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First Cycle NAAC Accreditation 2023

Criteria 3
Research, Innovations and Extension

3.3.1 Number of Research Papers Published per teacher in the Journals notified on UGC Care List during the last five years.

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Submitted to

THE NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL

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Year	2022-23	2021-22	2020-21	2019-20	2018-19
Number	**03**	**03**	**00**	**02**	**03**

1. **List of Teachers having Publication in the Journals notified on UGC Care**
2. **The Papers Published in the UCG Care Listed Journals**

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Research, Innovations and Extension

3.3.1 Number of Research papers published per teacher in the Journals notified on UGC Care List during the last five years.

Year	2022-23	2021-22	2020-21	2019-20	2018-19
Number	03	03	00	02	03

List of Teachers having Publication in the Journals notified on UGC Care List

Title of paper	Name of the Author/s	Department of the Teacher	Name of Journal	Year of Publication	ISSN Number
SOME GENERAL IDENTITIES OF ROGERS-RAMANUJAN TYPE	Dr. Shaikh Fokor Uddin Ali Ahmed	Mathematics	Juni Khyat ISSN: 2278-4632 (UGC Care Group I Listed Journal)	2023	Juni Khyat Journal, ISSN 2278-4632
Trends in Agriculture Trade and the Influence of Global Crises on Export of Agricultural Goods of India	Md. Jamir Uddin Ahmed	Economics	International Journal for Multidisciplinary Research (IJFMR)	2023	E-ISSN: 2582-2160
Rogers-Ramanujan-Slater Type Identities	Dr. Shaikh Fokor Uddin Ali Ahmed	Mathematics	Juni Khyat ISSN: 2278-4632 (UGC Care Group I Listed Journal)	2023	Juni Khyat Journal, ISSN 2278-4632
Government Policies for the Economy of Northeast India: An Analytical Perspective	Md. Jamir Uddin Ahmed	Economics	International Journal of creative research thoughts (IJCRT)	2022	ISSN 2320-2882
Few More Identities of Rogers-Ramanujan Type	Dr. Shaikh Fokor Uddin Ali Ahmed	Mathematics	IJISET - International Journal of Innovative Science, Engineering & Technology	2022	ISSN (Online) 2348 – 7968
Growth of Population in Assam with special reference to Char Areas: A Threat	Dr. M. Seik Mozibar Rahman	Economics	International Journal of creative research thoughts (IJCRT)	2022	ISSN 2320-2882
A Case study of Assamese Literature, Indigenous Knowledge for folk culture in relation to Environmental awareness in Assam.	Manju Ahmed	Assamese	International Journal of Research Hand Analytical Reviews	2020	E-ISSN: 2348-1269, P-ISSN-2349-51382160
A Study of Professional Ethics of Assamese Language and Involvement of short stories on Assamese Society in Assam	Nasir Uddin Ahmed	Assamese	International Journal of Research and Analytical Reviews	2020	E-ISSN: 2348-1269, P-ISSN-2349-51382160
Impact of contemporary Assamese Society with Special reference to Dr. Bhupen Hazarika	Nasir Uddin Ahmed	Assamese	International Journal of Research and Analytical Reviews	2019	E-ISSN: 2348-1269, P-ISSN-2349-51382160
An analytical Study of Linguistic Nationalism in early-colonial Assam with special reference to Orunodoi.	Manju Ahmed	Assamese	International Journal of Research and Analytical Reviews	2019	E-ISSN: 2348-1269, P-ISSN-2349-51382160
The Char People of Assam and their Indebtedness	Dr. M. Seik Mozibar Rahman	Economics	Think India Journal	2019	ISSN 0971-1260

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The Papers Published in the UCG Care Listed Journals

2022-23

SOME GENERAL IDENTITIES OF ROGERS-RAMANUJAN TYPE

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ABSTRACT:
In this paper, we have derived some identities of Rogers-Ramanujan Type modulo $9s$, $11s$, $15s$ and $45s$ (where s is any finite positive integer) by using the transformation theory of Basic Hypergeometric Series and Bailey Lemma. Some particular cases of such identities also have been derived.

Key Words:
Rogers-Ramanujan Identity, Basic Hypergeometric Series, Jacobi's Triple Product Identity, Bailey's Lemma.

Mathematics Subject Classification: 11P84, 11P81, 33D15, 05A17.

1. Introduction: The most famous of the "Series = Product" Identities are:
For $|q|<1$,

$$\sum_{n=0}^{\infty} \frac{q^{n^2}}{(q;q)_n} = \prod_{n=1}^{\infty} \frac{1}{1-q^n}, n \not\equiv 0, \pm 2 \ (mod \ 5)$$

$$\sum_{n=0}^{\infty} \frac{q^{n^2+n}}{(q;q)_n} = \prod_{n=1}^{\infty} \frac{1}{1-q^n}, n \not\equiv 0, \pm 1 \ (mod \ 5)$$

where $(q;q)_n = (1-q)(1-q^2)..(1-q^n)$,

which are known as the celebrated original Rogers-Ramanujan Identities and they have motivated extensive research work over the past hundred years.

In the last century, W. N. Bailey [4], G.E. Andrews [3], A. Verma and V.K Jain [1], and many others have extensively used the Transformation Theory of Basic Hypergeometric Series to derive many Identities of Rogers Ramanujan Type. In this paper, we use the techniques laid down by A. Verma and V.K Jain to derive some more identities of Rogers-Ramanujan Type which are not listed in [1].

Throughout this paper, we assume $|\mathbf{q}| < \mathbf{1}$ and, as customary, we define
$$(a;q)_0 = 1$$
$$(a;q)_n = \prod_{k=0}^{n-1}(1-aq^k), \text{ for } n \geq 1$$
$$\text{and} \quad (a;q)_\infty = \prod_{k=1}^{\infty}(1-aq^k).$$

It follows that $\quad (a;q)_n = \frac{(a;q)_\infty}{(aq^n;q)_\infty}$

The multiple q −shifted factorials is defined by
$$(a_1, a_2, \ldots . a_m; q)_n = (a_1;q)_n (a_2;q)_n \ldots . (a_m;q)_n$$
$$(a_1, a_2, \ldots . a_m; q)_\infty = (a_1;q)_\infty (a_2;q)_\infty \ldots . (a_m;q)_\infty$$

The Basic Hyper geometric Series is

$$_{p+1}\phi_{p+r}\left(\begin{matrix} a_1, a_2, \ldots \ldots, a_{p+1};q;x \\ b_1, b_2, \ldots \ldots, b_{p+r} \end{matrix}\right) = \sum_{n=0}^{\infty} \frac{(a_1;q)_n (a_2;q)_n \ldots (a_{p+1};q)_n x^n (-1)^{nr} q^{\frac{n(n-1)r}{2}}}{(q;q)_n (b_1 :q)_n (b_2;q)_n \ldots (b_{p+r};q)_n}$$

The series $_{p+1}\phi_{p+r}$ converges for all positive integers r and for all x. For $r = 0$, it converges only when $|x| < 1$.

Jacobi's Triple Product Identity: (See [3], (2.2.10) and (2.2.11))

$(zq^{1/2}, z^{-1}q^{1/2}, q; q)_\infty = \sum_{n=-\infty}^{\infty}(-1)^n z^n q^{\frac{n^2}{2}}$, and its corollary is given by

$$\sum_{n=-\infty}^{\infty}(-1)^n q^{\frac{(2k+1)n(n+1)}{2}-in} = \sum_{n=0}^{\infty}(-1)^n q^{(2k+1)n(n+1)-in} \cdot (1 - q^{(2n+1)i})$$

$$= \prod_{n=0}^{\infty}(1 - q^{(2k+1)(n+1)})(1 - q^{(2k+1)n+i})(1 - q^{(2k+1)(n+1)-i}) \tag{1.1}$$

The following Lemma is due to W. N. Bailey: (See [1], (2.1.5))
If p is a non-negative integer, then

$(aq; q)_\infty \sum_{n=0}^{\infty} a^n \cdot q^{n^2-pn} \cdot \beta_n$

$$= \sum_{j=0}^{p} \frac{(q^{-p}; q)_j(-a)^j q^{j(j+1)/2}}{(q; q)_j} \cdot \sum_{n=0}^{\infty} a^n \cdot q^{n^2-pn+2nj} \cdot \alpha_n \tag{1.2}$$

where $\beta_n = \sum_{k=0}^{n} \frac{\alpha_k}{(q;q)_{n-k}(aq;q)_{n+k}}$.

In this section, we begin by introducing the following transformations:

$$_{10}\phi_9 \left(\begin{array}{c} a, q\sqrt{a}, -q\sqrt{a}, b, x, -x, y, -y, q^{-n}, -q^{-n}; q; -\dfrac{a^3 q^{3+2n}}{bx^2 y^2} \\ \sqrt{a}, -\sqrt{a}, \dfrac{aq}{b}, \dfrac{aq}{x}, -\dfrac{aq}{x}, \dfrac{aq}{y}, -\dfrac{aq}{y}, -aq^{n+1}, aq^{n+1} \end{array} \right)$$

$$= \frac{(a^2 q^2; q^2)_n \left(\dfrac{a^2 q^2}{x^2 y^2}; q^2 \right)_n}{\left(\dfrac{a^2 q^2}{x^2}; q^2 \right)_n \left(\dfrac{a^2 q^2}{y^2}; q^2 \right)_n} \cdot {_5\phi_4} \left(\begin{array}{c} x^2, y^2, -\dfrac{aq}{b}, -\dfrac{aq^2}{b}, q^{-2n}; q^2; q^2 \\ -aq, -aq^2, \dfrac{a^2 q^2}{b^2}, \dfrac{x^2 y^2}{a^2} q^{-2n} \end{array} \right) \tag{1.3}$$

$$_{12}\phi_{11} \left(\begin{array}{c} a, q^3\sqrt{a}, -q^3\sqrt{a}, x, xq, xq^2, y, yq, yq^2, q^{-n}, q^{-n+1}, q^{-n+2}; q^3; \dfrac{a^4 q^{3+3n}}{x^3 y^3} \\ \sqrt{a}, -\sqrt{a}, \dfrac{aq^3}{x}, \dfrac{aq^2}{x}, \dfrac{aq}{x}, \dfrac{aq^3}{y}, \dfrac{aq^2}{y}, \dfrac{aq}{y}, aq^{3+n}, aq^{2+n}, aq^{1+n} \end{array} \right)$$

$$= \frac{(aq; q)_n \left(\dfrac{aq}{xy}; q \right)_n}{\left(\dfrac{aq}{x}; q \right)_n \left(\dfrac{aq}{y}; q \right)_n} \cdot {_6\phi_5} \left(\begin{array}{c} a^{\frac{1}{3}}, \omega a^{\frac{1}{3}}, \omega^2 a^{\frac{1}{3}}, x, y, q^{-n}; q; q \\ a^{\frac{1}{2}}, -a^{\frac{1}{2}}, (aq)^{\frac{1}{2}}, -(aq)^{\frac{1}{2}}, \dfrac{xy}{a} q^{-n} \end{array} \right) \tag{1.4}$$

Proof of (1.3)–(1.4): (See [1], Equation (1.3) and (1.6) respectively).
Multiple Series Generalization of Transformation (1.3): (See [1], (4.1)).
By induction on p, the multiple series generalization of (1.3) can be given in the form:

$$_{2p+4}\phi_{2p+3} \left(\begin{array}{c} a, q\sqrt{a}, -q\sqrt{a}, b, x, -x, y, -y, (c_{p-3}), (d_{p-3}), -q^{-n}, q^{-n}; q; \dfrac{-a^p q^{p+2n}}{bx^2 y^2 c_1 d_1 \ldots c_{p-3} d_{p-3}} \\ \sqrt{a}, -\sqrt{a}, \dfrac{aq}{b}, \dfrac{aq}{x}, -\dfrac{aq}{x}, \dfrac{aq}{y}, -\dfrac{aq}{y}, \dfrac{aq}{(c_{p-3})}, \dfrac{aq}{(d_{p-3})}, -aq^{n+1}, aq^{n+1} \end{array} \right)$$

$$= \frac{(a^2q^2;q^2)_n \left(\frac{a^2q^2}{x^2y^2};q^2\right)_n}{\left(\frac{a^2q^2}{x^2};q^2\right)_n \left(\frac{a^2q^2}{y^2};q^2\right)_n} \cdot \sum_{r_1,r_2,\ldots r_{p-3}} \prod_{j=1}^{p-3} \left\{ \frac{\left(\frac{aq}{c_jd_j};q\right)_{r_j} (c_j;q)_{M_{j-1}} (d_j;q)_{M_{j-1}}}{(q;q)_{r_j} \left(\frac{aq}{c_j};q\right)_{M_j} \left(\frac{aq}{d_j};q\right)_{M_j}} \right\}$$

$$\cdot \frac{(b;q)_{M_{p-3}} (x^2;q^2)_{M_{p-3}} (y^2;q^2)_{M_{p-3}} (q^{-2n};q^2)_{M_{p-3}} q^{M_{p-3}(M_{p-3}+1)/2}}{(-aq;q)_{2M_{p-3}} \left(\frac{aq}{b};q\right)_{M_{p-3}} \left(\frac{x^2y^2}{a^2}q^{-2n};q^2\right)_{M_{p-3}}}$$

$$\times {}_5\phi_4 \left[\begin{array}{c} \left(-\frac{a}{b}q^2\right)^{r_{p-1}} \cdot \left(-\frac{a^2q^3}{bc_{p-3}d_{p-3}}q^2\right)^{r_{p-2}} \cdots \left(-\frac{a^{p-3}q^{p-2}}{bc_{p-3}d_{p-3}\ldots c_2d_2}q^2\right)^{r_1} \\ x^2q^{2M_{p-3}}, y^2q^{2M_{p-3}}, \frac{-aq}{b}, \frac{-aq}{b}, q^{-2n+2M_{p-3}};q^2;q^2 \\ -aq^{1+2M_{p-3}}, -aq^{2+2M_{p-3}}, \frac{a^2}{b^2}q^{2+2M_{p-3}}, \frac{x^2y^2}{a^2}q^{-2n+2M_{p-3}} \end{array} \right]$$

                                                                                          (1.5)

where $M_i = r_1 + r_2 + \cdots + r_i$, $M_{-1} = M_0 = 0$ and $(a_{M,N})$ stands for the $(N - M + 1)$ symbols $a_M, a_{M+1}, \ldots, a_N$ (when $M = 1$, we write (a_N) in place of $(a_{1,N})$).

Similarly the multiple series generalization of (1.4) can be given in the form: **(See [1], (4.5)).**

$${}_{2p+4}\phi_{2p+3} \left[\begin{array}{c} a, q^3\sqrt{a}, -q^3\sqrt{a}, x, xq, xq^2, y, yq, yq^2, (c_{p-4}), (d_{p-4}), q^{-n}, q^{-n+1}, q^{-n+2};q^3; \frac{a^pq^{3p-9+x_n}}{x^3y^3c_1d_1\ldots c_{p-4}d_{p-4}} \\ \sqrt{a}, -\sqrt{a}, \frac{aq^3}{x}, \frac{aq^2}{x}, \frac{aq}{x}, \frac{aq^3}{y}, \frac{aq^2}{y}, \frac{aq}{y}, \frac{aq^3}{(c_{p-4})}, \frac{aq^3}{(d_{p-4})}, aq^{3+n}, aq^{2+n}, aq^{1+n} \end{array} \right]$$

$$= \frac{(aq;q)_n \left(\frac{aq}{xy};q\right)_n}{\left(\frac{aq}{x};q\right)_n \left(\frac{aq}{y};q\right)_n} \sum_{r_1,r_2,\ldots r_{p-4}} \prod_{j=1}^{p-4} \left\{ \frac{\left(\frac{aq^3}{c_jd_j};q^3\right)_{r_j} (c_j;q^3)_{M_{j-1}} (d_j;q^3)_{M_{j-1}}}{(q^3;q^3)_{r_j} \left(\frac{aq^3}{c_j};q^3\right)_{M_j} \left(\frac{aq^3}{d_j};q^3\right)_{M_j}} \right\} \cdot$$

$$\cdot \frac{(x;q)_{3M_{p-4}} (y;q)_{3M_{p-4}} (q^{-n};q)_{3M_{p-4}} (aq^3;q^3)_{2M_{p-4}} q^{2M_{p-4}(M_{p-4}+1)}}{(aq;q)_{6M_{p-4}} \left(\frac{xy}{a}q^{-n};q\right)_{3M_{p-4}}} \cdot$$

$$(a)^{r_{p-4}} \left(\frac{a^2q^3}{c_{p-4}d_{p-4}}\right)^{r_{p-5}} \cdots \left(\frac{a^{p-4}q^{3n-15}}{c_{p-4}d_{p-4}\ldots c_2d_2}q^2\right)^{r_1} \cdot$$

$${}_6\phi_5 \left[\begin{array}{c} a^{\frac{1}{3}}q^{2M_{p-4}}, \omega a^{\frac{1}{3}}q^{2M_{p-4}}, \omega^2 a^{\frac{1}{3}}q^{2M_{p-4}}, xq^{3M_{p-4}}, yq^{3M_{p-4}}, q^{-n+3M_{p-4}};q;q \\ a^{\frac{2}{3}}q^{3M_{p-4}}, -a^{\frac{1}{3}}q^{3M_{p-4}}, a^{\frac{1}{3}}q^{\frac{1}{2}+3M_{p-4}}, -a^{\frac{2}{3}}q^{\frac{1}{2}+3M_{p-4}}, \frac{xy}{a}q^{-n+3M_{p-4}} \end{array} \right]$$

                                                                                          (1.6)

for $p \geq 4$ (ω is the imaginary cube root of unity), and $M_i = r_1 + r_2 + \cdots + r_i$, $M_{-1} = M_0 = 0$.

Main Results:
2. Rogers-Ramanujan Type Identities Modulo 15s:

Replacing y by iq^{-n} and q by q^s in (1.3) and then letting $b, x \to \infty$ we find,

$$\sum_{k=0}^{n} \frac{(-1)^k (aq^s;q^s)_{k-1}(1-q^{2ks}) a^{3k} q^{\frac{7k^2 s - ks}{2}}}{(q^s;q^s)_k (a^4 q^{4s};q^{4s})_{n+k} (q^{4s};q^{4s})_{n-k}}$$

$$= \frac{1}{(-a^2 q^{2s};q^{2s})_{2n}} \sum_{k=0}^{n} \frac{a^{2k} q^{2k^2 s}}{(q^{2s};q^{2s})_k (-aq^s;q^s)_{2k} (q^{4s};q^{4s})_{n-k}} \tag{2.1}$$

The left hand side of Bailey's Lemma (1.2) for $a = a^4$, $q = q^{4s}$, $\alpha_0 = 1$, $\alpha_{k+1} = 0$ and,

$$\alpha_k = \frac{(-1)^k (aq^s;q^s)_{k-1}(1-q^{2ks}) a^{3k} q^{\frac{7k^2 s - ks}{2}}}{(q^s;q^s)_k}, \text{ gives,}$$

$$(a^2 q^{2s}; q^{2s})_\infty \sum_{n=0}^{\infty} \sum_{k=0}^{\infty} \frac{a^{4n+6k} q^{4n^2 s + 6k^2 s + 8nks - 4p(n+k)s}}{(q^{2s};q^{2s})_k (-aq^s;q^s)_{2k}(q^{4s};q^{4s})_n} \text{ , (upon using (2.1))} \tag{2.2}$$

The corresponding Right hand side of Bailey's Lemma (1.2) for the same, yields

$$\sum_{j=0}^{p} \frac{(q^{-4ps};q^{4s})_j (-1)^j a^{4j} q^{2j(j+1)s}}{(q^{4s};q^{4s})_j} \cdot \sum_{n=0}^{\infty} a^{4n} \cdot q^{(4n^2-4pn+8nj)s} \cdot \frac{(-1)^n a^{3n}(aq^s;q^s)_{n-1}(1-q^{2ns}) q^{\frac{7n^2 s - ns}{2}}}{(q^s;q^s)_n} \tag{2.3}$$

We equate (2.2) and (2.3) to get,

$$(a^2 q^{2s}; q^{2s})_\infty \sum_{n=0}^{\infty} \sum_{k=0}^{\infty} \frac{a^{4n+6k} q^{4n^2 s + 6k^2 s + 8nks - 4p(n+k)s}}{(q^{2s};q^{2s})_k (-aq^s;q^s)_{2k}(q^{4s};q^{4s})_n}$$

$$\sum_{j=0}^{p} \frac{(q^{-4ps};q^{4s})_j (-1)^j a^{4j} q^{2j(j+1)s}}{(q^{4s};q^{4s})_j} \cdot \sum_{n=0}^{\infty} \frac{(-1)^n a^{7n}(aq^s;q^s)_{n-1}(1-q^{2ns}) q^{\frac{15n^2 s - ns}{2} - 4pns + 8njs}}{(q^s;q^s)_n} \tag{2.4}$$

Setting $a = 1$ and then placing $p = 0, 1, 2$ successively in (2.4), we get the following Identities upon using (1.1):

$$(-q^s;q^s)_\infty \sum_{n=0}^{\infty} \sum_{k=0}^{\infty} \frac{q^{4n^2 s + 6k^2 s + 8nks}}{(q^{2s};q^{2s})_k (-q^s;q^s)_{2k}(q^{4s};q^{4s})_n}$$

$$= \frac{1}{(q^s;q^s)_\infty} \sum_{n=-\infty}^{\infty} (-1)^n q^{\frac{15n^2 s - ns}{2}}$$

$$= \prod_{n=1}^{\infty} \frac{1}{1-q^n}, \text{ where } n \not\equiv 0, \pm 7s \pmod{15s} \tag{2.5}$$

$$(-q^s;q^s)_\infty \sum_{n=0}^{\infty} \sum_{k=0}^{\infty} \frac{q^{4n^2 s + 6k^2 s + 8nks - 4ns - 4ks}}{(q^{2s};q^{2s})_k (-q^s;q^s)_{2k}(q^{4s};q^{4s})_n}$$

$$= \prod_{n=1}^{\infty} \frac{1}{1-q^n} + \prod_{n=1}^{\infty} \frac{1}{1-q^n}$$

where $n \not\equiv 0, \pm 3s \pmod{15s}$ and $n \not\equiv 0, \pm 4s \pmod{15s}$ respectively. $\tag{2.6}$

and,

$$(-q^s;q^s)_\infty \sum_{n=0}^{\infty} \sum_{k=0}^{\infty} \frac{q^{4n^2 s + 6k^2 s + 8nks - 8(n+k)s}}{(q^{2s};q^{2s})_k (-q^s;q^s)_{2k}(q^{4s};q^{4s})_n}$$

$$= \prod_{n=1}^{\infty} \frac{1}{1-q^n} + \frac{1+q^{4s}}{q^{4s}} \prod_{n=1}^{\infty} \frac{1}{1-q^n} + \prod_{n=1}^{\infty} \frac{1}{1-q^n}$$

where $n \not\equiv 0, \pm 1s \pmod{15s}$, $n \not\equiv 0, \pm 7s \pmod{15s}$ and $n \not\equiv 0 \pmod{15s}$ respectively. $\tag{2.7}$

$$(-q^s;q^s)_\infty \sum_{n=0}^\infty \sum_{r=0}^\infty \sum_{k=0}^\infty \frac{(-1)^k q^{(2n^2+7r^2+4k^2-4nr+4rk-4k+3r-2n)s}}{(q^s;q^s)_r(-q^s;q^s)_{2r+2k}(q^{2s};q^{2s})_{n-2r}}$$

$$= \prod_{n=1}^\infty \frac{1}{1-q^n} \qquad + \qquad \prod_{n=1}^\infty \frac{1}{1-q^n} \qquad (4.5)$$

where $n \not\equiv 0, \pm 3s \pmod{11s}$ and $n \not\equiv 0, \pm 4s \pmod{11s}$ respectively.

and,

$$(-q^s;q^s)_\infty \sum_{n=0}^\infty \sum_{r=0}^\infty \sum_{k=0}^\infty \frac{(-1)^k q^{(2n^2+7r^2+4k^2-4nr+4rk-6k+5r-4n)s}}{(q^s;q^s)_r(-q^s;q^s)_{2r+2k}(q^{2s};q^{2s})_{n-2r}}$$

$$= \prod_{n=1}^\infty \frac{1}{1-q^n} \qquad + \qquad \frac{1+q^2}{q^2}\prod_{n=1}^\infty \frac{1}{1-q^n} \qquad + \qquad \prod_{n=1}^\infty \frac{1}{1-q^n} \qquad (4.6)$$

where $n \not\equiv 0, \pm 1 \pmod{11s}$, $n \not\equiv 0, \pm 5s \pmod{11s}$ and $n \not\equiv 0, \pm 2s \pmod{11s}$ respectively.

5. Rogers-Ramanujan Type Identities modulo 45s: (where s is any finite positive integer)

Taking $q = q^s$, $x \to \infty, y \to \infty$ in the transformation (1.4), we find that,

$$\sum_{k=0}^n \frac{(-1)^k a^{4k}(aq^{3s};q^{3s})_{k-1}(1-aq^{6ks})q^{\frac{27k^2s-3ks}{2}}}{(q^{3s};q^{3s})_k(q^s;q^s)_{n-3k}(aq^s;q^s)_{n+3k}} = \sum_{k=0}^n \frac{a^k(aq^{3s};q^{3s})_{k-1}q^{k^2s}}{(q^s;q^s)_k(aq^s;q^s)_{2k-1}(q^s;q^s)_{n-k}} \qquad (5.1)$$

The Bailey's Lemma (1.2) for $q = q^s$, $\alpha_0 = 1$, $\alpha_{3k+1} = 0$ and,

$$\alpha_{3k} = \frac{(-1)^k a^{4k}(aq^{3s};q^{3s})_{k-1}(1-aq^{6ks})q^{\frac{27k^2s-3ks}{2}}}{(q^{3s};q^{3s})_k} \text{ gives (upon using (5.1)),}$$

$$(aq^s;q^s)_\infty \sum_{n=0}^\infty \sum_{k=0}^\infty \frac{a^{n+2k}(aq^{3s};q^{3s})_{k-1}q^{(n^2+2nk+2k^2)s-p(n+k)s}}{(q^s;q^s)_k(aq^s;q^s)_{2k-1}(q^s;q^s)_n}$$

$$= \sum_{j=0}^p \frac{(q^{-ps};q^s)_j(-1)^j a^j q^{\frac{j(j+1)s}{2}}}{(q^s;q^s)_j} \cdot \sum_{n=0}^\infty \frac{(-1)^n a^{7n}(aq^{3s};q^{3s})_{n-1}(1-aq^{6ns})q^{\frac{27n^2s-3ns}{2}+9n^2s-3pns+6njs}}{(q^{3s};q^{3s})_n} \qquad (5.2)$$

Setting $a = 1$ and then placing $p = 0, 1, 2$ successively in (5.2), we get the following:

$$\sum_{n=0}^\infty \sum_{k=0}^\infty \frac{(q^{3s};q^{3s})_{k-1}q^{(n^2+2nk+2k^2)s}}{(q^s;q^s)_k(q^s;q^s)_{2k-1}(q^s;q^s)_n} = \prod_{n=1}^\infty \frac{1}{1-q^n}, \text{ where } n \not\equiv 0, \pm 24s \pmod{45s} \qquad (5.3)$$

$$\sum_{n=0}^\infty \sum_{k=0}^\infty \frac{(q^{3s};q^{3s})_{k-1}q^{(n^2+2nk+2k^2)s-ns-ks}}{(q^s;q^s)_k(q^s;q^s)_{2k-1}(q^s;q^s)_n} = \prod_{n=1}^\infty \frac{1}{1-q^n} \qquad + \qquad \prod_{n=1}^\infty \frac{1}{1-q^n} \qquad (5.4)$$

where $n \not\equiv 0, \pm 27s \pmod{45s}$ and $n \not\equiv 0, \pm 24s \pmod{45s}$ respectively.
And,

$$\sum_{n=0}^\infty \sum_{k=0}^\infty \frac{(q^{3s};q^{3s})_{k-1}q^{(n^2+2nk+2k^2)s-2ns-2ks}}{(q^s;q^s)_k(q^s;q^s)_{2k-1}(q^s;q^s)_n}$$

$$= \prod_{n=1}^\infty \frac{1}{1-q^n} \qquad + \qquad \frac{1+q}{q}\prod_{n=1}^\infty \frac{1}{1-q^n} \qquad + \qquad \prod_{n=1}^\infty \frac{1}{1-q^n} \qquad (5.4)$$

where $n \not\equiv 0, \pm 30 \pmod{45s}$, $n \not\equiv 0, \pm 27s \pmod{45s}$ and $n \not\equiv 0, \pm 24s \pmod{45s}$ respectively.

