



A Study On The Growth Of The Edible Cup Market Using Millet Flours

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Abstract

The increasing concern over plastic waste and environmental sustainability has led to the exploration of biodegradable and edible alternatives for single-use packaging. This study focuses on developing and evaluating edible cups as an eco-friendly substitute for conventional disposable cups. Made from natural ingredients such as wheat flour, cornstarch, and plant-based sweeteners, these cups are designed to be both functional and consumable. The research examines their structural integrity, heat resistance, and consumer acceptance through experimental trials and surveys. Results indicate that edible cups can withstand hot and cold beverages for a reasonable duration while offering a palatable taste experience. Furthermore, consumer feedback highlights a positive response towards the concept, particularly in reducing plastic waste. This study concludes that edible cups present a promising solution to the environmental challenges posed by single-use plastics and recommends further research on scalability, cost-effectiveness, and flavour enhancements.

1.1 Introduction

Edible cups are a sustainable product that avoids plastic usage. This can also be a different and unique one in the tea cup market. In the future, edible cups will have a huge impact on consumption. Edible cups are easy for customers to use and handle. The purpose of this product is that after drinking cold/hot beverages, the consumer can eat up the cup. It also creates a sustainable environment among the people.

1.2 Objective

To analyze the edible cup market and raise consumer awareness about sustainable choices.

1.3 Benefits of edible cups for health

Edible cups offer a sustainable and innovative solution to reducing single-use plastic waste, addressing environmental concerns while enhancing consumer experience. Made from biodegradable and often nutritious ingredients like wheat, corn, or seaweed, these cups minimise landfill waste and pollution. They provide value by being both functional and consumable, eliminating disposal concerns. Additionally, edible cups can enhance food and beverage experiences by complementing flavours, making them ideal for cafes, events, and eco-conscious businesses.

1.4 Scenario in the World Market

Companies like **Cupffee (Bulgaria)**, **Eat Your Coffee (USA)**, and **BioBite (India)** have introduced edible cups made from ingredients such as wheat, oats, and seaweed, offering consumers an eco-friendly and innovative dining experience. These products are particularly popular in coffee shops, restaurants, and events aiming to reduce waste.

The demand for edible cups is growing, especially in regions with strong sustainability initiatives, such as Europe and North America. Market trends indicate that businesses and consumers are increasingly adopting these alternatives due to their dual functionality—serving as both containers and snacks. However, challenges such as production scalability, cost-effectiveness, and shelf stability remain key areas for improvement.

1.5 Edible cup production in India

Edible cup production in India has gained significant momentum, reflecting the country's commitment to sustainable and eco-friendly alternatives to single-use plastics. Several Indian enterprises have ventured into manufacturing edible cups using indigenous ingredients, offering innovative solutions to environmental challenges.

Notable Producers:

- **INTUGREEN (Coimbatore, Tamil Nadu):** This specializes in eco-friendly products, including edible
- **Enchi Crunch (Mangalore, Karnataka):** Produces edible tea cups using 100% natural millet and grain powder, available in various flavors such as biscuit, vanilla, chocolate, cardamom, strawberry, and pasta.
- **Use Eco (India):** Offers edible cups that are 100% vegan, GMO-free, and remain crunchy for over 40 minutes, suitable for hot beverages up to 85 degrees Celsius.
- **Elite Cup (India):** Provides edible biscuit cups in flavours like vanilla, cardamom, and chocolate, designed to be 100% vegan, whole grain, degradable, and free from plastic.
- **Jayalakshmi (Visakhapatnam, Andhra Pradesh):** A former teacher who developed edible tea cups using ragi and rice flour, producing around 30,000 to 40,000 cups per month and earning approximately Rs 7 to 10 lakh annually

Technological Advancements:

- **PEEPL Automation (Kochi, Kerala):** Developed the ECM A40C, a fully automatic edible cup-making machine capable of producing 40 cups simultaneously, featuring PLC control with HMI, pneumatic pressing, and accurate temperature control.
- **IIT Roorkee (Uttarakhand):** Researchers have developed Kodo millet-based edible cups, aiming to promote sustainable and cost-effective packaging, with production costs estimated to be around Re 1 per cup in mass production.
- These initiatives highlight India's proactive approach to integrating traditional grains and modern technology in the production of edible cups, contributing to environmental sustainability and offering consumers innovative alternatives to conventional disposable cups.

