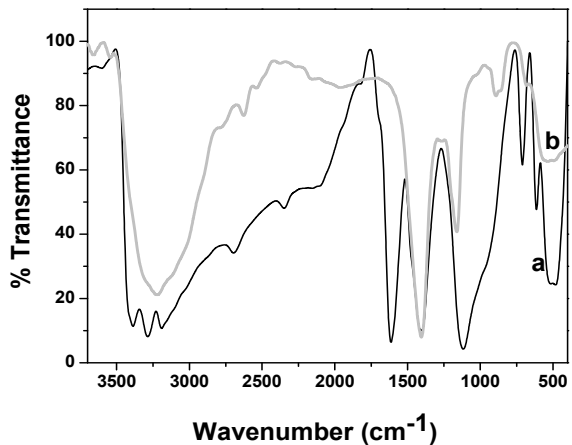
**Table 1. Lattice parameters of TU, BTCS and TTCS**

According to many reports in the literature, the structure of BTCS is orthorhombic. There is only one report in the literature on the structure of TTCS. L. Cavaca et. al have reported that the structure of TTCS is Triclinic. Many researchers have reported that the structure of Tris thiourea Zinc sulphate [13] and doped Tris thiourea Zinc sulphate [14] are Orthorhombic. Our studies reveal that both BTCS and TTCS have orthorhombic structure. There is a small shift in the peak positions of TTCS towards lower  $2\theta$  values. This means there is a slight increase in the d values and hence in the unit cell volume of TTCS as compared with that of BTCS. In order to understand the role of metal ions in the crystallographic properties of divalent metal thiourea complexes, a comparison is made between free ligand (TU) [15], Bisthiourea Cadmium Sulphate (BTCS) and Tristhiourea Cadmium Sulphate (TTCS) as shown in table 1

S.No.	Samples	a (Å)	b (Å)	c (Å)	$\alpha$ (°)	$\beta$ (°)	$\gamma$ (°)	Volume (Å <sup>3</sup> )
1	Thiourea	7.655	8.537	5.520	90	90	90	360.73
2	BTCS	20.981	7.200	5.803	90	90	90	876.71
3	TTCS	13.441	7.774	15.983	90	90	90	1670.21

**3.2. Vibrational analysis**

The vibrational analysis of the grown BTCS and TTCS crystals is done using FTIR. The FTIR spectrum is recorded in the range of 400-3800  $\text{cm}^{-1}$  using Bruker IF SGGV spectrometer. The recorded spectrums are shown in the fig 4. When compared with the spectrum of thiourea [16], a few peaks were found to be slightly shifted (table 2). Thiourea can coordinate with metal through S or N atom. Most of the metals form complex through sulphur. If the bonding is through sulphur, there will be decrease in CS stretching frequency and an increase in CN stretching frequency. The reverse happens if it is through nitrogen. From the FTIR it is observed that the CS stretching vibrations is shifted from 1412  $\text{cm}^{-1}$



**Fig.4. FTIR spectrum of (a) BTCS and (b) TTCS**

to  $1401\text{ cm}^{-1}$  for BTCS and  $1404\text{ cm}^{-1}$  for TTCS. However, the CN stretching vibration is shifted from  $1089\text{ cm}^{-1}$  to  $1117\text{ cm}^{-1}$  for BTCS and  $1159\text{ cm}^{-1}$  for TTCS. Thus there is a decrease in CS stretching frequency and an increase in CN stretching frequency. This confirms the formation of metal sulphur bonds. Moreover the increase in the CN stretching frequency can be attributed to the greater double bond character of the carbon to nitrogen bond on complex formation. There is no significant shift in the symmetric and asymmetric stretching modes of  $\text{NH}_2$  grouping of thiourea in BTCS and TTCS when compared to pure thiourea. This indicates that nitrogen to cadmium bonds are not present in the coordination compounds. Comparison of vibration of thiourea, BTCS and TTCS are shown in table 2.

**Table 2: Assignments of FTIR band frequencies ( $\text{cm}^{-1}$ ) of Thiourea, BTCS and TTCS**

Wavenumber ( $\text{cm}^{-1}$ )			Assignments
Thiourea	BTCS	TTCS	
3380	3388	-----	N-H asymmetric stretching vibration of $\text{NH}_2$ group
3279	3287	3222	N-H asymmetric stretching vibration of $\text{NH}_2$ group
3177	3190	-----	N-H symmetric stretching vibration of $\text{NH}_2$ group
3090	-----	-----	N-H symmetric stretching vibration of $\text{NH}_2$ group
-----	2696	2631	C-H stretching vibrations
-----	2354	2388	C-H stretching vibrations
1618	1613	-----	N-H bending vibration
1412	1401	1404	Asymmetric C=S stretching vibration
1089	1117	1159	Symmetric C-N stretching vibration
730	710	854	Symmetric C=S stretching vibration
487	482	498	N-C-N bending vibration

### 3.3. UV-Vis spectral analysis

The optical transmission spectra of BTCS and TTCS were recorded over a wavelength of 200 to 800 nm using Varian Cary 50 UV-Vis-NIR spectrometer. The recorded transmission spectra are shown in Fig. 5 (a and b). The transmittance spectra of BTCS and TTCS show that the transparency of TTCS is close to 95% and that of BTCS is 90%. This confirms the colourless nature of the crystals. The lower UV cut off wavelength for both BTCS and TTCS is 265 nm. Thus the increase in thiourea proportion seem to increase the percentage of transmittance in the UV visible region of Thiourea Cadmium Sulphate. However there is no

change in the UV lower cut off wavelength with increase in thiourea proportion. The high transmittance in the region between 300 and 800 nm shows that these crystals could be used for optical window applications [16] and for applications in second harmonic generation and optoelectronic devices [10].

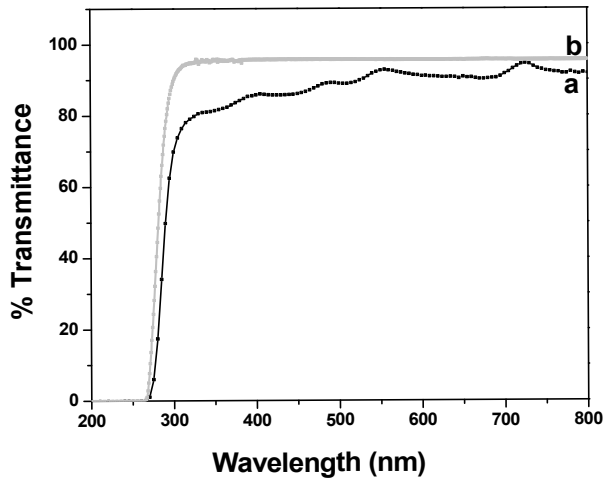


Fig.5. UV-Vis spectrum of (a) BTCS and (b) TTCS crystals

### 3.4. Microhardness analysis

Mechanical strength of any device material is represented by its hardness. Hardness of a material is a measure of its resistance to the local deformation caused by indentation. Mechanical properties of BTCS and TTCS crystals were studied by Vicker’s microhardness test. Microhardness measurements were carried out using Mitutoyo Microhardness Tester for applied loads (P) 25, 50 and 100 g. Several indentations were made for each load and the diagonal lengths (d) of the indented impressions were measured using a micrometer eye piece. The distance between any two indentations was maintained to be greater than 5 times the diagonal length in order to avoid any mutual influence of the indentations.

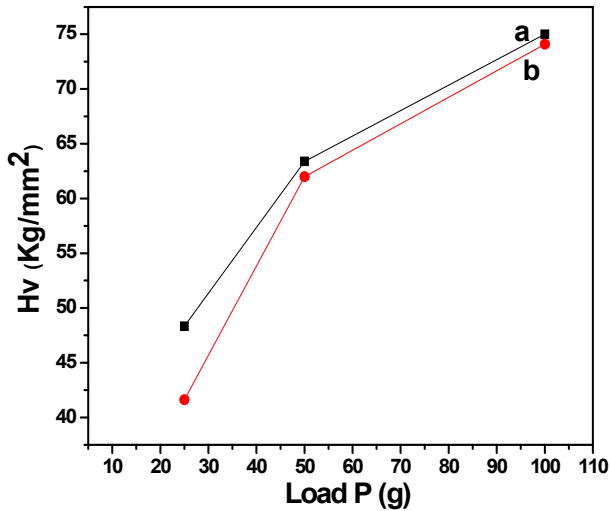
The Vicker’s hardness number was determined using the formula

$$H_v = (1.8544 * P) / d^2$$

Where,  $H_v$  is the the Vicker’s hardness number, P is the applied load and d is the diagonal length of the indentation impression.

The variation of hardness  $H_v$  with load P for BTCS and TTCS are shown in fig. 6(a and b). The measured hardness number of both BTCS and TTCS is found to increase with the

applied load. The Vickers microhardness measurements show that the BTCS crystals have a hardness value of 75 and TTCS crystals have a hardness value of 74 for a load of 100 g. Both crystals have better hardness but the hardness of TTCS is slightly less than that of BTCS. Thus the hardness of thiourea Cadmium sulphate seem to decrease with increasing thiourea proportion. This may be due to the strong bonding between thiourea molecules and cadmium ions [17]. These results indicate that both BTCS and TTCS crystals are suitable for device fabrication applications.



**Fig. 6. Variation of Vicker's microhardness number with applied load (a)BTCS and (b) TTCS**

### 3.5 NLO studies

The powder second harmonic generation efficiency for BTCS and TTCS were measured using the Kurtz Perry powder technique. The powdered sample was illuminated using a Q-Switched Nd: YAG laser beam of wavelength 1064 nm, with an input power of 4.5 mJ, and a pulse width of 8 ns with a repetition rate of 10Hz. The output from the sample was monochromated to collect the intensity of 532 nm component, and to eliminate the fundamental wavelength. Second harmonic radiation generated by the randomly oriented microcrystals was focused by a lens and detected by a photomultiplier tube. The generation of second harmonics was confirmed by the emission of green light. The optical signal generated from sample is converted into electrical signal and was measured on oscilloscope. The measured output for TTCS was 510 mV and that for BTCS is 385 mV respectively with



reference to 275 mV of KDP. This indicates that the SHG conversion efficiency of TTCS is greater than that of BTCS. Thus the SHG conversion efficiency of BTCS is roughly 1.4 times that of KDP while that of TTCS is 1.8 times that of KDP. The enhancement in SHG efficiency of TTCS is due to the presence of more quantity of optically active thiourea which increases its non-Centrosymetry and hence increasing its SHG efficiency [3].

### 3.6 Thermal studies

Thermogravimetric analysis of BTCS and TTCS were carried out using a simultaneous thermal analyser PL- STA 1500 in the temperature range 30-700 °C as shown in the fig. 7 (a and b). The sample was heated in a ceramic crucible and the analysis was carried out in a nitrogen atmosphere at a heating rate of 10 °C per min. The BTCS crystals exhibit single stage of decomposition. In the case of TGA curve of BTCS, it is observed that there is no weight loss upto 220 °C. This indicates that the material is stable up to 220 °C. It also indicates the absence of physically adsorbed or lattice water in the crystal. The DTA curve of BTCS shows an endothermic peak at 220 °C and this can be regarded as the melting point of BTCS. Sharpness of the endothermic peak indicates good degree of crystallinity [16]. The appreciable weight loss at 220 °C and the endothermic peak at 220 °C indicates a phase change from solid to liquid and then to vapour state.

In TGA of TTCS, it is observed that there is no appreciable weight loss upto 212 °C which shows the absence of physically adsorbed or lattice water in the crystal. The DTA curve shows an endothermic peak at 240 °C and this can be regarded as the melting point of TTCS. It is observed that the TTCS decomposes in several stages. First stage occurs at 212 °C and the weight loss is 48 %. This is due to the loss of thiourea molecules. The second stage starts at 245 °C and the weight loss is 56.4 %. This weight loss is due to the evaporation of organic compounds (ammonia) . The third stage starts at 291 °C and the weight loss is 61 %. This weight loss is due to the evaporation of residues (CdS) [8]. The DTA curve shows that melting of the TTCS occur at 240 °C. The results of thermal studies reveal that BTCS is thermally stable upto 220°C and TTCS is thermally stable upto 212°C. Thus the stability of the material seem to decrease with increase in thiourea proportion. The high melting point of BTCS and TTCS compared with other organic crystals is attributed to the existance of stronger bonding between the thiourea molecules and metal ion.

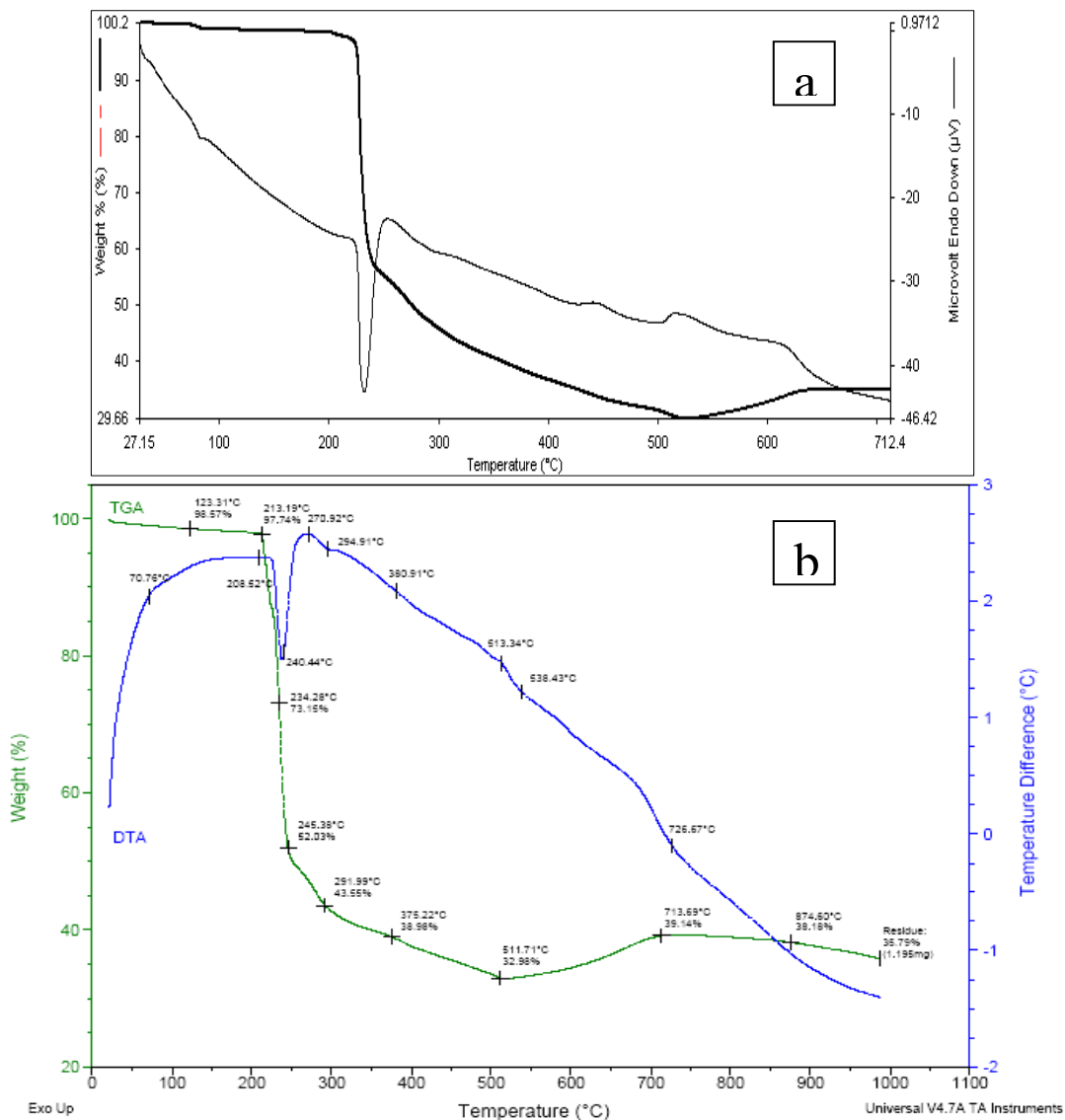


Fig. 7. TGA/DTA curves for (a)BTCS and (b) TTCS

#### 4. Conclusions

Good quality, optically transparent crystals of BTCS and TTCS have been grown by slow evaporation technique. The shifting of C=S stretching vibrations towards lower frequency region in the FTIR spectra of BTCS and TTCS as compared to thiourea confirms that the coordination of thiourea with the metal ions is through sulphur atom. The UV-Vis optical

transmission studies show that both BTCS and TTCS exhibit high optical transparency in the entire UV-Vis region with UV cut off wavelength at 265 nm. However, the Optical transmittance percentage of TTCS is slightly higher than BTCS. Vicker's microhardness studies reveal that both BTCS and TTCS crystals exhibit high hardness. But the hardness of TTCS crystals is slightly greater than that of BTCS crystals. The TGA/DTA thermal studies reveal that BTCS is thermally more stable than TTCS. Thus the proportion of thiourea in thiourea cadmium sulphate seem to influence its structure, optical transmittance, SHG efficiency, thermal stability, and hardness. These results also indicate that both BTCS and TTCS crystals could be used for NLO and optoelectronic device applications.

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## **MOBILE TECHNOLOGY FOR M-LEARNING**

**A. Josephine Sahaya Mala\***

### **ABSTRACT**

The innovation of new mobile technology opened the road towards the innovation of m-learning systems. This m-learning help the students to acquire knowledge irrespective of their location. Similarly the teachers can make use of this system to deliver the content in the form of small text, audio and video. This paper highlights the existing scenario of mobile learning, and discuss about few tools that are used for m-Learning. Then challenges that are faced by the m-learning are given. An architecture for m-learning is proposed. In this system the information are given through various applications to service management which has an extractor extracts the content from the source then it is given to the Learning Resource Management through a filter and get stored in the database. Course authoring with the help of learning object generator retrieve the information from the database and given to the user through wifi technology.

**Key Words: Service Management – Extractor - Multimedia filter – Learning Resource Management - Course Authoring Management- GUI**

### **1. INTRODUCTION**

M-learning is a type of learning through mobile technology. Students can have educational interaction by making use of the mobile technology. Students can access the educational information at their own convenience irrespective of the location. With this type of facility, students can have the control of what they want to learn. Without time schedule students can have their learning. They can have both formal and informal learning by making use of this technology. By making use of this mobile technology, both the educators and trainees are empowered to deliver the learning resources irrespective of the time and place.

### **2. MOBILE TECHNOLOGY AND RELATED WORK**

The acronym for 4G Technology is Fourth Generation Technology. This is can be consider as the successor of 3G standards. This technology is a wireless technology and is the higher version of wireless communication. The Wireless World Research Forum defines this 4G as; it is a technique which uses the combination of wired and wireless network in consumer electronics that have the applications of Wi-Fi and Wimax. The speed ranging from 100 Mbps to 1 Gbps in cell phones network and local Wi-Fi network. This technology provides higher quality and high security. IEEE officially named this 4G technology as beyond 3G (B3G).

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## 2.1 Mobile Learning

Mobile learning is a method of acquiring or providing educational resources on various digital devices like PDAs, smart phones and mobile phones. The educational resources refer to any form of content or media that are digitized and available on personal devices. Hand held computers that are used in mobile learning are in its infancy in terms of both technology and pedagogies. So there is dispute in defining the mobile learning in terms of devices and technologies; in terms of mobility of educators and the mobility of learning, in terms of experience in learning by using the mobile devices.

## 2.2 Related Work

Most researchers and educators view mobile learning as the immediate descendant of e-learning. Pinkwart, et al. (2003) for example, defines e-learning as ‘learning supported by digital “electronic” tools and media’, and by analogy, mobile learning as ‘e-learning that uses mobile devices and wireless transmission’. Quinn (2000) defined it as a, simple way of learning through mobile devices, or through the intersection of mobile computing and e-learning. In line with this definition, several authors (e.g., Turunen, et al. 2003) view mobile devices as a combination work, study and entertainment. Proper usage enhances the user to spend time in a productive way. Traxler (2005) defined it as “any educational provision where the sole or dominant technologies are handheld or palmtop devices”.

## 3. EXISTING SCENARIO

Mobile devices that are used in the field of education is comparatively a new concept. Literatures [1][2][3][4][5][6] discuss about the numerous labors taken by various academic and non-academic organizations to incorporate iPod learning tools into the existing educational framework. They have shown some of the possible use of the mobile technology. They are accessing lecture notes over the mobile devices, attending quiz, participating in group discussion, sharing information among students and replying to discussion threads. In addition Smartphone devices are used to enhance the individual learning experience by the way of quick access to reference books and dictionaries language translation and note taking

### 3.1 Software and Hardware requirements

Software that are needed for this m-Learning includes not only the mobile applications that are designed exclusively for learning purpose but also designed for other uses like geo location, readers, maps, data access etc . This application can be adopted for educative purpose. It needs Special OS which should capable of running all these specially designed

applications and customized applications. Hardware requirement for m learning includes mobile phones, tablets, and notebooks, handheld PCs and iPod etc. m-learning uses most of these devices, many of the devices are predominantly used by the present generation. This type of devices fosters students learning and provides them an opportunity to have an integral learning and making learning as a part of their life.

In Mobile learning the learners and trainers uses applications to have brief interaction, may be for five to ten minutes. The application can be used to have simple navigation and graphical demonstration in multiple screen size. All these application enables the users to have quick review of information rather than prolonged process of learning. The mobile applications are better suited for task like status check, asking for just in time information. On the contrary, the trainers and learners use multiple applications to track down complex data set, assignments, lecture notes, lectures, and to have collaborative learning through social network like Face book. All these m-Learning activities can be performed with Smartphone. The Smartphone allows the user to run applications on their system, browse web, send and receive email etc.

#### **4. MEDIA FORMAT FOR M-LEARNING**

The Educational resources like content of the PowerPoint, Audio, Video can be converted into the required format and redistribute to all major mobile platforms like iPhone, iPods, Blackberry, tablet, Microsoft phone 7, Symbian, Palm etc.. Some of the conversion of educational sources is discussed below.

##### **4.1 PowerPoint Format**

The Educators adopt different methods to present their lectures in the class room. Educators can make use of recording facilities available in the modern technology to record their entire lectures and redeployed it to their students through Wi-Fi technology. Some educators convert the entire courseware that they prepared in the PowerPoint into video and present them it in the class room. Various Mobile free application tools are available to convert the PPT slides to Video. Acoolsoft PPT to video convertor is available for Free. By making use of this software, four different formats can be created which are compatible with the most of the mobile devices. The output of the of text, pictures can be adjusted for the resolution and size of the text to have better performance when they deployed in various mobile devices.

## 4.2 Video format

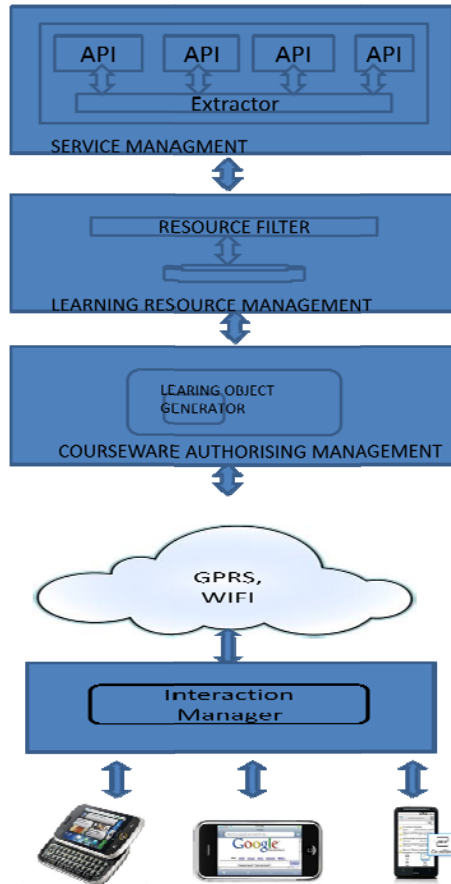
All major videos format can be converted to use in the mobile platform. This conversion can be done for standalone presentation or as a part of curriculum. One of the applications is Video Podcast. Most of the mobile devices support this Video Podcast. The educators can create the video content by making use of this Video Podcast in one format and deploy it in various mobile devices. Educators have to take care of two things while creating video, the video format (MP4, WMV etc) and Video dimensions. So the educator should develop the content in a common video format that is accepted in all mobiles devices. Major mobile devices support the same video format which enables the educators to develop the Podcast in one format and deploy it on various mobile devices

## 4.3 Audio Format

The content of the audio educational resources can be converted for mobile deployment. Message Board is a flexible tool to build the webpage. Through this web page the learners can send or receive messages, pictures, audio. Through this great variety of interactive learning tasks and projects can be done. Through this Media Board the learners can work as a team to discuss various topics and to solve various problems. Recording speeches can be done. This is a useful tool to conduct interviews. By making use of this tool both the educator and learners can build their own webpage to have an interactive learning. The Media Board is just look like a message board where one can view visual images, messages and can hear the audio.

## 5. MLEARNING ARCHITECTURE

System architecture is proposed to implement m-learning with the help of client server architecture. It will have four modules: Service Management, Learning Resource management, Courseware authorizing Management, Interaction Management. The proposed architecture is based on client server model is in Fig. 1. At the client side the mobiles will have GUI that should support GPRS and WIFI technologies. Main process will be located at Server side. Learning materials can be fetched from the server then it is packaged and delivered to the learners.



*Fig. 1 – M-learning Architecture*

### 5.1 Service Management

This is responsible of gathering learning materials from the source and response to a query that is given by the client or user. It has an extractor which extracts multimedia resources given by various applications like PowerPoint, flash etc. An extractor has to be developed by using a scripting language.

### 5.2 Learning Resource Management

Learning Resource Management is responsible for filtering, storing and structuring the learning materials retrieved by the extractor in the service management. A resource filter is used to filter the content according to the query given by the user. All the multimedia resources are stored in the database.



### 5.3 Courseware Authoring Management

The courseware Authoring Management has learning object generator. This Learning Object generator collects all text and multimedia resources from the database and generates learning objects according to the user need and specification of the mobile device

### 5.4 Graphical User Interface

Graphical User Interface installed on the mobile device includes the Interaction Manager which listens the user's request and provides the right service. It is also responsible for registration of the user's profile.

### 5.5 Proposed Design model

At the client side the GUI is installed on the mobile device which supports either WIFI or GPRS connection. The server must have a moodle platform, PHP and relevant filter retrieval applications should be installed. The Application model of the m-learning is provided in fig.2 The learner types his username and password. Once logged in, the profile and capability of the mobile device used by the learner is retrieved and stored in the database for the current session.

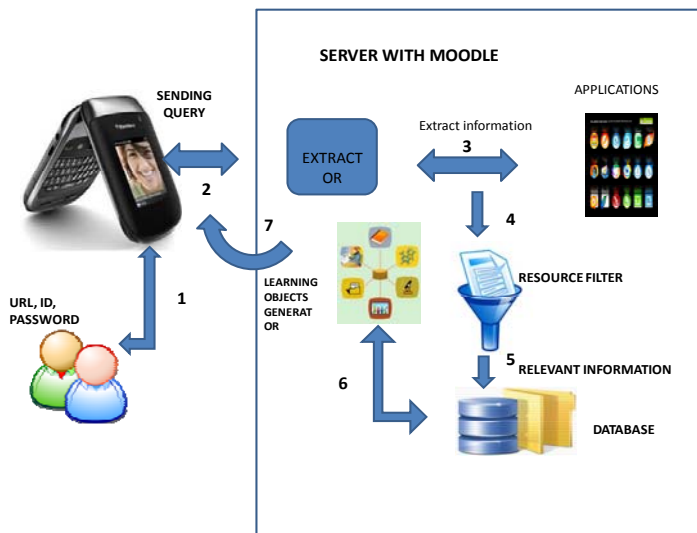


Fig. 2 – M-learning Application Model

The learner gives the query by making use of the graphical user interface which is available in the Mobile or hand held set. The interactive manager identifies the query given by the learner and sends that query to the Extractor of Service Management which is software that

has to be created and to be loaded in the server. The extractor retrieves all the applications that are in the server. Then relevant information is filtered with the help of resource filter and then the information is stored in the database. Then the Learning object generator gathers all text and multimedia resources from the database and generate the learning objects according to the user profile and specification of the mobile device used by the user which are already loaded in the database when the learner logs in. Then these learning objects are given to the learners through mobile or handheld set.

## **6. MOBILE TECHNOLOGY FEATURES**

The teachers use Smartphone to access an educational video library, download selected videos and screen them for students through a data projector.

### **6.1 Mobile technology for Teachers**

Mobile technology is a wonderful invention for the teachers to access various resources in the text, multimedia format. The teachers use Smartphone to access video library, download selected videos and display them to the students through a projector. They can send short messages like reminders to submit their assignments, to send their marks, to announce the date to submit the project etc.

### **6.2 Mobile Technology for Students**

Students have inquiry based learning activity by using this mobile technology. Through this type of learning method students can have a very interactive way of learning. In the class room some students are very shy to ask their doubts if the doubts are very rudimentary. This method gives them confidence to ask questions to clarify their doubts. The Project like EMIA-SMILE is available to have inquiry based learning. Students make use of the standard tools on mobile phones like digital cameras and text messaging to capture images, record videos and upload to share the files through social network like Face book etc, and also upload their information in You Tube. Sharing of knowledge is improved to certain extent among the students since the mobile phones are used by all the students.

Students and teachers use specialized platforms to communicate, share information, download course material and upload assignments. Examples include Blue Genesis and Blackboard Mobile Learn+, Moodle among others. These systems are normally accessed via the internet from any computer and can now be accessed through Smartphone, enabling more regular communication between students and teachers. It is vividly shown, that students use mobile phones independently to access educational resources and games etc.

This encourages the designers to develop new technology and new educational software to meet the requirement of the students rather than teacher training or support

## **7. CHALLENGES OF M-LEARNING**

The advantages of mobile learning are well known to all. We believe that with 4G technology, mobile learning education can bring us a new development stage. However, the fourth-generation mobile communication technology is still in the exploratory stage. Certain challenges need to be addressed. The mobile devices have small screen which makes reading text more difficult. The current market is focusing on producing a large variety of mobile equipments with new features, because of this the deployment of applications over mobile devices become more difficult. The limited processing speed act as a limiting factor for the deployment of these devices for m-Learning. Download in mobile phones is still be a problem to rectify because high speed broad band access is very costly and sometime completely unavailable. Most of the m-Learning projects have offered free internet access but this not in tune with the realities facing a large proportion of users, particularly in the developing world. The memory or storage capacities of mobile phones are limited. Extra random access memory for the storage of programs and files may be added to devices from external memory sticks or cards but cannot be inserted into all handheld devices. . In contrast, read-only memory, which runs the device operating system, cannot usually be increased.

## **8. CONCLUSION**

Mobile learning needs digital resources as one of its components, but they are not sufficient on their own since high end mobile devices only have the options to implement the mobile learning completely. In order to have effective m-learning, applications have to be developed based on the design of pedagogical adopted for a curriculum. Still the content prepared with the help of flash has not been able to download in the high end models like the product developed by Apple. The paper has given an idea to develop an architecture which can be used to implement m-learning. With this basic idea more facilities can be provided to the students to access web resources that are given through various service providers.

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## **A STUDY ON CONSUMER ORIENTED MARKETING AND BRAND PREFERENCE TOWARDS SELECT MULTINATIONAL COMPANIES (MNCs)**

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### **Abstract**

Consumer markets in India are undergoing rapid transformation. Gone are the days when the people of a particular nation were forced to stick on to products and services provided domestically. In the past it was an inevitable situation because of lack of availability and accessibility of overseas products. Current situation is different. Consumers have easy access to products and services provided by Multinationals.

This paper examines the marketing strategies influencing consumers' preferences towards the selected Multinational Companies Colour television sets. Six hundred consumers were selected from the list given by the dealers concerned. About 565 filled in questionnaires were received from the respective customers. The researcher has rejected 48 incomplete questionnaires and the remaining fully completed 517 questionnaires have been duly selected for analysis after a careful scrutiny. The research design employed descriptive, explorative and analytical methods. The analysis were done using cluster analysis. The study revealed that the LG CTV dominates other MNC CTVs because of its captivating appearance, free maintenance and added technically advanced features.

Key Words: Consumer preference of CTVs, LG, Samsung, Sony.

