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Editor's Desk

It is my privilege to write an editorial column in the position of new editor for the current issue of the Journal of Economic and Policy Research.

Changing expectations and predictions about India's growth over the last two years raise concerns of high growth achieved so far is sustainable. Optimistic outlook of RBI on India's high growth trajectory may sound defensible, since the economy has shown greater resilience amid global recession, but the growing inflation however, on the other side, cannot be ignored as there always exists a trade off between growth and inflation in a country like ours. Impact of inflation on growth prospects needs an in-depth probe and calls for a calibrated policy approach.

To restore growth, keeping inflation under control that has spiraled to higher than 5%, is quiet challenging for the government. Though the GDP clocking at 8.7 per cent in full fiscal year 2021-22 compared to 6.9 per cent in 2020-21, still fears grip the economy and often leads to skepticism whether the country can strike higher growth in coming years and harness the raging inflation that is hovering at 7.85%. At this juncture, policy makers may have to overhaul the spending policies prioritizing the financial needs of the sectors of the economy in the backdrop of high inflation and weak growth coupled with limited fiscal policy space.

Readers find interesting the present volume as it encapsulates the transformation of economies and their development.

A paper on agri clinics and agribusiness quantifies and analyzes the impact of agri clinics and agribusiness on the entrepreneurs and farmers tangible and intangible assets. The authors find that agribusiness results in increased productivity, income and savings of the farmers and significantly reduces the cost of cultivation.

Paper on National Dairy Plan examines the integrated approach of dairy development and practices with SDGs and discusses the government's initiatives during the phases of National Dairy Plan-I execution. The authors find that the government intervention extended the benefits of collective bargaining capacity of the landless, marginal and small producers through cooperative arrangement in addition to milk sustaining production measures.

African economic development is explored through building a causal relationship between education and economic growth. The author studied how expenditure on education brings in growth in the Sierra Leone economy suggested that Public-Private Partnership as the viable policy option to facilitate meaningful economic growth and competitiveness in the country's education sector.

Digital transformation of India is captured in the paper on Merchant Orientation. The author examines the implementation process, feasibility and usability of the applications of the e-wallet and finds that the adoption of digital payment mechanism is inevitable the post-demonetization.

Usha Nori
Editor

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Analytical Study of the Impact of Agriclinics and Agri-Business Centre

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P. Kanaka Durga[2]

Abstract

This Paper has quantified and analysed the impact of the Agriclinics & Agribusiness Centre Scheme (AC & ABC) on the entrepreneurs and the farmers' level in terms of tangible and intangible benefits. Primary data were collected from a randomly chosen sample of 160 entrepreneurs and 480 farmers for whom these agripreneurs are providing agricultural extension services. Descriptive statistical techniques and mathematical formulae are used to measure the tangible benefits. Intangible benefits are measured using a Likert 5 point scale. Connecting the tangibles to intangibles using the dummy independent models is another tool used. These agripreneurs have enjoyed tangible benefits in terms of net profit margin, rate of return on investment, net income, increase in household consumption expenditure, increase in the durable assets in their possession, improving quality of education for their children, improving health status and employment generation. The study highlights that the tangible benefits accrued to the agripreneurs are directly connected to their intangible benefits. The Scheme has brought improvements in investments by farmers, reduction in the cost of cultivation, increased productivity, increased income and savings. An econometric model formulated and estimated clearly demonstrates the impact of agripreneurs extension services on the income of the farmers. Because the Scheme has immense benefits in terms of providing employment opportunities to the unemployed and bridging the gap in agricultural extension, the Government has to strengthen the loan and subsidy support by strictly enforcing One bank branch – One agriclinics policy where each branch is mandated to provide support to attest one agripreneurs every year.

Keywords: Agri-Business, Agri Clinics, Agripreneur

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Growth and development in entrepreneurship is important for enhancing the employment opportunities for the unemployed, living conditions of the entrepreneurs and a benefit to the society at large. In order to enhance entrepreneurship development in agriculture and strengthen the extension services provided to the farmers the Ministry of Agriculture and Farmers' Welfare, Government of India, had launched the scheme of 'Agri-clinics and Agri –business Centers' (AC &ABC) on the 9th April 2002. Agri-clinics are envisaged to provide expert services and advice to farmers on cropping practices, technology dissemination, crop protection, market trends, prices of various crops in the markets and also clinical services for animal health etc. Agribusiness centres are envisaged to provide inputs such as farm equipment on hire, seeds, fertilisers and other services.

This Scheme has been implemented throughout the country by providing two months of training to the selected candidates and providing bank loans with a back-ended composite subsidy. Total number of candidates trained for the country as a whole as on May 2021 is 74520 and the number of agri ventures established is 31352, which means 42 per cent of the trained candidates could establish agri ventures. Maharashtra ranks number one in terms of trained candidates and number of ventures established with 18937 and 9195, respectively. Uttar Pradesh is in second position with 16494 trained candidates and 7894 ventures established (www.manage.gov.in). With a view to study the Social benefits generated by the Scheme, a study was conducted by MANAGE. This study has its uniqueness as many existing studies on AC & ABC have analysed the impact of the Scheme on income levels of entrepreneurs and farmers but did not cover the resultant social benefits generated MANAGE (2004) Chandrashekara.P., and Kanaka Durga, P.(2007), Kanaka Durga P. (2016), Shoji Lal Bairwa, et al. (2017), Rajashekhar Karjagi (2018).

Objectives

The overall objective of this article is to measure the impact of the AC & ABC Scheme by analysing the tangible and intangible benefits generated by the Scheme. However, the specific objectives are:

- To identify, measure and analyse the tangible and intangible benefits accrued to the agripreneurs
- To identify, measure and analyse the tangible and intangible benefits accrued to the farmers.
- To understand the total benefits (social benefits) generated under the Scheme

This article is divided into three sections. Methodology section provides the methodology adopted in sample design and coverage, analytical tools and techniques used to analyse the data. Analysis section discusses the

results and conclusion section summarises the findings and provides recommendations.

Methodology

Sample Design and Coverage

The study is carried out based on primary data sources, which were collected based on multi-stage random sampling. In order to have wider coverage, primary data is collected for all five regions of India viz., South, North, East, West and North East. From each region, one state is selected based on its share in total number of agri ventures established under the AC & ABC Scheme. A state having a maximum number of ventures from each region is selected for analysis.

The period considered for the analysis is from April 2002 to December, 2010. In order to have coverage of all the 32 activities which are mentioned in the Scheme Guidelines and benefits accrued activity-wise, five (5) agripreneurs are chosen for each activity and hence a total sample of 160 agripreneurs are selected. From the secondary data, it is observed that the states Viz., Uttar Pradesh (North) Karnataka (South), Bihar (East), Maharashtra (West) and Assam (North-East) are having maximum number of agripreneurs. These states are chosen for conducting this study by collecting the primary data.

The sample of 160 agripreneurs is divided among the five states based on the proportionate share of total number of ventures established in their respective states. The same criteria are used for the selection of districts viz. Varanasi (UP),Bangalore (Karnataka), Patna (Bihar), Pune (Maharashtra) and Kamrup (Assam) as these districts that have the maximum number of agripreneurs established their ventures. Based on this criteria, the sample size is 59 for UP, 43 for Maharashtra, 27 for Karnataka, 27 for Bihar and 4 for Assam (Table-1).

To analyse the benefits flowing out of the extension services of agripreneurs three farmers for each Agripreneur are selected randomly. Based on this, the sample size of farmers selected is 177 in UP, 129 in Maharashtra, 81 in Karnataka, 81 in Bihar and 12 in Assam. This constitutes a total sample size of 480 farmers (Table-1)

Table-1: Selected Sample Size of Agripreneurs & Farmers: District Wise

State	District	Number of Agripreneurs	Number of Farmers
Uttar Pradesh	Varanasi	59	177
Karnataka	Bangalore	27	81
Bihar	Patna	27	81
Maharashtra	Pune	43	129
Assam	Kamrup	4	12
Total		160	480

Analytical Tools Used

The primary data from the selected agripreneurs and farmers is collected with the help of a well-designed pre-tested schedule. The collected data has been analysed based on various qualitative and quantitative techniques. Tangible benefits and intangible benefits accrued to the Agripreneur due to AC & ABC are measured using various qualitative and quantitative techniques. Table-2 provides the list of identified tangible and intangible benefits at the Agripreneur level and at the farmer level.

Table-2: List of Identified Tangible, Intangible Benefits

At Agripreneur Level		At Farmer Level	
Tangible Benefits	**Intangible Benefits**	**Tangible Benefits**	**Intangible Benefits**
Return on Investment	Happiness	Increase in farm	confidence
Profitability	Self confidence	investment	Risk taking
Diversification in	stability	Reduction in cost	Knowledge, skill
Business	Risk taking	of cultivation	Credibility with the
Nature of business	Increase in skill	Yield per hectare	banks
Net Income	Increase in	Net income	
Household	knowledge	earned	
Expenditure	social respect	Family	
Employment	social contacts	expenditure	
Generation	Family confidence	Crop	
Salaries paid to	Credibility with the	diversification	
employees	bank		
Housing	Credibility with the		
Vehicles in	farmers		
possession	Media coverage		
Education of			
children			
Health Status			

Data were analysed using descriptive and inferential statistics with the aid of Statistical Packages for Social Scientists (SPSS). Descriptive statistical techniques and mathematical formulae are used to measure the tangible benefits. Intangible benefits are measured and analysed using a Likert 5 point scale. According to this measure the intangible benefits are listed in the schedule and have the respondents disagree or agree on a five-point scale. The mid-point then becomes neutral. Connecting the tangibles to intangibles (Bev Meldrum, Pete Read and Colin Harriso (2017) (using the dummy independent models is another tool used. This approach connects the intangible to a measure that is easier to value, a tangible. Some relationships mapped are Credibility with the farmers versus the volume of sales and diversification in business versus number of persons employed and self-confidence versus the amount of investment made. An Econometric Model is formulated to estimate the effect of agripreneurs' extension services on the agricultural production and thereby

income earned by sample farmers. The following model is formulated and estimated:

$$Yi = \beta 1 + \beta 2\, X1 + \beta 3\, X2 + \beta 4\, X3 + \beta 5\, X4 + \beta 6 X5 + \beta 7\, X6 + ui$$

Where

Y = production (income as a proxy is taken due to the problems of aggregation)

X1 = cropped area

X2 = number of labourers employed

X3 = investment

X4 = irrigated area

X5 = consumption of chemical fertilisers

X6 = agripreneurs extension services (It is a dummy independent variable where it takes the value 1 = with the intervention of

Agripreneur 0 = otherwise

ui = Random Error Term

$\beta 1, \beta 2, \beta 3\ \beta 4\ \ \beta 6\ \beta 7$ are the parameters to be estimated in the model

Analysis & Results

This section provides the socio-economic profile of the sample agripreneurs and analysis of tangible and intangible benefits accrued to the agripreneurs and farmers.

Socio-economic Profile of the Sample Agripreneurs

Out of the total 160 agripreneurs, 157 which means about 98 per cent of the respondents were males. The age-wise classification of the respondents shows that 101 respondents belong to the age group of 36-55 years, which means 62 per cent of the respondents are below 55 years of age, whereas in Varanasi only 49 per cent belong to the age group of 25-35 years. Only 6 per cent of the respondents belong to the age group of 56 and above. Out of 160 sample agripreneurs, 130 agripreneurs were married, including 22 from Bangalore, 23 from Patna, and 46 from Varanasi. The field findings showed that unemployment and marital status are strongly linked and for the agripreneurs who were well settled in terms of their business, their marriage prospects have improved. This is one of the important social benefits of AC & ABC Scheme observed in the field. With regard to the status of education, though the guidelines permit the undergraduates with agriculture subject at their Intermediate or plus two levels to undergo training under AC & ABC Scheme, a very less number of sample respondents belong to this category were observed wherein 48 sample agripreneurs are postgraduates and 101 are graduates. The caste classification of the agripreneurs shows that less than 3 per cent of the respondents belong to SC and ST category and it is the case invariably across all sample districts. About 34 per cent of the sample agripreneurs

belong to the OBC category, which was found to be the second important category in the caste classification of the sample respondents.

Business Profile of Sample Agripreneurs

Table-3 shows that out of 160 agripreneurs 60 agripreneurs were established ventures before undertaking AC & ABC training. The majority of the ventures were established after undertaking training in the sample districts. Table-4 shows the activities undertaken by sample agripreneurs. In Bangalore, Agriclinics was chosen as the most important activity by sample agripreneurs. Other activities observed were animal feed units, Biofertilizer production and marketing, horticulture and tissue culture laboratory. Dairy, Poultry and seed processing business units were widely prevalent activities in Kamrup. In Patna, Agriclinics, vermicomposting and seed production and marketing activities were undertaken by sample agripreneurs. As per the Guidelines of AC & ABC the agripreneurs can undertake business in 32 activities (www.manage.gov.in). It was observed that the sample agripreneurs were carrying out business in 19 activities in Pune, whereas in Varanasi majority of them, i.e., 51 agripreneurs, established agribusiness units only (Table-4). The diversity of activities in Pune is due to existing business prospects in these activities, which are lacking in the Varanasi district.

Table-3: Status of Venture Establishment of Sample Agripreneur

District	Agripreneurs	Ventures Established Before the Training	Venture Established After the Training	Total
Bangalore	Number	5	22	27
	Percentage	18.50%	81.50%	100.00%
Kamrup	Number	2	2	4
	Percentage	50.00%	50.00%	100.00%
Patna	Number	13	14	27
	Percentage	48.10%	51.90%	100.00%
Pune	Number	22	21	43
	Percentage	51.20%	48.80%	100.00%
Varanasi	Number	18	41	59
	Percentage	28.60%	25.40%	100.00%
Overall	Number	60	100	160
	Percentage	36.60%	62.40%	100.00%

Source: Primary Data

Table-5 explains the number of villages and farmers covered by sample agripreneurs across sample districts. Itt is clear from the table that on average, each agripreneurs had covered 17 villages with a maximum of 210 and a minimum of 2 villages.

Table-4: Activities undertaken by Sample Agripreneurs

S. No.	Name of the Enterprise	Name of the District				
		Bangalore	Kamrup	Patna	Pune	Varanasi
1	Agri-Clinics	22	0	9	7	1
2	Agri-Clinics and Agribusiness Centres	0		1	5	51
3	Animal Feed Unit	1	1	1	1	1
4	Bio-fertilizer production and Marketing	2		1	1	1
5	Contract Farming				3	
6	Farm Machinery Unit				3	
7	Floriculture				3	
8	Horticulture Clinic	1				
9	Landscaping + Nursery				2	
10	Nursery				2	
11	Organic Production / Food Chain				4	
12	Pesticides Production and Marketing			2	13	2
13	Value Addition			1		
14	Seed Processing and Marketing	1		4		
15	Soil Testing Laboratory		2		2	1
16	Tissue Culture Unit	1				
17	Vegetable Production and Marketing				3	
18	Vermicomposting / Organic manure			9	3	1
19	Crop Production				6	
20	Dairy / Poultry / Piggary / Goatary		4		4	9
21	Agriculture Journalism				1	

Source: Primary Data

Villages covered by each agripreneurs on an average are 28 in Bangalore, 38 in Kamrup, 17,11,16 in Patna, Pune and Varanasi, respectively. Each Agripreneur, on an average was, covering 2451 farmers with a maximum of 50000 and a minimum of 40 farmers. The number of farmers covered per village was highest in Varanasi with 303 and the least in Bangalore with only 13.14 farmers. In the Varanasi district, though the number of villages covered by average sample agripreneurs is relatively less when compared to the other districts, the number of farmers covered was relatively higher, which was found to be 4848. As the demand for the services of agripreneurs per village is relatively much higher in the Varanasi district, the agripreneurs in this district putting concerted efforts intensifying their business in a few villages only.

Table-5: Villages & Farmers Covered by Sample Agripreneurs

District	Agripreneurs	Villages Covered	Farmers Covered	Average Number of Farmers Per Village
	Mean	28	368	13.14
Bangalore	Minimum	4	60	
	Maximum	210	1100	
	Mean	38	1175	30.92
Kamrup	Minimum	15	200	
	Maximum	50	2000	
	Mean	17	557	32.76
Patna	Minimum	2	40	
	Maximum	165	6000	
	Mean	11	1533	139.36
Pune	Minimum	2	40	
	Maximum	100	50000	
	Mean	16	4848	303
Varanasi	Minimum	2	100	
	Maximum	180	50000	
	Mean	17	2451	144.18
Total	Minimum	2	40	
	Maximum	210	50000	

Source: Primary Data

Benefits Analysis

Tangible Benefits

Tangible benefits, which are quantifiable, were analysed by measuring the following financial performance indicators:

Investment Analysis

Investment analysis is carried out by looking at the following aspects: 1) Return on investment 2) Profitability

Table-6: Average Annual Return on Investment and Profitability of Sample Agripreneurs

S. No.	District	Investment (Rs Lakhs)	Sales / Turn Over Rs in Lakhs	Net Profit Earned (Rs Lakhs)	Net Profit Margin (%)	Return on Capital (ROI) (%)
1	Bangalore	20.78	49.43	30.05	60.79	144.61
2	Kamrup	53.5	100.67	61.65	61.23	115.23
3	Patna	6.8	22.06	16.82	76.25	247.35
4	Pune	15.3	42.36	36.89	87.09	241.11
5	Varanasi	6.48	19.46	12.6	64.74	194.44
6	Average	20.572	46.796	31.60	67.53	153.61

Source: Calculated from Primary Data

ROI = [(Current Value of Investment – Cost of Investment)/Cost of Investment] X 100

Table-6 shows the average investment made, sales or turnover, operating expenses and net profit earned by the agripreneurs. The investment made varies across districts, with a minimum of 6.8 Lakhs to a maximum of 53.5

Lakhs. The average investment made by each agripreneur is estimated at rupees 20.57 Lakhs. Some entrepreneurs in some districts incurred almost same operating expenses in states like Varanasi, whereas in other, they exceeded by 30 to 40 per cent more. Contrary to other states, in Kamrup the operating expenses are less than the investment made. The net profit earned can cover both the fixed costs and operating expenses. This shows the viability of the business. The net profit margin of the ventures is around 60 to 65 per cent for all enterprises. Maximum net profit margin is observed for ventures in Pune, followed by Patna. The return on investment is more than 100 per cent for all ventures and for some ventures, it is more than 200 per cent. Since most of the ventures established were in Agriclinics and Agribusiness Centers, which are mostly services oriented and do not require investment in fixed capital so ROI would be much higher for such enterprises. The high ROI calculations are justified by the fact that most of the business entities in AC & ABC are service-oriented.

