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STUDY ON RICE PRODUCTION IN ASSAM, INDIA: A RETROSPECTIVE STUDY

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Abstract

Rice is most important crop of North-East India and all over India. It is the Main food for most of the people of the country. In Assam, Rice productivity is medium-low to very low, therefore, average produce of rice is very poor. At present, about two-third of the rice occupies total cropped area in the state of Assam. Being the single vital source of agricultural GOP (Gross Operating Profit), rice plays an important role in the state economy. Further, its importance basket (the average monthly consumption per capita is about 13 kg) and also speaks volumes on the rice aim of the state of Assam. Especially is that rice orientation of the state. This paper attempt estimates the trend values for the production of Rice in Assam for period 1995 to 2015. A time series analysis has been made to estimate the trend values for the production of Rice for the period of 1995 to 2015, Assam, India. The data have been collected from Dhemaji District of Assam (India) with personal investigation. The natures of the data are secondary.
Keywords: Agriculture; Dhemaji; Least Square; Moving Average; Parabola, Rice and Trend.

1.Introduction

Agricultural Technology Management Agency (ATMA) was the first institutional operation in the form at the district level pilot tested under the innovations in Technology dissemination (IID) component of the National Agricultural technology project (NATP) in 28 Districts of 7 states from 1990 to 2015 based on its outcome.

1.1 Rice production Assam

Rice is traditionally growth through the year viz. summer, autumn and winter seasons, with winter (kharif) rice as the main crop. Though Assam produced about 3.5 million tons of rice in 1997-98 the state is difficient to the tune of a million tonnes making state a net importer of rice[1].

Aim of the Field work

The study of almost all branches of science remains incomplete without any practical knowledge. By means of field work we will be able to utilize our theoretical knowledge in practical life. Thus field works makes give trust to take any in independent study and our mind research align in our future career. The experiment depend much more the representation of data collected for a particular experiment so we have to look for the data which are the most appropriate and satisfactory for the particular experiment. And this the main criteria of field work. In field work several factors are to be taken into account which is in some way or other

may affect the study. Only by choosing some of the necessary information one cannot arrive at a correct result other one will arrive at an erroneous and absurd result so without practical experience of collection of data in the field complete knowledge in statistics can be claimed. The field works that which gives the student a chance to train up and to any carryout any work of statistical nature independently so that he would be able to solve statistical problems in the future[2-4].

1.2 Specific Objectives

The following are the objectives of time series analysis:

(1) To study the part behavior of the series, past experience is guides in future, time series analysis only bring to light the salient feature of this part experience.

(2) To study the trend values for the production of Rice in Assam for the period 1995 to 2015.

2. Materials and Methods

Research method is a way to systematically solve a research problem research as an art of scientific examination research comprises defining and redefining problems, formulae, organizing and evaluation data, making deduction and reach and reaching conclusions.

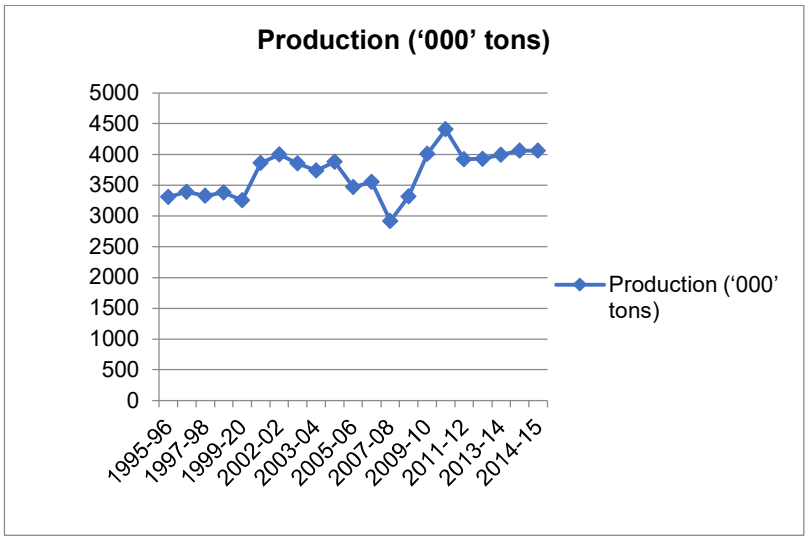
The raw data on the field work is enclosed here with "office of the Extension coordinator Agriculture Technology Management Agency", Dhemaji, Assam.