### **Introduction**

Consumer markets in India are undergoing rapid transformations. Gone are the days when the people of a particular nation were forced to stick on to products and services produced and provided domestically. Particularly the Liberalization, Privatization and globalization (LPG) policies of Indian government have paved way for incorporation, mobilization and operation of Multinational Companies (MNCs) from all over the world. Existing business condition and environment have let the world class goods move freely beyond national boundaries. It has become important to reflect on the relevant factors which are directly or indirectly affect the consumers' and dealers' preferences especially in dealing with the products of MNCs.

### **Background Literature**

When a 'need' drives a consumer to purchase a product, the follow up is naturally to go for collecting information about the product prior to actual purchase. Thorelli (1971) in his study found that those with more education might be more information - minded than those with less education. In their revealing attempts, Roering and Block (1976) surveyed certain

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predictions as the focus of their investigation. The consumers living in high and low density areas will differ with respect to their pattern of pre-purchase information search associated with the decision to buy various types of products. Padberg, Walker and Kepner (1967) presented a model which qualifies the attractive display of the product, motivates the consumer brand preferences. After a rigorous assessment of the literature on product feature as a source of preference, Robertso (1969) has justified, "the consistency of innovativeness cannot be expected across product categories, but can be expected within the product categories, and sometimes, between related product categories". Lessig V. Parker and Thomas P. Copley (1994) presented a model which qualifies the attractive display of the product, motivates the consumer brand preferences. In their study in a laboratory controlled experiment in the Ohio metropolitan area, they arrived at the following conclusion: brand, price, the proportion of display space allocated to each brand, the quality of display, sales promotion advertising and consumers brand preference influenced consumers purchase decision.

### **Need and Importance of the Study**

Since the mid-1990s, the Indian Television market has witnessed the entry of global brands like Akai, Aiwa, LG, Panasonic, Sansui, Samsung, Sony, Thomson, and Toshiba. At present, LG and Samsung operate through fully-controlled Indian operations, while the Akai, Sansui and Toshiba brands are marketed by Videocon (Akai was initially with Baron International, and later sold to Videocon). Aiwa is now a subsidiary of Sony. Many multinationals such as Sony, LG, Samsung, and Matsushita entered on their own and quickly captured the imagination of the consumers with innovations in product quality and other features.

The Colour Television (CTV) set prices were very high in the early 1990s. A 21 inch CTV set was sold for around Rs.24000. That was the time when Indian brands such as ONIDA, BPL, and VIDEOCON made good profits for over a decade but did not reduce the prices-an obvious reason why the low income group was not able to buy CTVs. Penetration price strategy of MNCs such as AKAI, THOMSON, and SANSUI brought down CTV prices in the industry. Domestic TV manufacturers were also forced to follow the same price line. Among the MNC brands, LG and SAMSUNG TV sets made a greater impact in the early 2000's and gained superior brand value compared to the then established brands like SONY. Companies like LG and SAMSUNG made their presence felt in domestic appliances and electronics markets too (like refrigerator, air conditioner, washing machine, computer etc..) in addition to CTV sets. This blanket branding strategy helped them to gain higher levels of customer loyalty. MNCs seemed to have entered the Indian market aggressively and impressed upon Indian consumers with technically advanced products at a reasonable price. MNCs made their products more popular than the Indian products and to increased brand preferences for all their products.

**Objectives of the Study**

1. To analyze the marketing strategies influencing consumers’ preferences towards the selected MNC CTV sets.
2. To measure the consumer preferences to the selected MNC CTV sets and its association with sources of information.
4. To suggest better consumer oriented marketing strategies for MNC TV brands.

**Research Methods**

The research design employs descriptive, explorative and analytical methods. The basic information is obtained through the survey method by administering a questionnaire and through personal enquiries. All the three methods are concurrently used to employ their characteristic features for effective research design.

**Data for the Study**

The following are the different sources of information used for the purpose of the study. First hand information was collected directly from the sample respondents relating to their preferences. Secondary data sourcing was done from reputed educational institutions like IIM, IFMR and LIBA, the reports of various associations, research articles in various national, international journals, reports from daily papers and websites.

**Sample Size and Sample Criteria**

Six hundred samples are selected from the list given by the dealers concerned. About 565 filled in questionnaires were received from the respective customers. The researcher had rejected 48 incomplete questionnaires and the remaining fully completed 517 questionnaires were duly selected for analysis after a careful scrutiny.

**Results and Discussion**

Association between Possession of different brands of MNC CTV and Cluster of Product details.

Null hypothesis: No association between possession of different brands of MNC CTV and cluster of product details.

Table No:1  
Cross-tab

Possession	Cluster Number of Case			Total
	1	2	3	
LG	11	143	98	252
Samsung	19	109	65	193
Sony	0	40	32	72
Total	30	292	195	517

**Table No: 2**  
**Chi-Square Tests**

Statistics	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.313(a)	4	.015
Likelihood Ratio	15.611	4	.004
Linear-by-Linear Association	.069	1	.793
N of Valid Cases	517		

From the tables no.1&2 it is found that the Pearson's chi-square value is 12.313,  $p = .015$ . So it is found that the null hypothesis is rejected at 5% level of significance and concluded that there is association between possession of MNC CTV and cluster of product details. It is implied that the consumers with all types of brands like LG, Sony and Samsung possess different types of awareness present in the product details of MNC CTV.

**Association between Possession of different brands of MNC CTV and different Cluster of Price details.**

Null hypothesis: No association between Possession of different brands of MNC CTV and different Cluster of Price details.

**Table No: 3**  
**Cross-tab**

Possession	Cluster Number of Case			Total
	1	2	3	
LG	53	149	50	252
Samsung	53	99	41	193
Sony	11	35	26	72
Total	117	283	117	517

**Table No: 4**  
**Chi-Square Tests**

Statistics	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.605(a)	4	.013
Likelihood Ratio	11.861	4	.018
Linear-by-Linear Association	2.734	1	.098
N of Valid Cases	517		



From the tables no.3 &4 it is found the Pearson’s chi-square value is 12.605,  $p= .013$ . So the null hypothesis is rejected at 5% level of significance and concluded that there is association between possession of MNC CTV and cluster of price details. It is implied that the awareness and preference about price details differ among the consumers with different brands of MNC CTV, such as LG, Sony and Samsung.

**Association between possess of different brand of MNC CTV and cluster of promotion details**

Null hypothesis. No association between possess of different brand of MNC CTV and cluster of promotion details

**Table No: 5**  
**Crosstab**

Possession	Cluster Number of Case			Total
	1	2	3	
LG	79	117	56	252
Samsung	51	106	36	193
Sony	24	31	17	72
Total	154	254	109	517

**Table No:6**  
**Chi-Square Tests**

Statistics	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.390(a)	4	.356
Likelihood Ratio	4.397	4	.355
Linear-by-Linear Association	.001	1	.977
N of Valid Cases	517		

From the tables no 5 & 6 it is found that the chi-square value is 4.390,  $p=.356$ . So the null hypothesis is accepted at 5% level of significance and it is concluded that the consumers with different MNC CTV are possessing same preference, in fact they are attracted equally by the promotional schemes of MNC CTV.

**Association between Possession of LG, Samsung and Sony CTV and Cluster of Place details.**

Null hypothesis. No Association between Possession of LG, Samsung and Sony CTV and Cluster of Place details.

**Table No: 7**  
**Cross-tab**

Possession	Cluster Number of Case			Total
	1	2	3	
LG	57	137	58	252
Samsung	62	101	30	193
Sony	22	39	11	72
Total	141	277	99	517

**Table No: 8**  
**Chi-Square Tests**

Statistics	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.882(a)	4	.096
Likelihood Ratio	7.918	4	.095
Linear-by-Linear Association	5.915	1	.015
N of Valid Cases	517		

From the tables no. 7 & 8 it is found that the Pearson's chi-square value is 7.88,  $p = .096$  therefore it is observed that the null hypothesis is accepted at 5% level of significance and concluded that the consumers with different brands such as LG, Samsung and Sony are possessing the same preferences, in fact they were attracted equally by the place details of MNC CTV.

**Association between different brand MNC CTV and Over All clusters.**

Null Hypothesis: There is no association between Possession of different brands of MNC CTV and Overall Cluster of Marketing Mix

**Table No: 9**  
**Crosstab**

Possession	Cluster Number of Case			Total
	1	2	3	
LG	84	113	55	252
Samsung	66	77	50	193
Sony	33	27	12	72
Total	183	217	117	517

**Table No: 10**  
**Chi-Square Tests**

Statistics	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.752(a)	4	.218
Likelihood Ratio	5.648	4	.227
Linear-by-Linear Association	1.519	1	.218
N of Valid Cases	517		

From the above table it is ascertained that the chi-square value is 5.752,  $p=.218$ . So the null hypothesis is accepted at 5% level of significance and concluded that the consumers with different MNC CTV are possessing different opinions about product details, price details, promotion details and place details.

**Summary/Recommendations**

The findings of the study reveals that the LG CTV dominated MNC CTV market because of its captivating appearance, free maintenance and technically advanced features. The sales volumes of LG CTV were very much directly influenced by the consumers’ preference and recommendations. LG CTV’s price, offer mechanism, impressive advertisements, effective personal selling and timely after sales service enabled it to be a fast moving CTV with an edge over other MNC CTVs.

The findings confirm that the consumers’ next preference was Samsung CTV. This was due to its good product appearance, normal maintenance cost, reasonable price, exchange mechanism and technically advanced features. It secured popular brand image in the market. This brand was also accompanied with effective personal selling, easy finance and better after sale service. Samsung had a very effective distribution system as well.

The study also found out that the advanced features, good appearance; less expensive maintenance, affordable price and high cost benefit attract the customers to prefer Sony CTV. It also carried good brand image, better product availability, accessibility, finance and appealing exchange offer.

It is understood from the study that the LG, Samsung and Sony CTVs are preferred over other brands for reasons based on the product, price, place and promotion factors. Directly or indirectly these factors influence the preference of the consumers.

### **Conclusion**

On an overall basis, the Indian CTV consumers point out the fact that they are becoming more and more sophisticated in their television buying behaviour, which is predominantly reflected by the fact that they are seeking more information about the product features and benefits. They are also conscious of the good looks of the CTVs. Consumers are also very price conscious and have somehow perfected the art of equating the price with advanced features and innovative designs of CTVs. The selected MNCs have promoted television sets so effectively to the Indian consumers that they have influenced the consumers to become more aware of intricate product information, product features and product performance by which they are able to equate the prices with the quality of the performance of the product. Moreover, the consumers have become demanding more in terms of services, promotion, benefits and attention from the dealers.

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## **INVESTMENT PATTERN OF SELECTED SCHEMES OF PUBLIC SECTOR MUTUAL FUNDS IN INDIA – A STUDY WITH SPECIAL REFERENCE TO SELECTION OF INSTRUMENTS**

**K.P. Sivakumar\*, K. Antony Baskaran, S. Raja Mohan**

### **Abstract**

This article analyses the style of investment choice by the various fund managers of various public sector mutual funds. The UTI MF and SBI MF schemes are considered as sample for this study. The study has revealed that the fund managers play an important role in the performance of the respective Mutual Funds by deciding the choice of instruments and sectors. This study is restricted to decision on investment pattern based on instruments. The MF industry need to be investor friendly and significantly improve their portfolio disclosure practices. For all mutual funds, the key to success would be size, geographic reach, product innovation, better investment management skills and customer service.

**Key Words:**Public sector Mutual Fund, UTI MF, SBI MF, Investment Pattern, Fund Manager

### **Introduction**

Investment pattern is the prime concept for Mutual Fund (MF) industry. It involves a decision making process made by the expert committee to analyze the present economic scenario and the future progress of economy. Decision making is a vital aspect to explain the fund performance. Fund manager is the key person for the success of a particular scheme. The importance of any pattern of MF scheme lies in the firm grip of the decision making authorities called Fund Managers. In general, in any patterns of deployment of funds, the crucial decision taken for the matters of investment and reinvestment by the fund managers of the respective schemes is the most significant aspect of sustaining the portfolio. The most important function of the MF managers is to generate superior performance by their stock selection techniques and by timing the stock market correctly, irrespective of the sector they fall in, over a period of time. So, it is mandatory on the part of the fund managers to have adequate knowledge, strategic skills and individualistic expertise in the areas for any fund manager.

### **Concept of Investment Pattern**

The MFs are in an enviable position to offer dependable investment options to the needy investors. The concept of investment decision taken by the fund manager is vital. So, the formulation of objectives which are classified according to the groups of schemes as growth, income, balanced, thematic funds and tax savings is expected to be strategic technical and performance oriented. The MF schemes having a long-term investment policy of a short-term benefit may deviate from the stated policy and gain benefits from the market movements. This is called investment strategy. Usually investment policies are derived from a variety of sources such as investment pattern, securities included in the set portfolio, portfolio turnover, quantum of capital gain, income and market timing and so on.

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The role and responsibility of the fund managers should include the investors' protection at the time of instrument choosing and of selection of sectors. The investors interest occupies a significant place in the concept of decision making. The prime objective of all MF is to ensure adequate safety, liquidity and profitability of the small investors on their hard earned money deposited with MFs. So, the fund managers have the responsibility to protect the investors in all respects.

### **Need for the Study**

The investor's return includes not just yield by way of annual dividends, but also capital appreciation of units over a period of time, along with periodical rights and bonus. Thus MF strives to achieve three components by investing the funds mobilized by various schemes generally, in low or medium risk but high yield instrument. Fund managers have to exercise maximum caution by choosing an important portfolio. In this context of investment the fund managers need to balance between two extremes such as defensive strategy and another one aggressive strategy. Thus in mediating between these two strategies the fund managers can prove their technicality, market experience and analytical skill. As the whole, help out the investors in selecting a portfolio of assets that guarantees the benefits of safety, liquidity and profitability. Hence the attempt has been made to examine the investment pattern of mutual funds based on selection of instruments.

### **Review of the Literature**

Bodie and Samuelson (1974) made a study on portfolio choice in life cycle model. They concluded that younger individuals have less risk aversion because of the flexibility they have on their labour. This study recommends that they can establish their own labour-leisure pattern and this flexibility gives them the capacity for compensating losses from folding risky assets as they have more number of productive years.

An analysis of an individual investors risk aversion and investment portfolio composition was made by Wilbour Lawellen and Lease (1975) and they identified that the investors age and their risk taking propensities were inversely related.

Pinto and Jerald (1992) have incorporated an empirical study investigating the informational efficiency of the US capital market. The evidence of each study is consistent with a traditional view of market efficiency. The first study examines the forecasting ability and performance of balanced MF contemporaneously available to investors, between 1965 and 1985 using quarterly asset composition information in Wiesenberger management results. It was found out from the first study that

- i) The asset allocation decision, exhibited insignificantly positive success overall in forecasting the sign of the stock bond relative return; the distribution of successes overtime did not exhibit clustering.
- ii) Macro forecasting performance was natural for funds as a group; ability to forecast interest rate was outweighed by inferior forecasting with respect to common stock.
- iii) The typical fund did not present the opportunity for a marginal mean variance improvement over a buy and hold investment in any of several benchmark portfolio.

Prather and Larry Joseph (1995) in their study re-examined the performance evaluation of managed portfolios. Past measures of portfolio evaluation such as the measures of Sharpe, Treynor's and Jensen are subject either to the inability to rank performance based on statistical significance or single factor CAPM return generating process and the selected market portfolio. They suggested that the performance ranking was sensitive to the selection of the market Proxy when the security market line was used to evaluate performance.

Nicolas P B Bollen and Jeffrey A Busse (June 2001) analyzed the existing studies of MF market timing monthly returns and found little evidence of timing ability. It is shown that the daily tests are more powerful and that the MF exhibit significant timing ability more often in daily tests than in monthly tests. A set of synthetic fund returns is constructed in order to control spurious results. The daily timings coefficient of the majority of funds are significantly different from their synthetic counterparts. These results suggest that MFs may possess more timing ability than previously documented.

A consulting firm Praxis of Delhi (2000) on analyzing the pattern of response to the public issues of different companies, concluded that of the four metros Mumbai ranked first with 66.53 per cent response to equity and hybrid issues in 1999 to 2000. Chennai accounted for 2.07 per cent only and it is an indication that Chennai investors are risk averse.

VidyaViswanathan (2001) analyzed the impact of UTI decision to stop repurchases of unit scheme-64 (US-64). The major holdings of the schemes are debt investments (govt. of India securities -20.73 per cent) and equity stocks of Reliance, Infosys, Tisco. These stocks were purchased during the period of controller of capital issues regime and bought at cheaper prices. The NAV was based on administered pricing. Repurchase of units were done from the fund mobilized rather than from the reserves. The author concluded that UTI should have gone for market driven NAV during Jan - 2000. When their repurchase price was equal to NAV, UTI had missed that opportunity.

T.Ramasamy and V.Balasubramanian (2005) concluded that the UTI MF is a strong force poised to serve the investors living in every nook and corner of the country. It is the largest MF house in India. In terms of head count, the UTI MF has around 85 per cent of the total investors of the industry. The UTI MF operates 42 domestic schemes and 4 off shore funds. It has a variety of funds to suit the different needs of people hailing from all walks of life. The management is sharply focused on its main business and is properly positioned to mobilize the savings of the community so as to enable it to maintain the leadership position in the industry.

### **Objectives of the Study**

The objectives of the study are as follows:

1. To study the investment pattern of various schemes of UTI Mutual Fund and SBI Mutual Fund.
2. To examine the composition of various instruments in each scheme of the mutual fund.

3. To ascertain the annual growth rate of various instruments held under various schemes of UTI Mutual Fund and SBI Mutual Fund.

### Methodology

This study is a blend of both the descriptive and the analytical method. This article attempts to analyse the style of investment choice by the various fund managers of public sector mutual funds. The UTI Mutual Fund and SBI Mutual Fund schemes are considered as sample for this study. This study is restricted to decision on investment pattern based on instruments.

The information related to the investment pattern of Mutual Funds by public sector participants has been collected from the annual reports of the respective schemes released from the respective institutions. Mostly these are second hand information used for data analysis purpose. The necessary secondary data were collected for the period 2005-06 to 2009-10 and they were tabulated. The percentage analysis and annual compounded growth rate (ACGR) were the statistical tools used for analysis.

### Results and Discussion

#### Investment Pattern of UTI MFs

The UTI MF house mobilises the funds from five different schemes. The mobilized funds are channelized with various instruments preferred by the expert team. Depending upon the economic condition prevailed, the managers choose the pick-up of instruments over the years. The art of choosing the instruments is the success of the scheme. Table 1 shows the investment pattern of UTI MFs.

**Table-1**  
**Investment Pattern of UTI Mutual Funds (5 Schemes) (Rs. in Crores)**

Types of Investment	2005-06	2006-07	2007-08	2008-09	AC GR
Equity and Preference shares	3,42,085 (85.95)	3,25,455 (80.03)	3,59,308 (78.57)	1,99,586 (73.75)	-12.60
Debentures	14,683 (3.68)	28,291 (6.95)	22,398 (4.90)	4,604 (1.70)	-25.17
Deposits and others	26,856 (6.75)	24,021 (5.90)	36,449 (7.97)	45,526 (16.82)	+14.14
Govt. Securities	4,622 (1.16)	5,641 (1.38)	2,088 (0.45)	588 (0.21)	-40.28
Commercial papers	-	-	6,388 (1.40)	4,721 (1.74)	-14.03
Others investment assets	9,761 (2.45)	23,233 (5.70)	30,647 (6.70)	15,612 (5.76)	+12.46
Total	3,98,007 (100)	4,06,641 (100)	4,57,278 (100)	2,70,637 (100)	-9.18

**Source:** 1. Annual Reports of five UTI MF Schemes  
2. Figures in brackets indicate percentage

The investment of UTI schemes has the maximum in equity and preference shares on a continuous basis. This is followed, with a wide margin by investments in deposits,



debentures and other investment assets. The percentage of total funds invested in equity shares and preference shares has been declining from 86 per cent in 2005-06 to 74 per cent in 2008-09. But, the percentage of investments in deposits has been on an increasing trend from 6.75 per cent in 2005-06 to 17 per cent during 2008-09. Thus, in debentures and bonds the percentage of investments has seen ups and downs during the study period. But, other investment assets are marginally increased from 2.45 per cent in 2005-06 to 5.76 per cent during 2008-09. Hence, it is concluded that the fund managers always prefer to invest at the maximum amount in equity and preference shares followed by deposits, debentures and other investment assets due to good performance of the funds over the period.

Over the course of four year period, the equity and preference shares of investment declined from Rs.3,42,085crores to Rs.1,99,586crores and its annual compounded growth rate (ACGR) was -12.60 per cent. The debentures investment also declined from Rs.14,863crores to Rs.4,604crores and its overall growth was -25.17 per cent. Deposit and others grew from Rs.26,856crores to Rs.45,526crores, further, the overall growth was 14.10 per cent. Government securities declined from Rs.4,622crores to Rs.588crores and its ACGR was -48.8 per cent. Hence, the overall performance of investment declined from Rs.3,98,007crores in 2005-06 to Rs.2,70,637crores in 2008-09 and its ACGR was -9.19 per cent.

#### Investment Pattern of UTI Mid-Cap Fund

Mid-cap fund is said to have been preferred for investment only in medium size companies. Some of the investors may prefer to invest in short term funds for a period between one and three years. At present in India, the performance of medium level companies is good. Hence, the fund managers prefer to invest in mid size industries. The unique approaches and aptitude of every manager results in the most individualized performance of the fund. Table -2 explains the investment pattern of UTI mid-cap fund.

**Table -2**  
**Investment Pattern of UTI Mid-Cap Fund ( Rs in Lakhs)**

Types of Investment	2005-2006	2006-2007	2007-2008	2008-2009	ACGR
	31.03.06	31.03.07	31.03.08	31.03.09	
Equity and Preference Shares	7,460.38 (92.34)	6,681.86 (88.56)	26,412.86 (85.41)	10,663.81 (73.55)	+9.34
Deposits and others Investments	441.00 (5.46)	533.84 (7.08)	4,089.04 (13.22)	3,500.34 (24.14)	+67.85
Other current assets	177.87 (2.20)	327.16 (4.34)	424.47 (1.37)	333.80 (2.30)	+17.04
Total	8,079.25 (100)	7,542.86 (100)	30,926.37 (100)	14,497.95 (100)	+15.74

**Source :**  
1. Annual Reports of UTI MF  
2. Figures in brackets indicate percentage

It is obvious from Table 2 that maximum investments have been made in the equity shares continuously from 2005-06 to 2008-09. However, during 2005-06 the

percentage of deposits and other investments has been increasing from 5.46 per cent to 24.14 per cent in 2008-09. The proportionate share of equity shares was found as high as 92.34 per cent during 2005-06. Further, it is important to note that deposits and other investments have also emerged as preferable financial assets. During the last two years 2007-08 and 2008-09, the investment in current assets has slowly come down during the study period. For the period of four years the equity and preference shares grew from Rs.7,460 lakhs to Rs.10,663 lakhs and its ACGR was 9.34 per cent. The other current assets grew from Rs.177 lakhs to Rs.333 lakhs during the study period between 2005-06 and 2008-09, and its overall return was 17.04 per cent. Hence, the overall performance grew from Rs.8,079 lakhs in 2005-06 to Rs.14,497 lakhs in 2008-09 and the ACGR was 15.74 per cent.

### Investment Pattern of UTI Master-Growth Unit Scheme

Master Growth Unit Scheme aims to obtain the maximum growth for the scheme. These types of funds are aggressive in nature. The investors want to earn high return from their investments. Investors who prefer to take high risk expect high returns. Table 3 presents the details of investment pattern of UTI master growth unit scheme.

**Table -3**  
**Investment Pattern of UTI Master-Growth Unit Scheme** (Rs.In Lakhs)

Types of Investments	2005-2006	2006-2007	2007-2008	2008-2009	ACGR
	31.03.06	31.03.07	31.03.08	31.03.09	
Equity and Preference Shares	35,880.31 (91.15)	34,392.42 (90.15)	34,249.11 (87.99)	15,901.75 (60.11)	-18.41
Deposits	1,848.44 (4.70)	416.47 (1.09)	2,358.07 (6.06)	8,424.77 (31.85)	+46.11
Current Assets	1633.90 (4.15)	3,340.30 (8.76)	2,315.82 (5.95)	2,123.56 (8.03)	+6.77
Total	39,362.65 (100)	38,149.19 (100)	38,923.00 (100)	26,450.08 (100)	-9.62

Source: 1. Annual Reports of UTI MF  
2. Figures in brackets indicate percentage

The UTI MF invested more than 90 per cent of its funds in equity shares during the year 2005-06 and 2006-07. However, in the years 2007-08 and 2008-09 the proportion of investment in equity shares remained over 88 per cent and 60 per cent respectively. The investment in current assets has also emerged as preferable financial asset during the study period. Further, investment in deposits during 2005-06 was 4.70 per cent, whereas in 2008-09 the investment in deposit was 31.85 per cent. The above table depicts that due to economic slowdown during the year 2008-09, the fund managers have shifted investment strategy from equity shares to deposits. Amount of investment in equity and preference shares has declined from Rs.35,880 lakhs to Rs.15,901 lakhs during the period from 2005-06 to 2008-09 and the ACGR was -18.41 per cent. In addition, the deposits grew from Rs.1,848 lakhs in 2005-06 to Rs.8,424 lakhs in 2008-09. The overall performance has declined from Rs.39,632 lakhs in 2005-06 to Rs.26,450 lakhs in 2008-09 which resulted in a negative ACGR of 9.62 per cent.

### Investment Pattern of UTI Balanced Fund

The balanced fund basically gives equal weightage for risk and return. The proportion of investments equally preferred are aggressive and defensive instruments. Generally, these types of investors are moderate risk takers. Hence, the fund managers have to concentrate on both returns and capital protection. Table 4 exhibits the details of investment pattern of the UTI balanced fund.

**Table -4**  
**Investment Pattern of UTI Balanced Fund (Rs. In Lakhs )**

Types of Investment	2005-2006	2006-2007	2007-2008	2008-2009	ACGR
	31.3.06	31.3.07	31.3.08	31.3.09	
Equity and Preference Shares	33,116.77 (51.61)	68,703.25 (61.14)	70,087.63 (63.92)	47,920.35 (77.77)	+9.68
Debentures and Bonds	14,683.22 (22.88)	28,290.71 (25.18)	22,398.03 (20.43)	4,603.64 (7.47)	-25.06
Govt. Securities	4,621.87 (7.20)	5,641.28 (5.02)	2,087.87 (1.90)	588.12 (0.95)	-40.27
Deposits and other Investments	6,437.58 (10.03)	4,893.54 (4.35)	8,488.58 (7.74)	6,835.61 (11.09)	+1.51
Current Assets and others	5,305.79 (8.27)	4,844.90 (4.31)	6,587.56 (6.01)	1,663.83 (2.70)	-25.17
Total	64,165.23 (100)	112,372.68 (100)	109,649.67 (100)	61,611.55 (100)	-1.01

Source: 1. Annual Reports of UTI MF schemes  
2. Figures in brackets indicate percentage

The Balanced Fund that was invested in equity shares was 52 per cent in 2005 – 06 , 61 per cent in 2006 - 07, 64 per cent in the year 2007 – 08 and 78 per cent during 2008 - 09. The debentures and bonds investment range from 20 per cent to 25 per cent except during the year 2008-09. The investment in Govt. securities gradually declined from 7.20 per cent in 2005-06 to 0.95 per cent in 2008-09. There were ups and down in the investment in deposits and current assets throughout the study period. The investment in equity and preference shares grew from Rs.33,116 lakhs in 2005- 06 to Rs.47,920 lakhs in 2008- 09 and its ACGR was 9.68 per cent. The investment in debentures and bonds haddeclined from Rs.14,683 lakhs in 2005-06 to Rs. 4,630 lakhs in 2008-09. Further, the deposit and other investment grew from Rs.6,437 lakhs in 2005- 06 to Rs.6,835 lakhs in 2008 – 09 and its overall ACGR was 1.51 per cent. It is noted that the overall performance has declined from Rs.64,165 lakhs in 2005 – 06 to Rs. 61,611 lakhs in 2008- 09 and the ACGR was -1.01 per cent.Hence, it is clear that the fund managers have preference for certain forms of instruments like equities and debentures and they do not give significant importance to deposits and current assets..

### Investment Pattern of SBI MF

The SBI MF house is a public sector bank sponsored MF. The same exposure may be effectively utilized to the MF schemes. Both the SBI and the SBI MF transactions are financial in nature. Moreover, the SBI MF house has to play an important role to fulfil the investors' expectation. Table 5 presents the investment pattern of select MFs schemes.

**Table - 5**  
**Investment Pattern of SBI MFs (4 Schemes) (Rs in Crores)**

Types of Investments	2007-2008	2008-2009	2009-2010
Equity shares	2,25,42,957	1,48,299	3,36,539
	(96.38)	(78.05)	(90.70)
Debentures	-	227	1010
	-	(0.00)	(0.00)
Certificates of Deposits	-	9,835	10,234
	-	(5.17)	(2.75)
Debt Securities	-	12,500	-
	-	(6.57)	-
Deposits	860	8,466	4,111
	(0.00)	(4.45)	(1.10)
Other Current Assets	8,45,110	10,682	9,418
	(3.61)	(5.62)	(2.53)
Total	2,33,88,927	1,90,009	3,71,027
	(100)	(100)	(100)

Source: 1. Annual Reports of SBI MF schemes  
2. Figures in brackets indicate percentage

In the year 2008- 09, SBI MF schemes preferred to invest in equity shares upto 78 per cent and the same investment was 96.38 per cent and 90.70 per cent during 2007- 08 and 2009- 10 respectively. The investment in current assets were 3.61 per cent, 5.62 per cent and 2.53 per cent during 2007- 08, 2008- 09 and 2009- 10 respectively. All other investments were made at marginal level only. Hence, it is concluded that irrespective of the funds' objective, majority of the fund managers give priority to investment in equity shares to a greater extent.

### Investment Pattern of Select Schemes of SBI MFs

SBI MF is the first institution to get permission from the Securities Exchange Board of India (SEBI). SBI MF is the first bank sponsored MF to enter in this new business in the year 1987. The entry of public sector MF institutions changed the mindsets of retail investors from post office savings to MF investment. Table 6 explains the investment pattern of select SBI MF schemes.



Table 6. shows that during 2008- 09, the managers of SBI Magnum Tax gain, the SBI Magnum Global Fund, SBI Pharma Fund and the SBI Contra Fund preferred to invest in equity shares on an average of 77 per cent, but in the same period, the managers of SBI IT Fund and the SBI FMCG Fund chose to invest 80 per cent and 88 per cent respectively. Further, during 2009- 10, all the fund managers preferred to invest at the maximum level between 93 per cent and 96 per cent. In 2008- 09 and 2009- 10, all the fund managers also showed preference to invest in deposits than other current assets at significant level. It is clear that during 2007- 08, the global economic meltdown created an impact to reduce the investment in equity shares. Later, the global economy gradually recovered, and the fund managers again preferred to invest in equity shares at the maximum per cent in the year 2009- 10.

### **Conclusion**

The fund managers role is in fact designed to promote the international recommendations of equity culture as the most influential target of MF houses. The investment pattern is on the basis of instrument chosen by the fund managers . The maximum preference is given to investments in the forms of equity and preference shares followed by debentures and bonds, certificates of deposits, current assets, commercial papers and govt. securities. In the case of investment pattern based on choosing industry-wise the preferences may be arranged as industrial capital goods and industrial products, consumer durables, banks and finance, auto ancillaries, software, hardware, retailing and so on. All the players operate in the same environment and everybody gets one's share of business. There is a huge market available in the country for channelizing the savings of the people into MFs.

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## **PERFORMANCE OF AGRICULTURE IN THE CHANGING STRUCTURE OF THE TAMILNADU ECONOMY: ISSUES REVISITED**

**A. Xavier Susairaj\* and V. Siva Sankar**

This paper discusses the nature of structure change in the economy of TamilNadu. The trend in the changing share of the different sectors to Gross State Domestic Product has been analyzed in brief. As the major factor of the study is agriculture, the state agricultural production and productivity has been measured. Using an empirical model.

**Key words:** Growth rate, Agricultural Production, Productivity, Tamil Nadu Economy.

**Introduction:** In any less developed region, agriculture is the prime sector of economic activity. It provides not only food and raw materials but also employment to people. Ricardo (1817) viewed the predicament of diminishing returns to agriculture as fundamental. He held that a check on the growth of agricultural output sets the upper limit to the growth of the nonagricultural sector. Kuznets (1965) discussed the contribution of agricultural sector as market contribution and factor contribution. Meier (1995) emphasis on agricultural development is for sustaining expansion in nonagricultural sector. The widely debated structural transformation process itself dependent on agricultural progress.