Source: Wikipedia

1.6 Review of literature

1.Shulga, O., et al. (2023). This article explores the consumer properties of biodegradable, edible cups as a potential ecological alternative to disposable cups for hot drinks. These cups are made from butter cookie-like biscuits, offering both functionality and taste. They can hold a beverage for 20 minutes to 1 hour, making them a practical and sustainable option. These cups can be used at standard temperatures between 85°C and 90°C without degrading. Edible cups provide additional benefits by being both consumable and waste-free. They are made from ingredients such as wheat flour, corn starch, white sugar, potato starch, margarine, and leavening agents, all of which offer health benefits. Additionally, they exhibit excellent ergonomic performance and decompose naturally, similar to other confectionery products, making them an eco-friendly alternative.

2. K V Satheesh Kumar et al.. (2021). This article explores different materials and methods used to make cups for hot drinks, focusing on paper, plastic, and edible options like biscuit cups. It discusses how traditional materials like paper and plastic have environmental and health concerns, such as waste and chemical leaching. The potential of edible cups made from biscuits, which are not only eco-friendly but also add flavor to the drink. These edible cups are especially beneficial for diabetics as they can be made sugar-free. The study reviews various manufacturing techniques and ingredients, emphasizing the need for sustainable and healthy alternatives to other cups. Edible cups could be a promising solution for reducing waste and enhancing the drinking experience.

3.Pawan Kumar Yadav.,(2011).This article provides a review of the nutritional and medicinal properties of wheat, highlighting its significance as a staple food crop worldwide. Wheat is a rich source of protein, minerals, B-group vitamins, and dietary fiber, making it an excellent health-building food. Whole wheat, which includes bran and germ, is important in preventing various diseases such as constipation, heart disease, obesity, and diabetes. The nutritional composition of different wheat products, their medicinal benefits, and potential prospects for improving wheat's nutritional quality through genetic engineering. The uses of wheat and its role in promoting overall health and well-being.

4. Colin A. Carter., et al. (2001). This article provides an overview of the global wheat market, focusing on production, consumption, trade, and policies. Wheat is a major food source worldwide, with most consumption cereal in developing countries due to population growth. Wheat production has increased over the years, mainly due to higher yields, but growth has slowed in recent decades. The trade patterns, with developing countries now driving import demand. The impact of government policies, like subsidies in the US and EU, distort the market and affect global prices. This uncertainty surrounding China's wheat reserves and trade can influence global markets.

5. Suja Karkada., et al. (2018). This study examines the effect of including ragi in the daily diet to prevent anemia and increase hemoglobin (HB) levels. Adolescence is a crucial period of rapid physical, emotional, and mental growth, often leading to health challenges such as anemia, which can negatively affect cognitive ability. The study aimed to evaluate the impact of ragi on improving HB levels. Sixty adolescent girls were divided into two groups of 30 each. One group consumed ragi daily, while the other did not. The results showed that the girls who included ragi in their diet experienced a significant increase in HB levels, whereas no changes were observed in the group that did not consume ragi. This study concludes that incorporating ragi into the daily diet effectively improves HB levels in adolescents, making it a beneficial dietary addition for preventing anemia.

6. Ishwaraptel., et al. (2016). This article highlights the nutritional benefits of ragi (finger millet), a staple food in rural India and parts of Africa. Ragi is rich in calcium, iron, fiber, and essential amino acids, making it highly nutritious. It is especially beneficial for growing children, pregnant women, and diabetics due to its low sugar content and slow digestion, which helps control blood glucose levels. Ragi can be processed through methods like grinding, roasting, and malting to improve its digestibility and flavor. Additionally, ragi's high fiber content aids in weight management and reduces the risk of chronic diseases like diabetes and heart disease. Ragi is a versatile and healthy grain that can play a key role in improving nutrition and health.

