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Status of Ball Clay Mining in the Economy of Bikaner

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INTRODUCTION: The Bikaner region is well known for the production of Ball clay which is the chief raw material for the ceramic industry.The Bikaner district alone accounts for more than 90% of Rajasthan's total Ball clay production. The clay is fine grained, plastic, and free from grits, whitish grey in colour with occasional iron stains. Clay deposits are found in Khari Charnan, Guda, Kotri, Mudh, Kolayat (2 MT), Inda Ka Bala (2MT), Madhogarh (0.10MT), Nal (.46MT),Guda (2 MT).Therefore, the present work is concentrated on various economic aspects based on clay mining.

Table 1: Number of Leases of Ball Clay in Bikaner (1998-99 to 2012-13)

Year	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
	78	78	78	72	73	72	73	74	74	71	71	75	78	89	91
Total	89	89	89	89	88	83	83	85	86	85	89	92	99	111	113
%	87.64	87.64	87.64	80.90	82.95	86.75	87.95	87.06	86.05	83.53	79.78	81.52	78.79	80.18	80.53

Table 2: Mining Area of Ball Clay in Bikaner (1998-99 to 2012-13)

Year	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
	7819.4	7819.35	7819.35	6993.33	6998.33	6873.46	6392.34	5758.98	5272.41	5012.82	4947.784	4779.964	4893.944	5009.21	5303.750
Total	12613	12512.8	12474.5	12594.5	12948.2	10774.7	10108.7	10100.1	10584.5	10727.23	12306.37	12657.50	13665.73	13919.61	14227.14
%	62.00	62.49	62.68	55.53	54.05	63.79	63.24	57.02	49.81	46.73	40.21	37.76	35.81	35.99	37.28

Table 3: Production of Ball Clay in Thousand Tonnes in Bikaner (1998-99 to 2012-13)

Year	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13

	492.1	658.90	698.47	704.88	792.82	878.54	590	320	584.5	892.93	1210.5	1549.15	1845.84	2116.55	2474.18
Total	884.48	1138.26	1225.09	1542.61	1855.37	2292.26	1765.23	1537.5	2755.75	2867.24	3408.82	3947.24	5630.41	6599.87	6225.23
%	55.64	57.89	57.01	45.69	42.73	38.33	33.42	20.81	21.21	31.14	35.51	39.25	32.78	32.07	39.74

Table 4: Sale Value of Ball Clay in Lac Rupees in Bikaner (1998-99 to 2012-13)

Year	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
	885.77	1015.32	1170.84	1409.75	1585.64	178.1	1181	640	1753	4911.12	7263	3795	3618	8466	13608
Total	1460.5	1903	2158.51	2715.37	3235.18	3954.66	1954.9	3683.76	9352.38	14105.84	15097	12899	29198.71	50792	55200.35
%	60.65	53.35	54.24	51.92	49.01	4.50	60.41	17.37	18.74	34.82	48.11	29.42	12.39	16.67	24.65

Table 5:Revanue of Ball Clay in Thousand Rupees in Bikaner (1998-99 to 2012-13)

Year	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
	10515	12812.3	14326.5	16692.5	17642	17240.3	17157.8	13444.7	17562.32	22617.81	28964	41595	46146	53523	85223
Total	19416	23685	27145.6	36954.3	40493	50928.3	58248.8	64342.5	109039.4	120727.9	189052	218957	265617.1	376855	470185.4
%	54.16	54.09	52.78	45.17	43.57	33.85	29.46	20.90	16.11	18.73	15.32	19.00	17.37	14.20	18.13

Table 6:Employment in Ball Clay Mining in Bikaner (1998-99 to 2012-13)

Year	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
	504	442	370	378	380	459	250	125	250	575	575	625	625	645	650

Total	**589**	**513**	**434**	**438**	**446**	**527**	**320**	**195**	**900**	**1230**	**1350**	**1465**	**1578**	**1446**	**1253**
%	**85.57**	**86.16**	**85.25**	**86.30**	**85.20**	**87.10**	**78.13**	**64.10**	**27.78**	**46.75**	**42.59**	**42.66**	**39.61**	**44.61**	**51.88**