This paper examines the nature of structural transformation in TamilNadu economy and performance of agricultural sector. Section2 presents a brief background of the TamiNadu agrarian economy. Section 3 provides the data sources and methodology for various indicators used. Section 4 examines the nature of the structural transformation. Section 5 issues of measurement of agricultural production and productivity of food crops and non-food crops were analyzed.

### **11. Background**

The economy of Tamil Nadu is characterized by the dominance of agricultural sector. Nearly, seventy percent of its population live in rural area and depend on agriculture for their livelihood.

Agriculture continues to be the mainstay of the state's economy with contribution about 20 percent to net state domestic product during 2010-11. The agriculture alone provides direct and indirect employment to around 60 percent of total workforce of the state as per 2011 provisional census. Nevertheless, the sector is continued to be characterized by low productivity. Nearly 70 percent of the cultivable land is rain fed and exposed to the vagaries of the monsoon. The percapita availability of cultivated land, which was 0.39 ha, in 1950-51, has declined to 0.17 ha, in 2010-11. Out of the total number of operational holdings of 72 lakhs, small and marginal farmers do not have the means to make adequate investment in agriculture

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due to poverty. Although the contribution of agriculture to GSDP has significantly declined, the percentage of work force engaged in agriculture has remained somewhat unchanged. This implies that there has been an overcrowding in agriculture without any perceptible increase in production. As the pace of industrialization in the state is slow and has not taken off, agriculture continues to provide sources of livelihood to a significant segment of population. Therefore, agricultural growth holds the key to the overall development of a state by way of creating employment, generating income, providing raw materials, to the industrial sector and last but not the least ensuring self- reliance in food production and food security to the deprived sections.

### **III. Data, Scope and Methodology**

The study is based on secondary data. The major source of the data for this study is TamilNadu Agricultural Statistics published by Directorate of Agriculture and Food production, Tamil Nadu

The labour data has been taken from Tamil Nadu Hand Book of Statistics which reproduced the Census of India Report. The state domestic product data has been taken from Estimate of domestic product, published by Directorate of Statistics and Economics Tamil Nadu. The study covered the period from 1990-2010 for which the latest data are available. The agricultural productivity is measured the empirical model has been estimated by generalized least square estimators, which discussed in detail later in the paper.

### **IV. Structural Change and Place of Agriculture**

There has been a marked structural transformation in the Tamil Nadu economy in the 1990 to 2010.

The inter-sectoral and intra- sectoral composition of GSDP underwent a significant change. The service sector has come to occupy a place of prominence in terms of its relative contribution to GSDP. Primary sector whose share was 21 per cent of GSDP in 2009-10. It has fallen sharply. Secondary sector in Tamil Nadu is rising at 34 per cent. The service sector has increased significantly from 43.27 percent in 1991. To 45 per cent in 2009-10. This is the only sector in Tamil Nadu economy that registered a spectacular growth in these twenty years in terms of its share in GSDP. The share of agriculture in GSDP, has declined significantly from 20.1 per cent in 1990-91 to 19 percent in 2009-10. To study the pattern of GSDP and the relative share of primary sector as a whole and agriculture over the period, we have fitted the following linear regression equation. Here, we have taken year as the independent variable and shown the movement of primary sector share and agriculture (as a subgroup of primary sector) share in GSDP.

**Regression equation** was used to calculate the growth rate of primary sector before and after reform periods. To find out the growth rate between the primary and secondary sector

in the post reform period and pre reform period during the years was calculated. From the simple OLS (ordinary least square) Regression equation the following are the important conclusions.

From equation 1, it is found that the share of primary sector is going down over the periods. there is a decline in share of primary sector by .37 percent as one unit change in time occurs. The model is highly significant with high- adjusted R square value. In equation 2, dependent variable is share of agriculture in GSDP. The share of agriculture is going down over the periods in gross state domestic product. The share of agriculture in primary sector falls by 0.27 percent with one unit change in time. Hence it implies a fall in share of agriculture in primary sectors in the post reform period.

Therefore, from the above discussions it is clear that over the years, primary sectors share in GSDP is decreasing fast and service sectors share has registered a significant increase. The share of agriculture in GSDP and in primary sector is declining over the years. The labour force has not moved out from primary sector through its share in GSDP has declined.

**Table-1: Contribution of Sectors to GSDP(1990-91 Prices) in TamilNadu**

Year	Primary percentage to GSDP	Secondary percentage to GSDP	Service percentage to GSDP	Agriculture percentage to GSDP
1990-91	22.2	34.53	43.27	20.1
1991-92	23.93	31.22	44.85	20.1
1992-93	23.27	31.82	44.91	23
1993-94	24.32	32.40	43.27	22.5
1994-95	23.79	32.82	43.37	22.64
1995-96	19.92	34.28	43.28	22.23
1996-97	18.55	32.38	45.81	18.43
1997-98	19.44	30.79	49.74	17.11
1998-99	20.06	28.94	51.01	18.16
1999-00	19.74	29.86	50.4	18.81
2000-01	19.60	30.76	52.71	17.81
2001-02	19.66	39.76	54.77	18.0
2002-03	21.4	46.39	56.1	18.1
2003-04	17.18	48.34	59.3	19.68
2004-05	12.26	41.0	58.2	21.06
2005-06	10.91	27.52	53.32	17.16
2006-07	13.07	35.0	54.30	10.91
2007-08	19.8	39.82	58.31	18.1
2008-09	20.0	38.0	50.0	19.81
2009-10	21.0	34.0	45.0	19.0

Source: Estimate of state Domestic Product, Directorate of Economics and Statistics, TamilNadu.

**Table 2, The OLS result of changing share of sectors with respect to years**

Equation		1	2
Dependent variable		PRI	AGPRI
Coefficient of independent Constant		20.47	22.34
Variable	X (year)	0.37	-.27
t-statistics	constant	22.1	22.68
	X(year)	-3.18	2.68
Adjusted Rsquare		0.32	.24
Fstatistics		10.15	7.21
D-W Statistics		0.70	1.03

PRI=Share of primary sector in GSDP, AGPRI=Share of agriculture in primary sector, dummy=1 for Post reform period.

### **Agricultural Diversification in Tamil Nadu**

Tamil Nadu shares about 4 per cent in respect of the geographical area, 7 per cent of population and 3 per cent of water resources of the country. The gross cropped area in 2008-09 accounted for about 39 per cent of the total geographical area, of which 56 per cent of the land was irrigated. However, the agriculture sector ensures household food security and brings forth equity in distribution of income and wealth which would result in the reduction of poverty.

The growth in the production of agricultural crops depends on many factors such as area cropped, input management and yield. The cropped area and productivity are determined by the fertility of soil, monsoon behavior, rainfall, irrigation, availability of agricultural labourers, climatic changes, prices etc. The principal crops like paddy, coarse cereals and pulses, groundnut, cotton and sugarcane accounted for more than 60 per cent of the gross cropped area of the State.

The major crops being cultivated are paddy, millets, pulses, oilseeds, cotton and sugarcane. Food grains have had a dominate share of crops cultivation in the State. Gross cropped area and production of principal crops is influenced by the spatial-temporal distribution of rainfall primarily during the north-east monsoon and the south-west monsoon periods. Owing to occurrence of droughts for three years in a row, the area brought under total food grains recorded a fall in terms of area, production and yield rate during 2002-03.

Area under total food grains decreased from 34.52 lakh hectares in 2001-02 to 27.92 lakh hectares in 2002-03. Total food grains production plummeted from 76.89 lakh tonnes in 2001-02 to 44.59 lakh tonnes in 2002-03. The yield rate of food grains decreased from 2228 kgs

to 1597 kgs. The area under paddy crop had declined from 20.60 lakh hectares in 2001- 02 to 15.17 lakh hectares in 2002-03. A dip in the area got reflected in the production of paddy. The total paddy production drastically tumbled to 35.77 lakh tonnes in 2002-03 from 65.84 lakh tonnes in 2001-02 the decline being 45.6 per cent. In sympathy with decline in area and production, the yield rate of paddy had also dipped by 26.2 per cent from 3196 kgs in 2001-02 to 2359 kgs in 2002-03.

Paddy is the staple food crop grown extensively in the rice bowl of the State namely the Cauvery delta districts viz., Thanjavur, Thiruvaur and Nagapattinam. Of the total area under food grains, the share of area under paddy had come down from 60 per cent in 2001- 02 to 54 per cent in 2002-03. The area under food grains had declined by 19.1 per cent from 34.52 lakh hectares in 2001-02 to 27.92 lakh hectares in 2002-03. Like-wise the total area under cotton, oilseeds and sugarcane except coarse cereals had witnessed a fall in 2002-03.

The total cropped area of food grains including paddy, coarse cereals, millets, pulses etc. both under kharif and rabi season together increased marginally from 30.97 lakh ha in 2007-08 to 31.91 lakh ha. in 2008-09. The total production of food grains had accelerated from 65.82 lakh tonnes in 2007-08 to 71.02 lakh tonnes in 2008-09, the increase being 7.9 per cent. Turning to productivity, the yield rate of food grains had witnessed a positive trend which had improved from 2125 kgs/ha to 2225 kgs/ha during the review year.

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Food grains production mainly consist of paddy, millets and pulses. In the food productions are divided into two broad categories: cereals and pulses. The cereals included rice, jowar, bajara, ragi, maize, korra, varagu, samai and others. The pulses included bengal gram redgram, greengram, blackgram, horsegram, and other pulses. Both, cereals and pulses have been sharply declined in present decade and as a result the total food production declined, from 2000-01 to 2008-09 (see table1). The total food grain production was 8616783 tonnes in 2000-01 and it declined to 7101735 tonnes in 2008-09. These declined much sharper in 2003-04 and these were due to drought. The deficient rainfall adversely impacted in the production of food grains.

In the case of non-food crops production have amplified very elevated in 2000-01, the non-food crop production was 9671186 tonnes and it rose to 38843340 tonnes in 2008-09 (see table 2). The noted point is that the food production had declined in 2003-04, but non-food production had increased in the above period. Between 2007-08 and 2008-09 the food production increased but non-food production declined from 45592787 to 38843340. The fluctuation of food crops and non food crops had shown in figure 1 and 2. The food crop continuously fluctuated and to declined and in the non-food crop also fluctuated and to increased.

**Table 1**

**PRODUCTION OF FOODGRAIN BY CROPWISE (in tonnes)**

	2000-01	2001-02	2003-04	2004-05	2007-08	2008-09
<b>A. CEREALS</b>						
1. Rice	7366320	6583630	3222776	5061622	5039954	5183385
2. Jowar (Cholam)	306020	274840	245933	252063	247836	213436
3. Bajra (Cumbu)	170370	152970	172341	124300	85840	84021
4. Ragi	259490	235310	176381	154085	175944	169944
5. Maize	139916	118463	250992	294717	810057	1257882
6. Korra	1131	652	1091	793	405	411
7. Varagu	13640	16330	9876	10455	8144	5679
8. Samai	44990	33060	27808	27866	24281	16503
9. Other cereals	2263	2887	3769	3712	4254	3104
<b>Sub Total (A)</b>	<b>8304140</b>	<b>7418142</b>	<b>4110967</b>	<b>5929613</b>	<b>6396715</b>	<b>6934365</b>
<b>B.PULSES</b>						
10. Bengalgram	3636	4551	4349	3942	4587	4363
11. Redgram	45060	41420	27475	28979	21077	16703
12. Greengram	61550	53470	53315	61760	46213	31336
13. Blackgram	132500	104320	75920	82998	79980	82983
14. Horsegram	46830	42570	18240	20110	21339	21052
15. Other pulses	23067	24388	21757	18642	11728	10933
<b>Sub Total (B)</b>	<b>312643</b>	<b>270719</b>	<b>201056</b>	<b>216431</b>	<b>184924</b>	<b>167370</b>
<b>TOTAL FOOD</b>	<b>8616783</b>	<b>7688861</b>	<b>4312023</b>	<b>6146044</b>	<b>6581639</b>	<b>7101735</b>

Source: Season and Crop Reports

**Table 2****PRODUCTION OF NON-FOODGRAIN BY CROPWISE (in tones)**

<b>CROPWISE PRODUCTION OF NON-FOODGRAIN</b>						
<b>Crop</b>						
<b>Non-Food Crops</b>	<b>2000-01</b>	<b>2001-02</b>	<b>2003-04</b>	<b>2004-05</b>	<b>2007-08</b>	<b>2008-09</b>
1.Sugarcane	3318830	3261490	19529277	24457244	38070965	32798888
2.Chillies	55266	41515	40067	44631	34084	32924
3.Turmeric	158643	118257	67250	118447	146008	172334
4.Coriander	6176	6943	9835	8391	5120	4817
5.Tamarind	67170	67589	65879	67136	62960	62063
6.Tapioca	4295529	4153046	3201414	4563776	5912307	4533359
7.Cotton	316600	229730	122687	185960	200673	187673
8.Caster	8946	7988	2972	2598	1624	1702
9.Groundnut	1358440	1249630	918241	1005342	1047586	974768
10.Gingely	64610	45990	29004	33840	32201	32242
11.Sunflower	8360	8530	13408	19303	70203	34356
12.Tabacco	12616	9015	9726	9274	9056	8214
<b>Total Non-food Crops</b>	<b>9671186</b>	<b>9199723</b>	<b>24009760</b>	<b>30515942</b>	<b>45592787</b>	<b>38843340</b>

**Source:** Season and Crop Reports

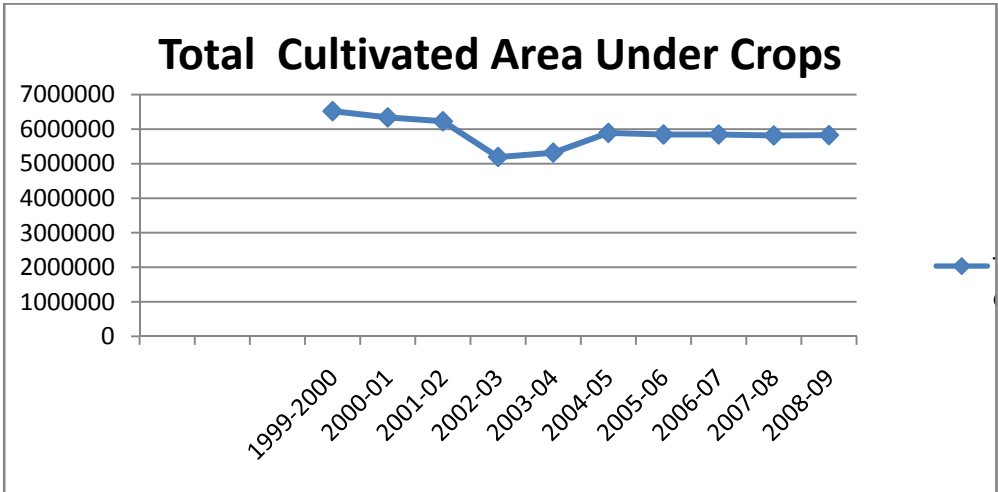
There are number of factors responsible to decline the production of food crops like reduction of public investment in agriculture, fertility of the soil, irrigation, climate and price. These factors are directly responsible and the indirect factors are WTO. In addition to this, area under cultivation of crop have been declined in the post-reform period; both food and non-food. In 1999-00, the area under food crop cultivation was 4657707 hectares and it continuously declined to 4268583 hectares in 2008-09. Similarly, in the non-food crop also declined from 1861402 hectares to 1555665 in the above respective periods. Despite, the area under crops declined had much among food crops than non-food crops (see table 3).

**Table 3**  
**AREA UNDER CROPS (in Hectares)**

<b>GROUPWISE AREA UNDER CROPS</b>		<b>1999-2000</b>	<b>2000-01</b>	<b>2001-02</b>	<b>2002-03</b>	<b>2003-04</b>	<b>2004-05</b>	<b>2005-06</b>	<b>2006-07</b>	<b>2007-08</b>	<b>2008-09</b>
<b>Sl.No</b>	<b>Crop</b>										
<b>A. FOOD CROPS</b>											
1	Cereals	2940222	2812857	2766169	2228992	2300397	2696555	2791400	2629611	2487987	2655525
2	Pulses	692539	687931	685403	562983	536849	590250	525237	536529	609552	535859
	<b>Food Grains</b>	<b>3632761</b>	<b>3500788</b>	<b>3451572</b>	<b>2791975</b>	<b>2837246</b>	<b>3286805</b>	<b>3316637</b>	<b>3166140</b>	<b>3097539</b>	<b>3191384</b>
3	Spices and Condiments	181588	171776	165707	151291	159654	148216	135190	148075	145393	145714
4	Sugar crops	331748	330086	335774	276093	206254	235605	348437	404118	366204	319843
5	Fruits and Vegetables	511610	532872	540255	480400	514779	555854	598203	615585	624577	611642
	<b>Other Food Crops</b>	<b>1024946</b>	<b>1034734</b>	<b>1041736</b>	<b>907784</b>	<b>880687</b>	<b>939675</b>	<b>1081830</b>	<b>1167778</b>	<b>1136174</b>	<b>1077199</b>
	<b>Total Food Crops</b>	<b>4657707</b>	<b>4535522</b>	<b>4493308</b>	<b>3699759</b>	<b>3717933</b>	<b>4226480</b>	<b>4398467</b>	<b>4333918</b>	<b>4233713</b>	<b>4268583</b>
<b>B. NON-FOOD CROPS</b>											
6	Fibre	181790	173820	167779	78929	97979	129628	109753	100356	99339	114522
7	Oil Seeds	1222941	1169029	1123733	942700	1053349	1079051	1087412	973985	1049376	982070
8	Dyes and Tanning	4702	3964	2768	2952	3910	4640	2063	2244	1433	1459
9	Drugs and Narcotics	114935	116266	114980	117542	117443	118887	119812	113942	114146	117265
10	Fodder Crops	179374	187940	200498	245955	224095	221294	207169	188210	171962	173075
11	Green Manure crops	7330	8351	8272	5761	3843	2401	1559	1401	1553	3305
12	Other Miscellaneous Non Food	150330	143217	115119	97510	97475	106688	106483	128734	143652	163969
	<b>Total Non Food Crops</b>	<b>1861402</b>	<b>1802587</b>	<b>1733149</b>	<b>1491349</b>	<b>1598094</b>	<b>1662589</b>	<b>1508872</b>	<b>1508872</b>	<b>1581461</b>	<b>1555665</b>
	<b>Total Crops</b>	<b>6519109</b>	<b>6338109</b>	<b>6226457</b>	<b>5191108</b>	<b>5316027</b>	<b>5889069</b>	<b>5842790</b>	<b>5842790</b>	<b>5815174</b>	<b>5824248</b>

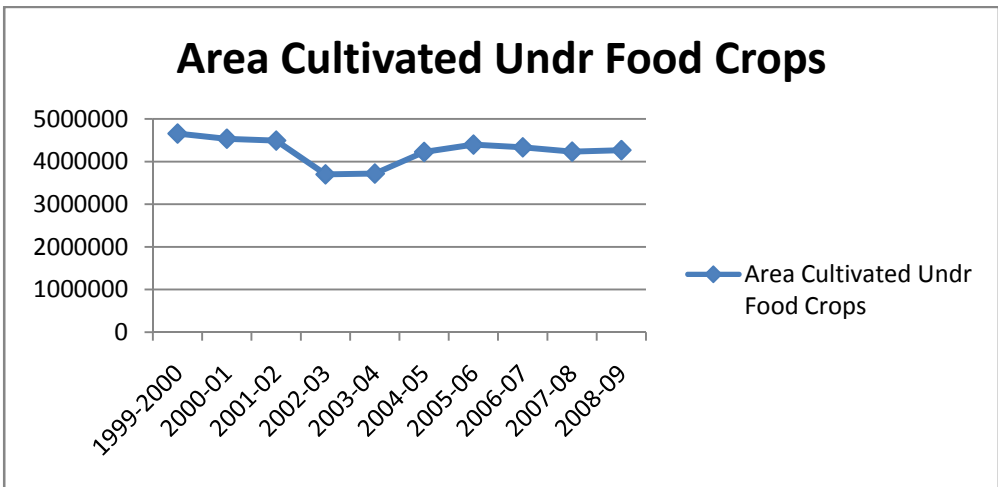
Source: Season and Crop Reports

Figure 3



Source: Derived from table 3

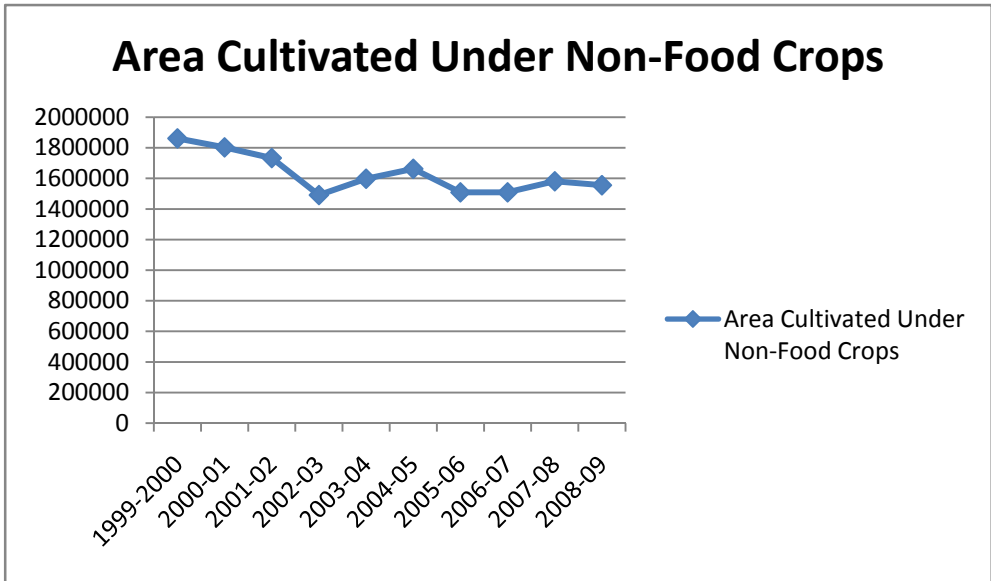
Figure 4



Source: Derived from table 3



Figure 5



## Conclusion

Sixty years of development effort of the state has not made any significant impact on poverty. Still, many people of the state are living in poverty. Industrial development is at its infancy and a viable alternative source of employment. Agriculture is the only sector, which is so far the livelihood providing sector for most of the people. Unfortunately, agricultural in TamilNadu is characterized by low productivity. There are many reasons the skewed distribution of land, small size of operational holdings, high cost of input price the other institutional factors affecting negatively agricultural productivity. Thus, while the benefit of reform or structural transformation is unequally distributed.

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## VEGETABLE MARKETING OF CHITHORE [MGH] RYTHU BAZAR OF A.P: A CASE STUDY

N. Maria Das\* & K. Krishna Mohan

### ABSTRACT

*This study was taken-up to generate empirical information on marketing costs, marketing margins and price-spread in vegetables, in Chithore [MGH] rythu bazar [farmers market] of the state of Andhra Pradesh. Further, the empirical information on the problems of both vegetable producers and consumers is also very crucial in framing suitable policies to safeguard the interests of both vegetable producers and consumers. The present study is an endeavor in this direction to examine the impact of rythu bazars mainly on the share of producers in the consumer's rupee in rythu bazar in the Chithore district of Andhra Pradesh. The findings of the study witness that Marginal costs for different vegetables in this study were in the range of 7.81 per cent to 22.13 per cent. It was found that marginal cost was very high for tomato [22.13 per cent], and it was very low for potato [7.08 per cent]. Marketing marginal was in the range of 77.87 to 93.47 per cent. The producers price was very high for bitter gourd [Rs.800/-] followed by ridge, green chillies and potato [Rs.640/-] and it was the lowest [Rs.280/-] for tomato. Selling the vegetables directly to the consumers by the producers, farmers are able to increase their income share, which is normally going to the middlemen; in the same extent poverty has also decreases in the farming community. The problems faced by both farmers and consumers as well as the suggestions offered for the effective functioning of the rythu bazars were discussed in the study. Of all problems faced by the farmers, the major ones are lack of technical guidance by horticulture officers and subsidized seeds [60 per cent], mode of transportation is not convenient [55 per cent]. On the other hand, the major problems of the consumers are; no safe drinking water facility [45 per cent], non availability of good quality vegetables [40 per cent], high price during Sundays and holidays [35 per cent]. The suggestions offered by the farmers and consumers should be strictly considered for effective functioning of rythu bazar.*

### **Introduction:**

Andhra Pradesh is the second largest producer of vegetables in the country. The predominantly grown vegetable crops are tomatoes, brinjal, bhendi, onion, beans and gourds. Regulated Market Yards for fruits and vegetables are functioning only at a few centers in the state. The marketing system for fruits and vegetables is in the hands of middlemen. Middlemen exist at various levels between the farmer and the consumer and exploit through malpractices in weighments, handling and payments. The farmer's share in the consumer's rupee is estimated to be just 40 paise. In addition, the estimated losses in handling of vegetables in the traditional channels of marketing are about 30 to 35 per cent. Large number of small farmers is unable to effectively bargain for a better price in the wholesale markets. Inefficiencies in wholesale markets result in a long chain of intermediaries, multiple handling and loss in quality and increase the gap between producer and consumer prices. Intermediaries and system inefficiencies come as disproportionate share of consumer prices. Large number of small retailers, each handling small quantities, create high overheads leading to high margins on produce. Rythu bazar [RB] operates

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outside the purview of Agricultural Market Committees to be managed by Estate Officers and under the control of Joint Collectors. It has been felt necessary to evolve an alternate marketing strategy where both growers and consumers are benefited through rythu bazars. Rythu bazars are thus planned for direct interface between the farmers and the consumers eliminating middlemen. Rythu bazars, if they function effectively, can act as price stabilization centres.

### **Objectives of the study:**

The focal purpose of the present empirical study is to examine and analyze the price spread, marketing margins and costs in marketing of selected vegetables and the problems of both consumers and vegetable growers in selected rythu bazars.

This has been examined with the following specific objectives:

1. To estimate the producer's share in consumer's rupee for vegetable crops in selected rythu bazars; and
2. To study the problems of vegetable producers and consumers in rythu bazars.

### **Hypothesis of the study:**

Keeping the above objectives in view, the empirical validity of the following hypothesis has also been tested.

“The producer's share in consumer's rupee in rythu bazar is relatively high as compared to producer's share in the consumer's rupee in retail vegetable markets”.

Since the present study is confined to Chithore [MGH] of Andhra Pradesh, this rythu bazar was selected on purpose from the district. A sample of 20 farmers and 20 sample consumers from the rythu bazar make a total of 40 persons are taken for collecting the cross section data for the present study. Apart from the primary data, the required secondary data were also collected from various reports, namely, functional manual of rythu bazars, rythu bazars in Andhra Pradesh, Status Report on rythu bazars for the council of ministers, daily and weekly averages, etc., brought out by the Directorate of Marketing, Government of Andhra Pradesh.

### **Crops selected for the study [Vegetables covered]:**

The following vegetables have been considered for the study.

[1] Tomato [2] Brinjal [3] Lady's finger [4] Green chillies [5] Bitter gourd [6] Bottle gourd [7] Ridge gourd [8] Cauliflower [9] Cabbage [10] Coccinia [11] Potato [12] Leafy vegetables. Price-spread, marketing margins and costs are being analyzed for 12 vegetables.

**Analytical technique/method - Price spread:**

The farmers [producers] usually bear the cost of loading, transportation of vegetables to rythu bazars, unloading, packaging and other charges. The producer's share in consumer's rupee is worked out per unit [unit = bag / 40kgs] as shown below:

$$P_p = C_p - M / C_p * 100$$

Where

$P_p$  = the producer's share in consumer's rupee

$C_p$  = consumer's price,

$M$  = marketing cost.

The marketing margins and costs were being worked out as a share in the consumers' rupee.

**Limitations:**

It should be noted that, the results of the present empirical study are based mainly on the data collected from the sample farmers and consumers. The results emerged would be very useful in understanding the producer's share in the consumer's rupee in respect of different vegetables and problems of both the producers and consumers. The study has been confined to the sample rythu bazar located at Chithore.

**Marketing costs, marketing margins and producer price:**

Below table -1 gives particulars on marketing costs, marketing margins and producer price in Chithore [MGH] rythu bazar. It was found that the total marketing cost of tomato was 22.13 per cent, where the marketing margin of the farmer was 77.87 per cent of the consumer price. This includes 16.13 per cent of marketing cost for packaging charges, 3.23 per cent for loading charges, 32.26 per cent for transportation charges, 3.23 per cent for unloading charges and 45.16 per cent for losses due to spoilage. In the case of marketing of lady's finger [bhendi] and brinjal, it has been found that total marketing cost was 12.09 per cent and the marketing margin of the producer was 87.91 per cent. These costs were represented as 17.24 per cent for packaging charges, 3.45 per cent for loading charges, 34.48 per cent for transportation charges, 3.45 per cent for unloading charges and 41.38 per cent for losses due to spoilage. Marketing coccinia involves 9.59 per cent of total marketing cost and 90.41 per cent of marketing margin of the farmer, of which packaging charges was 21.74 per cent, 4.35 per cent was for loading charges as well as unloading charges, 43.48 per cent was for transportation charges and 26.09 per cent was for losses due to spoilage. In the case of bitter gourd, it was found that the total marketing cost was 9.25 per cent and the marketing margin of the farmer was 90.75 per cent of the consumer rupee. This cost includes 13.51 per cent packaging charges, 2.70 per cent loading charges and 27.03 per cent transportation charges, 2.70 per cent unloading charges and 54.05 per cent losses due to spoilage. Marketing of green chillies involves a total marketing cost of 10.31 per cent in the consumer price; where as marketing margin of the farmer was 89.69 per cent of consumer rupee. This includes 15.15 per cent of marketing cost for packaging charges, 3.03 per cent for loading charges, 30.30 per cent for transportation charges, 3.03 per cent for unloading charges and 48.49 per cent for losses due to spoilage. In marketing ridge guard it was found that 10.20 per cent of the total marketing cost was for packing, 2.04 per cent for loading

charges, 20.41 per cent for transportation charges, 2.04 per cent for unloading charges, 65.31 per cent for losses due to spoilage. The entire marketing cost was 15.31 per cent and the farmers marketing margin was 84.69 per cent of the consumer price. In case of marketing of bottle guard, it has been found that the total marketing costs was 15.64 per cent and the sellers marketing margin was 84.36 per cent of the consumer price. This cost has been represented as 20.00 per cent for packaging charges, 4.00 per cent for loading charges, 40.00 per cent for transportation charges, 4.00 per cent unloading charges and 32.00 per cent for losses due to spoilage. Marketing of cauliflower involves 6.53 per cent of total marketing costs. The marketing margin of the producer was 93.47 per cent of the consumer price of which 29.41 per cent was packaging charges, 5.88 per cent was loading charges, 58.82 per cent was transportation charges, 5.88 per cent for unloading charges and no losses due to spoilage. In the case of marketing of cabbage, the total marketing cost was 10.64 per cent and the marketing margin of the farmer was 89.36 per cent of the consumer price. This cost is represented as 29.41 per cent for packaging charges, 5.88 per cent for loading charges, 58.82 per cent for transportation charges and 5.88 per cent for unloading charges and no losses due to spoilage. The total marketing cost, in the case of potatoes, was 7.81 per cent and the marketing margin was 92.19 per cent of the consumer price. This cost is represented as 20.00 per cent for packaging charges, 40.00 per cent for transportation charges, 4.00 per cent for loading and unloading charges and 32.00 per cent was for losses due to spoilage. In the case of marketing of leafy vegetable, it has been found that the total marketing cost was 11.00 per cent and the marketing margin of the farmer was 89.00 per cent of the consumer price. This cost is represented as 22.73 per cent for packaging charges, 4.55 per cent for loading charges, 45.45 per cent for transportation charges, 4.55 per cent for unloading charges and 23.76 per cent for losses due to spoilage.

