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The Sustainable Development in Madurai Jewellery Cluster

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Abstract –Global market for the Gold is estimated 3300 Metric Tons (in 2019). India is the 2nd largest consumer of the Gold followed by China. China (355 Tons) is the largest producer of Gold, followed by Australia (270 Tons) and USA (237 Tons) around 45% of total gold production. The Madurai Jewelry Cluster was formed during 2010 with 28 Micro Enterprises whose investment is less than Rs.1 crore with less than Rs. 5 crore turnovers as per MSMED Act 2006. The objective is to find the physical and financial the performance of Madurai Jewelry Cluster before and after Cluster Development Approach (CDA), to find the Productivity of the cluster by taking independent variable like No. of Units, Employment and Production and dependent variable like Turnover and to find performance of Madurai Jewelry Cluster before and after Cluster Development Approach. The methodology adopted by collecting the primary data like no of units [Un], employment in no's [En], production in crores [Pcr] and turnover in crores [Tcr] from the Madurai Jewellery Cluster before and after cluster development approach and analysing using Compound Annual Growth Rate (CAGR), Descriptive Analysis, Correlation Analysis, Trend Analysis, Regression Analysis and Structural Equation Modelling. There is increase in no. of units, employment, production and turnover after Cluster Development Approach when compared to before CDA and which leads to increase in productivity.

Keywords – Cluster Development Approach.

INTRODUCTION

Global market for the Gold is estimated 3300 Metric Tons (in 2019). India is the 2nd largest consumer of the Gold followed by China. China (355 Tons) is the largest producer of Gold, followed by Australia (270 Tons) and USA (237 Tons) around 45% of total gold production. The details of Jewellery Sector in India are given in Table I.

TABLE I
Gold Jewellery Sector in India

City	Jewellery
Jaipur	Polishing Precious & Semi Precious Gemstones
Surat	Diamond Processing Centre
Mumbai	Machine & Handmade Jewellery, Diamond Bourse,
Tiruchur	Gold Jewellery, Diamond
Delhi	Silver Jewellery Article
Kolkata	Light weight plain Gold Jewellery
Hyderabad	Precious and semi-precious studded Jewellery
Nellore	Handmade jewellery
Chennai	Gold Jewellery, Bangles
Coimbatore	Gold Chain, Bracelets, Studs, Ring

TECHNICAL SURVEY

Tamil Nadu consumes about 175 Tons which is 17% of the gold consumption of the Country. Gold Jewellery manufacturing is led by Chennai, Coimbatore, Madurai, Trichy and Tirunelveli.
These 5 locations major manufacturing of the Gold Jewellery and their performance are shown in figure 1.

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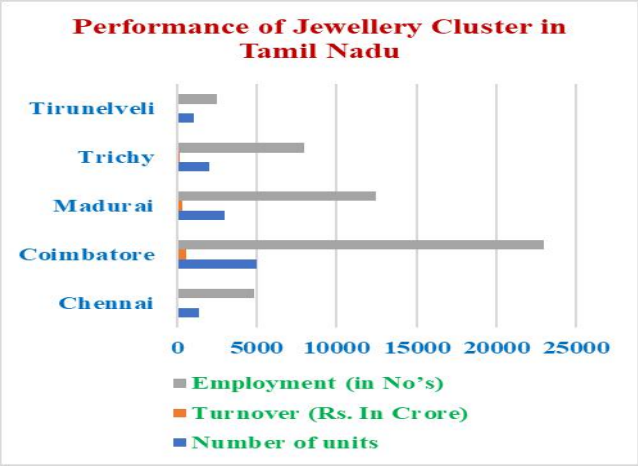

Figure 1: Performance of Jewellery Cluster in Tamil Nadu

The Madurai Jewellery Cluster was formed during 2010 with 28 Micro Enterprises whose investment is less than Rs.1 crore with less than Rs. 5 crore turnovers as per MSMED Act 2006. The status of the cluster is given in TABLE II.

TABLE II
Status of Madurai Jewellery Cluster

Name of the Cluster	Madurai Jewellery Cluster, Madurai
Created in	28-07-2010
Category of Products	Jewellery and Allied Services
Extent of Land	4200 Sq. Feet
No. of Units intended	28
No. of units created/established	46
No of occupancies	80
Present Board of Management	1.Managing Director 2. 6 Directors
Regularity of Conducting Meetings	Once in 2 months
No. of Members	31 MSMEs
Access to members/others (As per original plan)	SPV members and non-members
Existing facilities/Maintenance	1. Testing facility 2. Melting facility 3. Laser Marking and Soldering 4. Refining 5. Electro Plating 6. Hydraulic Pressing (Coins)
Financial Performance	Bank loan closed Self sufficient
Product refining etc as per original Proposal	As per the customer requirement model of design has changed.
Date of completion	24.10.2018