6. Some Particular Cases:

$$\sum_{k=0}^{n}\frac{(-1)^k(aq^s;q^s)_{k-1}(1-aq^{2ks})a^{2k}q^{\frac{5k^2s-ks}{2}}}{(q^s;q^s)_k(a^2q^{2s};q^{2s})_{n+k}(q^{2s};q^{2s})_{n-k}}=\sum_{k=0}^{n}\frac{(-1)^ka^{2k}q^{2k^2-k}}{(q^{2s};q^{2s})_k(-aq^s;q^s)_{2k}(q^{2s};q^{2s})_{n-k}} \quad (3.7)$$

The Bailey's Lemma (1.2) for $a=a^2$, $q=q^{2s}$, $\alpha_0=1$, $\alpha_{k+1}=0$ and,

$$\alpha_k=\frac{(-1)^k(aq^s;q^s)_{k-1}(1-aq^{2ks})a^{2k}q^{\frac{5k^2s-ks}{2}}}{(q^s;q^s)_k}, \text{ gives (upon using (3.7)),}$$

$$(a^2q^{2s};q^{2s})_\infty\sum_{n=0}^{\infty}\sum_{k=0}^{\infty}\frac{(-1)^ka^{2n+4k}\,q^{2n^2s+4k^2s+4nks-2pns-2pks-ks}}{(q^{2s};q^{2s})_k(-aq^s;q^s)_{2k}(q^{2s};q^{2s})_n}$$

$$=\sum_{j=0}^{p}\frac{(q^{-2ps};q^{2s})_j(-1)^ja^{2j}q^{j(j+1)s}}{(q^{2s};q^{2s})_j}\cdot\sum_{n=0}^{\infty}\frac{(-1)^na^{4n}(aq^s;q^s)_{n-1}(1-aq^{2ns})q^{\frac{(9n^2s-4pns+8njs-ns)}{2}}}{(q^s;q^s)_n} \quad (3.8)$$

Setting $a=1$ and then placing $p=0,1,2$ successively in (3.8), we get the following Identities:

$$(-q^s;q^s)_\infty\sum_{n=0}^{\infty}\sum_{k=0}^{\infty}\frac{(-1)^k\,q^{2n^2s+4k^2s+4nks-ks}}{(q^{2s};q^{2s})_k(-q^s;q^s)_{2k}(q^{2s};q^{2s})_n}=\prod_{n=1}^{\infty}\frac{1}{1-q^n}, \quad (3.9)$$

where $n\not\equiv0,\pm4s\pmod{9s}$

$$(-q^s;q^s)_\infty\sum_{n=0}^{\infty}\sum_{k=0}^{\infty}\frac{(-1)^k\,q^{2n^2s+4k^2s+4nks-2ns-3ks}}{(q^{2s};q^{2s})_k(-q^s;q^s)_{2k}(q^{2s};q^{2s})_n}=\prod_{n=1}^{\infty}\frac{1}{1-q^n}\quad+\quad\prod_{n=1}^{\infty}\frac{1}{1-q^n} \quad (3.10)$$

where $n\not\equiv0,\pm2s\pmod{9s}$ and $n\not\equiv0,\pm3s\pmod{9s}$ respectively.and,

$$(-q^s;q^s)_\infty\sum_{n=0}^{\infty}\sum_{k=0}^{\infty}\frac{(-1)^k\,q^{2n^2s+4k^2s+4nks-4ns-5ks}}{(q^{2s};q^{2s})_k(-q^s;q^s)_{2k}(q^{2s};q^{2s})_n}$$

$$=\quad\prod_{n=1}^{\infty}\frac{1}{1-q^n}\quad+\quad\frac{1+q^2}{q^2}\prod_{n=1}^{\infty}\frac{1}{1-q^n}\quad+\quad\prod_{n=1}^{\infty}\frac{1}{1-q^n} \quad (3.11)$$

where $n\not\equiv0\pmod{9s}$, $n\not\equiv0,\pm4s\pmod{9s}$ and $n\not\equiv0,\pm8s\pmod{9s}$ respectively.

4. Rogers-Ramanujan Type Identities Modulo 11s:

Setting $p=4$, $c_1=z$, $d_1=-z$, $q=q^s$ and then taking $b\to0$, $x,y,z\to\infty$ in the transformation (1.5), we get after some simplification,

$$\sum_{k=0}^{n}\frac{(-1)^k(aq^s;q^s)_{k-1}(1-aq^{2ks})a^{3k}\,q^{(7k^2s-ks)/2}}{(q^s;q^s)_k(q^{2s};q^{2s})_{n-k}(a^2q^{2s};q^{2s})_{n+k}}=\sum_{r=0}^{\infty}\sum_{k=0}^{n-r}\frac{(-1)^ka^{2k+2r}q^{5r^2s+8rks+2k^2s-2ks+rs}}{(q^s;q^s)_r(-aq^s;q^s)_{2r+2k}(q^{2s};q^{2s})_{n-r-k}} \quad (4.1)$$

The Bailey's Lemma (1.2) for $a=a^2$, $q=q^{2s}$, $\alpha_0=1$, $\alpha_{k+1}=0$ and,

$$\alpha_k=\frac{(-1)^k(aq^s;q^s)_{k-1}(1-aq^{2ks})a^{3k}\,q^{(7k^2s-ks)/2}}{(q^s;q^s)_k} \text{ gives (upon using (4.1)),}$$

$$(a^2q^{2s};q^{2s})_\infty\;\sum_{n=0}^{\infty}\sum_{r=0}^{\infty}\sum_{k=0}^{\infty}\frac{(-1)^ka^{2n+4k}\,q^{(2n^2+7r^2+4k^2-4nr+4rk-2k+r)s-2ps(n-r+k)}}{(q^s;q^s)_r(-aq^s;q^s)_{2r+2k}(q^{2s};q^{2s})_{n-2r}}$$

$$=\sum_{j=0}^{p}\frac{(q^{-2ps};q^{2s})_j(-1)^ja^{2j}q^{j(j+1)s}}{(q^{2s};q^{2s})_j}\cdot\sum_{n=0}^{\infty}\frac{(-1)^n(aq^s;q^s)_{n-1}(1-aq^{2ns})a^{5n}\,q^{(11n^2s-4pns+8njs-ns)/2}}{(q^s;q^s)_n} \quad (4.2)$$

Setting $a=1$ and then placing $p=0,1,2$ successively in (4.2), we get the following:

$$(-q^s;q^s)_\infty\sum_{n=0}^{\infty}\sum_{r=0}^{\infty}\sum_{k=0}^{\infty}\frac{(-1)^kq^{(2n^2+7r^2+4k^2-4nr+4rk-2k+r)s}}{(q^s;q^s)_r(-q^s;q^s)_{2r+2k}(q^{2s};q^{2s})_{n-2r}}$$

$$=\prod_{n=1}^{\infty}\frac{1}{1-q^n}, \text{ where } n\not\equiv0,\pm5s\pmod{11s} \quad (4.3)$$

3. Rogers-Ramanujan Type Identities Modulo $9s$: (where s is any finite positive integer)

Taking $q = q^s, b \to 0, x \to \infty, y \to \infty$ and $a = a^2$ in the transformation (1.3), we find,

$$\sum_{k=0}^{n} \frac{(-1)^k a^{4k}(a^2 q^s;q^s)_{k-1}(1-a^2 q^{2ks})q^{(5k^2 s-ks)/2}}{(q^s;q^s)_k (q^{2s};q^{2s})_{n-k}(a^4 q^{2s};q^{2s})_{n+k}} = \sum_{k=0}^{n} \frac{(-1)^k a^{4k} q^{3k^2 s}}{(q^{2s};q^{2s})_k(-q^s;q^s)_{2k}(q^{2s};q^{2s})_{n-k}} \quad (3.1)$$

The Bailey's Lemma (1.2), for $a = a^4, q = q^{2s}, \alpha_0 = 1, \alpha_{k+1} = 0$ and,

$$\alpha_k = \frac{(-1)^k a^{4k}(a^2 q^s;q^s)_{k-1}(1-a^2 q^{2ks})q^{(5k^2 s-ks)/2}}{(q^s;q^s)_k}, \text{ gives (upon using (3.1)),}$$

$$(a^4 q^{2s};q^{2s})_\infty \sum_{n=0}^{\infty}\sum_{k=0}^{\infty} \frac{(-1)^k a^{4n+8k} q^{2n^2 s + 5k^2 s + 4nks - 2p(n+k)s}}{(q^{2s};q^{2s})_k(-q^s;q^s)_{2k}(q^{2s};q^{2s})_n}$$

$$= \sum_{j=0}^{p} \frac{(q^{-2ps};q^{2s})_j (-1)^j a^{4j} q^{j(j+1)s}}{(q^{2s};q^{2s})_j} . \sum_{n=0}^{\infty} \frac{(-1)^n a^{8n}(a^2 q^s;q^s)_{n-1}(1-a^2 q^{2ns})q^{\frac{9n^2 s - 4pns + 8njs - ns}{2}}}{(q^s;q^s)_n} \quad (3.2)$$

Setting $a = 1$ and then placing $p = 0, 1, 2$ successively in (3.2), we get the following Rogers-Ramanujan Type Identities after using the Jacobi's Triple Product Identity (1.1):

(i) $(-q^s;q^s)_\infty \sum_{n=0}^{\infty}\sum_{k=0}^{\infty} \frac{(-1)^k q^{2n^2 s + 5k^2 s + 4nks}}{(q^{2s};q^{2s})_k(-q^s;q^s)_{2k}(q^{2s};q^{2s})_n}$

$$= \frac{1}{(q^s;q^s)_\infty} \sum_{n=0}^{\infty}(-1)^n (1+q^{ns})q^{(9n^2 s - ns)/2}$$

$$= \frac{1}{(q^s;q^s)_\infty} \sum_{n=-\infty}^{\infty}(-1)^n q^{(9n^2 s + ns)/2}$$

$$= \prod_{n=1}^{\infty} \frac{1}{1-q^n}, \text{ where } n \not\equiv 0, \pm 4s \ (\text{mod } 9s) \quad (3.3)$$

(ii) $(-q^s;q^s)_\infty \sum_{n=0}^{\infty}\sum_{k=0}^{\infty} \frac{(-1)^k q^{2n^2 s + 5k^2 s + 4nks - 2ns - 2ks}}{(q^{2s};q^{2s})_k(-q^s;q^s)_{2k}(q^{2s};q^{2s})_n}$

$$= \prod_{n=1}^{\infty} \frac{1}{1-q^n} \quad + \quad \prod_{n=1}^{\infty} \frac{1}{1-q^n} \quad (3.4)$$

where $n \not\equiv 0, \pm 2s \ (\text{mod } 9s)$ and $n \not\equiv 0, \pm 3s \ (\text{mod } 9s)$ respectively.

(iii) $(-q^s;q^s)_\infty \sum_{n=0}^{\infty}\sum_{k=0}^{\infty} \frac{(-1)^k q^{2n^2 s + 5k^2 s + 4nks - 4ns - 4ks}}{(q^{2s};q^{2s})_k(-q^s;q^s)_{2k}(q^{2s};q^{2s})_n}$

$$= \prod_{n=1}^{\infty} \frac{1}{1-q^n} \quad + \quad \frac{1+q^{2s}}{q^{2s}}\prod_{n=1}^{\infty} \frac{1}{1-q^n} \quad + \quad \prod_{n=1}^{\infty} \frac{1}{1-q^n} \quad (3.5)$$

where $n \not\equiv 0, \pm 1s \ (\text{mod } 9s)$, $n \not\equiv 0, \pm 4s \ (\text{mod } 9s)$ and $n \not\equiv 0, \pm 0 \ (\text{mod } 9s)$ respectively.

For $s = 1$, taking $a = q^{\frac{1}{2}}, p = 0$ in (3.2), we have the following:

$$(-q^2;q)_\infty \sum_{n=0}^{\infty}\sum_{k=0}^{\infty} \frac{(-1)^k q^{2n^2 + 5k^2 + 4nk + 2n + 4k}}{(q^2;q^2)_k(-q;q)_{2k}(q^2;q^2)_n} = \prod_{n=1}^{\infty} \frac{1}{1-q^n}, n \not\equiv 0, \pm 1 \ (\text{mod } 9) \quad (3.6)$$

Also, replacing y by $x^{1/2}q^{-n/2}$, q by q^s in (1.3) and then letting $b \to 0, x \to \infty$, we find that,

Taking $s = 1,2,3, ...$ successively in the identities $(2.5) - (2.7)$, we get many identities of the Rogers-Ramanujan Type modulo 15 and integral multiples of 15 in succession. For instance, if we put $s = 1,2,3, ...$ in (2.5), it gives the following identities:

$$(-q;q)_\infty \sum_{n=0}^{\infty} \sum_{k=0}^{\infty} \frac{q^{4n^2+6k^2+8nk}}{(q^2;q^2)_k(-q;q)_{2k}(q^4;q^4)_n} = \prod_{n=1}^{\infty} \frac{1}{1-q^n}, \text{ where } n \not\equiv 0, \pm 7 \pmod{15}$$

$$(-q^2;q^2)_\infty \sum_{n=0}^{\infty} \sum_{k=0}^{\infty} \frac{q^{8n^2+12k^2+16nk}}{(q^4;q^4)_k(-q^2;q^2)_{2k}(q^8;q^8)_n} = \prod_{n=1}^{\infty} \frac{1}{1-q^n}, \text{ where } n \not\equiv 0, \pm 14 \pmod{30}$$

$$(-q^3;q^3)_\infty \sum_{n=0}^{\infty} \sum_{k=0}^{\infty} \frac{q^{12n^2+18k^2+24nk}}{(q^6;q^6)_k(-q^3;q^3)_{2k}(q^{12};q^{12})_n} = \prod_{n=1}^{\infty} \frac{1}{1-q^n}, \text{ where } n \not\equiv 0, \pm 21 \pmod{45}$$

and so on.

For $s = 1,2,3, ...$ in (2.6), it gives

$$(-q;q)_\infty \sum_{n=0}^{\infty} \sum_{k=0}^{\infty} \frac{q^{4n^2+6k^2+8nk-4n-4k}}{(q^2;q^2)_k(-q;q)_{2k}(q^4;q^4)_n} = \prod_{n=1}^{\infty} \frac{1}{1-q^n} + \prod_{n=1}^{\infty} \frac{1}{1-q^n}$$

where $n \not\equiv 0, \pm 3 \pmod{15}$ and $n \not\equiv 0, \pm 4 \pmod{15}$ respectively.

$$(-q^2;q^2)_\infty \sum_{n=0}^{\infty} \sum_{k=0}^{\infty} \frac{q^{8n^2+12k^2+16nk-8n-9k}}{(q^4;q^4)_k(-q^2;q^2)_{2k}(q^8;q^8)_n} = \prod_{n=1}^{\infty} \frac{1}{1-q^n} + \prod_{n=1}^{\infty} \frac{1}{1-q^n}$$

where $n \not\equiv 0, \pm 6 \pmod{30}$ and $n \not\equiv 0, \pm 8 \pmod{30}$ respectively. and so on. Similarly, varying s over 1, 2, 3, ... in $(3.3) - (3.5)$ and $(3.9) - (3.11)$, we get Rogers Ramanujan Type identities modulo 9, 18, 27,......... onwards. Also, varying s over 1, 2, 3, onwards in $(4.3) - (4.6)$ and $(5.3) - (5.4)$ we get identities modulo 11, 22, 33, and 45, 90, 135, .onwards respectively.

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Trends in Agriculture Trade and the Influence of Global Crises on Export of Agricultural Goods of India

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Abstract:
Recently it is experienced that the agricultural trade in India has been tremendously change due to came into scene of global crises. In the year 2021 and 2022 exports recorded $ 50.2 billion and imports recorded $ 32.4 billion. The resulting surplus of $ 17.8 billion was significantly lower than the surplus amount of $ 27.7 in the previous record- breaking export year 2013-2014. Covid 19 pandemic and Ukraine war had a positive influence on the record exports from India. But the greater increase in imports has particularly offset the remarkable expansion in exports. In this context, an attempt has been made to examine the causes of this pattern in Indian export of agricultural produces. The study in this regard is significant because, aside from software services, this is one industry in which India has some comparative advantage. The nation must prioritize a stable trade policy, especially for those goods having highest trade potential.

Introduction:

India has been playing a major role in the agricultural sector in the world and is one of the ten top exporters of agricultural products in the world. This is the only sector experienced positive growth during 2021-2022 financial year, despite a 4.8 percent decline in gross value added (GVA) was the agricultural sector. Being a developing nation, India, the contribution of agricultural trade to economic development, poverty alleviation and ensuring food security is enormous. India's export portfolio has expanded to include non- traditional goods and differentiated products are now being more significant. After 2005-2006, there was a noticeable increase in both agricultural goods exports and imports. India is becoming more and more significant on the global market and it has improved its export competitiveness in some niche markets. The aims of this study is toprovide the current trends in the trade surplus and also gives a picture of the influence of global crisis on the Indian agricultural export by presenting the trends in the export.

Statement of the Problem:

India's exports were at highest level ever, were positively influenced by the recent Covid 19 pandemic and Russia Ukraine war. As there was also an increase in imports, the nation was unable to fully benefit from this trend, which ultimately caused the trade surplus to shrink.Until now, most studies focused on the decline in agriculture exports, the reasons for the same and the consequences of trade. Since the recent global crises had opened new opportunities for India to increase its exports, the phenomenon needs a fresh perception in the changed circumstances. The attention of the current study is to assess India's export

import patterns as well as the influence of the Covid19 pandemic and the Russia- Ukraine conflict on the nation's agriculture trade.

Objectives of the Study:
1. To evaluate the trend in trade surplus of agricultural produce in India.
2. To examine the influence of the Covid 19 pandemic and Russia- Ukraine conflict on exports from India.

Methodology of the Study:

This Study has been done on the secondary data resources. Data are collected from different sources like Various publications, various Government Reports, Various Newspapers, journals and official portal of India. Apart from this, various statistical tools like CAGR, percentage, line graphs are used

Trends of India's agricultural Trade:
Table- 1

Year	Exports (In Million Dollar)		Imports (In Million Dollar)		Trade Surplus (In Million Dollar)	
	$ MN	% growth	$ MN	% growth	$ MN	% growth
2012-13	41726.33		18978.33		22748.00	
2013-14	43251.66	3.64	15528.94	-18.18	27722.72	21.84
2014-15	39080.43	-9.64	21151.77	36.19	17928.66	-35.31
2015-16	32808.54	-16.07	22578.60	6.81	10230.04	-43.06
2016-17	33696.83	2.74	25643.40	13.50	8053.43	-21.06
2017-18	38897.21	15.43	24890.90	-2.93	14006.31	73.82
2018-19	39203.53	0.77	20920.34	-15.95	18283.19	30.48
2019-20	35500.47	-9.18	21859.99	4.49	13740.48	-24.84
2020-21	41895.68	17.70	21652.05	-0.96	20243.63	47.38
2021-22	50240.21	19.90	32422.30	49.75	17817.91	-12
CAGR (%)	1.87		5.5		-2.41	
April-Dec,21	36155.42		24071.55		12083.87	
April-Dec,22	38997.92		27770.64		11227.28	

Source: - Department of Commerce, Ministry of Commerce and Industry, Government of India.

The table -1, reveals the trends of India's exports, imports and trade surpluses of agricultural produces different years from 2012-13 to 2021-22. The data from 2012 – 2022 shows the fluctuations in the value of India's agricultural trade in dollar. In the year 2018-19, the trade surplus was highest (30.48) followed by 2013-14, (21.84), whereas from 2014-15 the trade surplus has been decreasing and reached the lowest point in 2016-17. Since then, there has been fluctuating the trade surplus without consistent increase or decrease in the trade surplus. From 2020 to 2021, there has been a steady decline. This pattern was also influenced by the Russia- Ukraine war, which prevented the normal movement of agricultural goods from one location to another location. The surplus in the b2021 and 2022 is very low. The highest surplus was recorded in the year 2018-19. There was not much difference in exports during these years. But an increase in import can be seen in the following years which is the reason for decrease in exports. The compounded annual growth rate (CAGR) calculated for the ten years from 2012 to 2022, reveals that

the growth in imports (5.5%) was almost 3 times than that of growth in exports (1.87%). It comes to the view that trade surplus is fluctuating and now it is decreasing with a negative CAGR of -2.41%.

Influence of Covid-19 and Ukraine war on the Agricultural Exports in India

The Covid-19 pandemic caused a rise in the demand for staple foods, opening the door for more exports of agricultural products. India was capable to rise to the occasion and establish itself as a dependable food supplier as a result of the administrative framework that was already in place at the state and District levels and focussed efforts were made to remove the bottlenecks brought in by the pandemic. India now exports more staple food than ever before, including rice, wheat, sugar other materials and meat. The Government quick action to assure the export of rice and other grains is believed to have caused the sharp increase in rice exports, particularly during the period when Covid-19 pandemic had disrupted supply chains of several commodities globally.

The Russia -Ukraine war, may be one of the major reasons that led the FPI of FAO to rise to an all-time high in 2021-22. The FAO food price index tracks the monthly change in a basket of food commodities international prices. It is made up of the weighted average of five commodity group price indexes averaged throughout the years of 2014 to 2016.

India's Farm Exports V/S World Food Prices:

From the figure-2, it can be inferred how closely India's farm performance is linked to international commodity prices. In the years 2012-13 and 2013-14 the FPI was above 100, but after 2014-15, FAO food price index and export deteriorated and down below 100. Exports bounced back in 2020-21 and 2021-22, as a result of rising global price and the FAO index, which in those two years averaged to 102.5 points and 133 points respectively. This increase may be due to the Russia – Ukraine war, as during this time the export or import of agricultural produce was not feasible. It was the European Union or the NATO countries, which was putting pressure over Russia, as they were not able to export from the Russian countries. Because of this halt in the production of agricultural produces the import and export also came to a standstill. This led to demand and supply gap, the prices of commodities increased and the FPI of FAO came to an all time high in 2021-22. Just after Russia invaded Ukraine in March 2022, the FAO index reached its highest value of 159.7 points. Since then, it has decreased each month, with the most recent measurement of 131.2 points in January 2023 being the lowest in September 2021 level of 129.2 points.

Figure -2.

Source: - Food and Agricultural Organization of United Nations.

India's new Markets for Wheat:

According to sources in the Ministry of Commerce and Industry, there has been an increase in wheat export despite a prohibition since 2022, on the same due to pre-existing orders. The impact of Russia – Ukraine war and demand for nations which previously did not buy wheat from India. The Conflict between Russia and Ukraine carried out more than 30% of the world's wheat trade, has disrupted the world supply of wheat. India is trying to obtain access to markets that have previously received wheat from Belarus and Ukraine. Buyers who are concerned about delays oin the supply chain from Ukraine and Russia have turned to India because they know that only India can now be a significant, reliable source of wheat. From $ 568 million in 2020 – 21 to about $ 2119 million in 2020-21, wheat sales increased by an extraordinary 273 %, near a four- fold increased. This information indicates that if India hadn't imposed export restrictions on wheat, the country's wheat exports would have increased massively.

Findings of the Study:

From the study, it is found that –

1. The surplus on the farm trade account has shown a narrowing trend.
2. In the fiscal year that ends on March 31, 2023, Indian's agricultural exports are anticipated to reach a new high. But rising imports reduces the excess in the overall farm trade.
3. Based on ten years compound annual growth rate calculated from 2012 to 2022, import growth 5.5% is nearly three times greater than export growth ,1.87%. In conclusion, it can be seen that the trade surplus varies and is primarily now declining with a negative CAGR of 2.41%.
4. India's agricultural exports fluctuated during the course of the ten- year period from 2012-13 to 2021-22 as a result of an unreliable fluctuating farm trade system and also due to glabal crisis.
5. Global demand for staple foods increased during the Covid pandemic and India was able to take advantage of this circumstance by responding promptly.
6. Due to "Global supply Crunch "brought on by the Russia and Ukraine war. India, which had been a marginal player in the world wheat market last year. This leads to demand from nations that had not previously purchased Indian wheat.

7. The world looks to India for supply of wheat and other food-grains even during current crisis caused by the Russia – Ukraine war.

8. In recent days, India secured contracts to export over 500,000 tons of wheat, taking advantage of a steep rise in global prices and indicating a significant increase in exports from the second – largest producer of the grain in the world.

Suggestions:

The agriculture sector would need to concentrate on exports and private investments while aiming for a 5% annual growth in agriculture GVA in order to achieve US $ 5 billion targets by 2025-26. For the agriculture sector to be stimulated, emphasis on agriculture marketing reforms and agricultural exports to double farmers income by financial year 2024 -25 would be acceptable. The nation must broaden its exports portfolio in terms of the products offered and the markets accessed other than always depending on just a few groups of nations to export its goods. Along with this, the increasing trend in imports should also be considered by encouraging their domestic production, otherwise, the advantages of growing exports get nullified by the narrowing trade surplus.

Conclusion:

India appears to be performing better overall in global agricultural trade and exports of agricultural commodities reached a record high despite the global crisis which positively influenced the export. Since 1995, the nation has constantly had a agricultural trade surplus. Now a narrowing trade can be seen in trade surplus due to increase in exports simultaneously with the increase in the country's exports. By seizing the opportunity provided by the global crisis, export should be increased by correcting the narrowing tendency in trade surplus. There is enormous untapped exports potential that may be realised with the right course of action.

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SOME GENERAL IDENTITIES OF ROGERS-RAMANUJAN TYPE

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ABSTRACT:
In this paper, we have derived some identities of Rogers-Ramanujan Type modulo $9s$, $11s$, $15s$ and $45s$ (where s is any finite positive integer) by using the transformation theory of Basic Hypergeometric Series and Bailey Lemma. Some particular cases of such identities also have been derived.

Key Words:
Rogers-Ramanujan Identity, Basic Hypergeometric Series, Jacobi's Triple Product Identity, Bailey's Lemma.

Mathematics Subject Classification: 11P84, 11P81, 33D15, 05A17.

1. Introduction: The most famous of the "Series = Product" Identities are:
For $|q|<1$,

$$\sum_{n=0}^{\infty} \frac{q^{n^2}}{(q;q)_n} = \prod_{n=1}^{\infty} \frac{1}{1-q^n}, n \not\equiv 0, \pm 2 \ (mod \ 5)$$

$$\sum_{n=0}^{\infty} \frac{q^{n^2+n}}{(q;q)_n} = \prod_{n=1}^{\infty} \frac{1}{1-q^n}, n \not\equiv 0, \pm 1 \ (mod \ 5)$$

where $(q;q)_n = (1-q)\left(1-q^2\right)..\left(1-q^n\right)$,

which are known as the celebrated original Rogers-Ramanujan Identities and they have motivated extensive research work over the past hundred years.

In the last century, W. N. Bailey [4], G.E. Andrews [3], A. Verma and V.K Jain [1], and many others have extensively used the Transformation Theory of Basic Hypergeometric Series to derive many Identities of Rogers Ramanujan Type. In this paper, we use the techniques laid down by A. Verma and V.K Jain to derive some more identities of Rogers-Ramanujan Type which are not listed in [1].

