

UNDERSTANDING HEALTH-FOODS CONSUMER PERCEPTION USING BIG DATA ANALYTICS

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ABSTRACT

'Health-food' is a health marketing term used for suggesting consumers, the specifically designed healthy diet for high nutrition and body growth. A health-food mainly includes organic food, natural and non-GMO foods, special foods for allergic people like gluten-free, lactose-free and dairy-free products and low fat-high protein keto diet products such as beans, legumes, nuts and seeds. Food consumption patterns of 'health-foods' and their preferences are constantly changing all over the world, due to change in urban-lifestyle patterns leading to high stress, anxiety and health related diseases like diabetes and obesity etc. In today's era "Eating healthy and living healthy" is a most suitable mantra for living a good life. According to the global health and wellness food market report, it is expected that during 2020-2024, the size of the health and wellness food market is likely to rise by US\$ 235.94, advancing at a CAGR of 6 percent. Organic and gluten-free foods are considered to be on top when talking about the health-foods. There is need to further explore the mindset of consumers regarding health-foods and their consumption, since its benefits looks promising but very little is known about the consumers' beliefs, motivations and values driving their decision in making the purchase of these foods. Various researches indicates that a better understanding of consumers' perception of health foods are the main factors for market positioning, growth and for negotiating market opportunities. Main objective of the paper is to understand the perception of consumer using Big Data analysis so as to assist health food manufacturers to improve food products according to customer choices and preferences. In this study, by using social media platforms such as Twitter, Facebook, blogs, posts, and reviews that have played a major role in increased sales of health foods, we will primarily concentrate on understanding the public perception regarding organic and gluten-free foods. The study will also provide in-depth insights about health-foods in form of positive, negative and neutral sentiments of the consumers using the social media data from Talkwalker and Google Trends. This research would help organic food and gluten-free food manufacturers to understand the consumer perception and to improve marketing return on investment. The results of the study discussed the 'most talked about' and anticipated product innovation in health-food sectors such as new snacks, fast food (pizza, pasta and noodles) and desserts. The study is unique since it combines big data to the niche market of health foods to draw the valuable consumer preferences using online platforms.

Keywords: Big data Analytics, Consumer Perception, Health-food, Motivation, Organic food, Social Media

INTRODUCTION

Big data analytics has become important for retail owing to the COVID times. In COVID pandemic, people across the globe have started eating healthy food such as organic food. Hence big data analytics can be to efficiently tract the businesses of organic foods and predict consumer

shopping patterns. In assessing customer behavior in the organic food market, Big Data plays a significant role. It is the approach used by companies to map and forecast customers' shopping habits. It is an integrated marketing management strategy used to make decisions in the organization in different areas focusing on consumer engagement, consumer retention and loyalty and marketing performance for the optimum utilization of resources. Big data refers to the complex, broad and disparate amounts of data generated both within and outside a business by people, tools, and machines. The organization and utilization of such data set requires advanced and innovative technology as they are large and complex in nature and traditional data management tools are outdated and can't perform the task effectively (Rana, J., & Paul, J. 2020). With the available large data and ever-increasing need for the organic food products in today's scenario, big data sets generate a huge amount of data for the need of the consumers through online purchases, web search, social media activities and geo- connected locations. Therefore, business must start using data very carefully with a plan strategy to implement their goals for the better solutions. Big data is being used in several distinct sectors, from healthcare to military operations. Researchers of Aarhus University implemented Big data analytics, suggest that customers with an interest in 'organic' products do not show any indication of reducing this preference for less 'artificial' products; in addition, more and more organic products are purchased by this segment and an increasingly predictable trend is followed.

Organic foods are characterised as foods that are free from pesticides and chemical fertilisers and are not developed by industry or genetically modified industries. As of its high nutritional value, organic foods are very expensive than conventional foods, plants improve their vitamin and antioxidant production that enhance their resistance to weeds and bugs. During 20th century, agriculture was characterised as organic activity. However, due to large supply of new items, traditionally agriculture was no longer considered organic, then with the time it was introduced into food production. In reaction to the industrialisation of agriculture, the organic farming movement emerged in the 1940s.