TIME SERIES ANALYSIS OF BALL CLAY IN BIKANER

Ball Clay has a significant position in the economy of Bikaner and has vast potential use in ceramics, cement industry, refractories, cosmetics and rubber industry. Data of last 15 years of ball clay production proves its vitality in Bikaner. The maximum clay production comes from Bikaner. From the mineral point of view Bikaner district can be called the clay district. Out of 113 major mining leases in the district,91 are for ball clay in the year 2012-13 which is 78 in the year 1998-99. The number of leases of Ball clay shows declining trend from 1998-99 to 2008-09 when the number of leases of Ball clay in Bikaner were minimum to 71and again it shows upward trend. The percentage ofleases of Ball clay is 80.53 % in the year 2012-13. (Table 1). Total mining area in 2012-13 is 5303.750 hectare, 37.28% of the total mining area of the district. The mining area of Ball clay was 7819.35 hectarein1998-99 which is 62.00% of the total mining area in Bikaner(Table 2).Which shows declining trend and in the year 2012-13 the mining area for ball clay mining is reduced to 5303.750 hectare which is only 37.28 % of the total mining area of the district. This declination in mining areas and mining leases also reflects in production too. In 1998-99, the percentage contribution of ball clay was 55.64 % (492.097 thousand tonnes) of the total major mineral production of Bikaner(Table 3). This contribution in the year 2012-13 was recorded 39.74% only. However, the sale value increased more than 10 times but the share of sale valueof ball clay declined to 24.65% which was 60.65 % in the year 1998-99. It may be because of starting of mining of lignite in the area in the year 2009-10(Table 4) and revenue increases 8 times in the last 15 years. As indicated in the sale value the percentage share of revenue from the ball clay shows declining trend. The revenue from Ball clay was contributed 54.16 % of the total revenue from the major mineral in the area was reduced to only 18.13 % of the total revenue collected from the major mineral in the year 2012-13. The main reason was the starting of the lignite mining in the district as reflected in the sale value of the ball clay(Table 5). Similarly the employment provided from the ball clay mining in the Bikaner was also shows the upward trend in the number but the share of employment provided by the ball clay in terms of percentage is show the declining trend. The percentage share of employment was 85.57% in the year 1998-99 which was reduced to 51.88 % in the year 2012-13 (Table 6)

2.8. TIME SERIES ANALYSIS OF PRODUCTION, SALE VALUE AND REVENUE OF BALL CLAY IN BIKANER

On the basis of these data regarding Ball clay of Bikaner, a Time Series Analysis related with Production(Table 3) Revenue (Table 5) and Sale value (Table 4) of ball clay) has been done.Their trend values are calculated by adopting OLS technique .The result is depicted in the following table (Table 7):

Trend equation: Y = a+bt

Where,

a = intercept

b = coefficient of trends

t = time

Significance of coefficient is indicated by 't'value as * at 5 % level.

Table 7presents the result of least square trend equations of time series data of Fifteen years regarding production, revenue and sale value of Ball clay. 't' values are marked by *, at 5% level of significance.

Table 7: Result of Time Series Analysis of Production, Revenue and Sale Value of Ball Clay in Bikaner.

Minerals	**Trend equation of Production**	**Trend equation of Revenue**	**Trend equation of Sale Value**
Ball clay	1053.9542+132.2284t	27697.5433+4292.0031t	3538.8958+713.00391t
't' value	.278	3.275*	2.014*
*, significant at 5% level of significance.			

Ball clay is the principal mineral found in Bikaner.Itshows high growth rate in production which is depicted by theirpositive value of production coefficients. Their positive sign of coefficient indicate the rising trend in their respective production.But the rise in production is not much significant. Least square trend in revenue from ball clayhas positive coefficient indicating their rising trend over the time period of 15 years which is significant in case of

ball clay. As far as sale value is concerned, there is a significant rise in sale value of Ball clay. On the basis of these estimated least square equation (Table 8) trend values are calculated of the Ball clay from Table 9 to Table 10 and their respective graphical presentation is depicted in Fig. 1 to Fig 3.