Table-7 shows a change in the investment pattern of agripreneurs who have established ventures before undertaking training in the AC & ABC Scheme. It shows clearly that there is a significant increase in investment made by these ventures after the training.

Table-7: Change in Investment Pattern of Agripreneurs

Sate	District	Investment (Rs in Lakhs)	
		Before Training	After Training
Assam	Kamrup	1.1	24.0
Maharashtra	Pune	5.7	13.6
Bihar	Patna	2.6	7.0
Karnataka	Bangalore	12.3	22.5
Uttar Pradesh	Varanasi	2.1	7.1
Overall (Average)		4.8	11.7

On average the investment increased from 4.8 Lakhs to 11.7 Lakhs in most of the districts. There is a change in the pattern of investment made by agripreneurs. About eighty per cent of entrepreneurs in all the selected districts invested less than 5 Lakhs In the initial years of their business and only 11 per cent of them invested more than 10 Lakhs. In Maharashtra, 86 per cent of the sample agripreneurs invested less than 5 Lakhs and gradually, more than 30 per cent of entrepreneurs invested more than 10 Lakhs. This may be due to the increasing opportunities for business prospects, which has been considered as one of the indicators of agribusiness success.

There is a change in services offered by agripreneurs to farmers, which is evident from Table-8. In order to prosper in business and enjoy economies of scale and economies of scope majority of the agripreneurs diversified

their services from time to time by offering varied services to farmers. Diversification allows for more variety and options for products and services.

Table-8: Perception of Status of Services Offered (Number of Agripreneurs)

District		Services Offered		Total
		No Change	Change	
Kamrup	No. of Agripreneurs	1	3	4
	Percentage	25	75	100
Pune	No. of Agripreneurs	19	24	43
	Percentage	44.2	55.8	100
Patna	No. of Agripreneurs	22	5	27
	Percentage	81.5	18.5	100
Bangalore	No. of Agripreneurs	6	21	27
	Percentage	22.2	77.8	100
Varanasi	No. of Agripreneurs	14	49	63
	Percentage	22.2	77.8	100
Bangalore	No. of Agripreneurs	62	102	164
	Percentage			

Increase in Net Income of Agripreneurs

The success of a small business depends on its ability to earn profits in a sustained manner. Earning a profit is important to a small business because profitability impacts whether a company can secure financing from a bank, attract investors to fund its Operations and grow its business. Companies cannot remain in business without turning a profit. In the previous section, the discussion was made on how agripreneurs could make a profit and succeeded in business.

Table-9 explains the net income changes of the agripreneurs within three years. The increase in income on an average per month can be observed in Kamrup by Rs 1.45 Lakhs followed by 1.36 Lakhs in Pune, and in other districts, the increase was less than Rs 50000. The entrepreneur in all the districts earns a minimum income of three thousand rupees in the initial years of business and Rs 12000 after 3 years of starting the business. The maximum earnings were Rs 25000 in the initial years and Rs 40000 after three years.

Table-9: Net Income Earned per Month (Rs in Lakhs)

District		Income Initial Years	Income After 3 Years	Increase In Mean Income
Kamrup	Mean	0.21	1.66	1.45
	Minimum	0.10	0.45	
	Maximum	0.30	3.00	
Pune	Mean	0.82	2.18	1.36
	Minimum	0.20	0.40	
	Maximum	25.00	40.00	

District		Income Initial Years	Income After 3 Years	Increase In Mean Income
Patna	Mean	0.23	0.49	0.26
	Minimum	0.05	0.15	
	Maximum	0.70	3.50	
Bangalore	Mean	0.30	0.64	0.34
	Minimum	0.05	0.12	
	Maximum	1.80	3.20	
Varanasi	Mean	0.03	0.36	0.33
	Minimum	0.07	0.25	
	Maximum	0.20	4.00	
Total	Mean	0.32	0.94	0.62
	Minimum	0.03	0.12	
	Maximum	25.00	40.00	

Source: Computed from Primary Data

Increase in Household Expenditure

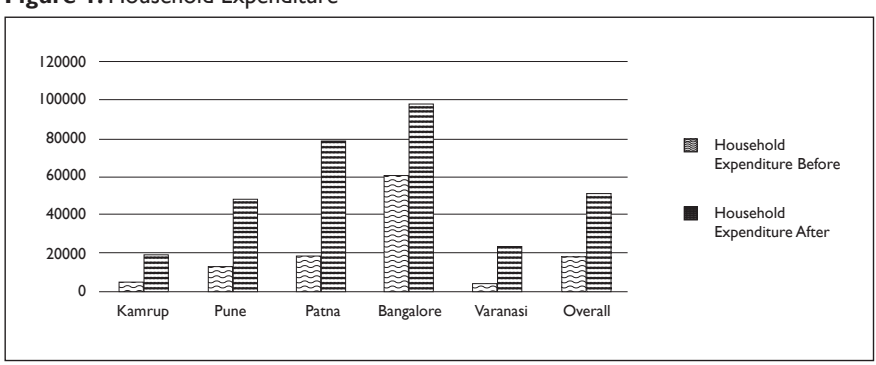
Expenses include the amount paid for lodging, food consumption within the house and other costs. Table-10 and Figure-1 show the average expenditure per month by agripreneurs households towards family expenditure. The income of agripreneurs increased significantly, that resulted in increased household expenditure. This is also one of the parameters of increased prosperity. Because the consumption expenditure has not increased in commensurate with the increase in income, household savings have gone up. Many of the entrepreneurs converted these savings for investment.

Table-10: Status of Household Expenditure per Month by Agripreneur (Rupees)

District		Expenditure Before Establishing Ventures	Expenditure After Establishing Ventures Unit
Kamrup	Mean	0.05	0.20
Pune	Mean	0.14	0.49
Patna	Mean	0.19	0.79
Bangalore	Mean	0.61	0.99
Varanasi	Mean	0.05	0.24
Total	Mean	0.19	0.52

Source: Primary Data

Figure-1: Household Expenditure



Status of Employment Generation by Agripreneur

Entrepreneurship development in rural industries appears to be the best potential alternative to find employment avenues for the rural population. The unemployed agricultural graduate who became agripreneurs under AC & ABC Scheme can provide employment opportunities to other rural unemployed youth (Table-11). This is one of the most important and direct social benefits which we can notice due to the promotion of agripreneurship by the Scheme.

Table-11: Status of Generation of Employment by Agripreneur (Number of Persons)

District	Number of Persons		
	Mean	Minimum	Maximum
Bangalore	4.67	0	46
Kamrup	4.75	2	9
Patna	2.52	0	7
Pune	6.67	0	100
Varanasi	2.79	0	16
Overall Sample	4.12 (Average)	0	100

Source: Computed from Primary Data

Table-12 shows the housing status of sample agripreneurs. The data analysis shows that more than 30 per cent of them could shift from kuccha house to pucca house due to increased income levels. Almost 50 per cent of them had pacca houses only for a very long period, the field visit made us understand that furnishings in the house have improved significantly. The living standards of the agripreneurs improved as they were able to enjoy certain comforts after starting their ventures. A large number of them could able to move from bicycle to two-wheeler. An equally important number could buy cars also comfortably (Table-13).

Intangible Benefits

Intangible benefits are the gains attributable to the Scheme performance that are not reportable for formal accounting purposes. These benefits are not included in the financial calculations because they are non-monetary though they may be very significant for social impact. The intangible benefits considered in this report are the increase in happiness, increase in self-confidence, increase in family confidence, increase in society recognition, increase in respect in the society, increase in stability, increase in risk-taking ability, increase in business skills, increase in media coverage, increase in credibility with the banks and with farmers.

The perceptions of the agripreneurs on the benefits accrued to them due to the AC & ABC Scheme after they became agripreneurs are captured

with the help of the Likert Scale and the same is presented in Table-14 to Table-16 The estimated Likert Scale shows that the majority of the agripreneurs across all the sample districts have strongly agreed that their happiness levels increased after they became agripreneurs.

Table-12: Housing Status of Agripreneurs

		Number of Agripreneurs			
		Continues to have kuccha house	**Change from kuccha house to pucca house**	**Continues to have pucca house**	**Total**
Kamrup	No. of Agripreneurs	1	2	1	4
	Percentage	25	50	25	100
Pune	No. of Agripreneurs	1	16	26	43
	Percentage	2.3	37.2	60.5	100
Patna	No. of Agripreneurs	0	2	25	27
	Percentage	0	7.4	92.6	100
Bangalore	No. of Agripreneurs	15	11	1	27
	Percentage	55.6	40.7	3.7	100
Varanasi	No. of Agripreneurs	4	29	30	63
	Percentage	6.3	46	47.6	100
Overall	No. tof Agripreneurs	21	56	83	160
	Percentage	12.8	36.6	50.6	100

Source: primary data

Table-13: Number of Agripreneurs Possessing the Vehicles

District Name	**Bicycle Only**	**Bicycle to Two Wheeler**	**Two Wheeler to Four Wheeler**	**Total**
Kamrup	1	0	2	4
Pune	0	8	17	43
Patna	2	2	1	27
Bangalore	0	9	13	27
Varanasi	7	38	14	59

Source: Primary Data

The Average Likert Scale2 In the range of 4.5 to 4.9 in districts such as Kamrup, Varanasi and Pune, respectively, indicates that majority of the agripreneurs strongly agreed that their happiness levels increased after they became agripreneurs due to AC & ABC Scheme, because these scales are close to 5 that represents strongly agree.

Table-14: Perception of Agripreneurs on Increase in Happiness Levels Due to Agripreneurship (Likert Scale)

District	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total	Average Likert
Kamrup				8	10	18	4.5
Patna	2	4	15	48	45	114	4.2
Pune	2	10	18	80	100	210	4.9
Bangalore	2	6	18	28	50	104	3.8
Varanasi	0	0	75	80	120	275	4.7

Source: estimated from primary data

Table-15 shows that the majority of the agripreneurs across all the sample districts have agreed that their confidence levels have increased after they became agripreneurs. The Average Likert Scale of 4.6 in Pune indicates that the majority of them have strong agreement on the increased confidence levels across the districts and is evident from the average Likert Scale at around 4.

The Likert Scale for Kamrup district is close to 5 in case of increase in skills, knowledge levels and societal respect and close to 4 in case of increase in risk-taking ability and credibility with the farmers, shows that there is a strong agreement on the improvements in case of skills, knowledge levels and societal respect and just agreed in case of increase in risk taking and credibility with the farmers. However, the majority of the agripreneurs in this district disagreed with the improvements in their bank credibility. The same findings are observed in Patna, Bangalore and Varanasi. In Pune, improvements in two parameters, such as risk taking and credibility, are strongly agreed. In all the districts, it was observed that the agripreneurs credibility with the banks has not improved as evident from the Likert Scale ranging from 2.9 to 3.8 (Table-16).

Table-15: Perception of Agripreneurs on Increase in Self Confidence Due to Agripreneurship (Likert Scale)

District	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total	Average Scale
Kamrup				16	0	16	4.0
Patna	0	0	6	40	60	100	3.7
Pune	0	0	9	48	140	197	4.6
Bangalore	0	0	12	56	45	113	4.2
Varanasi	0	0	12	80	125	217	3.7

The Likert Scale for Kamrup district is close to 5 in case of increase in skills, knowledge levels and societal respect and close to 4 in case of increase in risk-taking ability and credibility with the farmers, shows that there is a strong agreement on the improvements in case of skills, knowledge levels and societal respect and just agreed in case of increase

in risk taking and credibility with the farmers. However, the majority of the agripreneurs in this district disagreed with the improvements in their bank credibility. The same findings are observed in Patna, Bangalore and Varanasi. In Pune, improvements in two parameters, such as risk taking and credibility, are strongly agreed. In all the districts, it was observed that the agripreneurs credibility with the banks has not improved as evident from the Likert Scale ranging from 2.9 to 3.8 (Table-16).

Table-16: Perception of Agripreneurs on Benefits of AC & ABC Scheme (Likert Scale)

District	Risk Taking	Increase in Skills	Knowledge levels	Societal Respect	bank credibility	Credibility with the Farmers
Kamrup	4.1	4.8	4.8	4.9	3.1	3.8
Patna	4.2	4.7	4.7	4.8	2.9	3.9
Pune	4.8	4.2	4.2	4.2	3.5	4.5
Bangalore	4.4	4.6	4.6	4.1	3.8	4.8
Varanasi	4.2	4.9	4.9	4.6	3.2	5.0

Source: estimated from primary data

Connecting the Tangibles to Intangibles

This approach connects the intangible to a measure that is easier to value, which means linking a tangible resource to its intangible meanings. Effective interpretation is about connecting one to the other tangibles and intangibles exist together. The tangible and intangibles mapped in this article are credibility with the farmers with the value of sales; diversification in business with the number of persons employed; self-confidence with the amount invested; society recognition with the number of visits to the village. Regression coefficient is estimated to establish a connection between tangible indicators and intangible indicators using the dummy independent variable. The value of the estimated regression coefficients are presented in Table-17.

Table-17: Tangible and Intangible Variable Relationship

S. No.	Intangible Indicator	Tangible Indicator	Regression Coefficient	t Value
1	Credibility with the farmers	Value of Sales	0.80*	3.5
2	Diversification in business	Number of persons employed	0.50*	2.8
3	Self confidence	Amount invested	0.75*	6.8
4	Society recognition	Number of visits to villages	0.83*	2.8

*significant at 1% level

The regression coefficients estimated between the tangible indicator and intangible indicator are statistically significant at a 1% level. The regression coefficient between credibility with the farmers and value of sales shows that whenever entrepreneur has strong credibility with the farmers, there was an increase in his turn over or sales by 80% more

than the entrepreneurs who do not have any credibility. The regression coefficient between the diversification of business and the number of people employed is 0.5 which means employment increases by 50% more with diversification. The amount invested increases by 75% more if the person has self confidence than the person who does not have self-confidence. Likewise societal recognition depends on the number of visits to a village. The society recognition is 83% more to an entrepreneur who makes regular visits to provide advisory to the farmer than an entrepreneur who does not visit villages regularly.

Impact of Agripreneurs' Extension Services on Farmers' Income

The impact of agripreneurs' services on farmers is analysed in terms of change in investment, reduction in cost of cultivation, increase in yield and income of the farmers in the study area. Besides extension, several other factors also influence the increase in yield and thereby, income of the farmers. With the intervention of agripreneurs of AC & ABC as extension service providers, investments by farmers increased, cost of cultivation reduced, increased productivity, increased income and savings.

Increase in Investment

Farmers invest the highest amount in wells and other irrigation, followed by agricultural machinery, transport equipment and land improvements. Table-18 shows the impact of agripreneurs extension services on the investment made by the farmers in the study districts. It is clearly evident from the table that the farm investments increased with the intervention of agripreneurs. Overall there is a 92 per cent increase in investment and the maximum increase can be observed in Kamrup in Assam, followed by Pune in Maharashtra and Bangalore in Karnataka. The reason behind this increase in investments is the increase in confidence levels of farmers in carrying out farm operations.

Reduction in Cost of Cultivation: The average cost of cultivation of all crops cultivated by sample farmers was reduced by 13% in Maharashtra (lowest reduction) and by 26% in Karnataka (highest reduction) and in between these figures in other sample districts (Table-19).

Table-18: Investment Made in Agriculture by Sample Farmers (Rs in Lakhs)

S. No.	Name of the State/ District	Before Taking Extension Service from Agripreneur	After Taking Extension Service from Agripreneur	% Increase
1	Assam (Kamrup)	0.58	3.44	491
2	Bihar (Patna)	4.69	6.47	38
3	Karnataka (Bangalore)	0.38	0.98	160
4	Maharashtra (Pune)	1.39	3.99	188
5	Uttar Pradesh (Varanasi)	0.20	0.33	65
	Average	1.30	2.49	92

Source: Computed from Primary data

Table-19: Total Cost of Cultivation of all crops per acre by Sample Farmers (Rs in Lakhs)

S. No.	Name of the State	Before Taking Extension Service from Agripreneur	After Taking Extension Service from Agripreneur	% Change
1	Assam (Kamrup)	0.30	0.25	16.7
2	Bihar (Patna)	0.40	0.32	20.0
3	Karnataka (Bangalore)	0.42	0.31	26.2
4	Maharashtra (Pune)	0.94	0.82	12.8
5	Uttar Pradesh (Varanasi)	0.21	0.18	14.3
	Average	0.45	0.37	17.8

Source: Computed from Primary data

Increase in Farm Yield

Table-20 shows the increase in crop yield of all the crops grown by the selected farmers. For overall districts, about 228 farmers got increase in yield in the range of 10-25 per cent and 40 per cent of the farmers got an increase in yield in the range of 26-50 per cent. About 88 per cent of farmers' yield increases ranging from 26 to 75 per cent for overall. This pattern is almost the same across districts except in Maharashtra where 67 per cent of the farmers (the highest number) received increased yield in the range of 26 to 50 per cent.

Increase in Income

Table-21 shows the increase in income. The increase in income of farmers shows the same pattern as the increase in yield because both are directly proportional. For overall districts, about 228 farmers got increase in income in the range of 10-25 per cent and 40 per cent of the farmers got an increase in income in the range of 26-50 per cent. About 88 per cent of farmers' income increased in the range of 26 to 75 per cent overall.