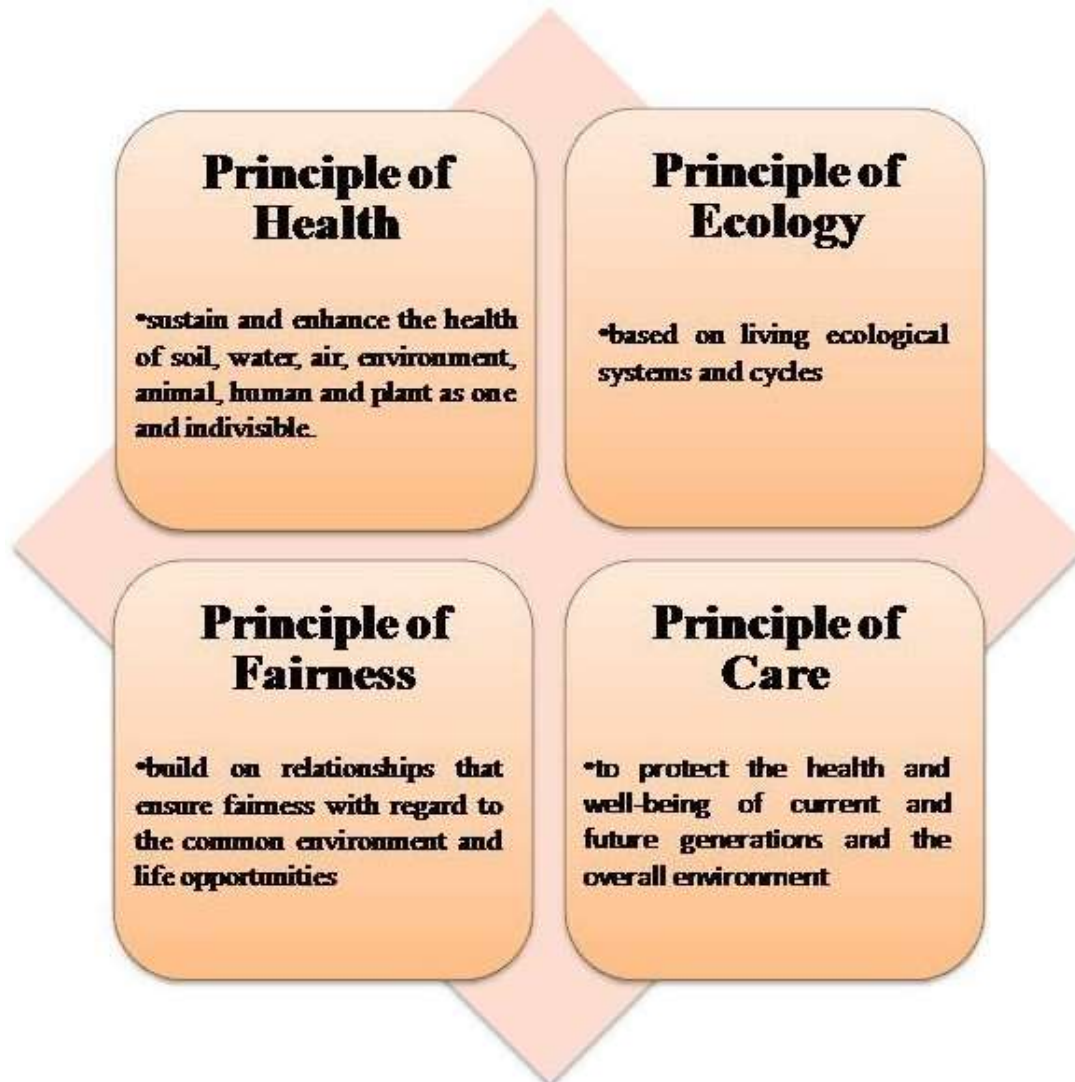
In 1940, the book written by Lord Northbourne "Look to the Land," explored the word organic farming from his conception of "farm as an organism," to identify a holistic, ecologically sustainable approach to farming that relies on "imported fertility" and "cannot be self-sufficient or an organic whole". With the beginning of Green Revolution in Indian Agriculture in 1965-65, the fertilizer consumption got a huge drive for sustaining the needs of growing population.

According to International Federation of Organic Agriculture Movements (IFOAM), organic agriculture described as a method of production that preserves the health of land, ecosystems and people and combines tradition, creativity, and science in order to benefit the environment and promote a fair relationship and a good quality of life. Early customers were found to be interested in organic food and think of non-chemically treated, Non-use of unapproved pesticides, freshly processed foods and wanted to buy directly from farmers.

In September 2009, according to the USDA, "knowing your farmer, knowing your food" became the motto for citizens and the reason behind. It constituted that "organic" were formed through direct experience: conversation with farmers, Physically seeing farm conditions, Farming activities or farming practises of farmers and health food stores or cooperatives were instrumental in taking organic food to the market as demand for food. Today, huge investment has been made in corporate farms for organic farming. For superstore buyers, however, food processing is not readily detected, and product labelling, such as "certified organic", depends on government legislation and inspectors from third parties for confirmation.

In September 2005, International Federation of Organic Agriculture Movements (IFOAM) has formulated and developed principle of organic farming and these principles are as follows:

