

An Ode to the Nutrient Mango: A Systems Approach

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Abstract

Mangos are indeed delicious, refreshing, and nutritious, but that's only the beginning of their exciting tale. So, let's slice the mouthwatering and juicy mango right in to begin a celebration. Both, the 'Langra Aam (Mango)' and city of Banaras hold a unique distinction. Mark Twain enthralled by the legend and sanctity of Banaras, wrote: "Banaras is older than history, older than tradition, older even than legend and looks twice as old as all of them put together". As the spectacular *Cassia fistula (Amaltash)* blooming as golden showers in the heat of summer are soothing to the observers' eyes; so do the mangoes acquire delicious taste after ripening in the scorching heat which is in consonance with the basic philosophy of life. However, the transportation of mango, being a perishable item, to multiple locations is a critical step and requires composite scientific networking involving the systems approach and artificial intelligence. Merchandising of Mangos is an accomplished art and the associated team should receive communication and training on an ongoing basis to transform logistics and supply chain as a game changer.

Introduction

I grew up in the sprawling beautiful campus of Banaras Hindu University (BHU). The cherished memories of my long association embedded in the rich cultural heritage with BHU as well as Banaras have left an

ever lasting imprint on my mind. The neighborliness of BHU and Banaras was apparently created by the Heaven and constructed by the Earth. Visionary Pandit Madan Mohan Malviya, the founder of Banaras Hindu University; the ‘*Banarasi Paan* (Betel-nut)’ and ‘*Langra Aam* (mango)’ capture the essence among other treasure troves of the city’s rich legacy. The *Banarasi Paan* and the *Langra Aam* got the GI (Geographical Indication) Tag for possessing qualities due to their geographical origin. The famous *Bharat Kala Bhawan* Museum at Banaras Hindu University has a unique collection of paintings of mangoes kind courtesy Maharaja of Banaras [1]. To dispel the gloom of these mango paintings, splashes of colours have been sprinkled here and there to soothe our eyes. The subtle vision of the Maharaja is also reflected in these paintings in respect of life because as a mango lover he planted mango trees in his palace too.

The farm-to-table voyage of a mango is full of colorful moments, joyful memories, and encounters with many fascinating features along the way. When we trace the historical records of this juicy and nutritious fruit, we come to know that Mangoes were first grown in India over 5,000 years ago. The word ‘Mango’ originated from the Portuguese word ‘Mangga’ which is said to have been a direct influence of what they heard in Kerala. In Malayalam, mango is locally called ‘Manga’. India is the leading mango producer in the world, with an annual turnover of an estimated 24.7 million tons. Ironically, although mangos are grown and harvested in India, very few of the mango varieties are distributed in the worldwide market.

As an anecdote, it may not be out of place to mention that when Nobel Laureate Rabindra Nath Tagore visited China on a long summer tour in April, 1924, the host observed that he was unhappy. When approached, Tagore replied “if you don’t get mango to eat in summers, life is incomplete”. Such is the replenishing joy of eating mangoes.

Nutrient Mango and Systems Approach

Vegan diet is always considered good for health. Regular consumption of a rich diet of vegetables and fruits can do miracles in our life; they can lower blood pressure, reduce the threat of stroke, prevent cancer, reduce the menace of eye and digestive infections, and have a decisive check upon blood sugar [2]. Mango is one of the most popular fruits in the world; there are 202 calories in one whole mango while each serving of mango is fat free, sodium free and cholesterol free. Nutrient mangoes are today’s super food because they contain more than twenty different vitamins and minerals besides being an excellent source of vitamin C and rich in protective anti-oxidants. This is the season for the king of fruits, the mango with attractive colour, superb taste and exotic aroma [Fig. 1]. The widespread use of mango has acquired new dimensions with time and requirement. The list is exhaustive – ranging from jam, jelly pickle, juice, squash, and *chutney* to syrup etc. The ‘*Langra Aam* (mango)’, also known as *Banarasi Langra*, is a mango cultivar primarily grown in Varanasi, or Banaras, Northern India [3] for which both the climate and the soil are favourable. An English translation of a common belief amongst Banaras community has been very well summarized below;



Figure 1

*Never leave Kashi (Banaras), the abode of Lord Vishwanath,
Upon death one gets the lap of Ganges, while living to relish 'Langra Aam (Mango)'.*

It has the highest yield in *Chiraiqaon* of Banaras. The *Langra* mango orchards are spread over 177 hectares in eight blocks of Varanasi district including *Araziline*, *Kashi Vidyapeeth*, *Harhua*, *Baragaon*, *Sewapuri* etc. Earlier the produce from Ramnagar, near Varanasi, was sent to the royal families of United Kingdom. *Langra—the piece de resistance*-- would meliorate the Echelon of the variegated India in the World. The narrative of the '*Langra Aam*' will remain incomplete without the story of a lame man who was called '*Langra*' by his friends and lived in Banaras [4]. The adjective '*Langra*' should not be construed in any way offensive but for the story of naming the '*Langra*' mango. This man ate a variety of mango and planted the seed in his backyard. With time, this mango variety impressed people and it was named after the man who cultivated it first. Growing popularity and acceptance of the "*Langra Aam*" ought to prove the relevance of the popular proverb "slow and steady wins the race".