Table 8: Least Square Trend Values in Production of Ball Clay in Bikaner from 1998-99 to 2012-13 Y = 1053.9542+132.2284t

Years	Production in Thousand Tonnes	a+bt = Yc
1998-99	492.097	194.4696
1999-2000	658.899	326.698
2000-01	698.426	458.9264
2001-02	704.879	591.1548
2002-03	792.82	723.3832
2003-04	878.542	855.6116
2004-05	590	987.84
2005-06	320	1053.9542
2006-07	584.5	1120.0684
2007-08	892.93	1252.2968
2008-09	1210.5	1384.5252
2009-10	1549.15	1516.7536
2010-11	1845.84	1648.982
2011-12	2116.55	1781.2104
2012-13	2474.18	1913.4388

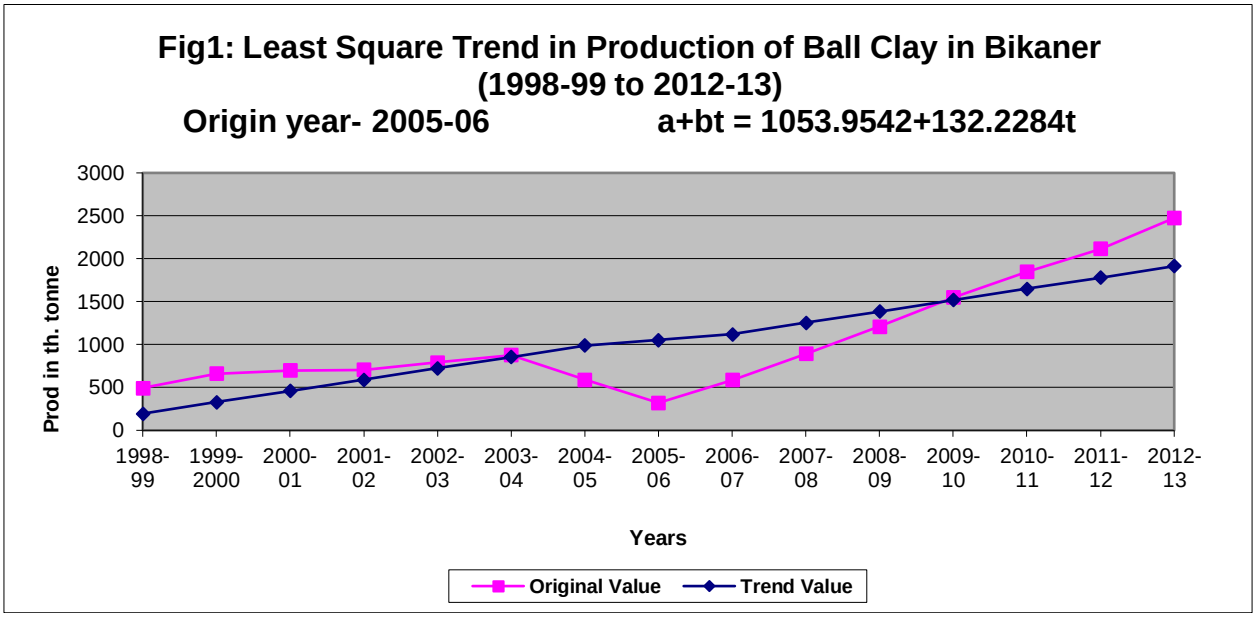

Table 9:Least Square Trend Values in Revenue of Ball Clay in Bikaner from 1998-99 to 2012-13Y = 27697.5433+4292.0031t

Years	Revenue in Lac Rs.	a+bt = Yc
1998-99	10515	-200.47682
1999-2000	12812.25	4091.52628
2000-01	14326.53	8383.52938
2001-02	16692.47	12675.53248
2002-03	17642	16967.53558
2003-04	17240.25	21259.53868
2004-05	17158.83	25551.54178

2005-06	13444.68	27697.54333
2006-07	17562.32	29843.54488
2007-08	22617.82	34135.54798
2008-09	28964	38427.55108
2009-10	41595	42719.55418
2010-11	46146	47011.55728
2011-12	53523	51303.56038
2012-13	85223	55595.56348