Table-20: Increase in Average Farm Yield of all Crops Grown by Selected Farmers

State Name	District Name	Number of Farmers with Yield Increase (%)					
		Less than 10	10-25	26-50	51-75	76-100	Total
Assam	Kamrup	0	0	7 (58)	3 (25)	2 (17)	12 (100)
Maharashtra	Pune	0	30 (23)	86 (67)	12 (9)	1 (1)	129 (100)
Bihar	Patna	4 (5)	37 (46)	32 (40)	6 (7)	2 (2)	81 (100)
Karnataka	Bangalore	2 (2)	39 (48)	29 (36)	10 (12)	1 (1)	81 (100)
Uttar Pradesh	Varanasi	13 (7)	122 (69)	38 (21)	4 (2)	0 (0)	177 (100)
Total		19 (4)	228 (48)	192 (40)	35 (7)	6 (1)	480 (100)

Source: Computed from Primary data

Figures in the parentheses are share of number of sample farmers in total

This pattern is almost same across districts except in Maharashtra, where 67 per cent of the farmers (the highest number) received increased income in the range of 26 to 50 per cent. Tables 21 and 22 show increase in income of the farmers before and after taking extension services from Agripreneurs. The income increased per annum is found out to be 94 per cent for overall sample and the highest increase is observed for farmers of Kamrup. In Kamrup, income per annum increased from Rs 51000 to Rs 4.25 Lakhs. Except in Patna, the increase in income is more than 100 per cent.

Table-21: Income Earned per annum in Agriculture by Selected Farmers (Rs in Lakhs)

S. No.	Name of the State	Before Taking Extension Service from Agripreneur	Before Taking Extension Service from Agripreneur	% Increase in Income
1	Assam (Kamrup)	0.51	4.25	728
2	Bihar (Patna)	7.40	12.21	65
3	Karnataka (Bangalore)	1.32	3.36	155
4	Maharashtra (Pune)	2.65	5.62	112
5	Uttar Pradesh (Varanasi)	0.86	1.72	101
	Overall	**2.48**	**4.81**	94

Increase in Credibility of farmers with the banks

Table-22 shows the status of the sample farmer's credibility with banks before taking extension services from agripreneurs and after taking extension services from agripreneurs. The Table-22 shows that a few farmers had credibility with the banks before taking the extension services from agripreneurs. After a substantial income gain, the credibility with the banks, though not 100 per cent increased, rather increased at a significant rate. Out of 480 sample farmers, 232 farmers gained credibility with the banks may be because of increased propensity to repay the bank loan. All the farmers in Bangalore district have shown some improvement with the banks they are linked to.

Table-22: Credibility with the Banks of Sample Farmers

S. No.	Name of the State	Number of Farmers Having Credibility with the Banks		
		Before	After	Number of Farmers with Increase in Credibility
1	Assam (Kamrup)	1	8	7
2	Bihar (Patna)	43	69	23
3	Karnataka (Bangalore)	2	81	79
4	Maharashtra (Pune)	35	86	51
5	Uttar Pradesh (Varanasi)	10	84	74
	Overall	92	324	232

Source: primary data

However, in Uttar Pradesh less than 50 per cent of sample farmers gained credibility with the banks. In addition to these gains, sample farmers

were ready and able to take risk and their confidence levels increased significantly.

Results of Multiple Linear Regression Model to show the effect of Agripreneurs' Extension Services on sample Farmers Income

The purpose of this section is to analyze the factors influencing farmers' income via increase in crop yields with the help of estimating a multiple regression model specified in section 2. The model gives the following results:

Y = 2562 + 1.523 X1 + 0.85 X2 + 2.67 X3 + 3.15 X4 + 0.65 X5 + 6.82 X6

t value (2.43) (3.85) (2.87) (4.25) (1.98) (10.25)

R2 = 0.98

The coefficient attached to the variable X6 in the above-estimated equation provides us the effect of agripreneurs' services on the income of the farmers. The model supports our hypothesis that increase in farmers' income is mainly due to the extension services of agripreneurs because only this variable distinguishes the two groups of farmers viz., a group of farmers who took extension services from agripreneurs and otherwise.

Conclusion

This Paper has quantified and analysed the social benefits viz., tangible and intangible benefits at the entrepreneurial level, at the farmer level and spillover benefits of the Agriclinics and Agri-Business Centre Scheme. Primary data were collected from a randomly chosen sample of 160 entrepreneurs and 480 farmers for whom the these agripreneurs are providing agricultural extension services.

Descriptive statistical techniques and mathematical formulae are used to measure the tangible benefits Intangible benefits are measured using a Likert 5 point scale. Connecting the tangibles to intangibles using the dummy independent models is another tool used. An Econometric Model is formulated to estimate the effect of agripreneurs' extension services on the income earned by sample farmers. These Agripreneurs have enjoyed tangible benefits in terms of net profit margin, rate of return on investment, net income, increase in household consumption expenditure, increase in the durable assets in their possession, improving quality of education for their children, improving health status and employment generation. There is a significant difference between agripreneurs who have improved or rather gained their intangible benefits getting higher tangible benefits than the agripreneurs who could not improve the intangible benefits. As a result, there is an improvement in investments by farmers, reduction in the cost of cultivation, increased productivity, increased income and thereby savings.

An econometric model formulated and estimated the impact of agripreneurs extension services on the incomes of the farmers demonstrates the same result.

Because the Scheme has immense benefits in terms of providing employment opportunities to the unemployed and bridging the gap in agricultural extension, the Government has to strengthen the loan and subsidy support by strictly enforcing One bank branch – One Agriclinics policy where each branch is mandated to provide support to attest one agripreneur every year.

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Effectiveness of National Dairy Plan-I in Preserving Sustainable Development Goals (SDGs) on the Rural Economy of India* – An Insight into the Process

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Abstract

Various policy mechanisms are available to support the positive effects of the Sustainable Development Goals (SDGs) and reduce the negative outcomes of economic activities on the environment through effective interventions. To preserve the integration of dairy development strategies and practices with SDGs, this paper examines the key relationships involved in this process by major stakeholders and observes critically some of the initiatives undertaken during the phases of executing the National Dairy Plan-I (NDP-I). The paper narrates how the dairy sector can actively help achieve sustainability goals recommended by the UN resolutions using the field data received from the Socio-Economic Survey of NCAER, carried out during the year 2019 for the National Dairy Development Board (NDDB).

Increased demand for dairy products adds pressure on ecosystems and biodiversity, and the dairy sector faces greater competition for capital, labour, land, water, and energy. On the other hand, increased milk production could prompt the emergence and spread of communicable diseases. In this count, NDP-I has reportedly helped expand the milk yield through effective cattle, buffalo breeding programmes, and scientific feeding methods that have enhanced the availability and affordability of feed and fodder. The programme extended the benefits of collective bargaining capacity for the landless, marginal, and small producers through the cooperative arrangement along with measures for sustaining milk production through

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village-based milk procurement systems (VBMPS), which has unequivocally boosted the share of the organised market and has contributed income-generating dairy activities for the poor and marginalised section of society.

Keywords: Artificial Insemination (AI), National Dairy Plan-1 (NDP-I), Ration Balancing Programme (RBP), Sustainable Development Goals (SDGs), Village Based Market Procurement System (VBMPS)

Introduction, Background and the Context

Dairy activities helped improve the lives of millions in rural India by ensuring reliable availability of milk and dairy products, generating income and employment, and enabling the ownership of assets for rural households to achieve their livelihoods.

Several policy mechanisms are used in the dairy sector to secure the positive effects of SDGs and lessen the negative outcomes through interventions. In order to support the integration of livestock policies and practices with Sustainable Development Goals (SDGs), this paper examines the key linkages involved in the initiatives under the National Dairy Plan-I (NDP-I) and recommends how the sector can dynamically help achieve sustainability goals.

While dairy production relates directly and indirectly to each of the SDGs, the linkages with some goals and targets are stronger than with others. A two-way linkage in which the development of the sector helps achieve some conceivable targets and creates the right conditions for attaining sustainable development of the sector is summarised in Table-1 below.

The dairy sector empowers rural women and members of the SC/ST community by providing them greater opportunities for participation in collective approaches to markets, improving the efficiency of natural resources, broadening access to clean and renewable energy along with supporting sustainable economic growth. In the true sense of its term, this sector stimulates small-holder entrepreneurship, reduces inequality gaps, and promotes quality consumption with sustainable production patterns. Simultaneously, it increases the flexibility of households to climate shocks and brings together multiple stakeholders to achieve all these goals. The dairy sector involvement of NDP-1 invests in programmes requiring the implementation of knowledge and skills. The use of technology and other improvements in production and marketing introduced in the dairy sector created employment opportunities for youth, particularly women, and the economically weaker sections, i.e., landless labourers in the rural areas.

The dairy sector is persistently finding ways to optimise efficiencies in water and energy use by lowering the operating costs of dairy farms.

By using animal manure as inputs in crop production and with feed efficiencies, farmers are ensuring improvements in yield that reduces their environmental footprint. Dairy farmers use manure as a substitute for fertiliser inputs and generate biogas for clean energy. This is especially beneficial in rural areas as a cheap energy source, which otherwise may prove to be an ecological threat. Thus, the dairy sector contributes to minimise environmental degradation by reducing greenhouse gases (GHGs). Protecting natural resources allows farmers not only to grow their businesses but also to safeguard their lands.

Table-1: Identification of the Related Targets of SDGs with NDP

SDG Goals	Target	The link between NDP Activities and the Specific Targets	Nature of the Impact of NDP on the Specific SDGs
1	Reducing poverty	Dairy income acts as remunerative support to cushion against the failure of crops. Chiefly landless workers and small and marginal farmers are covered under NDP which helps raise their income status above poverty. Moreover, above 60 per cent of the BPL community has benefited from NDP.	Direct impact as dairy development opens up avenues for improvement in income from milk-producing households that include the landless and poor.
2	Zero hunger	Increased livelihood opportunities through dairying and synergies between crop production and dairying help improve both the purchasing power of the population and the availability of food.	Indirect impact by improving income levels from milk production and sale.
3	Good health and well-being	A better income through dairy activities ensures better consumption that reduces nutritional deficiency while ensuring good health and well-being. The proportion of the population with access to basic amenities could be a worthy indicator.	Direct impact due to increased production of milk, a nutritious food item.
4	Quality education	Education is not directly linked to NDP. However, NDP necessitates imparting training and implementation of an awareness programme related to the domain activities.	Indirect impact, through imparting of training on the operation and management of dairy sector activities at both the farm level and the processing and distribution levels; both improve the skill levels of workers in the sector.

SDG Goals	Target	The link between NDP Activities and the Specific Targets	Nature of the Impact of NDP on the Specific SDGs
5	Improving gender equality	Women's involvement in dairy activities has expanded due to NDP schemes through various awareness and training programmes, which have helped improve mobility, status, and recognition for women in the NDP areas as reflected in the Socio-Economic Survey (SES) of NCAER.	Direct impact as it provides income-earning opportunities for women in rural households.
6	Clean water and sanitation	Although this is not directly linked to NDP, access to clean water and sanitation is imperative in order to ensure the procurement of quality milk.	Significant potential for an indirect impact through its impact at the local level by raising the participation of households in collective efforts at local development.
7	Affordable and clean energy	Proper dung management and emphasis on biogas usage in the NDP areas is closely linked to access to affordable clean energy.	Direct impact as it creates opportunities for the utilisation of dung of dairy animals in producing biogas for domestic uses.
8	Ensuring inclusive economic growth	NDP has helped enhance the importance of the milk business through the Village-Based Milk Procurement System (VBMPS), strengthening the business by providing Bulk Milk Coolers (BMCs) to the District Cooperative Society (DCS), which has provided decent work opportunities and thereby contributed to economic growth.	Direct impact, as the programme generates opportunities for the landless and poor among the rural population to enable them to earn income through milk production.
9	Industry, innovation, and infrastructure	Dairy activities emerged as an industry and the implementation of Artificial Insemination(AI) with other forms of breed development mechanisms and infrastructure provision (such as setting up of a semen station) have brought about a significant change in the NDP areas.	The modernisation of the dairy sector at the farm level, input supply level, and processing and distribution levels necessitates innovative approaches and supply infrastructure of high quality.
10	Preventing rising inequality	The landless, small, and marginal farmers benefited the most from NDP, which helped reduce inequality in the project areas as compared to areas that did not receive the interventions.	Dairy cooperatives provide equal access to farmers irrespective of how much milk they supply.

SDG Goals	Target	The link between NDP Activities and the Specific Targets	Nature of the Impact of NDP on the Specific SDGs
11	Supportable cities and peoples	This goal is not directly linked to NDP.	No significant linkage was found.
12	Reliable consumption and production	NDP has improved the consumption of milk, which, in turn, has helped reduce nutritional deficiencies. It has also increased production through measures like breed development, fodder development, RBP, and VBMPS, which have helped optimise production and channelise them through the market mechanism.	The dairy production process entails the adoption of feeding practices that raise the potential for conservation of land; the use of a collective approach to marketing also helps improve the quality of the product and reduce cost.
13	Lowering methane emission	The RBP as part of NDP has helped reduce methane emissions from the ruminants through better and balanced feed with green fodder development that has ultimately helped contain the emission of greenhouse gases (GHGs).	Adoption of feed mix that leads to a reduction in methane emissions in the dairying sector.
14	Life below water	This goal is not directly linked to NDP.	No direct linkage was observed.
15	Sustainable use of terrestrial ecosystems and land	India's milch herd with indigenous breeds of both buffaloes as well as cows helps address Goal 15 in terms of containing the loss of biodiversity.	The dairy sector can help in promoting the more sustainable use of natural resources by adopting practices as noted under SDGs 12 and 13.
16	Inclusive societies and institutions	NDP induces strong institutional linkages of various institutions like Dairy Cooperative Societies (DCS), Milk Producers' Institutions (MPI), New Generation Cooperatives (NGCs)	Through its significant impact on SDGs 1, 5, 8, and 10, dairy development, which is the primary aim of NDP, contributes to the achievement of SDG 16.
17	Partnership to achieve goals	NDP has successfully collaborated with different village-level institutions for ensuring the success of the NDP programme that eventually benefited the targeted population belonging to the deprived segments of society.	NDP requires collaboration with a range of stakeholders, through which it can enhance its contribution toward the achievement of the SDGs.

Source: United Nations, NCAER

In order to address the increasing challenges in the dairy sector and simultaneously promote gender equality, a central sector scheme named National Dairy Plan I (NDPI) was launched and executed during the

period 2011-12 to 2018-19. The two primary development objectives of this scheme were to increase the productivity of milch animals to meet the growing demand for milk and provide rural milk producers greater access to the organised milk market while maintaining the critical equilibrium required to achieve the SDGs. In order to fulfill these objectives, the NDP-I focused on several key areas like fodder availability, re-vegetation of land due to over-grazing; setting up of semen stations for a heritably improved high-yielding assortment of milch animals including bulls, etc. facilitated to achieve the SDG goals. In this context, the present paper examines the connection between the objectives and outcomes of NDP-I with the 17 broad SDGs mandated by the UN resolutions. As may be observed from Table-1, NDP, with its focus on achieving dairy development, has many associations with the SDGs. This paper focuses on the following seven SDG goals, which have close linkages with several of the NDP-I objectives:

Table-2: Focused Area of NDP-I

SDG Goals	Description
1	Reducing the level of Poverty
5	Reducing Gender Inequality
8	Ensuring Inclusive Economic Development
10	Preventing rising inequality
13	Lowering methane emissions
15	Propagating the Sustainable Use of Terrestrial Ecosystems and Land
16	Promoting Inclusive Societies and Institutions

India's dairy development approach, based on a structure of an institutional network with a significant contribution from women, addresses Goal 1 of reducing poverty, Goal 5 of improving gender equality, Goal 8 of maintaining inclusive economic growth, Goal 10 of averting rising inequality, and Goal 16 of promoting inclusive societies and institutions.

India's typical approach to milk production is based on feeding milch animals with crop residues, agricultural by-products, and using household labour to add value to resources, which otherwise would have fractional economic value. Buffaloes account for nearly 50 per cent of milk production in India and their average methane emissions are lower than the regional average due to the adoption of the RBP. In addition, avoiding the use of land for feeding animals helps address Goal 13 in terms of a lower per unit of methane emission and Goal 15 with the sustainable use of global ecosystems and land. India's milch herd comprises a number of indigenous breeds of both buffaloes as well as cows, which helps address Goal 15 in terms of containing the loss of biodiversity. The findings of the NCAER survey results are assimilated in the relevant places for the purpose of analysis.

Reducing Poverty, Improving Gender Equality and Ensuring Inclusive Economic Growth

Dairy activities play a catalytic role in firming up the resources used by rural households, enabling them to achieve their occupational objectives, and increasing the resilience of families to cope with shocks from agricultural operations. The possible indicators from the NDP-I survey, related to poverty eradication, are presented in Table-3, which shows the current status of involvement of households in poverty reduction and livelihood activities, and the availability of basic amenities as per the NDP-I Survey, 2019.

Table-3: Indicators Influencing SDGs 1, 5, and 8

Indicators	Treatment vs. Non-Treatment	Before / After	Percentage Coverage
(i)Households with milch animals	Project village	Before the project	49.4
		Currently (2019)	52.6
	Control village	Before the project	38.5
		Currently (2019)	43.9
(ii)Change in share of households engaged in dairy activities	Project village	Before the project	77.1
		Currently (2019)	81.0
	Control village	Before the project	47.2
		Currently (2019)	54.0
(iii) Contribution of dairy milk production to incomes of households (% reported as very significant)	Project village	Before the project	43.7
		Currently (2019)	59.4
	Control village	Before the project	30.0
		Currently (2019)	36.9
(iv) BPL households rearing milch animals	Project village	Before the project	
		Currently (2019)	61.0
	Control village	Before the project	
		Currently (2019)	58
(v) Tap drinking water	Project village	Before the project	
		Currently (2019)	48.7
	Control village	Before the project	
		Currently (2019)	42.5
(vi) Electricity grid connection	Project village	Before the project	
		Currently (2019)	94.1
	Control village	Before the project	
		Currently (2019)	97.5
(vii) Toilet inside the premises	Project village	Currently (2019)	83.3
	Control village	Currently (2019)	80.2
(viii) LPG connection	Project village	Currently (2019)	88.0
	Control village	Currently (2019)	84.4
(ix) Households with TV	Project village	Currently (2019)	61.5
	Control village	Currently (2019)	55.5
(x) Women's participation in dairy activities (increased)	Project village	Currently (2019)	66.0
	Control village	Currently (2019)	49.6

Indicators	Treatment vs. Non-Treatment	Before / After	Percentage Coverage
(xi) Women's position in household decision-making improved (% reported)	Project village	Currently (2019)	76.8
	Control village	Currently (2019)	63.8
(xii) Women's mobility outside households improved (% reported)	Project village	Currently (2019)	74.1
	Control village	Currently (2019)	64.1

Source: NCAER field data.

