The Potential of Frozen Food Technology to Reduce Food Wastage and Climate Change

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Abstract

The availability of frozen foods in the Indian market has brought about great change by reducing the food waste there by tackling the climate change. Earlier, women were spending lots of time in the kitchen and with the introduction of frozen foods; they are able to prepare a variety of mouth-watering dishes within no time to meet the taste of their family members. Among the different reasons for the popularity of frozen foods in India, the improving standard of living of the middle-income grouped people in India has also contributed towards the development of companies in the frozen food industry in India. Block-chain technology enables the food industry with transparent tracking of all the digital transactions online on a real time basis thus leads to reduction of frauds in food industry especially in processed, packed and frozen food products.

Keywords: Frozen Food Products, Food Wastage, Climate Change, Agricultural Productivity, Carbon Footprint, Sustainability.

Introduction

India is a large producer of food and is offering different opportunities and business propositions in food and food processing technologies, skills and equipment. The food- based industries encompass canning, dairy and food processing, specialty processing, packaging, frozen food /refrigeration.

Products which come under the frozen food industry are fruits, vegetables, fisheries, milk products, meat, poultry and other packaged and convenience foods. Although it is a huge producer of food products, India still has immense untapped potential in the frozen food export industry. The demand for Indian recipes from the Indian settled across the globe has served as an impetus to development of the frozen food industry in recent years. Vegetables like drumsticks and okra and prepared food like chapattis and paratha's are nowadays available in frozen form in neat packets all over the world. Thus it reduces the food wastage and assists in tackling the climate change.

Review of Literature

New range of food products are added in frozen food products and frozen food category leads to reduced wastages. The consumer awareness is increasing day by day and in future the demand will increase. As the food loss can be reduced this will lead to agricultural productivity.

Jitendra(2010) Due to lack of cold chain facility frozen food products are wasted but with improved supply chain quality the opportunities will be many.

The significant cold chain facilities are there only in UP,Uttarkhand,Maharastra and Westbengal only(Source: Directorate of Marketing and Inspection (DMI), Government of India Statistics (December 31, 2006)) hence majority of the states in India do not have adequate infrastructural facility.

Matani (2007**)** India is second largest producer of commodities such as fruits and vegetables. But the post harvest losses are huge.

C. **Maheshwar**(2006) About 30% of the fruits and vegetables grown in India (40 million tons amounting to US$ 13 billion) get wasted annually due to gaps in the cold chain such as poor infrastructure, insufficient cold storage capacity, unavailability of cold storages in close proximity to farms, poor transportation infrastructure, etc.

Fruits and vegetables intake is essential for healthy life style and the food pyramid shown below illustrates how fruits and vegetables are vital in a balanced diet hence occupy the bottom of the pyramid.

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Objectives:

1. To find which brand of frozen food product is fast selling
2. To find who is the market leader in frozen foodproducts.
3. To find out the percentage of frozen food users in the market

Scope of the Study:

- Provides analysis of frozen food products in Bangalore current performance and future prospects
- Supports for further research in frozen food industry.
- This study also helps in finding the preference of customers during the purchase of frozen food products from theretailers.

- The study reveals the scope of expansion for frozen food products invegetarian.
- This study also helps the company in coming out with better quality frozen food products in order to face stiff competition inmarket.

Methodology of the study:

Primary data: Primary data or original data are gathered. The data was collected from the survey conducted in various retail outlets, super and hyper markets and through direct interaction with customers.

Secondary data: Secondary data was collected from EBSCO host database.

Source of Data Collection: We use questionnaire as a research tool consisting of a series of questions and other prompts for the purpose of gathering information from respondents and

statistical analysis of the responses were made later. It is comprised of closed-ended questions, other questions respondent pick an answer from given options.

Sampling Population: The consumers who visit food retail outlets.

Sampling unit: Business people, Professionals, Government Employees, Non-Government employees, College students.

Sample Size: 100

Data collection instruments: The data collection is a key activity of the project work. The design of the data collection instrument is the backbone of the research design. The data has been collected with help of questionnaire and direct interview with the customers in the outlets.

Method of sampling: The researcher used simple random sampling method for data collection with 100 samples from different outlets in Bangalore.