The Study was conducted to know the various interventions needed for empowering the entrepreneurs engaged in Jewellery Manufacturing in the areas of Social, Technological, infrastructure related, Financial and Marketing for the successful promotion of Cluster. [1] The Ministry of Micro, Small and Medium Enterprises (MSME), Government of India (GoI) has adopted the Cluster Development approach as a key strategy for enhancing the productivity and competitiveness as well as capacity building of Micro and Small Enterprises (MSEs) and their collectives in the country. [2]

Many studies have been made to identify performance for Clusters under Cluster Development Approach like Match, Printing, Auto components, Leather, Plastic, Hosiery, Textile, Lorry Body Building, Pharmaceutical, Ceramic, Wet Grinder, Jewelry and Rice Mill [3]. Tamil Nadu is first to implement 24 clusters in India which includes Jewellery Manufacturing Cluster [4][5][6]. A cluster is identified by two constituents – the product and the place, and is generally localized. [6] However the Jewellery Cluster is not studied yet and this leads to study on the performance of Madurai Jewellery Cluster before and after CDA.

Under Micro Small Enterprises Cluster Development Programme of Ministry of Micro,

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Small and Medium Enterprises, Government of India the Madurai Jewellery Cluster has got funding from Government of India, and Government of Tamil Nadu. The SPV also contributed and obtained bank loan to finish the project about Rs.3.56 crore. The details of project cost are given figure 2.

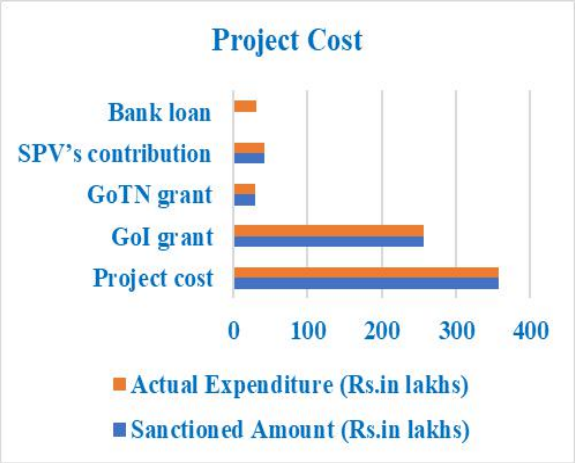

Figure 2: Project Cost of Cluster

OBJECTIVE OF THE STUDY

The objective of study is to

1. To find the physical and financial the performance of Madurai Jewellery Cluster before and after Cluster Development Approach (CDA).
2. To find the Productivity of the cluster by taking independent variable like No. of Units, Employment and Production and dependent variable like Turnover.
3. To find performance of Madurai Jewellery Cluster before and after Cluster Development Approach.

METHODOLOGY OF THE STUDY

The methodology adopted by collecting the primary data like no of units [Un], employment in no's [En], production in crores [Pcr] and turnover in crores [Tcr] from the Madurai Jewellery Cluster before and after cluster development approach and analysing using Compound Annual Growth Rate (CAGR), Descriptive Analysis, Correlation Analysis, Trend Analysis, Regression Analysis and Structural Equation Modelling.

TECHNICAL ANALYSIS

Before adopting Cluster Development Approach, the Micro Enterprises manufacturing jewellery were manually doing different types of Jewellery.

- The cluster members do not use modern and sophisticated technology.
- Many Units still following traditional methods
- Household type of venture
- Unorganised sector
- Obsolete machineries with cluster members – Need for technology infusion.
- Limited market. Mostly doing job work to Traders and Wholesalers / Retailers.
- Over dependence on Traders
- Poor Backward (Raw material and Advanced machineries) and Forward integration (Job order, Design, whole sale market and Export)
- Poor R & D activity – No new design development by cluster units
- Lack of in-house testing facilities
- Lack of training to work with modern machineries

NEED FOR COMMON FACILITY CENTRE

- Need for modern machineries for product making which are capable of making large number of homogeneous products in short period.
- Lack of Credit / limited resources for Investment in Latest Technology Machineries
- Need for reduction in the cost of production and wastages to compete with big players.
- Investment in latest technology machineries for various activities like gold melting, sheet and wire drawing, different types of chain making, laser welding, laser marking, cutting, refining etc., are beyond the reach of these micro artisan goldsmiths.
- Establishment of a Common Facility Centre for the cluster members will bring in radical change for the cluster members in terms of cost reduction, quality improvement, increased productivity, product diversification through design creation etc., and enable them to compete with organized players and create their own brand and market.

Works at Cluster Units before CDA

The following process were done before CDA.

