



## Food Mileage: An Indicator of Evolution of Agricultural Outsourcing

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### Abstract

*Purpose:*

The aim of this paper is to report the finding from study on distance traveled by fresh vegetables from farming location to consumer in traditional and organized retailing. The focus is on the five fresh vegetables and final consumer destination is the city of Chennai.

*Research methodology:*

The research is primarily exploratory in nature and research instruments include interviews and survey through questionnaire with players in the fresh vegetable supply chain viz agents, auctioneers, wholesalers, traditional retailers, organized retailers and customers. Additional data collected through secondary source, existing literature on Indian retail.

*Findings:*

'Food miles' is relatively recent concept in the fresh vegetable retailing. Entry of organized retail to India and its exponential growth, specifically in fresh vegetable marketing, has impacted the whole spectrum of supply chain practices. Shorter food miles is an indicator of near sourcing and longer food miles of fresh vegetables is an indicator for agricultural outsource. The result of this study reveals that significant increase in food miles in case of organized retailers. The capitalization of emerging opportunity by the agribusiness is shift towards outsourcing of agriculture.

*Research limitations:*

Being an early work in the area of food mileage of fresh vegetables in Indian context, there is no reference data available related to food mileage. Speed at which fresh vegetable reaching its destination has not been studied as time taken between any two points was not observed. This is the limitation of this study and also scope for further future research. The research study is not finding factors related to the food mileage.

**Keywords:** retail; agricultural outsourcing; food mileage; vegetable; India.

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## Introduction

The Indian political policy changes during last decade of the twentieth century regarding liberalization and which had ignited country's economy for faster growth. The liberalization of the Indian economy and simultaneous globalization triggered an accelerated industrial growth across, the spectrum of all market segments in India. The Indian industrial growth and liberalized economical policy attracted global players to India in every industrial sector (Saxena and Sahay, 2000). Retail industry as a whole is not an exception. Retail industry has witnessed advancement into organized trading. The evolution of organized retailing had been initiated in a big way by the entry of corporate, both domestic and global. Organized refers to marketing activities undertaken by licensed retailers, that is, those who are registered for sales tax, income tax and business is corporate, implement management techniques managed by professionals as a firm or limited company or cooperatives. Traditional refers to those who operate in unorganized markets.

Fresh vegetables play a vital role for the existence of people and marketing of vegetables also a very influencing force in the economy. Though fresh fruit, fresh vegetables and grocery retail has been considered as a very low margin business, the market potential has attracted Indian business houses and corporate, driving the forays through different models like single-format, multi-format or integrated urban-rural model (Sengupta, 2008). To attract the global leaders in retailing of fresh vegetables, the government allows foreign direct investment in cash and carry type business model to the tune of 100 per cent equity participation. The joint ventures of domestic Indian companies with the global players allowed to operate with domestic companies have controlling stack in the fresh vegetable and grocery retail.

Agriculture in India is the means of livelihood of almost two thirds of the workforce in the country and employs nearly 66.7 percent of the population (UNDP, 2005) and India is 12<sup>th</sup> largest economy in the world with GDP of USD 1,170 billion, agriculture output constitutes 18 percent and Trade 45.8 percent of GDP for the year 2007 (World Bank, 2008). The Indian retail market, which is the fifth largest retail destination globally, was ranked second after Vietnam as the most attractive emerging market for investment in the retail sector by

AT Kearney's seventh annual Global Retail Development Index (GRDI, 2008). According to a report by Research on International Economic Relations, the retail business in India would grow at 13 per cent annually from US\$ 322 billion in 2006–07 to US\$ 590 billion in 2011–12. The unorganized retail sector is expected to grow at approximately 10 per cent per annum with sales rising from US\$ 309 billion in 2006-07 to US\$ 496 billion. Organized retail, which constituted a low four per cent of total retail in 2006-07, is estimated to grow at a rate of 45-50 per cent per annum and attain a 16 per cent share of total retail by 2011-12. (ICRIER, 2008) Government of India termed retail as a sunrise sector, expected organised retail sector to generate 10 to 15 million jobs over the next 5 years, and that the value of the organised retail sector in India by 2010 would be around US \$ 45 billion from US \$12.4 billion business in the calendar year 2006 (GOI, 2007).