Tools of analysis: T – test, one way ANOVA, Linear regression, Cross tabulation

Limitations:

- The data may be biased in terms of the respondent's response.
- Time and cost constraints restricted the survey to some extent.

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- The sample size has been restricted to only 100 respondents.

Data analysis and interpretation:

Table no 7.1.1 Awareness of frozen food brand

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	28	28.0	28.0	28.0
	Yes	72	72.0	72.0	100.0
	Total	100	100.0	100.0	

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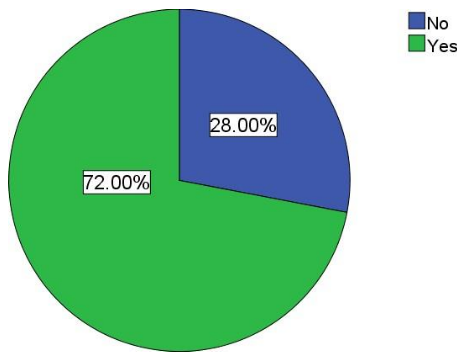

FIG 7.1.1

INTERPRETATION :

From the above figure 7.1 majority of respondents are aware of brand with 72% respondents out of 100%.

Table no 7.1.2. Source of awareness about frozen food

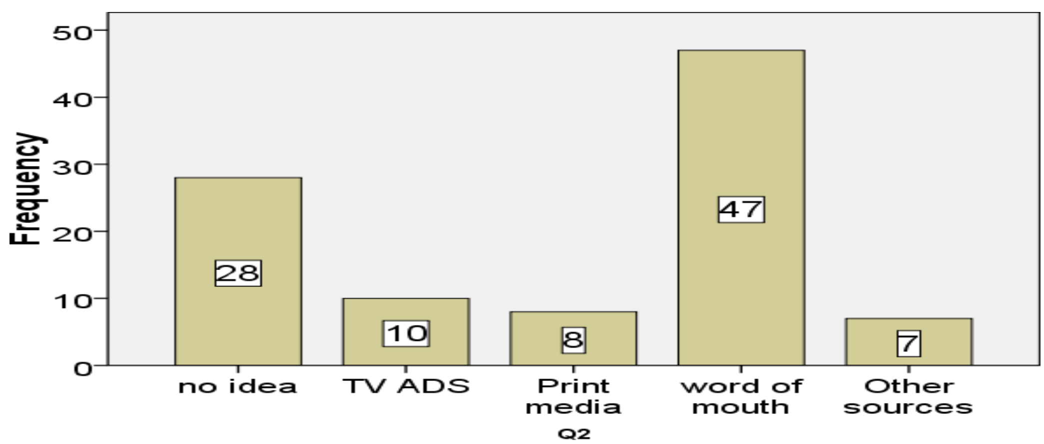

FIG 7.1.2
INTERPRETATION :

From the above figure 7.2 majority of respondents are aware of Maiyas through word of mouth i.e 47% out of 100%.

Table no 7.1.3.1. Tick Maiyas products on different attributes

7.1.3.1. Price of maiyas products

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No idea	28	28.0	28.0	28.0
	Extremely satisfied	26	26.0	26.0	54.0
	satisfied	42	42.0	42.0	96.0
	Neutral	4	4.0	4.0	100.0
	Total	100	100.0	100.0	