**FIGURE 1:
PRINCIPLE OF ORGANIC FARMING**

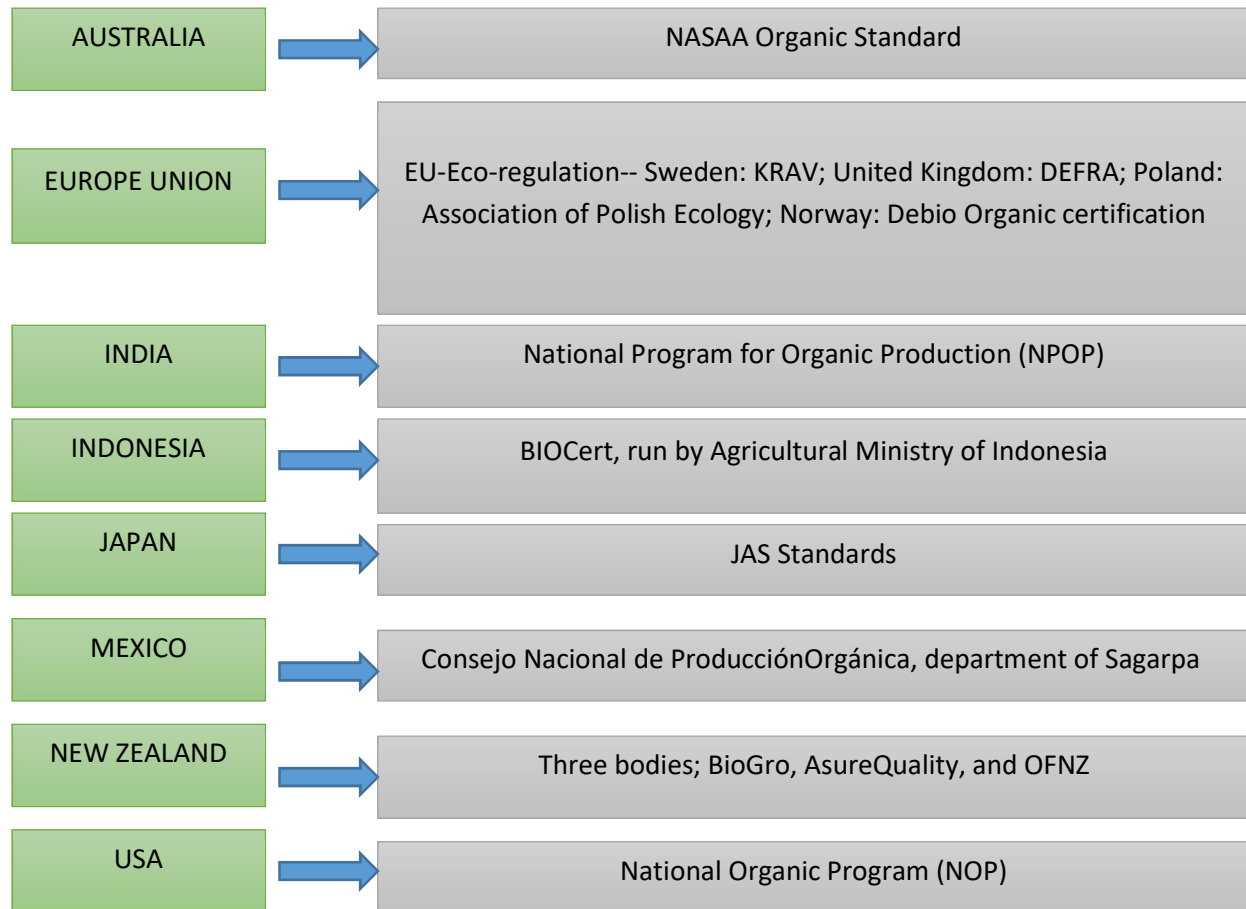


Organic farming is based on an extensive knowledge of the laws and rules of nature and generally prohibits the use of fertilisers, pesticides, growth regulators, etc., and relies primarily on organic sources to sustain soil health, provide plant nutrients, and reduce insects, weeds, and other pests. By retaining the levels of organic matter, fostering soil biological activity, and mechanical action, it preserves soil fertility. Provide crop nutrients indirectly using sources of insoluble nutrients that are accessible to the plant through the action of soil micro-organisms. Weed disease and pest control by relying on natural predators for crop rotations and restricting thermal, biological, and chemical interference (Rana, J., & Paul, J. 2020).

Organic food is more labour intensive as its certification is expensive and the organic feed for animals are double the price. Organic farms are small as its fixed cost and overhead are distributed across smaller produce volumes without government subsidies.

In order to be certified organic products seller, products must be grown and processed in a manner that complies with the requirements set by the country in which they are sold:

**FIGURE 2:
COUNTRIES AND CERTIFICATION AGENCIES**



Since organic foods are expensive due to the supply side, since farmers are unsure about the adoption of organic farming for different reasons, such as difficult and costly certification procedures, low financial feasibility, etc. (J. Rana, 2017).

REVIEW OF LITERATURE

The global health and wellness sector is sometimes referred to as the "next trillion dollar sector" and the wealth of applications and products is considered and often included in a number of industries such as nutraceuticals. In leaps and bounds, healthy eating, diet and weight loss,

complementary and alternative medicine, preventive and personalised wellness, and beauty and anti-aging have evolved. In the global economy, there are three patterns that make their appearance, viz. athleisure, boutique fitness, and organic diet. Health and wellness have found a significant role in the world population's daily life. During the prediction period, increased understanding of the benefits of organic food and healthier eating habits are the major factors that will push this market. In the next five years, the growing value of natural and organic food will further fuel demand for organic food manufacturers. These variables are part of the reason why it is projected that the demand will expand at a CAGR of almost 6% (Rana, J., & Paul, J. 2020).

There was a large rise in demand at the outset of the COVID-19 outbreak, possibly out of fear of potential shortage. The Food and Agriculture Organization (FAO) stressed that the demand for food will remain typically static and its influence on overall consumption is most likely to be minimal, while dietary habits will change in a narrow range. A disproportionately greater decrease in the consumption of animal protein and other higher-value items, such as seafood, fruit, and vegetables, is likely to occur. In poorer countries, food demand is more related to wages, and the lack of income-earning opportunities might affect consumption. Fear of virus contagion will result in decreased visits to food markets, and a shift in how people buy and consume food can be expected to be seen—lower visits to restaurants, increased deliveries of e-commerce, and increased home eating (Rana, J., & Paul, J. 2020).

Market interest in high-quality fresh goods and preservative-free features has resulted in the advancement of low temperature food processing technology as an alternative to traditional heat treatment (Chang, Wu, Chen, Huang, & Wang, C. Y. 2017).

Organic food is developed using environmentally sustainable and animal-friendly natural ingredients and the use of artificial fertilisers and pesticides is minimised. Fruits & vegetables, dairy products, processed foods, drinks, pulses, and grains are organic foods. Increasing lifestyle diseases have increased organic food sales, combined with unnecessary contamination of traditional foods. Retail chains also play a crucial role in the selling of organic foods by raising awareness of their health benefits and implementing lower prices for different private labels of organic products. Globally, the acceptance of organic food is growing in order to deliver options and benefits to health-conscious consumers. The global organic food market has been dominated by segment wise organic fruits & vegetables, followed by processed foods, milk products, beverages, pulses, and grains (Rana, J., & Paul, J. 2020).

It is expected that the Global Organic Food Market will rise to 11 percent CAGR and reach \$220 billion by 2024. In the coming years, the rising rate of awareness related to benefits of organic food consumption, increasing per capita spending on organic food products, and increasing health issues due to increasing numbers of cases of chemical poisoning are expected to drive the market. Ageing demographics have greatly influenced lifestyle choices and buying habits, especially in Western Europe and North America, with more attention being paid to disease prevention, which in recent years has driven the market for organic food products across these regions. In the projected period, ongoing product advancements and effective marketing implemented by major players and online retailers would have a positive effect on the Global Organic Food Industry. Danone, Hain Celestial Group Inc., EDEKA Handelsgesellschaft Nord GmbH, General Mills Inc., SFM, LLC., United Natural Foods Inc., Amy's Kitchen, Organic Valley, Newman's Own, Aldi Einkauf GmbH & Co Hogs, REWE Markt GmbH, Hipp GmbH & Co Vertrieb KG, Clif Bar &

Company, Aurora Organic Dairy, SunOpta Inc., Stonyfield Farm, Inc., Harmon Field Farm, Inc., are some of the leading players in the global organic food market.