Table –1 Marketing costs, marketing margins and producer price at Chithore [MGH] rythu bazar												
	Tomato		Brinjal		Bhendi		Green chillies		Bitter gourd		Bottle gourd	
	% in TMC	% in CP	% in TMC	% in CP	% in TMC	% in CP	% in TMC	% in CP	% in TMC	% in CP	% in TMC	% in CP
1	16.13	3.57	17.24	2.08	17.24	2.08	15.15	1.56	13.51	1.25	20.00	3.13
2	3.23	0.71	3.45	0.42	3.45	0.42	3.03	0.31	2.70	0.25	4.00	0.63
3	32.26	7.14	34.48	4.17	34.48	4.17	30.30	3.13	27.03	2.50	40.00	6.25
4	3.23	0.71	3.45	0.42	3.45	0.42	3.03	0.31	2.70	0.25	4.00	0.63
5	45.16	10.00	41.38	5.00	41.38	5.00	48.49	5.00	54.05	5.00	32.00	5.00
	100	22.13	100	12.09	100	12.09	100	10.31	100	9.25	100	15.64
	280	-	480	-	480	-	640	-	800	-	320	-
TMC = Total Marketing Cost, CP = Consumer Price												Contd.....

Table-1 Marketing costs, marketing margins and producer price at Chithore [MGH] rythu bazar												
	Ridge gourd		Cauliflower		Cabbage		Coccinia		Potato		Leafy vegetables	
	TMC	CP	% in TMC	% in CP	% in TMC	CP	% in TMC	CP	% in TMC	CP	% in TMC	CP
1	10.20	1.56	29.41	1.92	29.41	3.13	21.74	2.08	20.00	1.56	22.73	2.50
2	2.04	0.31	5.88	0.38	5.88	0.63	4.35	0.42	4.00	0.31	4.55	0.50
3	20.41	3.13	58.82	3.85	58.82	6.25	43.48	4.17	40.00	3.13	45.45	5.00
4	2.04	0.31	5.88	0.38	5.88	0.63	4.35	0.42	4.00	0.31	4.55	0.50
5	65.31	10.00	0.00	0.00	0.00	0.00	26.09	2.50	32.00	2.50	23.76	2.50
Total	100	15.31	100	6.53	100	10.64	100	9.59	100	7.81	100	11.00
Consumer price in Rs.	640	-	520	-	320	-	480	-	640	-	400	-

TMC = Total Marketing Cost, CP = Consumer Price



Table – 2: Marketing costs, marketing margin, producer price comparison in Chithore [MGH] rythu bazar

S. No	Vegetable	Marketing cost	Marketing margin	Producers price
01	Tomato	62/- [22.13 %]	218/- [77.87 %]	280/-
02	Brinjal	58/- [12.09 %]	422/- [87.91 %]	480/-
03	Bhendi	58/- [12.09 %]	422/- [87.91 %]	480/-
04	Green chillies	66/- [10.31 %]	574/- [89.69 %]	640/-
05	Bitter gourd	74/- [9.25 %]	726/- [90.75 %]	800/-
06	Bottle gourd	50/- [15.64 %]	270/- [84.36 %]	320/-
07	Ridge gourd	98/- [15.31 %]	542/- [84.69 %]	640/-
08	Cauliflower	34/- [6.53 %]	486/- [93.47 %]	520/-
09	Cabbage	34/- [10.64 %]	286/- [89.36 %]	320/-
10	Coccinia	46/- [9.59 %]	434/- [90.41 %]	480/-
11	Potato	50/- [7.81 %]	590/- [92.19 %]	640/-
12	Leafy vegetables	44/- [11.00 %]	356/- [89.00 %]	400/-

Figures in brackets are : per cent of Marketing Costs and Margins in producer price

Figures in without brackets : Actual price incurred/received on Marketing by the producer

Data pertaining to marginal costs, marketing margins and producer price were presented in the Table - 2. Marginal costs for different vegetables in this study were in the range of 7.81 per cent to 22.13 per cent. It was found that marginal cost was very high for tomato [22.13 per cent], followed by bottle gourd [15.64 per cent] and ridge gourd [15.31 per cent], and it was very low for potato [7.08 per cent]. Marketing marginal was in the range of 77.87 to 93.47 per cent. It was very high for cauliflower 93.47 per cent followed by potato 92.19 per cent and it was very low for tomato [77.87 per cent]. The producers price was very high for bitter gourd [Rs.800/-] followed by ridge, green chillies and potato [Rs.640/-] and it was the lowest [Rs.280/-] for tomato.

### **Comparison between local market rates and rythu bazar rates [Price per Kg]**

A comparison between RMR's and RBR's was presented in Table -3 and observed that the difference between these two rates was in the range of 11.11 to 20.00 per cent for different vegetables. RBR was always low as compared to RMR. The RBR was 20.00 per cent lower than RMR for bottle gourd. Similarly the absolute difference between these two rates was 14.29 per cent for brinjal, coccinia and leafy vegetables.

**Table - 3 Comparison between local market rates and rythu bazar rates [Price per Kg]**

	1	2	3	4	5	6	7	8	9	10	11	12
	Tomato	Brinjal	Bhendi	Green chillies	Bitter gourd	Bottle gourd	Ridge gourd	Cauliflower	Cabbage	Cocinia	Potato	Leafy vegetables
Chithore [MGH]												
<b>RMR</b>	8	14	16	18	18	10	16	16	10	14	18	14
<b>RBR</b>	7	12	14	16	16	8	14	14	8	12	16	12
<b>AD in %</b>	-12.50	-14.29	-12.50	-11.11	-11.11	-20.00	-12.50	-12.50	-20.00	-14.29	-11.11	-14.29

**Source:** Weekly/daily price analysis, Directorate of Marketing, Government of Andhra Pradesh, Hyderabad, August and September 2011.

**RMR** = Retail Market Rate, **RBR** = Rythu Bazar Rate, **AD in %** = Absolute difference in per cent [per cent of consumer benefit].

### **Problems of producers and consumers in rythu bazars - Empirical findings:**

One of the objectives of the present study is to study the problems faced by both farmers and consumers in selected rythu bazar. The data pertaining to this are collected from the respondents through an open-ended questionnaire and the analyses of the responses is presented below in terms of ranks and frequency.

### **Problems of producers and consumers - Suggestions for effective functioning of Chithore [MGH] rythu bazar:**

The second objective of the study is to analyze the problems faced by both the farmers and consumers in selected rythu bazars. The data were collected from the respondents through open-ended questionnaire and presented below.

**Table - 4.1 Problems faced by the farmers in Chithore [MGH] rythu bazar**

S. No	Problems of the Rythu bazar farmers	Number of respondents	Per cent	Rank
1	Lack of technical guidance and subsidized seeds	12	60	I
2	Inconvenient mode and high transportation cost	11	55	II
3	Presence of fake farmers in the rythu bazar	10	50	III
4	Fixing of arbitrary prices	10	50	III
5	No safe drinking water facility	9	45	IV
6	Bargaining and sorting of vegetables	8	40	V
7	No canteen facility	7	35	VI
8	Inadequate shops	5	25	VII
9	Lack of ward and watch facility during night	5	25	VII

The table 4.1, shows the problems of the farmers in Chithore [MGH] rythu bazar includes - lack of technical guidance by horticulture officers and subsidized seeds [60 per cent], mode of transportation is not convenient [55 per cent], selling of vegetables by fake farmers and fixing of prices by rythu bazar officials are arbitrary and less than the actual rates [50 per cent], no safe drinking water [45 per cent], bargaining and sorting of vegetables [40 per cent], no canteen facility [35 per cent], inadequate number of shops and lack of ward and watch facility during night [25 per cent].

**Table - 4.2 Suggestions offered by the farmers for effective functioning of Chithore [MGH] rythu bazar**

S. No	Suggestions offered by the farmers	Number of respondents	Per cent	Rank
1	Provision of technical guidance and subsidized seed	12	60	I
2	Improve the transport facility with low cost	11	55	II
3	Prohibition of fake farmers	10	50	III
4	Fixation of remunerative prices	10	50	III
5	Safe drinking water facility	9	45	IV
6	No bargaining and follow fixed rates	8	40	V
7	Canteen facility	7	35	VI
8	More shops should be provided	5	25	VII
9	Provision of proper watch and ward facility	5	25	VII

The table - 4.2, shows the suggestions offered by the farmers which includes - providing technical guidance by horticulture officers and subsidized seeds [60 per cent], improve in transportation facility [55 per cent], prohibition of fake farmers and collection of rates from more number of markets and fix remunerative prices [50 per cent], providing safe drinking water [45 per cent], absence of bargaining and provision for fixed rates [40 per cent], canteen facility should be provided [35 per cent], enough number of shops should be provided and rythu bazar in charge must provide proper watch and ward facility during night time [25 per cent].

**Table - 4.3 Problems faced by the consumers in Chithore [MGH] rythu bazar**

S. No	Problems of the rythu bazar consumers	Number of respondents	Per cent	Rank
1	No safe drinking water facility	9	45	I
2	Quality vegetables not available in the evening	8	40	II
3	High price during Sundays and holidays	7	35	III
4	Farmers do not allow consumers to sort and select	6	30	IV
5	Farmers ignore price list and charge more price	5	25	V
6	No proper sanitation facility	3	15	VI
7	Not much difference between RMR & RBR	2	10	VII
8	Farmers refuse to sell small quantities	2	10	VII
9	No canteen facility	2	10	VII

The table - 4.3 shows the problems faced by consumers includes - no safe drinking water facility [45 per cent], non availability of good quality vegetables [40 per cent], high price during Sundays and holidays [35 per cent], consumers are not allowed to sort and select the vegetables [30 per cent], farmers ignore price list and charge more price [25 per cent], no proper sanitation [15 per cent], not much difference between rythu bazar rates and local market rates, farmers refuse to sell small quantities and no canteen facility [10 per cent].

**Table - 4.4 Suggestions offered by the consumers for effective functioning of Chithore [MGH] rythu bazar**

S. No	Suggestions offered by the consumers	Number of respondents	Per cent	Rank
1	Safe drinking water facility should be provided	9	45	I
2	Availability of quality of vegetables in the evening	8	40	II
3	No hike in price during holidays	7	35	III
4	Farmers must allow consumers to sort and select	6	30	IV
5	Farmers should follow the price list	5	25	V
6	Maintenance of proper sanitation	3	15	VI
7	RBR should be less than RMR	2	10	VII
8	Farmers should sell the quantity required by consumer	2	10	VII
9	Canteen facility should be provided	2	10	VII

Table - 4.4 indicates the suggestions of consumers which includes - safe drinking water facility [45 per cent], make arrangements for fresh and good quality vegetables [35 per cent], rythu bazar officials should see that there is no hike in price of the produce during Sundays and holidays [35 per cent], farmers should allow sorting and selecting of vegetables [30 per cent], farmers should follow price list and charge appropriate price [25 per cent], maintenance of proper sanitation [15 per cent], there should be a difference between Rythu Bazar rates and retail market rates, farmers should sell the quantity required by consumers and canteen facility should be provided [10 per cent].

### **Summary and conclusions:**

The present study has been taken up to generate empirical information on the impact of rythu bazars on farmers and consumers using both cross-section data and secondary data. It should be noted that, the results of the present empirical study based on primary data collected from sample vegetable farmers and consumers, would be very useful in understanding the producer's share in consumer's rupee in respect of different vegetables and problems of both consumers and producers. The present study has been confined to the sample rythu bazar located in Chithore [MGH]. It is evident from the empirical findings that

in the selected rythu bazar, in respect of all selected vegetable varieties, the producer's share in the consumer's rupee i.e., the price spread is 100 per cent, because the producer is selling directly to the final consumer. Some part of the producer's price is incurred on marketing costs and the farmer in the form of marketing margin received the remaining share. The result of the study reveals that the marketing of the vegetables through rythu bazar is profitable to the farmers/producers. The findings of the study witness that by selling the vegetables directly to the consumers, the farmers are able to increase their income share, which is normally going to the middlemen, and in the same extent poverty also decreases in the farming community. Of all problems faced by the farmers, the major ones are lack of technical guidance by horticulture officers and subsidized seeds [60 per cent], mode of transportation is not convenient [55 per cent]. On the other hand, the major problems of the consumers are; no safe drinking water facility [45 per cent], non availability of good quality vegetables [40 per cent], high price during Sundays and holidays [35 per cent]. The suggestions offered by the farmers and consumers should be strictly considered for effective functioning of rythu bazar.

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## **SOLID WASTE PRACTICES IN THUVAKUDI MUNICIPALITY, TAMIL NADU**

**A. Noorjahan\*, A. Royal Edward Williams and M. Ravichandran**

### **Abstract**

Waste has become one of the unavoidable activities for every individual. Improper disposal of solid waste and unscientific treatment of solid waste causes serious environmental problems not only for the public but also for the economy as a whole. Issues on solid waste often remain a backlog for the country due to its population explosion, increased consumption, urbanization and the culture of throwaway society. Apart from all these economic reasons, in a fast growing world where the man's desire to earn more at the cost of polluting the nature has become the trend of the society. Destruction of environment remains ever since the advent of human civilization, the ecology has been continuously disturbed and off late, people of all lives with the sole motive of making quick money recklessly purse this want on distinction on environment. The paper highlights about the quantity and quality of the waste generated, collected, transported and disposal of solid waste and the steps taken by the local body in promoting solid waste practices in the study area.

### **Introduction**

The problem of SWM in India, when combined with rapid urbanization and unplanned development, is expected to be of such magnitude that significant reasons exist to initiate immediate action for improvement of this appalling situation. Improper solid waste management leads to substantial negative environmental impacts (for example, pollution of air, soil and water, and generation of greenhouse gases from landfills), and health and safety problems (such as diseases spread by insects and rodents attracted by garbage heaps, and diseases associated with different forms of pollution). Municipal (or local) authorities charged with responsibility of providing municipal solid waste management services (together with other municipal services) have found it increasingly difficult to play this role. The difficulty has been aggravated by lack of effective legislation, inadequate funds and services, and inability of municipal authorities to provide the services cost-efficiently.

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Solid waste management is more than just street cleaning and transporting the waste to a dumpsite. Households can play a major role in segregation and minimizing the waste. Treatment and disposal of waste can cost as much or more than collection and transport. A recent World Bank (2006) study estimated that the total cost per ton of solid waste management in India works out to Rs.1000-1200 (\$25-30 at current exchange rates) excluding the cost of land. Thus, a city of 1 million generating around 500 tons/day, would incur a cost of Rs.5,00,000 to Rs.6,00,000 per day to manage its waste. With economic and urban population growth, the quantity of waste to be managed will increase, and the cost of solid waste management will increase even more rapidly. (Paul Appasamy et al, 2007)

### **Scope of the Study**

The accumulated waste becomes a breeding ground for insects, flies, different bacteria, and micro-organisms this could create health problems. Stray animals like cats, dogs, goats and cows come to the bins in search of food end up in spreading the garbage around the bins. Often it has been observed that the cows swallow polythene bags along with the vegetables, plant foliage and other food materials. This causes serious health problems to them. Hardev Singh, director of the Veterinary Department of Uttar Pradesh state, 2008 says in an interview to the India Today magazine, "Cows consume garbage wrapped in polythene bags. This is how polythene is causing the death of thousands of cows which have polythene bags clogging their stomachs can cause diseases like tuberculosis and cancer" solve every year." The situation becomes worse in the rainy season. As the waste bins are open from both top and bottom the waste is directly exposed to the rain. The water makes the waste wet and it even drains out of the bin from the bottom, thus polluting the streets.

### **Objectives of the study**

- To study the quantity of solid waste generated in Thuvakudi Municipality.
- To identify the methods of treatment in the study area.
- To suggest policy measures for solid waste practices.

### **Methodology**

The present study is generally based on secondary source of information. The required data has been collected from the *Thuvakudi Thaluk* and from the officials who work for the Thaluk. The raw data has been classified and tabulated.



### Study Area and Practices of Solid Waste in Thuvakudi

The extent of Thuvakudi Municipality is 14.371 Sq. Km with a population of 35,428 as per 2001 census. Males constitute 51 per cent of the population and females 49 per cent. Thuvakudi has an average literacy rate of 73 per cent, higher than the national average of 59.5 per cent: male literacy is 97 per cent, and female literacy is 89 per cent. This taluk is located on the main road of Tiruchirappali - Thanjavur highways at a distance of 25 km from Tiruchirappali and 30 km from Thanjavur. Total No. of Wards is 21, in which 7 Wards are reserved for women and 2 Wards for reserve community. This Municipality remains to be an important residential and Industrial Town. The Total No. of house hold is 7726 and garbage generated in the town is 8.85 M.T. Out of 21 Wards primary collection of waste is done by 6 wards.

### Primary Collection

In the study area waste is primary collected from various generation points such as residential areas, commercial establishments, industrial areas, markets etc., The waste is collected through RCC bins of 0.25 MT capacities each. Households dump the waste directly into the nearest community bin from where it is collected for disposal. Door to door collection is is not practiced in this area. The vehicles used for primary collection of solid waste are push carts (10) and collection bins(50). Modernized vehicles are not adopted in the study area.

**Table 1 Primary Collection Vehicles**

Sl. No	Type of Vehicle	Number of Vehicles
1	Push Cart	10
2	Collection Bins	50

**Source:** Thuvakudi Municipality 2010

### Secondary Collection

The waste from the primary collection points are transported by the conservancy workers (ULBs or private) to the secondary collection points and dumper placers through wheel borrows and hand carts. From the open dumps and the community bins the waste are collected by the vehicles to the compost yard.

**Table 2** Vehicles for Secondary Collection

Sl. No.	Type of Vehicle	Number of Vehicles
1	Tractor Trailer	2 Nos (Existing)
2	Tipper Lorry	1 No

**Source:** Thuvakudi Municipality 2010

### **Waste Generation in Thuvakudi Municipality:**

Thuvakudi Municipality has been divided into 21 Wards with primary collection carried out in 6 wards. Thuvakudi town generates 5.5 MT of Solid Waste per day with a per capita waste generation of 250 grams per capita per day.

### **Compost yard**

Thuvakudi municipality has proposed a disposal site near Valavandankottai around 3.86 acres of land but still not acquired due to price variation. The site for compost yard has been selected and the proposal submitted to the District Collector.

Site for Compost yard has been selected and the proposal for that was sent to the District Collector Trichy.

### **Results and Discussions**

Thuvakudi Municipality generates 5.5 M.T of solid waste per day with a per capita waste generation of 250 grams per capita per day. Fully fledged Door-to-door collections is still not performed in few wards. The present study reveals that, there is no segregation of waste at source in study areas. Provision of waste bins is not adequate. Collection and storage points are open lands or out of order bins, regularly not cleaned, leading to an unhygienic condition in the surrounding areas. Inadequate numbers of vehicles, tractor, community bins still aggravate the problem. Moreover the higher officials are not aware of the Municipal Solid Waste (Management and Handling 2000) Rules.

Since the study is purely based on the secondary source of information, Data regarding Municipal solid waste collection, segregation, transportation and disposal has been collected from the Thuvakudi municipality. The quantity of solid waste in Thuvakudi

Municipality is about 5.5 MT per day. The main reason is due to the density of the area and population was high in this Municipality. In this study area so far there is no treatment processes have been done. Acute shortage of sanitary workers is a big nuisance for the municipality and the present workers lack awareness on the method of collecting, improper usage of sanitary materials, the mode of disposal of solid waste. As a policy measure it could be easier for municipalities like Thuvakudi to convert the waste into manure.

Conclusion can be made that the solid waste generation depends upon the area density and population. In practice the control of waste generation is very difficult. But waste can be used as a resource for any other purpose. Solid waste disposal has been an environmental threat to both urban and rural areas. Yet, there is increased awareness in urban areas towards SWM than in rural areas.

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## **A Study On Discriminatory Sales Strategies Of Retail Vegetable Sellers**

**J. Missiadoss\***

### **Abstract**

Sales maximization and profit maximization is the objective of any trader under normal circumstances. To achieve this objective, traders may use price and non price discrimination as a technique in the process of selling the product. This micro study identifies and analyses the various discriminatory sales strategies adopted by vegetable retail sellers in the market. The success or failure of any sales strategy depends on the level of consumer awareness and alertness. It would go to the advantage of the traders if consumers are ignorant. Hence this study may help the consumers to enhance their awareness and alertness through the suggestions on the basis of inferences made out of analysis made. Thus it would help the consumers to save a considerable income from improved pattern of purchasing vegetables and also improve healthy consumption of vegetables. Households spend major portion of their income on the purchase of vegetables steadily on daily basis. They do not seem to have realized the volume of income being spent. Thus this study becomes significant in influencing consumers.

### **Introduction**

Price discrimination is a technique in economics usually adopted by monopolist to maximise his profit through sale. Mostly it is practised in industrial products. Selling the same type of product to different consumers at different rate is known as price discrimination. This is practised to rob the consumer surplus enjoyed by the consumer to maximise the profit of the seller. But it need not be always found only in industrial products and monopoly market. It could also be found in non monopoly markets. Price discrimination is practised in disguise in agriculture especially in vegetable market. Price discrimination need not be reflected in differentiated price alone but also through non price strategy which may also indirectly relate to price and profit. This prompts the investigator to make this study on various discriminatory strategies adopted by vegetable retail sellers to maximise profit. Vegetable is a perishable commodity with varying degrees of time hence the strategies are also likely to vary with different vegetables. This study is attempted to help the consumers to enhance their awareness and reduce ignorance.

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## **Objective**

This is a micro study which aims at identifying and analysing the volume of discrimination adopted in vegetable sales. This study focuses only on the various strategies of discrimination and it does not concentrate on the technical aspects of relating them to profit or any other economic variable. Thus no hypothesis is involved here.

## **Methodology**

This is an exploratory study. The investigator has adopted direct observation method. The strategies were identified directly from the market experience. Fifty sample sellers were observed in the peak hours of market for two weeks for two hours per day. It is cross checked with ten vegetables sold in common. Ten vegetables with three perishable time variance were selected. Number of sellers practising each strategy is assumed to be frequency volume of that strategy. Tabulation of observed number of sellers have been classified as frequency data of that strategy and related to concerned vegetable.

## **Limitations**

This study is only a micro study covering only one market located in a Taluk town of Vellore district. The name of the town is not mentioned purposely to avoid controversy thus the focus is only on the consumers not the traders. This study does not cover the whole year due to time constraint. Technical aspect of relating sales strategies with revenue or profit is beyond the scope of this study. It is only an explorative study.

## **Concepts as used by the investigator**

Being perishable in nature vegetables has different life span before they become rotten and useless. The ten vegetables chosen for this study have been marked as S, M, and L which means vegetable perishable in Short period like one to two days, vegetable which have Moderate life period like three days and vegetables which have little Long life like 3 to 5 days respectively. The researcher assumes that these S, M and L also influences the tactics of discrimination. Green leaves are sold on Daily basis and marked as D. NA as found in the table indicate not available as it may not be applicable to that category. Zero entry in the frequency is used to denote that nobody is adopting that particular technique in that particular vegetable.

## **Discriminatory practices**

The ten discriminatory methods practised in vegetable market have special meaning in this study as we shall discuss them one by one. This may help the reader to understand and appreciate the interesting features found in this study. This would also help the reader to be prepared as a shrewd consumer to counter the sellers.

The following table reveals the various discriminations adopted by sellers, the volume and variations of them in different vegetable.

	Retail selling strategies	Ladies finger-S	Brinjal-S	Beans-S	Cabbage-M	Tomato-S	Potato-L	Carrot-M	Beetroot-L	Onion-M	Green leaves-D
1	Rate difference	0	0	20	0	43	5	22	17	13	16
2	Mixing low quality product with normal quality	0	0	38	4	7	21	2	23	28	0
3	Mixing old stock along with new stock	0	0	5	19	2	26	0	43	46	0
4	Quality difference	32	38	46	2	34	4	5	11	19	0
5	Weight manipulation	42	12	11	28	47	3	7	12	2	0
6	Balance like Rs.1 or 2 left with consumer	48	41	39	34	25	33	41	37	44	2
7	Accurate weight, Decent behaviour, clean environment, quality product	5	6	7	3	10	9	16	2	16	1
8	Not allowed to pick-up best pieces, force to buy all together	17	16	49	NA	2	0	0	0	0	NA
9	Rate discrimination on quantity purchase	41	44	42	44	39	37	34	46	6	NA
10	Bundle and heap selling - products like-greens- Bundle manipulation	NA	NA	NA	NA	NA	NA	NA	NA	NA	49

**Source:** Primary data from Questionnaire filled by direct observation

## Analysis

Rate difference is to mean difference in price per Kg as charged by different sellers in the same market for the same vegetable. This is highly practised in Tomato as 43 sellers practise this method. Nearly 50% of the sellers adopt this technique in carrot, mostly on the basis of colour and freshness difference. Nearly 25% of the sellers adopt this method in onion. Most of them justify this by promising quality difference. When compared to price difference, this quality difference is only artificial and futile. This method is never practised in Ladies finger, Brinjal and Cabbage.

Mixing low quality product with normal quality shows that the sellers mixes the most highly preferred tender vegetable (which is also considered as normal quality) with fully ripped and rough vegetable which is not at all preferred by consumers and considered as low quality. This method is adopted mostly in beans because of the difficulty in identifying the difference by consumers. This is not practised in short life produces and in green leaves. As the storage days are more for Potato, Beetroot and Onion this method is successfully followed in these vegetables.

Mixing old stock with new stock means here as fresh arrivals to the market which are mixed with unsold previous stock. Beetroot, Onion and Potato are the vegetables in which this is highly practised as they have long life span and it is also difficult to be identified by the buyers. 43 sellers in Beetroot and 46 sellers in Onion and nearly 50% of the potato sellers adopt this method. This is not practised in most short life produces as it could easily be found out by the buyers.

Quality difference means here as picking the fresh looking ones and keeping them aside to sell at high rate from the same package. Bought as common lot from the farmers but classified on the basis of size or freshness, to sell at different rate. All the short life produces fall under this discrimination. Tender beans are sold at high rate than the ripped ones.

Weight manipulation means the tactics of the sellers while weighing the vegetables. Mostly sellers seem to be generous to weigh more vegetables than the actual measurement. But they cleverly adopt a successful technique here. The real weight may be less by 10 to 50 grams per Kg. Sellers cleverly through the last units of vegetable with force into the balance plate so that it goes down to show as if it weighs more. Before the balance coming back to the normal state the vegetables are taken away by the sellers swiftly from the balance as if they are generous towards buyers by offering them more quantity. This is highly practised in Ladies finger and tomato.

Balance left with customers is another tactics by which the sellers leave the shortage of money of the buyers at one or two rupees as concession. Sellers mostly ask the buyers to give small denominations like 1 or 2 rupees at a later period to the convenience of the buyers. But they know mostly it won't come back to them. But in spite of it they do this to earn the good will of the consumer so that they become customers. This is mostly done by more purchases from a single seller. Being a low priced produce this method is not followed in green leaf sales. But in almost all the vegetables this is practised as it is evident from the table. 48 sellers out of 50 adopt this in ladies finger sales and almost all the sellers adopt this method. How do they manage this if the buyers are not promptly paying back the coins? The sellers add one or two rupees extra from the mixed vegetable buying consumers by using the ignorance of the buyers as they ask for the total amount without referring to rate of individual items.

Sellers may adopt this disciplined sale through accurate weight, decent behaviour, clean environment, quality product as a tactful way to charge high price. Their targeted customers are educated and rich looking people. Sellers of this type do not permit bargaining. They keep the vegetables in an orderly manner so that it attracts decent looking consumers and charge little higher price than other sellers. Even if there is a complaint from the consumer on higher price, sellers convince them on quality though it is not always true. Though this technique is adopted by less number of sellers compared to other methods it is mostly practised in tomatoes, carrots and onions.

Buyers are not allowed to pick-up best pieces of vegetables, forcing to buy all together is another strategy adopted especially while selling in bulk quantities. The customers who buy small quantities are sometimes exempted from this even if they buy little amount so that they would remain as long lasting customers. There are vegetables with lot of mixed poor quality in which mostly this method is adopted. If the buyer is allowed to pick up the best ones the residual at the end would go waste as considerable loss. This method is adopted to avoid this type of loss. Sellers usually remain rude with buyers at the time of buying as most buyers want to pick up the tender and good ones. These sellers usually prefer bulk buyers. This method is followed mostly in ladies finger, brinjal and beans. Nearly all the sellers practise this method in beans. All the other produces have no sellers to adopt this method as they permit buyers to pick up. This method is not available in green leaves sales. No seller is adopting this method with regard to Tomato, Potato, Carrot, Beetroot, and Onion even in the purchase is in smaller quantity.



Rate discrimination on the basis of quantity of purchase shows that the seller charges lower price to bulk buyers and high price to others. As it is evident from the data on the table almost all sellers adopt this method. They use this method with village vegetables vendors who buy from these market sellers in bulk quantities to resell in villages around the town. This rate discrimination is not directly practised. This is because of the presence of direct consumers along with these vendors. The sellers usually adopt this method through weighing manipulation. For example they add at least half kg. per ten kgs of purchase but it varies on the basis of market price situation.

Less quantity – Non weighing-products like greens-bundle manipulation is yet another tactful method in which sellers of greens especially coriander leaves dismantle the bundles they buy and redo bundling with less quantity in each bundle. This method helps at least 25% of increase in selling bundles without changing price. Green leaves are also bought in lot from farmers and the re-bundling is done with loose bundles and with less quantity in each bundle. They also sell at higher price to make profit. Almost all the sellers adopt this technique. Atleast 20% of the sellers of green leaves use another method. A ten rupee bundle is divided into ten bundles and each is sold at Rs. 2 and thereby making 100% profit. The consumers make ignorant purchase because of their requirement of very small quantity and the price also seems to be only Rs. 2 on which they do not want to bargain. The same method is also practised in some other vegetables which are sold in heap. Beans, ladies finger, brinjal and few seasonal vegetables are sold in heap by individual petty sellers on the platforms and they do adopt this method as they sell without weighing. They sell usually at 250 grams per heap at market price but the quantity in each heap is usually less than  $\frac{1}{4}$  Kg.

### **Inferences**

The following few interesting practical inferences are made from the above observations and analysis.

Vegetables which have long storage life (L) and moderate (M) life on which price discrimination is adopted directly. The quality difference is not justifiable and it is only artificial and not real.

Consumers' difficulty to make out the difference is used as safeguard to adopt the method of mixing low quality with preferred quality. It is done mostly in beans and long life (L) produces.

Mixing old stock with new stock is also practised in produces with long storage life like potato, beetroot and onion. If the old stock is sold separately they would remain unsold and could be sold only at lower price.

There are vegetables bought at the same rate in bulk from farmers but classified to sell at different rate. This method is adopted mostly in short life (S) vegetables.

Weight manipulation is mostly adopted when the vegetables are filled onto the balance plate by the sellers. Even when it is filled by buyers if the measurement is less, the seller swiftly fills the remaining vegetables to his advantage. Mostly the vegetables filled by sellers are fully ripped and wasteful ones.

To earn the goodwill of the consumers the sellers leave minor balance coins like Re.1 or 2 at the disposal of the buyers to pay later making the buyers to believe as if they are unmindful even if they would not pay.

Disciplined sales like accurate weight, decent behaviour, clean environment, quality product is used as another method to target high income group by charging higher prices. Though the price difference is meagre it enhances their profit.

Sellers adopt a method through which buyers are not allowed to pick-up best pieces of vegetables, forcing to buy all together. But usually they prefer to sell in bulk.

Different rates are charged from bulk buyers and petty consumers. Price discrimination of this type is not openly shown but hidden in weight concession.

Bundle manipulation and heap selling without weighing are also proved to be successful selling strategy adopted by green leaves sellers. Consumers usually ignore these sellers as each consumer buy small quantity of purchase. But of all the sellers these green leaves sales seems to make more profit with less investment. Their quantum of investment and profit may be less but their percentage of investment and return seem to be more in short period when compared to other vegetable sellers.

### **Suggestions**

Consumers should not be carried away by pretention of quality difference. They must go around the whole market area and enquire the prices of various sellers before

making purchases of vegetables. Make a price quality comparison and start purchase as a shrewd consumer.

Consumers must keenly observe and test the vegetables like potato, beetroot and other produces to make sure to avoid old stock and low quality. They can pick out the fresh and tender ones as per their requirement. If the seller do not permit to pick out to your choice, it would be better to avoid him.

Do not make compromise on quality even if the price is slightly higher. If purchase is made on low quality though at low price it would cost more to the consumers as they may have to through away many vegetables as waste and it would be a loss at the end.

It would be better to buy in bulk as one can bargain for lower price. If relatives living nearby and even neighbours can buy together in bulk quantities and divide among them as it would definitely cost less than individual purchases.

Weight manipulation is the most adopted technique in vegetable market. Hence it could be suggested that consumers themselves must fill the balance plate with vegetables. They must also fill with more than the measurement which they are going to buy. This is the most tricky situation where little prudence on the part of the consumer can save him a lot in the long run.

Pay the seller promptly even if the seller is lenient towards little amount like one or two rupees so that you would not become a victim one day. When purchase is made on mixed vegetable composition one must ask for detailed price and cross check the total before paying the seller. Do not go to the same seller on the same day again.