Currently, organized retailers are anchoring the metropolitan cities and urban markets. In the near future, corporate retailers will concentrate on the rural market which is uncovered and untapped potential by the organized marketing and distribution. The 87 percent of the rural markets and majority urban markets in India are served by traditional vegetable and grocery retailers. The traditional retailers are unorganized small shopkeepers, Kirana (Mom and pop) stores managed by families or individuals. There are two classifications of their formats, stores and non-stores. Stores formats includes stores with permanent and semi permanent building ranging from 50 square onwards, corner stores, paper and cigarette shops. Non-stores format covers street vendors, pavement vendors, cart vendors, mobile vendors (Head carrying), vendors at daily or weekly farmers markets.

An exploratory study has been carried out to calculate food miles for five fresh vegetables and understand the travel route in traditional and organized fresh vegetables retailing. The study was limited to the fresh vegetables retailing in the city of Chennai.

### Fresh Vegetable Retail

Presently the fresh vegetable retailing in India is carried by two distinctly different types of business groups. They are classified as 'organized' and 'traditional' organizations. Now, the vast majority urban market and rural market

and are served by traditional fresh vegetable and grocery retailers. Traditional Indian retailers account for 12 million retail outlets all over the country and more than 40 percent of them sell fresh vegetable and grocery (IBEF, 2008). Food and Grocery retail in India is the single largest block estimated to be worth a whopping 62 percent but the share of organized sector in this is miniscule (GOI, 2007). Indian food retail consists of staple commodities comprising grains, pulses and fresh vegetables. Indian food retail, especially fresh vegetable retailing is witnessing a rapidly growth in India's organized retail sectors. The traditionally retailing of fresh vegetables in India is not very much organized which amounts to 97% of the total market (Ernst & Young, 2006), extremely localized and highly fragmented with large number of intermediaries. The intermediaries between the customers and farmers are traditional retailers with different outlet formats – mom and pop shop, non permanent shops in the market, pavement vendors, road side vendors and push cart fresh vegetable sellers, wholesale traders, commission agents and auctioneers.

The farmers themselves sell their produces directly to the end consumers as sellers in local markets, regulated and unregulated 'Farmers markets', sell to intermediaries – agents and organized retailers. The market place is in close proximity to their farm land and customers accessing the market are in a closer distances. Farmers selling fresh vegetables directly to the customer amount to very small fraction by volume. Farmers sell bulk of their produces to agents and auctioneers. The agents buy even small quantities of produces from farmers and transfer it to wholesalers directly or through another agent. The auctioneers are those who have entered into buying contract with farmers for whole or partial quantity of the produces and sell the produce to an agent or a wholesaler. Auctioneers also transfer the fresh vegetables to wholesalers directly or through another agent. Wholesalers of fresh vegetables sell to retailers, both traditional and organized retailers and to customers, who buy in large quantity. Cart vendors, a type of traditional retailers, buy in fresh vegetables from wholesalers or organized retailers, sell to customers in mobile carts and deliver to customers at customer's door steps.

Whole sale market is a vital link in fresh vegetable supply chain. Both the traditional and organized retailers are impartibly dependent on whole sale market with different propositions. In the city of Chennai, the geographical area of this study has a whole sale market promoted by Chennai Metropolitan Development Authority (CMDA), a regulator of Tamilnadu state government. The whole sale market in Chennai, Periyar Fresh vegetable Market at "Koyambedu Wholesale Market Complex (KWMC)" is spreads over an area of 295 acres. It located at Koyambedu, the junction of Poonamalee High Road and Nesapakkam Road and can be easily accessed from all parts of City of Chennai. In Phase-I, the Wholesale Market for Perishables have been developed with 3,194 shops (CMDA 2008). It is one of the largest markets in Asia for fruits, flowers and fresh vegetables with about 2,500 wholesale shops and involve 10,000 daily wage laborers. The market generates about 100 MT of organic wastes per day which is being dumped into the landfill.