Note: For conducting the survey of beneficiary households, the NCAER team selected 15,000 sample households from a total of 420 tehsils and 1260 project villages. In addition, 3,000 households from 252 selected control villages were also surveyed to obtain a comparative insight into the impact. The sample villages were selected from the tehsil-wise percentage villages covered under the particular NDP intervention. For the selection of the control villages, a Similarity Index was developed.

The first four indicators, viz.: (i) households with milch animals, (ii) change in share of the households engaged in dairy activities, (iii) contribution of dairy milk production to the households' income, and (iv) BPL households rearing milch animals, may be considered as relevant national indicators for eradicating extreme poverty at the lowest income strata of the society.

The percentage of households with milch animals has been increasing in both the project and control villages. Before the start of NDP-I, 49 per cent of the households had milch animals, which increased to 53 per cent on completion of the project.

Similarly, there were positive changes in the share of households engaged in dairy activities. In the project villages, 77 per cent of the respondents reported positive changes before the commencement of the project, which went up to 81 per cent on completion of the project. It was also observed that the productive activities performed by the female members of the households were increasing after the implementation of the project. Further, the contribution of dairy income to the incomes of households remained significant.

About 44 per cent of the respondents from the project villages reported that the contribution of dairy income to the total household income had gone up to 59 per cent on completion of the project. About 60 per cent of the BPL households rearing milch animals indicated that the households were engaged in remunerative activities, which, inter alia, helped reduce income poverty.

The relevant indicators for assessing the "proportion of the population living in households with access to basic services" are (i) tap drinking water, (ii) electricity grid connection, (iii) toilet inside the premises, (iv) LPG connection, and (v) households with TV (Table-1).

The Socio-Economic Survey (SES) conducted by NCAER found that about half of the sample households had access to tap drinking water in the

project villages whereas the corresponding figure of sample households in the control villages was about 43 per cent. Secondly, electricity grid connections had reached over 95 per cent of the households in both the project and control villages. Third, more than 80 per cent of the households had toilets inside the premises in both the project and the control villages. Fourth, 88 per cent and 84 per cent of the households in both the project and control villages, respectively, owned LPG connections. The ownership of TV by households is a symbol of social status. About, 62 per cent and 56 per cent of the households in the project and control villages, respectively, owned TV sets.

Women and girls in rural areas are intensely involved in dairy activities. However, women face greater challenges in terms of economic, social, and institutional barriers than men do. The interventions under NDP-I facilitated empowering women at the farmer's level, functionary level, and institutional level. The steps taken under the project for ensuring greater inclusion of women include:

- Encouraging the formation of new Women Dairy Cooperative Societies
- DCSes;
- Enrollment of women members in the existing and new DCSes;
- Underlining participation of women in leadership roles as members of
- Management Committees and on the Boards of Milk Unions;
- Involving more women as field functionaries
- Gender integration in all the Training and Capacity Building Programmes;
- Ensuring participation of women in Capacity Building Programmes, and
- Providing advisory services directly to women beneficiaries.

The NCAER-SES identified a few more possible indicators, viz., (i) facilitating greater participation of women in dairy remunerative activities, (ii) improving the position of women in household decision-making, (iii) ensuring women's mobility outside the households, and (iv) increasing enrollment of women members in the existing and new DCSes.

The NCAER survey observed that 66 per cent of the women participated in dairy remunerative activities in the project villages as compared to 50 per cent in the control villages. Second, about 77 per cent of the respondents reported an improvement in women's position in household decision-making in the project villages as compared to a 64 per cent from the control villages. Third, about 74 per cent and 64 per cent of the women reported an improvement in women's mobility outside households in the project and control villages, respectively. Finally, about 50 per cent of the households reported enrollment of women members in the existing and new DCSes in the project villages.

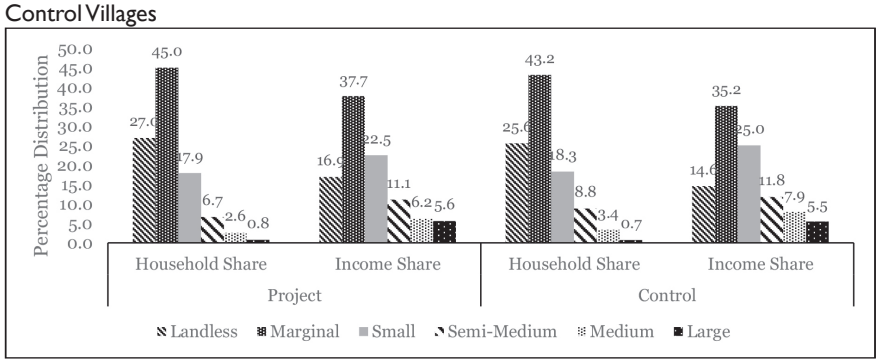
Goal 8 seeks the promotion of reasonable economic growth and productive employment. The dairy sector has the remarkable potential to create jobs and reduce inequality, thereby directly contributing to the SDG target of stimulating inclusive and sustainable economic growth with decent work for all. Dairying has become an important secondary source of income for millions of rural people and has assumed an important role in providing employment and income-generating opportunities, particularly for marginal farmers and rural women. The NCAER SES indicates that over the study period, there was a significant change in the income levels of farmers across gender in the project villages compared to the control ones. It is pertinent to note that the incomes of landless labourers along with those of small and marginal farmers changed perceptibly during the course of the project. By the end of NDP-I, the female members in the respondent households accounted for a higher percentage share of income from dairy activities as compared to their male counterparts. The impact of NDP-I thus emanated from improved income from dairy and milk-related products, as well as enhanced employment through an increase in wages and salaries.

Preventing Rising Inequality

Organised reforms in the dairy sector are imperative in stimulating small-holder business expertise and closing the inequality gaps. Livestock rearing is a potent facilitator for growth in income with relatively low investment, inputs requirement, and labour costs.

As already stated, NDP-I was intended to support the poorest sections of the rural economy to enhance their capability of remunerative incomes through dairy activities. The programme covered about 90 per cent of the landless labourers and small and marginal farmers. The shares of households from the categories of landless and marginal farmers in the project villages, along with their respective income shares, as compared to those in the non-treatment villages for both categories, are outlined in Figure-1.

Figure-1: Share of households and incomes among Land Categories in the Project and Control Villages



Source: NCAER field data.

After approximation of the Lorenz curve using data from the Socio-Economic Survey of NCAER, the Gini coefficient observed a value of 0.22 for the project villages and 0.24 for the control villages. This critically reflects the positive effect of intervention in registering a lower level of inequality for the NDP-I villages compared to the control ones, thereby fulfilling one of the critical objectives of the SDGs. However, it may be noted that in the rural areas, the work-related categories were mostly overlapping, which impacted the estimation of the coefficient.

Lowering Methane Emissions

Lowering emissions is important in combating climate change and its impact on the environment. The link between maintaining milch animals and climate change affects dairy productivity through the quality and availability of feed and forage and the incidence and occurrence of animal ailments.

As per the report of the Indian Network for Climate Change Assessment (INCCA, 2010), livestock contributes around 50 per cent of the total methane emitted by all the sectors in India. Ruminant creatures lose 4-12 per cent of their gross energy intake in the form of methane, which is disparaging to the environment and results in energy loss to animals.

Methane emission from milch animals in India, especially after NDP-I, was observed to be lower than the estimations of the International Panel for Climate Change (IPCC), that is, 46 kg per animal per year (Current Science, Vol. 91, No 10). The Ration Balancing Programme (RBP) implemented under NDP-I had the potential to increase milk production and decrease methane emissions. Studies carried out in the states of Gujarat, Uttar Pradesh, Andhra Pradesh, and Maharashtra show that feeding a balanced ratio reduced methane emission by 15-20 per cent in lactating animals (IDF, 2011; Kannan et al., 2010; 2011). The reduction in the methane emission witnessed in the studied regions is due to the balancing of nutrients, which might have altered the fermentation pattern towards more microbial cell production and lower acetate and butyrate production.

Kundu et al. (NDRI) carried out a similar study for Punjab. The study observed that initially, the average standard emission was 22.40 g/kg milk yield, which was significantly reduced by 13.6 per cent after a balanced ration (19.36 g/kg milk yield) fed to lactating cows. Similarly, in buffaloes, feeding a balanced ration significantly reduced enteric[3] methane emission by 11.2 per cent (31.40 versus 27.87 g/kg milk yield). Balanced feeding reduced average methane emission (g/kg milk yield) by about 12.4 per cent in lactating cows and buffaloes.

Kannan and Garg (2009) carried out a study on 22 lactating Jaffarabadi buffaloes and 5 Gir cows under controlled field conditions in Gujarat.

Their study reported a reduction in average methane emission in terms of gram per day and gram per kg DMI (Dry Matter Intake) in lactating buffaloes, which was lower compared to baseline emissions. The same is true for lactating cows. A field condition study was carried out by Subhash et al. (2016) in two villages in the Anand district of Gujarat on 37 early lactating cows and it was observed that balanced feeding had reduced the average methane emission (g/kg milk yield) by about 15.21 per cent for the experimental animals.

The above studies indicate that RBP has the potential to improve the production efficiency of cows and buffaloes with reduced methane emissions resulting in an increase in the net daily income of milk producers. Thus, the large-scale application of this programme can help in improving the output of milch animals in an ecologically justifiable manner.

Sustainable Ecosystems and Land

Sustainable use of ecosystems and land focuses on settling natural habitats to reduce biodiversity costs. Different schemes and programmes under NDP-I endeavoured to maintain the balance of the ecosystem by ensuring the conservation, restoration, and viable use of the available ecosystem. NDP-I aimed at improving the productivity of fodder crops and common grazing lands by preserving surplus green fodder to enhance its availability during the lean period.

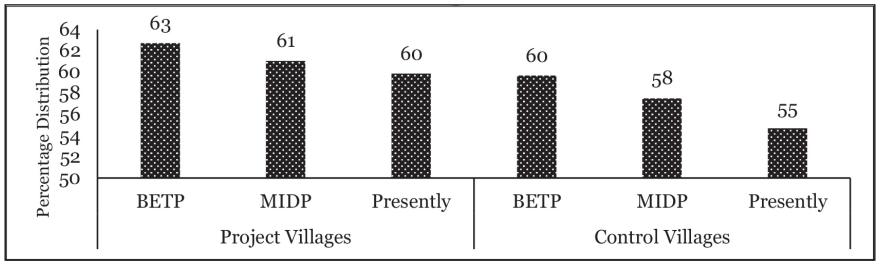
A few of the focused areas of operation under NDP-I were aligned with the fundamental realms of the SDGs. The Fodder Development Programme promotes the use of certified seeds to increase fodder production. Field demonstrations were carried out to popularise these technologies among farmers. The Socio-Economic Survey of NCAER indicates that fodder development activities are observed to be more significant in the NDP-I villages as compared with the non-NDP ones. The same variance is noted for efforts to re-vegetate grazing land, which is important for the growth of the dairy sector.

Animal waste is a major ecological worry as it releases large quantities of carbon dioxide and ammonia into the environment, which could contribute to acid rain and the related greenhouse effect. It is noted that due to efficient dung management, the use of biogas and slurry pits showed an increase in the project villages as compared to the control ones, reflecting greater awareness about and transition towards the attainment of the SDGs (NCAER-SES) through NDP-I. It is essential to build effective drainage outlets for animal sheds to ensure better management of residuals and hygiene. Over the years, there has been a considerable reduction in 'kutcha' drainage and a corresponding increase in 'pucca cemented drainage for releasing wastewater from the cattle sheds. The NCAER SES reveals that there was a marked reduction in households

using drainage to open areas during the project, falling from 49 per cent of the households before implementation of the project in the project villages to 39 per cent on completion of the project. As regards the use of 'inland freshwater ecosystems', the NCAER SES reports that about 49 per cent of the households in the project villages were using tap water as compared to 43 per cent of the households in the control villages. Consequently, the percentage of households using wells was about 11 per cent in the project villages as compared to 13 per cent in the control villages. This indicates that the increase in income from dairy activities in the project villages enhanced the capacity of the households to opt for tap water connections.

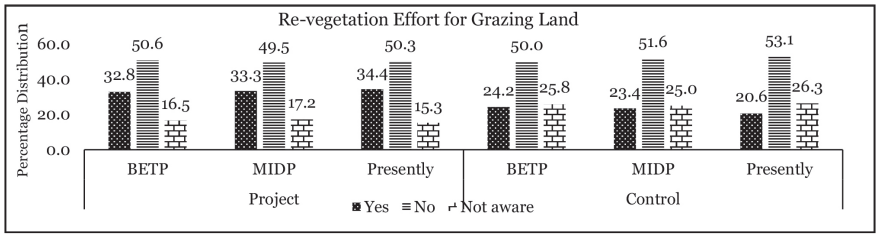
One of the crucial directives of the SDGs is to fight desertification, restore degraded land due to drought and floods and attain a degradation-neutral world by 2030. The Socio-Economic Survey of NCAER observed a decline in the availability of common grazing land in both the NDP-I and control villages (Figure-2). The major reason for this decline has been the allotment of common grazing lands by the government for various other activities. NDP-I aimed at the re-vegetation of such lands sullied due to over-grazing and over-exploitation through efficient institutional arrangements at the village level (Figure-3). The success of NDP-I in terms of the re-vegetation completed in the project and control villages is shown in Figure-4.

Figure-2: Percentage Share of Common Grazing Land in the Project and Control Villages



Source: NCAER field data. Note: BETP= Before the Project, MIDP= Middle of the Project

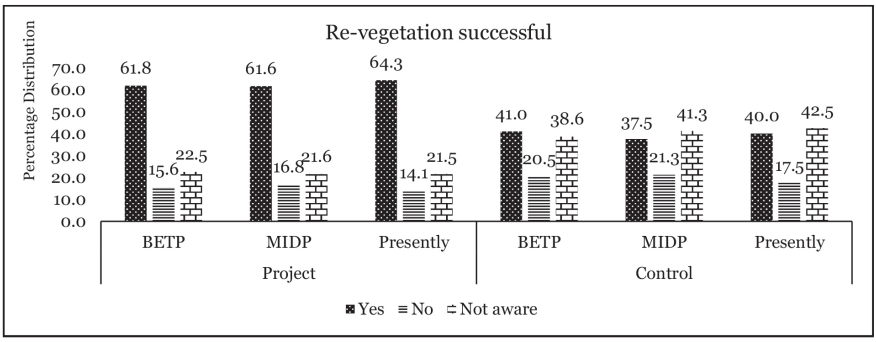
Figure-3: Re-vegetation in Selected Project and Control Villages



Source: NCAER field data. Note: BETP= Before the Project, MIDP= Middle of the Project

3 Enteric methane is a by-product of the intestinal process of the ruminants and is ejected by the animal through burping (FAO).

Figure-4: Achievement of Re-vegetation Efforts in Selected Project and Control Villages



Source: NCAER field data. Note: BETP= Before the Project, MIDP= Middle of the Project

Another mandate of SDG 15 is to promote fair and justifiable sharing of the benefits of inherent resources with appropriate access to high genetic merit (HGM) bulls, semen production, and the door-to-door Artificial Insemination (AI) delivery services which helped achieve a higher share of cross-bred cows in the project villages (NCAER Study, 2019).

In view of the NDP-I intervention and its overall impact, a 'big increase' in income was reported by more than 21 per cent of the households in the project villages compared to 16.8 per cent of the households from the control villages. A 'small increase' in income was attained by more than 50 per cent of the households in the project villages compared to a corresponding figure of only 27.5 per cent in its counterpart. Among the social groups, 28 per cent, 36 per cent, and 32 per cent of the SC, ST, and OBC households, respectively, in the project villages reported a higher contribution of dairy incomes to their total household incomes, while the corresponding proportions of such households were comparatively lower in the control villages. The proportion of households in the project villages reporting an increase in income due to more than two hours of involvement in dairy activities was 77 per cent as against only 53 per cent in the control villages. (NCAER-SES Survey). At the national level, the increase in the share of the livestock sector GVA to the agriculture sector GVA has gone up from 21.8 per cent in 2011-12 to 28.4 per cent in 2017-18, which is largely attributed to the effective implementation of various NDP-I programmes.

Promoting Inclusive Societies and Institutions

SDG 16 emphasises the promotion of inclusive societies and institutions as a crucial constituent for re-aligning with the objectives of the SDGs. Societies and institutions are the major sources of outreach to achieve specified impact through the delivery of welfare services to the poor and marginalised sections of society.

The Village-Based Milk Procurement System (VBMPS) under NDP-I envisioned to extend the benefit of organised milk processing activities

by forming and strengthening Dairy Cooperatives Societies (DCSes) and Producer Companies.

Furthermore, the existing societies/cooling points are supported by providing village-level capital assets like Bulk Milk Coolers (BMCs), milk cans, etc. Consolidation of the DCSes and Producer Companies through Data Processor-based Milk Collection Units (DPMCUs) and Automatic Milk Collection Units (AMCUs) has resulted in greater transparency and fairness in milk procurement operations, while the installation of BMCs has given farmers more flexibility in terms of increasing the quantity as well as improving the quality of milk. The Socio-Economic Survey of NCAER shows that 65.6 per cent of the project villages had DCSes within the village and 9.6 villages had societies in the adjacent villages.

Dairy cooperatives are the key channel for marketing, buying milk at a price accurately based on the quality of milk determined by various testing facilities available in the societies. The project villages are observed to be better equipped with milk testing facilities as compared to the control ones. Most of the dairy processed products, cattle feed, AI services, and mineral mixtures were being provided at reasonable prices to the cooperative members in the villages. In most of the cases, the payments for these services were being settled by the DCSes against the payments to be made to the dairy farmers. The level of support in such cases was proportionate to the amount of milk procured and the amount due for payment. This was found to be common across the states of Punjab and Gujarat and was also used as a strategy to prevent dairy farmers from shifting to middlemen from the DCSes.