Throughout this paper, we assume $|\mathbf{q}| < \mathbf{1}$ and, as customary, we define
$$(a;q)_0 = 1$$
$$(a;q)_n = \prod_{k=0}^{n-1}(1 - aq^k), \text{ for } n \geq 1$$
$$\text{and} \quad (a;q)_\infty = \prod_{k=1}^{\infty}(1 - aq^k).$$

It follows that $\quad (a;q)_n = \frac{(a;q)_\infty}{(aq^n;q)_\infty}$

The multiple $q-$shifted factorials is defined by
$$(a_1, a_2, ...a_m; q)_n = (a_1;q)_n (a_2;q)_n ....(a_m;q)_n$$
$$(a_1, a_2, ...a_m; q)_\infty = (a_1;q)_\infty (a_2;q)_\infty ....(a_m;q)_\infty$$

The Basic Hyper geometric Series is

$$_{p+1}\phi_{p+r}\left(\begin{matrix} a_1, a_2, ..., a_{p+1}; q; x \\ b_1, b_2, ..., b_{p+r} \end{matrix}\right) = \sum_{n=0}^{\infty} \frac{(a_1;q)_n (a_2;q)_n ...(a_{p+1};q)_n x^n (-1)^{nr} q^{\frac{n(n-1)r}{2}}}{(q;q)_n (b_1;q)_n (b_2;q)_n ....(b_{p+r};q)_n}$$

The series $_{p+1}\phi_{p+r}$ converges for all positive integers r and for all x. For $r = 0$, it converges only when $|x| < 1$.

Jacobi's Triple Product Identity: (See [3], (2.2.10) and (2.2.11))

$(zq^{1/2}, z^{-1}q^{1/2}, q; q)_\infty = \sum_{n=-\infty}^{\infty}(-1)^n z^n q^{\frac{n^2}{2}}$, and its corollary is given by

$$\sum_{n=-\infty}^{\infty}(-1)^n q^{\frac{(2k+1)n(n+1)}{2}-in} = \sum_{n=0}^{\infty}(-1)^n q^{(2k+1)n(n+1)-in}.(1-q^{(2n+1)i})$$

$$= \prod_{n=0}^{\infty}(1-q^{(2k+1)(n+1)})(1-q^{(2k+1)n+i})(1-q^{(2k+1)(n+1)-i}) \tag{1.1}$$

The following Lemma is due to W. N. Bailey: (See [1], (2.1.5))
If p is a non-negative integer, then

$(aq; q)_\infty \sum_{n=0}^{\infty} a^n . q^{n^2-pn}.\beta_n$

$$= \sum_{j=0}^{p} \frac{(q^{-p};q)_j (-a)^j q^{j(j+1)/2}}{(q;q)_j} . \sum_{n=0}^{\infty} a^n . q^{n^2-pn+2nj}.\alpha_n \tag{1.2}$$

where $\beta_n = \sum_{k=0}^{n} \frac{\alpha_k}{(q;q)_{n-k}(aq;q)_{n+k}}$.

In this section, we begin by introducing the following transformations:

$$_{10}\phi_9\left(\begin{matrix} a, q\sqrt{a}, -q\sqrt{a}, b, x, -x, y, -y, q^{-n}, -q^{-n}; q; -\dfrac{a^3 q^{3+2n}}{bx^2 y^2} \\ \sqrt{a}, -\sqrt{a}, \dfrac{aq}{b}, \dfrac{aq}{x}, -\dfrac{aq}{x}, \dfrac{aq}{y}, -\dfrac{aq}{y}, -aq^{n+1}, aq^{n+1} \end{matrix}\right)$$

$$= \frac{(a^2 q^2; q^2)_n \left(\dfrac{a^2 q^2}{x^2 y^2}; q^2\right)_n}{\left(\dfrac{a^2 q^2}{x^2}; q^2\right)_n \left(\dfrac{a^2 q^2}{y^2}; q^2\right)_n} . {}_5\phi_4\left(\begin{matrix} x^2, y^2, -\dfrac{aq}{b}, -\dfrac{aq^2}{b}, q^{-2n}; q^2; q^2 \\ -aq, -aq^2, \dfrac{a^2 q^2}{b^2}, \dfrac{x^2 y^2}{a^2} q^{-2n} \end{matrix}\right) \tag{1.3}$$

$$_{12}\phi_{11}\left(\begin{matrix} a, q^3\sqrt{a}, -q^3\sqrt{a}, x, xq, xq^2, y, yq, yq^2, q^{-n}, q^{-n+1}, q^{-n+2}; q; \dfrac{a^4 q^{3+3n}}{x^3 y^3} \\ \sqrt{a}, -\sqrt{a}, \dfrac{aq^3}{x}, \dfrac{aq^2}{x}, \dfrac{aq}{x}, \dfrac{aq^3}{y}, \dfrac{aq^2}{y}, \dfrac{aq}{y}, aq^{3+n}, aq^{2+n}, aq^{1+n} \end{matrix}\right)$$

$$= \frac{(aq;q)_n \left(\dfrac{aq}{xy}; q\right)_n}{\left(\dfrac{aq}{x}; q\right)_n \left(\dfrac{aq}{y}; q\right)_n} . {}_6\phi_5\left(\begin{matrix} a^{\frac{1}{3}}, \omega a^{\frac{1}{3}}, \omega^2 a^{\frac{1}{3}}, x, y, q^{-n}; q; q \\ a^{\frac{1}{2}}, -a^{\frac{1}{2}}, (aq)^{\frac{1}{2}}, -(aq)^{\frac{1}{2}}, \dfrac{xy}{a} q^{-n} \end{matrix}\right) \tag{1.4}$$

Proof of (1.3)-(1.4):(See [1], Equation (1.3) and (1.6) respectively).
Multiple Series Generalization of Transformation (1.3): (See [1], (4.1)).
By induction on p, the multiple series generalization of (1.3) can be given in the form:

$$_{2p+4}\phi_{2p+3}\left(\begin{matrix} a, q\sqrt{a}, -q\sqrt{a}, b, x, -x, y, -y, (c_{p-3}), (d_{p-3}), -q^{-n}, q^{-n}; q; \dfrac{-a^p q^{p+2n}}{bx^2 y^2 c_1 d_1 \dots c_{p-3} d_{p-3}} \\ \sqrt{a}, -\sqrt{a}, \dfrac{aq}{b}, \dfrac{aq}{x}, -\dfrac{aq}{x}, \dfrac{aq}{y}, -\dfrac{aq}{y}, \dfrac{aq}{(c_{p-3})}, \dfrac{aq}{(d_{p-3})}, -aq^{n+1}, aq^{n+1} \end{matrix}\right)$$

$$= \frac{(a^2q^2;q^2)_n \left(\frac{a^2q^2}{x^2y^2};q^2\right)_n}{\left(\frac{a^2q^2}{x^2};q^2\right)_n \left(\frac{a^2q^2}{y^2};q^2\right)_n} \cdot \sum_{r_1,r_2,\ldots r_{p-3}} \prod_{j=1}^{p-3} \left\{ \frac{\left(\frac{aq}{c_jd_j};q\right)_{r_j} (c_j;q)_{M_{j-1}} (d_j;q)_{M_{j-1}}}{(q;q)_{r_j} \left(\frac{aq}{c_j};q\right)_{M_j} \left(\frac{aq}{d_j};q\right)_{M_j}} \right\}$$

$$\cdot \frac{(b;q)_{M_{p-3}} (x^2;q^2)_{M_{p-3}} (y^2;q^2)_{M_{p-3}} (q^{-2n};q^2)_{M_{p-3}} q^{M_{p-3}(M_{p-3}+1)/2}}{(-aq;q)_{2M_{p-3}} \left(\frac{aq}{b};q\right)_{M_{p-3}} \left(\frac{x^2y^2}{a^2}q^{-2n};q^2\right)_{M_{p-3}}} \cdot$$

$$\times {}_5\phi_4 \left[\begin{array}{c} \left(-\frac{a}{b}q^2\right)^{r_{p-1}} \cdot \left(-\frac{a^2q^3}{bc_{p-3}d_{p-3}}q^2\right)^{r_{p-4}} \cdots \left(-\frac{a^{p-3}q^{p-2}}{bc_{p-3}d_{p-3}\ldots c_2d_2}q^2\right)^{r_1} \\ x^2q^{2M_{p-3}}, y^2q^{2M_{p-3}}, \frac{-aq}{b}, \frac{-aq}{b}, q^{-2n+2M_{p-3}};q^2;q^2 \\ -aq^{1+2M_{p-3}}, -aq^{2+2M_{p-3}}, \frac{a^2}{b^2}q^{2+2M_{p-3}}, \frac{x^2y^2}{a^2}q^{-2n+2M_{p-3}} \end{array} \right]$$

$$(1.5)$$

where $M_i = r_1 + r_2 + \cdots + r_i$, $M_{-1} = M_0 = 0$ and $(a_{M,N})$ stands for the $(N - M + 1)$ symbols $a_M, a_{M+1}, \ldots, a_N$ (when $M = 1$, we write (a_N) in place of $(a_{1,N})$).
Similarly the multiple series generalization of (1.4) can be given in the form: **(See [1], (4.5)).**

$${}_{2p+4}\phi_{2p+3} \left[\begin{array}{c} a, q^3\sqrt{a}, -q^3\sqrt{a}, x, xq, xq^2, y, yq, yq^2, (c_{p-4}), (d_{p-4}), q^{-n}, q^{-n+1}, q^{-n+2}; q^3; \frac{a^p q^{3p-9+3n}}{x^3y^3c_1d_1\ldots c_{p-4}d_{p-4}} \\ \sqrt{a}, -\sqrt{a}, \frac{aq^3}{x}, \frac{aq^2}{x}, \frac{aq}{x}, \frac{aq^3}{y}, \frac{aq^2}{y}, \frac{aq}{y}, \frac{aq^3}{(c_{p-4})}, \frac{aq^3}{(d_{p-4})}, aq^{3+n}, aq^{2+n}, aq^{1+n} \end{array} \right]$$

$$= \frac{(aq;q)_n \left(\frac{aq}{xy};q\right)_n}{\left(\frac{aq}{x};q\right)_n \left(\frac{aq}{y};q\right)_n} \sum_{r_1,r_2,\ldots r_{p-4}} \prod_{j=1}^{p-4} \left\{ \frac{\left(\frac{aq^3}{c_jd_j};q^3\right)_{r_j} (c_j;q^3)_{M_{j-1}} (d_j;q^3)_{M_{j-1}}}{(q^3;q^3)_{r_j} \left(\frac{aq^3}{c_j};q^3\right)_{M_j} \left(\frac{aq^3}{d_j};q^3\right)_{M_j}} \right\} \cdot$$

$$\cdot \frac{(x;q)_{3M_{p-4}} (y;q)_{3M_{p-4}} (q^{-n};q)_{3M_{p-4}} (aq^3;q^3)_{2M_{p-4}} q^{2M_{p-4}(M_{p-4}+1)}}{(aq;q)_{6M_{p-4}} \left(\frac{xy}{a}q^{-n};q\right)_{3M_{p-4}}} \cdot$$

$$(a)^{r_{p-4}} \left(\frac{a^2q^3}{c_{p-4}d_{p-4}}\right)^{r_{p-5}} \cdots \left(\frac{a^{p-4}q^{3n-15}}{c_{p-4}d_{p-4}\ldots c_2d_2}q^2\right)^{r_1} \cdot$$

$${}_6\phi_5 \left[\begin{array}{c} a^{\frac{1}{3}}q^{2M_{p-4}}, \omega a^{\frac{1}{3}}q^{2M_{p-4}}, \omega^2 a^{\frac{1}{3}}q^{2M_{p-4}}, xq^{3M_{p-4}}, yq^{3M_{p-4}}, q^{-n+3M_{p-4}};q;q \\ a^{\frac{2}{3}}q^{3M_{p-4}}, -a^{\frac{1}{3}}q^{3M_{p-4}}, a^{\frac{1}{3}}q^{\frac{1}{2}+3M_{p-4}}, -a^{\frac{1}{3}}q^{\frac{1}{2}+3M_{p-4}}, \frac{xy}{a}q^{-n+3M_{p-4}} \end{array} \right]$$

$$(1.6)$$

for $p \geq 4$ (ω is the imaginary cube root of unity), and $M_i = r_1 + r_2 + \cdots + r_i$, $M_{-1} = M_0 = 0$.

Main Results:
2. Rogers-Ramanujan Type Identities Modulo 15s:

Replacing y by iq^{-n} and q by q^s in (1.3) and then letting $b, x \to \infty$ we find,

$$\sum_{k=0}^{n} \frac{(-1)^k (aq^s;q^s)_{k-1}(1-q^{2ks})a^{3k}q^{\frac{7k^2s-ks}{2}}}{(q^s;q^s)_k (a^4q^{4s};q^{4s})_{n+k}(q^{4s};q^{4s})_{n-k}}$$

$$= \frac{1}{(-a^2q^{2s};q^{2s})_{2n}} \sum_{k=0}^{n} \frac{a^{2k} q^{2k^2 s}}{(q^{2s};q^{2s})_k(-aq^s;q^s)_{2k}(q^{4s};q^{4s})_{n-k}} \tag{2.1}$$

The left hand side of Bailey's Lemma (1.2) for $a = a^4$, $q = q^{4s}$, $\alpha_0 = 1$, $\alpha_{k+1} = 0$ and,

$$\alpha_k = \frac{(-1)^k(aq^s;q^s)_{k-1}(1-q^{2ks})a^{3k}q^{\frac{7k^2s-ks}{2}}}{(q^s;q^s)_k}, \text{ gives,}$$

$$(a^2q^{2s};q^{2s})_\infty \sum_{n=0}^{\infty}\sum_{k=0}^{\infty} \frac{a^{4n+6k} q^{4n^2s+6k^2s+8nks-4p(n+k)s}}{(q^{2s};q^{2s})_k(-aq^s;q^s)_{2k}(q^{4s};q^{4s})_n}, \text{ (upon using (2.1))} \tag{2.2}$$

The corresponding Right hand side of Bailey's Lemma (1.2) for the same, yields

$$\sum_{j=0}^{p} \frac{(q^{-4ps};q^{4s})_j(-1)^j a^{4j}q^{2j(j+1)s}}{(q^{4s};q^{4s})_j} \cdot \sum_{n=0}^{\infty} a^{4n} \cdot q^{(4n^2-4pn+8nj)s} \cdot \frac{(-1)^n a^{3n}(aq^s;q^s)_{n-1}(1-q^{2ns})q^{\frac{7n^2s-ns}{2}}}{(q^s;q^s)_n} \tag{2.3}$$

We equate (2.2) and (2.3) to get,

$$(a^2q^{2s};q^{2s})_\infty \sum_{n=0}^{\infty}\sum_{k=0}^{\infty} \frac{a^{4n+6k} q^{4n^2s+6k^2s+8nks-4p(n+k)s}}{(q^{2s};q^{2s})_k(-aq^s;q^s)_{2k}(q^{4s};q^{4s})_n}$$

$$\sum_{j=0}^{p} \frac{(q^{-4ps};q^{4s})_j(-1)^j a^{4j}q^{2j(j+1)s}}{(q^{4s};q^{4s})_j} \cdot \sum_{n=0}^{\infty} \frac{(-1)^n a^{7n}(aq^s;q^s)_{n-1}(1-q^{2ns})q^{\frac{15n^2s-ns}{2}-4pns+8njs}}{(q^s;q^s)_n} \tag{2.4}$$

Setting $a = 1$ and then placing $p = 0, 1, 2$ successively in (2.4), we get the following Identities upon using (1.1):

$$(-q^s;q^s)_\infty \sum_{n=0}^{\infty}\sum_{k=0}^{\infty} \frac{q^{4n^2s+6k^2s+8nks}}{(q^{2s};q^{2s})_k(-q^s;q^s)_{2k}(q^{4s};q^{4s})_n}$$

$$= \frac{1}{(q^s;q^s)_\infty} \sum_{n=-\infty}^{\infty} (-1)^n q^{\frac{15n^2s-ns}{2}}$$

$$= \prod_{n=1}^{\infty} \frac{1}{1-q^n}, \text{ where } n \not\equiv 0, \pm 7s \pmod{15s} \tag{2.5}$$

$$(-q^s;q^s)_\infty \sum_{n=0}^{\infty}\sum_{k=0}^{\infty} \frac{q^{4n^2s+6k^2s+8nks-4ns-4ks}}{(q^{2s};q^{2s})_k(-q^s;q^s)_{2k}(q^{4s};q^{4s})_n}$$

$$= \prod_{n=1}^{\infty} \frac{1}{1-q^n} + \prod_{n=1}^{\infty} \frac{1}{1-q^n}$$

where $n \not\equiv 0, \pm 3s \pmod{15s}$ and $n \not\equiv 0, \pm 4s \pmod{15s}$ respectively. $\tag{2.6}$

and,

$$(-q^s;q^s)_\infty \sum_{n=0}^{\infty}\sum_{k=0}^{\infty} \frac{q^{4n^2s+6k^2s+8nks-8(n+k)s}}{(q^{2s};q^{2s})_k(-q^s;q^s)_{2k}(q^{4s};q^{4s})_n}$$

$$= \prod_{n=1}^{\infty} \frac{1}{1-q^n} + \frac{1+q^{4s}}{q^{4s}}\prod_{n=1}^{\infty} \frac{1}{1-q^n} + \prod_{n=1}^{\infty} \frac{1}{1-q^n}$$

where $n \not\equiv 0, \pm 1s \pmod{15s}$, $n \not\equiv 0, \pm 7s \pmod{15s}$ and $n \not\equiv 0 \pmod{15s}$ respectively. $\tag{2.7}$

$$\sum_{k=0}^{n}\frac{(-1)^k(aq^s;q^s)_{k-1}(1-aq^{2ks})a^{2k}q^{\frac{5k^2s-ks}{2}}}{(q^s;q^s)_k(a^2q^{2s};q^{2s})_{n+k}(q^{2s};q^{2s})_{n-k}}=\sum_{k=0}^{n}\frac{(-1)^k a^{2k}q^{2k^2-k}}{(q^{2s};q^{2s})_k(-aq^s;q^s)_{2k}\,(q^{2s};q^{2s})_{n-k}} \tag{3.7}$$

The Bailey's Lemma (1.2) for $a=a^2, q=q^{2s}, \alpha_0=1, \alpha_{k+1}=0$ and,

$$\alpha_k=\frac{(-1)^k(aq^s;q^s)_{k-1}(1-aq^{2ks})a^{2k}q^{\frac{5k^2s-ks}{2}}}{(q^s;q^s)_k}, \text{ gives (upon using (3.7)),}$$

$$(a^2q^{2s};q^{2s})_\infty \sum_{n=0}^{\infty}\sum_{k=0}^{\infty}\frac{(-1)^k a^{2n+4k}\,q^{2n^2s+4k^2s+4nks-2pns-2pks-ks}}{(q^{2s};q^{2s})_k(-aq^s;q^s)_{2k}(q^{2s};q^{2s})_n}$$
$$=\sum_{j=0}^{p}\frac{(q^{-2ps};q^{2s})_j(-1)^j a^{2j}q^{j(j+1)s}}{(q^{2s};q^{2s})_j}\cdot\sum_{n=0}^{\infty}\frac{(-1)^n a^{4n}.(aq^s;q^s)_{n-1}(1-aq^{2ns})q^{\frac{(9n^2s-4pns+8njs-ns)}{2}}}{(q^s;q^s)_n} \tag{3.8}$$

Setting $a=1$ and then placing $p=0,1,2$ successively in (3.8), we get the following Identities:

$$(-q^s;q^s)_\infty\sum_{n=0}^{\infty}\sum_{k=0}^{\infty}\frac{(-1)^k\ q^{2n^2s+4k^2s+4nks-ks}}{(q^{2s};q^{2s})_k(-q^s;q^s)_{2k}(q^{2s};q^{2s})_n}=\prod_{n=1}^{\infty}\frac{1}{1-q^n}, \tag{3.9}$$

<center>where $n\not\equiv0,\pm 4s\ (\text{mod } 9s)$</center>

$$(-q^s;q^s)_\infty\sum_{n=0}^{\infty}\sum_{k=0}^{\infty}\frac{(-1)^k\ q^{2n^2s+4k^2s+4nks-2ns-3ks}}{(q^{2s};q^{2s})_k(-q^s;q^s)_{2k}(q^{2s};q^{2s})_n}=\prod_{n=1}^{\infty}\frac{1}{1-q^n}\quad+\quad\prod_{n=1}^{\infty}\frac{1}{1-q^n} \tag{3.10}$$

where $n\not\equiv0,\pm 2s\ (\text{mod } 9s)$ and $n\not\equiv0,\pm 3s\ (\text{mod } 9s)$ respectively.and,

$$(-q^s;q^s)_\infty\sum_{n=0}^{\infty}\sum_{k=0}^{\infty}\frac{(-1)^k\ q^{2n^2s+4k^2s+4nks-4ns-5ks}}{(q^{2s};q^{2s})_k(-q^s;q^s)_{2k}(q^{2s};q^{2s})_n}$$

$$=\quad\prod_{n=1}^{\infty}\frac{1}{1-q^n}\quad+\quad\frac{1+q^2}{q^2}\prod_{n=1}^{\infty}\frac{1}{1-q^n}\quad+\quad\prod_{n=1}^{\infty}\frac{1}{1-q^n} \tag{3.11}$$

<center>where $n\not\equiv0\ (\text{mod } 9s), \quad n\not\equiv0,\pm 4s\ (\text{mod } 9s)$ and $n\not\equiv0,\pm 8s\ (\text{mod } 9s)$ respectively.</center>

4. Rogers-Ramanujan Type Identities Modulo 11s:

Setting $p=4, c_1=z, d_1=-z, q=q^s$ and then taking $b\to 0,\ x,y,z\to\infty$ in the transformation (1.5), we get after some simplification,

$$\sum_{k=0}^{n}\frac{(-1)^k(aq^s;q^s)_{k-1}(1-aq^{2ks})a^{3k}\,q^{(7k^2s-ks)/2}}{(q^s;q^s)_k(q^{2s};q^{2s})_{n-k}(a^2q^{2s};q^{2s})_{n+k}}=\sum_{r=0}^{\infty}\sum_{k=0}^{n-r}\frac{(-1)^k a^{2k+2r}q^{5r^2s+8rks+2k^2s-2ks+rs}}{(q^s;q^s)_r(-aq^s;q^s)_{2r+2k}(q^{2s};q^{2s})_{n-r-k}} \tag{4.1}$$

The Bailey's Lemma (1.2) for $a=a^2, q=q^{2s}, \alpha_0=1, \alpha_{k+1}=0$ and,

$$\alpha_k=\frac{(-1)^k(aq^s;q^s)_{k-1}(1-aq^{2ks})a^{3k}\,q^{(7k^2s-ks)/2}}{(q^s;q^s)_k} \text{ gives (upon using (4.1)),}$$

$$(a^2q^{2s};q^{2s})_\infty\ \sum_{n=0}^{\infty}\sum_{r=0}^{\infty}\sum_{k=0}^{\infty}\frac{(-1)^k a^{2n+4k}\,q^{(2n^2+7r^2+4k^2-4nr+4rk-2k+r)s-2ps(n-r+k)}}{(q^s;q^s)_r(-aq^s;q^s)_{2r+2k}(q^{2s};q^{2s})_{n-2r}}$$
$$=\sum_{j=0}^{p}\frac{(q^{-2ps};q^{2s})_j(-1)^j a^{2j}q^{j(j+1)s}}{(q^{2s};q^{2s})_j}\cdot\sum_{n=0}^{\infty}\frac{(-1)^n(aq^s;q^s)_{n-1}(1-aq^{2ns})a^{5n}\,q^{(11n^2s-4pns+8njs-ns)/2}}{(q^s;q^s)_n} \tag{4.2}$$

Setting $a=1$ and then placing $p=0,1,2$ successively in (4.2), we get the following:

$$(-q^s;q^s)_\infty\sum_{n=0}^{\infty}\sum_{r=0}^{\infty}\sum_{k=0}^{\infty}\frac{(-1)^k q^{(2n^2+7r^2+4k^2-4nr+4rk-2k+r)s}}{(q^s;q^s)_r(-q^s;q^s)_{2r+2k}(q^{2s};q^{2s})_{n-2r}}$$

$$=\prod_{n=1}^{\infty}\frac{1}{1-q^n}, \text{ where } n\not\equiv0,\pm 5s\ (\text{mod } 11s) \tag{4.3}$$

$$(-q^s; q^s)_\infty \sum_{n=0}^\infty \sum_{r=0}^\infty \sum_{k=0}^\infty \frac{(-1)^k q^{(2n^2+7r^2+4k^2-4nr+4rk-4k+3r-2n)s}}{(q^s;q^s)_r (-q^s;q^s)_{2r+2k} (q^{2s};q^{2s})_{n-2r}}$$

$$= \prod_{n=1}^\infty \frac{1}{1-q^n} \quad + \quad \prod_{n=1}^\infty \frac{1}{1-q^n} \tag{4.5}$$

where $n \not\equiv 0, \pm 3s \pmod{11s}$ and $n \not\equiv 0, \pm 4s \pmod{11s}$ respectively.

and,

$$(-q^s; q^s)_\infty \sum_{n=0}^\infty \sum_{r=0}^\infty \sum_{k=0}^\infty \frac{(-1)^k q^{(2n^2+7r^2+4k^2-4nr+4rk-6k+5r-4n)s}}{(q^s;q^s)_r (-q^s;q^s)_{2r+2k} (q^{2s};q^{2s})_{n-2r}}$$

$$= \prod_{n=1}^\infty \frac{1}{1-q^n} \quad + \quad \frac{1+q^2}{q^2} \prod_{n=1}^\infty \frac{1}{1-q^n} \quad + \quad \prod_{n=1}^\infty \frac{1}{1-q^n} \tag{4.6}$$

where $n \not\equiv 0, \pm 1 \pmod{11s}$, $n \not\equiv 0, \pm 5s \pmod{11s}$ and $n \not\equiv 0, \pm 2s \pmod{11s}$ respectively.

5. Rogers-Ramanujan Type Identities modulo $45s$: (where s is any finite positive integer)
Taking $q = q^s$, $x \to \infty, y \to \infty$ in the transformation (1.4), we find that,

$$\sum_{k=0}^n \frac{(-1)^k a^{4k} (aq^{3s};q^{3s})_{k-1}(1-aq^{6ks}) q^{\frac{27k^2s-2ks}{2}}}{(q^{3s};q^{3s})_k (q^s;q^s)_{n-3k} (aq^s;q^s)_{n+3k}} = \sum_{k=0}^n \frac{a^k (aq^{3s};q^{3s})_{k-1} q^{k^2s}}{(q^s;q^s)_k (aq^s;q^s)_{2k-1} (q^s;q^s)_{n-k}} \tag{5.1}$$

The Bailey's Lemma (1.2) for $q = q^s$, $\alpha_0 = 1$, $\alpha_{3k+1} = 0$ and,

$$\alpha_{3k} = \frac{(-1)^k a^{4k} (aq^{3s};q^{3s})_{k-1}(1-aq^{6ks}) q^{\frac{27k^2s-3ks}{2}}}{(q^{3s};q^{3s})_k} \text{ gives (upon using (5.1)),}$$

$$(aq^s; q^s)_\infty \sum_{n=0}^\infty \sum_{k=0}^\infty \frac{a^{n+2k} (aq^{3s};q^{3s})_{k-1} q^{(n^2+2nk+2k^2)s-p(n+k)s}}{(q^s;q^s)_k (aq^s;q^s)_{2k-1} (q^s;q^s)_n}$$

$$= \sum_{j=0}^p \frac{(q^{-ps};q^s)_j (-1)^j a^j q^{\frac{j(j+1)s}{2}}}{(q^s;q^s)_j} \cdot \sum_{n=0}^\infty \frac{(-1)^n a^{7n} (aq^{3s};q^{3s})_{n-1}(1-aq^{6ns}) q^{\frac{27n^2s-3ns}{2}+9n^2s-3pns+6njs}}{(q^{3s};q^{3s})_n} \tag{5.2}$$

Setting $a = 1$ and then placing $p = 0, 1, 2$ successively in (5.2), we get the following:

$$\sum_{n=0}^\infty \sum_{k=0}^\infty \frac{(q^{3s};q^{3s})_{k-1} q^{(n^2+2nk+2k^2)s}}{(q^s;q^s)_k (q^s;q^s)_{2k-1} (q^s;q^s)_n} = \prod_{n=1}^\infty \frac{1}{1-q^n}, \text{ where } n \not\equiv 0, \pm 24s \pmod{45s} \tag{5.3}$$

$$\sum_{n=0}^\infty \sum_{k=0}^\infty \frac{(q^{3s};q^{3s})_{k-1} q^{(n^2+2nk+2k^2)s-ns-ks}}{(q^s;q^s)_k (q^s;q^s)_{2k-1} (q^s;q^s)_n} = \prod_{n=1}^\infty \frac{1}{1-q^n} \quad + \quad \prod_{n=1}^\infty \frac{1}{1-q^n} \tag{5.4}$$

where $n \not\equiv 0, \pm 27s \pmod{45s}$ and $n \not\equiv 0, \pm 24s \pmod{45s}$ respectively.
And,

$$\sum_{n=0}^\infty \sum_{k=0}^\infty \frac{(q^{3s};q^{3s})_{k-1} q^{(n^2+2nk+2k^2)s-2ns-2ks}}{(q^s;q^s)_k (q^s;q^s)_{2k-1} (q^s;q^s)_n}$$

$$= \prod_{n=1}^\infty \frac{1}{1-q^n} \quad + \quad \frac{1+q}{q} \prod_{n=1}^\infty \frac{1}{1-q^n} \quad + \quad \prod_{n=1}^\infty \frac{1}{1-q^n} \tag{5.4}$$

where $n \not\equiv 0, \pm 30 \pmod{45s}$, $n \not\equiv 0, \pm 27s \pmod{45s}$ and $n \not\equiv 0, \pm 24s \pmod{45s}$ respectively.