According to Assocham and Ernst & Young, India's organic products industry has risen at a CAGR of 25 percent and is projected to hit between 10,000 and 12,000 crores by 2020 from the current market size of about 4,000 crores by 2020. The combined research also projected that by 2021, the market size of Indian organic packaged foods is expected to reach 87.1 crore from 53.3 crore in 2016, increasing at a rate of 17 percent. The main reasons behind increased sale are increase in awareness and a rise in demand for organic food. Due to various awareness programs people are more aware of the harmful effects of chemical and pesticides and giving priority to health. People have begun to hunt for organic items for themselves and even organically grow some in their kitchen garden. In addition, families are now spending more and more on the well-being of their baby and are willing to pay a higher / premium price in terms of product quality due to an rise in disposable income and awareness. In population of India, over 110 million are babies, contributing around 11 per cent of the world population. Parents still want to give their kids the best, without sacrificing the product's consistency and safety aspects. The significant factor expected to fuel demand for organic food products in India during the forecast period is the online availability of organic food products. While the organic market is rising steadily, the mismanagement of the supply chain is one of the major challenges facing the sale of organic fruits & vegetables Demand as per requirement is difficult to satisfy. One of the main factors driving the selling of organic goods is the rise in the price of organic products relative to conventional products. In the case of organic fruits and vegetables, the shelf life of the product is short and it is difficult to produce the product within the period of its shelf life, resulting in damage, returns and residual inventory. In addition, wholesale Mandis' non-availability within city limits induces buyers or traders to purchase it from the farm only. In addition, customers' lack of faith in organic food products affects sales and people wonder whether organic products in India are organic or whether it is worth buying organic products (Chang, Wu, Chen, Huang, & Wang, C. Y. 2017).

Health motive and the purchase of organic food: A meta-analytical analysis that identified important variables known to regulate the buying behaviour of organic food. Because of these factors, the key reasons behind the purchase of organic food are health, product quality and concern about natural environmental degradation. Using the meta analyses of studies conducted over the last 25 years as the basis for conviction in the research, an effort was made to examine the most influential motives for consuming organic food. In order to find the key reasons for the purchase of organic food, milk, fruits and vegetables, multilevel meta-analyses have been applied to the studies under study. The research leads to the consequences of management and creates an agenda for future studies. (Rana, J., & Paul, J. 2020).

A global market research firm estimated that a CAGR of over 16 percent is expected to be posted in the global food market during 2015-2020. This consumer growth has contributed to increased buying power and growing awareness of the health benefits of organic food. Rising income levels, increasing living conditions and government policies aimed at fostering revenue growth around the world are other factors that have contributed to increase in sales around the world. Consumers around the world are becoming more conscious of health as understanding of

health benefits is growing, which has also changed their tastes and preferences. Organic food products are produced without pesticides and fertilizers which has increased the cost as high price was a major barrier for consumers to buy organic food and their demand increases product innovations (Chang, Wu, Chen, Huang, & Wang, C. Y. 2017).

Despite the global economy being in division with an estimated contraction of -3% in 2020, global organic food industry in contrast with increase in robust growth of 25 – 100% as consumers are recognising health benefits as immunity is a main concern to beat COVID-19. India has witnessed high demand of organic food during this COVID-19 outbreak as its demands has surged to 100%. Ashmeet Kapoor a founder of organic food aggregator “*I Say Organic*” has its retail store in New Delhi experienced 100% increase in demand of organic food, a pan- India e - tailer “*Naturally Yours*” has witnessed a increase in demand for organic by 70 – 80%. Due to this pandemic the demand has increased but the supply chain is affected since lockdown (Chang, Wu, Chen, Huang, & Wang, C. Y. 2017).

Organic product sales continue to increase trajectory in the post COVID-19 world. World’s largest natural food retailer “*wholefoods market*” stated that it has started putting constraints on the number of its online grocery customers due to increase in demand (Chang, Wu, Chen, Huang, & Wang, C. Y. 2017).

During COVID-19 organic farming has been considered as a home farm. Organizations and individuals are highly encouraged to adapt the organic farming techniques to grow in clean environment in rented lands all across India. USDA certification for organic food is the consumer major belief as organic food has various health benefits for consumers. USDA stresses on various standards and its label requirements do not imply on various food products.

DISCUSSION USING BIG DATA EXAMPLES

1. Google Trends

A new index is introduced for consumer search behaviour by Google using Google Trends data cover all Google Searches related to any topic example organic food. Search can be made for worldwide or for a specific country. In terms of time, search could be made for as early as one hour and as long a past decade. In Google trends search could be also made as per different categories, example for organic foods we made a search in Food & Drink category (Seabold & Coppola, 2015).

Time series graphs over Google Trends provide the details about given topic in terms of score of 100. A score of full 100 indicates peak popularity about the term searches. A score of 50 means half popularity as compared to 100 score. 0 score means that sufficient data was not available during that time period. For organic foods, it was observed that in past 12 month (Sept’19-Sept’20), maximum Google searches were made in the month of March 2020. The possible reasons were announcement of lock-downs worldwide and people became more conscious about their health, and a global increase in sales of organic foods was observed.