7. G. Swapna., et al. (2020). This article, titled Sweet Corn, A Future Healthy Human Nutrition Food, discusses the nutritional value, nutritional composition, and health benefits of sweet corn. Sweet corn is a staple food crop liked by people the most because of its sweetness and freshness, unlike field corn, which is harvested dry and is not eaten as fresh. Sweet corn provides a unique taste and is rich in carbohydrates, sugar, and vitamins A, B3, and C. It has folic acid, iron, ferulic acid, fiber, minerals, zinc, protein, magnesium, and antioxidants, which help to prevent diseases like cancer, diabetes, heart disease, and skin-related diseases. This study emphasizes the importance of sweet corn as a healthy food option to include in the daily diet and its potential to promote human health.

8. Okumura et al. (2013). This article is a review of the genetic, agronomic, and nutritional aspects of sweet corn. It explains that sweet corn is different from regular corn because it has special genes that make it sweeter and lower in starch. The article divides sweet corn into two groups: one with genes that make it slightly sweet and another with genes that make it super sweet. It also discusses how sweet corn is more demanding in terms of soil fertility, needing more nitrogen and potassium compared to regular corn. Proper harvesting and

handling to maintain quality, especially for industrial processing or fresh consumption. Overall, it provides a detailed look at how sweet corn is grown, its nutritional value, and the challenges farmers face in producing it.

1.7 Scope of study

The scope of edible cups is vast, driven by the global push for sustainable alternatives to single-use plastics. With increasing environmental regulations and consumer awareness, the demand for biodegradable and edible packaging is on the rise. Edible cups have potential applications in cafes, restaurants, airlines, events, and the hospitality industry, offering an eco-friendly and innovative way to serve beverages while reducing waste. Advancements in food technology and material science continue to improve their durability, taste, and cost-effectiveness, making them more viable for mass production. As businesses and consumers embrace sustainable choices, the edible cup market is expected to expand, creating opportunities for start-ups, food manufacturers, and eco-conscious brands worldwide.

1.8 Need for the study

The edible cup is a sustainable food product in the market. The scope is to serve food that is nutritious and biodegradable. The future generation may not prioritize Nutrition facts when it comes to food choices. To address this, we can promote sustainable practices by introducing edible Cups made from millet flour. This innovative approach not only reduces waste but also makes it easier to engage consumers and raise awareness about environmental sustainability.

1.9 Methodology

The secondary data gathered regarding the export of edible Cups made from millet flour as well as wheat, ragi, and corn starch indicates promising future trends in the global Market. This suggests that edible Cups have significant potential to gain traction worldwide.

+1.10 Source of data

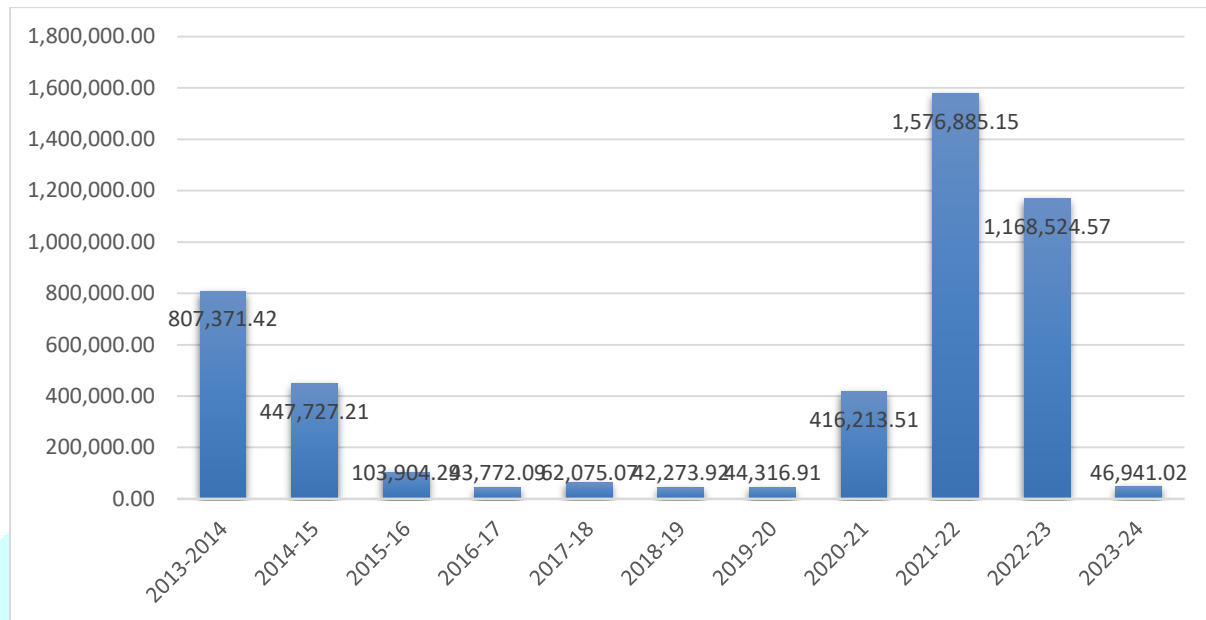
The secondary data was collected through the Ministry of Commerce and Export-Import Databank website. Data was collected and analyzed over the past ten years to identify trends and predict the future market of edible cup-based products.