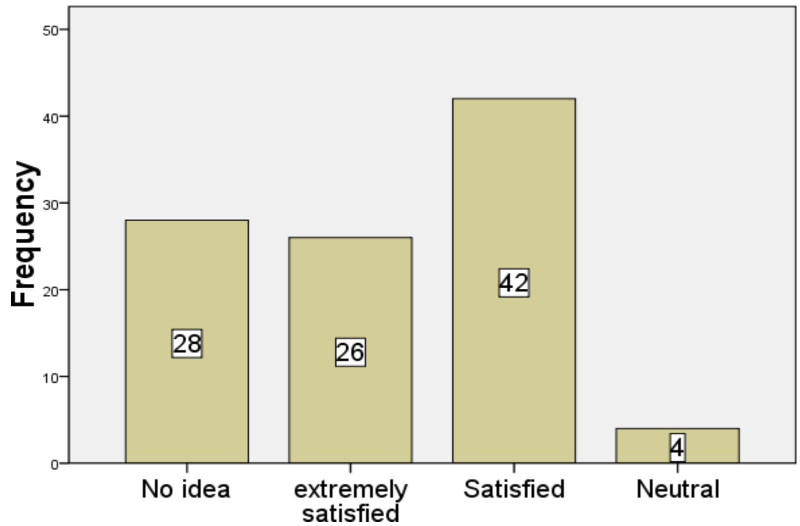

FIG 7.1.3.1

Interpretation :

From the above graph the majority of customers are satisfied with the pricing of Maiyas products i.e. 42% respondents out of 100%.

Table no 7.1.3.2 QUALITY of maiyas products

	Frequ	Perce	Valid P	Cumula

		ency	nt	ercent	tivePercent
Valid	No idea	28	28.0	28.0	28.0
	Extremely satisfied	16	16.0	16.0	44.0
	Satisfied	39	39.0	39.0	83.0
	Neutral	17	17.0	17.0	100.0
	Total	100	100.0	100.0	

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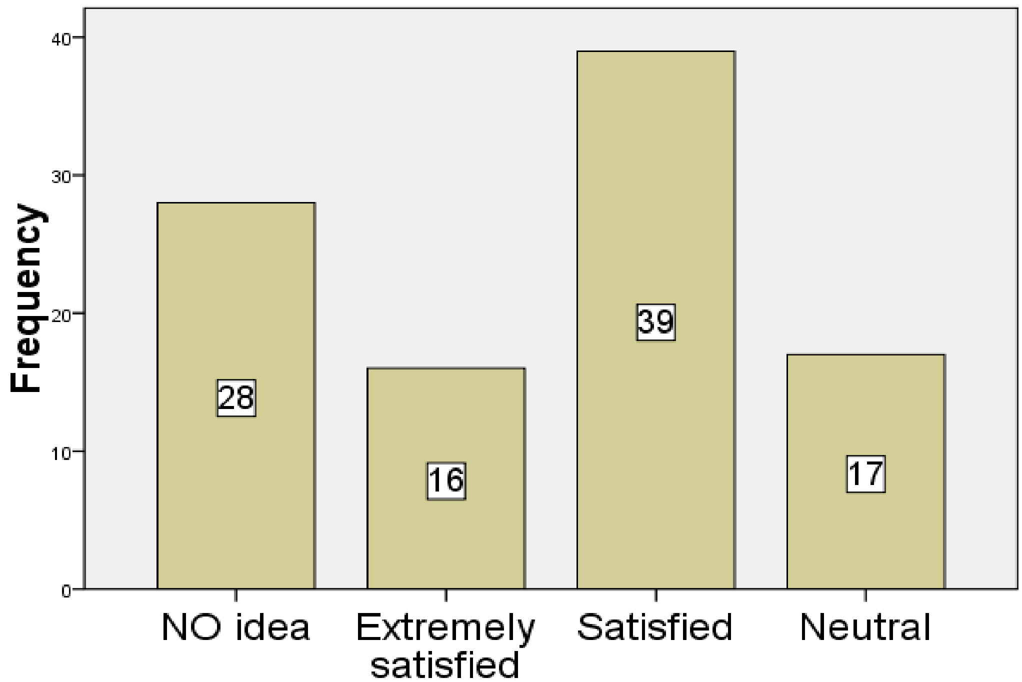

FIG 7.1.3.2

INTERPRETATION :

From the graph the majority of respondants are satisfied with the quality of Miayas products in market i.e 39% respondants are satisfied out of 100%.

Table no 7.1.3.3 TASTE of maiyas products.

	F r	P e	V a l	C u m

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		equency	rcent	idPercent	ulativePercent
Valid	No idea	28	28.0	28.0	28.0
	Extremely satisfied	25	25.0	25.0	53.0
	Satisfied	35	35.0	35.0	88.0
	Neutral	10	10.0	10.0	98.0
	Dissatisfied	2	2.0	2.0	100.0
	Total	100	100.0	100.0	

FIG 7.1.3.3

INTERPRETATION:

From the above graph the majority of customers are satisfied with taste of Maiyas products in market i.e 35% out of 100%.