### Research Methodology

In marketing of fresh vegetables, fresh vegetables have to reach the users at the minimum possible time every time, otherwise it is become waste. The food mileage of fresh vegetables causes considerable impact due to its perishable nature. The food mileage impact is realized by players in the fresh vegetable supply chain, from farmers to customers. Business leaders have adopted food miles as a model for understanding efficiency in a food supply chain, Ecologist consider food miles as Indicators of sustainability and different segments of people and different agencies perceived food miles differently. There is a need felt to study the food mileage for fresh vegetables in Indian context with current infrastructure and market condition.

The objective of this study is to outline the underlying logistical supply chain of the fresh vegetables both for traditional and organized retail industry enable to calculate the food mileage of fresh vegetables. Hence there is a need to assess the current status of Indian fresh vegetable market. As the Indian fresh vegetable market is very huge, the study has been carried out to explore the logistical practices of fresh vegetable marketing at Chennai taking in to consideration of the resource and location constrains the researchers have to satisfy.

Sl.	Name of the player
1	Food Bazaar (Pantaloon Retail (India) Ltd)
2	More (Trinethra Superretail Ltd.)
3	Reliance Fresh (Reliance Retail Ltd.)
4	Spencer's Retail Ltd
5	Subhiksha Retail Ltd.
6	Daily Life Super Market
7	Grace Super Market
8	Jeevan buy N save
9	Pazhamuthir Solai
10	Kovai Pazhamuthir Solai

Table I. List of organized fresh vegetable retailers.

This study is an exploratory study. Organized retailer, ten numbers listed in the table I, wholesaler from Periyar Fresh vegetable Market who constitutes 27 numbers, 20 commission agents 50 traditional retailers and 110 customers were interviewed for collecting data. Personal interview and Questionnaire were the instruments used. The questionnaire consists of open ended questions and interview is a semi structured. Five fresh vegetables viz Onion, Potato, Tomato, Egg Plant and Okra have been selected based on the volume of transaction (rough estimate of Koyambedu Market Fresh vegetables Merchants Association) at Koyambedu Wholesale Market for the study.

The study revealed two distinct and primary routes adopted one each by the traditional retailers and organized

retailers. Fresh vegetables traveled in those routes log different mileages. Effects of the 'Food Mileage' on the players of the fresh vegetable food chain are traced. The food mileage has been expressed in kilometer, "minimum" mileage is the shortest distance travel by a fresh vegetable and "market" mileage is the average mileage of the same fresh vegetable. The minimum mileage distance is contributed by very small quantity which is less than 0.5 % of the daily transactional volume. The food mileage values are for customer's destination at Chennai. The food mileage calculated for the fresh vegetables routed through organized retailing is based on the organized retailer's outlets at Chennai. The food mileage is the Weighted Average Source Distance (WASD) (Pirog R and Benjamin A, 2003). The formula for the WASD is:

$$\text{WASD} = \frac{\sum \{(\text{Fresh vegetable weight in Kg}) \times (\text{Distance traveled})\}}{\sum (\text{Fresh vegetable weight in Kg})}$$

As time taken between any two points were not observed, so speed at which fresh vegetables reaching its destination has not been studied. This is the limitation of this study and also scope for further future research. The efficiency of different mode of transport system and infrastructural facilities are out of scope of this study.

### Food Mileage

The term 'Food Miles' (or 'Food Kilometers') refers to the distance food travels from the location where it is grown

to the location where it is consumed, or in other words, the distance food travels from farm to plate. Food miles do not refer the input material, effort, efficiency or energy to the crop yield. Food miles are a way of attempting to measure how far food has traveled to reach consumer. That includes the journey from farm to processor, then from processor to retailer and finally from retailer to consumer. Studies estimate that processed food in the United States travels over 2080 kilometers (1300 miles), and fresh produce travels over 2400 kilometers (1500 miles), before being consumed (Holly Hill, 2008). In UK,

twenty percent of food (by weight) moves more than 200 kilometer (Garnett, 2003).