FIGURE 3:
TIME SERIES GRAPH FOR GOOGLE TRENDS ON ORGANIC FOODS

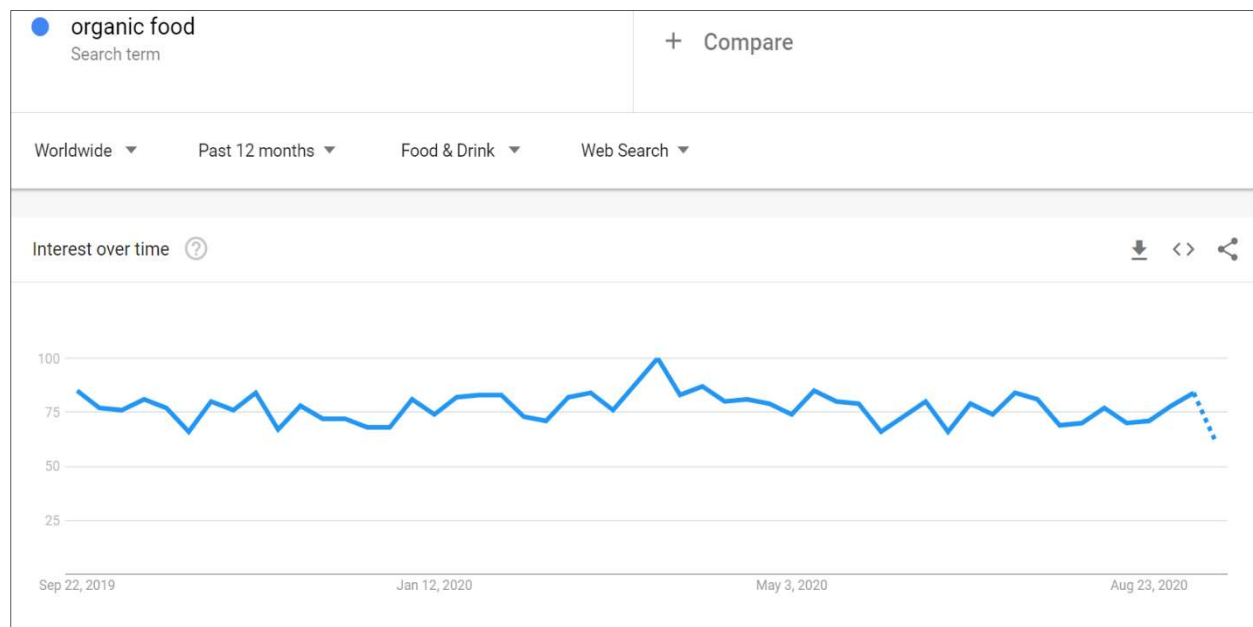
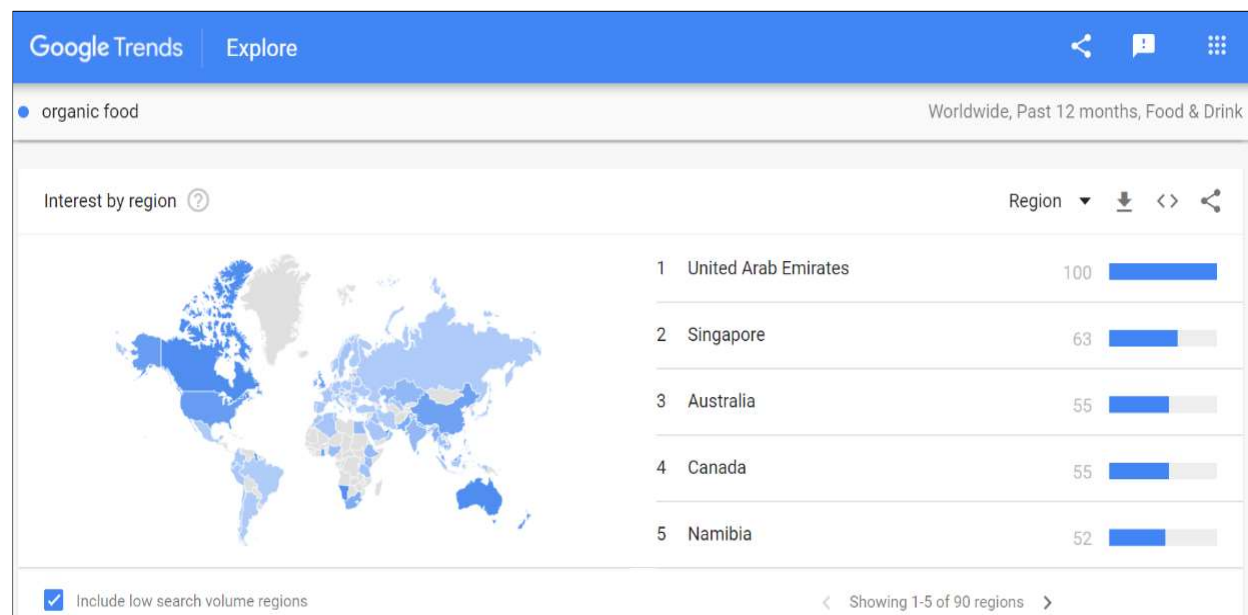


FIGURE 4:
HEAT MAP FOR ORGANIC FOODS OBTAINED FROM GOOGLE TRENDS



Another interesting analytics option provided by Google Trends is “Interest by region” represented by a heat graph. Higher colour intensity (example dark blue or score 70-100) shows areas with higher Google search about a particular trend. Then areas in light blue colour (having score between 30-70) represent medium level of Google search. Areas with no colour represent very less Google Search about that trend (score less than 30). Example in search about organic foods, we have identified that countries like UVE (United Arab Emirates), Singapore, Australia, Canada, and Namibia were the countries where people have searches maximum about the organic foods. They are represented in dark blue colour.

Google Trends also provides information about related topics (related topic along with main topic) and related queries (questions asked by the users in relation to the main topic).

FIGURE 5:
RELATED TOPICS AND RELATED QUERIES OBTAINED FROM GOOGLE TRENDS FOR ORGANIC FOODS

Related topics ?	Rising ▾	Related queries ?	Rising ▾
1 Food Lion - Grocery store company	+180%	1 kosher organic baby food	Breakout
2 Fast food restaurant - Topic	+170%	2 organic earth body food	+4,700%
3 Fast food - Food	+160%	3 hello fresh	+350%
4 Manufacturing - Topic	+120%	4 the big book of organic baby food	+190%
5 Food Lion Pharmacy - Topic	+100%	5 organic food kings	+190%
< Showing 1-5 of 7 topics >		< Showing 1-5 of 15 queries >	

2. TALKWALKER

In present study, we have used editorial and social media data gathered by “Talkwalker” software. We were especially interested in a few dimensions. *First*, we wanted to study ‘what will be the most important editorial and social media channel’ and hypothesized that people would reach out to their social network to share feeling and to seek public support: hence we believe that Twitter would be most famous channel to people reach through social network. *Second*, as people would find themselves in a pandemic, people would express emotions but these emotions would be both positive (helping) and negative (seeking help) – meaning these emotions would lead to formation of specific groups of conversations (called as nodes) some specific topics related to organic foods. *Third*, as some demographic segments would be the target (more susceptible to get hit by COVID-19 and would have started consuming organic foods), especially older people, we expected people around that age to do more searches. In addition, we expect that people from certain field or occupation (could be journalism, medicine, business executives etc.) would be most active about organic food in related conversations due its adverse impact. *Fourth*, as people would part of a group or nation, they would seek to learn from what other people, groups and nations are doing (social comparison in terms of hashtag trends or popular social media themes).