Do not show yourself as fashioned and belong to high income group and beware not to be too attracted towards fashioned and decent sellers.

It may cause a little inconvenience and time consuming but it would be better to pick up the best ones among the vegetables. So prefer some seller who permits this facility. The seller may advise you not to touch, not to press and not to twist the vegetables; he may even be little rude, just one should ignore all these. Otherwise avoid such sellers and go to someone else as this would cost you less.

One should prefer going to the retail sellers and it is better to avoid the whole sellers to buy for household purpose.

While buying greens it would be better to check quality and avoid the heap sellers. It would be better to buy through proper weighing. One need not compromise on little things as little drops make the big ocean. Make these suggestions as a habit and it would become your way.

### **Conclusion**

Expenditure on vegetables occupies an important portion of total household expenditure. Many of us do not seem to realise the importance of this expense as it is incurred mostly on daily basis. Consumers seem to be ignorant about the market behaviour as it has been observed from this study. Increased awareness and rationality of the consumer may go a long way in reducing wastage in this expenditure and help to save a considerable money income in the long run. It is also concerned about the health of the consumers as quality vegetable consumption would reduce health expenditure. This study is expected to help consumers to save consumer surplus from being exploited by the retailers. Various selling strategies, price and non-price discriminations adopted by retail vegetables sellers were analysed to help the consumers to enhance their consciousness so that they become alert consumers and realize the importance of this expenditure.

**Reference:** Own source and primary study.

## **ENHANCING EXTENT OF VOLUNTEERING AMONG NATIONAL SERVICE SCHEME VOLUNTEERS**

**J. Henry Rozario\***

### **Abstract**

National Service Scheme (N.S.S.) is a volunteer programme that gives opportunity to student youth to engage in socially useful activities and thereby enhance their spirit of volunteerism. The researcher has designed a Programme of Intervention (based on the regular implementation of N.S.S programme in a college unit and also based on the conceptual frame work of volunteer management) and probes whether the programme intervention enhances the volunteering of students in N.S.S. programme and if, to what extent. The study has concluded that the specifically designed Programme Intervention given to the experimental group has resulted in significant changes in the some of the motives of the N.S.S. Volunteers and in the extent of their volunteering. This is an important outcome of the research because if features of the N.S.S. programme is enhanced with the model used in the Programme Intervention, then it will result in strengthening the motive of the volunteers to serve the underprivileged.

This research paper is based on the report of the UGC Minor Research Project done by the author and submitted to UGC with the title ‘Enhancing the Extent of Volunteering among Volunteers’.

**Key Words: Volunteerism, Youth, Motives of Volunteering, Extent of Volunteering, National Service Scheme**

### **Introduction**

Formal education is an important input for youth development. An educational atmosphere, which is prolonged until the person completes his higher education, gives the youth ample opportunity not only in developing his mental abilities but also in developing his personality. This is possible because of the presence of co curricular activities and extra – curricular activities available to the youth in addition to classroom education. Gurmeet Hans (1999:

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589) is of the view that such activities are helpful in the socialization, character formation and preparation for adult roles of students, which the rest of the higher education achieves only marginally. This implies the importance of co curricular and extra curricular activities in the overall development of youth.

### **National Service Scheme**

National Service Scheme was introduced on 24th September 1969, the birth centenary year of Mahatma Gandhi, the father of the nation. In 1986, the New Education Policy declared N.S.S as one of the co-curricular activity along with N.C.C and sports. This was one of the major milestones in the history of N.S.S. The main purpose was to take the students out of the campus situation and to make them aware of the reality of life. The main aim of N.S.S is personality development of student volunteers through community service.

### **Statement of the Problem:**

The main research problem is to find out whether a specifically designed N.S.S. Programme Intervention influences the extent a student volunteers in N.S.S. programme. It also studies whether this intervention influences his motives to join N.S.S..

### **Methodology**

The field of study comprises of N.S.S. volunteers of two N.S.S. Units of Sacred Heart College, (Autonomous), Tirupattur, Vellore District. The design of the research is quasi experimental in nature referred as Non Equivalent Groups design. One group of N.S.S. volunteers forms the control group. The other group of volunteers comprises of the experimental group who were introduced to the programme intervention. Pre programme measurement was obtained on extent of volunteering of N.S.S. volunteers and their motives to join N.S.S. The experimental group underwent the Programme Intervention which is a combination of the regular N.S.S. programme and certain new facets based on the conceptual frame work of volunteer management. The control group had undergone the usual N.S.S. programme.

200 Volunteers of two N.S.S. Units of Sacred Heart College constituted the population. From them, using random sampling method, 45 volunteers from each of the Units have been chosen for the experimental group and control group. Simple random sampling method was used to select the respondents in this study. The same questionnaires was used to collect Pre Intervention data and Post Intervention data. The final tool

comprising the personal profile questionnaire, motives for joining N.S.S. and a checklist on measuring extent of volunteering consisted of 50 questions.

**Programme Intervention:** To the Experimental Group:

Induction and orientation to N.S.S. was given to N.S.S volunteers in detail in addition to what they have received with others in general. The importance of contributing one's service voluntarily with full involvement and commitment was highlighted. Volunteers were involved and consulted at every stage of planning of some of the regular activities conducted. Volunteers were led to SWOT Analysis and reflection sessions were conducted to make them realize the importance of their contribution. Expectations of N.S.S. volunteers were elicited in the beginning of the programme itself to design regular activities so as to meet their expectations. Few training sessions were conducted on topics such as Team work, Passion for Excellence, Communication, Inter Personal Relationship and Social Awareness.

### **Data Analysis – Experimental and Control Groups**

#### **Personal Profile of the Volunteers**

Most of the volunteers (61.1%) belonged to Hinduism, which is the major religion in the state as well as in the country. While 37.8 per cent volunteers belonged to Christianity only 1.1 per cent belonged to Islam. Of the total sample 84.4 per cent of the volunteers were from rural area and the remaining (15.6%) were from urban area. Nearly three fourth of the volunteers (78.9%) fall under moderate socio- economic status index and 15.6 per cent fall under low SES index. Only 5.6 per cent of the volunteers from high SES index were members of the experimental and control groups.

Majority of the respondents (77.8%) were studying science subjects. While 15.6 percent of them were studying commerce only 6.7 per cent of them studied Arts subjects. At the higher secondary level 50 per cent of the volunteers had scored above 60 per cent marks and only 3.3 per cent have scored less than 60 marks. In fact, 46.7 per cent of the volunteers had scored above 75 per cent i.e. distinction. Nearly three fifth of the respondents (64.4%) had attended special camp. This showed that of the total respondents, majority of them had shown interest to participate in camps.

## **Motive of the Volunteers in Joining N.S.S - Pre Test & Post Test Comparison of Experimental and Control Groups**

In many instances, the volunteers may have many reasons for joining N.S.S. “Most commonly, the reasons given included an element of altruism of wanting to help others but there was also general recognition of what the volunteer himself was getting from his work: personal benefit, interest, enjoyment and social contacts” (Aves, 1967:41). So a volunteer may join a programme like N.S.S. not only with altruistic motive but also to socialize with others, or to make use of one’s talents and abilities or even for getting a certificate.

### **(i) To Get Certificate from N.S.S**

Volunteers were asked a question whether they joined N.S.S. for the sake of getting a certificate from the programme. But the question did not mean whether they joined N.S.S. only for getting a certificate.

While in the Pre Test the difference in the Means of Experimental ( $M = 1.16$ ) and Control group ( $M = 1.31$ ) is not statistically significant ( $t = 1.76$ ,  $df = 88$ ,  $p > 0.05$ ), in the Post Test the Mean of Experimental group ( $M = 1.09$ ) is less than that of Control group ( $M = 1.31$ ) and it is statistically significant ( $t = 2.71$ ,  $df = 88$ ,  $p < 0.05$ ). Since the difference in the Mean score of Post test is statistically significant (One tailed independent samples ‘t’ test), it is observed that the programme intervention offered to the Experimental group is associated with the motive to join N.S.S. in terms of getting a certificate.

### **(ii) To Socialize with Others**

N.S.S. provides opportunities for volunteers to mingle with each other during regular activities and the special camping programme. In this context student youth have found N.S.S. as one programme that gives them such opportunity to socialize with others.

While in the Pre Test the difference in the Means of Experimental ( $M = 1.22$ ) and Control group ( $M = 1.31$ ) is not statistically significant ( $t = .948$ ,  $df = 88$ ,  $p > 0.05$ ), in the Post Test the Mean of Experimental group ( $M = 1.13$ ) is less than that of Control group ( $M = 1.31$ ) and it is statistically significant ( $t = 2.05$ ,  $df = 88$ ,  $p < 0.05$ ).

Since the difference in the Mean score of Post test is statistically significant (One tailed independent samples ‘t’ test), it is observed that the programme intervention offered to the Experimental group is associated with the motive to join N.S.S. in terms of socializing with



others. However, it is to be observed that the Mean score on the motive to socialize with others has become lesser after Programme Intervention.

### **(iii) To Exhibit One's Talent and Potential**

N.S.S. provides opportunities for volunteers to make use of their talents, skills and potential. Many of the volunteers get opportunities to involve in planning of the programme and exhibiting their talents in cultural programmes and awareness programmes. For most of such endeavors, they also get appreciation from their friends or beneficiaries. Many N.S.S. volunteers cherish this experience and join N.S.S. for this reason.

In the Pre Test the difference in the Means of Experimental ( $M = 1.11$ ) and Control group ( $M = 1.44$ ) is statistically significant ( $t = 3.76$ ,  $df = 88$ ,  $p < 0.05$ ) and the trend continues in Post test also. Mean of Experimental group ( $M = 1.11$ ), Control group ( $M = 1.40$ ) and it is statistically significant ( $t = 3.29$ ,  $df = 88$ ,  $p < 0.05$ ). Moreover, Mean score on the motive of joining N.S.S. to exhibit one's talent has remained the same both in Pre Test and Post Test.

Thus, based on the substantive analysis, it is concluded that the motive to join N.S.S. for the sake of exhibiting one's talent remained the same both before and after the specifically designed programme intervention. So it is observed that the programme intervention offered to the Experimental group is not associated with the motive to join N.S.S. in terms of exhibiting one's talents because the trend was the same even before the introduction of the specifically designed programme intervention.

### **(iv) To Help the Poor /Underprivileged:**

One of the primary reasons for a person to volunteer his time and energy is to help those people in need. While in the Pre Test the difference in the Means of Experimental ( $M = 1.51$ ) and Control group ( $M = 1.40$ ) is not statistically significant ( $t = 1.05$ ,  $df = 88$ ,  $p > 0.05$ ), in the Post Test the Mean of Experimental group ( $M = 1.58$ ) is more than that of Control group ( $M = 1.29$ ) and it is statistically significant ( $t = 2.86$ ,  $df = 88$ ,  $p < 0.05$ ).

Since the difference in the Mean score of Post test is statistically significant (One tailed independent samples 't' test), it is observed that the programme intervention offered to the Experimental group is associated with the motive to join N.S.S. in terms of helping the poor.

## **Extent of Volunteering of the Volunteers: Pre Test & Post Test Comparison of Experimental and Control Groups**

### **Extent of volunteering Index**

Extent of volunteering index is a composite variable. Wilson and Musick (1997) have constructed a volunteer index by considering the types of volunteer work the respondents reported. Keeping this as a reference, extent of volunteering has been constructed as a composite variable.

Participation in special camp:

Participated =1; Not Participated =0

Hours put in I year in Regular activities: Below 30 hours =1; 31 to 60 hours =2 ; 61 to 90 hours =3; 91 to 120 hours =4 ; 121 and above =5

Hours put in II year in Regular Activities: Same pattern as in I year

Maintaining work diary: Yes = 1 No = 0

Taking initiative in N.S.S: Yes = 1 No = 0

Meeting programme officer On his/her own: Yes = 1 No = 0

Suggestions given to improve the programme: Yes = 1 No = 0

Efforts in mobilizing resources: Yes = 1 No = 0

Due consideration was given before finalizing the weightage. As per weightage, a volunteer can get a maximum of 16 points and minimum of 2 points.

### **Extent of Volunteering of the Volunteers**

Table 1.1 and 1.2 presents the analysis of the association between programme intervention and the extent of volunteering of N.S.S. volunteers in the N.S.S. programme.

**Pre Test - Table – 1.1****Mean Scores with regard to Experimental and Control Groups and Extent of Volunteering of the Volunteers**

Groups	Extent of Volunteering of the Volunteers			't' Value	Stat. Sig.
	N	M	SD		
Experimental	45	10.66	3.57	0.826	0.409
Control	45	10.42	3.55		

**Null Hypothesis** - There is no association between programme intervention and extent of volunteering of the volunteers.

**Research Hypothesis** - N.S.S volunteers who undergo the programme intervention will have higher extent of volunteering than other N.S.S. volunteers who do not undergo the programme intervention.

**Post Test - Table – 1.2****Mean Scores with regard to Experimental and Control Groups and Extent of Volunteering of the Volunteers**

Groups	Extent of Volunteering of the Volunteers			't' Value	Stat. Sig.
	N	M	SD		
Experimental	45	10.93	3.59	2.90	0.004
Control	45	10.12	3.48		

While in the Pre Test the difference in the Means of Experimental (M = 10.66) and Control group (M = 10.42) is not statistically significant ( $t = .826$ ,  $df = 88$ ,  $p > 0.05$ ), in the Post Test the Mean of Experimental group (M = 10.93) is more than that of Control group (M = 10.12) and it is statistically significant ( $t = 2.90$ ,  $df = 88$ ,  $p < 0.05$ ).

Based on the statistical analysis, the Null hypothesis is rejected and the research hypothesis is accepted. Since the difference in the Mean score of Post test is statistically significant (One tailed independent samples 't'test), it is observed that the programme intervention offered to the Experimental group is associated with the extent of volunteering of the N.S.S. volunteers. Thus it is observed that N.S.S volunteers who have undergone the programme intervention have had higher extent of volunteering in the N.S.S. programme than other N.S.S. volunteers who have not undergone the programme intervention.

### **Implication for Practice**

The study has concluded that the specifically designed Programme Intervention given to the experimental group has resulted in significant changes in the motives of the N.S.S. Volunteers. First of all it has enhanced their motive to serve the under privileged. This is an important outcome of the research because if features of the N.S.S. programme is enhanced with the model used in the Programme Intervention, it will result in strengthening the motive of the volunteers to serve the underprivileged. Similarly, the Programme Intervention has made them realize that there is more to join N.S.S. than merely for the sake of getting a certificate. Programme Intervention has made them to focus more on the motive to serve the under privileged apart from joining N.S.S. with the motive of getting a certificate and getting the opportunity to exhibit talents.

“ Motivation to volunteer is complex and recent research has highlighted a duality of volunteering, challenging the traditional assumption that volunteers are solely altruistically motivated” (Fiona Wardell, p.230). Based on this view, it is better for the N.S.S. programme to respond positively to the changing needs and motives of youth in order to sustain their motivation. It is recommended to provide more avenues to the volunteers through zonal meetings and competitions, training programmes, state level cultural exchange programmes, youth volunteer festivals, and national integration camps. This would provide opportunities to volunteers to exhibit their talents and provide them with an opportunity to serve the under privileged.

Regular activities of N.S.S have to be made more systematic and regular. This will strengthen the existing programme model. Regular activities gradually introduce volunteers in community service and group interaction and are spread out throughout the year. In this way it has more scope of effecting and sustaining the personality development of the volunteers. So it is recommended that regular programmes shall be given more importance than it is given now. To facilitate this, it is recommended that the programme officer shall make use of volunteer leaders.

There are few other areas such as importance and priority given by the management to N.S.S., infrastructure and other facilities available in the campus, staff availability, staff turnover and the motive and background of volunteers that would enhance quality of output of the current N.S.S. Programme.

One of the major findings of the study indicates that variables related to specifically designed Programme Intervention are stronger predictors in influencing volunteerism. The study has pinpointed that variables such as involving volunteers in evaluation cum experience sharing sessions, giving them the much needed organizational support and orienting them properly in N.S.S., do enhance their extent of volunteering as well as their attitude towards volunteerism. Findings indicate that higher the organizational support, higher the extent of volunteering. Giving orientation to volunteers and involving them in evaluation sessions appear to influence their volunteerism.

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## **DIMENSIONS OF CLASS QUALITY CIRCLES AND DEVELOPMENT OF LIFE SKILLS – PERSPECTIVES OF CQC LEADERS**

**K. Arockia Raj\* and G. Kumar**

### ***Abstract***

*Class Quality Circle (CQC) is a boon for the holistic development of students in educational institution. CQC identifies and implements programs that benefit individuals, circle and the class. Members in CQC identify, analyze and solve their problems at circle, class and college by applying various systematic problem solving approach. This paper highlights the findings and recommendations derived from the experience gained by the CQC leader in Sacred Heart College, Tirupattur, Vellore Dist, TN. Life skill is considered as one of the essential elements in life. This paper depicts the extent of life skill development by the leaders through the CQC functions. Training to facilitator and leaders, scientific formation of CQC, evaluation, monitoring and involvement of alumni for scientific orientation and inspiration were the suggestions for effective function of CQC.*

**Key Words:** *Class Quality Circle (CQC), life skills*

### **Introduction**

In any educational system students are the most important stakeholders and all its activities should focus and centre on providing quality education and quality support services to the students. 'Quality' is never by accident. It is an outcome of continuous pursuit. There are many ways to improve the quality in an institution (Ravisankar, 2000). Class Quality Circle (CQC) is one of the important ways of improving quality through the participation of students. The world has piled up huge challenges and expectations in front of the present young generation. Educational institutions have greater responsibilities to get the students ready to handle the challenges to help themselves, family and the nation for its sustainable development. This initiation starts at educational institutions. The required skills, attitude and knowledge are updated in schools and colleges. This paper highlights how CQCs can be powerful instruments and their dimensions in enhancing the life skills of leaders at Sacred Heart College, Tirupattur, Vellore District in Tamil Nadu. The opinion of student leaders

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about the process of implementing the concept, benefits received and challenges faced are described in this paper.

### **Review of Literature**

Quality circles were first established in Japan in 1962 (Nonaka, 1990). Although quality circles have their roots in industry, quality circles have a promise as a pedagogical tool that makes students responsible for their own learning and increases class participation. Quality Circle concept has been sowed in academic institutions in the form of Class Quality Circle, which is a real boon in transforming students into resourceful young generation towards nation building. A Class Quality Circle consists of a small group of students who are interested to help the class for a better learning. It is a system under which students, staff and management satisfy themselves that control mechanisms are working to maintain and enhance the quality of teaching and learning process. CQC meets voluntarily, on a regular basis, to discuss problems, seek solutions, and cooperate with management in the implementation of those solutions. Quality circles operate on the principle that student's participation in decision-making and problem-solving improves the quality of student life (Akturk et al, 2002). Dinesh (2008) identified the benefits in implementing CQC such as Self-confidence and desire to excel, self-discipline and better manners, interpersonal and public relations, positive attitude and empathy, social responsibility, time management skills, scientific problem solving skills, communication and presentation skills, creativity and lateral thinking habits, working habits in a team, broader vision and academic knowledge. CQC decides to reduce the time devoted to lectures, to increase the time available for discussion and to change the location of the class to facilitate discussions. It was found that the students moved toward "a firmer and more scholarly approach" In addition, class participation increased from about 30 to 75 percent. The more the students participate the higher the interest in learning and understanding of the subject for an excellent career.

### **Benefits of Class Quality Circles**

1. It allows students' input into the academic progress of the course, which is determining the type and frequency of written assignments, the content of lectures, and testing methods to be used (Murray, 1983).
2. It accumulates and generates students' input into the course structure and content, which is classroom routine, and management, methods of presenting the subject matter, and increasing class participation (Hirshfield, 1983).

3. It improves education in the classroom and provides students with an opportunity to participate in the improvement or alteration of the course (Kogut, 1984).
4. It improves the quality of teaching in the class (Hau, 1991).
5. It enhances students' learning (Chizmar, 1994).
6. It allows students' input into restructuring both course content and pedagogical methodology to awaken student minds to the richness (Hirshfield, 1994).
7. It enhances the student learning of course material (Wendling, 1996).
8. It acquires continuous feedback for improving the course now and redesigning it for the next year (Useem, 1996).
9. It provides feedback about the instructors' teaching, the classroom experience, and student performance in class (Orts, 1997).
10. It facilitates to discuss matters of course management and agree on a set of policies that will be used to manage the course (Nugraha, 1997).
11. It improves the climate of learning by bringing issues and concerns, as well as positive comments, from the students in the course to the faculty (Cullen and Johnston, 1999).

Life skills have been identified as essential for the holistic well-being. The World Health Organization (1997) defines life skills as the skills required for better decision making, problem solving, creative thinking, critical thinking, effective communication, interpersonal relationship skills, self-awareness, empathy, coping with emotions, self coping, self management and coping with stress. As discussed above CQC could be an effective instrument to transform the students into better learners of subject and skills required for better life and to make this society a better place to live.

### **Objectives**

1. To study the process adopted in the formation of Class Quality Circle.
2. To find out the objectives of Class Quality Circles.
3. To study the life skills developed through Class Quality Circles.
4. To find out the challenges faced in implementing Class Quality Circles.



## Methodology

The research was carried out in 2011-2012 under Descriptive Design in Sacred Heart College, Tirupattur, Vellore Dist. The college was started in 1951. It has co-education system and functions in two shifts with 4000 UG, PG, M.Phil and Ph.D students. The CQC concept was introduced in the college in the year 2005. By using census technique, all the CQC leaders (N=65) of UG departments of both the shifts were the respondents of this study. Questionnaires were administered for collecting the data. Variables were classified to assess the CQC dimensions and life skills development through CQC. SPSS 14 version was used for processing and analysing the data.

## Results and Discussion

### Process Adopted in Formation of the CQC

Formation of CQC based voluntary membership will ensure good participation and contribution of members for the success of the CQC. The study revealed that three fourth (75%) of the groups were formed based on voluntary membership and the other one fourth (25%) of the leaders expressed that the group formation was done on compulsion by the teachers.

### Objectives of the CQCs

Class Quality Circles need to identify objectives for its effective and purposeful functioning. The following diagram depicts the different types of CQCs' objectives.

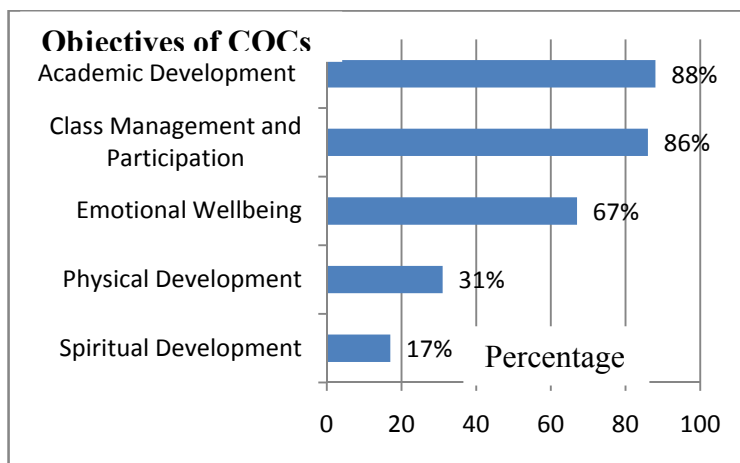


Figure No: 1

### Objectives of CQCs

Most of the CQCs had the objectives towards academic development, class management/participation and emotional wellbeing.

### Life Skills Developed through CQC by Gender

Life skills are one of the essential aspects that need to be developed by every student. The following table provides the details of life skills developed by the gender of the CQC leaders.

**Table No: 1**  
**Life Skills Developed through CQC by Gender**

Life Skill Development		N	Mean	t-test for Equality of Means		
				t	df	Sig. (2-tailed)
Gender	Girl	46	16.065	-.620	63	.037
	Boy	19	18.074			

*N*=65

The development of life skills differs in its mean value ( $p < 0.05$ ) by the gender and boy leaders have developed life skills more than the girl leaders.

### Life Skills Developed through CQC by Group Dynamics

CQC is expected to enhance the life skills when it formed, implemented and evaluated scientifically. The following table provides the difference in the life skills by the group dynamics observed in the CQCs.

**Table No: 2**  
**Life Skills Developed through CQC by Group Dynamics**

CQCs Dynamics		N	Mean	t-test for Equality of Means		
				T	df	Sig.(2-tailed)
CQC Formation	Volunteered	45	19.202	1.66	63	.001
	Divided	20	16.412			
Meetings	More Meetings	21	21.161	.16	63	.041
	Few Meetings	44	18.243			
Selection of Leaders	Volunteered	38	19.132	.63	63	.025
	Proposed by Others	27	17.225			
Teachers' Involvement	More Involvement	29	20.251	-.75	63	.021
	Lesser Involvement	36	17.743			

*N*=65

Development of leader’s life skills differ in its mean value ( $p < 0.05$ ) by the group dynamics adopted by the Class Quality Circles. Group formation by volunteerism, more number of meetings, selection of leaders based on volunteerism and lesser teachers’ involvement contributed to the development of life skills in a better way.

### Challenges Faced by Class Quality Circles

Challenges are barriers for the efficient functioning of Class Quality Circle. The following are the challenges perceived by the leaders which make the CQC a successful and useful one.

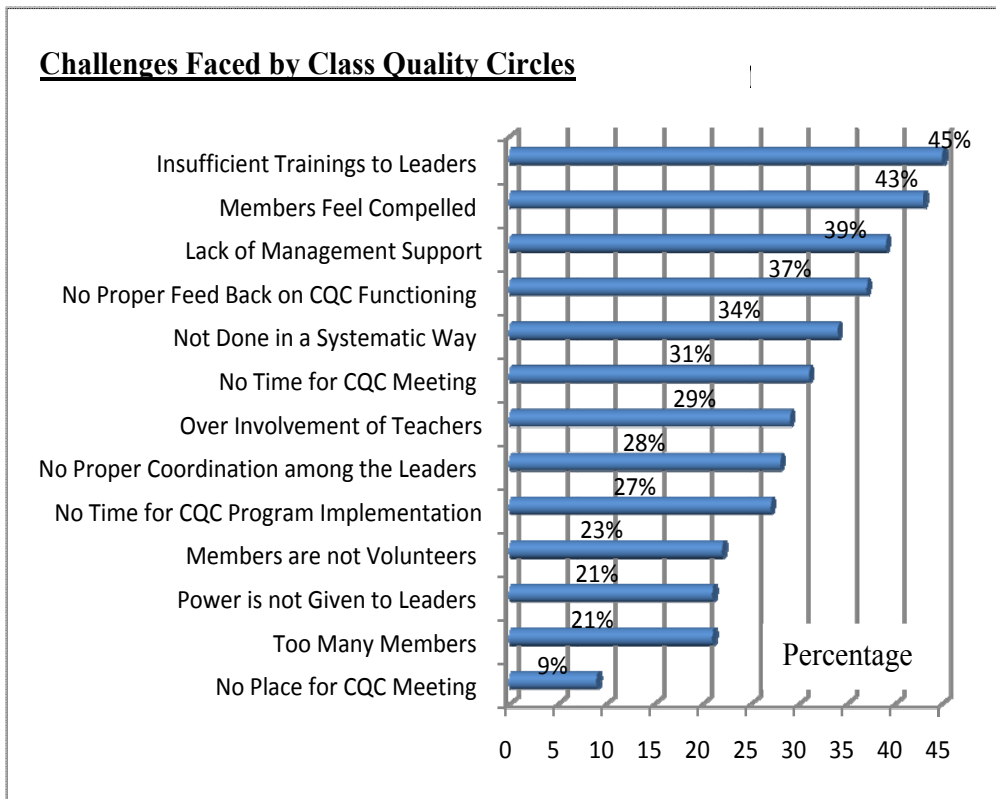


Figure No: 2

### **Challenges Faced by Class Quality Circles**

Insufficient training to leaders, compulsory membership and lack of management support are the three major challenges perceived by the CQC leaders.

#### **Recommendations**

1. Scientific orientation need to be given to the members and leaders in CQC about purposeful group formation.
2. Sufficient trainings need to be offered to CQC.
3. Teachers need to be oriented to understand the concept and implementation of Class Quality Circles.
4. Gaining Life Skills could be one of the very important outcomes of CQC. Hence, Life skill training could be made mandatory.
5. Feedback and evaluation have to be made available by the facilitators and coordinators for the betterment of individuals and circles.
6. Literature available on formation and implementation of CQC should be enhanced.
7. Selection of leaders and members should be only by volunteerism basis
8. Experts' involvement need to be ensured to inspire the CQCs and Alumni of the respective department could contribute to this cause.
9. Separate coordinators need to be appointed to concentrate, monitor and enable CQCs function effectively.
10. Award and reward systems need to be introduced to motivate the CQCs function effectively.

#### **Conclusion**

The scientific application of Class Quality Circle would certainly enhance the quality of learning and the holistic development of students. This will prepare them to excel in their career. As this paper described, Class Quality Circle has a greater role to enhance the life

skills of leader and members. It makes the job of teachers and management effective and meaningful. Participation of students as CQC members and leaders gives them experiences of team work, leadership, planning, delegating, monitoring, decision making, problem solving, creative thinking, critical thinking, effective communication, interpersonal relationship skills, self-awareness, empathy, coping with emotions, self coping, self management and coping with stress. Sufficient attention and support from the management through facilitation and training will yield good result when students perform in the college and in the long run in their career. Class Quality Circle is recommended to other institution towards the holistic quality enhancement.

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## ‘வினையே ஆடவர்க்கு உயிரே’ – சமூகவியல் நோக்கு

சு.மா.மாரியப்பன்\*

சங்க இலக்கியத் தொகுப்பில் அடங்கியுள்ள பாடல்கள் ஒரு காலத்தில் உருவாக்கம் பெற்றவை அல்ல. அவை நீண்ட கால இடைவெளி பரப்பையும் தொன்மையையும் கொண்டு விளங்கக் கூடியன. இக்கால இடைவெளியில் ஒரு சமூகம் பல்வேறு பரிணாம மாற்றங்களை அடைந்திருக்கும் என்பது உறுதி. இவ்வகையில் சங்க இலக்கியப் பாடல்கள் தொல் தமிழ்ச் சமூகத்தின் பன்முகப் பரிணாம வளர்ச்சியைப் பிரதிபலித்துக் காட்டுகின்றன. அவை இனக்குழுச் சமூகத்தின் வாழ்வு அதன் அழிவு, பேரரசு உருவாக்கம், பெருஞ்சமயத் தோற்றம், பேரறம் உருவாக்கம் என்பன. இவற்றின் தொழிற்படுதல்களால் மக்களின் வாழ்க்கை முறை பல்வேறு மாறுதல்களுக்கு உட்பட்டு அமைந்தன. ஆடவர்க்கும் மகளிர்க்குமான புதிய சமூக மதிப்பீடுகளும் கடமைகளும் தோற்றம் பெற்றன. இத்தகையதொரு கருத்தியல் பின்னணியில் சங்க இலக்கியப் பாடல்களை ஆராயும்போது சில விடயங்களுக்குக் காரண காரியங்களைக் காண்கூடும். இக்கருதுகோளினூடாகக் குறுந்தொகையின் 135-ஆம் பாடல் கட்டமைக்கும் ஆணுக்கும் பெண்ணுக்குமான கடமையைச் சமூகவியல் நோக்கில் ஆராய்வதே இக்கட்டுரையின் நோக்கமாகும். பாடலும், பாடலின் சூழலும், பொருளும் பின்வருமாறு,

“வினையே ஆடவர்க்கு உயிரே வாள்நுதல்  
மனைஉறை மகளிர்க்கு ஆடவர் உயிர்என  
நமக்கு உரைத்தோரும் தாமே  
அழாஅல் தோழி அழுங்குவர் செலவே”

என்ற தோழி கூற்றுப்பாடல் பாலைத் திணைக்குரியது. இப்பாடல் பாலை பாடிய பெருங்கடுங்கோவால் பாடப்பட்டது. தலைவன் பொருள் திரட்ட வேண்டி பிரிய எண்ணி இருப்பதை அறிந்து கலக்கமுற்று வருந்திய தலைவியை ஆற்றுவிக்கும் பொருட்டுத் தோழி உரைத்தது. பாடற்பொருள்: தோழி! தொழில்

\*உதவிப் பேராசிரியர், தமிழ்த்துறை, தாய நெஞ்சக்கல்லூரி, திருப்பத்தூர் - 635 601.

