



## TIME SERIES ANALYSIS OF AGRICULTURAL CREDIT DISBURSED TO THE FARMERS: NATIONAL STATE & DISTRICT LEVEL SCENARIO

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### Introduction

Agricultural finance generally relates to analyzing the financial aspects pertaining to farm business, which is the core sector of the country. The financial aspects include money matters relating to production of agriculture products and their disposal. The financial aspects in agriculture, embark upon capital required for agricultural production, Murray (1953) has defined agricultural finance as, “it is an economic study of borrowing funds by farmers, of the organization and operation of farm lending agencies, and of society’s interest in credit for agriculture.”

The role of farm finance in strengthening of both input and output markets in agriculture is crucial and significant. Indian agriculture is still traditional, subsistence and stagnant in nature. Agricultural finance is imperative to create the supporting infrastructure for adoption of new technology. Massive investment is inevitable to carry out major and minor irrigation projects, rural electrification and energisation, installation of fertilizers and chemical plants, execution of agricultural promotional programmes and poverty alleviation programmes in the country.

**Research Problem:** To estimate the growth rate & trend values of agricultural credit at national, state, & district level.

### Objectives

1. To Examine Credit requirement of the farmers at the national, state and district level.
2. To analyse the pattern of utilization of agricultural finances provided by the institutional agencies at district level.

### Methodology

Least square estimates/exponential trend method/log linear method has been applied for estimation of growth rate of agricultural credit, growth rate of yield rate of paddy at national, state and district level. Besides, Karl Pearson's correlation coefficient has been computed to find out the degree of correlation between per acre agriculture loan disbursed to the farmers and per acre yield rate of paddy in the district of Mayurbhanj.

### Plan of the Study

The entire study has been schematized into five sections. Section I. deals with introduction, Research problem, Objective, methodology, and plan of the study. Section II. Incorporates time series analysis of supply of farm credit and yield rate of principal crop. Section three incorporates the correlation analysis of Loan per Acre and yield rate. Section IV deals with pattern of loan utilization in the district of Mayurbhanj. Section V enumerates major findings, conclusions and recommendations.



**Section II**

**Table: 1 Flow of credit to the Agriculture Sector in India.**

Year	Agricultural credit Disbursement (Y), (Rs.Crore)
2002-2003	69560
2003-2004	86981
2004-2005	125309
2005-2006	180486
2006-2007	229400
2007-2008	254658
2008-2009	301908
2009-2010	384514
2010-2011	446779
2011-2012	262129
2012-2013	607376
2013-2014	702541
2014-2015	743577
2015-2016	902331
2016-2017	946850
2017-2018	961076
2018-2019	985678

Source: kurukshetra Vol.63 November 2014, Economic Survey, Gol, various issues

**Table:2: Application of Time Series Least Square Method For Estimation of Trend Values of Agricultural Credit**

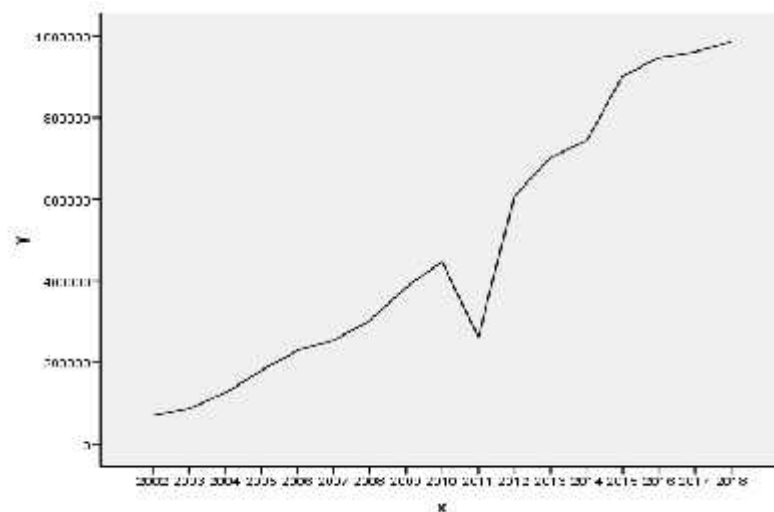
Year	Mid-point(X)	X=t-2010.5	X <sup>2</sup>	Agricultural credit Disbursement for Paddy(Y) (Rs.Crore)	Log y	XlogY	Y <sub>c</sub>
2002-2003	2002.5	-8	64	69,560	4.8423	-38.7384	9685
2003-2004	2003.5	-7	49	86,981	4.9394	-34.5758	1141
2004-2005	2004.5	-6	36	1,25,309	5.0979	-30.5874	1345
2005-2006	2005.5	-5	25	1,80,486	5.2564	-26.282	1584
2006-2007	2006.5	-4	16	2,29,400	5.3605	-21.442	1866
2007-2008	2007.5	-3	9	2,54,658	5.4059	-16.2177	2199
2008-2009	2008.5	-2	4	3,01,908	5.5849	-10.9596	2590
2009-2010	2009.5	-1	1	3,84,514	5.6500	-5.5849	3052
2010-2011	2010.5	0	0	4,46,779	5.6621	0000	3595
2011-2012	2011.5	1	1	2,62,129	5.4185	5.4185	3364
2012-2013	2012.5	2	4	6,07,376	5.7834	11.5668	4994
2013-2014	2013.5	3	9	7,02,541	5.8466	17.5398	5879
2014-2015	2014.5	4	16	7,43,577	5.8713	23.4852	6926
2015-2016	2015.5	5	25	9,02,331	5.9553	29.7765	8160
2016-2017	2016.5	6	36	9,46,850	5.9762	35.8572	9614
2017-2018	2017.5	7	49	9,61,076	5.9827	41.8789	1123
2018-2019	2018.5	8	64	9,85,678	5.9937	47.9496	1335
			$\Sigma X^2=408$		$\Sigma \log Y=94.448$	$\Sigma X \log Y=29.0847$	