“Food Mileage” is an indicator to evaluate impact on economic, social and ecological system and It associates the quality food availability, foods wastage and disposal. ‘Food miles’ is a factor to understand inefficiency of food supply chain. In economical or business perspective, every food miles is cost. Transportation cost is directly propositional to food miles. Every mile addition in transport is addition in cost of the goods. Customer pays for it. Fresh vegetables travel for miles, the less freshness. Means customers pay for fresh vegetables which have less initial nutritional value. Alternatively, to retain freshness, conditioning is required while transporting. Conditioned transport is again adding cost to goods. Food traveled less; the money is reinvestment closer to the farm land community and more financial contribution to local economy. Plant dollar close to home and watch community grow (FRN, 2008). Local farmers who sell direct to consumers receive a larger share of the profit for their food. Local family farmers spend their money with local merchants and build a stronger local economy. Socially impact of higher mileage food are food come in

from abroad , different food safety standards leads to more vulnerable to unsafe food. Fresh vegetables with less mileage are afresh, original taste, initial ingredients retained and more palatable. Less food miles create more sense of closeness and trust. Ecologically, ‘food mileage’ is a convenient indicator of sustainability and sustainable Development; less food miles indicate more sustainability. Reducing food miles is reduction of emissions. Shorter distance travels lead to reduced usage of fossil fuels and thus, conservation. Minimum food travel: minimum pollution, environmental degradation and Global warming.

**Traditional Retail Mileage**

‘Traditional retail model’ is the composite route for the logistical flow of fresh vegetables which is predominantly followed currently in traditional retail marketing. The figure 1 outlines the logistics of traditional retail model of fresh vegetable retail marketing. Players involve in this model are agents (commission agents), auctioneers, wholesalers, traditional retailer of all type of formats - family run ‘mom and pop’ stores, road side shops, pavement shops and cart vendor apart from farmers and customers.

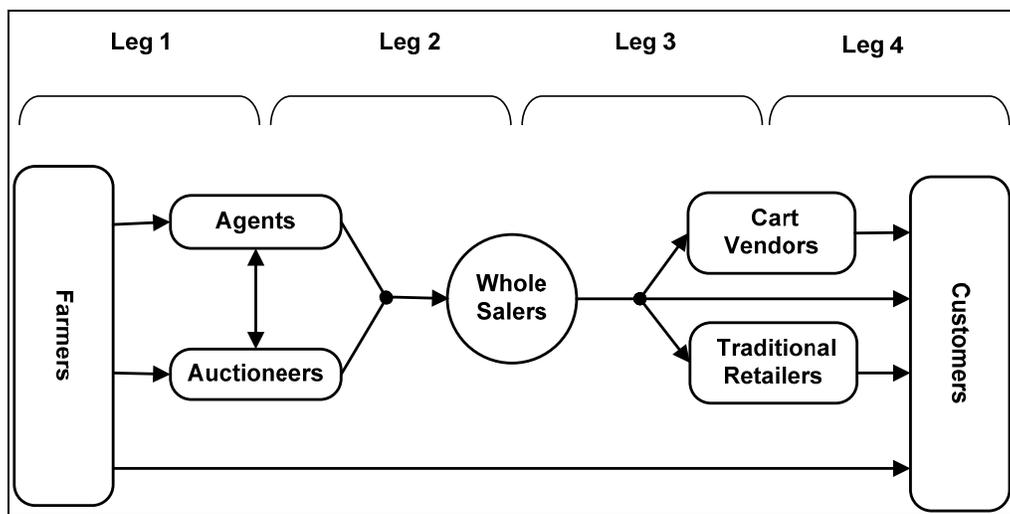


Figure 1. Logistics of Traditional Retail Model.

Agents, auctioneers and wholesalers are traders in fresh vegetable marketing. Farmers are the cultivator of produces and source of fresh vegetable supply. They are small by land holding and yield volume of crop and are highly fragmented across geographical areas. In this

traditional retail model, farmers sell their produces to customers and to intermediately. Agent and auctioneers are first level of middlemen in fresh vegetable supply chain and transferring fresh vegetables from customers to wholesalers. No of transfers of ownership as well as

transshipments of fresh vegetables are depending upon the number of agents present in between farmers and wholesalers. An agent operates from shops of small space, works for one or more wholesalers and normally deals particular range of fresh vegetables. Most of the wholesalers at Periyar Fresh vegetable Market, Koyambedu deal with specific fresh vegetable(s) only and there is very few exceptions who handle range of products. Normally wholesaler do not involve in transportation of fresh vegetables, both inward and outward transportations. The traditional retailers buy fresh vegetables from wholesalers and sell directly to customers. The families run 'mom and pop' type stores sell staple products including fresh vegetables. Customers constitute small domestic customers who buy fresh vegetables for household consumption from traditional retailers and hoteliers who buy for commercial consumption procuring their fresh vegetables form the whole sale market.