6. Some Particular Cases:

Taking $s = 1,2,3, \ldots \ldots$ successively in the identities $(2.5) - (2.7)$, we get many identities of the Rogers-Ramanujan Type modulo 15 and integral multiples of 15 in succession. For instance, if we put $s = 1,2,3, \ldots$ in (2.5), it gives the following identities:

$$(-q;q)_\infty \sum_{n=0}^\infty \sum_{k=0}^\infty \frac{q^{4n^2+6k^2+8nk}}{(q^2;q^2)_k(-q;q)_{2k}(q^4;q^4)_n} = \prod_{n=1}^\infty \frac{1}{1-q^n}, \text{ where } n \not\equiv 0, \pm 7 \text{ (mod 15)}$$

$$(-q^2;q^2)_\infty \sum_{n=0}^\infty \sum_{k=0}^\infty \frac{q^{8n^2+12k^2+16nk}}{(q^4;q^4)_k(-q^2;q^2)_{2k}(q^8;q^8)_n} = \prod_{n=1}^\infty \frac{1}{1-q^n}, \text{ where } n \not\equiv 0, \pm 14 \text{ (mod 30)}$$

$$(-q^3;q^3)_\infty \sum_{n=0}^\infty \sum_{k=0}^\infty \frac{q^{12n^2+18k^2+24nk}}{(q^6;q^6)_k(-q^3;q^3)_{2k}(q^{12};q^{12})_n} = \prod_{n=1}^\infty \frac{1}{1-q^n}, \text{ where } n \not\equiv 0, \pm 21 \text{ (mod 45)}$$

and so on.
For $s = 1,2,3, \ldots$ in (2.6), it gives

$$(-q;q)_\infty \sum_{n=0}^\infty \sum_{k=0}^\infty \frac{q^{4n^2+6k^2+8nk-4n-4k}}{(q^2;q^2)_k(-q;q)_{2k}(q^4;q^4)_n} = \prod_{n=1}^\infty \frac{1}{1-q^n} + \prod_{n=1}^\infty \frac{1}{1-q^n}$$

where $n \not\equiv 0, \pm 3 \text{ (mod 15)}$ and $n \not\equiv 0, \pm 4 \text{ (mod 15)}$ respectively.

$$(-q^2;q^2)_\infty \sum_{n=0}^\infty \sum_{k=0}^\infty \frac{q^{8n^2+12k^2+16nk-8n-8k}}{(q^4;q^4)_k(-q^2;q^2)_{2k}(q^8;q^8)_n} = \prod_{n=1}^\infty \frac{1}{1-q^n} + \prod_{n=1}^\infty \frac{1}{1-q^n}$$

where $n \not\equiv 0, \pm 6 \text{ (mod 30)}$ and $n \not\equiv 0, \pm 8 \text{ (mod 30)}$ respectively. and so on. Similarly, varying s over $1, 2, 3, \ldots\ldots$ in $(3.3) - (3.5)$ and $(3.9) - (3.11)$, we get Rogers Ramanujan Type identities modulo 9, 18, 27, $\ldots\ldots\ldots$ onwards. Also, varying s over 1, 2, 3, onwards in $(4.3) - (4.6)$ and $(5.3) - (5.4)$ we get identities modulo 11, 22, 33, and 45, 90, 135, .onwards respectively.

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First Cycle NAAC Accreditation 2023

Criteria-3
Research, Innovations and Extension

3.3.1 Number of Research papers published per teacher in the Journals notified on UGC Care List during the last five years.

Year	2022-23	2021-22	2020-21	2019-20	2018-19
Number	03	03	00	02	03

The Papers Published in the UCG Care Listed Journals

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Growth of Population in Assam with Special reference to Char Areas: A Threat

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1. Introduction:

Population is the most important component of economic development in a country. Development is consumed by human being either horizontally or vertically. With the rapid growth of population, vertical development has become an alternative way of living for the people. With each addition of population, it is creating pressure on earth. There is no doubt that manpower is essential for economic development, but excess supply of unskilled labour and larger dependent population may not be in the best interest of the country in this juncture (Misra & Puri: 2001). That is why, population may either be an asset or a liability. In case of India, country's existing population is regarded as a liability rather than an asset considering the available utilisable resources and technological progress. Further increase of population will increase burden on the economy. Therefore, it is very important to know about the population structure of a country so as to minimize problems to be arisen. Age and sex structure are one of the most important characteristics of population composition. The usefulness of data on age is more noticeable for other reason also. Apart from purely demographic concerns, the data on age and sex are required for age specific analysis for planning, scientific, technical and commercial purposes. What percentage of population is dependent[1] and what percentage is engaged in productive activities is very important to know from economic point of view. Knowing about the population as per the age composition is very important for more than one reason as;

a) Population of age 0-14 years is dependent group,
b) Population of age 15-60 years is working group and
c) Population of age above 60 years is old-aged and hence dependent group

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[1] Dependency ratio is the ratio of economically active to economically inactive persons.

Population of age 0-14 years is interpreted as gauge of birth rate, while population within the second age group is meant for larger labour force. However, larger population in the age group of 60+ is also dependent group but meeting the criteria of HDI for development.

Population growth in Assam has been a prolonged debate since last decade, i.e., whether it is caused due to immigration or natural growth is a matter of enquiry. Here in this research paper, it is tried to find out the extent of natural growth of population in Assam in general and Char Areas[2] in particular. Char areas are one of the most backward areas of Assam experienced with high birth rate (Begum: 2022), poor living standard (Rahman: 2021), and blamed to be illegally migrated (Islam: 2022).

2. Objectives: Following are important objectives of the present study;

i) To find out age-wise population structure in Assam and Char Areas.

ii) To put policy suggestion on the study

3. Research Methodology: Present study basically depends on both primary and secondary sources of data. Primary sources are collected through direct personal interview using a suitable 'schedule' while secondary data are collected from different secondary sources like books, journal, newspaper, government sources, internets etc.

Char areas of Kamrup District are regarded as the population of the study. There are 15 number of Development Blocks under Kamrup District of Assam of which 5 blocks have char areas. Since, present study is proposed to cover the livelihood of the char people, hence the Development Blocks having char areas are taken as the population of the study.

Households were regarded as the sample unit of survey. The sample was designed on the representation basis. Since, population in the study is quite large, 'sample' had to be selected from some selected blocks as well as villages, therefore, multi-stage random sampling technique was used to select the sample sizes. The villages were selected purposively while the sample households were selected at a random on the basis of simple random sampling. Sample villages were selected purposively for the convenience of data collection. The sampling process undergoes through certain stages. In the first stage, 60% of the char blocks were selected. The selected blocks are Goroimari, Chamaria and Rampur. In the second stage, sample villages were selected shown in the flow chart 3.1. In the third stage, sample households were selected.

Sampling Strategic Table: 3.1

Nos. of Char-chapori Villages of the Blocks	% of Selected Villages	Size of Household in the Selected Villages	% of Selected Households
Having<15 Villages	25	Having<100 HHs	25
Between 16 to 100 Villages	15	Between 101 to 300 HHs	12
>100 Villages	5	>300 HHs	7

Note: HHs implies 'Households'

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[2] Char Areas are basically meant for the sandy land area in the river Brahmaputra where people can live and cultivate. The people dwelling in such areas are isolated from the main land passes a very vulnerable life style frequently affected by flood and river erosion. Most of such people are illiterate and dependent on agriculture.

25 per cent of the villages were selected from those blocks having less than 15 villages, 15 per cent of villages from those having 16 to 100 villages and 5 per cent from those having more than 100 villages. However, 25 per cent households were selected from those villages having less than 100 households, 12 per cent households were selected from those villages having 101 to 300 households and 7 per cent households were selected from those villages having more than 300 households. The process of sample selection is shown in Table 3.2. Accordingly, the total number of sample size would be 240.

TABLE 3.2

Selected Sample Blocks, Sample Villages and Sample Households

| SL. Nos.	Selected Blocks	Villages			HHs of Sample Villages	
		Total	Char	Selected	Total	Selected
1	Goroimari	70	30	4	721	90
2	Chamaria	88	11	3	586	70
3	Rampur	60	13	3	518	80
	Total:	218	54	10	1825	240

4. Data Analysis

The children of age below 15 years are supposed to be the dependency group who are out of working purview. Besides, it is very important indicator in measuring natural growth rate of population by the rationale of, there is a fair amount of confidence that population at this age is least likely be affected by unnatural growth. Table 4.1 & fig-4.1 give age-wise population distribution in the Sample Blocks.

TABLE 4.1

Percentage of Population in different Age Group in the Sample Blocks

Name of Blocks	Age Group					Total
	0-14	15-24	25-44	45-60	Above 60	
Goroimari	46.03	30.49	11.83	8.50	3.14	100
Chamaria	38.67	22.67	22.93	8.53	7.20	100
Rampur	40.68	17.56	25.48	11.35	4.93	100
All Blocks:	42.23	24.01	19.45	9.47	4.84	100

Source: Compiled from Filed Survey, 2017.

FIGURE 4.1
Age-wise Distribution of Population in the Sample Blocks
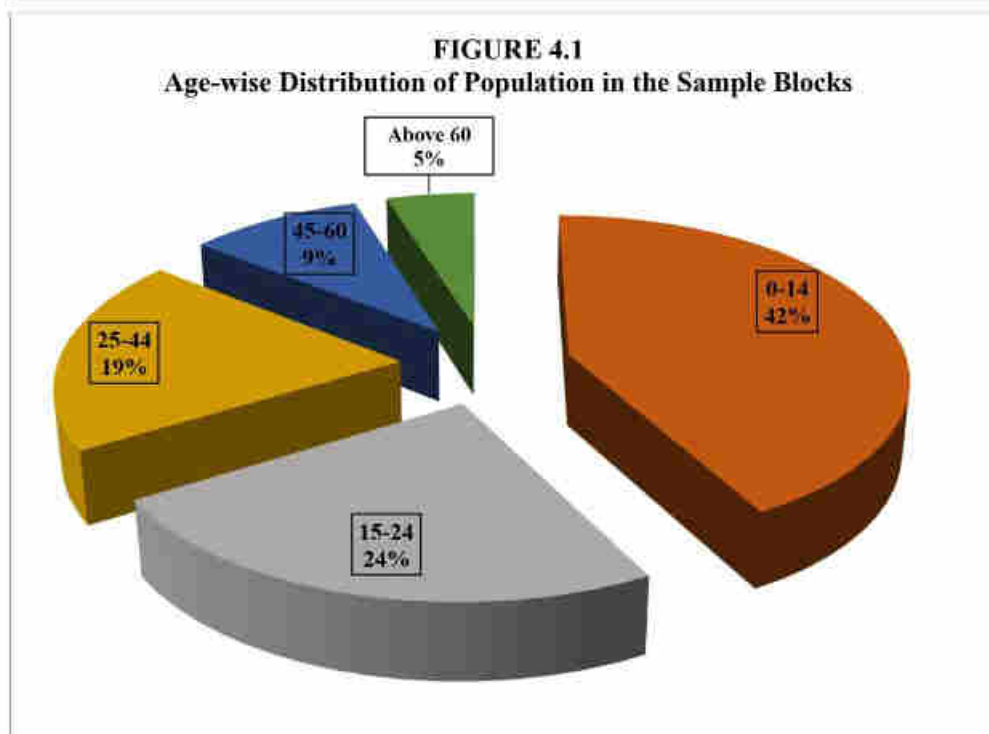
The table 4.1 reveals that population age below 15 years are 42.23 per cent in the Sample Blocks. It diverges from 38.67 per cent in Chamaria Block to 46.03 per cent in Goroimari Block. It is 40.68 per cent in Rampur Block. In 42.23 per cent population of age group 0-14 years, share of population below 7 years is 15.18 per cent (shown in Appendix 4.1) which may be interpreted a little decline in the growth rate of population at present.

However, population in the age group 15-24 years, 25-44 years & 45-60 years are 24.01 per cent, 19.45 per cent and 9.47 per cent respectively. Percentage of population in age group 15-24 years & 25-44 years show skewed against having a similarity in age group 45-60 years among the blocks. Aged population (above 60 years) records only 4.84 per cent in the surveyed blocks that might designate lower value of HDI in terms of longevity of life. People are less conscious about their health and education. Most of times they remain busy in agricultural field. The Char people are realised to be physically olden even before 60 years due to poor and unconscious diet pattern. There are hardly any people seen who is health sensitive. Consequence to it, people fall in sick in their old age and easily embrace death. That is why number of population in the age group above 60 years is less. Table 4.2.gives age-wise comparison of population between the surveyed blocks and Assam.

TABLE 4.2

Percentage of Population in different Age Group in Assam and Sample Blocks

State/ Blocks	Age Group					Total
	0-14	15-24	25-44	45-60	Above 60	
Assam	32.84	19.16	29.60	11.68	6.72	100
Sample Blocks	42.23	24.01	19.45	9.47	4.84	100

Sources:

i)   Compiled from Field Survey, 2017.
ii)   Population Census, 2011.

Note: Population of Assam of age group (45-60) actually includes in age group (45-59

Percentage of child population (0-14) in the studied area (42.23%) is considerably higher compared to state figure (32.84%). National figure in the corresponding age group was 29.5 per cent in 2011. It shows that growth rate of population is much higher in the surveyed area. There are several reason such discrepancy in the growth of population. First of all, there is cent per cent Muslim people dwelling in the area, "growth rate among Muslims is much higher than that of Hindus as a whole. But when we separately examine the growth rates of SC and ST (within Hindus), it is seen that their growth rates area still higher than that of Muslims. This trend exists almost everywhere in India (Mannan: 2017." Secondly, it is the poverty, illiteracy and other social backwardness works in such rapid growing population in the area.

Population at the age group of 15-24 years are supposed to be in the early working stage and the age group of 25-44 are full working stage. The population in this two groups are 24.01 per cent & 19.45 per cent in the Sample Blocks against 19.16 per cent & 29.60 per cent in the state. Percentage of population in the early working age is more in the studied area and lower in the full working age compared to state.

Population in the age group 45-60 years also fall within the working group but as age nears to 60 years, their physical fitness decays and consequently productivity also starts to decline. Percentage of population above 60 years is very important as the indicator of measuring economic development. Higher the percentage of population above 60 years of age, its HDI value increases and vice-versa. Figures in the age group of 60 years for all India, Assam and Sample Blocks are 8%, 6.72% and 4.84% respectively. It may be interpreted that there is gradual deteriorated longevity of life in rural India.

Actually, population in the age group of 15-60 years are supposed to carry the dependency load of the population below 15 years as well as population above 60 years of age. The population within the age group 15-60 years for all India, Assam and Sample Blocks register 62.5%, 60.44% & 52.93% respectively. While, figures of dependency age group (population of age below 15 years & above 60 years) in all India, Assam and Sample Blocks register 37.5%, 39.56% & 47.07% respectively. Population structure of Norway (the country with world highest HDI) in the age group 0-14 years, 15-64 years and above 65 years register 18.8%, 66.2% & 15% in 2010 respectively (Wikipedia: 2017). It exhibits an opposite picture with India inferring faster growth rate of population in the country. In this study, some more phenomena would be investigated which will clear for such discrepancy of population structure in different age group. Fig-4.2 shows bifurcation of population in different age group in Assam & surveyed area.

FIGURE 4.2
% of Population in different Age Group in Assam and Sample Blocks
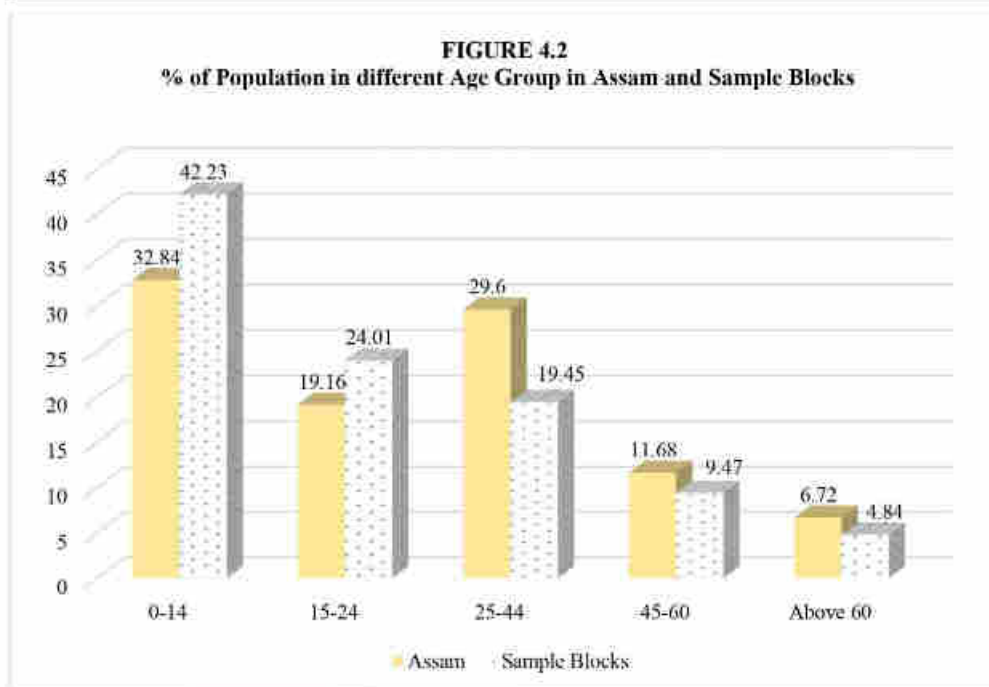
From the above discussion, it can be concluded that countrywide growth rate of population is faster which is intensified in the rural areas. About 99 per cent of the total land masses in the state belongs to the rural area and 50 per cent of the total land area is utilized for cultivation GOA: 2012). High birth rate works behind sky figuring of population in the age group below 15 years for which precaution is urgently needed. Women and children are very vulnerable in the Char areas of Assam. Char people are less bothered about their physical & health condition. Most of the people in the area are the victim of malnutrition. Even pregnant woman as well as children don't get any special care in the way of living.

Children are regarded as the present asset in the Char area. In most of the cases, children are seen to be used as the source of income. In agrarian society, certain factors work behind inducing more children. Coal & Hoover rightly remarked, "These beliefs and customs are reinforced by the economic advantages to a peasant family of a larger number of births. The burden of child care rests primarily on women in a peasant society and cost of educating children are minimal because of the level of education given. Children contribute at an early age to agrarian production and are to traditional source of security in the old age of parents (Coale & Hoover: 1985). They are engaged in earnings hence either not sent for schooling or immediately drooped out from the field of schooling.

IMAGE 4.1
Women and Children in the Char of Goroimari Block

5. Findings: Following are some of the findings summarised of the present study.

i) Percentage of population in the age group 0-14 years was found to be higher (42.23 %) in the Char areas compared to Assam (32.84 %) in the corresponding age group.

ii) Population in the working age group (25-60) was found to be lower (28.92%) in the surveyed areas compared to state (41.28%) in the corresponding age group.

iii) Population in the age group of 60+ was found to be 4.84% in the studied area and 6.72% in the state.

iv) The population within the age group 15-60 years for all India, Assam and Sample Blocks register 62.5%, 60.44% & 52.93% respectively.

v) Population in the dependency age group (population of age below 15 years & above 60 years) in all India, Assam and Sample Blocks register 37.5%, 39.56% & 47.07% respectively.

6. Suggestions:

i)   Population policy of Assam should be properly implemented in the state Assam especially in rural areas. Char areas should by no means be neglected in this regard.

ii)   Way of population control should be familiarized among the rural population in the state. There should be organized awareness camp among the illiterate people in the state in general and char area in particular.

iii)   Proper health facility should be provided among the people of the rural areas. Facility related to population control should be easily accessible among the rural people.

iv)   Idle family norms should be implemented among the people of Assam. However, people who are going for sterilization may be encouraged and awarded in this regard. Incentive may be offered to such family who are implementing such policy.

vi)   Population education should be important priority of the government policy. RTE should properly implemented in the char areas of Assam.

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Few More Identities of Rogers-Ramanujan Type

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ABSTRACT: We derive some Identities of Rogers-Ramanujan Type modulo 3s, 10s and 15s where s is any finite positive integer. Particular cases for such identities modulo 20, 30 and 45 also have been derived.

Key Words: Rogers-Ramanujan Identity, Basic Hypergeometric Series, Jacobi's Triple Product Identity, Bailey's Lemma etc.

1. **Introduction:** The following two identities, namely for $|q|<1$,

$$\sum_{n=0}^{\infty} \frac{q^{n^2}}{(q;q)_n} = \prod_{n=1}^{\infty} \frac{1}{1-q^n}, n \not\equiv 0, \pm 2 \ (mod\ 5)$$

$$\sum_{n=0}^{\infty} \frac{q^{n^2+n}}{(q;q)_n} = \prod_{n=1}^{\infty} \frac{1}{1-q^n}, n \not\equiv 0, \pm 1 \ (mod\ 5)$$

where $(q;q)_n = (1-q)(1-q^2)..(1-q^n)$,

are called the Rogers-Ramanujan Identities and they have motivated extensive research work over the past hundred years. In the recent decades, several eminent mathematicians like W. N. Bailey, G.N. Watson, G.E. Andrews, A. Verma and V.K Jain have derived many identities of the Rogers-Ramanujan Type. In this paper, we have derived few more identities of the Rogers-Ramanujan Type.

For $|q|<1$, the q −shifted factorial is defined by

$$(a;q)_0 = 1$$
$$(a;q)_n = \prod_{k=0}^{n-1}(1 - aq^k), \text{ for } n{\geq}1$$
$$\text{and} \quad (a;q)_\infty = \prod_{k=1}^{\infty}(1 - aq^k).$$

It follows that $\quad (a;q)_n = \dfrac{(a;q)_\infty}{(aq^n;q)_\infty}$

The multiple q-shifted factorials is defined by

$$(a_1, a_2, \ldots . a_m; q)_n = (a_1;q)_n (a_2;q)_n \ldots (a_m;q)_n$$

$$(a_1, a_2, \ldots . a_m; q)_\infty = (a_1;q)_\infty (a_2;q)_\infty \ldots (a_m;q)_\infty$$

The Basic Hyper geometric Series is

$$_{p+1}\phi_{p+r}\begin{pmatrix} a_1, a_2, \ldots\ldots, a_{p+1}; q; x \\ b_1, b_2, \ldots\ldots, b_{p+r} \end{pmatrix} = \sum_{n=0}^{\infty} \frac{(a_1;q)_n (a_2;q)_n \ldots (a_{p+1};q)_n x^n (-1)^{nr} q^{\frac{n(n-1)r}{2}}}{(q;q)_n (b_1:q)_n (b_2;q)_n \ldots (b_{p+r};q)_n}$$

The series $_{p+1}\phi_{p+r}$ converges for all positive integers r and for all x. For r = 0 it converges only when $|x|<1$.