A substantial number of people depend entirely on the growth of the cooperatives for their living and, therefore, any incidence relating to the loss of accountability can be detrimental to the foundation of the cooperatives. In the case of Bihar, for instance, the lack of access to infrastructure at all levels has somewhat hindered the progress of the dairy sector. To enhance the procurement of milk, NDDB envisaged mobilisation and institution building through the promotion of new Milk Producers' Institutions (MPI) and New Generation Cooperatives (NGCs), which would have to be registered subsequently as Producer Companies under the Companies Act. The field data of NCAER observed that around 20 per cent of the Project villages and 7 per cent of the Control villages have NGCs.

BMCs are observed to be crucial for strengthening the value chain. A better substitute to the present collection system is cooling of milk immediately after milking in Bulk Milk Chilling Units (BMCU), which has become common in increasing the shelf life of milk but also provides a systematic and simple way of procuring milk from the untapped remote areas. Project villages are better off in terms of the availability of BMC facilities and Genset facilities for uninterrupted operations of BMC compared to the villages without intervention.

The various State Federations (SFs) remained the key to the impact on markets and profitability concerning NDP-I interventions. The role of the State Milk Federations (SMF) is changing due to the demand-driven market for milk in India. For instance, federations are competing for new markets with the removal of restrictions associated with milk-shed areas and aligning with the expansion of existing markets that are coming up through a higher level of industrialisation and urbanisation.

Milk Unions (MUs) primarily work under the overall guidance of the SFs and are responsible for the procurement and processing of milk. The level of dependency and autonomous functioning of the MUs vary across the states. Although guided by the SFs on certain aspects, the MUs follow their own set of approaches to increasing the participation of the producers. The MUs of some of the districts have tried to innovate, such as in the case of the Banaskantha Milk Union, which has introduced numerous pioneering schemes. Banaskantha in Gujarat is situated in a desert area with a lack of scope for industrialisation. The local people here joined actively in the integrated business of milk by initiating cooperative activities through MUs. It has not only invested in training and capacity-building but has also coordinated its activities with other government schemes, apart from initiating some of its own schemes.

The participation of the SC/ST population in dairy activities is dependent on several factors related to the development of dairying across regions. The feedback received from stakeholders from the States revealed a common pattern, wherein major concerns are linked to limited understanding of dairying and lack of access to monetary resources like seed capital, credit, and the absence of alternative sources of income. However, the families already involved in dairying have not reported any grievances at the DCSes level. Among members of the lower socio-economic categories, women have continued to play an important role in dairying at both the household and DCSes levels.

The type of participation, however, is mostly determined by education levels, prevailing gender dynamics as well as the opportunities available in the region. Some of the MUs in Karnataka (for example, Kolar) have encouraged the training of female workers as artificial insemination (AI) technicians. On the other hand, in states like Punjab, a shift in the use of migrant labour for work purposes has been observed.

Among various breed development processes, AI is one of the most effective practices available to dairy farmers for improving the productivity and profitability of their business on a long-term basis. In AI, a few superior-quality bulls are efficiently used to expand the breeding coverage for a large number of dairy cows, apart from their location. The usage of AI services in the project villages went up from 59 per cent to 67 per cent in the NDP-I villages as per the SES survey of NCAER, while it went up from 26.3 per cent to 33 per cent in the villages without intervention. It is

also observed that AI constituted a major part of the application for cross-bred cows in the project villages (45%).

The AI services are also available in the Government veterinary hospitals and dispensaries. Some of the states have integrated the AI services with the other service providers in the field. The MUs, too, were taking an interest in the delivery of AI services in the village, though their intervention was partial in terms of providing training and confirming the supply of liquid nitrogen (LN) and semen doses. The quality of AI services through the use of semen doses provided by the MUs was reportedly adequate.

Impediment to the growth of the dairy sector comes from the prevalence of diseases of the milch animals like Foot and Mouth Disease (FMD), Peste des Petits Ruminants (PPR), Brucellosis, Anthrax, Hemorrhagic Septicemia (HS), Black Quarter (BQ), Classical Swine Fever (CSF), Ranikhet Disease (RD), and Avian Influenza (AI) etc. All these diseases affect animal productivity with a higher rate of illness and mortality.

The presence of diseases discourages domestic and foreign investment in the sector. It was observed that during the pre-project period, serious diseases were common in 51 per cent of the project villages and 53 per cent of the control villages. However, due to various animal disease control-related programmes and interventions, this incidence was reduced to 46 per cent in the project villages and 42.1 per cent in the control villages. The veterinary departments across states have not been able to raise the service delivery system up to the expectation of the dairy farmers in most of the states.

Conclusion

Dairy development in India is based on a small-holder production system model linked to an institutional network with a significant contribution from women. This sector, therefore, helps address various SDGs, which include reducing poverty, improving gender equality, ensuring inclusive economic growth, preventing rising inequality, promoting inclusive societies and institutions, achieving lower average per unit methane emissions and facilitating the sustainable use of terrestrial ecosystems and land'.

The quality of animals is critical in determining the volume of milk output and productivity. NDP-I has reportedly helped increase the milk yield through effective cattle upbringing programmes and scientific feeding methods that have enhanced the availability and affordability of quality feed and fodder. Following effective AI breeding intervention, the proportion of high-yielding breed cows has gone up in the project villages through the semen stations along with procurement, production, and distribution of breeding inputs through capacity building programmes that also involve women's role in cattle rearing.

Village-based milk procurement systems (VBMPS) have boosted the share of the organised market, which along with measures for sustaining

milk production and dairy activities, has helped extend the benefits of collective bargaining capacity for the landless, marginal, and small producers in the project villages.

Demand for dairy products in India is expected to grow in the coming years, buoyed by higher incomes and nutritional awareness among a significant portion of the population. The demand for processed and packaged dairy products too is increasing in urban areas and all of these would help support to achieve the objectives of the sustainability goals directed by the UN resolutions.

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Causal Relationship Between Education and Economic Growth in Sierra Leone

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Abstract

This paper was spurred out of the need to explore the causal relationship between economic growth, government expenditure on education and tertiary education in Sierra Leone during 2000 to 2014. In other words, the study aims to explore the value addition that expenditure on education is making to growth in the Sierra Leone economy. The study commences with initial diagnostics of the basic unit root test, which revealed the presence of I(1) and I(2) for the three variables, which is sufficient for the unrestricted Vector Autoregression (VAR) model to be utilised as the main estimation technique. Other relevant post-diagnostic test outcomes like Heteroskedasticity, Serial LM Correlation and Normality were also carried out, which indicates the model's robustness. A 10-period innovation impulse response shock shows a rapid response of immediate reaction to the variables themselves. There is even a more revealing response to the shock to government investment and RGDP, which confirms that growth in tertiary education is highly hinged on the need to boost investment in the education sector. This is highly needed to catalyze a sustained level of growth in the Sierra Leone economy. Variance Decomposition shock also manifests a similar pattern, with the resulting outcome revealing economic growth (RDGP) as a major catalyst to boost human resource capacity. The conclusion finally proffers policy action in support of the establishment of Public-Private Partnership (PPP) as a way of facilitating meaningful economic growth and competitiveness in the country's education sector, particularly at the tertiary level.

Keywords: Causal Relationship, Education, Growth, Investment, Sierra Leone

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Introduction

A popular quotation by Benjamin Disraeli (15th June 1874), as highlighted here, was used as a means to express the worth of education to society: "Upon the education of the people of this country, the fate of this country depends" (Whyte, 1994). Education is proving to be an essential asset for self-empowerment and most importantly, as a form of consumer and capital goods, given the fact that it offers utility to consumers while also serving as a valuable input in the production of other valuable goods and services (Jackson, Jackson & Jackson, 2020; Zivengwa et al., 2013: 107). Human resource capital is an essential factor in the production of goods and services - in this regard, investment in skills development is considered very critical in paving the way for a country's developmental progress. As emphasised by Zivengwa et al. (ibid), education contributes to economic growth in two ways:

- Firstly, education affects economic growth by making individual workers more productive.
- Secondly, education indirectly affects economic growth through knowledge creation and technological innovation – this can be championed through means of acquiring quality education itself or as a direct input that contributes meaningfully towards development in research, capable of producing new skills.

There is a high degree of mutuality between human resource development and economic growth. Such analogy is illustrated in the virtuous circle diagram provided in Figure-1 below - the diagram indicates that education is considered very important in its contribution to the economic growth of a nation. This implies that an increased growth rate in an economy has the potential of improving the employment rate, which also implies that part of the reward from investment in education can be reinvested in developing future capacity for human up-skilling. More importantly, the impact of this is likely to result in a reduction in the poverty rate, with the potential of empowering human skillset towards meaningful future investment opportunities. This can only be achieved on the proviso of ceteris paribus conditions, notably the existence of a stable political economy environment, and supported by effective resource management in all sectors of an economy (Jackson, 2017a; Jackson, 2017b).

The motivation for this study is borne out of the author's thirst to discover the influence of education on growth in Sierra Leone. Sierra Leone, once perceived as the Athens of West Africa, has witnessed a noticeable slump in the quality and standard of human capacity, which is needed to boost investment and sustained growth on a national scale (Jackson, 2016; Jackson, 2016b). Given years of ill-managed affairs in the country, it is almost easy for anyone to attribute the situation to an inept state of decades of governance, giving rise to the brain-drain of a skilled workforce for

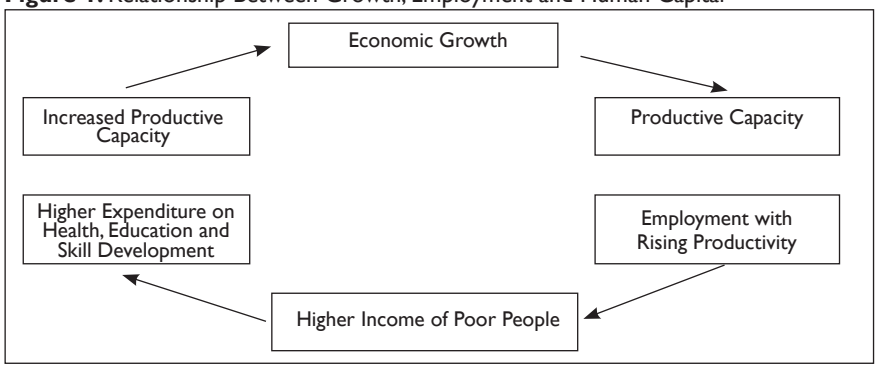
greener pastures in other parts of the world (Jackson, 2016a). Such a low level of investment is resounding itself in all corners of the economy, with a noticeable dwindling gap in areas pertaining to Research and Development (R&D) when compared to similar economies in the West African Monetary Zone (Jackson, 2017).

In view of the aforementioned discourse, it is, therefore, the aim of this study to explore the following research question: Is there causality between investment, education and growth in Sierra Leone?

The undermentioned objectives are hereby set to assist the researcher in answering the above-stated research question:

- To assess the causal relationship between economic growth and education using initial diagnostic test outcomes.
- To utilise the appropriate econometric technique to observe shock responses between government investment, education and growth in Sierra Leone.

Figure-1: Relationship Between Growth, Employment and Human Capital



Source: Islam (2004) and excerpted from Selim (2006)

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- To assess the causal relationship between economic growth and education using initial diagnostic test outcomes.
- To utilise the appropriate econometric technique to observe shock responses between government investment, education and growth in Sierra Leone.
- To proffer policy recommendations that support future scope for growth and development to harness a higher level of human development potential in Sierra Leone.

In view of the aforementioned introduction, the rest of the paper is detailed as follows: Section two provides a background to education and economic growth in Sierra Leone (2000-2014). Section three provides a review of relevant literatures, sub-sectioned into theoretical and empirical literatures relating to education, investment in tertiary education and economic growth. Section four outlines the methodology (highlighting the model specification, causality and initial test outcomes), while section five provides the outcome of the empirical VAR result, post estimation results and both Impulse and Variance Decomposition analysis. Section six concludes the study with some pointers for policy action by state actors.

Historical Background and Data Description

Briefing on Sierra Leone's Education Provision and Challenges

Sierra Leone has a long history as the first country in the West African Sub-region to experience a westernised form of education, with the relics of Fourah Bay College (FBC) established as the first constituent institution within the University of Sierra Leone framework. The University of Sierra Leone was later mandated to accommodate specialised constituent institutions like Njala University College (now an independent institution of its own – renamed as Njala University), Institution of Public Administration and Management (IPAM – originally known as the Civil Service Training College) and College of Medicine and Allied Health Sciences (COHMAS). With the need to expand higher education provision across the country, other institutions were also established, namely Milton Margai Teachers College (now Milton Margai Technical University – MMTU), Freetown Teachers College, Makeni Teachers College (Now Ernest Bai-Koroma University), Bumbuna Teachers College (now part of the Eastern Technical University of Sierra Leone), University of Makeni and many more. Given

the need to expand education provision across the country after the civil crisis, there was an expanded awareness from state actors to increase the existing education provision, which also gave rise to the establishment of new emerging educational institutions across the country (ranging from primary to higher education establishments).

More recently, and particularly after the 2018 elections (Presidential and Parliamentary), a commitment was made to increase spending on education as enshrined in the Sierra Leone People's Party manifesto (SLPP, 2018). Despite challenges faced on the part of the government (e.g., low real sector base and the emerging shock of COVID-19) to increase its revenue base, more so from domestic sources to honour planned expenditures, the priority to continue with the free education system for primary and secondary education provision is stull championed (Ministry of Finance, November 2019). The higher education sector is also realizing gains from the government's increased spending on education, with commitments to expanding the existing higher education provision and upgrading some institutions to the standard of a university status (SLPP, 2018). More important, in the government's determination to raise the standard of education across the country, there is an effort made to clamp down on examination malpractices across the education spectrum. This is highly needed to resurrect the country's profile as the 'Athens of West Africa', with the return of high-quality graduates transiting across the education ladder and most importantly, the need for final year graduates from HEIs to add substantial value to work output.

Data Description

Figures 2, 3 and 4 below provide an illustration of the three variables (sourced from the Bank of Sierra Leone Dataware system) to be utilised for the empirical analysis in this study, particularly in relation to their pattern/ trend throughout the scoping period (2000-2014).

Figure-2: Tertiary Education Spending

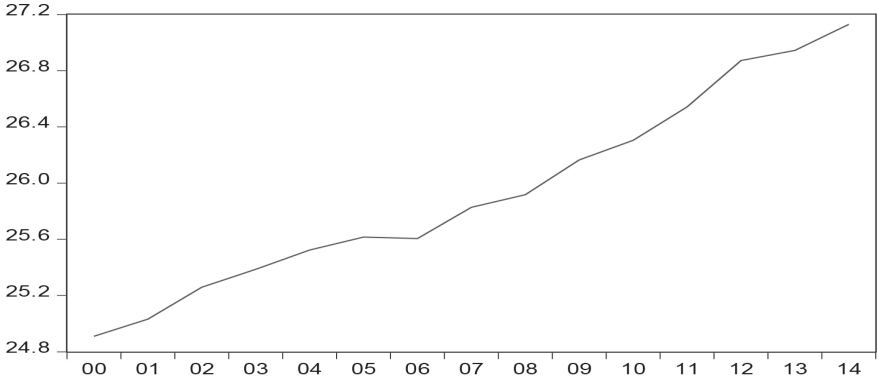


Figure-2 above illustrates the level of tertiary education spending over time, which manifest an increase in uptake of higher education courses across the country. Given the expansion of tertiary education establishments in Sierra Leone after the civil crisis in 2002, it is quite evident to see the upward trend in spending on education throughout the period under investigation. This is also an attestation of increased demand for students' enrolment at higher education institutions across the country, particularly in the need for people to empower themselves in tertiary education learning, supposedly needed to compete in the world of work. Despite spending on tertiary education being shown to be rising, this is still not consistent with the level and standard of output from graduates graduating from universities. Equally, investment innovation in technology is also proving to be a concern for graduates, which is required in the current information age to compete in the job market (Jackson, 2016).

Figure-3: GDP Per Capita

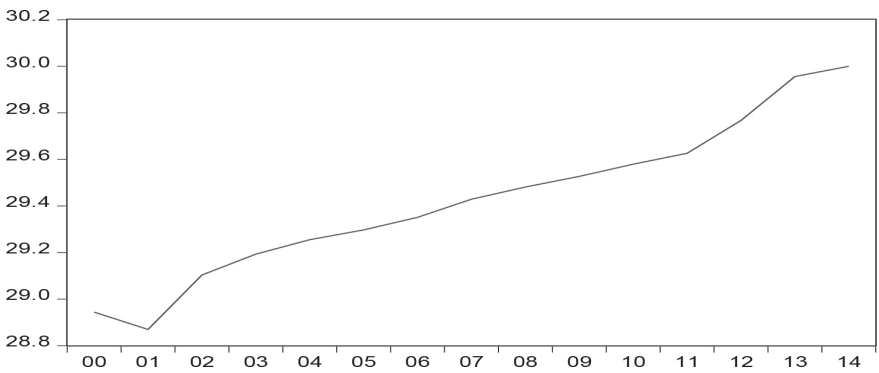


Figure-3 shows that GDP per capita is rising gradually, despite a fall in 2001. This could be explained on account of the aftermath of a brutal war that was experienced in the 1990s and throughout the early part of the 2000 millennium. GDP Per Capita is a clear measurement of a country's standard of living. In reality, the situation as depicted in Figure-3 above is indicative of the contribution of the country's natural wealth sector to continue generating revenue from various sources in addressing core developmental objectives (Jackson, 2016c). One question that can be raised from the above representation is: does the upward trajectory reflect reality as far as education standard and investment in tertiary education are concerned? In reality, the increased level of GDP growth does not seem to be reflective of the real investment needed to support a reasonably sustained level of growth in the country, particularly in the area of human skills, which are needed to compete in the world of work when it comes to the accreditation of prior learning (Warburton and Jackson, 2020). The growth

rate around 2013-14 slowed down on account of perturbed incidences of twin shocks (commodity price slump and the Ebola epidemic) experienced in the country (Jackson & Jabbie, 2019; Jackson & Jabbie, 2020). The lagged state of diversifying real sector operation in the country during the boom time of mineral exploration is a real attestation of the present-day structural problem the country is experiencing, with a rising debt burden, both domestically and internationally (Jackson, Tamuke & Sillah, 2021; Jackson & Jabbie, 2020; Jackson, Tamuke & Jabbie, 2019).