Food transportation has four legs and handling, both loading and unloading is manual in this traditional retail model of fresh vegetable retailing and Food Mileage values

for the selected fresh vegetables for this study are shown in the Table 2. Mode of transport operations in the individual legs are:

*Leg 1:* The first move in fresh vegetable journey starts with the transportation of fresh vegetables from farmland to agent. Farmers are responsible for bring the fresh vegetables to agent's premises. In case of contract, the auctioneers take care of the transportation of fresh vegetables from farmland to his premises and transportation is seller's responsibility for the transaction of fresh vegetable between the agents and auctioneers. Mode of transports are mini truck, farm tracker, bullock cart, bi cycle, tricycle, motor cycle and head carrying.

*Leg 2:* The outward transportation from agents to wholesalers is handled by agents. Mode of transport is unconditioned trucks and for shorter distance farm tractors are used. Agents make arrangement to pickup fresh vegetables directly form farming locations to deliver at wholesaler's premises for huge volume of produce.

Fresh vegetables	Leg 1		Leg 2		Leg 3		Leg 4		Total Mileage	
	Minimum	Market	Minimum	Market	Minimum	Market	Minimum	Market	Minimum	Market
Onion	2	10	40	365	3	30	NA	1	45	406
Potato	NA*	NA	600	1500	3	30	NA	1	----	1531
Tomato	2	10	40	120	3	30	NA	1	45	161
Egg Plant	2	15	40	170	3	30	NA	1	45	216
Okra	2	15	40	170	3	30	NA	1	45	216

Source: Primary Data (Mileages in Kilometers and \* No Data available / Not Applicable)

Table 2. Food Mileage in Traditional Retail Model

*Leg 3:* Traditional retailers, cart vendors and commercial customers buy fresh vegetables and make their own arrangements for transport from whole sale market to their destinations. The retailers jointly hire a truck to share the transportation cost. The regular modes of transport for them are mini truck, motor cycle, bi cycle, tricycle, and push cart.

*Leg 4:* Domestic customers shop for their fresh vegetables at traditional retailers stores which are conveniently located closer to their residence and walk

down. The average distance is less than half a kilometer (average distance has been rounded off as 1 kilometer in the table 2). Fresh vegetables are delivered at door steps of the customers by cart vendors who sell fresh vegetables in push carts, tricycles, bullock carts.

**Organized Retail Mileage:**

At present all organized retailers are adopting 'Hub and Spoke' model of fresh vegetables chain with minor modifications to fit in to their marketing and logistical

strategies of their organizations. The figure 2 illustrates the logistics of organized retail model of fresh vegetable retail marketing. Fewer players are involved in this model compare to the traditional retailing model. Farmers, organized retailers, wholesalers and customers form this chain. Buying centers, hub and stores (retail outlets) are operational units of the organized retailers. Small farmers and contract farmers those who executed a trade contract with the organized retailers are the primary source of supply of fresh vegetables to the organized retailers. The buying centers make the fresh vegetable purchases directly from the farmers and transport it to the hubs. A hub is served by one or more buying center and a buying center serves one or more hubs. Hub infrequently buys small volume of fresh vegetables from the local wholesale market to balance demand supply gap. Hub intern distributes fresh vegetables to stores attached to it. A

store is served by only one hub. Store sells fresh vegetables in retail quantity to the customers.

Food transportation has four legs and handling, both loading and unloading is manual in this organized retail model of fresh vegetable retailing and Food Mileage values for the selected fresh vegetables for this study are shown in the Table 3. Mode of transport operations in the individual legs are:

*Leg 1:* Farmers transport fresh vegetables from farming location to the buying centers. Mode of transports are mini truck, farm tracker, bullock cart, bi cycle, tricycle, motor cycle and head carrying. Buying centers arrange to pickup fresh vegetables in a truck from the farm gates of the contract farmers.