The q-analogue of Saalchutz Theorem is

$$_3\phi_2\begin{pmatrix} e, f, q^{-n}; q \\ \dfrac{aq}{c}, \dfrac{cefq^{-n}}{a} \end{pmatrix} = \dfrac{\left(\dfrac{aq}{ec}\right)_n \left(\dfrac{aq}{cf}\right)_n}{\left(\dfrac{aq}{c}\right)_n \left(\dfrac{aq}{cef}\right)_n} \qquad (1.1)$$

We require the following Jacobi's Triple Product Identity (See [3], 2.2.10 and 2.2.11)

$(zq^{1/2}, z^{-1}q^{1/2}, q; q)_\infty = \sum_{n=-\infty}^{\infty}(-1)^n z^n q^{\frac{n^2}{2}}$, and its corollary is given by

$$\sum_{n=-\infty}^{\infty}(-1)^n q^{\frac{(2k+1)n(n+1)}{2}-in} = \sum_{n=0}^{\infty}(-1)^n q^{(2k+1)n(n+1)-in}.(1-q^{(2n+1)i})$$

$$= \prod_{n=0}^{\infty}(1-q^{(2k+1)(n+1)})(1-q^{(2k+1)n+i})(1-q^{(2k+1)(n+1)-i}) \qquad (1.2)$$

The following Lemma is due to W. N. Bailey: (See [1], (2.1.5))

If p is a non-negative integer, then

$$(aq;q)_\infty \sum_{n=0}^{\infty} a^n . q^{n^2-pn} . \beta_n = \sum_{j=0}^{p} \frac{(q^{-p};q)_j (-a)^j q^{j(j+1)/2}}{(q;q)_j} . \sum_{n=0}^{\infty} a^n . q^{n^2-pn+2nj} . \alpha_n \qquad (1.3)$$

where $\quad \beta_n = \sum_{k=0}^{n} \dfrac{\alpha_k}{(q;q)_{n-k}(aq;q)_{n+k}}$

2. We begin by introducing the following transformations:

$$
{}_{12}\phi_{11}\left(\begin{array}{c} a, q\sqrt{a}, -q\sqrt{a}, x, \omega x, \omega^2 x, y, \omega y, \omega^2 y, q^{-n}, \omega q^{-n}, \omega^2 q^{-n}; q; \dfrac{a^4 q^{4+3n}}{x^3 y^3} \\[2mm] \sqrt{a}, -\sqrt{a}, \dfrac{aq}{x}, \dfrac{aq\omega^2}{x}, \dfrac{aq\omega}{x}, \dfrac{aq}{y}, \dfrac{aq\omega^2}{y}, \dfrac{aq\omega}{y}, aq^{1+n}, \omega^2 aq^{1+n}, \omega aq^{1+n} \end{array}\right)
$$

$$
= \frac{(a^3 q^3; q^3)_n \left(\dfrac{a^3 q^3}{x^3 y^3}; q^3\right)_n}{\left(\dfrac{a^3 q^3}{x^3}; q^3\right)_n \left(\dfrac{a^3 q^3}{y^3}; q^3\right)_n} \cdot {}_6\phi_5\left(\begin{array}{c} aq, aq^2, aq^3, x^3, y^3, q^{3n}; q^3 \\[2mm] (aq)^{3/2}, -(aq)^{3/2}, a^{3/2}q^3, -a^{3/2}q^3, \dfrac{x^3 y^3}{a^3} q^{-3n} \end{array}\right) \tag{2.1}
$$

$$
{}_{12}\phi_{11}\left(\begin{array}{c} a, q^3\sqrt{a}, -q^3\sqrt{a}, x, xq, xq^2, y, yq, yq^2, q^{-n}, q^{-n+1}, q^{-n+2}; q^3; \dfrac{a^4 q^{3+3n}}{x^3 y^3} \\[2mm] \sqrt{a}, -\sqrt{a}, \dfrac{aq^3}{x}, \dfrac{aq^2}{x}, \dfrac{aq}{x}, \dfrac{aq^3}{y}, \dfrac{aq^2}{y}, \dfrac{aq}{y}, aq^{3+n}, aq^{2+n}, aq^{1+n} \end{array}\right)
$$

$$
= \frac{(aq; q)_n \left(\dfrac{aq}{xy}; q\right)_n}{\left(\dfrac{aq}{x}; q\right)_n \left(\dfrac{aq}{y}; q\right)_n} \cdot {}_6\phi_5\left(\begin{array}{c} a^{\frac{1}{3}}, \omega a^{\frac{1}{3}}, \omega^2 a^{\frac{1}{3}}, x, y, q^{-n}; q; q \\[2mm] a^{\frac{1}{2}}, -a^{\frac{1}{2}}, (aq)^{\frac{1}{2}}, -(aq)^{\frac{1}{2}}, \dfrac{xy}{a} q^{-n} \end{array}\right) \tag{2.2}
$$

Proof of (2.1) and (2.2): (See [1], (1.5) and (1.6) respectively)

The multiple series generalization of (2.2) can be given in the form: (See [1], (4.5)).

$$
{}_{2p-4}\phi_{2p+3}\left(\begin{array}{c} a, q^3\sqrt{a}, -q^3\sqrt{a}, x, xq, xq^2, y, yq, yq^2, (c_{p-4}), (d_{p-4}), q^{-n}, q^{-n+1}, q^{-n+2}; q^3; \dfrac{a^p q^{3p-9+3n}}{x^3 y^3 c_1 d_1 \dots c_{p-4} d_{p-4}} \\[2mm] \sqrt{a}, -\sqrt{a}, \dfrac{aq^3}{x}, \dfrac{aq^2}{x}, \dfrac{aq}{x}, \dfrac{aq^3}{y}, \dfrac{aq^2}{y}, \dfrac{aq}{y}, \dfrac{aq^3}{(c_{p-4})}, \dfrac{aq^3}{(d_{p-4})}, aq^{3+n}, aq^{2+n}, aq^{1+n} \end{array}\right)
$$

$$
= \frac{(aq; q)_n \left(\dfrac{aq}{xy}; q\right)_n}{\left(\dfrac{aq}{x}; q\right)_n \left(\dfrac{aq}{y}; q\right)_n} \sum_{r_1, r_2, \dots r_{p-4}} \prod_{j=1}^{p-4} \left\{ \frac{\left(\dfrac{aq^3}{c_j d_j}; q^3\right)_{r_j} (c_j; q^3)_{M_{j-1}} (d_j; q^3)_{M_{j-1}}}{(q^3; q^3)_{r_j} \left(\dfrac{aq^3}{e_j}; q^3\right)_{M_j} \left(\dfrac{aq^3}{d_j}; q^3\right)_{M_j}} \right\} \cdot
$$

$$\frac{(x;q)_{3M_{p-4}}(y;q)_{3M_{p-4}}(q^{-n};q)_{3M_{p-4}}(aq^3;q^3)_{2M_{p-4}}q^{2M_{p-4}(M_{p-4}+1)}}{(aq;q)_{6M_{p-4}}\left(\frac{xy}{a}q^{-n};q\right)_{3M_{p-4}}}.$$

$$(a)^{r_{p-4}}(\frac{a^2q^3}{c_{p-4}d_{p-4}})^{r_{p-5}}\cdots\left(\frac{a^{p-4}q^{3p-15}}{c_{p-4}d_{p-4}\cdots c_2d_2}q^2\right)^n.$$

$${}_6\phi_5\left(\begin{matrix}a^{\frac{1}{3}}q^{2M_{p-4}}, \omega a^{\frac{1}{3}}q^{2M_{p-4}}, \omega^2 a^{\frac{1}{3}}q^{2M_{p-4}}, xq^{3M_{p-4}}, yq^{3M_{p-4}}, q^{-n+3M_{p-4}}; q; q\\ a^{\frac{1}{2}}q^{3M_{p-4}}, -a^{\frac{1}{2}}q^{3M_{p-4}}, a^{\frac{1}{2}}q^{\frac{1}{2}+3M_{p-4}}, -a^{\frac{1}{2}}q^{\frac{1}{2}+3M_{p-4}}, \frac{xy}{a}q^{-n+3M_{p-4}}\end{matrix}\right)$$

$$(2.3)$$

for $p \geq 4$ (ω is the imaginary cube root of unity), and $M_i = r_1 + r_2 + \cdots + r_i, M_{-1} = M_0 = 0$

Main Results:

3. Rogers-Ramanujan Type Identities Modulo 15s: (where s is any finite positive integer)

Replacing q by q^s in (2.1), it can be written as,

$$\sum_{k=0}^{n}\frac{(a;q^s)_k(a^2q^{2s};q^{2s})_k(x^3;q^{3s})_k(y^3;q^{3s})_k(q^{-3ns};q^{3s})_k(\frac{a^4q^{4s+3ns}}{x^3y^3})^k}{(q^s;q^s)_k(a^2q^{2s};q^{2s})_k(\frac{a^3q^{3s}}{x^3};q^{3s})_k(\frac{a^3q^{3s}}{y^3};q^{3s})_k(a^3q^{3s+3ns};q^{3s})_k}$$

$$=\frac{(a^3q^{3s};q^{3s})_n\left(\frac{a^3q^{3s}}{x^3y^3};q^{3s}\right)_n}{\left(\frac{a^3q^{3s}}{x^3};q^{3s}\right)_n\left(\frac{a^3q^{3s}}{y^3};q^{3s}\right)_n}\sum_{k=0}^{n}\frac{(aq^s;q^{3s})_k(aq^{2s};q^{3s})_k(aq^{3s};q^{3s})_k(x^3;q^{3s})_k(y^3;q^{3s})_k(q^{-3ns};q^{3s})_kq^{3k}}{(q^{3s};q^{3s})_k(a^2q^{3s};q^{6s})_k(a^3q^{6s};q^{6s})_k(\frac{x^3y^3q^{-3ns}}{a^3};q^{3s})_k} \quad (3.1)$$

Taking $x, y \to \infty$ (3.1), we find after some simplification, the following equation,

$$\sum_{k=0}^{n}\frac{(-1)^k(aq^s;q^s)_{k-1}(1-a^2q^{2ks})a^{4k}q^{\frac{9k^2s-ks}{2}}}{(q^s;q^s)_k(1+a)(a^3q^{3s};q^{3s})_{n+k}(q^{3s};q^{3s})_{n-k}}=\sum_{k=0}^{n}\frac{a^{3k}(aq^s;q^s)_{3k}q^{3k^2s}}{(q^{2s};q^{3s})_k(a^3q^{3s};q^{3s})_{2k}(q^{3s};q^{3s})_{n-k}} \quad (3.2)$$

The left hand side of Bailey's Lemma (1.3) for $a = a^3$, $q = q^{3s}$, $\alpha_0 = 1$, $\alpha_{k+1} = 0$ and,

$$\alpha_k = \frac{(-1)^k(aq^s;q^s)_{k-1}(1-a^2q^{2ks})a^{4k}q^{\frac{9k^2s-ks}{2}}}{(q^s;q^s)_k(1+a)}, \text{ gives,}$$

$$(a^3 q^{3s}; q^{3s})_\infty \sum_{n=0}^\infty \sum_{k=0}^\infty \frac{a^{3n+6k}(aq^s;q^s)_{3k} \, q^{3(n+k)^2 s - 3p(n+k)s + 3k^2 s}}{(q^{3s};q^{3s})_k (a^3 q^{3s};q^{3s})_{2k}(q^{3s};q^{3s})_n} \quad , \text{ (upon using (3.2))} \tag{3.3}$$

The corresponding Right hand side of Bailey's Lemma (1.3) for the same, yields

$$\sum_{j=0}^p \frac{(q^{-3ps};q^{3s})_j (-1)^j a^{3j} q^{\frac{3j(j+1)s}{2}}}{(q^{3s};q^{3s})_j} \cdot \sum_{n=0}^\infty \frac{(-1)^n a^{7n}(aq^s;q^s)_{n-1}(1-a^2 q^{2ns})q^{\frac{15n^2 s - ns - 6pns + 12njs}{2}}}{(q^s;q^s)_n(1+a)} \tag{3.4}$$

Equating (3.3) and (3.4), we obtain,

$$(a^3 q^{3s};q^{3s})_\infty \sum_{n=0}^\infty \sum_{k=0}^\infty \frac{a^{3n+6k}(aq^s;q^s)_{3k} \, q^{3(n+k)^2 s - 3p(n+k)s + 3k^2 s}}{(q^{3s};q^{3s})_k (a^3 q^{3s};q^{3s})_{2k}(q^{3s};q^{3s})_n}$$

$$= \sum_{j=0}^p \frac{(q^{-3ps};q^{3s})_j (-1)^j a^{3j} q^{\frac{3j(j+1)s}{2}}}{(q^{3s};q^{3s})_j} \cdot \sum_{n=0}^\infty \frac{(-1)^n a^{7n}(aq^s;q^s)_{n-1}(1-a^2 q^{2ns})q^{\frac{15n^2 s - ns - 6pns + 12njs}{2}}}{(q^s;q^s)_n(1+a)} \tag{3.5}$$

Setting $a = 1$ and placing $p = 0, 1$ successively in (3.5), we get the following Identities upon using (1.2):

$$\frac{(q^{3s};q^{3s})_\infty}{(q^s;q^s)_\infty} \sum_{n=0}^\infty \sum_{k=0}^\infty \frac{(q^s;q^s)_{3k} \, q^{3(n+k)^2 s + 3k^2 s}}{(q^{3s};q^{3s})_k (q^{3s};q^{3s})_{2k}(q^{3s};q^{3s})_n}$$

$$= \frac{1}{2(q^s;q^s)_\infty} \sum_{n=0}^\infty \frac{(-1)^n (q^s;q^s)_{n-1}(1-q^{2ns})q^{\frac{15n^2 s - ns}{2}}}{(q^s;q^s)_n}$$

$$= \frac{1}{2(q^s;q^s)_\infty} \sum_{n=-\infty}^\infty (-1)^n \, q^{\frac{15n^2 s - ns}{2}}$$

$$= \frac{1}{2} \prod_{n=1}^\infty \frac{1}{1-q^n}, \text{ where } n \not\equiv 0, \pm 8s \pmod{15s} \tag{3.6}$$

$$2 \frac{(q^{3s};q^{3s})_\infty}{(q^s;q^s)_\infty} \sum_{n=0}^\infty \sum_{k=0}^\infty \frac{(q^s;q^s)_{3k} \, q^{3(n+k)^2 s - 3(n+k)s + 3k^2 s}}{(q^{3s};q^{3s})_k (q^{3s};q^{3s})_{2k}(q^{3s};q^{3s})_n}$$

$$= \frac{1}{(q^s;q^s)_\infty} \sum_{n=-\infty}^\infty (-1)^n \, q^{\frac{15n^2 s + 7ns}{2}} + \frac{1}{(q^s;q^s)_\infty} \sum_{n=-\infty}^\infty (-1)^n \, q^{\frac{15n^2 s + 5ns}{2}}$$

$$= \prod_{n=1}^\infty \frac{1}{1-q^n} \qquad + \qquad \prod_{n=1}^\infty \frac{1}{1-q^n} \tag{3.7}$$

where $n \not\equiv 0, 4s \pmod{15s}$, $\quad n \not\equiv 0, 5s \pmod{15s}$

4. Rogers-Ramanujan Type Identities Modulo 3s: (where s is any finite positive integer)

Taking $x, y \to 0$ in (4.1) and then replacing q by q^{-s}, we find that,

$$\sum_{k=0}^{n} \frac{(-1)^k a^{-2k}(aq^{-3s};q^{-3s})_{k-1}(1-aq^{-6ks})q^{\frac{(9k^2s+3ks)}{2}}}{(q^{-3s};q^{-3s})_k(aq^{-s};q^{-s})_{n+3k}(q^{-s};q^{-s})_{n-3k}}$$

$$= \frac{(-1)^n a^{-n} q^{(n^2s+ns)/2}}{(q^{-s};q^{-s})_n} \cdot \sum_{k=0}^{n} \frac{(-1)^k (aq^{-3s};q^{-3s})_{k-1} \, q^{\frac{-k^2s-3ks+2nks}{2}}}{(q^{-s};q^{-s})_k(aq^{-2s};q^{-2s})_{k-1}(aq^{-s};q^{-2s})_{2k}(q^{-s};q^{-s})_{n-k}} \qquad (4.1)$$

The Bailey's Lemma (1.3) for $q = q^{-2s}$, $\alpha_0 = 1$, $\alpha_{3k+1} = 0$ and,

$$\alpha_{3k} = \frac{(-1)^k a^{-2k}(aq^{-6s};q^{-6s})_{k-1}(1-aq^{-12ks})q^{(9k^2s+3ks)}}{(q^{-6s};q^{-6s})_k}, \text{ gives (upon using (4.1))},$$

$$(aq^{-s};q^{-s})_\infty \sum_{n=0}^{\infty} \sum_{k=0}^{\infty} \frac{(-1)^{n+2k}(aq^{-3s};q^{-3s})_{k-1} \, q^{\frac{-(n+k)^2s+(n+k)s+2p(n+k)s+k^2s-3ks+2nks}{2}}}{(q^{-s};q^{-s})_k(aq^{-2s};q^{-2s})_{k-1}(aq^{-s};q^{-2s})_{2k}(q^{-s};q^{-s})_n}$$

$$= \sum_{j=0}^{p} \frac{(q^{ps};q^{-s})_j(-a)^j q^{-j(j+1)s/2}}{(q^{-s};q^{-s})_j} \cdot \sum_{n=0}^{\infty} \frac{(-1)^n a^n(aq^{-3s};q^{-3s})_{n-1}(1-aq^{-6ns})q^{\frac{(3n^2s+3ns+6pns-12njs)}{2}}}{(q^{-3s};q^{-3s})_n} \qquad (4.2)$$

Setting $a = 1$ and then placing $p = 0,1$ successively in (4.2), we get the following Identities upon using (1.2):

$$\frac{(q^{-s};q^{-s})_\infty}{(q^s;q^s)_\infty} \sum_{n=0}^{\infty} \sum_{k=0}^{\infty} \frac{(-1)^{n+2k}(q^{-3s};q^{-3s})_{k-1} \, q^{\frac{-(n+k)^2s+(n+k)s+k^2s-3ks+2nks}{2}}}{(q^{-s};q^{-s})_{n+k}(q^{-s};q^{-s})_k(q^{-2s};q^{-2s})_{k-1}(q^{-s};q^{-2s})_{2k}(q^{-s};q^{-s})_n}$$

$$= \frac{1}{(q^s;q^s)_\infty} \sum_{n=-\infty}^{\infty} (-1)^n \, q^{\frac{(3n^2s+3ns)}{2}}$$

$$= \prod_{n=1}^{\infty} \frac{1}{1-q^n}, \text{ where } n \not\equiv 0 \ (\text{mod } 3s) \qquad (4.3)$$

$$\frac{(q^{-s};q^{-s})_\infty}{(q^s;q^s)_\infty} \sum_{n=0}^{\infty} \sum_{k=0}^{\infty} \frac{(-1)^{n+2k}(q^{-2s};q^{-3s})_{k-1} \, q^{\frac{-(n+k)^2s+3(n+k)s+k^2s-3ks+2nks}{2}}}{(q^{-s};q^{-s})_k(q^{-2s};q^{-2s})_{k-1}(q^{-s};q^{-2s})_{2k}(q^{-s};q^{-s})_n}$$

$$= \frac{1}{(q^s;q^s)_\infty} \sum_{n=-\infty}^{\infty} (-1)^n \, q^{\frac{3n^2s+3ns}{2}} + \frac{1}{(q^s;q^s)_\infty} \sum_{n=-\infty}^{\infty} (-1)^n \, q^{\frac{3n^2s+9ns}{2}}$$

$$= 2 \cdot \prod_{n=1}^{\infty} \frac{1}{1-q^n}, \text{ where } n \not\equiv 0 \ (\text{mod } 3s) \qquad (4.3)$$

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5. Rogers-Ramanujan Type Identities Modulo 10s: (where s is any finite positive integer)

Setting $p = 5, c_1 = z, d_1 = zq$ in the transformation (2.3), we get,

$$_{14}\phi_{13}\left(\begin{array}{c} a, q^3\sqrt{a}, -q^3\sqrt{a}, x, xq, xq^2, y, yq, yq^2, z, zq, q^{-n}, q^{-n+1}, q^{-n+2}; q^3, \dfrac{a^5 q^{6+3n}}{x^3 y^3 z^2 q} \\ \sqrt{a}, -\sqrt{a}, \dfrac{aq^3}{x}, \dfrac{aq^2}{x}, \dfrac{aq}{x}, \dfrac{aq^3}{y}, \dfrac{aq^2}{y}, \dfrac{aq}{y}, \dfrac{aq^3}{z}, \dfrac{aq^2}{z}, aq^{1+n}, aq^{2+n}, aq^{1+n} \end{array}\right)$$

$$= \dfrac{(aq;q)_n \left(\dfrac{aq}{xy};q\right)_n}{\left(\dfrac{aq}{x};q\right)_n \left(\dfrac{aq}{y};q\right)_n} \sum_{r=0}^{\infty} \dfrac{(\frac{aq^2}{z^2};q^3)_r (x;q)_{3r}(y;q)_{3r}(q^{-n};q)_{3r}(aq^3;q^3)_{2r} q^{3r(r+1)} a^r}{(q^3;q^3)_r (\frac{aq^3}{z};q^3)_r (\frac{aq^2}{z};q^3)_r (aq;q)_{6r} (\frac{xyq^{-n}}{a};q)_{3r}} \times$$

$$_6\phi_5\left(\begin{array}{c} a^{\frac{1}{3}}q^{2r}, \omega a^{\frac{1}{3}}q^{2r}, \omega^2 a^{\frac{1}{3}}q^{2r}, xq^{3r}, yq^{3r}, q^{-n+3r}; q; q \\ a^{\frac{1}{2}}q^{3r}, -a^{\frac{1}{2}}q^{3r}, a^{\frac{1}{2}}q^{\frac{1}{2}+3r}, -a^{\frac{1}{2}}q^{\frac{1}{2}+3r}, \dfrac{xy}{a}q^{-n+3r} \end{array}\right)$$

$$\hspace{12cm} (5.1)$$

Letting $n, x, y, z \to \infty$ in (5.1) and then replacing q by $q^{2s/3}$, we get,

$$(aq^{\frac{2s}{3}}; q^{\frac{2s}{3}})_\infty \sum_{r=0}^{\infty}\sum_{k=0}^{\infty} \dfrac{(aq^{2s};q^{2s})_{2r+k-1} a^r \cdot q^{8r^2 s + \frac{2}{3}k^2 s + 4rks}}{(aq^{\frac{2s}{3}};q^{\frac{2s}{3}})_{2k+6r}(q^{\frac{2s}{3}};q^{\frac{2s}{3}})_k (q^{2s};q^{2s})_r}$$

$$= \sum_{k=0}^{\infty} \dfrac{(-1)^k a^{2k}(aq^{2s};q^{2s})_{k-1}(1-aq^{4ks}) q^{5k^2 s - ks}}{(q^{2s};q^{2s})_k} \hspace{3cm} (5.2)$$

Putting $a = 1, q^2$ successively in (5.2), we get the following two identities upon using (1.2):

$$\dfrac{(q^{\frac{2s}{3}};q^{\frac{2s}{3}})_\infty}{(q;q)_\infty} \sum_{r=0}^{\infty}\sum_{k=0}^{\infty} \dfrac{(q^{2s};q^{2s})_{2r+k-1} q^{8r^2 s + \frac{2}{3}k^2 s + 4rks}}{(q^{\frac{2s}{3}};q^{\frac{2s}{3}})_{2k+6r}(q^{\frac{2s}{3}};q^{\frac{2s}{3}})_k (q^{2s};q^{2s})_r} = \dfrac{1}{(q;q)_\infty} \cdot \sum_{k=0}^{\infty} \dfrac{(-1)^k (q^{2s};q^{2s})_{k-1}(1-q^{4ks}) q^{5k^2 s - ks}}{(q^{2s};q^{2s})_k}$$

$$= \dfrac{1}{(q;q)_\infty} \cdot \sum_{k=-\infty}^{\infty} (-1)^k q^{5k^2 s + ks}$$

$$= \prod_{k=1}^{\infty} \dfrac{1}{1-q^k}, \text{ where } k \not\equiv 0, \pm 4s \pmod{10s} \hspace{2cm} (5.3)$$

$$\dfrac{(q^{2s};q^{\frac{2s}{3}})_\infty}{(q;q)_\infty} \sum_{r=0}^{\infty}\sum_{k=0}^{\infty} \dfrac{(q^{4s};q^{2s})_{2r+k-1} q^{8r^2 s + \frac{2}{3}k^2 s + 4rks + 2rs}}{(q^{\frac{8s}{3}};q^{\frac{2s}{3}})_{2k+6r}(q^{\frac{2s}{3}};q^{\frac{2s}{3}})_k (q^{2s};q^{2s})_r}$$

$$= \frac{1}{(q;q)_\infty} \cdot \sum_{k=-\infty}^{\infty} (-1)^k \, q^{5k^2 s + 3ks}$$

$$= \prod_{k=1}^{\infty} \frac{1}{1-q^k}, \text{ where } k \not\equiv 0, \pm 2s \pmod{10s} \qquad (5.4)$$

6. Particular cases:

a. Identities Modulo 20:

Letting s = 2 successively in (5.3) and (5.4), we get

$$\frac{(q^{\frac{4}{3}};q^{\frac{4}{3}})_\infty}{(q;q)_\infty} \sum_{r=0}^{\infty} \sum_{k=0}^{\infty} \frac{(q^4;q^4)_{2r+k-1} \cdot q^{16r^2 + \frac{4}{3}k^2 + 8rk}}{(q^{\frac{4}{3}};q^{\frac{4}{3}})_{2k+6r} \, (q^{\frac{4}{3}};q^{\frac{4}{3}})_k \, (q^4;q^4)_r} = \prod_{k=1}^{\infty} \frac{1}{1-q^k}, \text{ where } k \not\equiv 0, \pm 8 \pmod{20} \qquad (6.1)$$

$$\frac{(q^4;q^{\frac{4}{3}})_\infty}{(q;q)_\infty} \sum_{r=0}^{\infty} \sum_{k=0}^{\infty} \frac{(q^0;q^4)_{2r+k-1} \cdot q^{16r^2 + \frac{4}{3}k^2 + 8rk + 4r}}{(q^{\frac{16}{3}};q^{\frac{4}{3}})_{2k+6r} \, (q^{\frac{4}{3}};q^{\frac{4}{3}})_k \, (q^4;q^4)_r} = \prod_{k=1}^{\infty} \frac{1}{1-q^k}, \text{ where } k \not\equiv 0, \pm 4 \pmod{20} \qquad (6.2)$$

b. Identities Modulo 30:

Letting s = 2 successively in (3.6) and (3.7), we get

$$\frac{2 \cdot (q^6;q^6)_\infty}{(q^2;q^2)_\infty} \sum_{n=0}^{\infty} \sum_{k=0}^{\infty} \frac{(q^2;q^2)_{3k} \, q^{6n^2 + 12nk + 12k^2}}{(q^6;q^6)_k (q^6;q^6)_{2k} (q^6;q^6)_n} = \prod_{n=1}^{\infty} \frac{1}{1-q^n}, \text{ where } n \not\equiv 0, \pm 16 \pmod{30} \qquad (6.3)$$

$$\frac{2 \cdot (q^6;q^6)_\infty}{(q^2;q^2)_\infty} \sum_{n=0}^{\infty} \sum_{k=0}^{\infty} \frac{(q^2;q^2)_{3k} \, q^{6n^2 + 12nk + 12k^2 - 6n - 6k}}{(q^6;q^6)_k (q^6;q^6)_{2k} (q^6;q^6)_n} = \prod_{n=1}^{\infty} \frac{1}{1-q^n} \quad + \quad \prod_{n=1}^{\infty} \frac{1}{1-q^n} \qquad (6.4)$$

where $n \not\equiv 0, 8 \pmod{30}$ and $n \not\equiv 0, 10 \pmod{30}$ respectively.

Letting s = 3 successively in (5.3) and (5.4), we get

$$(-q;q)_\infty \sum_{r=0}^{\infty} \sum_{k=0}^{\infty} \frac{(q^6;q^6)_{2r+k-1} \, q^{24r^2 + 2k^2 + 12rk}}{(q^2;q^2)_{2k+6r} \, (q^2;q^2)_k \, (q^6;q^6)_r} = \prod_{k=1}^{\infty} \frac{1}{1-q^k}, \text{ where } k \not\equiv 0, \pm 12 \pmod{30} \qquad (6.5)$$

$$(-q;q)_\infty \sum_{r=0}^{\infty} \sum_{k=0}^{\infty} \frac{(q^6;q^6)_{2r+k} \cdot q^{24 + 2k^2 + 12rk + 6r}}{(q^2;q^2)_{2k+6r+3} \, (q^2;q^2)_k \, (q^4;q^4)_r} = \prod_{k=1}^{\infty} \frac{1}{1-q^k}, \text{ where } k \not\equiv 0, \pm 6 \pmod{30} \qquad (6.6)$$

c. Identities Modulo 45:

Letting s = 3 successively in (3.6) and (3.7), we get

$$\frac{2 \cdot (q^9;q^9)_\infty}{(q^2;q^2)_\infty} \sum_{n=0}^{\infty} \sum_{k=0}^{\infty} \frac{(q^3;q^3)_{3k} \, q^{9n^2 + 18nk + 9k^2}}{(q^9;q^9)_k (q^9;q^9)_{2k} (q^9;q^9)_n} = \prod_{n=1}^{\infty} \frac{1}{1-q^n}, \text{ where } n \not\equiv 0, \pm 24 \pmod{45} \qquad (6.7)$$

$$\frac{2.(q^9;q^9)_\infty}{(q^2;q^2)_\infty} \sum_{n=0}^{\infty} \sum_{k=0}^{\infty} \frac{(q^3;q^3)_{2k}\, q^{9n^2+18nk+18k^2-9n-9k}}{(q^9;q^9)_k (q^9;q^9)_{2k} (q^9;q^9)_n} = \prod_{n=1}^{\infty} \frac{1}{1-q^n} \quad + \quad \prod_{n=1}^{\infty} \frac{1}{1-q^n} \qquad (6.8)$$

where $n \not\equiv 0,12 \pmod{45}$ and $n \not\equiv 0,15 \pmod{45}$ respectively.

7. **Conclusion:** The transformation (2.3) which is the series generalization of (2.2) can also be used for searching further identities of the Rogers-Ramanujan type in this line for some higher values of p. Researchers can also go through the generalization of the transformation (2.1) which is available in the work of Verma and V.K. Jain [1].

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Government Policies for the Economy of North-East India: An Analytical Perspective

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Abstract: North – East India is in the North – East boundary of India, covering with eight states of Indian Union. The region is surrounding by Tibet, Bhutan, Nepal, Myanmar and Bangladesh on all sides except a narrow corridor which connected the region with other states of the Indian Union. North -East region is a beautiful and world bio- diverse region having covered 60% of forest area. Though the region is well endowed with natural resources, the region has been lagging behind than many states of Indian Union.

The development of the NER has remained high on the agenda of both the central and the respective state governments. The North -East Council (NEC) has been playing a major role to take a series of projects for the balanced development of the region. The government has also set up the Department of North Eastern Region (NONER) in 2001 and priority is given to the per capita level of central assistance to the state plans in the North – East region.

Through this research paper the government's policies will be brought into the focus to understand the real development of this region.

Index Terms - North- East Region, Natural Endowment, Government Policies.

I. INTRODUCTION

North – East India is in the North – Eastern boundary of India, covering with eight states of Indian Union. The region is surrounding by Tibet, Bhutan, Nepal, Myanmar and Bangladesh on all sides except a narrow corridor which connected the region with other states of the Indian Union. North -East region is a beautiful and world bio- diverse region having covered 60% of forest area. Though the region is well endowed with natural resources, the region has been lagging behind than many states of Indian Union.