Figure-4: GFCF Investment

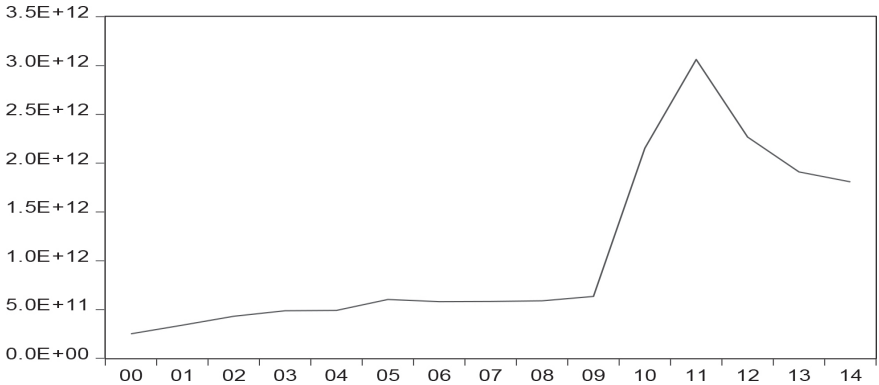


Figure-4 illustrates government investment in the economy and for which most of it is expected to be diverted towards education. The figure above manifests a slow pace in investment during 2000-2009. This low level of investment could be attributed to the legacy of a brutal civil war the country went through for nearly two decades. Growth in investment took a steep rise from 2009-2011, and after that, it slowed down until 2014. This can be attributed to perturbed events in the global economy and the over-reliance of the country to continue its importation of essential or basic commodities to sustain lives in the domestic economy. As already explained, the high debt burden, particularly that which is owed to international institutions and also mismanagement in the public services, could be cited as evidence of the slow growth rate experienced in the country (Jackson, 2018 & 2017a).

Literature Review

Theoretical Review

Drawing from Lucas (1988) and Loening (2002) studies, human capital is thought to be an independent factor of production, which according to Zivengwa et al. (2013) is also an important element in the endogenous growth model as stated in Equation 1 below.

$$Yt = A.K^{\alpha}H^{\theta}L^{(1-\alpha-\theta)} \quad ...1$$

This is also known as the Cobb-Douglas growth model; typically, Y is Output; A is the total factor of productivity or technological change; K is physical capital; H is human resource capital and L is the active labour force.

According to Zivengwa et al. (2013), originally cited in Lucas (1988), it is a well-known fact that the growth rate in human capital is a critical factor for growth – such (human) investment is highly hinged on the need to devote time and effort in capacitating human skills development. Lucas's model was later protracted by Rebelo (1991) to accommodate physical factors, which is also an important element for growth and development. Knowledge, which is construed to be an exogenous factor in the Cobb-Douglas model, is very important in supporting the innovative transformation of skills, as expressed by Saffa & Jabbie (2020) and Romer (1990) in an earlier proposition. Some authors like Benhabib & Spiegel (1994) also supported the idea of incorporating human resource capital accumulation as a key element for real economic growth in a nation.

It is a widely held belief that the growth of an economy is highly hinged on factors like the stock of physical capital, which in this case could be likened to land, buildings and also, components like total factor productivity or innovations and as well as human capital stock, which in this case is quality education as expressed in the Cobb-Douglas expression in equation 1 above. In that vein, investment in education is construed as a very important engine for economic growth in the world economy (Asongu and Odhiambo, 2019). On that note, investment in education should be made sufficient enough to capacitate human potential at all levels, with the ultimate goal of transforming skillset to sustain a high growth rate in an economy (Jackson et al., 2020; Jabbie et al., 2020; Saffa & Jabbie, 2020).

In as much as theoretical propositions have stressed the need for investment in formal education as the key driver for economic growth (Sakamota & Powers, 1995; Schultz, 1971), effort should also be devoted to vocational education (Jackson, Jackson & Jackson, 2020; Wall and Hindley, 2018; Wall et al.; 2017). This is equally important in supporting well-balanced economic growth at the national level and facilitating human innovative skillset beyond national borders.

The need to transform human skills or knowledge is highly relevant as a way of facilitating growth and development in a nation. Ilhan (2001) also added value to the theoretical literature pertaining to the importance of education for transformative development. This should be promoted at all levels and in an equitable manner that supports both formal and vocational education equitably to facilitate the prospect for economic growth and development in a nation (Jackson & Jackson, forthcoming; Jackson, Jackson & Jackson, 2020). Both Lucas (1988 and 1998) and Mankiw (1992) also reiterated the importance of investment in human capital as a means for sustained economic growth in an economy.

Empirical Literature

Suri et al. (2011) carried out empirical research that explored the two-way relationship between economic growth (EG) and human development (HD). They developed a panel data strategy to estimate the strength of the relationships – the outcome proved that HD plays an important role in determining growth trajectory, which is a yardstick measure of sustained growth. The study emphatically proved that, despite the relevance of HD as a major factor in determining the measurement of basic human well-being, it also came out as a critical input for economic growth. Findings from the study also illustrate the empirical relevance of endogenous growth, which seem to be consistent with threshold effect models. Regarding policy implication, the outcome proves that early focus on HD is needed to support a well-balanced economic growth due to its direct impact in sustaining EG.

In close reference to the study at hand, Zivengwa et al.(2013) investigated the causation between education and economic growth in Zimbabwe around 1980 to 2008. The empirical study was done using Pairwise Granger Causality and Vector Autoregression (VAR) model, with Unit Root Tests, given the non-stationary nature of macroeconomic time series data. The findings confirmed a uni-directional causality between education and economic growth in the Zimbabwean economy, running from education to economic growth. The outcome was proven through granger causality tests, variance decomposition and impulse response functions. The result suggests that investment in education is an important factor of economic growth. Equally, the study also shows evidence of transmission running from education to economic growth through physical capital investment, which indicates that an increase in human resource capital also supports an increased level of output on physical investment. The recommendations from this study suggest that both government and private sector should create partnerships through schemes like "Public-Private Partnerships [PPP]" to make it possible to improve the level of the education system.

Amassoma & Nwosa (2011) examined the causal relationship between human capital investment and economic growth in Nigeria to support a sustained level of development in Africa between 1970 and 2009. Vector Error Correction (VEC) and Pairwise Granger causality methodologies were utilised for this study. The variables were tested for stationarity using Augmented Dickey-Fuller and Philip Perron test - results shows stationarity at the first level/difference. Co-integration test was also accomplished, and the results indicated an absence of co-integration running between Investment in human capital and economic growth. The VAR model and pairwise estimation show no causality between human capital development and economic growth. The recommendations indicate that increase budgetary allocation is needed to boost the education and health sector and also the creation of solid vocational institutions to help the facilitate rapid growth in human resource capital, which is needed to

support economic growth. There was also an observed labour incongruity considered necessary to support a sustained level of economic growth. This means that policy-makers should endeavour to collaborate with employers and institutions to provide an update on the labour market and qualifications offered in a bid to add value to the education system. This is considered vital to ensure that investment in education is visibly seen as making a valuable contribution to economic growth.

Empirical studies to address causal relationships between education and economic growth seem to be an ongoing exploration by researchers, both in economics and in public policy. A real attestation to this relates to a study conducted by Bils & Klenow (2000), who indicated some form of opposite causation moving from higher economic growth to additional education, which is considered vital given the causal effect of education on growth in cross-country association. Equally, De Meulemeester & Rochat (1995) equally used the Granger causality test between higher education enrolments and economic growth in six countries – Sweden, the United Kingdom, Japan, France, Italy and Australia. Data for this study covered 1885-1987. The study outcome shows a uni-directional short-run causality moving from higher education enrolments to economic growth in countries like Sweden, the United Kingdom, Japan, and France. On the other hand, a bi-directional causality existed between higher education enrolments and economic growth in Australia and Italy. Similar studies involving uni-directional and bi-directional relationships were also carried out by authors like Katircioglu (2009), this time in association with Northern Cyprus & Jaoul (2004).

Despite efforts made to address concerns around the topic, an empirical exploration of a similar study in the case of Sierra Leone (with a focus on higher education investment) is very timely in support of the government's flagship on quality education, which is the ultimate way forward in addressing development prospect in the current age of transformational technology (Asongu et al, 2019; Asongu & Le Roux, 2017; Jackson, 2015). This study intends to contribute towards existing literatures by providing empirical evidence in ascertaining causal relationships. The use of econometric model techniques like VAR to explore outcomes from Impulse Response and Variance Decomposition to understand the nature of the relationship between human capital and growth will be utilised. It is expected that the outcome from this study will make value addition to policy recommendations geared towards capacitating a high and sustained growth rate in Sierra Leone.

Methodology and Model Specification

The methodological approach for this study is rooted in the foundation of Cobb-Douglas' production function and for which the Vector Autoregression technique is to be applied as the proffered empirical

technique in ascertaining the causal relationship between the identified variables. In order to digress into the details of the methodology, the process will commence by determining Unit Roots and Granger Causality tests for all the variables (both dependent and independent) as outlined in Section 5.1.

Unit Root

Table-1: Unit Root Test Results

Variable	ADF Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	Result
LGFCF_INVEST	-6.569930	-4.121990	-3.144920	-2.713751	Stationary (2) Prob: 0.0000
LRGDP	-5.288429	-4.057910	-3.119910	-2.701103	Stationary (1) Prob: 0.0013
LTERTIARY_ED	-7.717829	-4.121990	-3.144920	-2.713751	Stationary (2) Prob: 0.0001

Critical Value: * 1%, ** 5% and *** 10% respectively
Note: Trends and constant options have been used for first and second differencing.

The ADF test [refer to Table-1 above] was utilised with the following variables: Government (Capital) investment in Education [LGFCF_ INVEST], Real Gross Domestic Product [LRGDP] and Expenditure on Tertiary Education [LTERTIARY_ED], with data spanning from the year 2000 to 2014. The result from the unit root tests shows that LRGDP is stationary at the first difference, while both LGFCF_INVEST and LTERTIARY_ED are both stationary at the second difference. This then makes it more obvious to use the unrestricted VAR model, given the fact that the variables are stationary at different levels. In furtherance, a diagnostic outcome like Pairwise Granger causality (reference to Table-2) was also carried out as one of the core objectives of the study in order to establish the direction of and strength of causality between the variables.

Table-2: Pairwise Granger Causality Tests

Null Hypothesis	Obs	F-Statistic	Prob.
LTERTIARY_ED does not Granger Cause LRGDP	13	13.3928	0.0028
LRGDP does not Granger Cause LTERTIARY_ED		0.89846	0.4446
LGFCF_INVEST does not Granger Cause LRGDP	13	8.31859	0.0111
LRGDP does not Granger Cause LGFCF_INVEST		1.78350	0.2288
LGFCF_INVEST does not Granger Cause LTERTIARY_ED	13	1.11229	0.3748
LTERTIARY_ED does not Granger Cause LGFCF_ INVEST		7.19245	0.0163

Source: EVIEWS Output

Results in Table-2 above (Pairwise Granger Causality Tests) indicate a uni-directional relationship running between all the variables; this also support a priori expectation, particularly in the case of LRGP and LGFCF_ INVEST, which indicate that investment is a vital indicator for economic

growth in an economy. This is also considered important to support a high level of investment and growth in the Sierra Leone tertiary education system.

Vector Autoregression (VAR) Specification

As mentioned earlier, this study is set to utilise VAR as the main empirical approach, having established evidence of Unit Root (at different levels) and Causal relationships between education and economic growth in Sierra Leone. As emphasised in various empirical undertakings (Jackson & Jabbie, 2020; Jackson et al., 2020), there seems to be evidence of a weak theoretical base for using VAR methodology, but its relevance has been utilised to address a strong level of inter-dependence among variables. This is hereby represented as shown in Equation 2 below, also linked with the Cobb-Douglas theory as the foundational base for this study. All variables in the VAR system equation as represented in Equation 2 are treated as exogenous components, and this is normally shown through a system of simultaneous equation analysis. The benefit of utilising VAR comes with its embedded feature of incorporating innovation through impulse response functions and variance decomposition analytics (Zivengwa et al., 2013).

$$\boldsymbol{X_t = \sum_{i=1}^{n} \beta_i X_{i-1} + \mu_i} \quad \ldots 2$$

On application to variable at use for this study, Eqn. 2 is now represented as:

$$\boldsymbol{X_i = (LGFCF\_INVEST_i, LGDP_i, \mathrm{LTERTIARY\_ED}_i)} \quad \ldots 3$$

The representation as specified in Eqns. 2 and 3 are a form of a 3x3 vector of variables and parameter $\beta_1 - \beta_n$ matrix coefficient. Where μ_i, on the other hand is a vector of the error term. In the event that a VECM was to be constructed, all variables in equation 3 should be of I(1) order, which is a first difference equation. According to Table-1 above, the variables are of varying order of integration. Hence, the unrestricted VAR is hereby considered as the preferred model estimation for this study (see estimation outcome in Section 5).

VAR Innovation Technology

Impulse Responses

The impulse response function innovation technique determines how each variable responds over the period of time to external change or shock. In short, the impulse response function describe the reaction of a system as a function of other independent variables that seem to have parameterized the dynamic behaviour of a system (Jackson & Jabbie, 2020; Zivengwa et al. 2013). Where the impulse response function shows a stronger and persistent reaction of growth outlook to shock in education for example, then shock in other variables will lend support to the hypothesis that education is certainly a strong determinant of economic growth in Sierra Leone. Impulse response reaction for the three variables certainly helps in the understanding degree of causal effects in the estimation.

Variance Decomposition

This allows the conclusion to be inferred out of movement within a particular period based on prior shocks emanating from other variables in the VAR series. Such outcome of shock can be traced through the equation system to determine its effects on the variables within the VAR systems equation, and this is also inclusive of future outcomes to the shocked variable (Zivengwa et al, 2013). The variance decomposition technique makes it possible to decompose the forecast errors for each variables emanating from a particular shock period, thereby giving an indication of which variables are more influential in terms of determining future strengths of the relationship (Jackson et al., 2020; Jackson & Jabbie, 2020).

Model Estimation and Analysis

VAR Estimation Result

Table-3: Vector Autoregression Estimates
Standard errors in ( ) & t-statistics in [ ]

	D(RGDP)	D(GFCF_ INVEST)	D(TERTIARY_ED)
D(RGDP(-1))	-0.167166	-0.262316	0.015378
	(0.27253)	(0.50548)	(0.02232)
	[-0.61340]	[-0.51894]	[0.68888]
D(GFCF_INVEST(-1))	-0.104115	0.077043	0.030102
	(0.21189)	(0.39302)	(0.01736)
	[-0.49136]	[0.19603]	[1.73438]
D(TERTIARY_ED(-1))	10.93926	-4.236217	-0.004458
	(3.75603)	(6.96676)	(0.30766)
	[2.91245]	[-0.60806]	[-0.01449]
@TREND	2.71E+10	4.58E+10	4.13E+09
	(2.9E+10)	(5.5E+10)	(2.4E+09)
	[0.92052]	[0.83860]	[1.71302]
R-squared	0.585108	0.102845	0.639385
Adj. R-squared	0.446811	-0.196206	0.519180
Sum sq. resids	9.81E+23	3.38E+24	6.58E+21
S.E. equation	3.30E+11	6.12E+11	2.70E+10
F-statistic	4.230804	0.343905	5.319122
Log likelihood	-360.8534	-368.8846	-328.3258
Akaike AIC	56.13129	57.36686	51.12705
Schwarz SC	56.30512	57.54069	51.30088
Mean dependent	5.56E+11	1.13E+11	4.08E+10
S.D. dependent	4.44E+11	5.60E+11	3.90E+10

Source: EVIEWS Output

The most appropriate lag length of 1 as shown in Table-1 above, was selected based on the AIC criterion. The outcome from the VAR estimation as shown in Table-3, indicate that most of the variables are insignificant, with the exception of Tertiary Education (Tertiary_Ed) on Growth (GDP), which indicates that a unit increase in Tertiary Education will increase

RGDP by 10.94 units under ceteris paribus condition. The R2 and adjusted-R2 values, which are indicators of the explanatory power of the model, reflect that approximately 58.5% and 44,7%, respectively, of the difference in the dependent variable, is explained by the independent variables. The F-Statistic also indicate that the variables are jointly significant in the explanation of the outcome in the dependent variable.

Diagnostic Test Results

Table-4: Stability Test Outcome

Endogenous variables: D(RGDP) D(GFCF_INVEST) D(TERTIARY_ED)

Root	Modulus
-0.576416	0.576416
0.240917 - 0.373102i	0.444124
0.240917 + 0.373102i	0.444124

Source: EVIEWS Output

The diagnostic test outcome in Table-4 shows that the model is stable, with all Modulus values less than one (1).

Table-5: Serial Correlation

Lag	LM-Stat	Prob.
1	10.89938	0.2827
2	12.04099	0.2110

Chi-square prob. with 9 df.

Source: EVIEWS Output

Table-6: Heteroskedasticity Test

Chi-sq	Df	Prob.
59.88408	48	0.1166

Source: EVIEWS Output

Table-7: VAR Residual Normality Tests

Included observations: 13

Component	Skewness	Chi-sq	Df	Prob.
1	0.699661	1.060640	1	0.3031
2	0.048115	0.005016	1	0.9435
3	0.164605	0.058706	1	0.8086
Joint		1.124362	3	0.7712
Component	**Kurtosis**	**Chi-sq**	**Df**	**Prob.**
1	3.837617	0.380035	1	0.5376
2	3.085975	0.004004	1	0.9495
3	2.217268	0.331863	1	0.5646
Joint		0.715901	3	0.8695
Component	**Jarque-Bera**	**Df**	**Prob.**	
1	1.440674	2	0.4866	
2	0.009020	2	0.9955	
3	0.390568	2	0.8226	
Joint	1.840263	6	0.9338	

Source: EVIEWS Output

The post estimation diagnostic test outcomes in Tables 4-7 shows that the VAR model utilised is very appropriate and reliable in determining the effect of education on economic growth in Sierra Leone.