“Talkwalker” is a mining tool as it requires a keyword as a start. The metrics on the dashboard includes overall conversation, engagement, sentiment scores, and potential reach. It also supports conversation and sentiment trend visualization over time. One of the highlights of this tool is there are many dimensions users can choose to slice the result. For example, users can filter the result based on media type, location, language, devices, sentiment, and demographic. In addition, it also supports keyword comparison, which facilitates competitor analysis. “Talkwalker” mediated platforms such as Twitter, online news, blogs, magazines, YouTube, press release, TV/radio and VKontakte were taken into consideration for this research. Quantitative behavioral data including Twitter tweets, online news, blogs, newspaper, forums, news agency, magazines,

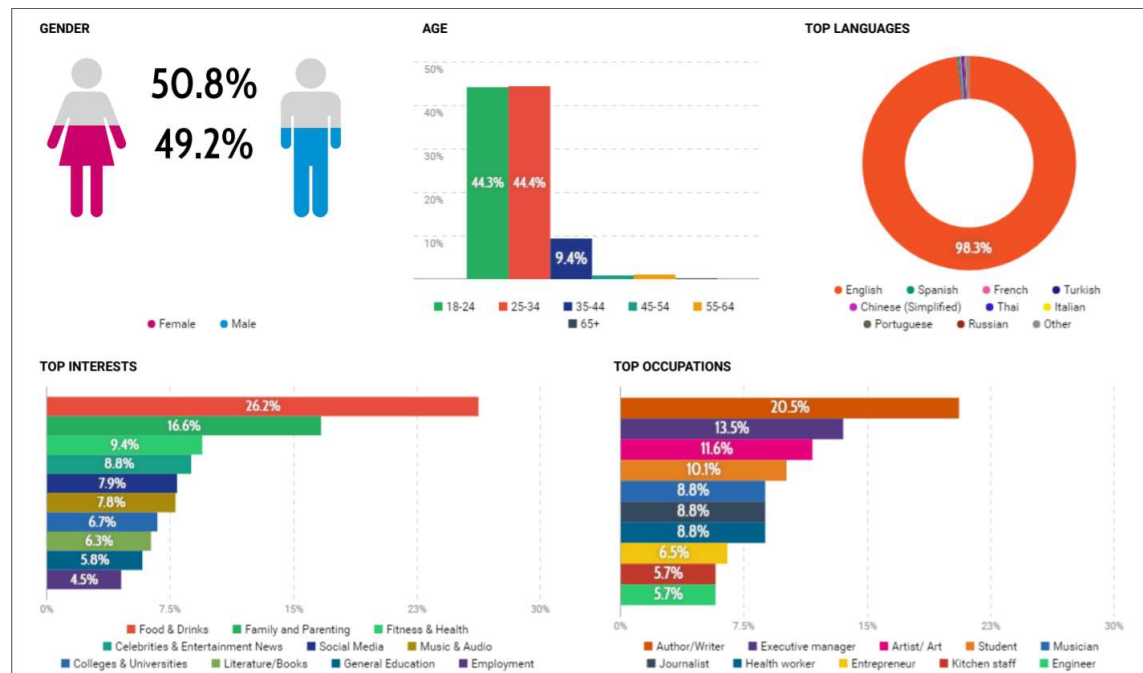
YouTube, press release, TV/radio and some other forums were used to collect and assess the data on public sentiment about organic foods.

**FIGURE 6:
TIME SERIES AND SENTIMENT ANALYSIS CHARTS FOR ORGANIC FOODS
FROM TALKWALKER**



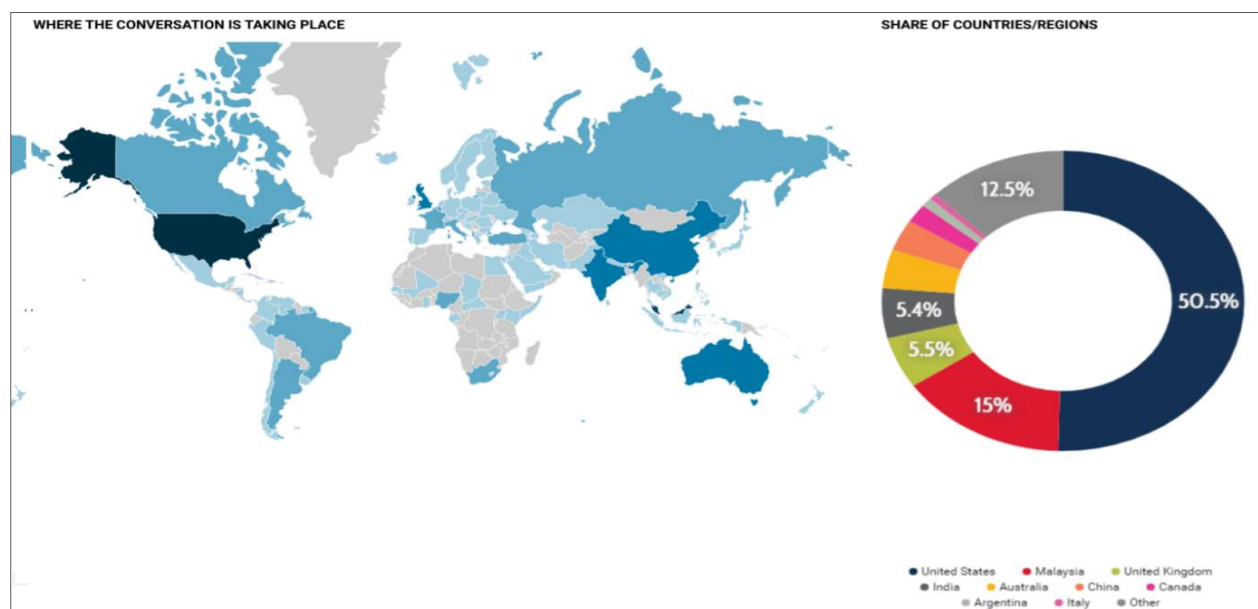
Talkwalker analysis about organic foods revealed that in a duration of one week (i.e., 15th Sep'20-21st Sep'20), people have talked about 38% positive things and 19% negative things about organic foods. Sentiment analysis which is also known as opinion mining, is a type of language processing for tracking the mood of the public about a particular product. It also involves in building a system to collect and examine opinions about the product made in blog posts, comments, reviews, or tweets. Sentiment analysis can be useful in several ways. For example, in marketing it helps in judging the success of an ad campaign or new product launching, determining which versions of a product or service are popular and even identifying which demographics like or dislike particular features. The difference between sentiment analysis from editorial media and social media (Facebook, Twitter, Youtube) sentiment analysis is that text is short, usually one sentence composed of at most 140 characters, in the case of Twitter. In this study, consumer preferences for organic-free foods were analyzed.