Fig 2:Least Square Trend in Revenue from Ball Clay in Bikaner (1998-99 to 2012-13)

Origin Year- 2005-06 a+bt = 27697.5433+4292.0031t

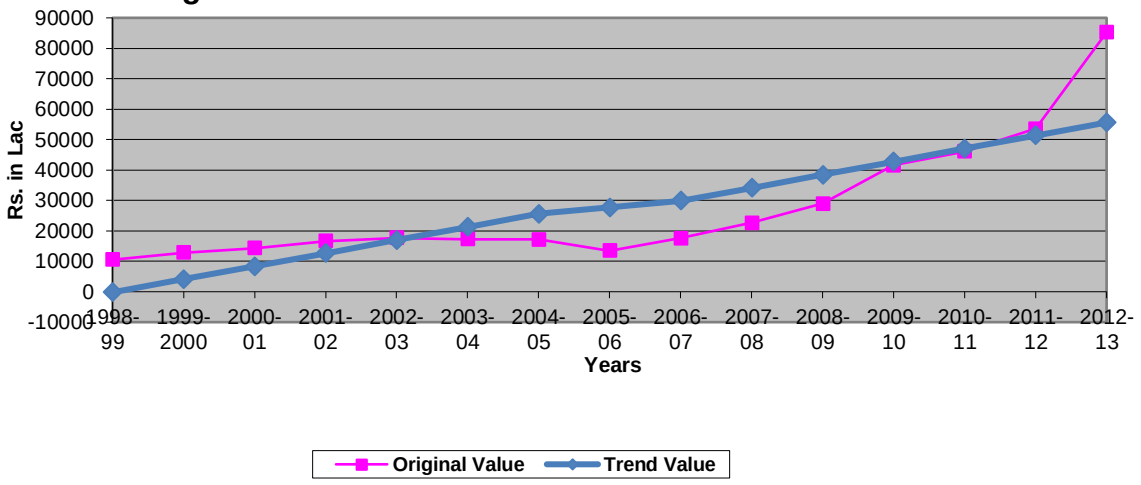

Table 10: Least Square Trend Values in Sale Value of Ball Clay in Bikaner from 1998-99 to 2012-13 Y = 3538.8958+713.00391t

Years	Sale Value	a+bt = Yc
1998-99	885.77	-1095.629615
1999-2000	1015.324	-382.625705
2000-01	1170.838	330.378205
2001-02	1409.75	1043.382115
2002-03	1585.64	1756.386025
2003-04	1781	2469.389935
2004-05	1181	3182.393845
2005-06	640	3538.8958
2006-07	1753	3895.397755
2007-08	4911.115	4608.401665
2008-09	7263	5321.405575
2009-10	3795	6034.409485
2010-11	3618	6747.413395
2011-12	8466	7460.417305
2012-13	13608	8173.421215

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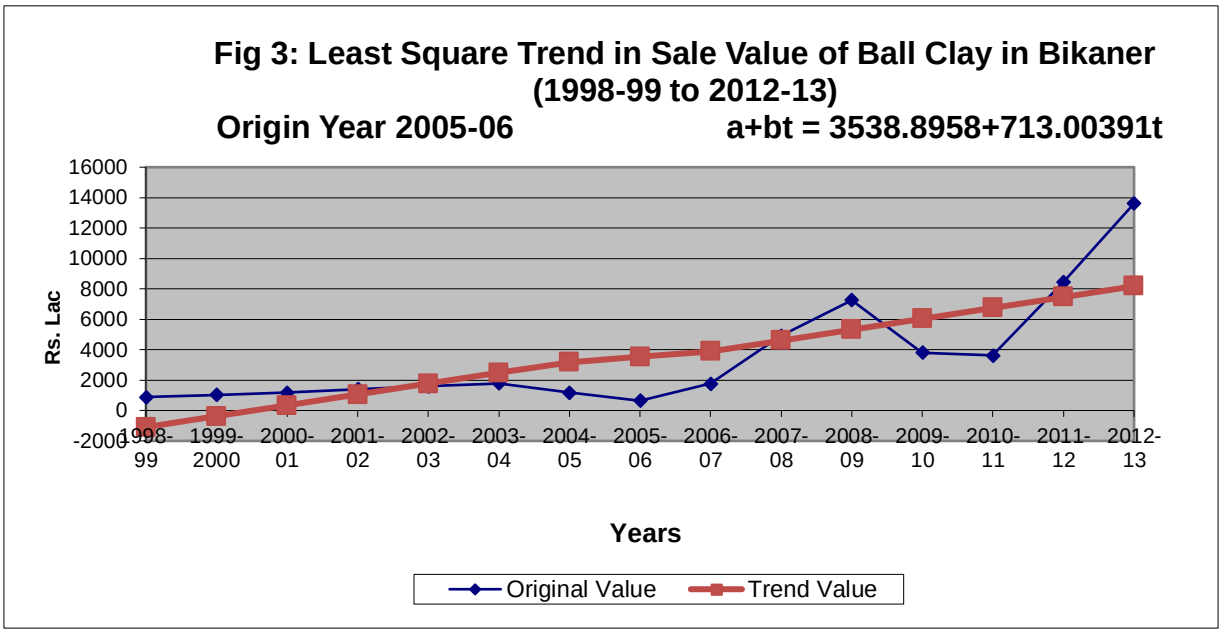