a= 359500, b=1.176

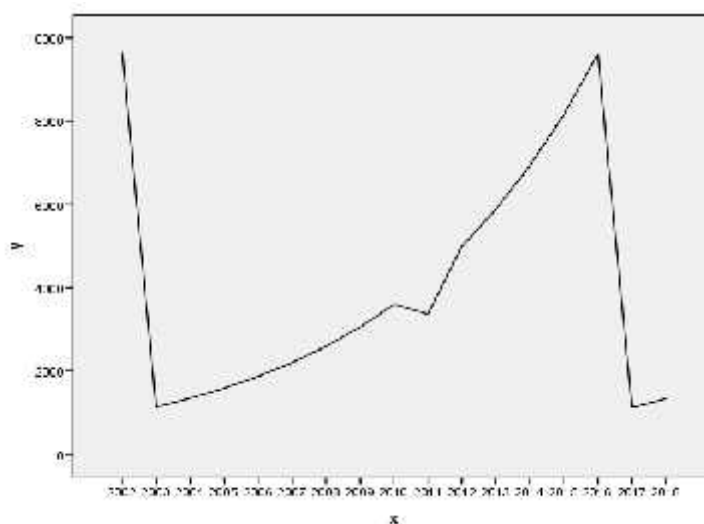


**Graph of Actual Data on Agricultural credit at national Level**

**Trend line:-**



**Graph of Trend values of Agricultural credit at National level**



**Table: 3 Flow of Agricultural credit to the Agricultural Sector in Odisha**

Year	Agricultural credit Disbursement for Paddy (Y) (Rs.Crore)
2002-2003	8925.00
2003-2004	1112.00
2004-2005	1386.00
2005-2006	1726.00
2006-2007	2151.00
2007-2008	2680.00
2008-2009	3339.00
2009-2010	4150.00
2010-2011	5572.00
2011-2012	8520.00



2012-2013	8457.00
2013-2014	12582.00
2014-2015	12866.00
2015-2016	15869.00
2016-2017	15534.2
2017-2018	16529.8
2018-2019	21780.00

Source: Directorate of Agriculture and food Production, Odisha and Economic Survey, Govt. of Odisha various issues.

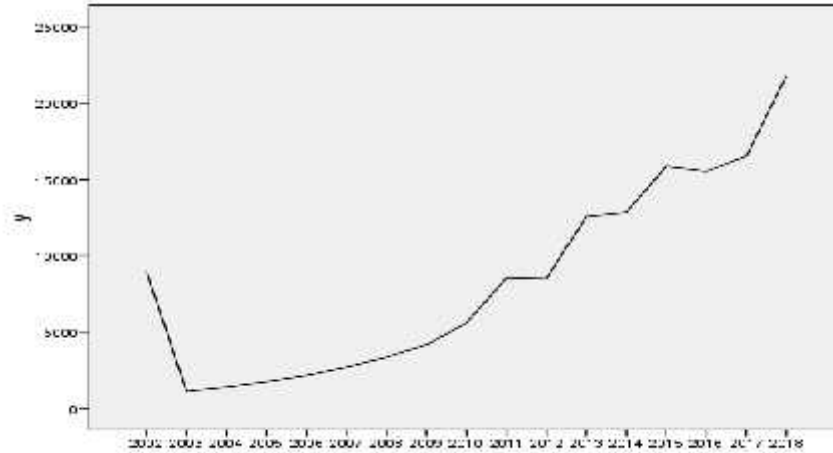
**Table : 4:Application of time series least square method to estimate Trend values of agricultural credit in Odisha**