Table - 1: Export of wheat during the years of 2013 – 14 to 2023 -24

YEAR	INQTYTONS (1000units)	IN INR PERUNIT	PERCENTAGE
2013-2014	47,32,201.00	8,07,371.42	16.96%
2014-15	26,62,081.75	4,47,727.21	9.40%
2015-16	6,52,720.75	1,03,904.29	2.18%
2016-17	2,59,641.86	43,772.09	0.91%
2017-18	3,21,033.47	62,075.07	1.30%
2018-19	2,25,715.81	42,273.92	0.88%
2019-20	2,19,134.30	44,316.91	0.93%

2020-21	21,49,332.50	4,16,213.51	8.74%
2021-22	72,14,639.00	15,76,885.15	33.12%
2022-23	46,39,167.50	11,68,524.57	24.54%
2023-24	1,87,979.06	46,941.02	0.98%
TOTAL	232,63,647.00	47,60,005.16	1000.00

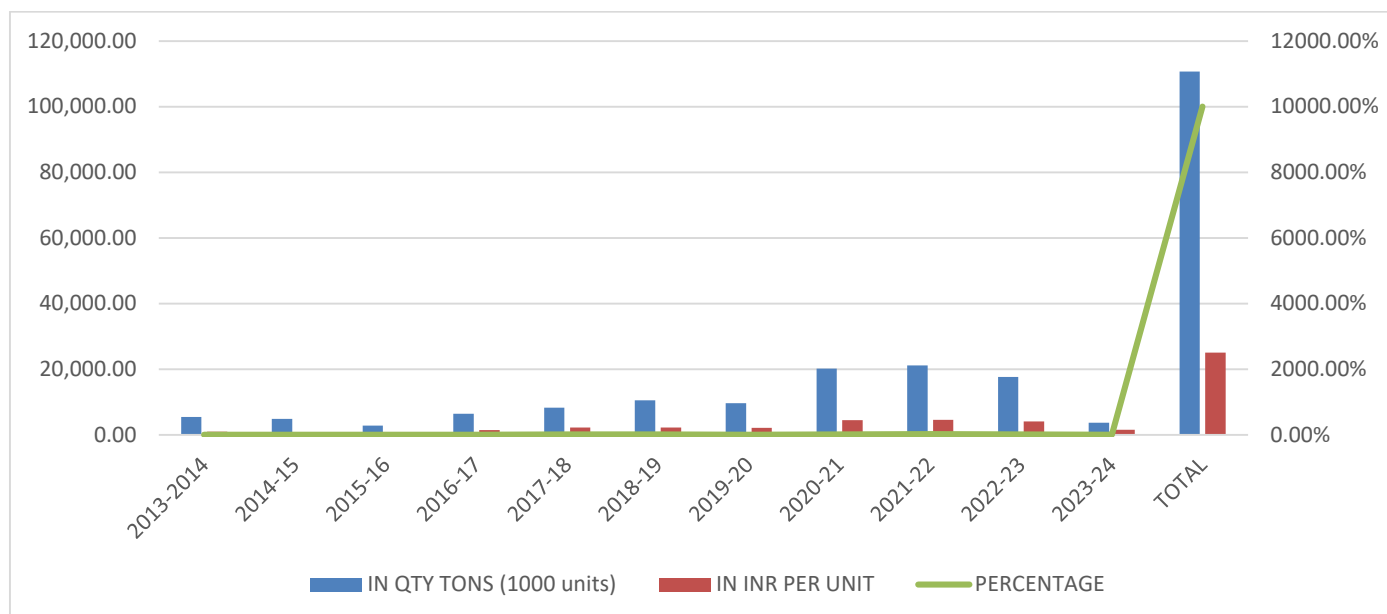
Chart- 1: Export of wheat during the years of 2013 – 14 to 2023 -24