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B. **Facilities created in Common Facility Centre (CFC)**

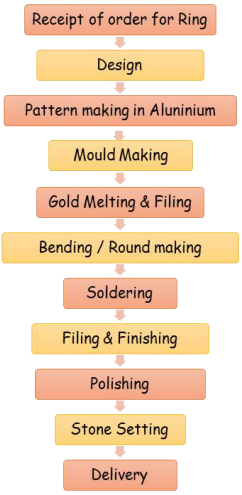
To improve productivity the following facilities were created in the cluster during 2018 and also shown in figure 3.

1) XRF Machine
2) Laser welding Machine
3) Laser Marker
4) Induction Furnace
5) Coli Heating Machine
6) Assaying Furnace
7) Bangle Making Machine
8) Sheet, Wire & half round machine
9) Hydraulic press
10) Die Hand press
11) Hand Bali press
12) Pneumatic press

Figure 3: CFC created in Cluster

The Value Chain Analysis after CDA is as follows and also shown in Table III.

Manufacturing Process – Stone Fixed Ring



PHYSICAL PERFORMANCE

The physical performance is shown in figure 4

Figure 4: Physical Performance

As per figure 4, CAGR for Un = 19.13% and for En = 9.5%

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FINANCIAL PERFORMANCE

The financial performance is shown in figure 5

Figure 5: Financial Performance

As per figure 5, CAGR for Pcr = 24.57% and for Tcr = 26.57%

DESCRIPTIVE ANALYSIS

TABLE IV

	Un	*En*	*Pcr*	*Tcr*
Mean	78.40	920.00	91.00	3.70
Standard Error	11.83	67.40	19.84	0.68
Median	72	960	75	4
Standard Deviation	26.46	150.71	44.36	1.52
Sample Variance	700.30	22712.50	1967.50	2.33
Kurtosis	1.38	0.31	-2.18	0.00
Skewness	1.05	-0.58	0.60	-0.54
Range	70	400	100	4
Minimum	50	700	50	1.5
Maximum	120	1100	150	5.5
Sum	392	4600	455	18.5
Count	5	5	5	5

TREND ANALYSIS

Un = 30.4 + 16 T [p = 0.01, R^2 = 0.91].....[1]

The annual average increase in no. of units is 16.

En = 641 + 93 T [p = 0.01, R^2 = 0.95] .....[2]

The annual average increase in employment is 93.

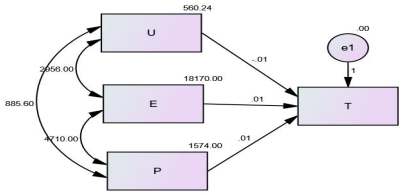
Pcr = 10 + 27 T [p = 0.01, R^2= 0.92] .....[3]

The annual average increase in production is Rs.27 crores.

Tcr = 0.85 + 0.95 T [p = 0.002, R^2 = 0.97] .....[4]

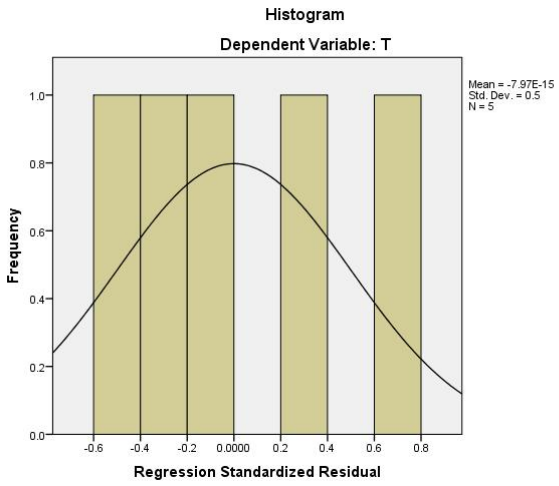
The annual average increase in turnover is Rs.0.95 crores.

STRUCTURAL EQUATION MODELLING



Tcr = -5.21-0.006 Un + 0.009En + 0.006 Pcr [p= 0.03 < 0.05, R^2 = 0.99] .....[5]

For one unit increase in turnover, production increases by 0.01 units, Employment by 0.01 units and there is decrease in no. of units.



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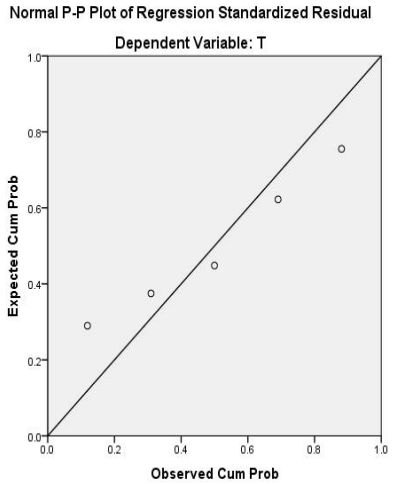

REGRESSION ANALYSIS

Pcr = -40.27+1.5 Un + 0.015En [p= 0.11 > 0.05, R^2 = 0.94] .....[6]

For one unit increase in production, employment increases by 0.02 units and no. of units by 1.5 units.