Year	Mid-Point (X)	X=t - 2010.5	X <sup>2</sup>	Agricultural credit Disbursement for Paddy (Y) (Rs.Crore)	Log Y	Xlog Y	Y <sub>c</sub>
2002-2003	2002.5	-8	64	8925.00	3.9506	-31.6048	1117
2003-2004	2003.5	-7	49	1112.00	3.0461	-21.3227	1397
2004-2005	2004.5	-6	36	1386.00	3.1417	-18.8502	1748
2005-2006	2005.5	-5	25	1726.00	3.2370	-16.185	2186
2006-2007	2006.5	-4	16	2151.00	3.3326	-13.3304	2735
2007-2008	2007.5	-3	9	2680.00	3.4281	-10.2843	3421
2008-2009	2008.5	-2	4	3339.00	3.5236	-7.0472	4279
2009-2010	2009.5	-1	1	4150.00	3.6180	-3.6180	5352
2010-2011	2010.5	0	0	5572.00	3.7460	0000	6694
2011-2012	2011.5	1	1	8520.00	3.9304	3.9304	8431
2012-2013	2012.5	2	4	8457.00	3.9272	7.8544	1047
2013-2014	2013.5	3	9	12582.00	4.0997	12.2991	1310
2014-2015	2014.5	4	16	12866.00	4.1094	16.4376	1639
2015-2016	2015.5	5	25	15869.00	4.2005	21.0025	2049
2016-2017	2016.5	6	36	15534.2	4.1912	25.1472	2564
2017-2018	2017.5	7	49	16529.8	4.2182	29.5274	3707
2018-19	2018.5	8	64	21780	5.3380	42.704	4012
			$\sum X^2$ =408		$\sum \log Y$ = 65.0383	$\sum X \log Y$ =3 9.66	

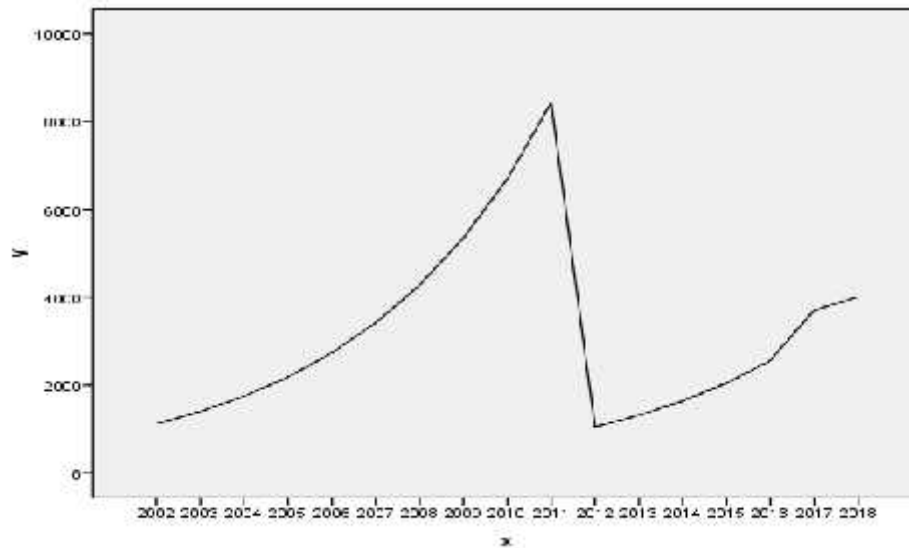
a=124900,b=1.246



**Graph of Actual Data on Agriculture credit in Odisha  
 Trend line**



**Graph of Trend values on Agricultural credit in Odisha**



**Table : 4: Farm Credit of Mayurbhanj District**

Year	Agricultural credit Disbursement for Paddy (Y) (Rs.Crore)
2002-2003	279700
2003-2004	295300
2004-2005	311900
2005-2006	329400
2006-2007	347800
2007-2008	367400
2008-2009	388000
2009-2010	409800
2010-2011	432700
2011-2012	456900
2012-2013	482600
2013-2014	6560121
2014-2015	8875869
2015-2016	2805804