In brief the results of least square trend values reveal some important aspects regarding Ball Clay Mining in Bikaner:

- The production of ball clay is not increasing at the significant rate (Table 3) despite the maximum leases among major minerals in Bikaner (Table 1).The factors responsible for this can be highlighted as:

1. There is an unsystematic and un-organized mining of ball clay in Bikaner. With a shortage of labour availability in mining areas and upsurge trend in labour wages the mine owners are unable to coordinate the demand and supply of ball clays, secondly, the mine owners are unable to compensate this labour shortage through incorporation of automatic mining due to small mining lease area.
2. Lack of proper marketing of mining product according to the demand of buyers. Grading of clay according to its uses was not proper in Bikaner because of the lack of Ceramic testing laboratory in the years of study. Recently the ceramic testing facility has been developed in Bikaner.
3. Clay mining, although, is facing the problem of water shortage for setting up improved mining system which utilizes water (wet mining) but the other systems for automatic production in clay mining can be modified to suit the mining environment in Bikaner.
4. Lack of development of ceramic industries in Bikaner because of unavailability of power, entrepreneurship and ceramic education.
5. Along with the mechanisation and technological development for higher production in ceramic industries, the demand for ball clay with quality consistency is increasing at faster rate. But there is a dearth of testing and beneficiation facilities at mine sites which are the vital factor to sustain the demand for ball clay.
6. Local ceramic industries could not compete with Idian ceramic industries as their products were inferior in quality.

EMPLOYMENT STATUS OF BALL CLAY IN BIKANER:

Employment in Minerals has been represented in the Table 6 during the study period. (1998-99 to 2012-13).

On the basis of the data given in Table 6 of the clay found in Bikaner, Time series Analysis has been done and their trend values are calculated by Ordinary Least Square technique (OLS). The results are depicted in Table 11.

Least square equation**:** **Y = a + bt**

Where

Y = Trend value in employment of major/minor minerals.
a = intercept
b = slope of the trend line/rate of change
t = time (no. of years)

Significance of coefficient is indicated by ‘t’ value as * at 5% level.