Table 1: Copy of the raw data collected

Year	Production ('000' tons)
1995-96	3309.1
1996-97	3390.0
1997-98	3328.2
1998-99	3382.9
1999-20	3254.8
2000-01	3860.7
2002-02	3998.4
2002-03	3854.0
2003-04	3738.0
2004-05	3880.0
2005-06	3470.0
2006-07	3552.0

2007-08	2916.0
2008-09	3319.0
2009-10	4008.0
2010-11	4408.0
2011-12	3920.2
2012-13	3927.2
2013-14	3992.7
2014-15	4061.1

Graph-1



2.1 Statistical Model

Time series is an arrangement of the statistical data in sequential order. In other words a set of data depending on the time is called a 'time series'[5-6].

Mathematically, a time series is defined as the values u_1, u_2,…,u_n of a variable U (Temperature ,rainfall, population etc) at time t_1, t_2,...,t_n this is a function of t symbolized by u=f(t)

So, the series of values of a variable at difference points of time can be termed at of time series and is given as

$$t: t_1,t_2,\ldots, t_n$$
$$U: u_1, u_2,\ldots, u_n$$

Thus, a time series invariably gives a bivariate distribution, one of the two being time (t) and the other being the value (U_t) of the phenomenon at different points of time. The value of t may be given hourly, daily, weekly, monthly, yearly, usually but not always at equal intervals at time[7-11].

2.2 Analysis of the data

Calculation of Trend by Moving Average

Table 2: computation of 5 yearly moving averages

Year	Production ('000' tons)	5 yearly moving total	5 yearly moving average
1995-96	3309.1		
1996-97	3390.0		
1997-98	3328.2	16665.0	3333.0
1998-99	3382.9	17216.6	3443.32
1999-20	3254.8	17825.0	3565
2000-01	3860.7	18350.8	3670.16
2001-02	3998.4	18705.9	3741.18
2002-03	3854.0	19331.1	3866.22
2003-04	3738.0	18947.1	3789.42
2004-05	3880.0	18500.7	3700.14
2005-06	3470.0	17562.7	3512.54
2006-07	3552.0	17143.7	3428.74
2007-08	2916.0	17271.7	3454.34
2008-09	3319.0	18127.7	3625.54
2009-10	4008.0	19131.9	3826.38
2010-11	4408.0	19740.1	3948.02
2011-12	3920.2	19724.8	3944.96
2012-13	3927.2	19377.9	3875.58
2013-14	3992.7		
2014-15	4061.1		

Method of least squares

Model

$Y_t = ab^t$ …… (i)

Taking logarithm of both side of (i), we have

$LogY_t = loga + t\ logb$

⇨ $Y = A + Bt + E$…… (ii)

The normal equation are-

⇨ $NA + B\Sigma = \Sigma Y$ …… (iii)

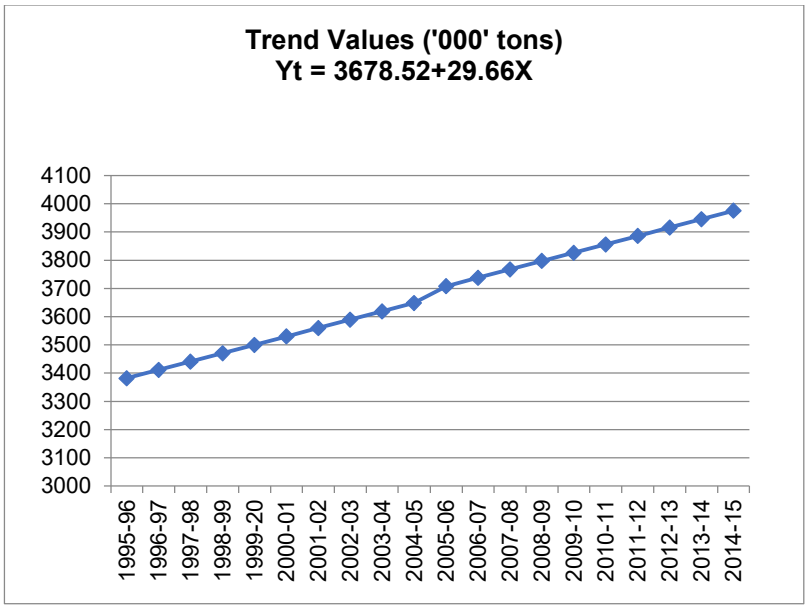
⇨ $A\Sigma t + B\Sigma t^2 = \Sigma tY_1$ …… (iv)