Table no 7.1.3.4. VAIRETY of maiyasproducts.

		Frequency	Percent	ValidPercent	CumulativePercent
Valid	No idea	28	28.0	28.0	28.0

Extremely satisfied	19	19.0	19.0	47.0
Satisfied	31	31.0	31.0	78.0
Neutral	18	18.0	18.0	96.0
Dissatisfied	4	4.0	4.0	100.0
Total	100	100.0	100.0	

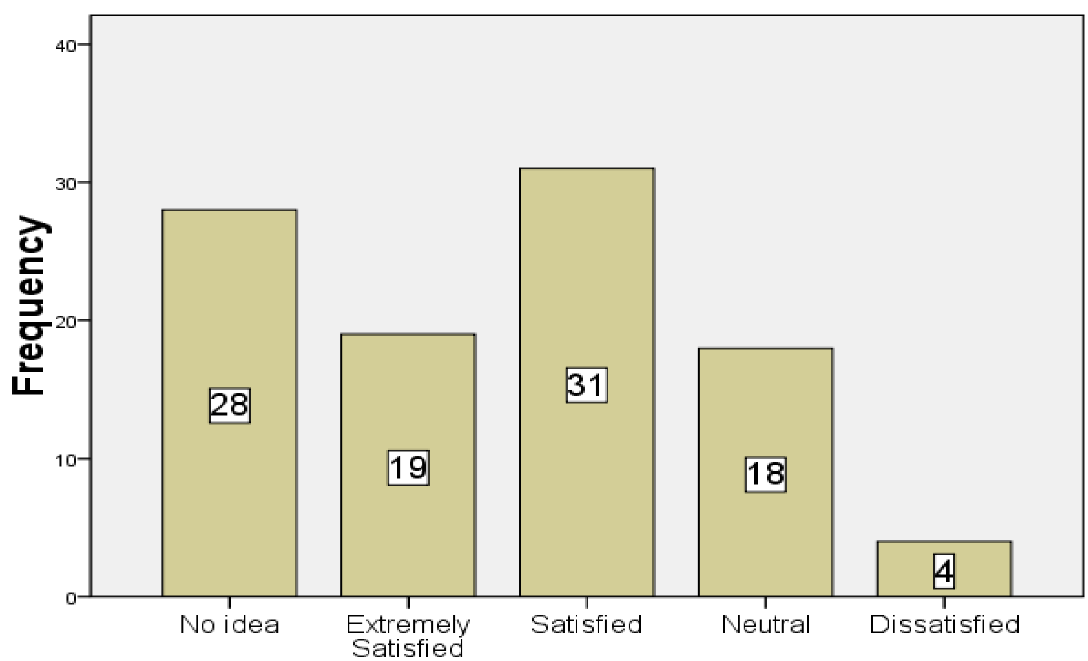

FIG7.1.3.4

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INTERPRETATION :

From the above graph the majority of respondents are satisfied with variety of Maiyas products available in market .i.e. 31 % out of 100 %.

Table no 7.1.4. Aware of frozen food products in market

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	7	7.0	7.0	7.0
	Yes	93	93.0	93.0	100.0
	Total	100	100.0	100.0	