தான் ஆண்களுக்கு உயிராகும் என்றும் வீட்டில் வாழும் மகளிர்க்குக் கணவன்மாரே உயிராவர் என்றும் நமக்கு உரைத்தவரும் தலைவரே. ஆதலால், தலைவர் பொருள்மேற்பிரிந்து செல்லுதலைத் தவிர்ப்பார், அழுதலை ஒழிப்பாயாக.

வினையே ஆடவரின் உயிராகக் கருதப்பட்டாலும் மனையில் வாழும் மகளிர்க்கு ஆடவரே உயிராவர் என்பதையும் அறிந்துள்ள நம் தலைவர் பிரியமாட்டார். ஆதலால், நும் அழுகையை விட்டு வருத்தம் ஒழிப்பாயாக என்பது பாடலின் உட்கருத்து.

இப்பாடல் ஆடவரின் உயிர் வினைமேற் செல்லல் என்றும் மனையுறை மகளிரின் உயிர் தன்னை மணந்த ஆடவரே என்றும் ஆடவர்க்கும் மகளிர்க்குமான ஓர் அறத்தைக் கற்பிக்கின்றது. இத்தகையதான ஓர் அறம் / கடமை உருவாவதற்கான சமூகப் பின்னணி என்ன? ஆணுக்கும் பெண்ணுக்கும் இவ்வாறான அறத்தை வலியுறுத்துவதற்கான சமூகத் தேவை என்ன? ஆண்கள் பெண்களைத் தங்கள் அன்புக்குரியவர்களாக / உயிர்க்கு நிகரானவர்களாகக் கருதவில்லையா? கருதப்பட்டிருந்தும் பொருள்திரட்ட பிரிந்தே ஆக வேண்டும் என்று கட்டாயப்படுத்தியது எது? தொழில் முனைவில் பெண்கள் ஈடுபடவில்லையா? என்ற பலவித வினாக்களை இப்பாடல் தன்னகத்தே தாங்கி நிற்கக் கூடியனதாக விளங்குகின்றது. இவ்வினாக்களுக்கு விடை காணுதல் மூலம் ஆணுக்கும் பெண்ணுக்குமான இவ்வறம் தோற்றம் பெற்றதற்கான சமூகப் பின்னணியை ஒருவாறு அறிந்து கொள்ள முடியும்.

இவ்வாய்வின் முதற்பகுதியாகத் தமிழ் ஆய்வாளர்கள் முன்வைக்கும் தமிழ்ச் சமூகத்தின் பரிணாம வளர்ச்சியை அறிதல் ஆய்வுப் பொருண்மையை விளங்கிக் கொள்ள உதவியாக அமையும். தொல்காப்பியமும் சங்க இலக்கியப் பாடல்களும் தொல் தமிழ்ச் சமூகத்தின் பரிணாம வளர்ச்சியைப் புலப்படுத்தி நிற்கின்றன. 'தொல்காப்பியர் கூறும் குறிஞ்சி, முல்லை, மருதம் போன்றன தமிழகத்தின் வெவ்வேறு காலகட்டத்தில் வழக்கிலிருந்த சமுதாயத்தை விளக்குவன ஆகலாம். தொல்காப்பியர் மேற்கொண்ட பணி தம் காலத்ததும் தமக்கு முந்தைய காலத்ததுமாகிய சமுதாய வழக்கங்களைத் தொகுத்தளிக்கும் முயற்சியே ஆகும். களவு, கற்பு என்பன இருவேறு மண வடிவங்கள்; தொன்மைக் காலத்து மண வகைகள். களவு என்பது



## ‘வினையே ஆடவர்க்கு உயிரே’ – சமூகவியல் நோக்கு

தொன்மைக் காலத்துச் சுதந்திர மணத்தைக் குறிப்பதாகும். கற்பு என்பது வளர்ச்சியடைந்த, சடங்குகள் தோன்றிவிட்ட, ஆண்வழித் தலைமை நிலைபெற்ற சமூகத்து மணமுறையைக் குறிப்பதாகும். இவற்றின் அடிப்படையில் குறிஞ்சித்திணை தமிழரின் ஆதி சமூகத்தில் நிலவிய சுதந்திர புணர்ச்சி வழிப்பட்ட காதல் வாழ்க்கையையும், முல்லைத்திணை தொன்மைக்கால மனிதன் அநாகரிக நிலையிலிருந்து நாகரிக நிலைக்கு மாறும்போது அவனின் முதல் சொத்து ஆநிரைகளாகவே இருந்தன. இந்த ஆநிரைகள் வழியே தனியுடைமை உருவாக்கம் பெற்றது. தனியுடைமை தோன்றவே அதனை விடுத்துச் செல்ல வாரிசரிமை தோன்றியது. வாரிசரிமையை நிலைநாட்ட ஒருதார மணமும் அதில் தோன்றும் வழக்களைக் களையக் கற்பு விதிகளும் உருவான சமூக வாழ்க்கையும் உருவாகியது; மருதத்திணை முல்லை நிலச் சமூக அமைப்பை அடுத்து ஆநிரைகள் வழியே நிலவுடைமைச் சமுதாயம் மலர்ந்தது. அரசு உருவாக்கம், அரசன் ஏராளமான அதிகாரங்களின் மையமாகத் திகழ்ந்தது, ஏராளமான மகளிரைத் தம் இன்பத்திற்கு வைத்துக்கொள்ளுதல் போன்றவை தோற்றம் பெற்றன. நிலவுடைமை, பொருளையும் அதன்வழி பெண்களையும் ஒருவனுக்குச் சொந்தமாக்கியது; நெய்தல் திணை மருத வாழ்வு பெரும் பொருட் சேர்க்கையை உண்டு பண்ணியதின் காரணமாக வாணிபம் என்னும் வியாபாரச் சந்தை உருக்கொள்வதாயிற்று. வாணிபம் தரைவழி, கடல்வழி மேற்கொண்டதில் கடற்கரைத் துறைமுகப் பட்டினங்கள் உருவாயிற்று’ (சிலம்பு நா.செல்வராசு, 2005.பக்.147-150).

மேற்காணப்பட்டவையிலிருந்து தமிழ்ச் சமூகம், வேட்டைச் சமூகத்திலிருந்து தனியுடைமைச் சமூகமாகவும்; தனியுடைமைச் சமூகத்திலிருந்து நிலவுடைமைச் சமூகமாகவும் அதாவது தனியுடைமைச் சமூகத்தை அடுத்து பேரரசும், பெருஞ்சமயமும் பேரறமும் தோற்றம் பெற்ற சமூகமாகவும் பரிணாம வளர்ச்சி அடைந்து வந்துள்ளதை அறிய முடிகிறது. இங்கே, பாலைத்திணைக்குரிய சமூக உருவாக்கம் என்ன? என்ற கேள்வி எழக்கூடும். பாலைத் திணைக்குத் தனி நிலமும் சமூக உருவாக்கமும் இல்லை என்பதைத் தொல்காப்பியத்தின் வழி அறியலாம். தொல்காப்பியர் தம் நூலில் தமிழக நிலப்பரப்பை நானிலமாக மட்டுமே வகைப்படுத்திக்

காட்டுவார் (அகத்.2). பாலைத் திணைக்குத் தனி நிலம் கூறாது விடுவார். சிலப்பதிகார ஆசிரியர் இளங்கோவடிகளே பாலைத்திணைக்குரிய நிலம் உருவாக்கம் பெறுவதை விளக்கிக் காட்டுவார். அவை,

“வேனிலங் கிழவனொடு வெங்கதிர் வேந்தன்  
தானலந் திருகத் தன்மையிற் குன்றி  
முல்லையும் குறிஞ்சியும் முறைமையின் திரிந்து  
நல்லியல் பிழந்து நடுங்குதய ரறுத்துப்  
பாலை யென்பதோர் படிவங் கொள்ளும்  
காலை எய்தினிர் காரிகை தன்னுடன்”

(சிலம்பு.11: 62-67)

என்னும் அடிகளில் வேளிற்காலத்தில் வெவ்விய கதிர்களையுடைய ஞாயிறு நலம் வேறுபடுதலான் முல்லை, குறிஞ்சி எனும் இரு நிலமும் தமது இயற்கை கெட்டு, வறட்சியற்று நல்லில்புகளை இழந்து தம்மைச் சேர்ந்தோர் நடுங்கும் வண்ணம் துன்பம் தரும் பாலை என்பதோர் வடிவினைக் கொள்ளும் இக்காலத்து காரிகையுடன் அடைந்தீர் என மாங்காட்டு மறையோன் வாயிலாகக் கூறிப் போந்துள்ளார். எனவே, பாலை என்பது முல்லை, குறிஞ்சி நிலங்கள் வேளிற்காலத்தில் கொள்ளும் வறட்சியான நிலச்சூழலைக் குறித்து நிற்பதை அறியலாம். பாலைக்குத் தனிநிலம் கொள்ளாமல் அப்பருவத்தில் ஏற்படும் பிரிவை மட்டுமே திணை ஒழுக்கமாகக் கொண்டு சங்கப் புலவர்கள் பாடியுள்ளதாகக் கொள்ளலாம்.

மழை இல்லாத வேளிற் காலத்தும் ஓரளவு வளத்தைக் கொடுப்பது குறிஞ்சி நிலத்து மலையும், மருத நிலத்து தேக்கிய நீர் நிலைகளைக் கொண்ட வயலும் ஆகும். எக்காலத்தும் வளத்தை நல்குவது நெய்தல் நிலத்துக் கடல். ஆனால், மழை இல்லாத வேளிற்காலத்து மிகவும் பாதிக்கக் கூடியது குன்றுகளையும் மேய்ச்சல் நிலங்களையும் கொண்ட முல்லை நிலமே ஆகும். சிறு நீர்நிலைகள் வறண்டு போனதாலும் மேய்ச்சல் நிலங்கள் காய்ந்து போனதாலும் ஆநிரைகளின் உணவுக்காக வேற்று மேய்ச்சல் நிலத்தைத் தேடிப் போக வேண்டிய கட்டாயம் ஏற்படுகிறது. தனியுடைமைச் சமூகமாக மலர்ந்த முல்லை நிலத்தில் பிரிதல் என்பது தொடக்கத்தில் ஆநிரைகளின் மேய்ச்சலுக்கான பிரிவாகவே இருந்திருக்க வேண்டும். மழைக்காலத்தில்

## ‘வினையே ஆடவர்க்கு உயிரே’ – சமூகவியல் நோக்கு

உற்பத்திச் செய்யப்பட்ட விளைச்சளைச் சேமித்து, மழையற்ற வேளிக்காலத்தில் தம் குடும்பத்திற்குத் தேவையான உணவாகப் பயன்படுத்தினர். தனியுடைமைச் சமுதாயத்தில் உணவு உற்பத்தியும், சேமிப்பும், ஆநிரை வளர்ப்பும் வழக்கமாயின. இச்சமூகத்தில் மேய்ச்சல் நிலம் பொதுவானவை. ஆநிரை என்ற உடைமையைத் தனக்கு அடுத்துப் பாதுகாத்து அனுபவிப்பதற்கான வாரிசுகளைப் பெற்றுத் தருவளாகவும், ஓர் ஆணுக்கு மட்டுமே உரிமை உடையவளாகவும் பெண் மாற்றப்பட்டமையின் பிரிந்து சென்ற கணவன் வரும் வரையிலும் அவனுக்காக வீட்டில் ஆற்றியிருத்தல் கட்டாயமாக்கப்பட்டது. காத்திருத்தலின் போது ஏற்படும் பாலியல் தவறுகளைக் களையக் கற்பும் வலியுறுத்தப்பட்டது. பாலநிலத்துப் பிரிதல் ஒழுக்கம் என்பது முல்லை நிலத்து இருத்தல் ஒழுக்கத்தின் மாற்று ஒழுக்கமாகவே அமைவதை உணரலாம். இருத்தல் பெண்ணை மையப்படுத்தியும், பிரிதல் ஆணை மையப்படுத்தியும் நிகழக்கூடியதாக இருந்தாலும், இவ்விரு வகை ஒழுக்கங்களும் பெண்ணை முதன்மைபடுத்தியே இயங்குகின்றன. எனவே, இருத்தல், பிரிதல் என்ற இருவகை ஒழுக்கங்களும் முல்லை நிலத்து மக்கள் ஒழுக்கங்களாக அமைவதாகவே கொள்ளலாம்.

தனியுடைமைச் சமூகத்தை அடுத்து அமைந்த நிலவுடைமைச் சமூகத்தில் அரசு உருவாக்கம் பெற்றது. அரசு உருவாக்கம் பெற்ற சமூக அமைப்பில், மன்னன் கடவுளுக்கு இணையானவன், குடிமக்களின் உயிர் போன்றவன், மன்னனுக்கு ஆபத்து நேரும்போது குடிமக்கள் அவனுக்காக உயிரைக் கொடுக்கக் கூடியவர்கள், ஆடவர் மன்னனுக்காகப் போர்க்களத்திற்குச் சென்று பகைவருடன் பொருது விழுப்புண்ணேற்று வீழ்தல், பகைவர் முன் மானத்தோடு வாழ்தல், பிறர்வீட்டு வாயிலில் சென்று இரவாமை, முன்னோர் சேர்த்து வைத்தப்பொருளை விரும்பாமை, இரப்போர்க்கு ஈதல், விருந்தோம்பல், மணக்கூட்டத்திற்கும், காமக்கூட்டத்திற்கும் பொருளே அடிப்படை, பெண் ஒரு ஆணுக்கு உடைமையானவள், நாணமும் கற்பும் கொண்டவள், தம் கணவனையே உயிராக மதிக்கத் தக்கவள், மனைக்கு விளக்குப் போன்றவள், நற்புதல்வனைப் பெற்றெடுக்கக் கூடியவள் போன்ற புதிய சமூக அறங்களும், ஆண் பெண்ணுக்கான புதிய மதிப்பீடுகளும் கடமைகளும் உருவாக்கம் பெற்று கற்பிக்கப்பட்டன.

இப்புதிய ஆணாதிக்க நிலவுடைமைச் சமூக மாற்றத்தால் ஆண், பெண் உடனிருந்து வாழ்ந்த பழைய குடும்ப வாழ்க்கை முறையில் சிதைவு ஏற்பட்டது. பெண் பொருள் உற்பத்தியிலும், பொருள் திரட்டுவதிலும் ஈடுபடுவதைத் தடைசெய்து, மனையை மட்டும் மையமாகக் கொண்டு வாழக்கூடியவளாக மாற்றப்பட்டாள். கணவன் பிரிந்த காலத்தில் அவனையே தன் உயிராக எண்ணி அவன் வருகைக்காகக் காத்திருத்தல் கட்டாயமாக்கப்பட்டது. ஆண்கள் தம் விருப்பம் போல் காதல் கொண்ட மனைவியுடன் ஒன்றிணைந்து வாழ்ந்த வாழ்க்கைக்கும் இடையூறு நேர்ந்தது. வீட்டில் மனைவியுடன் காதல் கொண்டு வாழும் வாழ்க்கையை விட, பொருள் திரட்டி அறம் செய்து பகைவன் முன் மானத்தோடு வாழும் வாழ்க்கையே சிறந்தது என்னும் கருத்து முதன்மைப்படுத்தப்பட்டது. இதனால், காதல் கொண்ட மனைவியை வீட்டில் தனியே விட்டுவிட்டுப் பல்வேறு கொடுமைகள் மிகுந்த பாலை நிலத்தைக் கடந்து சென்று, வேற்று நாடுகளில் பொருள் திரட்ட வேண்டிய கட்டாயம் ஏற்பட்டது. நிலவுடைமைச் சமூகத்தில் தம் மனைவியை விட்டு வேற்று நாடுகள் சென்று பொருள் திரட்டுவதும், அரசன் பொருட்டுப் போர்முனைக்குச் செல்வதும் ஆடவர்களின் கடமைகளாக வலியுறுத்தப்பட்டன. எனவே, வீட்டில் காதல் மனைவியுடன் சேர்ந்து இருப்பதைச் சோம்பி இருப்பதாக இழித்துரைத்துவிட்டுப் பிரிந்து வினைமேற் செல்லலே ஆடவரின் உயிராகக் கற்பிக்கப்பட்டது.

பொருள்மேற் செல்லும் தலைவன் நிலவுடைமைச் சமூகத்தில் உருவாக்கம் பெற்ற இப்புதிய அறங்களின், கடமைகளின் உந்துதலாலேயே தன் அன்புக்குரிய மனைவியை வீட்டில் தனியே விட்டுப் பிரிந்து செல்லக் கூடியவனாகக் காணப்படுகிறான். சான்றாக,

- அறநெறியிலிருந்து பிறழாத வாழ்க்கையும், என்றும் மற்றவர் வீட்டு வாயிலில் நின்று பொருள் கேட்டுக் கையேந்தாத நிலை இரண்டும் பொருளினால் அமையக்கூடியன என்று கூறி, தலைவன் பொருள் தேடச் செல்கிறான் (அகம்.155:1-3).
- நண்பர்களின் வறுமையும், உறவினர்களின் துன்பமும், மாற்றார் செல்வப் பெருக்கமும் கண்டு ஓர் ஊரில் இருந்து அமைதியாக

வாழ்தல் முடியாது என்று பொருள் திரட்டச் செல்கின்றான் (அகம்.279:1-3).

- தம் பகைவர் செருக்கினை அழித்தலும், தம்மைச் சேர்ந்தோர்க்குத் துன்பம் நேரிடுமிடத்து உதவி செய்தலான ஆண்மையும் வீட்டில் முயற்சியில்லாமல் சோம்பி இருப்போர்க்கு இல்லை என்று எண்ணி, நல்ல புகழைக் கருதி தலைவன் முயற்சியில்லாமல் இல்லில் இருப்பதை நீக்கிப் பொருள்மேற் செல்கிறான்(அகம்.231:1-4).
- பிறர்க்கு உதவி வாழ்வதற்கும் தனக்கு நேரும் பகை முதலியவற்றை நீக்கி வெற்றி பெறுவதற்கும் தன் மனம் விரும்பும் காதல் இன்பத்தை நுகர்தலுக்கும் பொருளே ஆதாரமானது என்று எண்ணி காதலர் பொருள்மேற் பிரிந்து சென்றார் (கலி.11:1-5).
- முன்னோர் பொருளை வைத்து வாழக்கூடியவனின் வாழ்க்கை இரந்துண்ணும் வாழ்வைவிட இழிவானதாகும் என்று கூறி பொருள்மேற் செல்கிறான் (குறுந்.283).
- அறநெறியினின்றும் நீங்காது இல்வாழ்க்கை நடத்தலும், சிறப்புற்ற சுற்றத்தாரது பலவகையான துன்பங்களைத் தாங்களும், தம்மிடம் அருள் கொண்டு வந்த அந்தணர், அறவோர் முதலியோர்க்கு வேண்டுவன கொடுத்தலும், பெரிதாய பகைகளையெல்லாம் சினந்து அச்செருக்கினாற் தம்மை வழிபடாதாரை அழித்தலும், முற்பிறப்பில் இருவர்க்கும் உண்டான காதலினால் இப்பிறப்பில் மனம் பொருந்துதல் அமர்ந்த கூட்டத்தினையும் பொருளே தருமென்று கூறி காதலியைப் பிரிந்து பொருள்வயிற்பிரிவை நன்றென்று எண்ணிச் செல்கிறான் (அகம்.173:1-4; கலி.11:1-4).
- “ஈதலும் துய்த்தலும் இல்லோர்க்கு இல்” – குறுந்.63.

இத்தன்மையில் அமைந்த பல பாலைத் திணைப் பாடல்களைச் சங்க இலக்கியத்தில் காணலாம்.

### முடிவாக

சங்க காலம் இருவேறு சமூக அமைப்பைத் தன்னகத்தே கொண்ட மாறுதல் நிலைக் காலமாகத் திகழ்வதால், தொல் சமூகத்தின் எச்சங்களையும் நிலவுடைமைச் சமூகத்தின் நிலைக்கொள்ளலையும் பிரதிபலிக்கக் கூடியனவாகச் சங்க இலக்கியப் பாடல்கள் திகழ்கின்றன.

நெய்தல் நிலத்து உமணப் பெண்கள் (அகம்.390,140), பரதவப் பெண்கள் (ஐங்.47,48) மருத நிலத்து உழவர் பெண்கள் (நற்.97), முல்லை நிலத்து ஆயப் பெண்கள் (பெரும்பாண்.155-166) பொருள் திரட்டலில் ஈடுபட்டுள்ளதைப் பழைய சமூகத்தின் எச்சங்களாக அல்லது நிலவுடைமைச் சமூகத்தின் பாதிப்பிற்கு உள்ளாகாத மக்களாகக் கொள்ளலாம்.

ஆணாதிக்கத்தின் வழி உருவாக்கம் பெற்ற தனியுடைமை, நிலவுடைமைச் சமூகங்களில் தோற்றம் கண்ட அறங்களையும் கடமைகளையும் மேற்கொண்டு வாழ்தல் சமூக அறமாகக் கற்பிக்கப்பட்டதன் பின்னணியாகவே, வினைமேற் செல்லல் ஆடவர்களின் உயிராகவும்; மனையுறை மகளிர் தம் கணவனையே உயிராகவும் கொண்டு வாழ்தல் வேண்டும் என்னும் ஆணுக்கும் பெண்ணுக்குமான கடமை தோற்றம் பெற்றதாகக் கொள்ளலாம். பெண், ஆண் ஒருவரின் உடைமைப் பொருளாகவும், அவனையே தன் உயிராகவும் கொண்டு கற்புள்ளவளாக வாழவும், ஆண் சமூக அறங்களை மேற்கொண்டு வாழ்வதற்காகப் பொருள் திரட்டுவதையும், அரசனுக்காக போர்மேற் செல்வதையும் தம் உயிராகக் கொண்டு செயலாற்றவும் வலியுறுத்தப்பட்டனர்.

தன் அன்புக்குரிய தலைவியின் நலங்களை நுகரும்படி அவளுடன் சேர்ந்திருப்பதை விடுத்து, அவளுடைய நலன்கள் எல்லாம் அழியும்படியாக தனியே விட்டுப்பிரித்து பொருள்மேல் ஆசை கொண்டு பல்வேறு கொடுமைகள் மிகுந்த பாலைவிலத்தின் வழியே அழைத்து வந்த தன் நெஞ்சை இடைச்சுரத்துக் கடிந்துரைக்கும் தலைவர்களைச் சங்கப் பாடல்களில் காணமுடிகிறது. பொருள் ஏதேனும் ஓர் இன்பத்தைத் தருவதாக இருந்தாலும் காமவின்பத்திற்கு ஈடாகாது. பொருள் தரும் இன்பத்தை எப்பருவத்தும் அனுபவிக்கலாம். ஆனால், காமவின்பத்தை இளமை உள்ள காலத்து மட்டுமே அனுபவிக்க முடியும். சென்ற இளமையைப் பொருள் கொடுத்து

மீட்டெடுக்க முடியாது என்று பொருள்மேற் செல்ல விரும்பும் தன்நெஞ்சிற்கு அறிவுறுத்துகிறான் (நற்.126:7-12). தம் மனைவியை விட்டுப்பிரிந்து பொருள் திரட்ட கட்டாயப்படுத்தும் இப்புதிய வாழ்க்கை முறையின் எதிர்பாளர்களாகவும் இவர்களைக் கருதலாம்.

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## சங்க காலத்துச் செங்கண்மா மூதூரின் சிறப்பும் கட்டமைப்பும்

க. மோகன்காந்தி\*

### முன்னுரை

மனிதன் ஓரிடத்தில் நிலையாக வாழாமல் உணவினைத் தேடி அலைந்து, திரிந்த காலத்தைப் பழங்கற்காலம் என்கிறோம். பின்னர் தமக்கென்று ஒரு குழுவை அமைத்து ஒரு தலைவன் கீழ் வாழ்ந்த காலத்தை இனக்குழுச் சமூகம் என்கிறோம். தனி மனிதனன்றி ஒரு குழுவாக மக்கள் வாழ்ந்த இடம் 'ஊர்' எனப்படும். மக்கள் நிலத்திற்கு ஏற்றாற் போலக் கூடி வாழ்ந்த இடங்களைப் பலவாறாக அறியமுடிகிறது.

சங்க நூல்கள் குறிஞ்சி நில மக்கள் வாழ்ந்த இடத்தைச் 'சிறுகுடி' என்றும் முல்லை நிலத்து ஊர்களைப் 'பாடி' என்றும் நெய்தல் நில ஊர்களைப் 'பட்டினம்', 'பாக்கம்' என்றும் வழங்குவதைக் காணமுடிகிறது. சங்க காலத்தில் சிறப்புற்றிருந்த ஊர்கள் பேரூர், மூதூர் என்னும் சொல்லாட்சிகளில் குறிக்கப்பட்டுள்ளன. சங்க காலத்தில் உறையூர், மதுரை, வஞ்சி, தகடூர், திருக்கோவலூர், கிடங்கில் போன்ற ஊர்கள் மூவேந்தர் மற்றும் சிற்றரசர்களின் தலைநகரங்களாய் விளங்கியுள்ளன. இத்தகைய பழம்பெரும் ஊர்களின் வரிசையில் செங்கண்மாவையும் இணைக்கச் சிறப்பும். சங்க இலக்கிய நூல்களில் பத்துப்பாட்டில் ஒன்றான மலைபடுகடாம் என்னும் நூல் சவ்வாதுமலை அடிவாரத்தில் அமைந்துள்ள 'செங்கண்மா'வைத் தலைநகரமாகக் கொண்டு, ஆட்சிபுரிந்த நன்னன் சேய் நன்னனைப் பாட்டுடைத் தலைவனாகக் கொண்டு பாடப்பெற்றுள்ளது.

### செங்கண்மா – பெயர்க் காரணம்

செங்கண்மா = செம்மை + கண் + மா என்று பிரித்தால் சிவந்த கண்களையுடைய பெரிய விலங்கு என்று பொருள் கொள்ளலாம். சவ்வாதுமலை மிக அகன்ற காடுகளையும் நீரோடைகளையும் கொண்டு விளங்குவதால் புலி, யானை, கரடி, காட்டெருமை, காட்டுப்பன்றி போன்ற

\*உதவிப் பேராசிரியர், தமிழ்த்துறை, தூய நெஞ்சக்கல்லூரி, திருப்பத்தூர் - 635 601.



## சங்க காலத்துச் செங்கண்மா முதாரின் சிறப்பும் கட்டமைப்பும்

கொடிய விலங்குகள் சுற்றித்திரிந்த காரணத்தால் செங்கண்மா என இவ்வருக்குப் பெயர் ஏற்பட்டிருக்கும். செம்மை (சிவந்த) என்பது கொடிய விலங்குகளின் கோபத்தின் அடையாளமாகக் கொள்ளலாம். இன்றைக்கும் இம்மலைப் பகுதியில் புலிமடு, யானைமடு, முதலைமடு, மீன்மடு போன்ற நீர் நிலைகள் உள்ளன.

“விலங்குகளின் பெயரில் ஆவூர், உம்பற்காடு, எருமைவெளி, கோழி, செங்கண்மா முதலியவை ஊர்ப்பெயர்களாக அமைந்துள்ளன”. (இலக்கியத்தில் ஊர்ப் பெயர்கள், ப.35, 1984) என்று ஆர். ஆளவந்தார் செங்கண்மாவோடு விலங்குகளை இணைத்துக் கூறுவது நோக்கற்பாலது.

### சங்க காலத்துச் செங்கண்மா முதார்

இன்றைக்குத் திருவண்ணாமலை மாவட்டத்தில் திருவண்ணாமலையிலிருந்து 35 கி.மீ தொலைவில் மேற்குத்திசையில் உள்ள ‘செங்கம்’ என்னும் ஊரே சங்க காலத்துச் ‘செங்கண்மா’வாகும். பத்துப்பாட்டு நூலில் ஒன்றான மலைபடுகடாம் 583 அடிகளில் அமைந்துள்ளது. இந்நூல் நவிரமலை, காரியுண்டிக் கடவுள், சேயாறு போன்றவற்றோடு குறிஞ்சி, முல்லை, மருதம் ஆகிய மூன்று நில மக்களின் வாழ்வியலையும் எடுத்தியம்புகிறது. தொண்டை மண்டலத்திலுள்ள 24 கோட்டங்களில் ஒன்றான பல்குன்றக் கோட்டத்தைச் செங்கண்மாவிலிருந்து நன்னன் சேய் நன்னன் ஆட்சி புரிந்துள்ளான்.

பண்டைய நகரமைப்புப் பெரும்பாலும் நீரை மையப்படுத்தும் ஆற்றங்கரை நாகரிகமாகவே அமைந்துள்ளன. அவ்வகையில் செங்கண்மா முதாரும் சேயாற்றின் கரையில் அமைந்துள்ளது. இன்றைக்குச் ‘சேயாறு’ என்பது ‘செய்யாறு’ என்று மருவியுள்ளது. இந்த ஆறு சவ்வாதுமலைகளிலிருந்து உற்பத்தியாகி வரும் பல நீரோடைகளின் மூலம் உருவாகிறது. புதூர் நாடு, புங்கம்பட்டு நாடு நீரோடைகள் குப்பந்தம் அணைக்கு வந்து சேருகின்றன. தென்மலைப் பகுதியிலிருந்து உற்பத்தியாகி வரும் மேல் சிலம்படியாறு, கல்லாறு, செல்லமுடியாறு போல்வனவும் குப்பந்தத்தில் வந்து கலக்கின்றன. செய்யாறு உற்பத்தியாகும் இடமாக சமுனாமரத்தாரிலிருந்து தென்திசையில் ஏறத்தாழ 20 கி.மீ தொலைவிலுள்ள கூட்டாத்தூர் என்பதை அறியமுடிகிறது. கல்யாணமந்தை ஆறு,

விளாமுச்சியாறு, நல்லாப்பட்டு ஆறு ஆகியவை ஒன்றிணைந்து செய்யாறாக உற்பத்தியாகின்றன. இந்த ஆறுகள் கூடுமிடத்தில் 'செய்யாற்றின் கன்னி' என்னும் பெண் தெய்வ வழிபாடு நடைபெறுவது குறிப்பிடத்தக்கது.

இத்தகைய பல நீரோடைகள் குப்பந்தம் நீர்த்தேக்கத்திற்கு வந்து சேருகின்றன. ஆற்றுப்போக்கு மலையிலிருந்து பரமனந்தல் வழியாக செங்கத்தை வந்தடைகிறது. சவ்வாதுமலை அடிவாரத்திலிருந்து ஏறத்தாழ 12 கி.மீ தொலைவில் உள்ளது செங்கம். செங்கம் மூதூரின் ஊர்க் கட்டமைப்பிற்குச் செய்யாறு முக்கிய காரணமாகும்.