Troubled by history and geo- politics, the north -east region has remained one of the most backward regions of the country. The trauma of partition of the country in 1947 not only put the clock of economic progress back by over a quarter century.

On the eve of independence, the region was in the forefront of development. The British was aware of its rich resource potential and built the country's second earliest railway line between Dibrugarh and Chittagong in the late 19th century. Well connected to the mainland through undivided Bengal and to the seas through the Chittagong port, the North- east region had significant trade and investment. However, with the partition, the Northeast became completely landlocked and connected to the mainland through a narrow 27kilometer Siliguri corridor. Poor connectivity and transportation costs added to non-competitiveness. Stagnancy, remoteness, poor infrastructure, and non- responsive governance provided a fertile ground for various insurgency groups, creating a vicious cycle of low investment and growth in the region.

A major precondition for economic progress is promotion of trade and investment, which calls for immediate effort to end the isolation of the region. The economic isolation of the region has led to is lagging behind in development, with per capita income over 30% lower than the average for the country. The Vision 2020 document adopted by the North Eastern Council shows – assuming that India's gross domestic product (GDP) will grow 9% per year in order to catch up with the income level in the rest of the country by 2020 GDP in the region will have to accelerate from the prevailing 5.3% to 12. 9% per year (NEC 2008). This would require a massive increase in investment. The region has vast potential to increase production and trade in a variety of horticultural products, rubber, herbs and spices and move up the value chain and gain competitive advantage to export processed goods (Brunner 2009, Ch. 3 and Arnold 2009). In addition to agro-processing, the region can also export handicrafts and environmentally sustainable forest products, coals and crude oil and use its considerable power-generation potential for the benefit of the region's people.

The development of the NER has remained high on the agenda of both the central and the respective state governments. The North -East Council (NEC) has been playing a major role to take a series of projects for the balanced development of the region. The North -Eastern Council is the nodal agency for the economic and social development of the North- Eastern Region which consists of the eight States Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland Tripura and Sikkim. The North- Eastern Council was constructed in 1971 by an Act of Parliament. The constitution of the council has marked the beginning of a new chapter of concerted and planned endeavour for the rapid development of the Region. Over the last thirty-five years, NEC has been instrumental in setting in motion a new economic endeavour aimed at removing the basic handicaps

that stood in the way of normal development of the region and has ushered in an era of new hope in this backward area of full of great potentialities.

The Central government has also set up the Department of Development of North - Eastern Region (DONER) in 2001 and the ministry is mainly concerned with the creation of infrastructure for the economic development of this region.

2. **Objectives of the Study:**

The proposed paper's main objectives are taken into accounts of the followings.

> To highlight the socio- economic development achieved as well as taken for the North- East Region by NEC.
> To Explain the Developmental activities are undertaken by the Government for the North- East Region and trade relation with neighbouring countries with NER.

3. **Research Methodology:**

The research paper has been prepared dependent on secondary sources of information. The data are collected from ministry of Development of North Eastern Region as well as various journals published time to time on this regard and also from online information.

4. **Policy achievement and Recent Major Initiatives of NEC:**

The North Eastern Council has been able to significantly improve its financial performance during the years 2014-15 to 2016-17. The Budget allocation has increased from Rs. 579 crores to 969 crores during the three years period as tabulated below.

Table 1- Budgetary allocation for NEC (Rs. in crores)

Financial Year	Budget estimates	Actual allocation	Actual expenditure	Expenditure over allocation (%)
2014-15	770	579	578.98	100.00%
2015-16	773	773	764.82	98.94%
2016-17	800	969	965.81	99.67%
Total	2343	2321	2309.61	99.51%
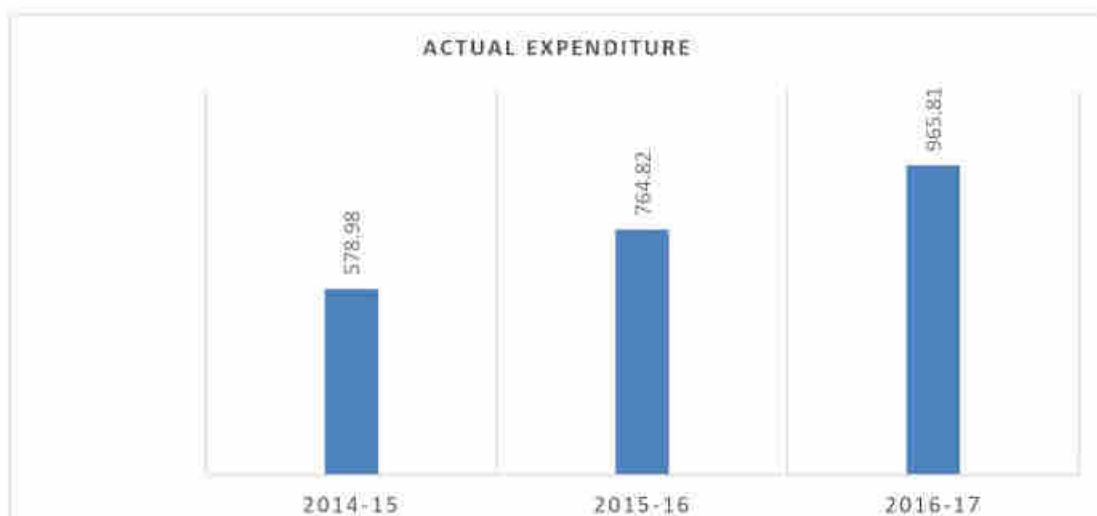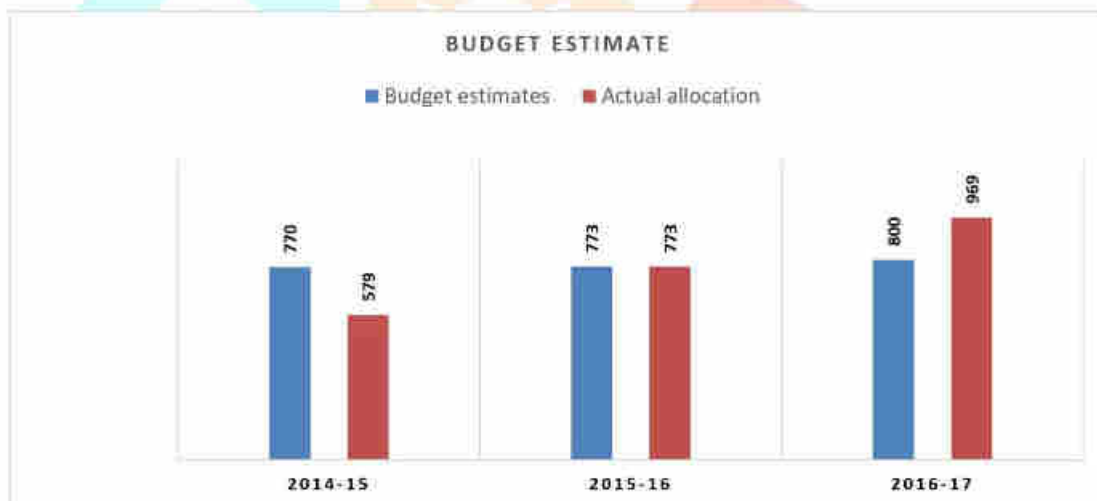
Source: Ministry of Development of North – Eastern Region.

Table 1- depicted that for the session 2014-15, budget estimation was 770 crores, gradually this amount has been increased and in 2016-17 session budget estimation was 800 crores. However, for the year 2014-15, actual allocation was 579 crores and it was increased up to 969 crores in 2016-17. The actual expenditure from the budgetary allocation was 578.98 crores in 2014-15 which was increased 764.82 crores and 965.81 in the session of 2015-16 and 2016-17 respectively. It is found that in the session 2014-15, the expenditure over allocation was about 100% and for the next successive years it decreased slightly.

Sector- wise Achievements of NEC: The NEC has 11 sectors catering to different development needs of the as below:

Major Projects in Agriculture & allied Sector:

2014-15
- Expenditure in 2014-15, 2015-16 and 2016-17 is Rs. 98.25crores, Rs.105.68 crores and Rs. 205.88 crores respectively.
- Establishment of Hi- Tech Garden of Mandarin Orange, Guava and Large cardamom garden under Tegiso, NayaHappa of Pech Village in Papumpare District, Arunachal Pradesh.
- Organizing 11th State Level Orange Festival & Craft Exhibition Tamenglong District headquarter, Manipur.
- Implementation of NERCORMP- III in different states.

2015-16
- Development of sericulture in Arunachal Pradesh.
- Model Horticulture Centre at three locations- Ngarumphung, Tupul and Haipi in Manipur.
- Establishment of Rootstock bank for Grapes at Mualkawi village,Champai district and Scion bank and Rootstock bank for Citrus at Maudarh, Lunglei district in Mizoram.
- Establishment of poultry breeding farm- cum- hatchery at Phulbari in West Garo hills district of Meghalaya.

2016-17
- Cultivation of large Cardamom in various districts of Arunachal Pradesh.
- Establishment of poultry, Goatery, Piggery, Dairy, Fisheries as a single component for the community at Mai village, Lower Subansiri district of Arunachal Pradesh.
- Watershed management for sustainable Agriculture production and improved livelihood in Nagaland.
- Integrated agriculture and Horticulture development projects for the state of Manipur Nagaland and Mizoram.

Railways Connectivity for NER:
Major initiative has been taken by the government to develop the railway connectivity of this region. Some Projects have been completed such as Beloni to Sabroom (39.12km) railway line in Tripura has been completed which will help to easy access to southern Tripura and Chattagram Port in Bangladesh. Another completion of project is 25.05 km doubling of Hawaipur to Lumding Section of New Jalpaiguri to Lumding Project – increased line capacity of trunk line.
Some new projects are sanctioned such as-
- Doubling - New Bangaigaon to Agthori via Rangia (142 km) at the cost of Rs.2042.51 Crores.
- Bridges on River Brahmaputra
  a) Saraighat Bridge Estimated cost of Rs. 888 Crores.
  b) Tezpur – Silghat Bridge Estimated cost of Rs.3512 Crores.
- Electrification of entire Railway Network in NER- Length 2352 km, estimated cost of Rs. 2293 crores.

Connecting NER by National Highways
The Government has taken bold Steps for better connection of NER by National Highways, for this purpose 35 projects are awarded to NER of costing Rs.7707 Crores and 536 km length. Some important Projects are -4 Laning of Imphal to Moreh to Pkg I (20km) 0f costing Rs.762 Crores. This Project has been done for the Connectivity of India to Myanmar, and Myanmar to Thailand Trilateral Highway. Another National highway connectivity of NER is Aizwal Tuipang pkg -I (57km) of way of costing Rs, 678 crores to provide access to Kaladan MMT project.
Three projects are already completed in Arunachal Pradesh Covering 65 km length. They are-
- Hunli to Anini (NH 313) total length of 16 km.
- Singer River to Sizoh Nallah (NH 513) total length is 23 km.
- Pasighat to Pangin of 27 km of highway.

Inland Water Connectivity in NER
The inland waterway connectivity of NER has been developed which has saved the logistic cost. Which helps in bulky cargo and container movement from Kolkata and Haldia ports to Pandu port in Guwahati. It also developed Indo - Bangladesh Protocol (IBP) Route in Bangladesh at estimated cost of Rs.305.84 crores.

India's Trade with Neighbouring Countries
The scenario of India's trade with neighbouring countries, the NER does not look optimistic. In general, India's exports to South Asian countries as a ratio of total exports from the country in 2006-07 were just about 5% and its share of imports in total imports was abysmal at 0.8%. In contrast, India exported almost 10% of total exports to Association of Southeast Nations (ASEAN) countries and its imports were close to 9% of the total imports.
Unfortunately, there is no information on volume of trade from the NER with the contiguous countries. However, even at the national level, the volume of trade from NER with the countries contiguous to NER except the PRC is abysmal. Among the other four lowest with Bhutan (0.05%). Imports from these countries were even lower. The highest imports were from Myanmar (0.41%), followed by Napal (0.16%), Bangladesh (0.12%) and Bhutan (0.07%). Even in the case of PRC, much of the trade is through the mainland and there is hardly any contribution from the NER. Of the four neighbouring, NER's potential for trade with Bangladesh, the PRC, and Myanmar is significant.
Myanmar is the only member of ASEAN with which India shares a common land border. In fact, it has contiguity with States of Mizoram and Manipur though, at present, the only functioning trade route through land is Moreh in Manipur and Tamu in Myanmar.

Indian trade volume with Bangladesh is not very significant. India's imports from Bangladesh are abysmal, constituting just 0.1% of total imports. Its exports to Bangladesh are dominated by agricultural commodities and basic textiles although, in recent years, machinery and transport equipment have been gaining importance.

The PRC's importance in world trade has grown in recent years and it has become one of India's major trading partners. In 2006-07, imports from the PRC constituted 9.1% of India's total imports and exports to the PRC were 6.6% of total exports from India. Almost 75% of India's exports consist of mineral ores, chemicals, iron and steel, and India's imports consist mainly of electrical products, mechanical machinery, organic chemicals and silk. Sine 2000-01, India's trade with the PRC has expanded phenomenally and both imports and exports have increased more than 10 folds.
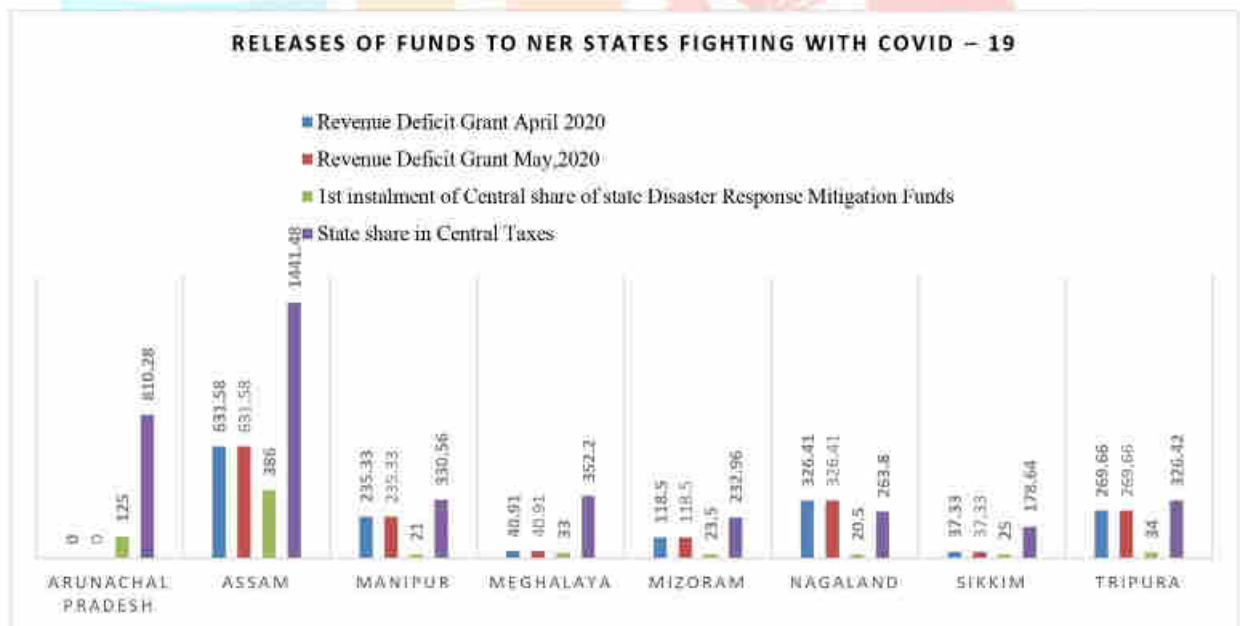
From the development perspective of the NER, it is border trade from the region rather than general trade between the PRC and India that must be considered. In this context, it is important to note that border trade has now been resumed formally between the two countries via Nathu La pass in Sikkim.

Releases of Funds to NER States Fighting with Covid – 19

During the period of Covid -19, the Ministry of Finance in 2020-21, released a bulky amount of funds to fight with Covid-19.

(Rupees in crores)

Sl No.	State	Revenue Deficit Grant April 2020	Revenue Deficit Grant May,2020	1st instalment of Central share of state Disaster Response Mitigation Funds	State share in Central Taxes	Total
1	Arunachal Pradesh	0.00	0.00	125.00	810.28	935.28
2	Assam	631.58	631.58	386.00	1441.48	3090.64
3	Manipur	235.33	235.33	21.00	330.56	822.22
4	Meghalaya	40.91	40.91	33.00	352.20	467.02
5	Mizoram	118.50	118.50	23.50	232.96	493.46
6	Nagaland	326.41	326.41	20.50	263.80	937.12
7	Sikkim	37.33	37.33	25.00	178.64	278.30
8	Tripura	269.66	269.66	34.00	326.42	899.74
	Total	1659.72	1659.72	668.00	3936.34	7923.78

Source: Ministry of Finance 2020-21

RELEASES OF FUNDS TO NER STATES FIGHTING WITH COVID – 19

- Revenue Deficit Grant April 2020
- Revenue Deficit Grant May,2020
- 1st instalment of Central share of state Disaster Response Mitigation Funds
- State share in Central Taxes

Fund Released by Ministry of Health & Family Welfare for Covid – 19 (Rupee in Crores)

Sl No.	State	2019-20	2020-21	Total
1	Arunachal Pradesh	8.91	9.37	18.28
2	Assam	72.75	84.29	157.02
3	Manipur	5.94	6.37	12.31
4	Meghalaya	5.94	5.94	11.88
5	Mizoram	3.71	4.17	7.88
6	Nagaland	3.71	3.71	7.42
7	Sikkim	2.98	2.98	5.96
8	Tripura	7.42	7.42	14.84
	Total	111.34*	124.25	235.59

* Released Fund on 26/03/2020

Fund Released by Ministry of Health & Family Welfare for Covid – 19
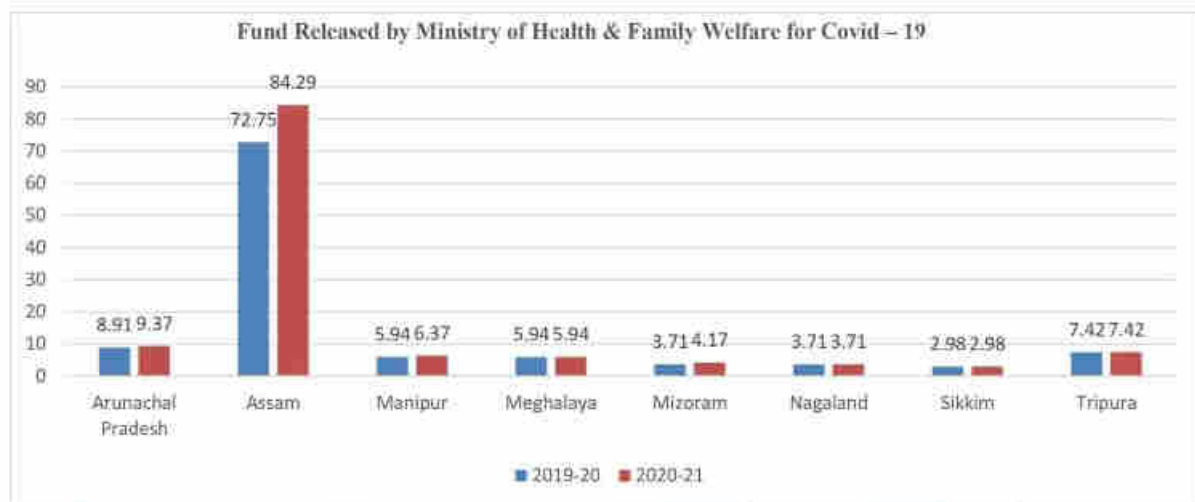
Conclusion

Many Government policies are under taken by the Government of India for the balance development of NER with the development of the other states of the mainland. Former governments had given importance to the development by the "Look east policy" and presently Modhi government has taken steps in this regard "Act east policy". Various projects are completed and sanctioned for the many folds development of the region.

But the rapid development of this region would be possible if it is to open the foreign trade with the neighbouring countries. Acceleration in growth can be achieved only by expanding trade and investment. Opening up trade routes and the promotion of trade relations with neighbouring countries, and the creation of world class infrastructure and connectivity to facilitate movement of people and goods and to attract investment to the region.

Although at present the volume of NER trade with neighbouring countries is not significant, there is a significant potential to increase trade with Bangladesh, the PRC and Myanmar.

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First Cycle NAAC Accreditation 2023

Criteria 3
Research, Innovations and Extension

3.3.1 Number of Research papers published per teacher in the Journals notified on UGC Care List during the last five years.

Year	2022-23	2021-22	2020-21	2019-20	2018-19
Number	03	03	00	02	03

The Papers Published in the UCG Care Listed Journals

2019-20

A Study of Professional Ethics of Assamese Language and Involvement of Short Stories on Assamese Society in Assam

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Abstract

The present study is focused on the professional ethics of Assamese language and involvement of short stories on Assamese society in Assam. A normative survey method was adopted for conducting the paper, by the investigator especially for this purpose. This study reveals that there is a relationship between professional ethics and short stories among the Assamese society involved with special reference to north-east region identified in Assam is located. The main effect of Lakshiminath Bezbaruah short stories on Assamese society and impact the age of romanticism in Assamese literature in Assam also identified in this area. The cases are referred ones and are coming for rural development a pioneer of modern Assamese literature and a literary artist of great acumen and versatility was the first true Assamese short story writer. Therefore, study was undertaken to investigate the study involvement among Assamese society in relation to residence locality, type of institution, academic stream, socio-economic status and academic achievement as well as a fruitful result for enhancement of development of short stories on our society was observed.

Keywords: Professional Ethics, Assamese Language, Involvement, Short Stories and Assamese Society.

Introduction:

The Assamese society has changed, but the change has not been for the better. People were less materialistic and more conscious about their duties and social responsibilities when I was young. We were cultured in the true sense of the term. Today, we see a hybrid culture emerging primarily due to rapid urbanization. The sense of belonging to a bigger community has eroded. The ethnologic history of the northeast is different from Assam is unique because it happens to be the melting pot of different ethnic, religious and linguistic communities. The result can be seen in the creation of a great Assamese culture. A peep into the history of Assam reveals that this state has seen the intermixing of three racial elements, the Australians, the Mongoloids and the Caucasoid. However there is a perfect blending of culture and heritage of the various ethnic groups in spite of their having disparate socio-cultural heritages and speaking different languages. Thus Assam has been blessed with a truly composite culture. In fact Assam especially the Brahmaputra valley served as a kind of linking road between India and Southeast Asia. Different groups entered Assam from different directions. From

the western direction came the Caucasic people and the Mongoloid people from the North and the East. Waves of migration brought.

Towards the mid-nineteenth century the socio-political life of the people of Assam came under great stress. One of the major factors was the repeated Burmese invasions which virtually reduced Assam into a wasteland. This was gradually followed by the spread of English education and western thought which affected almost all spheres of life and society. The spread of western education and ideas brought about radical changes in the form and content of Assamese literature. Orunudoi came as a breadth of fresh air and revitalized the Assamese language "which was almost on the verge of attrition due to the colonial policy of replacing Assamese with Bengali as a medium of instruction and language of the court."

The movement to develop Assamese literature gained momentum after the establishment of the Assamese Language Development Society in 1883 by the college students. Western influence made Assamese literature more humanized and gave the language greater tangibity. The novel and the short story developed as a result of the western impact in the nineteenth century. The English language which ushered in western influence also led to the growth of literary criticism. In the age of 'Jonaki' the search for an Assamese identity assumed a new form. A new humanistic movement based on new ideas of science, justice and human dignity took root in contemporary poetry. The impact of the west through English in the nineteenth century gave Assamese literature a certain new shape and direction. The publication of the 'Jonaki' ushered in an age when western literary influences became direct and clear. This journal launched the Romantic Movement in Assamese literature. Inspired by English Romanticism, the literature of the age reveals all the features of Western Romanticism. Exaltation of imagination, worship of nature, adoration of beauty and expression of personal love, revival of interest in folk literature, recreation of medieval lores and legends, profound love of the motherland, experimentation with new verse forms and use of the language of daily life are some of the distinguishing characteristics of the literature of the period.

Review of the Related Literature:

The final an important specific reason for reviewing the related literature is to know about the recommendations of previous researchers listed in their studies for further research. A review of some major studies is necessary to formulate and project the problem of proposed study. Fairchild (2003) says that the importance given by worker to such a variable as working condition also depends upon the type of job. Pack (2007) Concluded that female teachers were more dissatisfied than male teachers of teaching profession. The contact with the British and liberal education through the medium of the English language brought about a remarkable social and intellectual awakening which led to the emergence of a new literary era. Kakati's (1941) assertion that Assamese has an Austroasiatic substrate is generally accepted which suggests that when the Indo-Aryan centers formed in the 4th-5th centuries, there were substantial Austroasiatic speakers that later accepted the Indo-Aryan vernacular. His Kripabor Baruah's Kakotor Topola (Kripabor Barua's Bundle of Papers, 1904: originally serialized in Jonaki) established his reputation. Among his original short-story collections are Surabhi

(1909), Sadhu Kathar Kuki (1912) and Jonbiri (1913). Lakshminath was inspired by English literature. Bezbarua also lent a touch of simplicity to the Romantic tradition through poems like Basanta (spring) and Bin Boragi.

Origin of the Study:

Today it is deeply set in the country. But it is hardly in keeping with the needs and aspirations of Assamese people. At present this country is passing through a very critical phase. The forces of diversity are striking with full vehemence. In the East, Assam is in turmoil, is being ripped up by the enemies of this nation. The obvious reason for this is its isolation from the Indian society in its long history of development. The present study seeks to measure the professional ethics of Assamese teachers in relation to their Assamese literature is the entire corpus of poetry, novels, short stories, plays, documents and other writings in the Assamese language. This paper will attempt to highlight the professional ethics and the impact of romanticism was felt in the sphere of poetry also. Its major theme is the study of Indian education in the light of the peculiarities of the Assam as well as Indian society. It is very clear that these directive principles emphasize the role of education. No amount of effort on the part of the state can be successful in raising the standard of living, in protecting the social order and in ensuring the welfare of the people unless they are educated. So, the efforts of the investigators should be now directed towards this area. Teachers associations must play a significant role in upholding professional integrity, enhancing the dignity of the teacher and in curbing professional misconduct. National level associations of teachers could prepare a code of professional ethics for teachers and see to its observance. The new programmes of teacher education will emphasize continuing education and the need for teachers meet the thrusts envisaged in this policy. Investigator fear that Assam's future is very bleak unless the politics of identity is combated and Assamese originated in Old Indo-Aryan dialects, though the exact nature of its origin and growth is not clear yet. It is generally believed that Assamese and the Kamatapuri dialects derive from the Kamarupi dialect of Eastern Magadhi Prakrit though some authors contest a close connection of Assamese with Magadhi Prakrit. Sarat Chandra Goswami (1887-1944) was a prominent writer of Assam who enriched the Assamese literature with his short stories. Goswami was a founder member of Asam Sahitya Sabha and elected as a Secretary of the Sabha for the first time. Bhubanmohan Baruah alias Kanchan Baruah is one of the popular names that made its debut in Assamese literature by writing several evergreen novels in the 40s. Bhubanmohan Baruah alias Kanchan Baruah's evergreen creation has continued to enthrall the readership even today.

Statement of the Problem:

The problem under investigation entitled is, "A Study of Professional Ethics of Assamese Language and Involvement of Short Stories on Assamese Society in Assam."

Objectives of the Present Study:

The following objectives are selected for the present study:

(i).To finds out the professional ethics of modern Assamese society.

(ii).To identifies the involvement of short stories on Assamese society in Assam.

(iii) To assess the colonial and post-colonial to the emergence north-east history.

Methodology:

The Normative Survey method is chosen for the present study. The primary and secondary sources have been collected in this paper.

Sources of Data:

For the present study both primary and secondary sources of data are used. The primary data has been collected by field survey based and the secondary sources of data have been collected by the thesis, Dissertations, library, Research Articles, Journal, Government reports, documents, officials records, Newspapers, Internet etc.