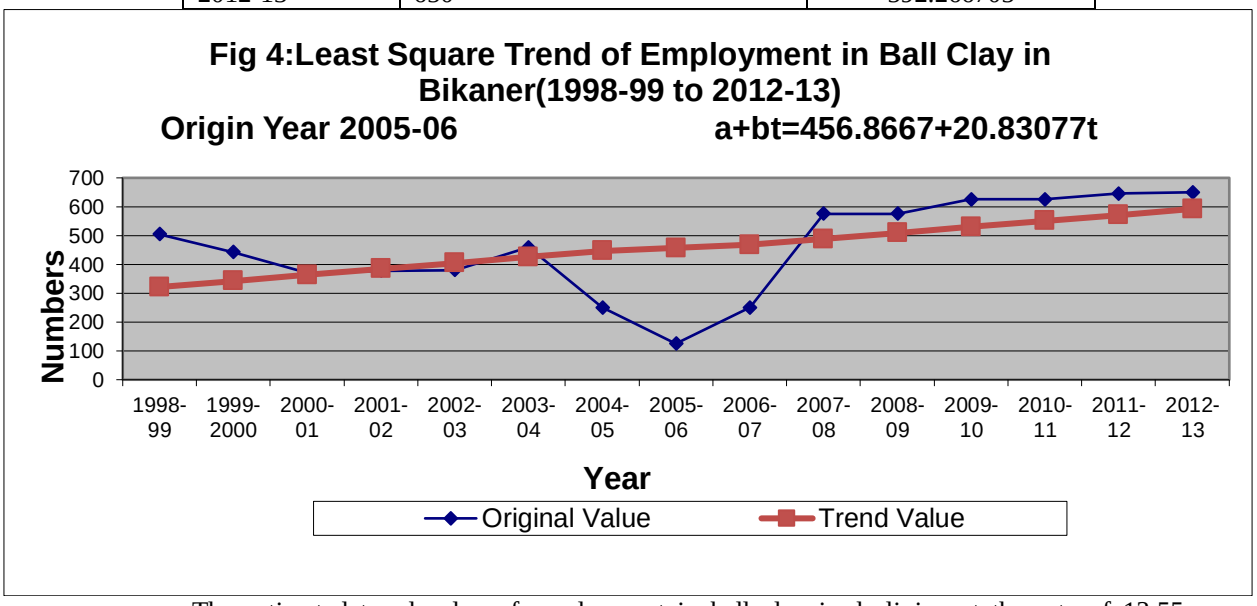
The results of Least Square Trend Equations of employment status of various minerals found in Bikaner are shown in Table 11 and ‘t’ values are marked by *, at 5% level of significance. Employment in ball clay has negative employment coefficient. So employment status is not satisfactory in mineral sector in Bikaner.

Table 11:Result of Time series Analysis of Employment status in Ball Clay in Bikaner (1998-99 to 2012-13)	
Minerals	**Least Square Trend Equations**
Ball clay 't' value	Y= **456.8667+20.83077t** -.908
*, significant at 5% level of significance	

The least square trend values are calculated in Table 12. Thesetrend values are based on the estimated equations depicted in the Table 11 and their graphical presentation are shown in Figure 4.

Table 12:Least Square Trendof Employment in Ball Clay in Bikaner(1998-99 to 2012-13) (Y= 456.8667+20.83077t)

Year	Employment	a+bt = Yc
1998-99	504	321.466695
1999-2000	442	342.297465
2000-01	370	363.128235
2001-02	378	383.959005
2002-03	380	404.789775
2003-04	459	425.620545
2004-05	250	446.451315
2005-06	125	456.8667
2006-07	250	467.282085
2007-08	575	488.112855
2008-09	575	508.943625
2009-10	625	529.774395
2010-11	625	550.605165
2011-12	645	571.435935
2012-13	650	592.266705



The estimated trend value of employment in ball clay is declining at the rate of 13.55 persons annually (Table 12 and Figure 4) despite maximum leases and vast clay deposits in the area. The factors responsible for the declining trend in employment of Ball clay are:

- Lack of value addition facility in ceramics in Bikaner.
- Lack of R&D facilities in ceramic minerals.
- Lack of skilled man power required by ceramic tile, insulators and other clay based industries.

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REFERENCES

1. Chatterjee K.K.(1991): An Introduction to Indian Mineral Economics,Prentice Hall, Kolkatta,ch.-11,pp.131.
2. DMG, Rajasthan, Mineral Statistics (2008-14).
3. Economic Review, Rajasthan (2008-14): Directorate of Economics and Statistics, Govt. of Raj. Jaipur.
4. Sinha R.K. and Sharma N.L.(1995): Mineral Economics, 4th edition, Oxford & IBH Co. Pvt. Ltd. Kolkata, pp.132.
5. Somra S.S.(2008): "Industrial development in Rajasthan: An econometric analysis." Article in Rajasthan Economic Journal, volume 32, pp.243-246.