2016-2017	5974804
2017-2018	6084454
2018-2019	669500

Source: Lead Bank,BOI statistics, Mayurbhanj.  
 Growth rate of Yield rate of Paddy at National Level

**Table : 5: Application of Time Series least square method to estimate Trend values of Agricultural credit in the district of Mayurbhanj**

Year	Med point	X=t-2010.5	X <sup>2</sup>	Agricultural credit Disbursement for Paddy (Y) (Rs.Crore)	Log Y	X logY	Y <sub>c</sub>
2002-2003	2002.5	-8	64	279700	5.4466	-43.5725	151200
2003-2004	2003.5	-7	49	295300	5.4702	-38.2914	191800
2004-2005	2004.5	-6	36	311900	5.4940	-32.964	243400
2005-2006	2005.5	-5	25	329400	5.5177	-27.5885	308800
2006-2007	2006.5	-4	16	347800	5.5413	-22.1652	391800
2007-2008	2007.5	-3	9	367400	5.5651	-16.6953	497200
2008-2009	2008.5	-2	4	388000	5.5888	-11.1776	630800
2009-2010	2009.5	-1	1	409800	5.6125	-5.6125	800400
2010-2011	2010.5	0	0	432700	5.6361	0000	101600
2011-2012	2011.5	1	1	456900	5.6598	5.6598	128800
2012-2013	2012.5	2	4	482600	5.6835	11.367	163500
2013-2014	2013.5	3	9	6560121	6.8169	20.4507	207400
2014-2015	2014.5	4	16	8875869	6.9482	27.7925	263200
2015-2016	2015.5	5	25	2805804	6.4480	32.24	333900
2016-2017	2016.5	6	36	5974804	6.7763	40.6578	423700
2017-2018	2017.5	7	49	6084454	6.7842	47.4894	537600
2018-19	2018.5	8	64	669500	6.8257	54.6056	682200
			$\Sigma X^2=$ 408		$\Sigma \log y=$ 102.1141	$\Sigma X \log y=$ 42.1955	

a=1016,b=1.269

Source: Economic Survey GOI,2004-05,07-08,08-09,11-12,14-15,16-17,18-19

**Table :6 : Estimation of Trend Values of Yield Rate of Paddy In India**

Year	Mid point(X)	X=t-2010.5	X <sup>2</sup>	Yield Rate Rate of Paddy(Y)	Log Y	X logY	Y <sub>c</sub>
2002-2003	2002.5	-8	64	17.44	1.2415	-9.932	193100
2003-2004	2003.5	-7	49	20.77	1.3174	-9.2218	196900
2004-2005	2004.5	-6	36	19.84	1.2975	-7.785	200700
2005-2006	2005.5	-5	25	21.02	1.3226	-6.613	204700
2006-2007	2006.5	-4	16	21.31	1.3285	-5.314	208700
2007-2008	2007.5	-3	9	22.02	1.3428	-4.0284	212900
2008-2009	2008.5	-2	4	21.86	1.3396	-2.6792	217100
2009-2010	2009.5	-1	1	21.30	1.3283	-1.3283	221400