Delimitations:

The present study has been carried out some limitations as following:

(i)   The study has been delimited to the professional ethics of Assamese language only.

(ii)   The areas of has been restricted in Assam only.

(iii) The study has been confined- involvement of short stories on Assamese society in Assam only.

Conclusions:

The major findings of the present investigation the respective objectives following conclusions were arrived. From the aforementioned operational definitions stated so far, we can draw some conclusions regarding the nature of the term the main study of professional ethics of Assamese language and involvement of short stories on Assamese society in Assam since this area is relatively unexplored, it is hoped it will be of intense practical value for the researchers, administrators, educationists, counselors and political leaders, because of the novelty with regard to relevance and utility in the field of education. These salient needs initiated the investigator to work in this area. In case of main the impact of romanticism was felt in the sphere of poetry also. Poetry gained a new vitality and vigour. The new poetry sang of freedom from political dependence, social injustice, religious bigotry and of the dignity of the individual. Nature with all her beauty and mystery revealed herself through the poets' vision. Jonaki was first published on February 9, 1889, by Chandrakumar Agarwala. It was the journal of the Asamiya Bhashar Unnati Sadhini Sabha- Society for the Development of the Assamese Language. Jonakimarked the coming of age of Assamese literature, Anandaram Dhekial Phookan, Hemchandra Barua and Gunabhiram Barua were the three writers who defined Assamese literature in this period. The Romantic Age in Assamese literature was heralded in by Lakshminath Bezbarua, Chandra Kumar Agarwala and Hem Chandra Goswami. During this period satirical and humourous writing, short stories, historical novels and plays, lyrical and narrative poetry, personal essays and literary criticism were written and they all helped enrich Assamese literature. Hemchandra Barua (1835-96) is called the father of modern

Assamese prose. He was a great satirist and in his writings he exposed the vices and evils of contemporary society. His Bahire Rang Sang Bhitare Kowabhaturi is a satirical novelette wherein he castigates the evil of social and religious corruption. In 1861 he published Kaniyar Kirtan which is also a satirical farce dealing with the evil effects of addiction to opium. He will always be remembered for his epochmaking dictionary Hemkosh which was published posthumously in 1900. His satire exposes the shams and hollowness of society and the prevalent social evils of the time. Gunabhiram Barua's (1837-95) Ramnavami was the first drama written on the western model. It was written in 1857 and serialized in Orunodoi, the first Assamese journal. This social play revolved around the theme of widow remarriage and had a tragic end. He also wrote Anandaram Dhekiyal Phukanar Jiwan Sarit which was in the lines of a biography and gave ample details about the subject. Chandra Kumar Agarwala is considered as instrumental in ushering in romanticism into Assamese poetry. He was a true humanist and regarded man as God. This is evident in his poem Manav Bandana, wherein he stresses on worship of man because according to him there was no God superior to man. His BaanKunwari, appeared in the very first issue of Jonaki, where it is seen that supernatural elements were being used in the treatment of a natural theme. His collection of poems Pratima and Bin Boragi created ripples in Assamese literature. It is wealthy sufficient and throw glow on the varied components of Assamese societal life and its prosperous way of life.

In this paper it was Ramakanta Choudhury (1846-89) and Bholanath Das (1858- 1929) who experimented with blank verse in epic poetry. Ramakanta Choudhury used this new verse form in his epic poem Abhimanyu Badh and Bholanath Das perfected the form in his poem Sitaharan Kavya. Bholanath Das is also said to be the forerunner of lyric poetry which flourished in the early decades of the twentieth century. The influence of Jonaki era's Romanticism was far-reaching and is still felt today. The western impact gave birth to two new forms-the novel and the short-story. With the publication of Jonaki literary criticism also came into being Lakshminath Bezbarua is considered to be the father of Assamese shortstory. His short-stories are an exposition of social evils like pride, vanity and superstition. A pioneer in the field of the Assamese short-story, Bezbarua was equally at home with the folk tale and the modern story. Lakshminath Bezbarua is regarded as the high-priest of Assamese prose and to this day he holds his sway over Assamese literature

It is increasingly recognized that western literary influence brought about radical changes in Assamese literature and modern drama also took a huge leap forward in terms of form and content. Earlier there had been the flourishing of the 'Ankiya-nat'. However now drama came to be divided into acts and scenes and different types of comedy and tragedy was introduced. Assamese literature is the entire corpus of poetry, novels, short stories, plays, documents and other writings in the Assamese language. It also includes the literary works in the older forms of the language during its evolution to the contemporary form and its cultural heritage and tradition. The literary heritage of the Assamese language can be traced back to the 9th to 10th century in the Charyapada, where the earliest elements of the language can be discerned. Banikanta Kakati divides the history of Assamese literature into three prominent eras Early Assamese, Middle Assamese and Modern Assamese which is generally accepted.

From this it may concluded that there has been a phenomenal growth in contemporary writers include- Arupa Patangia Kalita, Parismita Singh, Monikuntala Bhattacharya, Mousumi Kondoli, Monalisa Saikia,

Geetali Borah, Juri Borah Borgohain. Emerging trends are marked by experiments with post-modernist literary technique and growing fascination of young writers with magic realism and surrealism. In the realm of literary criticism young literary critics Areendom Borkataki, Bhaskar Jyoti Nath, Debabhusan Borah are exploring different possibilities and ideas to meet the needs in literary criticism. Assamese literature is currently booming in Assamese-speaking world, with readership of Assamese books gradually increasing over the last decades. A huge success can be seen in North East book fair and Nagaon book fair, when selling of Assamese books increased then English books.

The research paper highlighted the influence and impact of folk literature which is a part of literature and has its imperative constituent of professional ethics of teachers refers to the basic values and conceptions of good practice that constitutes guidelines for professional conduct. Professional ethics correct us if we are good doing any wrong or intending to do wrong. Professional ethics enable a person to judge himself and decide and not accept what others decide for him. By following professional ethics, the teacher's conduct and behaviour becomes respectable and socially acceptable. The main effect of Lakshiminath Bezbaruah short stories on Assamese society and impact the age of romanticism in Assamese literature in Assam also identified in this area. The cases are referred ones and are coming for rural development a pioneer of modern Assamese literature and a literary artist of great acumen and versatility was the first true Assamese short story writer.

Suggestions for Further Research:

The obstacles suggestions are forwarded to general awareness programmes should be taken of village area to sensitizes them about the modern development of science and technology so that they could give up superstitious believes and attitudes. There are many gaps in the investigations in the field of environmental sustainability and conservation: issues and challenges with special reference to their family environmental education. The study of sociological aspects of educational institutions has not received the importance which is needed to be given to it. Similarly the areas like relation of education with economy and polity, religion and secularism and their impact on educational planning, the environmental education or sociology of teaching profession, the classroom as a social system, student or youth culture, organizational properties of educational institutions etc. have all received very meagre attention. Thus, the further researcher can improved his method of leaving, teaching vocation or occupation or teaching one processing as well as his behaviour or personality included for his correct mistakes in his learning process and further researcher in the present study as anxiety, stressed, academic achievement, motivation and self-image etc. of different groups like- Garo and Hajong, Boro and Non-Boro languages etc. also included.

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A Case Study of Assamese Literature, Indigenous Knowledge for Folk Culture in Relation to Environmental Awareness in Assam

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Abstract

Assamese literature has played an important role in revealing the status of environmental awareness in our society. The present paper is an exploratory one which aims at studying the role of indigenous knowledge for folk culture, in relation to environmental awareness through education in Assam. A case study or survey method was adopted for conducting the paper, by the investigator especially for this purpose. The principal aim is to examine the effect of the impact of folk culture, Assamese literature and environmental awareness and this paper is an attempt to describe the major research carried out on indigenous people and how their knowledge can be utilization for human resource development in India with special reference to Assam. This study highlights two major aspects of application of Assamese literature; indigenous knowledge for folk culture of human potential is an essential factor of development. Human beings are to be converted into human resource. Development does not start with goods; it starts with people and their knowledge, skills and abilities. Without these three, all resources remain latent, untapped and potential. The field of indigenous knowledge utilization has emerged from several different research traditions including drama, nayika natyakar and different attitudes in the same or different circumstances. Hence, Assamese language & literature has developed tremendously due to the impact of modernity, as a result the ability requires continued practice and informed guidance and the diverse cultural heritage of all sections of people including the Garo, tribes & sub-tribes. Lastly, the paper describes the various problems for utilizing the indigenous knowledge, source knowledge, forms of knowledge and Assamese folk culture and literature have its great value in Assamese society etc. and its solutions.

KEYWORDS: Folk Culture, Assamese, Literature and   Environmental Awareness.

INTRODUCTION:

Literature is a part of folk culture that not only enriches a particular society. Probably the earliest text in a language that is incontestably Assamese is the Prahlada Charitra of the late 13th century poet Hema Saraswati. Banikanta Kakati divides the history of Assamese literature into three prominent eras - Early Assamese, Middle Assamese and Modern Assamese. The antique Assamese folk culture and its varied literature have been contributing a significant task in traditional Assamese society. In this unit, we will discuss folk culture and its various kinds, like Oral literature, customs and traditions and performing arts in Assam North East India has its great resources on Assamese literature, indigenous knowledge for folk culture. Folk culture and literature is the canvas of a nation and is a dependable directory to the backdrop and environment of the people. There has

always been a simple ability of folklore through pilgrimages, melas, dances, cultural fiestas, pujas, fairs and festivals etc. There are some folk tales, folk narrations, dances, music, songs, riddles and proverbs with them and there is an unremarkable amalgamation. It is just that the folk culture and literature was passed on from age group to age group by utterance of mouth before they came to be condensed to scripting or lettering. The definition of indigenous is something or someone who is native to an area or who naturally belongs there or originating or occurring naturally in a particular place, native. An example of indigenous is the native Assamese languages state in Assam. Among the states of the North-East region, Assam has the most varied cultural traditions and mixture of cultures. Assam is rich in natural resources and the fertile land, particularly in the Brahmaputtra valley added to the richness of the state.

Statement of the Problem:

The problem under investigation entitled is, "A Case Study of Assamese Literature, Indigenous Knowledge for Folk Culture in Relation to Environmental Awareness in Assam".

Objectives of the Present Study:

The main objectives of the present study investigation are as follows:

i). To highlight the concept and impact of Assamese literature, indigenous knowledge and folk culture.

ii). To focus about the different Assamese folk cultures and its literatures as an important tool for cultural identity with especial reference to Assam languages status.

i).To studies the effect of indigenous knowledge for folk culture and Assamese literature in Assam.

Methodology:

The paper is based upon analytical and descriptive method essentially used, collecting response from the representative population through environmental awareness and education in Assam. The primary sources and secondary sources have been collected from different Books, Dissertations, Journals, Edited volumes, Periodicals, Research papers, Research Articles, Paper clips, Newspapers, Internet etc.

Significance of the Present Study:

The present study was conducted to explore the study of involvement is a condition of total participation of the self as a knower, organizer, observer, status seeker and as socialized being. This is the need of the hour that girls and women should be studied as learners so that their special problems of education may be understood properly and existing educational provision may be modified accordingly. Beginning of ethical education or any doctrines existed in as a very normal growth. Folk culture and literature has been highlighting lesson to the common people in varied facets of life. For the most part, folk culture and literature of North East India and Assam is the rich resources for the women folk. Folk culture and literature is similar to Air Naam, Biya Naam,

Bihu Naam, Dakar Bachan etc. It is akin to proverbs. In Assamese culture and literature there are different kinds of folk based literature and language. In the light of the above discussion of the significance of the study under investigation, the title of the study has been fixed as, "A Case Study of Assamese Literature, Indigenous Knowledge for Folk Culture in Relation to Environmental Awareness in Assam". The definition of indigenous is something or someone who is native to an area or who naturally belongs there or originating or occurring naturally in a particular place, native. An example of indigenous is the native Assamese languages state in Assam. Assam has a rich tradition of folk songs, which are sung on different occasions and in different environments. Some of these have been obsolete and others are flowing with force. Marriage songs (biya-naam), appeasing song (nisukani geet) Kamripi and Goalparia folk songs are most popular among other folk songs like- Aainam,Dhainaam, Dotara (tokari) songs, Chiyageet, Nangeli Geet (cow-boy song), Cherradhek etc. Therefore, folk literature includes extensive vicinity counting within its periphery as traditional songs, musics, stories, tales, narratives, faiths and beliefs.

Analysis and Discussions:

A few elements of folk culture of Assam are briefly explanation and outcome of analysis and discussed below:

Literature:

The Braman dynasty established in the middle part of the 4th century and the following royal dynasty first used Sanskrit and later on Assamese (evolved from Sanskrit) as the official language. However, the modern Assamese language has been formed after crossing various stages from the time of evolving from Sanskrit. From the scriptures of Barman dynasty, Salastambha dynasty, Paul dynasty, Koch royal dynasty and Ahom scriptures this fact comes out. However, the Ahoms used their own Tai language and the modern form of Assamese language Journal 'Arunodoi".

During the period from 10th and 14th century, the only written Assamese literature was mostly a collection of songs called Charyapada. In the 14th century, Hem Saraswati, Rudra Kandali, Haribar Bipra, Kavirantna Saraswati and Madhab Kandali created literature in vesee for based on Purana and other ancient Indian epic. Madhab Kandali was patronized by Barahi King Mahamanikya. Other scholars were patronized by the king of Kamata. It is important to mention that Madhab Kandali translated the Ramayana into Assamese, titled 'Saptakanda Ramayana', which was the first work of translation from Sanskrit into a North Indian language.

The Vaishnavite movement launched by Sankaradeva and Madhabdeva in the 15th century influenced the life of the people of Assam in all aspects. This religious movement had a major impact on Assamese literature and a lot of poetry, songs, prose, charit puthi, drama etc. were written during that time. The main subject matters of these literary works were Ramayana, Mahabharata, Purana, theories of Hindu religion etc. Sankaradeva and Madhabdeva themselves wrote a number of classics. Sankaradeva's Kritan, and Madhabdeva's Namghosha and the Borgeets of both the gurus were most popular among these.

The plays Ankiya Naats of Sankaradeva-Patniprasad, Kaliya Daman, Keli Gopal, Rukmini Haran, Parijat Haran, Ram Bijay; Dadhi Mathan of Madhabdeva and his Jhumuras 'Chordhara' and 'Pimpara Guchowa' etc.

are presented before huge gathering of spectators at Namghar and Satras. The first naat (drama) Chihnajatra of Sankaradeva was even written and staged before Shakespeare's drama. The famous textile design of Sankaradeva the Brindabani Bastra was a magnificent creation of the Assamese weavers. This textile design has been preserved in British museum and in a few other famous museums in parts.

After Sankaradeva and Madhabdeva, prominent writers like Bhattadev, Ananta Kandali, Ram Saraswati and other kept up the tradition of Assamese literature. The real Assamese prose writing was first introduced by Bhattadeva with his writings like Katha Geeta, Bhagawat Katha, Ratnwali Katha etc. Staying away from the ambit of the Sankari style of writing, writers like Pitambar Kavi, Durgabar Kayastha, Su-kabi Narayandeva, Mankar and others also enriched Assames literature. They composed story based on lyrics like Devi Manasaa, Padmaa, Sati Beula etc. The 'Padya Geeta' written by Govinda Mishra born in 16th century is still widely popular.

The histories written under the patronage of the Ahom kings also enriched Assamese literature. First those were written in the own language of Ahoms, but from the 16th century onwards, those were written in Assamese language also. During the British rule, a number of such histories were restored, preserved and printed. Those include Deodhai history, Tungkhungiya history, Kachari history, Jayantiya history, Tripura history, Padya history, Padshyah history etc. The modern Assamese language evolved after the American Baptist Missionaries published the first Assamese magazine Arunodoi in1846.

Thoughts of Folk Literature:

Generally, the Assamese literature was influenced by various styles and characteristics of literature as follows:

a). Folk literature is the literature which is broadcasted verbally.

b). Folk literature is one of the mainly significant conventional widest sectors under its colorful fabric of a nation.

c). In 19th century, the folklore came out as a novel meadow when antiquaries in England as well as philologist in Germany started to take an innovative concept on traditional literature. d). In the 1812, the German brothers Jacob and Wilhelm Grimm started publishing powerful quantities of folk narratives and understanding of Germanic myths.

e). In the 19th century the word 'Folk' highlight an illiterate man in an educated society. Folk literature or oral literature covers all the customary spoken or orally broadcasted shapes of traditional words.

f). Folk literature includes extensive vicinity counting within its periphery as traditional songs, music, stories, tales, narratives, faiths and beliefs.

Folk Culture:

Assam has a very rich cultural heritage. In addition to the common cultural heritage, every tribe and sub-tribes have their own rich traditional cultural heritage. Every tribe has its own dialects, folk-literatures, ornaments, food habits, housing culture, agriculture, fishing culture, various festivals, style of using cane and bamboo, family & social relationships, customs and traditions, dresses, music, traditional musical instruments etc. The natural feelings and expressions of a society or community are reflected by its folk culture. These

traditional cultures practiced for years are acquired by the people without any formal training. But a person can understand the tradition of other's culture through especial observation of environmental awareness only through education in Assam. Of late, the social scientists have shown keen interest in the traditional folk cultures of different groups of people of the world.

Folk Concepts:

A folk idea is a view that has a universal, commonly understood meaning meticulous to a socio-cultural alliance, other than which has not been officially, properly cleared. Implication the affecting valence of words is a vital constituent in clutching folk identities. Folk culture and folk literature includes broad vicinity counting within its margin, as traditional songs, tales, stories, narratives, faiths and beliefs.

Idea of Folk Culture:

i). Folk or folkways are custom principles of everyday life and are the traditional ways that people act similar to drinking, eating, individual cleanliness, dressing, etc.

ii). Folkways are events and traditions which are of modest ethical implication.

iii). Culture is a trait of societies, not of individuals and is the route of social life.

iv). Folk culture is learned, communally transmitted legacy of artifacts, understanding, attitudes, principles and normative prospects.

v). Folk culture provides an individual in a society the right and suitable ways to eat, dress, words and the verbal communication to exercise.

Assam has a rich tradition of folk songs, which are sung on different occasions and in different environments. Some of these have been obsolete and others are flowing with force. Marriage songs (biya naam), appeasing song (nisukani geet) Kamrupi and Goalparia folk songs are most popular among other folk songs like Aainam, Dhainaam, Dotara (tokari) song, Chiyageet, Nangeli Geet (cow-boys song), Cherradhek etc.

Major Finding and Conclusion:

As already mentioned that the main ethnic groups of people in India are also found in Assam and the process of cultural assimilation also happened in Assam as occurred in India. As a result, a mixed culture was developed in Assam with the integration of Arya and Anarya. The old name of Assam was Pragiyotishpur and Kamrup. These names are found in old writings including the Ramayana, Mahabharata, Vishnu Puran, Kalika Puran, Yoginitantra, writings of Hiuen Tsang and even in the inscriptions of ancient Royal families. These two Sanskrit words have connected Assam to the Hindu mythology or Hindu astrology.Noted scholar Banikanta Kakati was of the view that the words Pragjyotishpur and Kamrup originated from similar words in the Austric language. The Ahoms ruled the state from the 13th century. Some experts opined that the name Assam (Asom) emerged from sanskritization of the words 'a-cham'and 'ha-chom' used by the Ahom and the Bodo people respectively.

The whole society is like a book to study the folk culture of it. To know valuable elements of folk culture, one has to observe the activities and behaviours of the common people of the society. Hence, finally the findings of this study the folk culture of Assam means the diverse cultural heritage of all sections of people including the tribes and sub-tribes.

In conclusion therefore, the researcher ardently hopes that this important field of investigation would be continued and carried over with the passage of time. The findings of the paper are as follows:

Folk literature and culture is the identity of each races, castes and communities. The influence of folk literature is a part of literature. Folk culture and folk literature is the identity of entire Assamese culture. In each level folk culture is a topic of study. The varied ancient Assamese folk-literature and culture has been singing a significant task in customary Assamese society. India has a heritage of wealthy and mixed folk literature. The folk literature is the identity from generation to generation. Assam has a affluent and prosperous documentation of folk literature. The research paper highlighted the influence and impact of folk literature which is a part of literature and has its imperative constituent. The researchers, folkloristic and the sociologists must provide a high-quality connection regarding the ethnicity, traditions, values and viewpoints of the people and to transformations therein all the way through the ages. Folk literature continues as a spontaneous recitation which obtains a bright forms and it generates stunning and amazing humankind of dream from side to side its own ability of narration. Really speaking, folk literature absorbs a solution in Assamese identity. It is wealthy sufficient and throw glow on the varied components of Assamese societal life and its prosperous way of life.

Remedial Measures:

The focus in this issue is on putting education in values and for character building on the national agenda. Keeping in view the above obstacles the following suggestions are forwarded to increase the extent of indigenous is the native Assamese languages state in Assam influenced. Following suggestion may guide in making fields more authentic. A study may be conducted on vast area sample may be large in size and other stated may be taken.

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First Cycle NAAC Accreditation 2023

Criteria 3
Research, Innovations and Extension

3.3.1 Number of Research papers published per teacher in the Journals notified on UGC Care List during the last five years.

Year	2022-23	2021-22	2020-21	2019-20	2018-19
Number	03	03	00	02	03

The Papers Published in the UCG Care Listed Journals

2018-19

An Analytical Study of Linguistic Nationalism in Early-Colonial Assam with Special Reference to Orunodoi

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Abstract

The present study aims to prepare a database on an analytical study of linguistic nationalism in early-colonial Assam with special reference to Orunodoi. The present study explores the main focused on the nature of the colonial and post-colonial state, its interaction with everyday politics, its emerging society and operation of its economy, then how much does north-east appear in this process of doing intellectual history of India. This paper is attempt to the emergence of linguistic nationalism as a direct offshoot of the language debate in early-colonial Assam. The method of investigation in the present study is descriptive survey method employed. The present investigation is aimed at the American Baptist Mission at Sadiya started publishing a monthly magazine called Orunodoi. This study reveals that Orunodoi gradually became a critical instrument in the effort to reinstate Assamese as the language of the province's courts and schools. Through an analysis of some articles published in Orunodoi, read along with private letters and official correspondences of the American Baptist Mission in Assam, and recover the context of the debate around language in nineteenth-century Assam. Therefore, the variety described here is representative of colloquial Assamese spoken in the eastern districts of Assam. Particularly, the pre-colonial period of Assam contains various neglected travelogues like the anonymous anthologist.

Keywords: Linguistic, Nationalism, Colonial, Baptist Mission & Orunodoi.

Introduction:

Nationalism is a modern movement. Throughout history people have been attached to their native soil, to the traditions of their parents, and to established territorial authorities, but it was not until the end of the 18th century that nationalism began to be a generally recognized sentiment molding public and private life and one of the great, if not the greatest, single determining factors of modern history. Because of its dynamic vitality and its all-pervading character, nationalism is often thought to be very old; sometimes it is mistakenly regarded as a permanent factor in political behaviour. Nationalism is an ideology that emphasizes loyalty, devotion, or allegiance to a nation or nation-state and holds that such obligations outweigh other individual or group interests.

The Government appointed S.K. Dhar commission to look into this matter but its recommendations were not considered. Leaders were still apprehensive. The same position was echoed by Nehru, even as late as 1952 when he argued that: "I have been overburdened with the thought that we must give the topmost priority to the development of a sense of unity in India because these are critical days. Any decision that might come in the way of that unity should be delayed till we have laid a strong foundation for it. The idea of linguistic provinces will intensify provincial feelings and that; undoubtedly will weaken the concept of a unified India". Nation is not built by bricks and mortars but by the quality of men. It does not require any evidence to say that society and its development are positively correlated to the development of education. Education is a process of development from the cradle to the grave. Man becomes a gentleman through education and he alone can be educated while the other living organisms are trained. While his life is guaranteed by food, it is glorified by education. Education is the most powerful instrument for imparting ideal training to the people.

Orunodoi was first published in January-1846, printed by the Baptist Missionary Press in Sibsagar. The tag line for the magazine was, "The Orunodoi, monthly paper, devoted to religion, science and general intelligence". It continued to be published till 1879, the press, however, was sold in 1883. The editors of the magazine include Dr. Nathan Brown, A. H. Denforth, William Ward, and others. It contained articles related to science, current affairs, astrology, history, and local trivia. This paper helped to entrench the Assamese intelligentsia, bringing to the fore three key figures from the Assamese literary world: Anandaram Dhekial Phukan, Hem Chandra Baruah and Nidhi Levi Farwell. The crowning glory of Brown's career was Orunodoi which means 'the dawn'. Brown did the editorial work whereas Oliver Cutter was involved in printing and publishing the magazine. Brown was the editor of this magazine till he left for the US. Under his editorship, Orunodoi published history by bringing out the texts of old chronicles in properly edited form, such as Chutia Buranji, Purani Asom Buranji and Kamrupar Buranji. He also patronized various Assamese scholars and helped them publish. Notable among these publications are Kashinath Tamuly Phukan's Asom Buranji (1842) and Anandaram Dhekial Phukan's Axomiya Lorar Mitro (1849) and A Few Remarks on the Assamese Language and on Vernacular Education (1855), Bronson's A Spelling Book and Vocabulary in English, Assamese, Singpho and Naga (1839) printed at the Mission Press in Sibsagar.

Review of the Related Literature:

Review of related literature is an indispensable and important part of research process. Through the review of related literature, researcher can avoid unintentional duplication of well-established findings. It is no use to replicate a study when the stability and validity of its results have been clearly established. After Brown, the Orunodoi was in circulation with occasional breaks until 1880. Following the example of Orunnodoi, several newspapers and magazines were published in Assam of the second half of the 19th century. Prominent among these were Asam Bilasini (1871), published by Dharma Prakash Press, Auniati Satra- Majuli; Asam Darpan (1874) in Tezpur; Asam Mihir in Guwahati (1872); Goalpara Hitshadini (1876); Chandrodaya in Nagaon (1876); Asam Dipak in Guwahati (1876); Jonaki in Calcutta (1889) and Assam News an Anglo-Assamese weekly (1885); Assam Bandhu in Nagaon (1885); Mau in

Calcutta (1886). Orunodoi explained global geography and gave descriptions of the night sky with its stars and planets- Maheswar Neog, Bhagavati Prasad Baruva; writing of him (1983). Nationalist movements have included those by or on behalf of Tibetans in China. According to Hem Chandra Baruah's advice, ward changed the system of orthography of orunodoi from the previous and simplified one of Jaduram Deka Baruah that was adapted by Brown, to the Sanskrit system as it used today. Replacing the dental by cerebral of Assamese alphabets, ward corrected the spelling of Orunudoi in January-1861. This laid a milestone in the development of Assamese language. Ward's wife Susan was also associated with Orunodoi and edited a few issues of the magazine. She revised the missionary Oliver Cutter's wife Harriet Cutter's work vocabulary and phrases in English and Assamese (1841) and added many new entries, bringing the total to about 4500 entries, published as brief vocabulary in English and Assamese with rudimentary exercises in 1864. It was the first book of this kind till Bronson's A Dictionary in Assamese and English was published in 1867. She also authored A Glimpse of Assam (1884).

Significance of the Study:

The present study aims to prepare a database on an analytical study of linguistic nationalism may refer to: a dominant culture's use of language to exercise its dominance, see linguistic imperialism. The use of linguistics to support nationalistic ideologies, see historiography and nationalism. This paper is an attempt to describe the major research carried out on the identification with one's own nation and support for its interests, especially to the exclusion or detriment of the interests of other nations. It advocacy of or support for the political independence of a particular nation or people. Nationalism is an idea and movement that holds that the nation should be congruent with the state. As a movement, nationalism tends to promote the interests. Nationalism, translated into world politics, implies the identification of the state or nation with the people or at least the desirability of determining the extent of the state according to ethnographic principles.