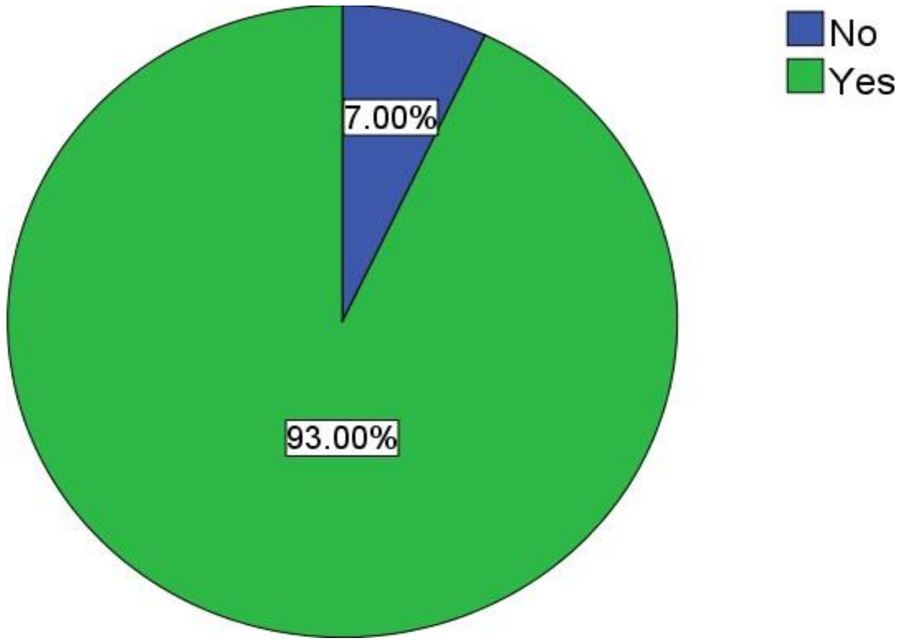

FIG 7.1.4

INTERPRETATION :

From the above figure the majority of respondents are aware of frozen food products available in market i.e 93% of respondents out of 100%.

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STATISTICAL ANALYSIS :

Linear regression between occupation and their usage level. DEPENDENT VARIABLE : Often use of frozen food products. INDEPENDENT VARIABLE : Occupation of frozen food products.

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.903	1	4.903	5.197	.025[a]
	Residual	92.457	98	.943		
	Total	97.360	99			

Table no 7.2.1.1

Coefficients[a]

	Unstandardized	St an		

Model	Coefficients		dardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	1.501	.208		7.221	.000
Q14	.222	.097	.224	2.280	.025

INTERPRETATION :

From the above table it shows that we can interpret that respondents occupation is highly coefficient with their purchase of frozen food products in market.

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One way annova between regular buyers and afford to buy :

DEPENDENT VARIABLE : Afford to buy frozen food product INDEPENDENT VARIABLE : How often do they buy

ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	39.275	4	9.819	13.426	.000
Within Groups	69.475	95	.731		
Total	108.750	99			

Table no 7.2.2.1

Q8 * Q9 Crosstabulation

		Q9	

		0	5 DAYS	15 DAYS	1 MONTH	DEPENDS	Total
Q8	0	7	0	0	0	0	7
	30-40	0	0	10	4	5	19
	40-50	0	5	14	7	8	34
	50-60	0	5	13	9	5	32
	60-70	0	0	3	5	0	8
Total		7	10	40	25	18	100

Table no 7.2.2.2

INTERPRETATION :

From the above able we can interpret that customers buying ability is highly coefficient with the often use of thr frozen food products by customers in market.

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INFERENCE:

From the above table it is clear that respondents who can afford to buy within 40-50 buy frozen once in 15 and also majority of customers buy once in 15 days i.e 40 out of 100 customers.

Regression between awareness and sources of awareness DEPENDENT VARIABLE : Awareness about brand maiyas INDEPENDENT VARIABLE : How did they come to know aboutMaiyas

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.152	1	15.152	296.506	.000[a]
	Residual	5.008	98	.051		
	Total	20.160	99			

Table no 7.2.3.1

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Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.179	.039		4.620	.000
	Q2	.278	.016	.867	17.219	.000

Table no 7.2.3.2

Q1 * Q2 Crosstabulation

		Q2					
		0	Tvads	Printmedia	WOM	OS	Total
Q1	No	28	0	0	0	0	28
	Yes	0	10	8	47	7	72
Total		28	10	8	47	7	100

Table no 7.2.3.3

INTERPRETATION :

From the above table we can interpret that the awareness of Maiyas among respondents is highly coefficient with the source of advertising at 0.00 level of significance.

INFERENCE :

From the above table It is clearly mentioned that the majority of respondents who are aware of brand Maiyas came to know about the brand through word of mouth i.e 47 % of respondents out of 72 %. And only 10 respondents out of 72 are influenced by TV ads followed by print media and some other sources .

T-test between usage and aspects to buy frozen food products.