India has much to cater to the delicacies of the tasting buds of one and all. Known for its king of fruits-mangoes, it exports the same to UK, USA and many other parts of the world. India exports most of its Alphonso mango to the United Kingdom and to several location across the globe. USA, Indonesia, China, Netherlands and the European Union (EU) are top importers of mangoes from India [5]. In January 2022, the Indian government secured the approval of the United States Department of Agriculture for the export of mangoes to USA. A mango festival was organized in Tokyo as a part of *Azadi ka Amrit Mahotsav* in March 2022 to enable export of fresh mangoes (*Alphonso and Kesar*) to Japan. In June 2022, a Mango Festival was organized in Brussels to create awareness among the Europeans and create a market for Indian mangoes in Europe. In this way, India vigorously pursues mango diplomacy and the outcome is bound to be really sweet.

In an era of fast mobility, it has become pertinent to address the issue, of transportation of perishable items like mangoes. Noting that mangoes have a short shelf life, it is important to design transport strategies from rural to urban locations and international destinations [Fig. 2]. In this context one has to solve the transportation problem subject to minimization of the cost of transportation and travel time with the objective of maximization of profit. Further, the issue of transient analysis becomes very important. Such problems require appropriate modeling and optimization frameworks, highlighting the interaction of transportation and socioeconomic systems. Accordingly, the systems approach provides an appropriate framework which can address the above mentioned issues. In this context, Prof. Satsangi made pioneering work and proposed physical system theory approach in the field of transportation [6]. This approach not only addresses serious limitations inherent in graph theoretic systems framework but is also amenable to transient analysis. The proposed line of action becomes an eminently suitable framework to deal with the transportation of such perishable items. Concomitantly, the application of artificial intelligence (AI) holds great potential in revolutionizing the key segment of transportation for controlling accidents, reducing pollution and enhancing overall efficiency [7]. Thus the process of relocating goods from one location to another will make our life easier with AI put in place.

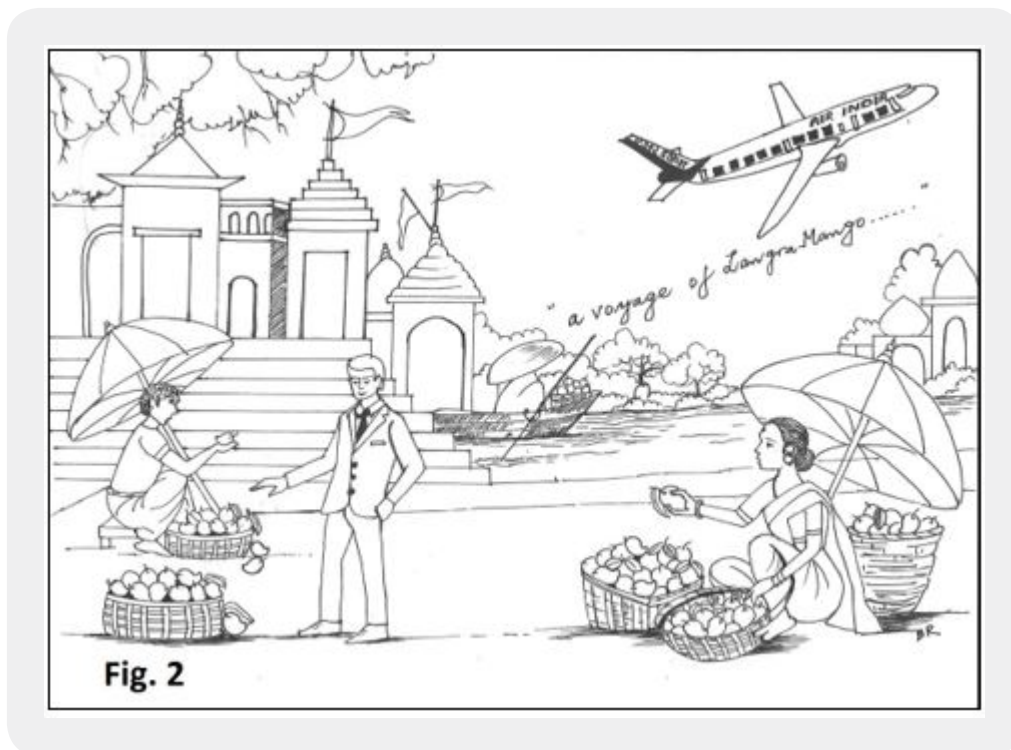


Figure 2

The harvesting of the mango fruit requires a detailed planning as all fruits, even on the same tree; do not mature at the same time. Thus harvesting at the correct maturity stage becomes a critical factor. As per mango harvesting guidelines, it is recommended to have two/three rounds of harvest in a weekly interval. Mango handling and ripening protocol (<http://www.mango.org/retail>) notes: “An immature mango will

eventually become softer as there is no post-harvest treatment”. The maturity and ripens guide in the appendix lists five maturity stages for the common varieties of mango sold in U.S. Accordingly, the time-interval factors and other issues need to be accounted for in the mango transportation modeling framework [8].

To address competitiveness for the sale of fresh mangos, there is a major need to experiment with sea shipments as well. For longer transit routes, air shipments are the regulatory norms. To improve the mobility and connectivity from the rural to urban sector, the application of system’s approach is imperative. A blend of Engineering and Social Sciences is helpful in developing a smart and efficient future system of mobility and connectivity for improving logistics and freight traffic. Community based service with cooperative hubs has the potential to improve upon the current scenario. To conclude, our love affair with mangoes is centuries old and the brand name ‘*Langra*’ has a special place in our hearts.

Conflict of Interest

There is no conflict of interest with any one in publishing the editorial article.

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