Tcr = 0.88+0.03 Pcr [p= 0.04 < 0.05, R^2 = 0.90] .....[7]

For one unit increase in turnover, production increases by 0.03 units.

T TEST

t-Test: Paired Two Sample for Means

	Ua	*Ub*
Mean	92.33333	62.33333
Variance	616.3333	126.3333
Observations	3	3
Pearson Correlation	0.893539	
Hypothesized Mean Difference	0	
df	2	
t Stat	3.326496	
P(T<=t) one-tail	0.039857	
t Critical one-tail	2.919986	
P(T<=t) two-tail	0.079714	
t Critical two-tail	4.302653	

Ho: Ua = Ub , p = 0.03 < 0.05 (Rejected)
Ha: Ua # Ub (Accepted) Ua > Ub

t-Test: Paired Two Sample for Means

	Ea	*Eb*
Mean	1015	838.3333
Variance	5575	17108.33
Observations	3	3
Pearson Correlation	0.893386	
Hypothesized Mean Difference	0	
df	2	
t Stat	4.229861	
P(T<=t) one-tail	0.025802	
t Critical one-tail	2.919986	
P(T<=t) two-tail	0.051604	
t Critical two-tail	4.302653	

Ho: Ea = Eb , p = 0.02 < 0.05 (Rejected)
Ha: Ea # Eb (Accepted) Ea > Eb

t-Test: Paired Two Sample for Means

	Pcra	*Pcrb*
Mean	116.6667	60
Variance	1458.333	175
Observations	3	3
Pearson Correlation	0.866025	
Hypothesized Mean Difference	0	
df	2	
t Stat	3.564168	
P(T<=t) one-tail	0.035248	
t Critical one-tail	2.919986	

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	86
	0.0704
P(T<=t) two-tail	97
	4.3026
t Critical two-tail	53

Ho: Pcra = Pcrb , p = 0.03 < 0.05 (Rejected)
Ha: Pcra # Pcrb (Accepted) Pcra > Pcrb

t-Test: Paired Two Sample for Means

	Tcra	*Tcrb*
	4.666667	2.833333
Mean		
	0.583333	1.583333
Variance		
Observations	3	3
	0.953824	
Pearson Correlation		
Hypothesized Mean Difference	0	
df	2	
t Stat	5.5	
	0.015752	
P(T<=t) one-tail		
	2.919986	
t Critical one-tail		
	0.031504	
P(T<=t) two-tail		
	4.302653	
t Critical two-tail		

Ho: Tcra = Tcrb , p = 0.02 < 0.05 (Rejected)
Ha: Tcrb # Tcrb (Accepted) Tcra > Tcrb

FINDINGS, SUGGESTIONS AND CONCLUSION

A study was conducted to find the productivity of Madurai Jewellery Cluster before and after cluster development approach. There is increase in CAGR after CDA. There is increase in mean value after CDA. There exists strong relationship between dependent variables like turnover and independent variables like no. of units, employment and production. There is annual average increase in no. of units, employment, production and turnover. There is increase in no. of units, employment, production and turnover after Cluster Development Approach. There is cost reduction in individual unit after CDA. Due to CDA, The Jewellery products are diversified, new design has been developed, direct export by cluster units has taken place and brand creation has been developed in Madurai Jewellery Cluster.

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TABLE III
Value Chain Analysis in Madurai Jewellery Cluster

S. No.	Type of Product	Work at the individual Units [BEFORE CDA]	Value addition at the CFC	Post CFC work at the Unit level [AFTER CDA]
1	Jewelry Item like Ear Ring, Bangles, Ring, Stud, etc (Only one piece / set)	Goldsmith Workshop (Gold melting, sheet / wire drawing, welding, polishing, stone fixing, enamel work, engraving work etc)	-	-
2	Mangal sutra as per customer's request	Entire work will be done at the Goldsmith workshop	-	
3	Bulk order (more than 10 numbers) of same item (homogeneous product) – like same type of Chains, Bangles etc.,	Order procurement Gold Quality assessment	Gold melting Chain making (continuous length) Bangle making (continuous length) Hook making	Machine Cutting, Hook attachment, Pendent attachment, Stone fixing for chain/ bangles and Engraving work on Bangles Back to CFC for buffing & polishing work
4	Bulk order – Ring (Casting type)	Order procurement Gold Quality assessment	Casting working Gold melting Polishing work	Filing Work Stone Setting Finishing work Engraving / Enamel work Back to CFC for buffing & polishing work
5	Bulk order – Ring	Order procurement Gold Quality assessment	Gold melting Hollow pipe making	Cutting into requirement sizes Design work Back to CFC for polishing and cutting work

Source: Primary data