Source: Ministry of Commerce

Table- 2: Export performance of ragi during the year of 2013 – 2014 to 2023 - 2024

YEAR	INQTYTONS (1000units)	IN INR PERUNIT	PERCENTAGE
2013-2014	5,479.93	931.58	3.71%
2014-15	4,872.03	900.46	3.59%
2015-16	2,795.93	533.13	2.12%
2016-17	6,439.87	1481.27	5.91%
2017-18	8,272.92	2189.23	8.73%
2018-19	10,534.40	2258.81	9.01%
2019-20	9,645.07	2127.59	8.49%
2020-21	20,190.20	4449.59	17.76%
2021-22	21,132.87	4589.61	18.32%
2022-23	17,618.81	4061.81	16.21%
2023-24	3,706.67	1528.58	6.10%
TOTAL	1,10,688.70	25051.66	100.00

Chart- 2: Export performance of ragi during the year of 2013 – 2014 to 2023 - 2024

Source: Ministry of Commerce

The above chart shows that the growth of the ragi export rate is having the decline, but the export rates are having a progression. End suddenly, in the COVID period, the export rate was rising.

Table -3: Computation of least squares in terms of value.

YEAR	IN INR PER UNIT(TON)	X	XY	X ²
2013-14	807371.42	-5	-4036857.1	25
2014-15	447727.21	-4	-1790908.84	16
2015-16	1,03,904.29	-3	-311712.87	9
2016-17	43,772.09	-2	-87544.18	4
2017-18	62,075.07	-1	-62075.07	1
2018-19	42,273.92	0	0	0
2019-20	44,316.91	1	44316.91	1
2020-21	4,16,213.51	2	8832427.02	4
2021-22	15,76,885.15	3	4730656.45	9
2022-23	11,68,524.57	4	4674098.28	16
2023-24	46,941.02	5	234705.1	25

Table -4: Computation of least squares on exports in terms of value.

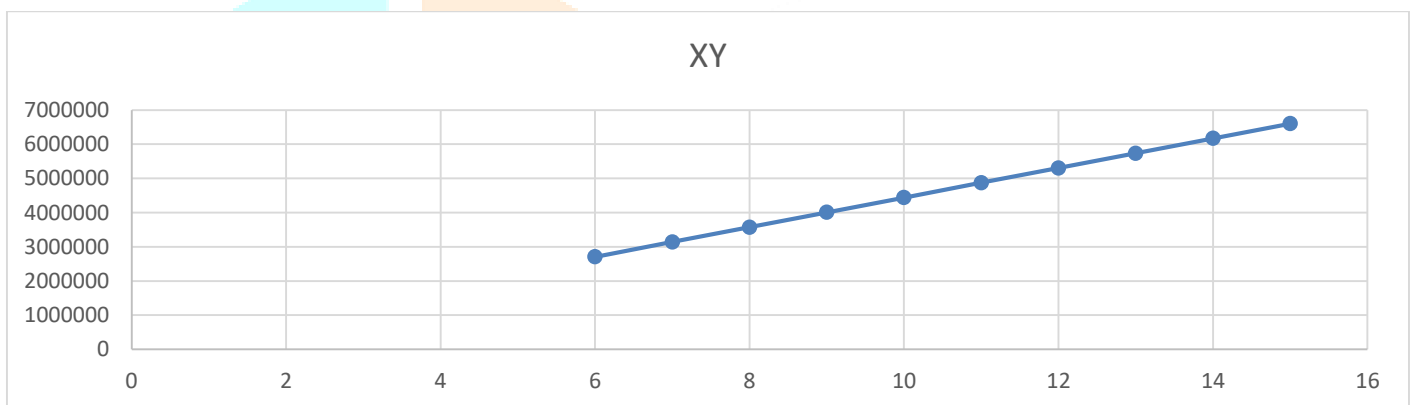
YEAR	IN INR PER UNIT(TON)	X	XY	X ²
2013-14	931.58	-5	-4657.9	25
2014-15	900.46	-4	-3601.84	16
2015-16	533.13	-3	-1599.39	9
2016-17	1481.27	-2	-2962.54	4
2017-18	2189.23	-1	-2189.23	1
2018-19	2258.81	0	0	0
2019-20	2127.59	1	2127.59	1
2020-21	4449.59	2	8899.18	4
2021-22	4589.61	3	13768.83	9
2022-23	4061.81	4	16247.24	16
2023-24	1528.58	5	7642.9	25