Table 3: Method of Least Squares

Year X	Production total in ('000' tons) Y_t	X= t-2005	XY_t	X^2	Trend values ('000' tons) Y_t= 3678.52+29.66X
1995-96	3309.1	-10	-33091	100	3381.92
1996-97	3390.0	-9	-30510	81	3411.58
1997-98	3328.2	-8	-26625.6	64	3441.24
1998-99	3382.9	-7	-23680.3	49	3470.9
1999-20	3254.8	-6	-19528.8	36	3500.56
2000-01	3860.7	-5	-19303.5	25	3530.22
2001-02	3998.4	-4	-15993.6	16	3559.88
2002-03	3854.0	-3	-11562.0	9	3589.54
2003-04	3738.0	-2	-7476.0	4	3619.2
2004-05	3880.0	-1	-3880.0	1	3648.86
2005-06	3470.0	1	3470.0	1	3708.18
2006-07	3552.0	2	7104.0	4	3737.84
2007-08	2916.0	3	8748.0	9	3767.5
2008-09	3319.0	4	13276	16	3797.16
2009-10	4008.0	5	20040	25	3826.82
2010-11	4408.0	6	26448	36	3856.48

2011-12	3920.2	7	27441.4	49	3886.14
2012-13	3927.2	8	31417.6	64	3915.8
2013-14	3992.7	9	35934.3	81	3945.46
2014-15	4061.1	10	40611.0	100	3975.12
	ΣY_t=73570.3	ΣX=0	ΣXY_t=22839.5	ΣX^2=770	

Graph-2



Let the trend equation between Y_t and x be

$Y_t = a + bx$, $x = (t - 2005)$ …… (v)

Since $\Sigma X = 0$, the normal equation for estimation a and b are

$a = \frac{\Sigma Y_t}{n} = \frac{73570.3}{20} = 3678.52$

$b = \frac{\Sigma XY_t}{\Sigma X^2} = \frac{22839.5}{770} = 29.66$

Hence the least square trend line be comes

$Y_t = 3678.52 + 29.66X$ …… (vi)

Where b = 29.66 unit represent yearly increase in the production.

The trend vales of the year 1995-2015 can now be obtained from (vi) on putting it x = 10, -9, …,9, 10 respectively, as show in the column at the above table.

Estimate for 2011: when t = 2016, we get from x = (t – 2005), we get

X = (2016 – 2005) = 11

Hence the predicted production for 2016

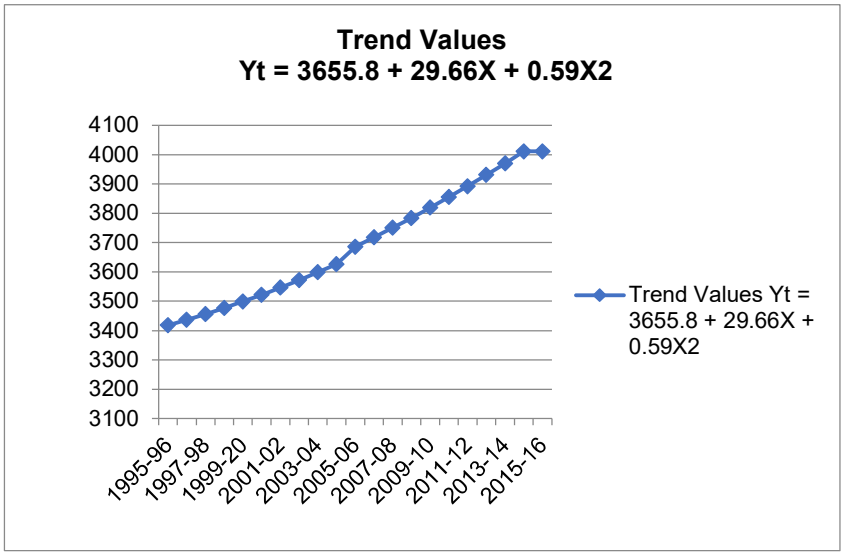
$Y_t = 3678.52 + 29.66 \times 11 = 4004.78$ (‘000’ tones)