### செங்கண்மாவின் சிறப்பு

செய்யாற்றின் கரையில் அமைந்துள்ள செங்கம் நகரத்தின் சிறப்பினை இரணிய முட்டத்துப் பெருங்குன்றூர்ப் பெருங்கௌசிகனார் என்னும் நல்லிசைப் புலவர் பாடியுள்ளார். கடையேழு வள்ளல்களுக்கு இணையானதொரு கொடைத் தன்மை மிக்கவனாக நன்னன் சேய் நன்னன் விளங்கியுள்ளான். வறுமையில் வாடிய 'கூத்தர்கள்' நன்னனிடம் சென்று பரிசில் பெற்று வருவதற்காகச் செல்கின்றனர். நன்னனிடமிருந்து பெரும் பரிசில் பெற்றுத் திரும்பும் கூத்தர், கூட்டம், எதிர்ப்படும் தன் இனக் கூத்தர்களைக் கண்டு மூங்கில் மரங்கள் நிறைந்த நவிரமலையில் மழைபொழிவது எவ்வாறு பொய்க்காதோ அதுபோல நன்னன் கொடுக்கும் பெரும் பரிசிலும் பொய்க்காது என்று ஆற்றுப்படுத்துகின்றனர். இத்தகுச் சிறப்புடைய நன்னனின் மூதூரைப் புலவர் கீழ்க்கண்டவாறு போற்றுகின்றார். இதனை,

“நிதியந் துஞ்ச நிவந்தோங்கு வரைப்பிற்  
பதியெழு வறியாப் பழங்குடி கெழீஇ  
வியலிடம் பெறாஅ விழுப்பெரு நியமத்து  
யாரெனக் கிடந்த தெருவிற் சாரென  
இகழுநர் வெருஉங் கவலை மறுகிற்  
கடலெனக் காரென ஒலிக்குஞ் சும்மையொடு  
மலையென மழையென மாட மோங்கித்  
துனிதீர் காதலின் இனிதமர்ந் துறையும்  
பனிவார் காவிற் பல்வண் டிமிரும்  
நனிசேய்த் தன்றவன் பழவிநன் மூதூர்” - (மலைபடு.477-487)

இப்பாடலடிகள் நன்னனின் மூதூரான செங்கண்மாவைத் தொன்மை வாய்ந்ததாகப் பறைச்சாற்றுகின்றது. செல்வம் நிறைந்த மிக ஓங்கிய மதில்களை உடையதாய், ஊரினின்றும் பெயர்தலை அறியாத பழைய

## சங்க காலத்துச் செங்கண்மா முதாரின் சிறப்பும் கட்டமைப்பும்

குடிமக்கள் நிறைந்ததாய் செங்கண்மா முதார் இருந்துள்ளது. மேலும் பெரிய அங்காடித் தெருக்களை உடையதாகவும், பேராறுகள் கிடந்தாற் போன்ற அகன்ற ஊராகவும், மலை போன்ற உயர்ந்த மாடங்களை உடையதாகவும் பல பூம்பொழில்களை உடையதாகவும் நன்னனின் முதார் இருந்தாக அறியமுடிகிறது. மேலும் இன்றைய செங்கத்திலுள்ள இடபந்துறை ரிசபேசுவரர் ஆலயத்தில் கண்டெடுக்கப்பட்ட கல்வெட்டுச் செய்தியொன்று,

“மூவண்டறை தார்மன்னர் பலைபடைத் தென்மன்னரை  
வென்கண்ட திறற் காங்கேயன் கண்சிவப்ப பண்டே  
மலைகடாம் பாட்டுண்ட மால்வரை செஞ்சொரி  
அலைகடாம் பாட்டுண்டது” (நன்னன் நாடு மாத இதழ், 1983)

என்னும் செங்கம் கல்வெட்டு வண்டுகள் மொய்க்கும் மலர் மாலைகளணிந்த மன்னர்களின் மலை போன்ற படையையும், தென் மன்னரையும் வெற்றி கண்டவன் காங்கேயன் அவன் கண் சிவந்தான். இந்த வெள்ளம் பெருக்கெடுத்தது அலைஅலையாகக் குருதிப்புனல் ஒலி கூட்டியது எங்கே முன்பொருகால் மலைகடாம் பாட்டினைப் பெற்ற அதே மலையில் என்னும் கருத்தை இக்கல்வெட்டு வெளிப்படுத்துகிறது. இக்கல்வெட்டுச் சான்றுபடி மலைபடுகடாம் பாட்டினைப் பெற்ற ஊர் இதுவென அறியமுடிகிறது.

மேலும் இவ்வூரைச் சுற்றிப் பல நடுகற்களும், முதுமக்கள் தாழிகளும், புதிய கற்கால கற்கோடாரிகளும், கல்வெட்டுகளும், ஆண்டிப்பட்டி நாணயங்கள் போன்றவை இவ்வூரின் பழமையையும் சிறப்பினையும் வெளிப்படுத்திக் கொண்டிருக்கின்றன.

## செங்கண்மா ஊரின் அகக் கட்டமைப்பு

செங்கண்மா ஊரின் கட்டமைப்பை இரு கூறுகளாகப் பகுக்கலாம். 1. அகக் கட்டமைப்பு 2. புறக்கட்டமைப்பு. பகைவர்கள் படையெடுக்கும் போது தங்கள் நாட்டின் மக்களையும் செல்வங்களையும் பாதுகாக்க நடைபெறுவது கோட்டை முற்றுகைப் போராகும். எதிரிப் படைகள் உழிஞைப் பூக்களைச் சூடிக் கொண்டு கோட்டையைச் சுற்றி வளைப்பதும், மதிலைக் காக்க நொச்சிப்பூவைச் சூடிக்கொண்டு கோட்டையின் உள்ளிருப்போர் காப்பதையும் தொல்காப்பியர் கூறுவார்.

“முழுமுதல் அரணம் முற்றலும் கோடலும்  
அனைநெறி மரபிற்றி ஆகும் என்ப”- தொல்.பொருள்.புறம்.1011

இதன் மூலமாக ஒவ்வொரு நாட்டை ஆளும் மன்னர்களும் கோட்டை அரணை ஊர் நடுவே அமைத்திருப்பர் என்பது தெளிவாகிறது. கோட்டை, மதில், அகழி முதலியவற்றோடு மக்கள் வாழும் தெருக்களையும் வேளாண்மை நடைபெறும் விளைநிலங்களையும், வணிகம் நடைபெறும் கடைவீதிகளையும் ஊரின் அகக் கட்டமைப்பில் அடக்கலாம். செங்கண்மாவின் சிறப்பு என்னும் உட்தலைப்புச் செங்கண்மா முதாரின் பழமையான குடிமக்களையும், ஆறு கிடந்தாற்போன்ற பெருந் தெருக்களையும், வாணிப சந்தை கூடுமிடத்தையும் குறிப்பிட்டுள்ளது இங்குப் பொருந்தும். மலைபடுகடாம் செங்கண்மா முதாரின் உட்கட்டமைப்பாக,

“இரைதேர்த் திவரும் கொடுந்தாள் முதலையொடு  
திரைபடக் குழிந்த கல்லகழ் கிடங்கின்  
வரைபுரை நிவப்பின் வான்றோய் இஞ்சி  
உரைசெல வெறுத்ததவன் முதார் மாலையும்” (மலைபடு. 90-93)

இப்பாடல்கள் நன்னனால் அரசாளப்பெற்ற பெரும் கோட்டைச் செங்கண்மாவில் இருந்ததையும் அதனைச் சுற்றி மதில்கள் இருந்ததையும் அகழிகள் இருந்ததையும் அகழி நீரில் இரையைத் தேடி அலையும் கொடிய முதலைகள் சுற்றித் திரிந்ததையும் உரைக்கின்றது. இன்றைய சூழலிலும் நன்னனால் அரசாளப்பெற்ற கோட்டைமேடு 25 ஏக்கர் நிலப்பரப்பில் விளைநிலமாக அமைந்துள்ளது. “செங்கண்மா நகருக்குக் கீழ்ப்பால் ஓடும் சேயாற்றின் தென்கரையில் நன்னன் கோட்டைமேடு இருக்கிறது. அம்மேட்டை 1940-41 ஆண்டுகளில் மத்திய அரசின் தொல்பொருள் துறையினர் அகழ்வாராய்ச்சி செய்த போது அவ்விடத்தில் கோயில் ஒன்றும் கோட்டைக்குத் தண்ணீர் கொண்டு செல்வதற்கான செங்கற்களால் கட்டப்பெற்ற மதகு ஒன்றும் இருந்ததற்கான அறிகுறிகளைக் கண்டனர்” (நன்னன் நாடு மாத இதழ், 1983) என்னும் செய்தி செய்யாற்றிலிருந்து கோட்டையின் அகழிக்குத் தண்ணீர் சென்றுள்ளதை அறியமுடிகிறது. இன்றைக்கும் செங்கத்தின் வரைபடத்தை நோக்கும் போது செய்யாற்றின் உட்பகுதியில் அமைந்துள்ள செங்கம், நான்கு நேர் வீதிகளைப் பெற்றுள்ளது.

## சங்க காலத்துச் செங்கண்மா மூதாரின் சிறப்பும் கட்டமைப்பும்

1.கொசத்தெரு, 2.சிவன் கோயில் தெரு, 3.பெருமாள் கோயில் தெரு, 4. இராசவீதி இந்நான்கு தெருக்களும் நேராக அமையப்பெற்றுக் கோட்டை மேட்டில் சென்று சேருமிடத்தில் குறுகி காட்சியளிக்கிறது. தாமரை மலரின் மொட்டு குவிந்திருப்பது போல் இந்நகர் அமைந்துள்ளது. பகைவர்கள் நாட்டைச் சூழும் போது மக்கள் அரசனின் கோட்டைக்குள் சென்று பாதுகாப்பாக இருப்பதற்காக வடிவமைக்கப்பட்டுள்ளதைப் போலத் தோன்றுகிறது. இவ்வமைப்புகள் அகக் கட்டமைப்பைச் சூறுகின்றன.

## II. புறக்கட்டமைப்பு

சங்ககாலம் போர்கள் மிகுந்த காலம் என்பதால் பகைவர்களை நாட்டின் உள் வாரா வண்ணம் தடுத்துநிறுத்த நவீன போர் போலன்றி தரைப்படையும், தேர்ப்படையும், குதிரை மற்றும் யானைப் படைகள் கொண்டும் போர் புரிந்தனர். எனவே மலை, ஆறு, காவற்காடுகள் போல்வன புறக்கட்டமைப்பில் முக்கிய பங்கு வகித்துள்ளன.

திருவள்ளூர் கூறும் ஒரு நாட்டின் புறக்கட்டமைப்பு நன்னன் நாட்டிற்கு மிகவும் பொருந்தி நிற்பதைக் காணமுடிகிறது.

“மணிநீரும் மண்ணும் மலையும் அணிநிழற்  
காடும் உடையது அரண்” (குறள் 742)

நீர், நெடும் நிலப்பரப்பு, மலை, காடு உடையது சிறந்த அரண் என்கிறார் வள்ளூர். செங்கண்மாவைச் சவ்வாதுமலைத் தொடர் மேற்கு மற்றும் வடக்குப் புறத்தில் நின்று பெரும் அரணாகப் பாதுகாத்துள்ளது. மலைபடுகடாம் முடிவில்,

“வென்றெழு கொடியிற் தோன்றும்  
குன்றுகூழ் இருக்கை நாடுகிழ வோனே” (மலைபடு.582-583)

என்னும் பாடலடிகள் நன்னனைக் குன்றுகள் சூழப்பெற்ற மலைநாட்டின் தலைவனே என்று உரைப்பது இவ்வூரின் மலை அரணைக் காட்டுகிறது.

பரிசில் பெறச் செல்லும் கூத்தர்களைப் பெருங்கௌசிகனார் ஆற்றுப்படுத்தும் போது, செங்கண்மாவை அடைவதற்கு முன்பாக சேயாறு எதிர்ப்படும், அந்த ஆற்றில் குயவன் வனைகின்ற மட்கலத்தில் சக்கரம் சுழல்வது போலக் குமிழிகள் சுழன்று தோன்றும். விரைந்த ஓட்டத்தையும்

மிக்க நீர்ப் பெருக்கினையும் உடைய சேயாற்றின் கரையை அடைந்தால் அதன் ஒருகரை வழியே செங்கண்மா மூதூரை அடையலாம் என்று ஆற்றுப்படுத்துகிறார். இதனை,

“வனைகலத் திகிரியிற் குமிழி சுழலும்  
துணைசெலற் றலைவா யோவிறந்து விரிக்கும்  
காணுநர் வயாஅங் கட்கின் சேயாற்றின்  
யாண ரொருகரைக் கொண்டனர் கழிமின்” - மலைபடு.474-477

சவ்வாது மலையிலிருந்து சேயாற்றின் ஒரு கரையில் சென்றால் செங்கண்மாவை அடையலாம் என்று இப்பாடிகள் கூறுகின்றன. மலையிலிருந்து கீழ்நோக்கி பயணப்பட்டால் சேயாற்றின் வடகரை வழியாகவே வர இயலும். ஆனால் செங்கண்மா மூதூர் சேயாற்றின் தென்கரையில் அமைந்துள்ளது. செங்கத்திலுள்ள சிவாலயத்திற்கு இடபந்துறை ரிசபேசுவரர் ஆலயம் என்று வழங்கப்படுகிறது. இங்குத் “துறை” என்பது நீர்நிலைகளைக் கடக்க உதவும் பரிசல்கள் இருந்த இடம் என்பதை அறியமுடிகிறது.

இந்தச் சிவனாலயம் ஆற்றின் தென்கரையில் அமைந்துள்ளது. எனவே ஆற்றின் வடகரையில் இருப்போர் தென்கரையிலுள்ள செங்கண்மாவிற்கு வரவேண்டுமெனில் இடபந்துறையிலிருந்து படகு மூலமாகவே சென்று வந்திருக்க வேண்டும். எனவே இப்பெயர் காரணத்தோடு அமையப் பெற்றுள்ளதை அறியமுடிகிறது. இதன் மூலம் செங்கண்மாவின் வடக்குத் திசையில் சேயாறு வேலிபோல் அமைந்து பாதுகாத்துள்ளதை உணர முடிகிறது. ஆகவே செங்கண்மாவின் புறக்கட்டமைப்பில் சேயாறு முக்கிய இடம் வகித்துள்ளது தெளிவு.

ஊரின் புறக்கட்டமைப்பில் மிளை எனப்படும் காவற்காடுகளும் முக்கிய இடத்தை வகிக்கின்றன. ‘மிளை’ என்னும் சொல் காவற்காடு என்பதைக் குறிக்கும். ஊரின் அகத்தே உள்ள கோட்டை, மதில், அகழி போல் அல்லாமல் ஊரிலிருந்து பல மைல் தொலைவில் காவற்காடுகள் அமையப் பெற்றிருக்கும். ஆநிரைகளைப் பாதுகாக்கக் கோவலர் தங்கியிருந்த மிளைகளைப் பற்றி மலைபடுகடாம் சான்றுபகர்கிறது. இதனை,

‘வளையான் தீம்பால் மிளைசூழ் கோவல்’

(மலைபடு. 409)

## சங்க காலத்துச் செங்கண்மா மூதூரின் சிறப்பும் கட்டமைப்பும்

இன்றைக்கும் சவ்வாதுமலையின் கிழக்கு மற்றும் மேற்கு அடிவாரங்கள் பல குறுங்காடுகளைத் தன்னகத்தே கொண்டு விளங்குகிறது. இயற்கை அளித்த கொடை நன்னன் நாட்டின் பாதுகாப்பு அரணாகத் திகழ்ந்துள்ளதை அறியமுடிகிறது.

செய்யாறும், சவ்வாதுமலையும், சவ்வாதுமலையை அடுத்திருக்கும் தரைக்காடுகள் பலவும் செங்கண்மாவைப் பாதுகாத்தன. செங்கண்மாவைச் சுற்றி வரலாற்றுச் சிறப்புமிக்க ஊர்கள் அமைந்திருப்பதைப் பொறியாளர் கு.வெங்கடாசலம் கீழ்க்கண்டவாறு உரைக்கிறார். “இம்மூதூரைச் சுற்றிலும் குயிலுவம் (சங்கநுப்போர்) வண்ணக்கன்பாடி (நாணயப்பரிசோதகன்) தொருக்கைப்பாடி (ஆநிரைகள், எருமைகளைக்காக்கும் ஊர்) அரட்டன்பாடி (குறும்பன் அல்லது குறுநில மன்னர்கள் வாழ்ந்த ஊர்) கோளாப்பாடி (கோல்பாடி கைக்கோல் படையினர் வாழ்ந்த ஊர்) மல்லப்பாடி (மல்லர்கள் வாழ்ந்த ஊர்) என்ற ஊர்ப்பெயர்கள் இங்கு ஒரு பெரும் நகர் இருந்ததற்கான அடையாளங்களாக உள்ளன” என்கிறார். (நன்னன் நாடு, மாத இதழ் 2000) பகைநாட்டினரிடம் இருந்து தம் நாட்டைக் காக்க இம்மன்னனின் காவற்காடுகள் அரணாக அமைந்திருந்தது என்பது என்பது தெளிவாகிறது.

### முடிவுரை

நன்னன் சேய் நன்னனின் செங்கண்மா மூதூர் சேயாற்றங்கரையில் அமைந்த வளமான ஊராகும். இவ்வூரில் வாழ்ந்த மக்கள் ‘வேற்றுப்புலம் அறியாத பழங்குடி’ மக்களாவர். வேளாண்மையும், வாணிகத் தெருக்களும் மக்கள் கூட்டமும் நிரம்பிய செல்வவளம் மிக்க ஊராக மலைபடுகடாம் இவ்வூரின் சிறப்பை எடுத்துரைக்கின்றது. இன்றைக்கும் இங்குக் காணக்கிடைக்கும் கோட்டைகள், நடுகற்கள், கல்வெட்டுகள், கற்கோடாரிகள், முதுமக்கள் தாழிகள் போல்வன செங்கண்மாவின் பழமையையும் சிறப்பையும் எடுத்துரைக்கின்றன.

செங்கண்மாவின் ஊர்க் கட்டமைப்பு அகக்கட்டமைப்பு மற்றும் புறக்கட்டமைப்பு என்று இருநோக்கில் காண முடிகிறது. சிதைந்துபோன கோட்டை, மதில், அகழி போல்வன அகக்கட்டமைப்புக்குள் அடங்குகின்றன. இன்றைக்கும் கோட்டைக்குள் சென்று சேரும் அமைப்பிலேயே செங்கண்மா வீதிகள் அமையப்பெற்றுள்ளது நோக்கத்தக்கது. இவ்வூரின்

புறக்கட்டமைப்பிற்குச் செங்கண்மாவைச் சூழ்ந்திருக்கும் சவ்வாதுமலையும், இம்மலையிலிருந்து பெருகிவரும் செய்யாற்றுப் போக்கும் இவ்வூரைச் சூழ்ந்துள்ள பல வரலாற்றுச் சிறப்புமிக்க ஊர்ப்பெயர்களும், இவ்வூரைச் சூழ்ந்துள்ள தரைக்காடுகளும் இவ்வூரின் புறக்கட்டமைப்பைப் பறைச்சாற்றி நிற்கின்றன.

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## RUSKIN BOND: THE SHORT STORY WRITER

Marie Raj\* and Maria C. Serrao

### ABSTRACT

*The prominent features of Ruskin Bond as a short story writer are the autobiographical element, his love for nature in all its forms, a realistic portrayal of Indian life, life-like characters, a variety of themes, his simple plots, his sense of humour and his technique of evoking a sense of nostalgia in his stories.*

*In conclusion it can be said that a direct, straightforward and effective short story writer like Ruskin Bond whose stories are meant for people of all ages, presents a variety of themes, It is up to the reader to discover these themes. His achievements as a writer lies in the fact that he writes from the heart and his stories are of human interest, having a universal appeal both with regard to place and age. The themes are universal in nature ranging from love, friendship, fortitude, sacrifice, innocence and nature.*

**Keyword:** Flora and fauna, nostalgia, autobiographical element

“A little girl once told me “Sir, you are not a bad writer” – I guess this describes me as a writer. And as for being a human being... I guess I am not bad, after all...”said Ruskin Bond in interview with Jhelum Biswas(Good Housekeeping ,p.204)

Ruskin Bond popularly known as the man from the mountains is an Indian author of British origin who was born on 19<sup>th</sup> May 1934, in Kasauli, Himachal Pradesh and grew up in Jamnagar (Gujarat), Mussoorie, and Dehradun. He now lives in Landour, a picturesque Himalayan hill station close to Mussoorie in the northern Indian state of Uttarnchal.

As a young boy Ruskin Bond was closer to his father. But with his father’s untimely death and his mother’s remarriage Bond became a loner. After Bond completed his education, he along with the family moved to England. While in England he suffered the pangs of separation and yearned to get back to India.

So he did many odd jobs in order to collect enough money to buy a ticket back to India. It was during this time that he wrote his first novel The Room on the Roof, (1951) which met with tremendous success and the money he received from it enabled him to return to India.

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He received the John Llewellyn Rhys memorial prize for this novel. Once, he reached India, he made a career out of what he enjoyed best that is writing.

He is indeed a prolific writer, who over the course of writing career spanning over fifty years, has written over a hundred short stories, novels, essays, poems and more than fifty books for children. His famous collection of short stories include The Night Train at Deoli(1988), Time Stops at Shamli (1989) and Our Trees Still Grow in Dehra (1992), which won him the central Sahitya Akademi Award for Indian Writing in the year 1992 and the prestigious Padma Shri in 1999.

M. K. Naik in his book A History of Indian English Literature (p.250)\_rightly observes a love for nature in Ruskin Bond's stories:

Another special feature of Bond's stories is his acute responsiveness to nature, the 'great affinity between trees and men'. It is not simply a matter of nature description as a narrative technique, but a genuine feeling for the natural world which has somewhat of a Wordsworthian quality about it.

Ruskin Bond, as a writer of nature can be compared to essayist William Henry Hudson, who was an ardent observer and lover of nature. As a patient and solitary watcher of nature, he took great interest in the observation and appreciation of wild life, especially of birds, but in his view, all wild life was an integral part of the human world.

Ruskin Bond too is a keen observer of nature. Therefore, most of his stories revolve around his love for nature. By way of illustration we have in "The Big Race", a vivid and graphic description of the early morning, "On the maidaan, the slanting rays of the early morning sun were just beginning to make emeralds of the dew-drops. Later in the day the grass would dry and be prickly to the feet, but now it was cool and soft." (Children Omnibus, p.168) Whereas in "when the Guavas are Ripe", the ripening of guavas is described in the following lines "... the guavas were ripening, turning from green to gold; no longer hard, but growing soft and sweet and juicy."<sup>76</sup> (Omnibus p.186)

In "The Tunnel", the gradual of movement from evening to dusk is covered in the following words "it had been a long hot day, but now the earth was cooling, and a light breeze was moving through the trees. It had carried with it the scent of mango blossoms, the promise of rain." (Omnibus p.162)

Again, the setting of the sun and its effect on the river, in terms of the changing colour of nature are beautifully depicted by the author in “Angry River “:

Towards evening the river changed colour. The sun, low in the sky, emerged from behind the clouds, and the river changed slowly from grey to gold, from gold to a deep orange, and then, as the sun went down, all these colours were downed in the river, and the river took on the colour of the night. (Omnibus p.85)

Such accurate and meticulous description reveals his keen eye for detail, powers of observation, and the ability to portray them skillfully in his writings. Ruskin Bond captures the sights and sounds of nature, with vivid detail distinguishing between sounds of the day and sounds of night. “They drank their tea, listening to the sharp notes of the tailor-bird and the noisy chatter of the seven-sisters. As the brief twilight faded, most of the birds fell silent.” (Omnibus p.163) But the sounds of the night life of the forest are conveyed in the following description:

... the sharp call of a barking deer, the cry of a fox, the quaint *tonk-tonk* of a nightjar... sounds that came from the trees, creaking’s and whisperings, as though the trees were coming to life, stretching their limbs in the dark, shifting a little, flexing their fingers.” (p.163)

“Nobody captures as he does, the Himalayan landscape with its moods, its seasons, its flora and fauna.” says Margaret Deefholts who interviewed Ruskin Bond. (A Chat with Ruskin Bond).His stories are filled with details about flora and fauna. He talks of birds such as flying foxes, herons, sarus-cranes, crows, parrots, bulbuls, tailor-bird and mynahs; animals like the donkey, the cheetah, the barking deer, the fox, the nigh-jar, the leopard, buffaloes, frogs, tadpoles, squirrels, and rabbits; insects like grasshoppers, beetles, and spiders; flowers like daisies, nasturtiums, geraniums and marigolds.

Ruskin Bond’s knowledge regarding names of various flowers, trees, birds and animals is absolutely amazing. This information has been gained painstakingly by him through the years prompted by his genuine love and interest in nature, which imparts credibility to his stories. The real test of good fiction is its ability to evoke visual images.

Ruskin Bond’s short stories reveal that he is a passionate animal lover and feels strongly about animal rights. In Grandfather’s Private Zoo he makes an ardent plea for the protection and preservation of the environment. The stories deal with the description of various

animals, birds and reptiles, including their names, appearance and behavior. The writer stresses on the need for man to live in close harmony with nature.

The narrator's grandfather was fond of birds, animals and reptiles and kept a number of them in his own house, which the author called 'Grandfather's Private Zoo.' There were a variety of them and they were also given names such as Harold the Hornbill, Toto the Monkey, Caesar the Crow, Henry the Chameleon, the white Rat, the grey squirrel, a tortoise, a pair of rabbits, a tame squirrel, a pet goat, family donkey called Nana and even a python.

The narrator shared his grandfather's fondness for pets and enjoyed their company, much to the dismay of his grandmother and most of the time they tried to hide from her the arrival of a new pet. Ruskin Bond's philosophy about the protection of nature is indirectly expressed through the narrator's grandfather in "A Week in the Jungle":

Grandfather never hunted wild animals, he couldn't understand the pleasures some people obtained from killing the creatures of our forests. Birds and animals, he felt, had as much right to live as humans. We could kill them for food, he said, because even animals killed for food; but not for pleasure. (Omnibus p.147)

Various pets such as animals, birds and reptiles feature as character in his stories in Grandfather Private Zoo. "The Adventures of Toto" is devoted to the narrator's pet money Toto and his mischievous pranks. Toto did not get along with the other pets in grandfather's zoo and also played havoc, as the narrator aptly mentions "If there is a part of the brain especially devoted to mischief, that part was largely developed in Toto."<sup>84</sup> Toto's bath time is described with minute precision. In a humorous vein, the narrator goes to elaborate that "If anyone laughed at him during this performance, Toto's feelings would be hurt and he would refuse to go on with his bath." (Omnibus p. 120) The writer feels that even animals have their sense of feelings and emotions and we should respect them.

"The Conceited Python", is about yet another pet in grandfather's zoo on a short stay. Grandfather has no apprehensions of the python and brings it home curled round his neck, much to the horror of his wife. The narrator's attitude towards the python is one of sympathy. He feels sorry for the python, when grandfather locks it in the bathroom and says "After closing the door on it, he gave me a sad look." (p 123)

Ruskin Bond tries to educate us on snakes in “The Conceited Python”. The young narrator concludes “A python bite is not poisonous, but it can swallow a live monkey, and it can be a risky playmate for a small boy”. (p.125). Eventually, the python according to the narrator gets obsessed with his looks and is more often than not found in front of the mirror, and as the narrator’s grandfather rightly remarks, “It’s the first time I’ve seen a snake fall in love.” (p.126)

The narrator’s love for birds is expressed in “A Crow in the House”, when he saves the life of a young, almost a dead crow. With the help of his grandfather, he nurses the young crow back to life. The narrator mentions:

I did our best to bring it round. We fed it by prising its beak gently open with a

a pencil, pushing in a little bread and milk, and then removing the pencil to allow it to swallow. We varied this diet with occasional doses of Grandmother’s home-made plum wine, and as a result the young crow was soon on the road recovery. (p 141)

Ruskin Bond’s sensitivity and compassionate nature towards birds is reflected in this story”

In “Henry: A Chameleon”, the writer tries to dispel some of the myths associated with reptiles such as chameleons. The narrator comments, “Many people believe the chameleon is a dangerous and poisonous reptile.” (p.145) He then goes to narrate how the chameleon became an intrinsic part of his grandfather’s zoo:

When Grandfather was visiting a friend in the country, he came upon a noisy scene at the garden gate. Men were shouting, hurling stones and brandishing sticks. The cause of all this was a chameleon who had been discovered sunning himself on a shrub. The gardener declared that it was a thing capable to poisoning people at a distance of twenty feet, and as a result the entire household had risen in arms. Grandfather was in time to save the chameleon from certain death, and brought the little reptile home.<sup>92</sup> (p 145)

The argument the writer wants to drive home is the harmless nature of reptiles, because people harbour irrational fears about them and unnecessarily causes their death. Henry is described as a pet that never deliberately caused any trouble in the house or to anyone except once inadvertently he caused a commotion in a nursery school, close to the narrator’s house.

Henry entered into one of the classrooms. There he climbed onto a desk, while children ran in all directions, some to get away from Henry, some to catch him. In all the chaos and confusion Henry gets lost and the narrator loses hope of ever retrieving him. But, the faithful Henry returns and surprisingly allows itself to be recaptured.

In the fictional world of Ruskin Bond even ferocious animals like leopards are looked upon as harmless. While referring to leopards and panthers Ruskin Bond says with interview with Anuja Atula “They never harm. We should be sensitive and protect them. I want to develop this awareness in children, for I see some hope in them. Only children can guard our wild life heritage now.” (*Rendezvous with Ruskin Bond, Reading Rainbow*)

Ruskin Bond’s love for flora and fauna is a reflection of an autobiographical element. This brings us to the next feature of Ruskin Bond as a short story writer. Ruskin Bond’s short stories are characterized by a distinct autobiographical element. Most of them, if not all, are coloured by his personal experiences and observations. As Bijay Kumar Das puts it “The incidents and situation depicted in his stories are not wholly fictional. He projects a part of his personality into his stories to make them authentic and interesting.” (*Critical Essays on Post Colonial Literature* p 113). Herein, lies Ruskin Bond’s genius as a good short story writer who instills his stories with a lot of credibility, through the use of the autobiographical note. “I’m a very personal writer. Seventy per cent of my writing comes out of my own life experiences...” confessed Ruskin Bond in an interview with Rashmi Sehgal (2007)

To put it in the words of M K. Naik, Ruskin Bond’s “favourite subjects are pets, animals and a variety of have-nots including... orphans, abnormal children, restless adolescents, and frustrated old men, whom he portrays with genuine compassion.”<sup>83</sup> (p 250)

This confirms the fact, that his stories are largely autobiographical in nature, describing people he has met and the relationships he has developed with them. In the “Introduction” to *The Night Train at Deoli and Other Stories*, Ruskin Bond reveals “I prefer to write about the people and places I have known and the lives of those whose paths I have crossed.” For instance, the story “The Tunnel” which is about Suraj’s and the watchman’s encounter with a leopard, is in a way similar to the real life experience of the author. Ruskin Bond while referring to his stories says that “... all of these are true accounts and real life experiences - mine or other people’s. Leopards and panthers still roam these hills.” (Interview with Anuja Atula.) A panther sighting is also described in, “A Week in the Jungle”. The young narrator mentions “I saw a full-grown panther making off into the jungle with one of the dogs held in his mouth.” (Omnibus p. 150)

The young narrator in the Grandfather's Private Zoo, collection of stories, in many ways resembles Ruskin Bond as a child. In "A Week in the Jungle", the young narrator mentions that while his Uncle Henry went on a hunt in the jungle, he passed his time reading books by some well known authors. "I chose at random *The Wind in the Willows*, *The Jungle Book* and *David Copperfield*." (Omnibus p.149. Here again, we find an autobiographical element as the author has grown up reading books by authors such as Rudyard Kipling and Charles Dickens.

Ruskin Bond himself, confirmed the autobiographical elements in his stories when in another interview with Mala Kumar he said that, "In many cases, the stories are autobiographical. The Rusty stories, for instance are all most from real life. Rusty is my alter ego." "The Thief", can be cited as another example a strong resemblance to Ruskin Bond.

In order to make his stories more impressive and emphatic, Bond writes in the first person narrative, which make his stories appear entirely autobiographical in nature. He says to Mala Kumar "I do like to write in the first -person, putting myself into different shoes!"

However, he does acknowledge the fact, that the incidents in his stories are not wholly autobiographical, but a blend of fiction and reality. In an interview, he admits "Grandfather and the pets he had are real, but Grandpa died when I was just one. I heard a lot about him from my family. And so the boy in the "Grandpa" stories is fictitious." (Interview with Mala Kumar)

He draws heavily from the rich repertoire of his life experience, especially his childhood and early adulthood, for yet another story line or another character. Since, Ruskin Bond draws heavily from his own experiences, his stories are realistic in nature. Thus, the chief characteristic of Ruskin Bond's stories is that they are extremely credible, because he gives a realistic backdrop to his stories.

R. K. Narayan is remembered for the creation of the fictional world of 'Malgudi', which is the setting for most of his novels and short stories. However, unlike Narayan, Bond has not invented an imaginary place. Ruskin Bond's short stories have their setting in Dehradun and in the Himalayan foothills, which provide us with glimpses of Indian villages and small towns and what life is for people living there. Village life is depicted in his stories with minute details like the crowing of the cock to announce the break of dawn, the croaking of frogs from the ponds, buffaloes in the muddy ponds.

The atmosphere of the evening bazaar in the small towns with its characteristic sights and sounds are described very realistically in “The Long Day”:

The evening crowd had just begun to fill the road, and there was a lot of bustle and noise: the street-vendors called their wares in high, strident voices; children shouted and women bargained. There was a medley of smells and aromas coming from the little restaurants and sweet shops, and a medley of colour in the bangle and kite shops. (*Omnibus* p.184)

As Bijay Kumar Das opines, “To read Ruskin Bond’s stories is to see the Maplewood in Dehra and to transport one’s self into the quiet realms of nature and Garhwal hills – therein lies his success as a story teller.” (pp. 122-123) The slow-paced life in and around Mussoorie, finds thoughtful expression in his writings. Hence, Bond’s stories are simple tales about everyday life and ordinary people in day-to-day situations. Ruskin Bond has made effective use of realistic descriptions of the natural beauty of the countryside, as yet untouched by the corrupting influence of man in his stories especially “The Blue Umbrella”.