Table -5: Computation of least squares on exports in terms of value

YEAR	IN INR PER UNIT(TON)	X	XY	X ²
2013-14	3897.53	-5	-20659.09	25
2014-15	5658.97	-4	-22635.88	16
2015-16	5347.99	-3	-16043.97	9
2016-17	6471.83	-2	-12943.66	4
2017-18	5518.8	-1	-5518.8	1
2018-19	7969.71	0	0	0
2019-20	8968.19	1	8968.19	1
2020-21	9915.79	2	19831.58	4
2021-22	9941.15	3	29823.45	9
2022-23	24926.06	4	99704.24	16
2023-24	23214.39	5	116071.95	25

Table -6: Trend projection for wheat exports for the year 2024 -2025 to 2033 -2034

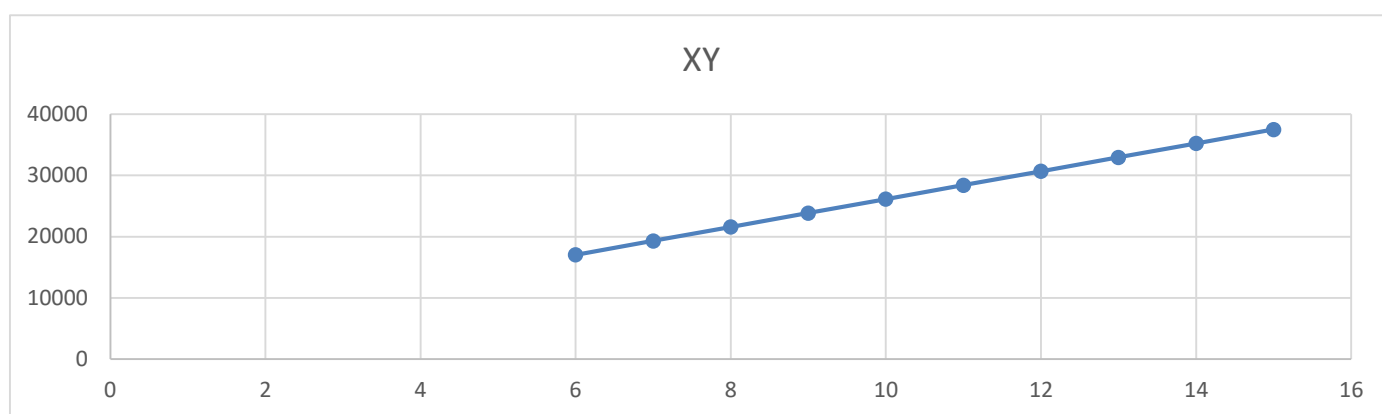
YEAR	X	XY
2024-2025	6	2708086.2665
2025-2026	7	3140814.0083
2026-2027	8	3573541.7501
2027-2028	9	4006269.4919
2028-2029	10	4438997.2337
2029-2030	11	4871724.9755
2030-2031	12	5304452.7173
2031-2032	13	5737180.4591
2032-2033	14	6169908.2009
2033-2034	15	6602635.9427

Chart -3: Trend projection for wheat exports for the year 2024 -2025 to 2033 -2034

From the table, it was understood that the export performance of wheat will have a positive trend.