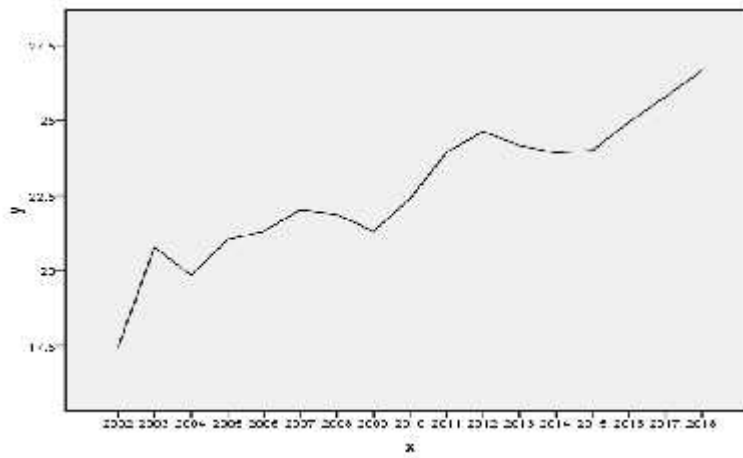


2010-2011	2010.5	0	0	22.39	1.3500	00000	225800
2011-2012	2011.5	1	1	23.93	1.3789	1.3789	230200
2012-2013	2012.5	2	4	24.62	1.3912	2.7824	234800
2013-2014	2013.5	3	9	24.16	1.3830	4.149	239400
2014-2015	2014.5	4	16	23.91	1.3785	5.514	244200
2015-2016	2015.5	5	25	24.00	1.3802	6.901	249000
2016-2017	2016.5	6	36	24.94	1.3968	8.3808	253900
2017-2018	2017.5	7	49	25.78	1.4112	9.8784	258900
2018-2019	2018.5	8	64	26.65	1.4256	11.4055	264000
			$\Sigma X^2=408$		$\Sigma \log y=23.0136$	$\Sigma X \log y=3.49$	

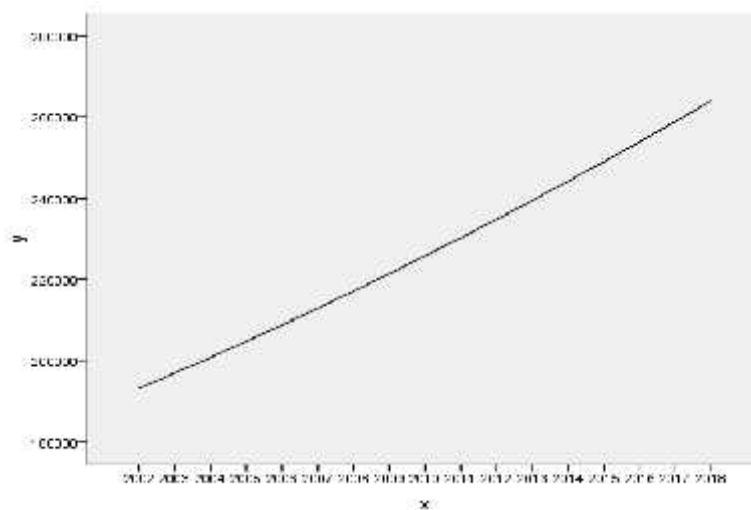
a=2561,b=1.020

Source: Economic survey,GOI,2004-05,07-08,08-09,11-12,14-15,16-17,18-19

**Graph of Actual Data on yield rate of paddy in India**  
**Actual Data**



**Trend Line**  
**Graph of Trend values on yield rate of paddy in India**





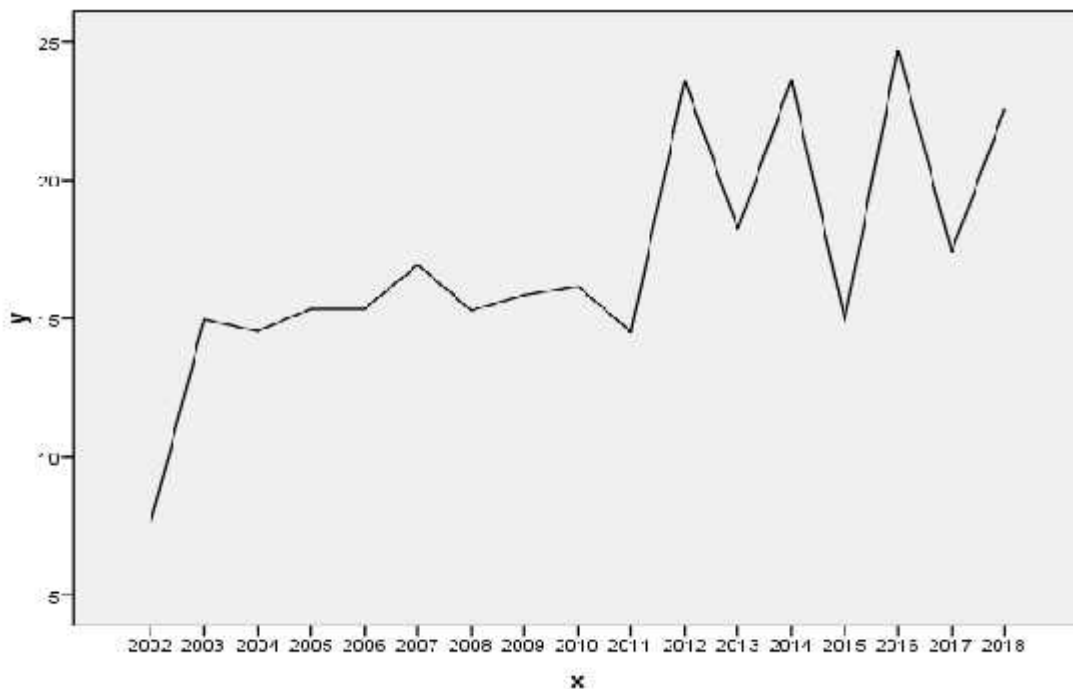
**Table :7: Growth Rate of Yield Rate of Paddy At State Level.**