Table-8: Variance Decomposition

Period	S.E.	D(RGDP)	D(GFCF_INVEST)	D(TERTIARY_ED)
1	1.08E+11	100.0000	0.000000	0.000000
2	1.51E+11	57.42002	41.78468	0.795300
3	2.43E+11	24.48569	74.54019	0.974122
4	4.90E+11	16.89925	79.20360	3.897146
5	5.15E+11	20.80386	73.99135	5.204789
6	5.76E+11	17.74817	76.75357	5.498265
7	6.24E+11	18.70591	74.76560	6.528493
8	6.31E+11	19.22186	74.33336	6.444779
9	6.31E+11	19.26571	74.26753	6.466760
10	6.48E+11	18.67321	75.01472	6.312065

Source: EVIEWS Output

Table-9: Variance Decomposition of D(GFCF_INVEST)

Period	S.E.	D(RGDP)	D(GFCF_INVEST)	D(TERTIARY_ED)
1	4.90E+11	2.774464	97.22554	0.000000
2	6.38E+11	16.13627	76.37484	7.488891
3	8.01E+11	11.42914	82.96391	5.606951
4	8.99E+11	15.08316	76.61863	8.298210
5	9.06E+11	14.89816	76.87901	8.222826
6	9.09E+11	14.95523	76.40649	8.638280
7	9.10E+11	14.90929	76.47391	8.616800
8	9.47E+11	14.65560	77.17818	8.166214
9	9.53E+11	15.18278	76.47146	8.345767
10	9.77E+11	14.76098	77.04877	8.190245

Source: EVIEWS Output

Table-10: Variance Decomposition of D(TERTIARY_ED)

Period	S.E.	D(RGDP)	D(GFCF_ INVEST)	D(TERTIARY_ED)
1	1.64E+10	42.34553	7.894465	49.76000
2	1.90E+10	32.12379	25.29418	42.58203
3	3.84E+10	18.32988	68.30239	13.36774
4	3.97E+10	19.69790	66.44424	13.85786
5	5.25E+10	16.63190	71.97565	11.39246
6	5.40E+10	18.63600	69.31337	12.05062
7	5.46E+10	18.32213	69.38330	12.29457
8	5.47E+10	18.36783	69.21967	12.41249
9	5.56E+10	18.02889	69.96530	12.00581
10	5.71E+10	18.23126	70.04798	11.72077

Cholesky Ordering: D(RGDP) D(GFCF_INVEST) D(TERTIARY_ED)

Source: EVIEWS Output

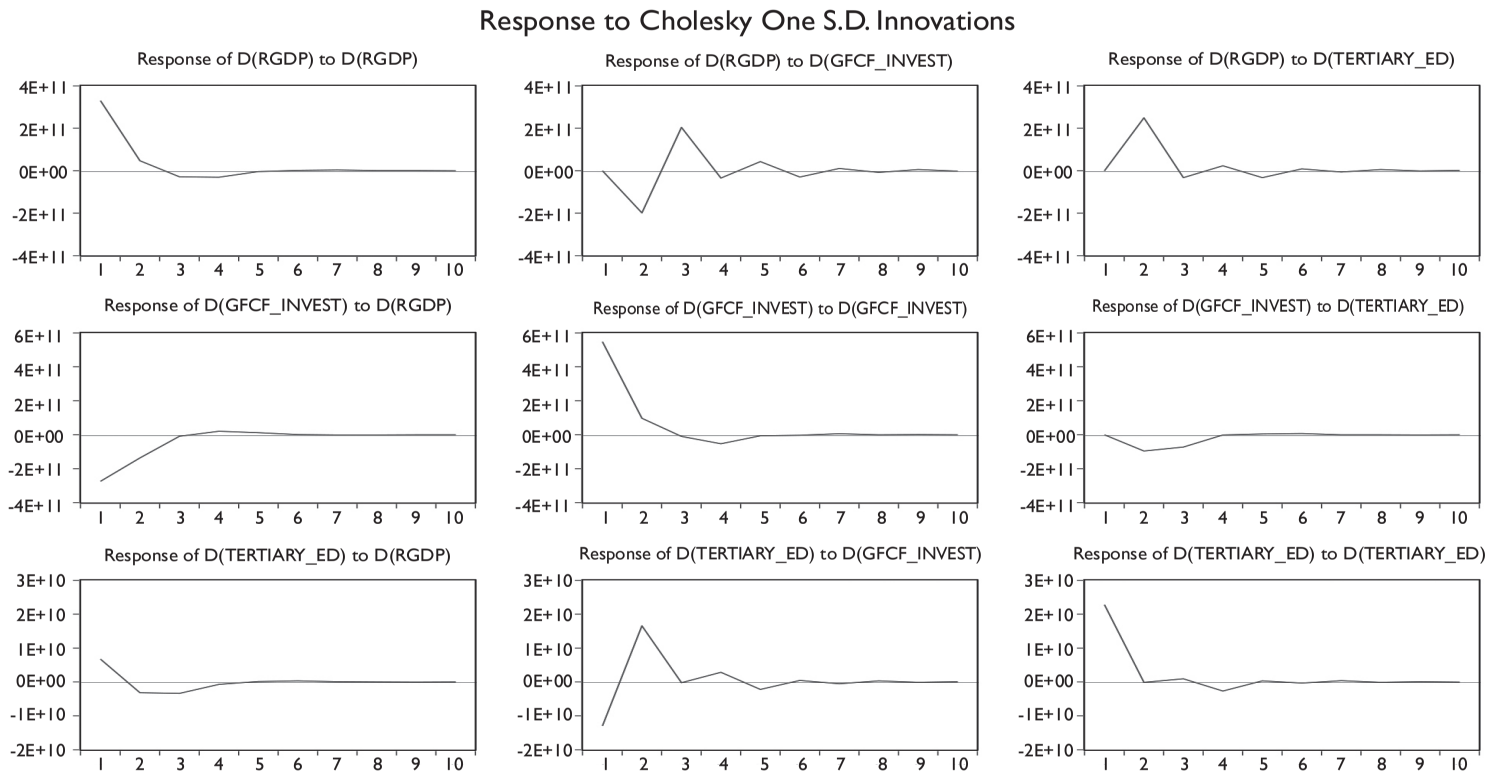
Analysis of Estimation Results

Analysis of Impulse Response Function Outcome

Table-8 to Table-10 indicate the impulse response functions for tertiary education (LTERTIARY_ED), Government investment in education

Impulse Response Function and Variance Decomposition

Figure-5: Impulse Response / Variance Decomposition



Source: EVIEWS Output

(LGFCF_INVEST) and economic growth (LGDP). The response of the shock to variables themselves seem to be very highly significant in the initial periods, as shown in Figure 5. The response of economic growth to government investment in education is rather weak, or one could say insignificant throughout most of the time, except in periods three and five. The response of government investment in education to growth seemed rather insignificant throughout the shock period. This could be linked with the situation faced by successive governments' efforts to make substantial progress in attracting possible investments in the country. There is a significant response of tertiary education to economic growth, while on the other hand, tertiary education to investment is insignificant.

On the whole, the outcome indicate that investment generally in education has been very low. This, on the whole, is affecting scope for expanding tertiary education provision, which is also likely to impact on the quality of graduate output and ultimately, slow-paced growth in the country. The outcome clearly shows that government needs to make tremendous investment in the education system, which ultimately would impact directly on tertiary education and its overall impact resulting in a higher level of growth prospects in the Sierra Leone economy.

Analysis of Variance Decomposition Outcome

Table-8 indicates evidence of the variance decomposition (VD) for the three variables utilised in the VAR model. The outcome shows that own shock to the system explains most of the error variance despite shocks imposed are been affected by other variables in the model. Table-8 indicates variance decomposition for economic growth (RGDP). The outcome from the VD indicates that less than 7% of the shocks in RDGP can be explained by tertiary education. In contrast, investment in education (LGFC_INVEST) seems to be a strong influence on growth over the long-term period of shocks imposed. This confirm that government investment in education (both public and private) is a possible catalyst for investment over a longer-term period, which could explain the current action of the 2018 regime's insistence on free education for both primary and secondary education during their first term of office. This is also impactful on future standards in tertiary education provision, with high scope of improving economic growth in the country.

The result from Table-9 shows that, on average, just about 8% of government investment (GFCF_INVEST) is explained by tertiary education, while the outcome of economic growth is about 15% on average. This also speaks to the fact that government should focus more of its investment effort on promoting tertiary education to a high standard to make it worthwhile for the overall impact to translate highly into sustained economic growth for the Sierra Leone economy.

Table-10 shows that on average, investment in tertiary education (TERTIARY_ED) translated into a higher level of economic growth (on average 42%) for the first two period of shocks, but at a diminishing pace of 18% over the remaining shock periods. On a more realistic note, a shock to tertiary education indicates high level of government investments generally to ensure the outcome is worthwhile for the higher scope of economic growth throughout the country.

Conclusion

The empirical outcome from the initial granger causality test shows the uni-directional relationship between all the variables, which implies a strong indication to utilise the selected variables and their significance in addressing Sierra Leone's prospect for sustained economic growth. Outcomes from both the Impulse Response Function and Variance Decomposition indicate that government investment should be directed towards the tertiary education sector, given its importance as engine for economic growth in Sierra Leone. This is an affirmation that a high level of resource investment is required to enable the country to make the necessary growth expected at the Sub-Saharan African region level to start with. Such investments would be needed in areas connected with resource capacity in a bid to ensure tertiary education institutions in Sierra Leone are able to compete internationally through high-quality graduate outputs. Equally, there is a need for investments to be directed at capacitating human potential, which so far has received a welcoming boost by the incumbent 2018 regime through its free education package for primary and secondary schools throughout Sierra Leone (Jackson, Jackson & Jackson, 2020; SLPP, 2018). While the effort is to ensure resources are poured across the spectrum of the education system, an effort must be made to ensure quality assurance system is set in place to monitor the high standard of delivery and where possible, through competitive assessment of higher education institutions across the country by courses and an overall ranking of institutions. This is very important to make sure tertiary education institutions in Sierra Leone are placed at par with the international system set up to rank institutions globally (Jackson, 2016).

Outcomes from the study have significant implications for the country's growth prospect, particularly at a level that is sustainably capable of ensuring graduates from Sierra Leone are well equipped to compete at the international level for high calibre jobs or even in pursuing further studies. In this vein, investment in human capital can only be made to translate into economic growth where government investment is targeted judiciously, with focus on Higher Education Institutions (HEIs) in capacitating quality resources for educators in a bid to narrow the skills gap across the country. The outcome of this study lend serious support to the 2018 regime change,

which is aimed at boosting quality education, in addressing the country's hope of sustained growth. Here, the focus is to ensure human skillsets are targeted to challenge the ongoing creative destruction speculations in areas pertaining to technology innovation and many more (Jackson, 2020a; Jackson, 2020b).

Owing to a plethora of reasons, notably the legacy of nearly two decades of civil war and more notably, non-prudent actions of people in a position of trust (Jackson & Jabbie, 2020), it is evident that resources will need to be directed at capacitating higher education staff in a bid to equip them with the right level of skillset required to compete at international level. Equally, government investments should be directed at equipping middle-manpower skills potential. This will require a high proportion of resources directed in establishing vocational training centres across the country to support essential services that do not necessarily require graduate-level qualifications, but with the hope of ensuring qualifications earned at every level are sufficient to warrant points for progression to a degree level.

The way forward with this is to ensure education (be it vocational or formal academic) is made an essential part of the Sierra Leone government's charter. This should also ensure equality of opportunity is availed to all citizens, particularly the under-represented, mostly female and those already classed in the special education needs category. Evidence from empirical and other forms of studies have availed the contribution of women as critical in the effort to champion economic growth through their empowerment in the 'Science, Technology, Engineering and Mathematics (STEM)' curriculum (Jackson & Jackson, 2020). The outcome of such an effort towards widening participation in the education system will also serve as a way of reducing the poverty level and as well as a preferred option for embracing the United Nations Sustainable Development Goals (SDG) agenda earmarked for 2030 – notable example of the SDG agenda include high growth prospect, job creation as enshrined in SDG8 charter and many more see Jackson & Jabbie, 2019).

On a final note, the effort of the government to champion growth and development with the right level of investments in education is a laudable venture. To minimise unwanted failures or bureaucracy, the government should endeavour to facilitate Public-Private Partnership (PPP) collaboration with those in the private sector to facilitate a high standard of delivery and output for graduate completion rate (also enshrined in the 2018 manifest for the regime/government). Resources utilised should regularly be monitored to ensure the system is efficiently managed and judiciously utilised for the right causes. Efforts should also be made to champion innovation in much needed areas pertaining to real sector development to make it worthwhile for the country to minimise heavy dependence on imports of inelastic goods and services in particular, which is currently

denting Sierra Leone's hope of attaining the sustained level of low / single-digit inflation (Jackson, Jabbie, Tamuke & Ngombu, 2020).

The study is limited in its use of 14 years of data on account of problems inherent in collecting annual data on GDP and tertiary education. It is hoped that future studies of this nature will make use of updated data pertaining to improving the quality of education in the country as a whole.

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Merchant Orientation: A Study on the Significance of Payment Platforms in India with Special Reference to e-Wallet

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Abstract

Payments are the end means of closing a sale. From cash to digital platforms, customers have always been motivated by merchants, service providers and financial firms by loading tonnes of benefits in terms of cashback, discounts and various sets of offers directly infused into the payment process. Digital payment instruments, including plastic cards, e-Vouchers, digital Wallets, UPI apps, etc., today are making huge progress in the domain of digital transactions. These online payment instruments, including prepaid instruments to post-paid or credit-based instruments, have always been emerging and appealing players in terms of market presence. But, is it similar in the city of Assam? Particularly is it viable for the merchants of Dibrugarh city? we will have to look inside. In this study, the researcher has tried to understand the implementation process, practical feasibility and usability of the applications in terms of quality, benefits, security and acceptance. Most business houses had to either adopt or adjust after demonetisation was exercised at the end of 2016 in India. Thus, with the emergence and growth of digital payment systems, it has become necessary for us to carry out a study on the various modes of payment systems and instruments to find the most effective ones for the sellers or merchants. We, therefore, try to highlight the importance of various payment instruments, including e-Wallets, used by shopkeepers, restaurants and businesses while engaging with customers.

Keywords: e-Wallet, Merchant, Prepaid Payment Instruments, Transaction

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Introduction

In the age of technology, almost all business transactions today have become a part of the digital economy or intend to become the only means for transactions. It is equally important to note that the thousands of transactions each hour regularly have become possible by the tap of touch-enabled/physical buttons on the mobile. Many reports have shown the significance of new online technologies introduced by FinTech firms. Further, we can also find BigTechs[i] such as Google, Facebook, etc., have built their spaces within masses. Smart computing devices have provided many ways for users and shown how to accept, use and receive benefits by using technology.

On the point of gameplay, we can now have online-based payment instruments[ii]. That includes e-Wallets such as PhonePe, Paytm, HDFC PayZapp, Amazon Pay, ICICI Pockets and many more. We can also find companies like Google introducing Google Pay in India, which depends on a Unified Payment Interface (UPI), which was incorporated by NPCI. Most of such platforms maintain a real-time settlement system for users' accounts used while executing transactions. A user will have to use a unique UPI ID and PIN to carry out such a transaction online. Similarly, the existential nature of e-Wallets cannot be ignored, a means to freedom by not carrying cash. This is a prepaid payment instrument or can be used to complete a financial transaction successfully with the help of a UPI ID or any other payment instrument, excluding cash.

Moving further ahead, digital service is beneficial in creating a digital or a virtual relationship. The virtual relationship can be developed through transactions and one such study highlighted by Ji Xiaojing (2017)[iii] explained a red packet to be a monetary gift which seems to be quite common during Chinese festivals. This may symbolise a transfer of emotions during personal interactions; and may serve to strengthen the otherwise weak virtual relationships.

Hence, users' acceptability and usability are of utmost importance because of the gigantic prospect or volume of data that the system is likely to handle in the near future.

With respect to the discussion above, the following research has been executed among the retailers of Dibrugarh, Assam (India), to draw out the underlying issues of the e-Wallet platforms. It may be noted that the study intends to help researchers to draw out the details of the subject, which is an e-Wallet. This research would provide the basic assumptions behind using the digital wallet and how far people will accept it compared to other available means. The paper highlights satisfaction levels and dissatisfaction levels and means to disapprove the use of technologies in their retail chains, stores, stores or during an ongoing interaction with the customer.

The payment platforms comprising Unified Payment Interface can be found in mobile apps like Google Pay, BHIM, SBI Pay etc. Even e-Wallets and payment gateways allow users to use UPI along with plastic cards and other various payment platforms. Bohme, R. et al.(2015)[iv] stated that cryptocurrency such as Bitcoin is of interest to economists because they can disrupt existing payment systems. There are many challenges in using and advocating for e-Wallets as customers may like to get certain benefits from debit/credit cards or UPI technologies. There are no charges or zero charges for digital transactions via UPI or through RTGS and NEFT, and hence the job is challenging for e-Wallet companies.

What is An e-Wallet?

With the advent of new technologies and an urge among technologists to find better ways to put human life at ease, we have seen many examples in different fields. Finance is such a domain that neither was behind nor is excluded by technologists. Stock markets, international banking, consultancy and customer services, international marketing (Joshi)[v] Guidance and investment decisions are more actively planned, created, operated and upgraded at different moments, guided by similar rules and standards in all economies. Similarly, along these same lines, we now have a platform which is more convenient and easy to use in the name of electronic wallets that may become more active than ever before after bringing in all payment solutions built inside the e-Wallet.

The e-Wallet may be described as an unique electronic account or identity-based application through which online transactions can be made by using a computer or even more conveniently, by using a smartphone. Its primary utility is the same as that of a wallet. However, now some major corporations are upgrading it to a credit or debit card, payment gateway, ecommerce platform, UPI based transaction service, etc. A digital wallet can be processed and linked to a plastic card or bank account to process payments to Service Points or brick and mortar stores. There may be stores which act as Point to deposit cash which in turn is deposited into the account of the e-Wallet user. Such types of payment systems have successfully made a significant change in the dimensions of service quality (Khan et al.)[vi]. Further, digital wallets have proliferated into marketing present in the digital world (Ahuja)[vii] spaces. The e-Wallet services are now clubbed with Payments Banks[viii] too, in order to mobilise funds and increase digital or online transactions.

e-Wallet Components

The e-Wallet may have mainly three components hardware, that is, the computing device, software tool and applications, i.e., the app and verified or authenticated user information. The software may have several modules with a different purpose, such as to store personal information, provide the security, encryption / decryption services, or create an informational

database having the details that are provided by the user that includes respective details such as name, address, means of payment, the amount paid, debit or credit card information, etc. The major e-Wallet apps now come with integrated payment technology such as UPI, Payments Bank linked account, e-marketplace partner, or electronic plastic cards and have all the value-added services within each app. Digital payment-related services such as Prepaid Payment Instruments[ix], have competitively marketed (Ramaswamy et al.)[x] Many products to capture market share.