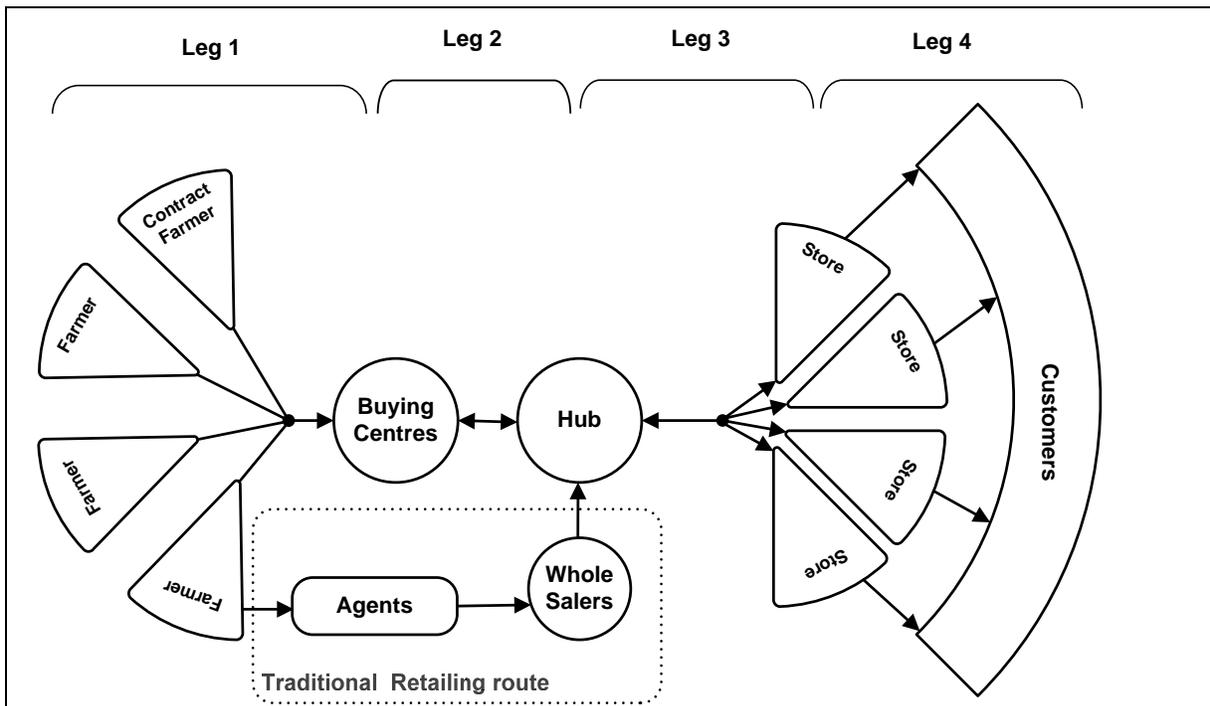


Figure 2. Logistics of Organized Retail Model.

*Leg 2:* The transport of fresh vegetables from buying centers to hub is arranged by buying centre and mode of transport is unconditioned trucks. Hubs get direct delivery from the contract farming locations.

*Leg 3:* Fresh vegetables are transported from hub to stores twice a day and collection stores return of self expiring fresh vegetables from stores to hub for disposal

once a day. Mode of transport is unconditioned small trucks

*Leg 4:* Customers buy and pick up fresh vegetables from the organized retail stores. Home delivery is provided by the stores for a shorter coverage area and high value of purchase.

Fresh vegetables	Leg 1		Leg 2		Leg 3		Leg 4		Total Mileage	
	Minimum	Market	Minimum	Market	Minimum	Market	Minimum	Market	Minimum	Market
Onion	5	15	NA *	520	NA	30	NA	5	NA	570
Potato	5	15	NA	2200	NA	30	NA	5	NA	2250
Tomato	5	15	NA	180	NA	30	NA	5	NA	230
Egg Plant	5	15	NA	350	NA	30	NA	5	NA	400
Okra	5	15	NA	350	NA	30	NA	5	NA	400

Source: Primary Data (Mileages in Kilometers and \* No Data available / Not Applicable)

Table 3. Food Mileage in Organized Retail Model

### Conclusion

Measuring food miles is a complex task and simplistic concept relating to the distance food travels as a measure of its impact on economical, environmental and social issues associated with transportation cost, pollution, energy conservation and nutrition vale of food products.