Year	Mid point(X)	X=t-2010.5	X <sup>2</sup>	Yield Rate of Paddy(Y)	Log Y	X logY	Y <sub>c</sub>
2002-2003	2002.5	-8	64	7.59	0.8802	-7.0416	125000
2003-2004	2003.5	-7	49	14.96	1.1749	-8.2243	127200
2004-2005	2004.5	-6	36	14.55	1.1628	-6.9768	132100
2005-2006	2005.5	-5	25	15.34	1.1858	-5.929	137200
2006-2007	2006.5	-4	16	15.34	1.1858	-4.7432	142500
2007-2008	2007.5	-3	9	16.94	1.2289	-3.6867	148000
2008-2009	2008.5	-2	4	15.29	1.1844	-2.3688	153800
2009-2010	2009.5	-1	1	15.85	1.2000	-1.2000	159700
2010-2011	2010.5	0	0	16.16	1.2084	00000	165900
2011-2012	2011.5	1	1	14.50	1.1613	1.1613	172400
2012-2013	2012.5	2	4	23.61	1.3730	2.746	179100
2013-2014	2013.5	3	9	18.21	1.2603	3.7809	186000
2014-2015	2014.5	4	16	23.63	1.3734	5.4936	193200
2015-2016	1015.5	5	25	14.91	1.1734	5.867	200600
2016-2017	2016.5	6	36	24.72	1.3930	8.358	208400
2017-2018	2017.5	7	49	17.39	1.2402	8.6814	216500
2018-2019	2018.5	8	64	22.58	1.3537	10.8296	220300
			ΣX <sup>2</sup> =408		Σlog y=20.7395	ΣXlog y=6.7474	

a=1659,b=1.039

Source: Economic Survey, Govt of Odisha, 2004-05, 2006-07, 2007-08, 09-10, 11-12, 14-15, 17-18, 18-19