**FIGURE 7:
DEMOGRAPHIC INFORMATION RELATED TO CONSUMER OF ORGANIC FOODS
FROM TALKWALKER**



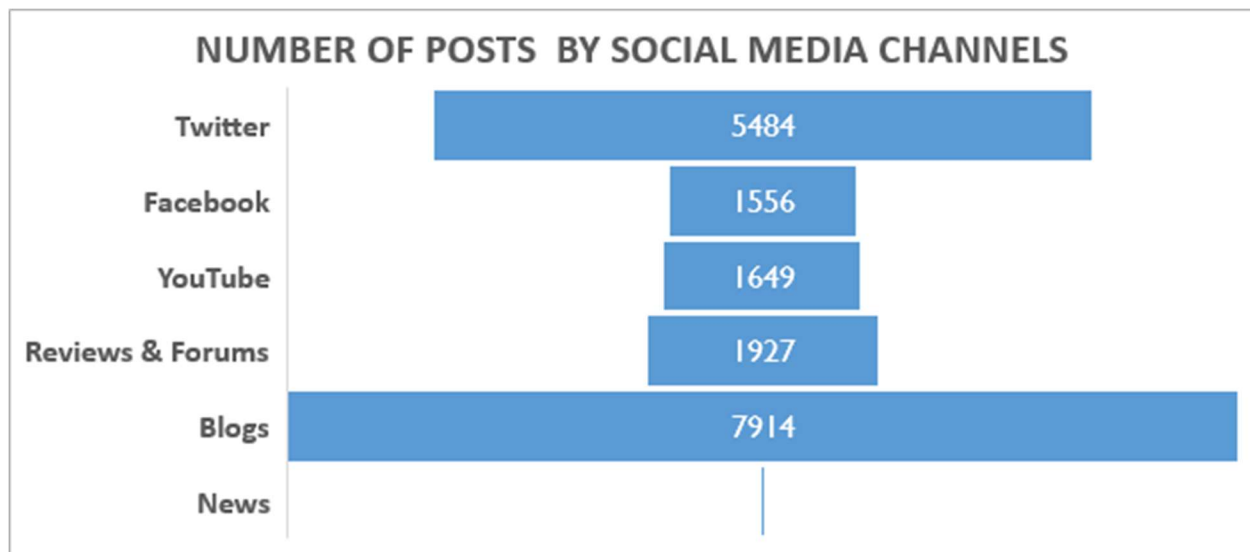
Most active age groups in searching about organic foods on social media were 18-24 years and 25-34 years. People mostly posted in English about organic foods on social media. Top interest was food & drink category for the organic food search on Talker. Similarly, top occupation, came out to be author and writer that wrote maximum blogs and posts about organic foods. Consumer behaviour is the study about individuals and groups that how they select, purchase, use, and dispose goods, and services to satisfy their needs. It refers to the actions of the consumers in the marketplace and the underlying purposes for those actions.

FIGURE 8:
HEAT MAP RELATED TO CONSUMER OF ORGANIC FOODS FROM TALKWALKER



modelers, and other analytics professionals to analyze large volumes of transaction data and to draw out meaningful results. Sentiment analysis included the techniques to understand the attitude and mood of a speaker or a writer with respect to some topic or the overall contextual polarity of a document by determining the polarity of a given text as positive, negative, or neutral or as “angry”, “sad”, and “happy”. The sentiment analysis about organic foods revealed that 13% people posted positive thoughts about organic foods while only 5% people posted some complaints or negative thoughts about organic foods in month of Aug’20 at social media.