He writes about what he knows best and thus describes only that which he himself has observed. This makes him a subjective writer. As Nirmal Sandhu comments, “... Only a writer of deep understanding and observations can draw so much from the otherwise eventless, dreary life in the hills.” (Interview with Nirmal Sandhu, [Meet the author Bond Unbound](#))

While this subjective approach on the one hand limits his creative canvas, on the other hand it embellishes his detailed descriptions with a realistic flavor. His own experience shapes itself into the vivid account of his stories.

Ruskin Bond finds himself strongly rooted in India. His ‘Indianness’ is apparent in his writing. “I have loved India and it is very fascinating to be a part of its history of the last hundred years.” proclaims Ruskin Bond. (Interview with Anuja Atula) His writings testify to this statement. He believes that he is a part of it. “Once you have lived with mountains, there is no escape. You belong to them” (Bijay Kumar Das, p.114)

Bond is well-versed with Indian Culture and Hindu mythology. This knowledge is reflected in his stories like “Angry River”, Sita’s grandmother used to tell her stories about gods. In his stories, he touches upon aspects like the sacred river Ganga, where Hindus take a dip to cleanse them of their sins, the removal of shoes or footwear before entering the kitchen, having meals on the kitchen floor, eating on a banana leaf, and school remaining closed due



to religious festivals. He embellishes his looks by adding to the element of Indianness are words from the Hindi language, such as lathi pakoras, chaat, jalebis etc. His constant use of these words in his stories reflects his thorough knowledge of Hindi and understanding of Indian Culture.

The characters described in Ruskin Bond's stories are reflective of the author, patient and contented people. Bond comes across as very down to earth person, "I never wanted bigger things. I am a very simple man." He reveals in an interview with Anuja Atula. The people living in the hills are seen as used to waiting for buses even if they were late by an hour" As long as it arrived safely and got them to their destination, they would be content, they were patient people". (Omnibus p.99)

His characters are ordinary hill-folk who earn their living as humble farmers or cattle-herders and Bond imbues them, with vitality and charm. Ruskin Bond in "The Blue Umbrella", vividly describes the female protagonist, a young nine year old girl, Binyadevi or Binya as she is popularly known:

Like most mountain girls, Binya was sturdy, fair of skin, with pink cheeks and dark eyes and her black hair tied in a pigtail. She wore pretty glass bangles on her wrists, and a necklace of glass beads. From the necklace hung a leopard's claw. It was a lucky charm, and Binya always wore it. (Omnibus pg.18-19)

In "The Tunnel", the character of Sunder Singh, the watchman is described as amiable man who minds the tunnel. Sunder Singh, the watch man, is one with nature around him. He knows the sounds of the jungle too well and can identify even the slightest sound. The watchman is fearless about the leopard in the tunnel. He even risks his own life in order to save the life of the leopard in the tunnel. Suraj is indeed flabbergasted and struck with awe by this attitude of the watchman. He is a man who belongs to the jungle around him and is more at home there than he is in the town. He tells Suraj, "It is safer in the jungle than in the town. Nothing happens to me out here. But last month, when I went into town, I was almost run over by a bus". (Omnibus p. 163)

Nirmal Sandhu writes, "Those familiar with his writings know Ruskin's fondness for nature and children." The Road to the Bazaar, contains a host of stories about children such as, Koki a ten year old girl who is tomboyish in nature; Bhim a lanky, bespectacled boy of fourteen and Ranji a eleven year old. Being well built, he was a member of his school

cricket team and displayed a lot of guts. Ranji had "... a good bye and strong wrists..." (Omnibus p. 172). Traits which made him qualify to be a good batsman for his team.

Then, there are the have-nots in the stories of Ruskin Bond. For instance, Mohan in "The Visitor" works as a street hawker to earn his living during the day and studies at night under a street lamp. His poverty prevents him from going to a regular school, but does not deter him from dreaming about career, "The way to a career would be open to him, he could study further, become an engineer, or a scientist or an administrator. No more selling combs and buttons at street corners..." (Omnibus pp. 236-37) It can be observed that, Mohan is ambitious and aspires for a better life which he feels is possible with education. The thief Deepak in "The Thief" believes in the power of education reasoning "I knew that once I could write like an educated man there would be no limit to what I could achieve." (The Night Train at Deoli and Other Stories p.39). This tells us that he is a thief by chance and not by choice.

Most of Bond's stories are based on the mutual relationships of the characters, and his deep understanding of human nature, enables him to skillfully portray different types of human relationships with complete authenticity. Ruskin Bond writes with a note of fondness and nostalgia about the relationship of the narrator with his grandfather and grandmother in stories from the collection Grandfather's Private Zoo.

The narrator describes his grandmother as having white hair, although she is said to have looked much younger than her age. "Grandmother was old, but there were very few wrinkles on her skin." (Omnibus p. 152) He writes lovingly about grandmother as a lady who was an efficient housewife. She saw to our meals, she did the shopping, kept the household accounts, and dealt with a variety of tradesman. Grandmother however did not approve of her husband's hobby of buying unusual pets and maintaining a zoo, but subsequently began to tolerate the birds and animals brought to the house by her husband, but she drew the line at reptiles. The narrator is sympathetic towards grandmother and blamed the pets of the house for making grandmother lose her temper when they interfered with her running of the house. Though grandmother is said to have grumbled about grandfather's hobby of keeping pets in the house, nonetheless, she tolerated them and took care of them whenever they fell sick. "... She kept her own bird-bath in the garden, where mynas, thrushes, bulbuls and flower-peckers would come for a dip or a drink, and she never forgot to fill the stone bath with fresh water in the mornings." (Omnibus p. 153)

Thus, “Ruskin Bond’s stories dive deep into human psyche and unfolds human mind in relation to nature and environment” (B.K. Das). He is adroit at noticing the working of characters, their limitations and their relationships.

Ruskin Bond is a master story teller. This is apparent in the simple yet brilliant plots he has for his stories. Be it a cricket match that is disrupted by a crocodile in “Cricket for the Crocodile”; or the mischief created by the ghost in “Ghost Trouble”; a young boy’s meeting with a strange woman on a railway platform in “The Woman on Platform 8” or Suraj’s failed attempt to run away from home in “Home”.

When questioned about his creative process as a writer and the inspirations that fuel his creative process, he says, “I guess the first thing is to get the first sentence down and then carry on from there. I get my ideas sometimes on walks, or while in bed, doing nothing, or contemplating – There is no pattern really.”

Ruskin Bond believes that his job as a writer is to write something that will give the reader pleasure and not something that is complex. “A reader should read a literary work, as Ruskin advises, only if it gives pleasure. Literature should be read for enjoyment only.”<sup>137</sup>

The presence of humour, is a characteristic of many Ruskin Bond’s stories. Most of the stories are greatly humorous. In an interview to Jhelum Biswas, Ruskin Bond mentions “... as I grew older, I realized that life is not as serious as I thought it to be. In fact, I think life and people are very funny most of the time. And it’s these people and humorous moments that now come alive in my writings.”

In “Ghost Trouble”, humour arises due to the mischievous acts of the ghost, which are very hilarious, especially the manner in which inmates of the house react to the mischief. With the arrival of the narrator’s Aunt Ruby, the ghost stops troubling the inmates of the house, only for a while, because he develops an instant attraction to Aunt Ruby, as deduced by Grandfather. “I think the *prêt* has taken a fancy to your aunt,” said Grandfather mischievously. “He’s behaving himself for a change.” (*Omnibus* p. 154) The *pret*’s fondness for Aunt Ruby is confirmed, when the parrot also utters words like ‘kiss’ in the presence of Aunt Ruby, which of course he learns from the *pret*.

Humour is also revealed in Bond’s portrayal of characters, such as their comic appearance and utterances. In the story “When the Guavas are ripe”. Gopal, the watchman is described in a very comic manner, especially when he takes a nap under the Jackfruit tree, “He was...

snoring so loudly that the flies who had been buzzing round him felt a storm was brewing and kept their distance.” (*Omnibus* p. 188)

Again, when Gopal boasts of his physical strength “I’ll have you know that I was once the wrestling champion of the entire district of Dehra. Come on out and fight me if you dare!” (*Omnibus* p. 189) But, at the next moment he can neither run after the little intruders nor climb the wall of the guava orchard. This has the reader in splits. What is most hilarious is that the children are aware that the stories of Gopal’s heroic exploits as a wrestling champion are not true, as he claims them to be, but nevertheless they do not make it known to him and listen to him patiently, only to eat the guavas.

In, “Mukesh starts a Zoo”, humour arises out from the commotion and havoc created by the black dog amidst the other animals, the escape of the talking parrot, the children buying a substitute for their lost talking parrot with the money they had earned from their little zoo, the newly purchased parrot unable to recite the prayers like the old one, and Teju making amends for it by reciting prayers in front of the parrot regularly much to the delight of his grandmother who was happy that Teju was learning his prayers.

It can be concluded that the humour present in Ruskin Bond’s stories is a humour that “... is purely comic: it evokes, as it is sometimes said, sympathetic laughter, or else laughter which is an end in itself.” (M. H. Abrams, p.331)

Ruskin Bond as a short story writer evokes a sense of nostalgia in his stories. He helps us to once again revive the moments of our childhood because his stories revolve around the carefree lives of children, their games and little enjoyments, which we now yearn. As M. K. Naik rightly points out “Bond is at his best in evoking a mood of nostalgia for the vanished sights and scenes of boyhood, of the pathos of the inexorable march of Time” (p.250).

Finally, in dwelling on Ruskin Bond’s creative aspirations as a short story writer, his own beliefs speak volumes for themselves. In an interview with Mala Kumar published in The Hindu Young World, he sheds light on this by stating that

I think every writer wants future generations to read what he has written. I don’t know whether I have written anything of lasting value. One can’t look into the future and tell whether a piece of writing is going to be liked. But I’ve always tried to produce my best...never setting out to be a great writer. (Interview)

To summarize the prominent and noticeable features of Ruskin Bond the short story writer

- Realistic portrayal of Indian Life
- An Autobiographical element
- Simplicity of plot
- A sense of humor and nostalgia

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## **Native American Literature and the Politics of Representation: An Overview**

Sheena John\*

Native American Literature encompasses a history of twenty thousand years and a geographic area from the Arctic Circle to the tip of South America. The long history of the emergence of American Indian writing from its oral beginnings and hieroglyphics to the recent written mode is both rich and tragic. On the one hand, American ethnic writers celebrate their rich cultural and spiritual past while, on the other, they share the historical experience of colonization that began five hundred years ago, with the discovery of the continent by Columbus. Though the discovery of the New World has been given the rubric of “conquest” and “manifest destiny,” Native American writers have all along countered it by regarding it as an “invasion,” the effects of which are still continuing. Contemporary Native American writers, N.Scott Momaday, James Welch, Louise Erdrich, Wendy Rose, Leslie Marmon Silko and Joy Harjo, among others, do not simply highlight ethnic diversity but also speak of the structural and entrenched features of racial oppression. They argue that the Native people of America, in spite of their postcolonial status, still exist in conditions of politically sustained subalternity. Through their writings, these ethnic writers relate how the process of colonization has debilitated their cultures, religions, traditions and identities. Human and cultural genocide, imperial domination, forced acculturation, stereotyping, indoctrination, displacement and relocation are highlighted as the horrible consequences of internal colonization. Their writings also reveal how the denial of basic amenities to the Native American population led to unemployment, alcoholism, violence, depression and poverty.

Since the Native American Renaissance of the 1960s and 70s, ethnic literature in the U.S. has been attempting to counter the stereotyped images of the Indian projected in canonical American literature. Most of the self-representational texts by Native writers try to reflect the changing iconography of the Indian. One important strand of contemporary Native American writing has been mixed-blood literature by bicultural writers, whose texts reflect the attempts of the Indigenous peoples to come to terms with their bicultural situation. Literary works by ethnic writers of mixed-blood bring to light the plight of hybrid groups who have been doubly marginalised. Demonstrating “a shared consciousness” and “an identifiable world view” (Rainwater xi), which Michael Dorris maintained in 1979 would be

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the characteristic feature of a distinct Native American literature, these narratives portray the mixed-blood's quest for a sense of place, tribe, and self.

The notion of the authentic Indian and the stereotypes associated with it pose problems to contemporary Native American writers. The history of the stereotyping of the Indian in canonical texts is long and complex. It was only in the nineteenth century that the people indigenous of the Americas entered Euramerican consciousness. True, the native had been made subject matter in the dominant discourse of the west, but those texts merely augmented the stereotyped image of the Indian as barbaric savage. There were also occasional romanticized portrayals of the "noble savage" in Euramerican literature. In the opinion of Kateri Damm, such images as the "howling savage" or the "noble savage" served as ideological weapons for the white man in subjugating the Indians, thus obscuring their true identity. In the later decades, there were theories like the "doomed culture theory," which predicted that the Indians would soon die out or get assimilated. Stereotypes continued to be built around the already prevailing notions about the native, who was seen either as a "welfare bum" or a "tragic victim" debased by alcohol and disease.

The function of the stereotypes was to encourage an artificial sense of difference between the white European "Self" and the non-white "Other." As Edward B.Said observes in *Orientalism*, this strategy served to emphasise colonial authority. Those writers who depicted the Indian as savages, associated him with values opposed to white control, orthodox Christianity and ordered landscapes. The Indian was identified in their literature with pagan superstition, animalistic irrationality, promiscuity, and nomadic disorder, as opposed to the monotheistic religion, rational order, moral refinement, and supremacy of the white man. In the following decades, the white man's Indian policy gradually assumed an assimilationist and coercive character. The Indians were relegated to reservation, where they would be civilized by missionaries and governmental organisations. The newly-constructed residential schools in the reservations prohibited native children from speaking their own languages and practising their tribal customs.

At the turn to the twentieth century, there was growing awareness among Native American that they should raise their voice against such "organized and institutionalized cultural genocide" (Coltelli 42). More and more Indians started writing in the white man's language in order to articulate their concern about the destruction of the red man's culture. Drawing heavily on their own oral tradition, the tribal literature of American Indians tried to evolve a new perspective. The latter half of the twentieth century thus witnessed an explosion of creative writing in English, by Native Americans, who were trying out a wide

range of genres. They were involved in a struggle to produce what may be termed “Fourth World Fiction,” which projected the contemporary realities of indigenous life.

Native writing in America may thus be looked upon as resistance literature – a cultural movement – among American Indians, who sought not only to expose the injustices suffered by their people at the hands of the white settlers but also to recover the tradition and culture of their ancestors. Their quest narratives marked a brave gesture to rewrite their lives from their perspective, and thus challenge the colonizer’s versions.

To counter the process of colonization and continuing invasion, these writers turned to the past as a repository of values. For healing and regeneration, for re-establishment and restoration of individual’s harmony with the surroundings and the cosmos, they re-enact the ceremonies, rituals, and myths of their past. The healing and restorative aspect of these rituals, stories, myths, and ancient wisdom do not merely appeal to nostalgia; rather, contemporary Native American writers use these stories and myths as alternative narratives to enter into dialogue with the metanarratives of Euro-American history. The basic opposition between history and myth is challenged in the works of recent Native historians like Frederick Hoxie and literary writers such as Leslie Marmon Silko, N.Scott Momaday and Louise Erdrich. Practising a literary style which Clifford Gurtz describes as a “blurring of genres” (Krupat 56), Leslie Marmon Silko returns to a point in history and human memory in her work where the line between history and myth is not clearly marked. In Silko’s “Storyteller” and Momaday’s *A Way to Rainy Mountain*, the personal, communal, historic and mythic narrative voices merge into one another to present an alternative view of the real and to counter the misrepresentation in Euramerican historical narratives. Albert Memmi in *The Colonizer and the Colonized*, holds that the most serious blow suffered by the colonized has been the “removal from history” (Vickers 132). It is thus with an aim of finding a new way of making history, of a new way of forging a new historicity that the contemporary Native American writers write stories of their past. Thomas King, Gerald Vizenor, and Louise Erdrich use the trickster as a cultural trope to disrupt the metanarrative of western history. Tricksters have shades of the ambiguous, ambivalent, polyvalent ; they are shape-shifters, situation-inverters, capable to crossing boundaries of gender, species, and being, and are hence used by Native writers to fragment the epistemological, moral and physical aspects of the colonial discourse. The trickster’s hybrid situation within two cultures and his/her ability to transcend colonial time help in retelling of history that, in a way, disrupts the official history. Leslie Marmon Silko’s *Ceremony* is such an attempt on the part of the Native writer to fight one’s way into Euramerican history, through a process of dialogue and necessary correction. The discourse of “manifest destiny” and “conquest” is



decontextualized by Silko from the native point of view. Silko in *Almanac of the Dead* asserts that the natives will regain their lost power by controlling the whites who are nothing but their own imaginative invention.

The western naturalization of time promotes a linear trajectory of human development which excludes other temporalities. Native writers challenge this linear, progress-oriented structure of the Euramerican novel. They also question the enlightenment ideology of the autonomy of the subject and the ways in which the traditional western form of the novel replicates and enforces such subject construction. Rather, they favour multigeneric works and multiple narratives where the different versions define reality from different subject positions, thus frustrating linear development of the novel. Catherine Rainwater observes how orality has influenced such narrative strategies, through which native writers challenge the codified position of non-native readers. Countering the western notion of progressive time, which Paula Gunn Allen describes as “mechanical,” in Native American narratives, space becomes spherical and time cyclical.

Contemporary Native American writers also counter stereotypes by frustrating the expectations of the readers who have preconceived, stereotyped images of the Indian. Gerald Vizenor strongly objects to the term “Indian” and considers it a simulation of racialism. These essentialized notions of the Indian, writes Vizenor, “do not reveal the experience of diverse native communities” (244). In *Defeathering the Indians*, Emma LaRocque makes a point that stereotypes perpetuate myths and thus not only hide the truth but also prevent it. Sherman Alexie also discusses the consequence of stereotyping and codification of Native identity, especially the distortion of ethnic identity through the images on television and cinema screen. He shows how the educational, legal and cinematic systems have codified Indians as inferiors, and how these systems have provided legitimacy to such essentialist images through repetition and synecdoche. Native writing in the U.S.A., during the 1960s and 1970s, thus became highly charged with a sense of purpose. In their writings, one finds a gradual resurgence of Indian pride. Personal narratives became a substantial part of this phase of resistance writing. There were also writers like Sherman Alexie and Leslie Marmon Silko who came up with imaginary alternatives to the dominant culture’s narratives of conquest. They agree that their imaginary alternative narratives might not change history but in envisioning a history, in which Native Americans write themselves back into the landscape, they can influence the future.

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## **CORRELATION OF ANCIENT HASTINAPUR AND THE PRE-INDEPENDENT INDIA THROUGH SHASHI THAROOR'S - THE GREAT INDIAN NOVEL**

B. Samrajya Lakshmi\*

### **ABSTRACT**

The Great Indian Novel is modern English Prose novel Whereas Ved Vyasa's Mahabharata is an epic poem in Sanskrit. The writer presents an apt correlation of ancient Hastinapur and the pre-independent India. Tharoor's Ganapathi is a Southern Indian like C.R. Bhishma is correlated to Mahatma Gandhi. Ghandhari of Mahabharata is blind-folded whereas Kamala is invalid. Dhritarashtra, is India's first Prime Minister, Nehru; while the chaste Kaurava pater familias Bhishma, generally referred to Gangaji, is Gandhi. But rather than a hundred sons, Tharoor's Dhritarashtra fathers a single daughter, Priya Duryodhani -the oldest Kaurava in the Mahabharata is called Duryodhana-, hailed as the future ruler of all India: an obvious reference to Indira Gandhi. Shishupal is correlated to Lal Bahdur sastry. Draupadi, who represents the "body politic", or Indian democracy and wilts visibly with the imposition of Duryodhani's "siege" -a reference to Indira Gandhi's State of Emergency from 1975 to 1977. Yudhistir is correlated to Morarji Desai. In his novel, Jarasandha may be taken as a personification of East and West Karnistans, which are both inhabited by Muslims but are totally separated by the Indian army with Bhim as a soldier, Arjun as a spy and Krishna as the thinker. Ekalavya is correlated to V.V.Giri. Jaya prakash Drona is correlated to Jayaprakash Narayana. Karna, Kunti Devi's child by the sun, becomes Muhammad Ali Jinnah, first president of Pakistan, etc. There are, however, countless other literary allusions, such as those to Paul Scott's novels of the Raj.

**Key words:** The Great Indian Novel, The Mahabharata, Kaurava, allusion, Emergency

### **INTRODUCTION**

Tharoor thus cleverly conflates poet and redactor, ironically authenticating his otherwise fantastic narrative by placing this composite figure at its very centre. The ability to detect literary parallels in the novel is ultimately determined by one's knowledge of the Mahabharata and familiarity with modern Indian history. Ganga Datta is named 'Bhishma' though his father has failed in his parental dharma, Bhishma performs his filial duty by choosing to remain a life long celibate.

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The Britishers are introduced into the story to give an impression that the entire story happens in colonized India. At first Satyavati's marriage is put to trial by the British and later with the modest appeal of Ganga Datta, which is approved by the British Government. It is here that Bhishma is correlated to Mahatma Gandhi. The superimposition of the political event of the twentieth century on the basic structure of The Mahabharata is made plausible by variation in stylistic levels and tones. The Transformation of the ancient myth into contemporary politics seems to have been more successful than the transformation of contemporary politics into some kind of myth or other. But the Gangaji-Gandhiji identification seems to break down at crucial stages in the narrative. Hence K. Ayyappa Paniker says

“It is rasabhasa rather than pure rasa that dominates.

This makes the work a mock-epic as was intended by Tharoor”

After failing in his ‘Grihastha Dharma’, Gangaji starts transforming himself into a sage, an impersonal, man of action. The transformation of the ‘man’ into ‘humane can be clearly witnessed through the words of Churchill:

“Problem is, he is now going further. Preaching a  
 Lot of damn nonsense about equality and justice  
 And what have you. And you tell me he cleans  
 His own toilet, instead of letting his damn bhisti Do it”.

Gangaji tries to eradicate class distinction. To some extent he even questions the ‘varna dharma’. Britishers look down upon Hindustan & Hindustani, commenting on the peculiarities of genders in Hindustani.

“I mean is there any good reason why a table  
 Should be feminine and a bed masculine? D’you  
 Think it has to do with what you do on them?”

Gandhari and Dhjristarashtra give birth to a daughter Priya Duryodhani who grows up to rule all India. Gandhari fails in her dharma top her husband as well as to her daughter. Ghandhari of Mahabharata is blind-folded whereas Kamala is invalid.

So faithfully does Tharoor transpose elements of the Mahabharata to modern Indian history, that it may be more useful to consider the significant differences between the novel and its epic original, rather than the many similarities? Tharoor’s Kauravas thus represent India’s

Congress Party; the blind patriarch, Dhritarashtra, is India's first Prime Minister, Nehru; while the chaste Kaurava pater familias Bhishma, generally referred to as Gangaji, is Gandhi. But rather than a hundred sons, Tharoor's Dhritarashtra fathers a single daughter, Priya Duryodhani -the oldest Kaurava in the Mahabharata is called Duryodhana-, hailed as the future ruler of all India: an obvious reference to Indira Gandhi. Another elaboration of the epic original concerns the five Pandavas themselves, as Tharoor moves to more direct allegory: Yudishtir thus symbolizes India's best political traditions, Bhim its loyal armed forces, Arjun an articulate press, Nakul and Sahadev the administrative and diplomatic services, respectively. All five Pandavas are also devoted to their common wife, Draupadi, who represents the "body politic", or Indian democracy and wilts visibly with the imposition of Duryodhani's "siege" -a reference to Indira Gandhi's State of Emergency from 1975 to 1977. Pandu, the non-biological father of the Pandavas, thus becomes Subash Bose, founder of the pro-Japanese Indian National Army; Karna, Kunti Devi's child by the sun, becomes Muhammad Ali Jinnah, first president of Pakistan, etc.

Priya Duryodhani in Mahabharata has a little role to play whereas in *The Great Indian Novel* she is given utmost importance. She is successful in fulfilling her 'Dharma' towards her parents. She looks after her mother till her death and accepts and follows her father's teachings, which he had taught her through letters. She is a self made woman, with firm conviction, time and again the novelist returns to the character of Gangaji. Jaya prakash Drona is correlated to Jayaprakash Narayana.

At last Viscount Drowpad summons up the representatives of the three parties, kauravas, Sikhs and Muslim group and announces that the British Government is ready to transfer the power to the Indian self-Government but he asks them to resolve the conflicts between the groups and come as one before 15 Aug., 1947. Karnistan is finally divided from Indian province in the maps by the Geographers.

Meanwhile Dhritarashtra who is active in politics and has also become a close acquaintance of Drowpad, falls into an affair with Lady Drowpad. Even after Drowpad leaves India on 26 Jan., 1950, his wife periodically visits Dhritarashtra which results in a pre-mature baby named Draupadi Mokrasia (a personification of India)

After independence vidur, the principal secretary for integration, moves on to Devpur the capital of Manimir and meets the Maharaja at an odd hour to convince him in order to sign the instrument, the first kaurava-karnistan war begins.

Dhritarashtra along with Priya is successful in bringing about a modern Industrial revolution. After Dhritarashtra there is no man of truly national stature to succeed Dhritarashtra; the Kaurava party decides to have a collective leadership, with the working committee effectively in command. They selected Shishupala as the Prime Minister. Later, Priya Duryadhani is given a chance to become the P.M. because she was only a woman and she would decorate the office, so that the Kaurava working committee can act accordingly. The phrase ‘only a woman’ shows us the stature of woman in the post-independence India, particularly in the area of Indian politics.

The diplomatic nature of the politicians is better expressed through the burning of the lac house which is referred to as ‘Trojan house’ by the same Prime Minister, who expresses her sorrow later.

The Pandavas start gaining importance in the Indian politics. In this context, Draupathi Mokrasa represents the Indian independence and the Pandavas are entrusted to be its protectors. Arjuna moves from Delhi to Kerala where he meets D. Krishna Parthasarathi who becomes his friend and promises to be his adviser later on. Priya’s reign is aptly named as ‘the reign of error’ because it has destroyed the unity and morality of the Kaurava party. In its fourth general elections, the Kaurava party loses seats all over the country, but retains its power. So Yudhishthira questions the leadership of Priya, and so he is appointed as the Deputy P.M. He is functioning as the chief executive. He also presides over the cabinet like the chairman of the Board.

Priya ignores Yudhishthira which leads him to resign. Yudhishthira is correlated to Morarji Desai. She appeals to all ‘Progressive’ and ‘like-minded’ people outside the Kaurava party to join her efforts. The first one to react to her call is Ashwathama who fights against privy purses to Ex. Maharajas and proposes the issue of nationalization of banks which is readily accepted by the Prime-Minister. The bill is passed.

In Mahabharata, Ashwathama always remains subservient to Drona. Whereas in The Great Indian Novel Ashwathama acts as an individual entity in politics. When Drona represents the Janata party, he worked with Congress.

The President who is a Muslim, signs the bill and makes an act. By now Draupadi is lawfully ill. Tharoor’s comparison of the political giant to Frankenstein’s monster is quite apt and logical. Like Shelley’s Frankenstein who is a creation who tries to devour the creator, Priya’s rise is abominable.

When a candidate is nominated by the kaurava working committee for the presidency, priya supports an independent candidate called Ekalavya.

In his novel, Jarasandha may be taken as a personification of East and West Karnistans, which are both inhabited by Muslims but are totally separated by the Indian army with Bhim as a soldier, Arjun as a spy and Krishna as the thinker. Now Draupadi is shown to have moments of good health. Tharoor's title 'The reign of error' is quite apt for the rule of priya. Dharma even in The Mahabharata seems to mean differently at different times. Impendency rather than stable ethics seems to have been practiced even by Krishna before, during and after the Great War. The raja dharma as it is known and practiced by the kings is to preserve safe guard and perpetuate their power.

Drona emerges from his retreat and calls for a peoples uprising against Priya. Arjun ignores politics and takes to non-political freelance journalism. Nakul takes over Vidur's post in Nationals service. Sahadev enters the Foreign Service. Drona preaches new civil disobedience against the rule of the prime minister. In Drona's home state the chief minister resigns and the "presidents rule" is imposed. Prime minister is advised by a Bengali lawyer shakuni shanker Dey to arrest and imprison the agitators. Yudhistir starts working actively with Drona for Janata Morcha or people's front. The siege is accompanied by the declaration of a twenty point socio-economic programme which the government seems determined to implement. This shows the mind of the Indians and illustrates both their resilience and their self-absorption in the circumstance.

The life of the poor has become miserable. They are subject to random police harassment. They are forced displacement from their homes in the name of slum clearance campaigns. They are all forced to compulsory vasectomies in pursuance of population control.

Suddenly Priya suspends the siege and calls for free general elections. She is very confident that she would sweep the polls. The novelist makes fun of the elections as 'the great Indian thamasha' which is conducted at irregular intervals and various levels amid much fanfare. As usual ballot boxes are stuffed, booths are captured, and the election, candidates, workers and voters are assaulted, kidnapped and at times shot. But nothing stops the franchise. People feel that they have got a chance to choose in a free election, between 'democracy' and dictatorship' and also between 'dharma' and 'adharm'. It is like the great battle of kurukshetra; the only difference is that in the end it becomes a tragedy. But this war is devoid of bloodshed. It is between good and evil. Various opposition factions get together in a people's front. At last the results are announced and priya is defeated by the Janatha Front.

“If you begin an examination by avoiding the most  
Difficult question it raised it is that very question  
That will eventually guarantee your failure”.

Yudhistir is elected as the prime minister by janatha front. Now Draupadi is quite healthy and her skin is glowing with honour.

The new prime minister is ‘stiff, straight backed and humourless and drinks his own urine’. He also gives speeches for the upliftment of the backward strata of the society. Priya is preparing plots against the Government, Drona, is a flawed Mahaguru, because his goodness is not balanced by shrewdness. A majority of the Fronts M.P’s back-stop the prime minister and the Government finally falls.

In the closing chapter of this novel, Tharoor talks extensively of dharma. It is a unique and untranslatable Sanskrit term. He says:

“India, the land where truth and honour, valour  
And dharma were worshiped as the cardinal  
Principles of existence, is now a nation of weak-  
Willed compromisers, of leaders unable to lead,  
of rampant corruption and endemic faithlessness.  
It is now a land where dharma and duty have  
Come to mean nothing”.

In order to be true to himself the author admits that he portrays a nation in struggle both against external and internal forces. The novelist may seem to be a pessimist when he calls India a land of adulteration, black marketing, corruption, communal strife, and dowry killings. But his being realistic is depicting life in its raw terms.

Tharoor emphasizes the view that not the efforts of Gangaji could get us freedom but that the affair of Dhritarashtra with Lady Draupadi achieves it. Therefore the insignificance of Gangaji’s sacrifice is complete. It is not dharma that bought India its independence but kama, the third of the purusharthas.

Yudhister’s encounter with dharma reminds us of the fatal flaws which lead India to collapse. The flaws are as follows: Basically, people are willing to serve institutions rather than values. They do their job but forget about the larger duty to greater cause. Dharma plays a unique role in Tharoor novels. His note of dharma is marvelous and gets us closer to the



real core of dharma. The same idea about dharma, "From dharma comes success" is expressed and revealed in the novel. In this novel Shashi Tharoor shows India's transformation from dharma to adharma and from nobility to brutality. But he fails to give measures to restore its past glory.

## CONCLUSION

The writer is skilful in mingling politics, mythology, culture and tradition. The Zigzag narrative, constantly shifting from the present to the past, from reality to illusion, discovers and defines, enlarges and evaluates the central theme of the novel. The novelist proves himself successful in merging the earlier themes of public issues like the achievement of political freedom and more recent phase of writing where the problem of what is means to be an authentic human being. In this novel, the novelist explains the concept of 'Dharma' in terms of 'Duty' to be performed by different persons. He also shows how 'Dharma' varies with the persons and their occupations. But still it is the only yardstick with which the purposefulness of human life on earth is measured. On the whole Shashi Tharoor shows his Socio-Moral vision and mourns for the lack of 'Dharma' in modern times. The satirical and sarcastic tone in the novel is an indication of the author's concern for lack of values on the part of the characters. In a society with the 'transvaluation of values', a rigid, inflexible values system is an anachronism. So though The Mahabharata frame work has been chosen by Tharoor for this contemporary situation, the reduction of dharma is portrayed in all its multifarious revisions.

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