Table 4: Fitting of Second Degree parabola

Year(t)	Production ('000' tones) Y_t	X= t - 2005	X^2	X^3	X^4	XY	X^2Y	Trend values $Y_t = 3655.8 + 29.66X + (0.59X^2)$
1995-96	3309.1	-10	100	-1000	10000	-33091	330910	3418.2
1996-97	3390.0	-9	81	-729	6561	-30510	274590	3436.65
1997-98	3328.2	-8	64	-512	4096	-26625.6	213004.8	3456.28
1998-99	3382.9	-7	49	-273	1911	-23680.3	165762.1	3477.09
1999-20	3254.8	-6	36	-216	1296	-19528.8	117172.8	3499.08
2000-01	3860.7	-5	25	-125	625	-19303.5	96517.5	3522.25
2001-02	3998.4	-4	16	-64	256	-15993.6	63974.4	3546.6
2002-03	3854.0	-3	9	-27	81	-11562	34686	3572.13
2003-04	3738.0	-2	4	-8	16	-7476	14952	3598.84
2004-05	3880.0	-1	1	-1	1	-3880.0	3880	3626.73
2005-06	3470.0	1	1	1	1	3470.0	3470	3686.05
2006-07	3552.0	2	4	8	16	7104	14208	3717.48
2007-08	2916.0	3	9	27	81	8748	26244	3750.09
2008-09	3319.0	4	16	64	256	13276	53104	3783.88
2009-10	4008.0	5	25	125	625	20040	100200	3818.85
2010-11	4408.0	6	36	216	1296	26448	158688	3855

2011-12	3920.2	7	49	273	1911	27441.4	192089.8	3892.33
2012-13	3927.2	8	64	512	4096	31417.6	251340.8	3930.84
2013-14	3992.7	9	81	729	6561	35934.3	323408.7	3970.53
2014-15	4061.1	10	100	1000	10000	40611	406110	4011.4
	ΣY_t=73570.3	ΣX =0	ΣX^2= 770	ΣX^3 = 0	ΣX^4 =49686	XY=22839.5	X^2Y=2844313	

Graph-3



3. Fitting of Second Degree Parabola

The normal equation for estimating a, b and c in $Y_t = a + bx + cx^2$, where x = t – 2005 …… (1)

$\Sigma Y_t = na + b\Sigma x + c\Sigma X^2$

$\Rightarrow 73570.3 = 20a + 770c$ …… (a)

$\sum XY_t = a\Sigma x + b\Sigma X^2 + c\Sigma X^3$

$\Rightarrow 22839.5 = 770b$ …… (b)

$\Sigma x^2 Y_t = a\Sigma x^2 + b\Sigma x^3 + c\Sigma x^4$

$\Rightarrow 2844313 = 770a + 49686c$ ……(c)

From (b), $b = \frac{\Sigma xy}{\Sigma x^2} = \frac{22839.5}{770} = 29.66$

From (a) and (c), we get

c = 0.59

Substituting in (a) we get

a = 3655.8

Substituting the values of a, b, and c in (1) we get the required trend equation as

$Y_t = 3655.8 + 29.66x + 0.59x^2$…… (vii)

The trend values Y_t can be computed on putting x= -10, -9… 9, 10 in (vii) and are given in the last column of the table -4.

3. Results

In this paper, a time series analysis has been made to estimate the trend values for the production of rice for period 1995 to 2015. The data have been collected from the official record of the office of the Extension coordinator Agricultural technology management agency Dhemaji with personal investigation. The data are secondary in nature.

4. Conclusion

1. We observe from tables 2, 3, 4 and graphs 1, 2, 3 that all these method applied here leads to the same conclusion that there a gradual increase in trend. Although there is slight fall in production in the years 2011-12, 2007-08, 1999-20 even shows upward trend. The downfall in the production may be the due to the following reasons.
   (a) Insufficient rainfall
   (b) Rise in temperature
   (c) Weather condition
   (d) Pests etc.

The calculated trend values by least squares method and second degree parabola for the data collected on the production of Assam rice for the period 1995-2015.

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