DEPENDENT VARIABLE : Use of frozen food products

INDEPENDENT VARIABLE : Important aspects to buy frozen food products

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One-Sample Statistics (table no7.2.4.1)

	N	Mean	Std. Deviation	Std. Error Mean
Q6	100	1.92	.992	.099
Q7	100	1.71	.998	.100

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One-Sample Test(7.2.4.2)

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	Df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Q6	19.361	99	.000	1.920	1.72	2.12
Q7	17.136	99	.000	1.710	1.51	1.91

Table no 7.4.2.4

		Q7				
		0	taste	Price	Health	Total

Q6	0	7	0	0	0	7
	Green peas	0	12	5	13	30
	Sweetcorn	0	18	2	9	29
	Cut,sam	0	15	7	10	32
	l,V,D	0	2	0	0	2
Total		7	47	14	32	100

INTERPRETATION :

From the above table we can interpret that the purchase of frozen food product is highly significant with certain aspects while buying i.etaste , healthiness and price with the significance level of 0.00.

INFERENCE :

From the above graph we can clearly notice that majority of customers buy frozen food products considering taste as their main aspect followed by health issues and at last price. Majority of customers buy sweet corn because of the taste followed by cutlet and samosa with 15% out of 47%. And in third place is the green peas regarding health issues.

One way annova between product preferred and occupation and income level

DEPENDENT VARIABLE : Which product id preffered INDEPENDENT VARIABLE : Occupation of respondents INDEPENDENT VARIABLE : Income level of customers

ANOVA (table no7.2.5.1)

		Sum of Squares	Df	Mean Square	F	Sig.
Q14	Between Groups	18.602	5	3.720	4.308	.001
	Within Groups	81.188	94	.864		
	Total	99.790	99			

Q15	Between Groups	6.857	5	1.371	1.122	.354
	Within Groups	114.853	94	1.222		
	Total	121.710	99			

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Q5 * Q14 Crosstabulation(table no7.2.5.2)

		Q14				Total
		WP	STUDENT	HOUSEWIFE	BUSINES	
Q5	0	0	7	0	0	7
	Safal	26	18	4	0	48
	Sumer	8	0	5	2	15
	McCa	7	2	4	3	16
	Yumy	3	0	2	5	10
	Os	2	2	0	0	4

Total	46	29	15	10	100

INTERPRETATION:

From the above table we can interpret that the buying of particular frozen food brand is highly coefficient with the occupation of respondents with significance level of 0.01.

INFERENCE :

From the above table it clearly states that 26 working professionals out of 46 buy safal for their daily use followed 18 students out of 29 buy safal. And in the second place comes sumeru followed by McCam and Yummiez.

FINDINGS:

- Majority of respondents in market are aware of frozen foodbrands.
- Majority of respondents are aware of block-chain technology through word ofmouth.
- Safal has the highest demand among the other brands in themarket.
- Cutlet/samosa has been fast moving followed by green peas and sweet corn as perthe respondent'sfeedback.
- Majority of customers prefers taste followed by health issues while buying frozenfood product inmarket.
- The majority of the respondents are satisfied with taste, price, taste, variety of productsin market.
- Majority of respondents are ready to spend around 40-50 rupees followed by50-60 rupees.
- Majority of respondents buy frozen food products once in 15 days from themarket.
- Majority of respondents who buy frozen food product in market are working professionals followed bystudents hence block-chain technology can be applied

CONCLUSIONS:

During the study it shows that vegetarian frozen food product like frozen fruits and vegetables are widely accepted and the demand for frozen food product is increasing day and by day. Majority of the sales in frozen food is green peans/sweet corn and cutlet/samosa in the market which has the highest market share and they are the present market leader in the market in frozen food department. Hence the popularity of frozen food products will lead to reduction of food waste and there by reduces the carbon footprint. Thus it enhances agricultural market efficiency and overall agricultural productivity benefits all the stakeholders.

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Scope for Further Study

The study on the wastage of food in major categories can be analyzed including the other categories like fresh food, processed and packed foods. Future studies can also focus on the farm labor shortage, migration, irrigation challenges and farmer conflicts and legal assistance.

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