Research Importance

The study aims to understand the current status of e-Wallet systems among major retailers of Dibrugarh. The importance of the study lies in identifying new emerging digital payment platforms that are instrumental in conducting a transaction successfully between the seller and the buyer. Also, the research has set a goal to find the most used and acceptable payment systems by sellers. This paper tries to find those outlets that may be using any number of payment systems to deal with different customers having different perceptions.

Objectives of the Research

- Aims to identify newly adopted e-Wallet Service Platforms.
- Aims to compare and present the various payment platforms and to measure the significance that exists among them.

We have constructed the Hypothesis statements formulated with respect to various features, risks, speedy sale closer, security and complaint handling.

H01: There is no significant difference among payment-related services w.r.t. Payment Features.

H11: There is a significant difference among payment-related services w.r.t. Payment Features.

H02: There is no significant difference among related payment based services w.r.t. Minimum Risk Involved.

H12: There is a significant difference among payment-related services w.r.t. Minimum Risk Involved.

H03: There is no significant difference among the payment based services w.r.t. Fast Closer of Sale.

H13: There is a significant difference among payment-related services w.r.t. Fast Closer of Sale.

H04: There is no significant difference among payment based services w.r.t. Platform Security.

H14: There is a significant difference among payment-related services w.r.t. Platform Security.

H05: There is no significant difference among the related payment-related services w.r.t. Complaint Handling.

H15: There is a significant difference among payment-related services w.r.t. Complaint Handling.

Methodology

A descriptive study of major e-Wallet Service Providers has been carried out in Dibrugarh, India. A city covered by Dibrugarh Municipality Corporation. This research primarily looks at data collected through questionnaires from Sellers who use digital wallet based apps during a specific period of two years before the pandemic of 2020.

In this study, the city of Dibrugarh is identified for the purpose. Proper pre-testing methods were considered and various steps were undertaken to check the face validity with reliability which can be generally accepted. To carry the process of data analysis, calculations, compilations, etc. have been done with MS Excel 2019[xi].

Sampling Procedures Adopted

Sellers with e-Wallet Applications form the Population. An unknown population is considered as the researchers cannot identify directly and therefore, a pilot study was conducted to find the Retailers of e-Wallet apps who are active.

Sampling Unit: For the field study on Sellers' Points: Retailers who are owners, as well as Users, have been identified and considered.

Primary data is considered for the study and proper analysis is conducted to study the Retailers using at least one such e-Wallet app.

Judgmental Sampling was considered to execute the field survey. Fifty-five stores were identified, but affirmative responses could not be taken from all and as such only 31 sellers are part of this study.

Merchants / Transaction Points

Since the researchers cannot be certain about the registered number of retail stores having e-Wallet services, the researchers have found the retail stores offering e-Wallet services by inquiry and observation.

The survey was conducted among 55 retailers of e-Wallet Applications in Dibrugarh, where only 31 of them provided valid input and the validity of questions was found to be intact. The following platforms were most common among merchant users and were active among Merchant Users in Dibrugarh: PayTM, Google Pay. PayTM and Mobikwik were the prominent players. Through this survey, we have identified that a few UPI-based platforms (e.g. Google Pay) may become challenging for e-Wallet apps.

Considering Friedman (Sheldon et al.)[xii] We have employed validity test. For F_T,

$$F_T = \left[\frac{12}{b(k)(k+1)}\sum_{j=1}^{k} T_j^2\right] - 3b(k+1)$$

k = no. columns (treatments)
b = the number of nows (blocks)
T^2_j = the square sum of ranks for sample received (column) j

Friedman's test method is to analyse the nonparametric data concerning human competence. This test will allow producing the results of various groups, i.e., comparable to each other, with or without any concern for the size of the group, even if the numbers are small. [15]

Also, if the hypothesis can be rejected, the post hoc test (Stoll)[xiii] It shall have to be taken. Here, the payment-related services are generally compared to help identify such payment-related services that are significantly different from other services accepted by stores.

Collection of Data

The Observation Method: The researchers have analysed the data received from respondents and have observed the respective input, including the interactions with the platform used along with the normal business routine. The researcher's observations have been recorded and found to be important to the purpose.

The Personal Interview Method: Researchers had extensive interviews with Sellers / Outlet owners using different e-Wallet apps. This method provided the researchers with in-depth know-how of payment-related services offered, which even highlighted the issues such as satisfaction level on service quality dimensions and patterns of usage.

Data Analysis & Interpretation

The field survey concluded with responses from 31 retailers who have been identified to use more than one payment platform. Distinctly, eight retailers were registered retail users of e-Wallet apps, mostly using PayTM.

Demographical data was also collected through the same field survey.

Within a short period of two months, the researchers have found many prominent payment platforms and e-Wallet platforms to be active such as Airtel Payments Bank's App/e-Wallet, PhonePe, PayTM, etc., with BHIM and Google Pay.

Initial Findings

The following are the key findings from the field survey and are highlighted below:

- There were a total of eight registered retail users of the e-Wallet service known as PayTM, i.e., nearly 26% of the respondents.
- 77.42% of the respondents have provided the facility at least once. Therefore among the respondents, we can conclude that the PayTM platform is the leader among various e-Wallet service providers. (refer to Table-1). It was an interesting observation noted by the researcher that a few of the sellers were using and open to using two or more e-Wallet services that their customers would like to prefer.

Table-1: Different Services

Services	No. of Merchants Points
PayTM	24
Amazon Pay	1
Google Pay	5
Others	1

Source: Field Survey

- Majority of the respondents, a total of 96.77%, were found to have been providing the facility of Debit Card and Credit Cards to the customers along with cash. However, all were accustomed to the new payment systems.

Table-2: Digital Payment Related Services to Others

Digital Payments	30
Others	1

Source: Field Survey

Demographic Information

- Most of the Merchant Users were found to be between the age of 30 to 40 years.
- Almost all merchant points with payments systems like e-Wallet and Plastic cards were operated by the male.
- 93.6% of the retail stores using various payment systems were married. A similar number was found to be of those males who used e-Wallets along with other payment interfaces.
- Data revealed that the majority of businesses had a turnover of about 15-20 Lakhs per year who responded. The response rate was nearly 48% when this query was made.
- Majority of the respondents were graduates using the payments services.

The summarised ranks from the market survey on parameters such as features, risks, quick sale closer, Security and Complaint Handling can be highlighted as shown below:

Table-3: Payment Features

Cash Based	e-Wallet app	Debit / Credit Card	Others
4	1	2	3

Table-4: Risk Involved

Cash Based	e-Wallet app	Debit / Credit Card	Others
1	2	4	3

Table-5: Fast Closer of Sale

Cash Based	e-Wallet app	Debit / Credit Card	Others
1	4	3	2

Table-6: Security

Cash Based	e-Wallet app	Debit / Credit Card	Others
1	3	4	2

Table-7: Complaint Handling

Cash Based	e-Wallet app	Debit / Credit Card	Others
1	2	4	3

Testing of Hypothesis

Critical Values are represented through the Critical Value Approach and given as follows:

The Lookup Critical Value is 7.81

In the Calculated Static Test Value, we have used the Friedman Test

Significance Level, considered, $\alpha = .05$

With the P-Value, the researchers compared the p-value with the significance level.

We have taken a note that the more smaller the p-value, the higher will be the chances for rejection of the null hypothesis. Hence, we compared the p-Value and Significance Level ($\alpha = .05$), which holds significance:

If, the p-Value =< α; rejection of the Null Hypothesis,

If, the p-Value =< α; acceptance of the Null Hypothesis,

C = No. of groups (e-Wallet app, Cash-Based, Debit/Credit Card and Others) = 4;

Total Comparisons = 6;

Studentised Range Q Table is used for finding Q value[xiv] which is found to be 3.87:

- The hypothesis is tested to look into the significance of payment-related services, that is, Cash-Based, Debit/Credit Card, e-Wallet app and 'other' various platforms on features as 'Payment Features' has been described below:

H01: Significant difference does not exist among the payment-related services w.r.t. Payment Features.

H11: There is a significant difference among payment-related services w.r.t. Payment Features.

After conducting the test for looking into the proportion of Retailers that prefer various services. $F(t) = 58.39$; $p < .05$. Statistically, there is a significant difference in the proportion of Retailers who prefer different payment-related services for transactions.

Here, the null hypothesis is accepted. Hence to find the significant difference among services, we will have to compare them. After the Tukey Kramer Post Hoc Test, the Critical Range Value = 0.48 (n = number of observations =31; Q = 3.87; S2pooled = 0.48 [Q√ S2pooled /n] are noted.

Hence, we can give the conclusion that with an absolute difference value of 0.13, the group relationship from 'Cash to Others' is not the only significant pair, all other group comparisons have revealed values of 2.10, 1.45, 0.65, 1.97, 1.32 (for Cash to e-Wallet, Cash to Plastic Card, e-Wallet to e-Wallet, e-Wallet to Others, Plastic Card to Others) which is found to be significantly different, concerning available payment-related features on various methods including methods such as Demand.

Draft, Cheque, etc.

- The hypothesis is tested to look into the significance of payment-related services, that is, Cash-Based, Debit/Credit Card, e-Wallet app and 'other' various platforms on risks observed as 'Risk Involved' has been described below:

H02: Significant difference does not exist among payment-related services w.r.t. Risk Involved.

H12: There is a significant difference among payment-related services w.r.t. Risk Involved.

The test was conducted to look at the proportion of Retailers who preferred various services. $F(t) = 46.78$; $p < .05$. Statistically, there is a significant difference in the proportion of Retailers who prefer different payment-related services for transactions.

As the null hypothesis is accepted, the researchers have conducted the test to find the service/services where a significant difference might exist among various payment-related services after pairwise comparison.

After the Tukey Kramer Post Hoc Test, the Critical Range Value = 0.56 (n = number of observations =31; Q = 3.87; S2pooled = 0.48 [Q√ S2pooled /n] was noted.

Hence, after comparisons, we can conclude that except for the relationship 'Plastic Cards to Others' having an Absolute Difference value of .29, all other comparisons having values of 1.13, 2.06, 1.77, 0.94, 0.65 are significantly different, as the users responded on the minimum risk involved in processing a payment.

- The hypothesis is tested to look into the significance of payment-related services, that is, Cash-Based, Debit/Credit Card, e-Wallet app and 'other' various platforms on the parameter 'Closing Sales' has been described below:

H03: There is no significant difference among payment-related services w.r.t. Fast Closer of Sale.

H13: There is a significant difference among payment-related services w.r.t. Fast Closer of Sale.

The test was conducted to look at the difference in the proportion of Retailers preferring various payment-related services. $F(t)$ {4, N=31} = 46.16; $p < .05$. Statistically, there is a significant difference in the proportion of Retailers who prefer different payment-related services for transactions.

The null hypothesis is accepted, and hence the researchers have tested to find significant difference which may be found in various services after group-wise comparison.

After the Tukey Kramer Post Hoc Test, the Critical Range Value = 0.56 (n = number of observations =31; Q = 3.87; S2pooled = 0.48 [Q√ S2pooled /n] was noted. In the 'Plastic Card to Others' pair, the Absolute Difference was noted to be .03, highlighting that it is not significant w.r.t. to Absolute Difference Values of 2.23, 1.19, 1.16, 1.03, 1.06 in 'Cash to e-Wallet', 'Cash to Plastic Card', 'Cash to Others', 'e-Wallet to e-Wallet', and 'e-Wallet to Others'.

Hence, the researcher concludes by stating that apart from the group relationship from Plastic Cards to Others, all other comparisons are Significantly Different to each other, in a situation where the users were requested to reply on how fast a Sale can be concluded.

- The hypothesis is tested to look into the significance for payment-related services, that is, Cash-Based, Debit/Credit Card, e-Wallet app and 'other' various platforms on the parameter 'Security' has been described below:

H04: Significance difference does not exist among payment-related services w.r.t. Security.

H14: There is a significant difference among payment-related services w.r.t. Security.

The test was conducted to look at the difference in the proportion of Retailers preferring various payment-related services. $F(t) = 50.38$; $p < .05$. Statistically, there is a significant difference in the proportion of Retailers who prefer different payment-related services for transactions.

The null hypothesis is accepted. Hence the researchers make an attempt to find services where the significant difference might come out within services after a pairwise comparison.

After the Tukey Kramer Post Hoc Test, the Critical Range Value = 0.53 (n = number of observations =31; Q = 3.87; S2pooled = 0.48 [Q√ S2pooled

/n] was noted. In 'e-Wallet to Others' pair Absoluted Difference was noted to be .06, highlighting that it is not significant w.r.t. to Absolute Difference Values of 1.29, 2.32, 1.23, 1.03, 1.10 in 'Cash to e-Wallet', 'Cash to Plastic Card', 'Cash to Others', 'e-Wallet to e-Wallet', and 'Plastic Card to Others'.

Hence, the researchers conclude by stating that apart from 'e-Wallet to Others', all other are Significantly Different after the users replied on the importance of Security.

- The hypothesis is tested to look into the significance for payment-related services, that is, Cash-Based, Debit/Credit Card, e-Wallet app and 'other' various platforms on the parameter 'Grievance Handling or Redressal' has been described below:

H05: Significance difference does not appear in services w.r.t. Complaint Handling.

H15: There is a significant difference among services w.r.t. Security.

The test was conducted to look at the difference in the proportion of Retailers preferring various payment-related services. $F(t) = 53.21$; $p < .05$. Statistically, there is a significant difference in the proportion of Retailers who prefer different payment-related services for transactions.

Since the null hypothesis is accepted, we will have to find the service or set of services where a significant difference might exist among various payment-related services after pairwise comparison.

After the Tukey Kramer Post Hoc Test, the Critical Range Value = 0.52 (n = number of observations =31; Q = 3.87; S2pooled = 0.48 [Q√ S2pooled /n] was noted. In 'e-Wallet to Others' pair Absoluted Difference was noted to be .42, highlighting that it is not significant w.r.t. to Absoluted Difference Values of 1.32, 2.29, 1.74, 0.97, .55 in 'Cash to e-Wallet', 'Cash to Plastic Card', 'Cash to Others', 'e-Wallet to e-Wallet', and 'Plastic Card to Others'.

Hence Hence, the researchers conclude by stating that apart from 'e-Wallet to Others', all other are Significantly Different after the users respond to handling queries and issues.

- The study brings new hope to the e-Wallet technology, as the merchants have become more abled by using it, and the app was found to be user friendly.

Findings, Suggestions and Related Issues of Importance

The payment platforms or services are dependent on the number of users. The more the users, the more willingly the retailers will come forward with the platform. The e-Wallet service seems more advanced and requires an understanding of the application with its wide range of features which are incomparable with the services of Plastic Cards. In a fast-changing market

and customer service quality enhancements and convenience, the study has given a clear picture of payment systems. The present scenarios have highlighted major issues in the following:

Payment Features and Specific Promotion

When we have considered the aspect of Payment Features, we found that e-Wallet has more features than the rest. Since no significant difference was found among the rank orders of Cash and Others, which included UPI, DD and Cheque, we may assume that little or no difference exists among these payment-related services. Hence, the e-Wallet service providers may have successfully added varied payment features to the application. But, Cash and other payment options remain with meagre features.

Risk and Exposure

Cash was found to have less or little risk when used and was mostly accepted as the best option among available services. Cash was significantly different than the rest, but a significant difference was not found among Plastic Cards and Others, which means that these services are relatively similar when used.

To minimise the risk, involvement and engagement need to be enhanced. Therefore, the frequency of exposure to e-Wallet applications can be increased through various promotional events. Some of the currently available benefits include offers, discounts, cashback, etc., which must continue.

Fast Closing of Sale by Smart Use

Cash was found to be used mostly in terms of quick closure of the sale process. Most payment-related services have their significance based on varied circumstances, but Plastic Cards and various other services such as Cheque, UPI, and DD, have no such conditions. Therefore, e-Wallet systems have to incorporate an effective transaction closing mechanism even though the UPI option has now been added in most e-Wallet apps.

Security and Staff Awareness

The payment option 'Cash' has been found to be highly significant even though it has been followed by e-Wallet in terms of security, with a few outlets finding counterfeit currency on an irregular interval but to a bare minimum. There has been no significant difference between e-Wallet and Plastic Card when these ranks are compared by the Post hoc test.

The services' points should have exclusive Customer Service Points and people appointed specifically to make customers aware and address the issues of payment platforms to build confidence in electronic payment systems.

Complaint Handling, Redressal and Seller being Customer-Centric

As the post hoc test was conducted, the study found no significant difference between e-Wallet apps and Plastic Card, i.e. Debit/Credit Cards w.r.t. handling Merchant Complaints and Grievances. Cash still has a stronghold as the merchant users still may consider hard Cash in terms of complaints w.r.t. e-Wallet apps, Debit/Credit Cards and other means of payment-related services.

Hence, payment-related services with an e-Wallet platform shall find their place by maintaining people's sentiments and usability when demanded.

Becoming Platform-independent

Plastic cards or E-Debit cards, UPI Interface and Banking facilities, including mutual fund investments, are now part of the e-Wallet platform. Whereas, now loading cash into the wallet is just a formality with no mandatory requirement to add cash beforehand and having cash reserves in the wallet account. Each time while making a payment, the e-Wallet itself acts like a payment gateway. The means to take more and more financial services into the ambit of the e-Wallet platform must continue.

Conclusion

Major players selling products and providing services seem to work actively with different payment platforms. The study successfully highlights the aspects of different payment platforms in Dibrugarh city being in use. This research highlights the utilities of the e-Wallets over debit/credit cards, UPI apps, hard cash, etc. Henceforth, the availability, acceptance, convenience and performance of e-Wallet platforms will bring significant changes in lifestyles. The study effectively puts forth the views expressed by merchant users or retailers regarding the significance of payment systems.

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