Table 7: Trend projection for ragi exports for the year 2024 -2025 to 2033 -2034

YEAR	X	XY
2024-2025	6	17032.064
2025-2026	7	19309.494
2026-2027	8	21586.924
2027-2028	9	23864.354
2028-2029	10	26141.784
2029-2030	11	28419.214
2030-2031	12	30696.644
2031-2032	13	32974.074
2032-2033	14	35251.504
2033-2034	15	37528.934

Chart 4 : Trend projection for ragi exports for the year 2024 -2025 to 2033 -2034

From the table, it was understood that the export performance of will have a positive trend in the years of 2024 -2025 to 2033-2034.

Table 8: Trend projection for sweet corn exports for the year 2024 -2025 to 2033 -2034

YEAR	X	XY
2024-2025	6	56774.84
2025-2026	7	66037.5
2026-2027	8	75300.16
2027-2028	9	84562.82
2028-2029	10	93825.48
2029-2030	11	103088.14
2030-2031	12	112350.8
2031-2032	13	121613.46
2032-2033	14	130876.12
2033-2034	15	140138.78

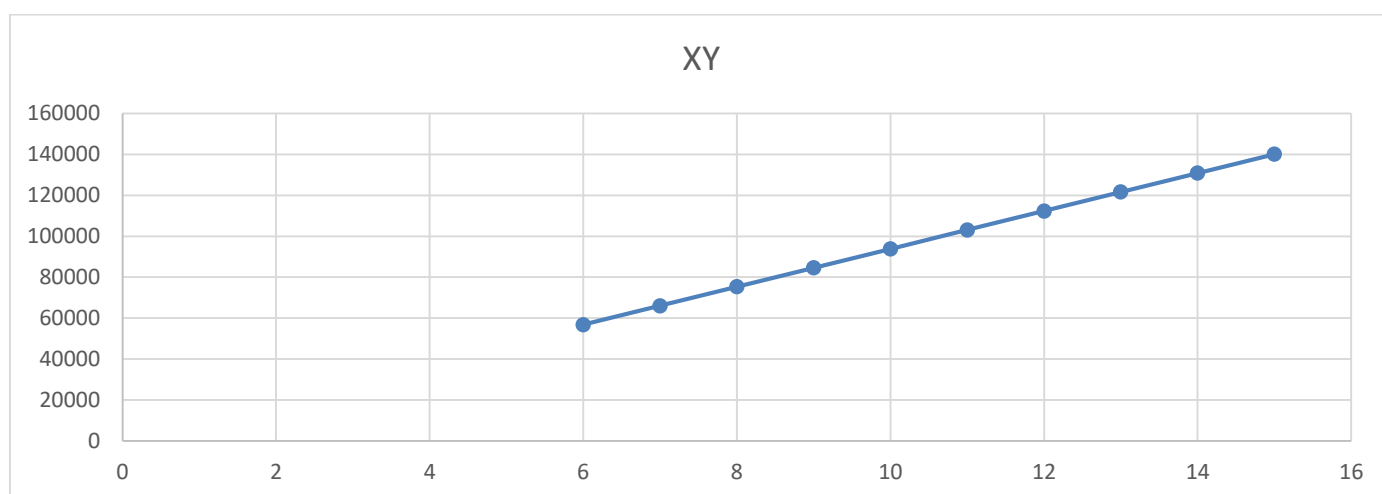
Chart 5: Trend projection for sweet corn exports for the year 2024 -2025 to 2033 -2034

Table 4: The global market for edible cups has experienced a slight decline since its initial launch. However, our trend analysis indicates a positive shift on the horizon. In the coming years, we anticipate a significant surge in growth, particularly with the emergence of more Millet-based products following the COVID period.

With a growing focus on health and well-being, consumers are increasingly seeking out organic and nutritious options.

1.12 Conclusion

Wheat, ragi, and sweet corn are experiencing significant export growth. Looking ahead, the potential for further expansion in these exports is promising. This trend is poised to benefit the edible cup industry, as these millets will contribute to the market's development in India. Additionally, this growth will support medium and small enterprises, creating a flourishing environment for both the millet and edible cup sectors.

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