**Graph of Actual Data on yield rate of paddy in Odisha**

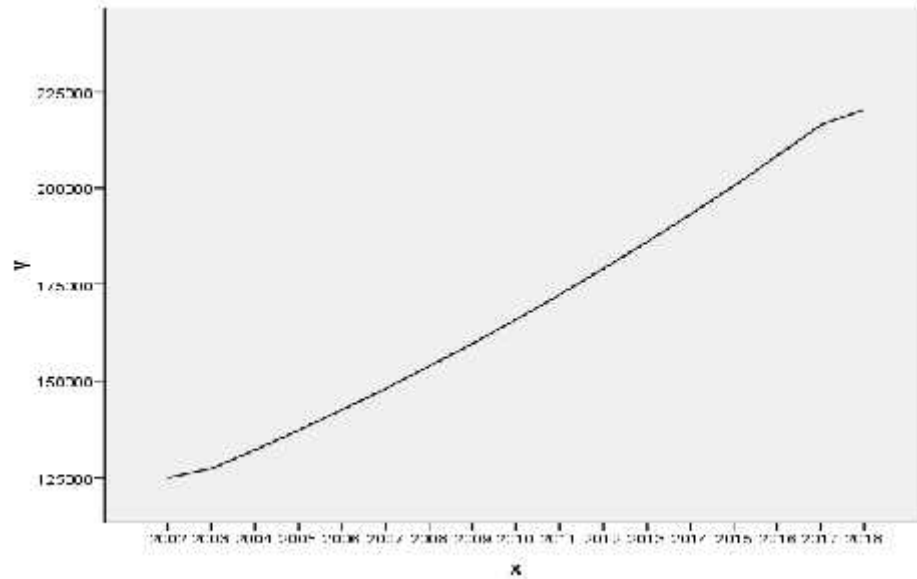


**Graph of**





**Trend values of yield rate of paddy in Odisha**



**Table : 8: Growth Rate of Yield Rate of Paddy In The District of Mayurbhanj.**

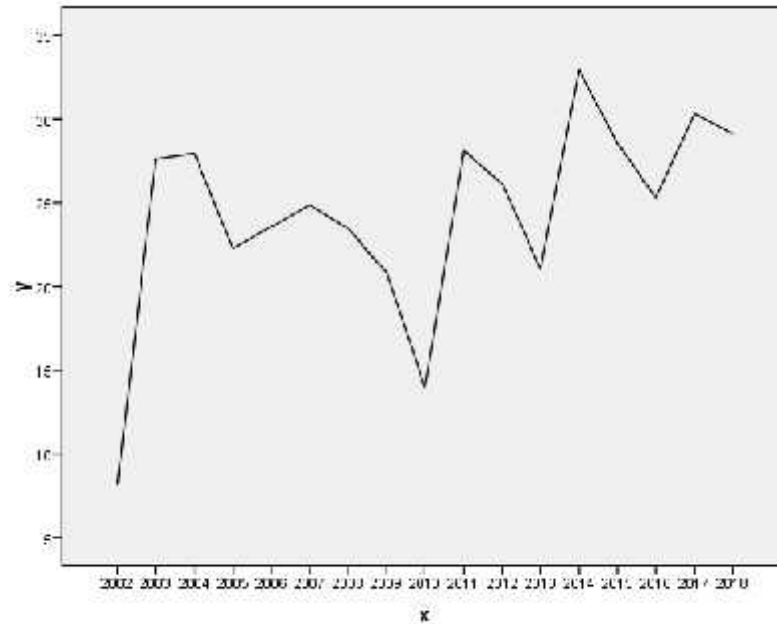
Year	Mid point(X)	X=t-2010.5	X <sup>2</sup>	Yield Rate of Paddy (Y)	Log Y	X logY	Y <sub>c</sub>
2002-2003	2002.5	-8	64	8.14	0.9106	-7.2848	181200
2003-2004	2003.5	-7	49	27.60	1.4409	-10.0863	187500
2004-2005	2004.5	-6	36	27.95	1.4463	-8.6778	193400
2005-2006	2005.5	-5	25	22.28	1.3479	-6.7395	199500
2006-2007	2006.5	-4	16	23.57	1.3723	-5.4892	205900
2007-2008	2007.5	-3	9	24.88	1.3958	-4.1874	212400
2008-2009	2008.5	-2	4	23.46	1.3703	-2.7406	219300
2009-2010	2009.5	-1	1	20.83	1.3186	-1.3186	226200
2010-2011	2010.5	0	0	13.92	1.1436	00000	233400
2011-2012	2011.5	1	1	28.12	1.4490	1.4490	240800
2012-2013	2012.5	2	4	26.15	1.4174	2.8384	248500
2013-2014	2013.5	3	9	21.06	1.3234	3.9702	256400
2014-2015	2014.5	4	16	32.96	1.5179	6.0716	264500
2015-2016	2015.5	5	25	28.55	1.4556	7.278	273000
2016-2017	2016.5	6	36	25.30	1.4031	8.4186	281600
2017-2018	2017.5	7	49	30.33	1.4818	10.3726	290600
2018-2019	2018.5	8	64	29.12	1.4641	11.7128	299800
			ΣX <sup>2</sup> = 408		Σlogy= 23.2586	ΣXlog y=5.587	

a=2334,b=1.031 ,

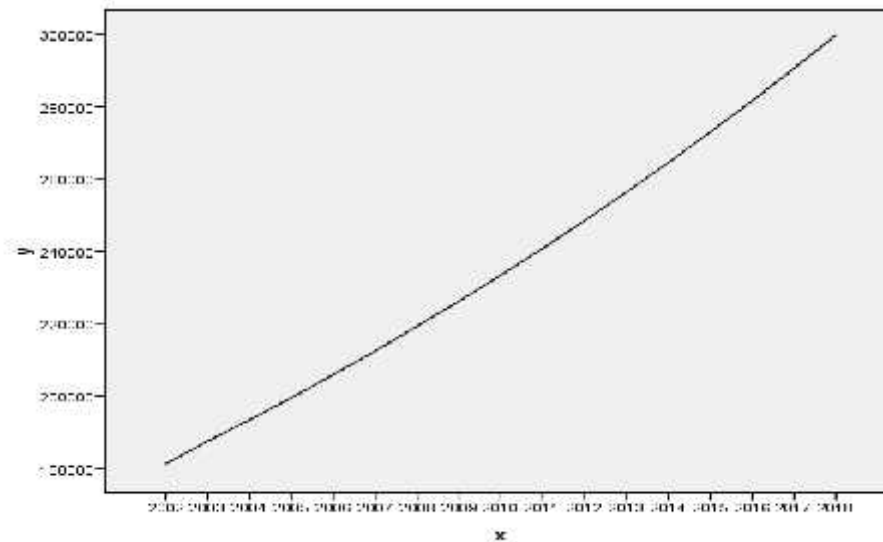
Source: Economic Survey GOI 2004-05,2006-07,2007-08,09-10,11-12,14-15,16-17,18-19