Organized retail trade has resulted in more and more fresh vegetables traveling ever-increasing distances from

cultivation to ultimate consumption. There is a paradigm shift from local food system to the global food system. Lesser food mileage refers to more of local and greater mileage refers more of global foods in our dietary habits. Of the 5 fresh vegetables assessed, model wise comparison of mileage is depicted in Table 4 and Figure 3.

Model	Fresh vegetable Mileage in Km				
	Onion	Potato	Tomato	Egg Plant	Okra
Traditional (T)	406	1531	161	216	216
Organized (O)	570	2250	230	400	400
Difference (O - T) in Km	164	719	69	184	184
Difference (O - T) in %	40	47	43	85	85

Source: Primary Data

Table 4. Food Mileage of Traditional and Organized models

One of many factors that have contributed to higher 'Food Miles' for organized retailer is the result of wider sourcing of supplies closer to the fresh vegetable harvest which are located far away from retail hubs. Other reasons for increase in food miles: greater product availability at the retail outlets, particularly for seasonal items which consumers now to buy all year round and consumers are

exposed to wider range and higher quality fresh vegetables. Organized retailers business strategy is to reduce for over all cost than distance traveled. Food mileage is one of the factors along with value density (ratio of product value to weight), utilization of vehicle capacity, average payload weight to calculate the efficiency and profitability of the business.

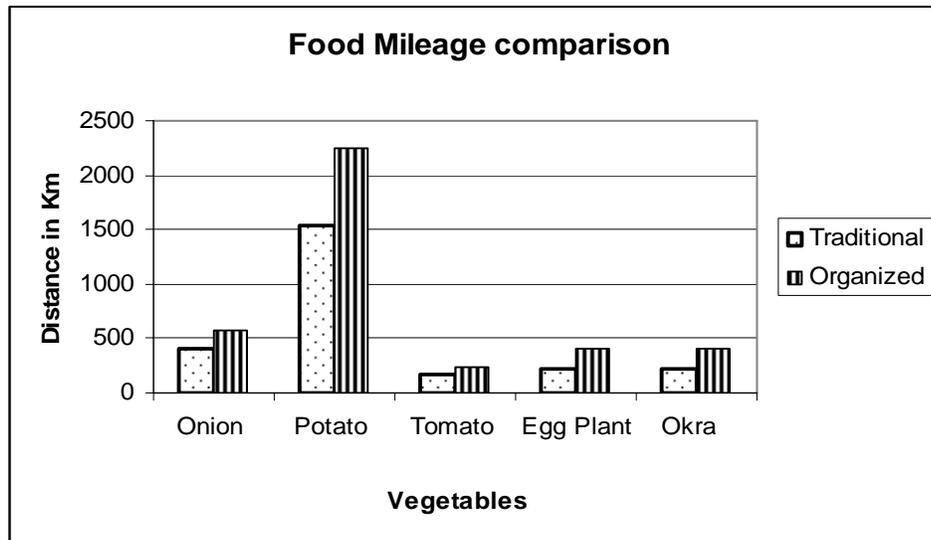


Figure 3. Food Mileage comparison (Model Wise)

The present trend indicates 'food mileage' is traded off with better utilization of cheaper manpower available in the rural where major cultivation of fresh vegetables are located, continued business opportunity to marginal farm owners, persistent job availability to farm workers, indirect job creation for professions associated with transportation and agriculture. With the diverse agro climatic regions, untapped huge rural resources, sharply rising food demand, wide market, growing modern market mechanisms, government's agricultural sector initiatives, expected investments in agribusiness and infrastructure are tilting factors of rural market integrating in to global supply chain. A unified market, integration of rural and urban markets pave a way for free movement of goods across the boundaries. Free movements induce longer travel of goods with out restrictions. As shorter food miles is an indicator of near sourcing or rural sourcing and longer food miles of fresh vegetables is an indicator for agricultural outsource. It should be noted that study concentration of only one dimension, "Food Mileage" which direct us to conclude more food mileage is an indication of agricultural outsourcing.

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