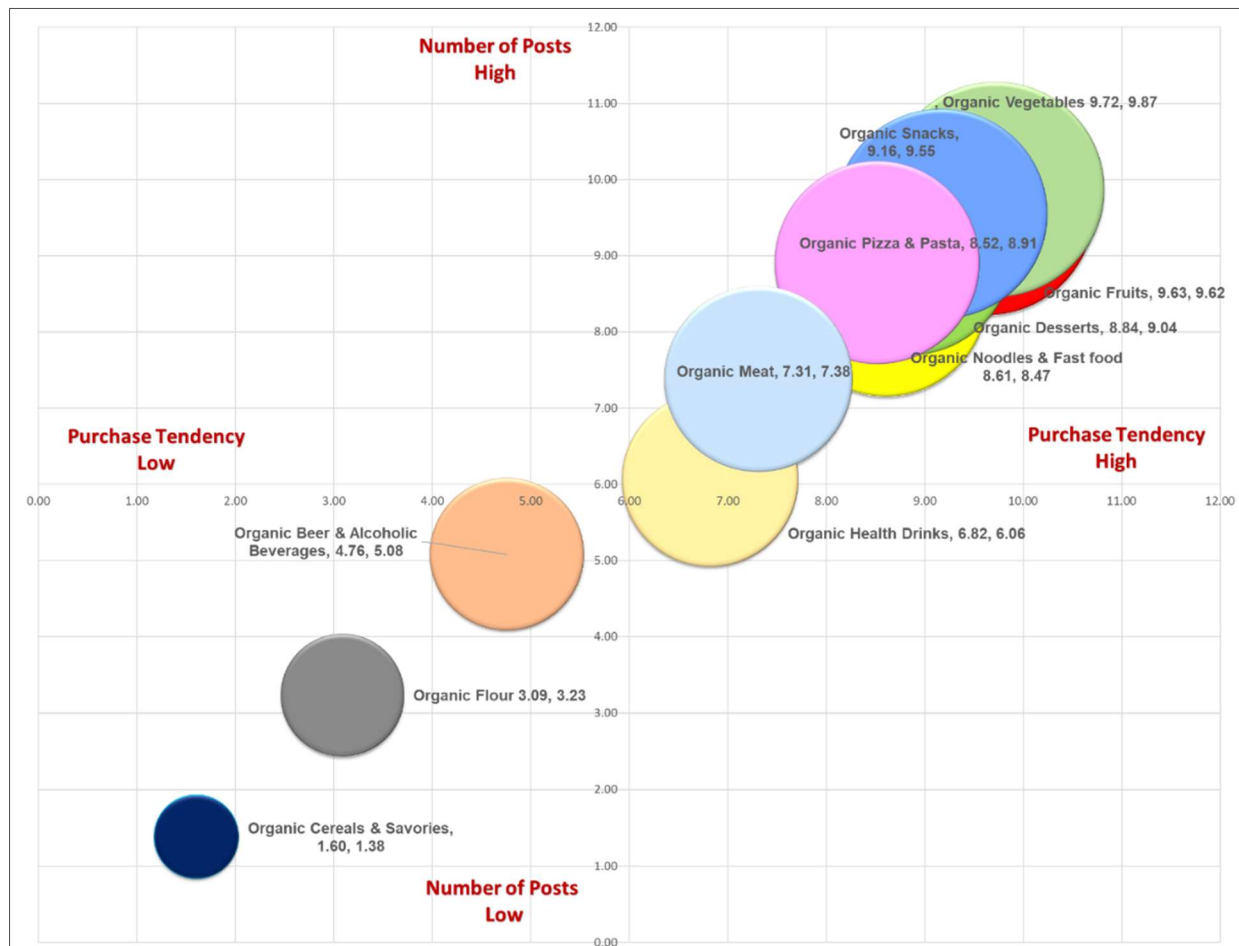
FIGURE 11:
NUMBER OF POSTS OBTAINED FROM DIFFERENT SOCIAL MEDIA CHANNELS FOR ORGANIC FOODS



Meltwater data crawler provides data from various social media platforms like Twitter, Facebook, YouTube, Reviews & Forums, Blogs and online news. Twitter is most popular social media followed by Facebook across whole world. Thus, people posted maximum reviews on Twitter about organic foods followed by Facebook and YouTube.

Perceptual mapping was used as research tool to study the trends of editorial media. Perceptual map was prepared based on weighted score of sentiment, number of articles and percentage share of articles. The articles of all the editorial media were read carefully and their sentiment was decided based on text mining for each food category. Food categories taken into consideration were organic vegetables, organic fruits, flour & mixes, fast food (including pizza & pasta), bakery, cereals & cornflakes, snacks, soft & energy drinks, liquor, confectionary and last category was desserts. Then, positive, negative and neutral sentiments for all articles were compiled into a total number for each food category. Total number of articles for each category of sentiment were multiplied with their score allotted. Positive sentiment as given a score of 1.5, neutral sentiment was given a score of 1 and negative sentiment was given a score of 0.5. Dimensions used are number of articles for each category and weighted score of each category based on sentiment analysis.

FIGURE 12:
PERCEPTUAL MAP PREPARED ON BASIS ON SOCIAL MEDIA POSTS OBTAINED ABOUT ORGANIC FOODS



CONCLUSION

Big data analysis revealed that maximum online searched about organic foods on editorial and social media were made in developed nations like USA, which had high availability and huge variety of organic foods. Organic foods in developing nations like India were at a very niche stage and play a major role in human's life with its nutritional benefits, users here searched for very basic food options like organic fruits & vegetables, biscuits, snacks, and noodles. By using social media analytics like Twitter, Facebook, blogs, articles and reviews it was observed that consumers opinion regarding organic food and gluten free foods were much on the higher side due to its nutritional benefits and demand as they both considered as a health food. It was observed that data volume of social media was very high compared to editorial media as people posted many things on social media especially on Twitter about organic diet and its health benefits. However, in editorial media only journalists, blog writers and researches publish their findings and opinions about organic food.

The study also revealed that most of the consumers talked and expected product innovation in food sections like snacks, fast food (pizza, pasta, and noodles) and desserts on social and editorial media. This study would provide direction to manufacturers of organic foods to develop food products according to the choices and preferences of consumers based on ideas and reviews obtained from social and editorial media. The study is unique since it combines big data to the niche market of organic foods to draw the valuable consumer preferences using online platforms.

As big data analysis also plays a major role in social media where consumers generate the “big data” with large volumes of information, and offer detailed descriptions of behaviours, including time and place by using GPS. If these data-rich sources linked and analyzed, they have the potential to contribute greatly towards answering questions to respond to societal challenges regarding health-foods and their sustainability. Use of Google Trends or Talkwalker data cover all Google Searches related to any topic example organic food consumer’s behaviour. Search can be made for worldwide or from a specific country. In terms of time, search could be made for as early as one hour and as long a past decade.

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