**Graph of Actual Data on yield rate of paddy in Mayurbahnj**



**Graph of Trend values of yield rate of paddy in Mayurbahnj**



**Table : 9 Correlation Analysis of per Acre Loan and yield rate of paddy per Acre in Mayurbahnj**

Years	Loan per Acre	Yield Rateper Acre
2009	7660	10.5
2010	8500	7
2011	8625	14
2012	9702	13
2013	9875	10.5
2014	10375	16.5



2015	12815	18
2016	12815	21
2017	12970	24
2018	13670	27.5
2019	13670	32

Source: Economic Survey, Govt. of Odisha 2009-10,11-12,14-15,16-17,18-19

Correlations			
		x	y
x	Pearson Correlation	1	.896**
	Sig. (2-tailed)		.000
	N	11	11
y	Pearson Correlation	.896**	1
	Sig. (2-tailed)	.000	
	N	11	11

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Authors own Estimation

### Pattern of Utilization

Loan utilization pattern is not so bad in case of Mayurbhanj district. According to lead bank data 5% people are utilize the finance fund for meeting their daily needs. 7% people are utilize the agriculture finance for purchasing durable consumer goods.6% people are use the finance for marriage and other convention means. Total 18% people misutilise there finance .82% people are properly utilize their finance. Due to high communication and weather forecasting system & implementation of modern agricultural technique return in agriculture production increase day by day. So number of defaulters are reduced. Amount of NPAs are also decreased. Due to high agricultural production and minimum support price willful defaulters are also decreasing day by day.

### Major Findings/Observations

1. Regression Coefficient of Agricultural credit disbursed to Agriculture Sector in india has been estimated at 1.176 i.e growth rate of 17.6% over the period of 2002-03 to 2018-19.
2. Regression Coefficient of Agricultural credit disbursed to Agriculture Sector in Odisha has been estimated at 1.246 i.e. growth rate of 24.6% over the period 2002-03 to 2018-19.
3. Regression Coefficient of Agricultural credit disbursed to Agriculturist in the district of Mayurbahnj has been estimated at 1.269 i.e. growth rate of 26.9% over the period 2002-03 to 2018-19.
4. Regression Coefficient of yield rate of paddy in India has been estimated at 1.020 i.e. growth rate of 2.0% over the corresponding period .
5. Regression Coefficient of yield rate of paddy in Odisha has been estimated at 1.039 i.e growth rate of 3.9% over the corresponding period .
6. Regression Coefficient of yield rate of paddy in Mayurbahnj has been estimated at 1.031 i.e growth rate of 3.1% over the corresponding period .



7. Karl Pearson's correlation coefficient between Agricultural credit per Acre in and yield rate of paddy per Acre in the district of Mayurbhanj has been estimated at 0.896 which is proved to be significant at 1% level of significance.

### Conclusion

Despite Institutional Finance purveyed to the farmers by the Nationalized Banks and Regional Rural Banks through refinance facilities by NABARD, yield rate of paddy has not been perceptible and repaying capacity of small and marginal farmers has not been satisfactory. Agricultural income of the farmers has not supported the repaying capacity due to low minimum support price (MSP) and distress sale of paddy attributed to the apathetic attitude of Govt. Authority incharge of procurement of paddy. Besides loan overdues on the borrowers can be attributed to frequent crop failures due to vagaries of monsoon and natural disasters, unproductive utilization of loan amount and priority assigned to repayment of loan borrowed from indigenous Bankers. Repayment of loan can be improved subject to persistent monitoring by bank loan officers just after the harvest session and follow up action against the willful defaulters.

### Suggestions

1. Loan disbursement, seed and fertilizers to farmers should be released in the nick of time for augmentation of agricultural productivity
2. Farmers have to utilize the loan amount for productive purposes to enhance Agricultural yield rate
3. Procedure of loan disbursement have to be simplified and accessible to the farmers
4. Strict follow up actions have to be imposed against willful defaulters for expediting loan recovery.
5. Stringent legal action has to be imposed against chronic defaulters such as auction of land holdings of borrowers.

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