The present investigation has broad in to light some interesting fact of Orunodoi explained global geography and gave descriptions of the night sky with its stars and planets. The news of great events in India and in foreign countries was brought to the door of the Assamese even as they took place. They could have the intelligence of scientific inventions and discoveries in a simple and digestive form. Beyond all these somewhat startling matters, looking like coming from another world, which tended to reshape the Assamese mind, there were 'newsy' and 'sensational' matters from a familiar sphere meaning from different parts of Assam. The mind of the readers was thus treated to a very much rich fare. Therefore, it has got relevance a study is to investigate the significant an analytical study of linguistic nationalism in early-colonial Assam with special reference to 'Arunodoi' or Orunodoi. The present study explores the main focused on the nature of the colonial and post-colonial state, its interaction with everyday politics, its emerging society and operation of its economy, then how much does north-east appear in this process of doing intellectual history of India. This paper is attempt to the emergence of linguistic nationalism as a direct offshoot of the language debate in early-colonial in Assam. Thus the selection procedure should be

based on absolute fitness without any loopholes in it. The present study is completely the urgent need for effective Orunodoi and this field is relatively unexplored in Assam. In the light of the above discussion of the significance of the study, the title of the study has been fixed as, "An Analytical Study of Linguistic Nationalism in Early-Colonial Assam with Special Reference to Orunodoi." So that remedial measures can be taken. The rationality and origin of the study is the linguistic nationalism in early-colonial in Assam. In conclusion therefore, the researcher ardently hopes that this important field of investigation would be continued and carried over with the passage of time.

Statement of the Problem:

The problem under investigation entitled is, "An Analytical Study of Linguistic Nationalism in Early-Colonial Assam with Special Reference to Orunodoi."

Objectives:

The following objectives are selected for the present study:

(i).To finds out the linguistic nationalism in early-colonial in Assam.

(ii).To identifies the Orunodoi in Assam.

(iii) To assess the early-colonial in Assam towards Orunodoi.

Delimitations:

In the present study were delimited with regard to the following:

1). The present study will be confined to the linguistic nationalism in early-colonial of Assam.

2). The study has conducted in only Orunoidoi in Assam.

Methodology:

The present study was conducted through the descriptive survey method of research used.

Sources of Data:

For the present study both primary and secondary sources of data are used. The primary data has been collected by field survey based and the secondary sources of data have been the thesis, library, journal, Government reports, documents, officials records etc.

Discussions:

This paper tries to access the history of the after the both primary and secondary sources of data has been collected through the use of various tools it must be processed and analyzed to draw meaningful inferences. However, valid reliable and adequate the data may be, it does not sever any worthwhile purpose unless it is carefully edited, systematically classified and scientifically analyzed, intelligently interpreted and rationally concluded. The reasoning starts with certain assumptions. The main role of a national language is to culturally homogenize the nation so that the state, nation, and language come to coincide with one another, and modern form of Assamese language journal 'Arunodoi'.

The multilingual culture of India has affected every aspect of life and had also been an important means for serving the nationalist movement of India, against the British. Although, some may consider the role of language to be minimal, language did prove to be an effective tool against the British during the nationalist movement. The rise of vernacular languages is an important marker in the aid of mass movements. For some leaders, it was the revisiting of historical glory, for some, the radicalization of independence struggle, and for some a matter of identity.

In order to understand the role of language nationalism in the Indian context, it is pertinent to study the topic from the perspective of the British as well as the Indian nationalist leaders. The education policy of the British with the introduction of English and the language policy of the INC are both important in understanding the role of languages in consolidating a national identity.

In conclusions, it can be understood from the end of the 18th century on, the nationalization of education and public life went hand in hand with the nationalization of states and political loyalties. Poets and scholars began to emphasize cultural nationalism first. They reformed the mother tongue, elevated it to the rank of a literary language, and delved deep into the national past. Thus, they prepared the foundations for the political claims for national statehood soon to be raised by the people in whom they had kindled the spirit.

In the present study, the investigators decided to find out the Assam lies in India's northeast, one of its remotest and most problematic regions. Arunodoi is the first Assamese magazine paper. This paper was printed from Sibsagar. From the Baptist Missionary printing press situated on the bank of Dikhow River, Sibsagar, Orunodoi was first published in January-1846. The punch line for the magazine was "The Orunodoi, monthly paper, devoted to religion, science and general intelligence". It continued to be published till 1879 and finally in 1883 the printing press was sold. The editors of this paper included Dr. Nathan Brown, Denforth, William Ward, Ms Susane etc. Though Christanity was the main aim of the paper, it also included various news related to current affairs, Science, astrology, history and also trivia. This created a new era to the Assamese literary world. Assamese people got to know about the western world through this paper only. Orunodoi gave a new confidence to the Assamese literature to carry forward with Assamese dictionary, grammar and other essential parts of a language. It is concluded from the study that the this paper gave birth to three Assamese authors- Anandaram Dhekial Phukan, Hemchandra Baruah and Nidhi Linai Pharowal. The Orunodoi used a simple approach instead of borrowing words from other languages, removing complexity among various alphabets, mainly pronunciation oriented word construction etc. Emphasis should be laid on this paper was an attempt to discuss the originality, though this effort was not accepted in the long run, but the Orunodoi opened the gate to the literacy in the Assam.

Thus, in the light of the above major findings of the present investigation the respective objectives were tested and following conclusions were arrived at: It is observed that in case of objectives states second and third that, to identify the Orunodoi in Assam & to assessed the early-colonial in Assam towards Orunodoi. Ward worked along with Nathan Brown in building up Orunodoi. He contributed many articles for this magazine and was also involved in editing and publishing it from 1861 to 1873. The present investigation is aimed at the American Baptist Mission at Sadiya started publishing a monthly magazine called Orunodoi. Through an analysis of some articles published in Orunodoi, read along with private letters

and official correspondences of the American Baptist Mission in Assam, and recover the context of the debate around language in nineteenth-century Assam. Particularly, the pre-colonial period of Assam contains various neglected travelogues like the anonymous anthologist. The findings of the present study are that there is positive of the objectives and significant the linguistic nationalism in early-colonial in Assam and finally, to assess the early-colonial in Assam towards Orunodoi are in conformity with the findings of Markhan (1979), Dutta (1994), and Roy (2007). This finding was further supported by Dash (2016).

Suggestions:

The investigation has put some suggestions for further study. The following suggestions may guide in making fields more authentic. Indian nationalism is an instance of territorial nationalism, which is inclusive of all of the people of India, despite their diverse ethnic, linguistic and religious backgrounds. The study can be extended to other states of the country. The focus in this issue is on putting education in values and for character building on the national agenda. It is speaking for itself and aloud. Replicative follow-up studies may be conducted for generalizability of results obtained in the present study; may also be taken up in order to examine their effects in respect of others areas. Therefore, true, language is more than the repertoire of shared programmes and practices and one of the literary stalwarts of the Jonaki Era, the age of romanticism in Assamese literature. It is the connector that validates our sense of nationalism: the shared feeling of pride and socio-cultural experiences. However, nationalism and language are both dynamic notions depending on time and place in history.

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Impact of Contemporary Assamese Society With Special Reference to Dr. Bhupen Hazarika

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Abstract

The present study is focused on the contemporary Assamese society of Assamese language in relation to their Dr.Bhupen Hazarika. This study reveals that there Dr. Bhupen Hazarika was an Indian playback singer, lyricist, musician, poet, actor, anthologist and filmmaker from Assam, widely known as Xudha Kontho. His songs, written and sung mainly in the Assamese language by himself, are marked by humanity and universal brotherhood and have been translated and sung in many languages, most notably in Bengali and Hindi. In the present study, the investigators decided to find out Dr. Bhupen Hazarika aim was to eradicate misunderstandings between the Assamese and the Bengalis. In this present study, the Assamese version of the travelogue has been used to explore and interpret the socio-cultural milieu of Assam as represented in the narrative. Hence, Assamese society of Assamese language & literature has developed tremendously due to the impact of modernity. This paper critically reviews firstly, to explore the way ethnographic information about Assam has been represented in it and secondly, to generate an understanding of the progressive thinking of the writer as evident from it. In the context of Assam, travel writing is an area which offers immense possibilities. Lastly, the paper describes the various problems for utilizing the Assamese society of Assamese language of indigenous knowledge, source knowledge, forms of knowledge etc. and its solutions.

Keywords: Contemporary, Assamese Society, Languages and Ethnographic.

Introduction:

Globalization is at the centre of diverse intellectual and political agendas, raising ousted questions about what is widely considered to be the fundamental dynamic of our time an epoch defining set of changes, that is radically transforming social and economic relations and contemporary Assamese society in the 21st century. It is an ideology that currently dominate thinking, policy making and political practice. Assamese society of Assamese language & literature has developed tremendously due to the impact of modernity. The modernity education system in Assam is the best among the other states of north-east region. In that period the political and social scenario of Assam was unstable and very less importance was given to education sector. Modern education has to

serve as a powerful instrument of social, economic and cultural transformation of the society and to keep pace with the advancement of the modern trend.

Assam is situated in the north-eastern region of India. It has a glorious past with rich culture, society in north-east India and as such in Assam. Assamese society of Assamese language & literature possessed great freedom of work and movement in the past time. Assamese societal education was limited to the high caste and equivalent castes only. In the new millennium, the education system in Assam is the best among the other states of north-east region. They are becoming victims of various social injustice and they are not being able to enjoy their due right and status in Assamese society. Like in India, social struggle from early in Dr. Bhupen Hazarika life, he was at the forefront of a social battle against the entrenched forces of casteism that sneered at a member of the Koibarta community making it as a musician of note, and kept him away from the upper-caste Brahmin woman he had loved. Eventually, when the spirited Dr. Bhupen Hazarika did marry, it was to a Brahmin woman, his revenge of sorts against a caste-ridden society. Dr. Bhupen Hazarika, who made fame as a musician, was born on 8 September 1926 to Nilakanta and Shantipriya Hazarika in Sadiya, an interior place of Assam on the bank of river Brahmaputra.

Justification of the Topic:

The paper seeks to examine the contemporary Assamese society how the fantastic encounters of Dr. Bhupen Hazarika protagonist and the mysterious non-human entities challenge the centrality and superiority of the human, and, in doing so, how the text draws attention to the complexities of our lived relations with non-human others. It is becoming increasingly clear that mankind is now facing the most severe crisis in its history. The justification of impact of contemporary Assamese society with to Dr. Bhupen Hazarika in the development of human potentials needs no evidence. There is great need to make provision for adequate funds with which programmes for conducting research studies in different mares a may be carried out for the welfare of Assamese society. It will be important to state in the very beginning how the results of the research will influence educational theory or practice. The urgency and worthwhileness of the research have to be justified the impact of contemporary Assamese society. It will convince the readers about the need and significance of the investigation. The research worker would asses to what extent the solution of the problem would contribute for the furtherance of human knowledge of Assamese society. Hence, the investigator fixed a problem, for this purpose selected the topic, "Impact of contemporary Assamese society with special reference to Dr. Bhupen Hazarika." It is no use to replicate a study when the stability and validity of its analysis have been clearly established in this paper. The present study is an attempt to analyse the status of impact in various Indian languages and rural development, the urgency and worth wholeness of the research have to be justified by the investigator. Therefore, it has got relevance a study is to investigate the investigator has to indicate the chief purpose of the study at the outset and other subsidiary specific objectives that have compelled his to outset and such an investigation. So, the efforts of the investigators should be now directed towards this area.

Review of Related Literature:

Review of related literature is an indispensable and important part of research process. It establishes the key foundation for the researcher of his problem of research. A review of related literature provides the academic guidance to the researchers. It is considered as a critical variable in educational research.

During the period from 10th and 14th century, the only written Assamese literature was mostly a collection of songs called Charyapada. In the 14th century, Hem Saraswati, Rudra Kandali, Haribar Bipra, Kavirantna Saraswati and Madhab Kandali created literature in vesee for based on Purana and other ancient Indian epic. Madhab Kandali was patronized by Barahi King Mahamanikya. Other scholars were patronized by the king of Kamata. It is important to mention that Madhab Kandali translated the Ramayana into Assamese, titled 'Saptakanda Ramayana', which was the first work of translation from Sanskrit into a North Indian language.

Statement of the problem:

Precisely stated the problem in the present study is an entitled as, " Impact of contemporary Assamese society with Special Reference to Dr. Bhupen Hazarika."

Objective of the Study:

The study was designed to pursue the following objectives;

(i) To identify contemporary Assamese society towards Dr. Bhupen Hazarika.

(ii) To investigate the impact of high effective and low effective Assamese society.

Methodology:

The method followed in the present study was based on descriptive survey used.

Sources of Data:

For the present study both primary and secondary sources of data are used. The primary data has been collected by field survey based and the secondary sources of data have been the Government reports, documents, official's records, journals etc.

Limitations of the Study:

The present study has been carried out some limitations as following:

(i)   The present study has been confined to contemporary Assamese society

(ii)   The study has been delimited to the Dr. Bhupen Hazarika only.

(iii) The areas of has been restricted of Assam only.

Discussions and Conclusions:

The following conclusions were derived based on the presentation of the discussions:

It was in Tezpur that Bhupen Hazarika, then 10-years-of-age, was discovered by Jyotiprasad Agarwala, the noted Assamese lyricist, playwright and the first Assamese filmmaker, and Bishnu Prasad Rabha, renowned Assamese artist and revolutionary poet, where he sang a Borgeet-the traditional classical Assamese devotional songs written by Srimanta Sankardeva and Sri Sri Madhabdeva, taught by his mother at a public function.

As a singer, Hazarika was known for his baritone voice; as a lyricist, he was known for poetic compositions and parables which touched on themes ranging from romance to social and political commentary; and as a composer, for his use of folk music. In a poll conducted in Bangladesh, his song, Manush Manusher Jonno-Humans are for humanity was chosen to be the second most favourite number after the National anthem of Bangladesh. Some of his most famous compositions were adaptations of American black spiritual that he had learned from Paul Robeson, whom he had befriended during his years in New York City in the early 1950s. His famous song 'Bistirno Parore' is heavily influenced by "Man River" sung by Paul Robeson.

This song is translated in various Indian languages, including Bengali and Hindi and sung by the artist himself, and is still popular. Being inspired from some other foreign ones, he also composed several other songs in Indian languages. He was exposed to the Spiritual, and the multi-lingual version of We are in the same boat brother became a regular feature in his stage performance. At Columbia University, he met Priyamvada Patel, whom he married in 1950. Tez Hazarika, their only child, was born in 1952, and he returned to India in 1953.

During his lifetime, a full-length docu-feature biopic film on his life titled Moi Eti Zazabor jointly directed by Late Waesqurni Bora and Arnab Jan Deka was launched in 1986 at his Nizarapar residence in Guwahati city. Music for this biopic film has been scored by five-time International Best Music Awards winner only Assamese musician, songwriter, composer and singer Jim Ankan Deka, who also worked as chief assistant director of this film. During the next two decades, the joint directors Late Bora and Deka shot him live for the film during his various public performances all over India, as well as many private moments in his domestic and social life. Arnab Jan Deka also extensively interviewed him regarding his life and its creative aspects for the film, which had been recorded during their joint travel to different metropolises and remote corners of Assam and rest of India. The film has been under production since 1986 with film negative footage of currently preserved in different film laboratories in Bombay, Calcutta and Madras. The film was targeted for public release during the lifetime of Dr Bhupen Hazarika in 2008. But, the production was halted after sudden demise of one of the co-directors Waesqurni Bora in November-2008. Eventually, after the death of Dr Hazarika, the film's subject, the surviving co-director Arnab Jan Deka is currently carrying out necessary works to finish the film at the earliest and release for public consumption in several language versions including English, Assamese,

Bengali and Hindi, with support from Late Waesqurni Bora's widowed wife Nazma Begum and Dr Hazarika's bereaved family members including his wife Priyam Hazarika and Tej Hazarika. Meanwhile, two books describing the unforgettable experiences of the making of this milestone biopic film had been authored by its co-director Arnab Jan Deka titled Anya Ek Zazabor and Mor Sinaki Bhupenda, first of which had been officially released in February 1993 by Late Sippy, then president of film federation of India and producer of world-record holder Hindi film 'Sholay' at a public function organised by Dr Bhupen Hazarika himself.

Hazarika was hospitalized in the Kokilaben Dhirubhai Ambani Hospital and Medical Research Institute in Mumbai in 2011. Dr Bhupen Hazarika was admitted to the intensive care unit on 30th June 2011. He died of multi-organ failure on 5th November 2011. His body lay in state at Judges Field in Guwahati and cremated on 9th November 2011 near the Brahmaputra River in a plot of land donated by Gauhati University. His funeral was attended by an estimated half a million people. Education is the key factor for an Indian playback singer, lyricist, musician, poet, actor, anthologist and filmmaker from Assam, widely known as Xudha Kontho and rural development.

The present study is an attempt to analyze the status of modern philosophical and environment literature in terms of various indicators such as access to education, India's recorded and unrecorded culture and civilization are rare features in the course of world history of Dr Bhupen Hazarika songs, based on the themes of communal amity, universal justice and empathy, are especially popular among the people of Assam, West Bengal and Bangladesh. He is also acknowledged to have introduced the culture and folk music of Assam and north-east to Hindi cinema at the national level. He received the National Film Award for best music direction in 1975, the Sangeet Natak Akademi Award (1987), Padma Shri (1977), and Padma Bhushan (2001), Dada Saheb Phalke Award (1992), the highest award for cinema in India and Sangeet Natak Akademi Fellowship (2008), the highest award of the Sangeet Natak Akademi. He was posthumously awarded both the Padma Vibhushan, India,s second-highest civilian award, in 2012 and the Bharat Ratna, India's highest civilian award, in 2019. Hazarika also held the position of the Chairman of the Sangeet Natak Akademi from December 1998 to December 2003. In conclusion therefore, the researcher ardently hopes that this important field of investigation would be continued and carried over with the passage of time.

Suggestions:

Keeping in view the above obstacles the following suggestions are forwarded to increase the extent of contemporary Assamese society. Future research based on a social representation approach is needed to allow teachers and stress management practitioners a shared understanding of stress, mental hygiene and mental health. Therefore, reflective study involving large and different population, as also follow-up study may be undertaken to establish the validity of findings of the present study. Therefore, a further study to cover more variables should be urgently needed.

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The Char People Of Assam And Their Indebtedness

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1. Introduction

Char is a locally used word for 'River Island' in the discourse of regional studies. The alluvial sandy river island created by the change of the main stream of the river Brahmaputra and their silt depositions is known as char (Rahman: 2014). According to the State Government of Assam, the sandy area extending in the river Brahmaputra where people can live and cultivate comes under the purview of char (GOA: 1983). An extensive area lies within the river Brahmaputra which are unfit for cultivation due to deserted character. Hence, the area is densely agglomerated and over pressured that consequences very low operational holdings.

Char areas of Assam are mostly inhabited by Bengalese Muslims who came to Assam during the first half of the twentieth century in search of food and shelter. They engaged themselves in the agriculture sector. Assam up to the thirties of the twentieth century was a land rich state. Earlier, in spite of having abundant supply of fertile land, agricultural economy of Assam could not extract sufficient quantum of food grains to meet the domestic demand because of either shortage of manpower or negligence of the indigenous people to work in this sector. Abundant supply of virgin land offered very lucrative scope for the livelihood of immigrants which was also favourable for the economy of Assam (Dutta: 1968). Historian Guha observed that immigration was a welcome phenomenon for labour-shortage and land-abundant Assam from economic point of view (Guha: 1947). The immigrants came to Assam, cleaned the jungles and occupied the fertile land of the riverine tract (Hussain; 1998). They were expert in agriculture as they were migrated from agrarian based economy. The immigrants carried their own agricultural practice, methods, skill, many of which were not prevalent in Assam. They initiated a revolutionary change in the agriculture of colonial Assam (Madhab: 2006). The Mymensingh cultivators in Nagaon and Mangaldoi had shown that along with rice and jute, many varieties of crops like *mung, seasamum*, mustard, wheat, tobacco, chillies, ginger, turmeric, potato, cabbage, cauliflower, tomato, garlic, brinjal, onion etc. could be grown (GOI: 1930).

The Bengalese immigrants transformed an extensive unused hinterland into the crop producing field is of great important in the historical study of agriculture in Assam. The cultivation of these types of crops in such low-lying flood prone waste area was really the beginning of the agricultural development in the history of Assam. From the above discussion we can conclude that the Bengalese Muslims immigrants have been immensely contributing in the development of agricultural sector of Assam. But matter of fact is that in spite of hard labouring in the field of agriculture, majority of the char dwellers are economically poor and deprived from the basic necessities of life. About 68 percent of them belonged to the BPL families and 80 percent of them were illiterate and are mostly indebted (GOA: 2003).

2. Objectives:
Present study has the following two objectives,

a) To find out the extent of indebtedness and causes of indebted for the char people

b) To obtain the sources of financing of their debt

3. Research Methodology

Present study is solely dependent on the primary source of information. The data were collected through field survey using suitable schedule. The sampling process undergoes through certain stratums. In the first stratum, out of 14 char districts of Assam, three districts viz, Kamrup, Barpeta and Jorhat were selected as the representative districts. Selection of 40 percent blocks of the total char blocks of respective districts viz, Goroimari, Chomoria, Chenga, Rupshi and Majuli were the second stratum. In the third stratum, villages were selected proportion basis. For the selection of sample households, 20 percent households were selected from those villages having less than 100 households, 15 percent households were selected

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from those villages having 101 to 300 households and 7 percent households were selected from those villages having more than 300 households as shown in Table 3.1.

TABLE 3.1
Selected districts, Sample blocks, Sample villages and Sample households.

Name of Districts	Selected Blocks	Villages			Households	
		Total	Char	Selected	Total	Selected
Kamrup	Goroimari	70	30	4	424	90
	Chomoria	88	11	3	683	70
Barpeta	Rupshi	68	18	3	805	70
	Chenga	58	29	4	610	92
Jorhat	Majuli	110	110	6	894	140
	Total:	404	289	20	3416	462

In accordance with the strategic sampling table, total number of sample household is 462.

4. Indebted Status of Char People

Agriculture is the basic economic foundation of the char economy. About 78.13 percent of the total population are directly or indirectly dependent on agriculture sector. But average size of operational holdings is as low as 0.71 hectare on which almost all the family members are dependent. Substantial number of households dwell in joint family which is comparatively big in size that reinforces in raising their extent of poverty. On the contrary, the area is extremely vulnerable due to flood that causes damage of standing crops. Flood as well as river are erosion are two burning question in the area that often make the char people landless and homeless that work behind to the victim of indebted. Table 4.1 shows the number of indebted people in the sample blocks.

TABLE 4.1
Block-wise Number of Indebted Households

Name of Sample Blocks	Number of Indebted Households	% of Indebted Households
Goroimari	25	27.77
Chomoria	27	38.57
Chenga	43	61.43
Rupshi	29	31.52
Majuli	11	7.86
All Blocks:	135	29.22

Source: Compiled from Field Survey
Note: Percentage of indebted households is estimated to sample households of respective blocks

About 29.22 percent of the households were found indebted in the sample blocks. It was highest in Chena Block (61.43 %) followed by Chomoria Block with 38.57 percent. Percentage of indebted people in Chenga Block was more because of practising of some vegetables and *Irri* Paddy which is capital intensive compared to the cultivation other crops. Number of indebted people in Majuli Block was lowest with only 7.86 percent. Reason behind lesser people indebted is people in the block were found not affected by the erosional activities of river. Percentages of indebted people in Rupshi and Goroimari Blocks were 31.52 & 27.77 respectively. Table 4.2 shows the number of households indebted for.

About 30.37 percent of the sample households were found indebted for the purpose of agricultural activities while 16.29 percent were indebted for fooding. Considerable number of households in the char areas go borrowing for homestead purpose is about 8.89 percent. More than 25 percent borrowing of the char people occurs for fooding as well as housing because of regular damages due to flood and river

erosion. An interesting point is to be noted here that about 8.88 percent of the char people are found indebted for the purpose of litigation. Char areas are temporary in nature due to river erosion. After the reappearance of a new char, it loses the boundary mark and becomes very difficult to demarcate it. There occurs quarrel among the char people to reoccupy and to approach the court that compel them to bear heavy cost and consequently indebted.

TABLE 4.2
Number of Households indebted for in the Sample Blocks

Indebted For	Number of Indebted Households					All Blocks
	Goroimari	Chomoria	Chenga	Rupshi	Majuli	
Agriculture	6 (24)	6 (22.22)	8 (18.60)	14 (48.27)	7 (63.64)	41 (30.37)
Litigation	3 (12)	3 (11.11)	5 (11.63)	1 (3.45)	-	12 (8.88)
Repayment of Debt	2 (8)	1 (3.71)	2 (4.65)	1 (3.45)	1 (9.09)	7 (5.18)
Business	1 (4)	5 (18.52)	4 (9.30)	1 (3.45)	-	11 (8.15)
Livestock	2 (8)	1 (3.71)	2 (4.65)	3 (10.34)	-	8 (5.92)
Medical	1 (4)	3 (11.11)	5 (11.63)	3 (10.34)	-	12 (8.89)
Fooding	5 (20)	6 (22.22)	7 (16.28)	4 (13.79)	-	22 (16.29)
Homesteads	5 (20)	-	4 (9.30)	1 (3.45)	2 (18.18)	12 (8.89)
Others	-	2 (7.41)	6 (13.95)	1 (3.45)	1 (9.09)	10 (7.41)
Total:	25 (100)	27 (100)	43 (100)	29 (100)	11 (100)	135 (100)

Source: Same as Table 4.1.
Note: Others imply for marriage, education, service etc.

Table 4.3 shows the sources of borrowing of the char people. As is mentioned that land is the most reliable source of capital of char people, majority of them borrow on land mortgage. About 42.22 percent of the households in the area are found indebted on the land mortgage. Next to it, 16.29 percent of the households are found indebted from other sources where other source is basically meant for shopkeeper. They go borrowing from the shopkeeper for food items as well as agricultural inputs.

TABLE 4.3
Number of Households indebted from Different sources in the Sample Blocks

Source of Indebt	Number of Households					All Blocks
	Goroimari	Chomoria	Chenga	Rupshi	Majuli	
Money Lender	4 (16)	5 (18.52)	3 (6.97)	7 (24.14)	-	19 (14.07)
NGOs	3 (12)	4 (14.82)	1 (2.33)	1 (3.45)	-	9 (6.67)
Banks	-	1 (3.70)	1 (2.33)	8 (27.58)	6 (54.54)	16 (11.85)
Land Mortgage	7 (28)	11 (40.74)	29 (67.44)	10 (34.48)	-	57 (42.22)
Relatives	6 (24)	-	4 (9.30)	1 (3.45)	1 (9.09)	12 (8.88)
Others	5 (20)	6 (22.22)	5 (11.63)	2 (6.89)	4 (36.36)	22 (16.29)
Total:	25 (100)	27 (100)	43 (100)	29 (100)	11 (100)	135 (100)

Source: Same as Table 4.1.
Note: Others imply for "Shopkeepers".

Percentage of borrowers from banks were 11.85 percent only, where no household from Goroimari block and a single household from Chomoira and Chenga Blocks each are found borrowed from banks. Percentage of households borrowed from banks in Majuli Block were 54.54 percent against 27.58 percent in Rupshi Block. On the contrary, more than 20 percent of the households are found borrowed from the private money lenders as well NGOs in which rate of interest is very high. However, percentage of borrowers from the relatives in the sample blocks were 8.88 percent which is a convenient means of borrowing in sense of interest because borrowing from relatives may be without bearing the cost of interest.

5. Findings
i) Majority of the char people are dependent on agriculture which is regularly affected by flood and river erosion.

ii) Considerable number (29.22 %) of households in the char areas are involved in debt. It was highest in Chenga Block followed by Chomoria Block.

iii) Majority of the indebted people are found indebted for agricultural purpose.

iv) Non-govt. funding agencies play the prime role in the char areas of Assam. Land is the major source of borrowing in the areas.

v) Role of bank is very poor even disappears in some blocks.

6. Conclusion:

Role of financial institutions especially banks is very necessary for modern economic development. Role of banks is very important in gathering small savings in rural areas like char. But private funding agencies has been playing pivotal role in the area in which there is more probability of pushing them into the debt trap. Since agriculture is the mainstay in Assam, Government should take necessary action for financing agricultural activities in the area where majority of the people are dependent on this particular sector.

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