Status of Value Addition and Export of Moringa Produce in Tamil Nadu—a Case Study

C. Sekhar 1, N. Venkatesan 1, D. Murugananthi 1, A. Vidhyavathi 1
1 Department of Agricultural Economics, Tamil Nadu Agricultural University, Coimbatore – 641 003, India
2 Department of Social Sciences, Agricultural College and Research Institute, Kiliikulam – 628 252, India
3 Department of Agricultural and Rural Management, Tamil Nadu Agricultural University, Coimbatore – 641 003, India

Corresponding email: saekarck@gmail.com

International Journal of Horticulture, 2018, Vol.8, No.3 doi: 10.5376/ijh.2018.08.0003

Received: 03 Jan., 2018
Accepted: 08 Jan., 2018
Published: 10 Feb., 2018

Copyright © 2018 Sekhar et al., This is an open access article published under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Preferred citation for this article:
Sekhar C., Venkatesan N., Murugananthi D., and Vidhyavathi A., 2018, Status of value addition and export of moringa produce in Tamil Nadu – a case study, International Journal of Horticulture, 8(3): 16-28 (doi: 10.5376/ijh.2018.08.0003)

Abstract Moringa is widely used as vegetable and grown commercially for its edible pods and leaves. Moringa oleifera is an important food commodity which has had enormous attention as the ‘natural nutrition of the tropics’. The leaves, fruit, flowers and immature pods of this tree are used as a highly nutritive vegetable in many countries particularly in India, Pakistan, Philippines, Hawaii and many parts of Africa. India is the prime producer of Moringa (Drumstick) with an annual production of 2.2 million tonnes of tender fruits leading to the productivity of around 51 tonnes per ha. Tamil Nadu is one of the largest producers of Moringa with an annual production of 6.71 lakh tonnes of tender fruits from an area of 13042 ha. An aggregate sampling to the tune of one hundred farmers amongst the various products, the Moringa Wunder mix is exported to Germany and has received good repute to the firm. One hundred gram of Wunder Mix is priced at Rupees seven which is equivalent to $ 10.77. The firm has gained FSSAI certificate, HALAL certificate, Good Management Practices Certificate and Organic Verification Certificates to its credit. The need of Value added products of Moringa is growing alarmingly both in Regional, National and International Markets and hence the technology and infrastructure support must be provided with a focus on precision farming technologies for enhancing higher productivity from the level of 28 tonnes per ha. For that an organizational intervention is needed and hence a “National Research Centre for Moringa” or a Commodity Board on the lines of “Tea Board” may be established and pronounced as a “Moringa Board” for tapping its potentials both in production, processing for value addition and Export.

Keywords Value addition; Export of moringa; Case study on moringa; Natural nutrition; Wunder mix; Moringa chocolates; Moringa tablets; Moringa leaf powder

Background
Moringa (Moringa oleifera Lam.) belongs to the family ‘Moringaceae’ is a fast-growing multipurpose medicinal tree extensively grown in tropics and subtropics of India and Africa. It is also widely distributed in India, Egypt, Philippines, Sri Lanka, Thailand, Malaysia, Burma, Pakistan, Singapore, West Indies, Cuba, Jamaica and Nigeria. In eastern and southern regions of India, Moringa is widely used as vegetable and grown commercially for its edible pods and leaves. Moringa oleifera is an important food commodity which has had enormous attention as the ‘natural nutrition of the tropics’. The leaves, fruit, flowers and immature pods of this tree are used as a highly nutritive vegetable in many countries particularly in India, Pakistan, Philippines, Hawaii and many parts of Africa (D’Souza and Kulkarni, 1993; Anwar and Bhanger, 2003; Anwar et al., 2005).

Moringa leaves have been reported to be a rich source of β-carotene, protein, vitamin C, calcium and potassium and as a good source of natural antioxidants; and thus, enhance the shelf-life of fat containing foods due to the of various types of antioxidant compounds such as ascorbic acid, flavonoids, phenolics and carotenoids (Dillard German, 2000; Siddhuraju and Becker, 2003). In the Philippines, it is known as ‘mother’s best friend’ because of its...
utilization to increase woman’s milk production and is sometimes prescribed for anaemia (Estrella et al., 2000; Siddhuraju and Becker, 2003).

1 Moringa across the Globe

In Mozambique, Moringa trees grow naturally given the country’s suitable land and excellent climatic conditions. Therefore, Moringa is well-known and mostly consumed as Moringa Leaf Powder. There is a great potential for small holders to engage in Moringa production, offering them both a crucial nutritional input for their own families and an income opportunity, by selling surpluses to the market.

Globally, the demand for Moringa products, such as Moringa Leaf Powder and Moringa Oil, has been growing. Moreover, international organizations and institutions are exploring the best ways on how to use Moringa as a nutritional supplement and in food fortification. There are several species of Moringa across the world. Its usage has been well received among the global consumers for its nutritional, medicinal, culinary uses. In this context, it is important to highlight the species available globally, nutritional status and its services to the mankind. Table 1 described the number of species which are native to different countries and its origin.

Table 1 Different Species of Moringa in the World

| Sl. No. | Different Species of Moringa | The Country of Origin     |
|--------|----------------------------|---------------------------|
| 01     | Moringa arborea            | Kenya                     |
| 02     | Moringa barziana           | Somalia                   |
| 03     | Moringa concanensis        | Northern India            |
| 04     | Moringa drouhardii         | Madagascar                |
| 05     | Moringa hildebrandtii      | Madagascar                |
| 06     | Moringa longituba          | Ethiopia and Somalia      |
| 07     | Moringa oleifera           | North Western India       |
| 08     | Moringa ovalifolia         | Namibia and Angola        |
| 09     | Moringa peregrine          | Egypt                     |
| 10     | Moringa pygmala            | Somalia                   |
| 11     | Moringa rivae              | Kenya, Ethiopia           |
| 12     | Moringa ruspoliana         | Ethiopia                  |
| 13     | Moringa stenopetala        | Kenya, Ethiopia           |

Note: Wikipedia.org; August 2017

Table 1 revealed that there are 13 Moringa species across the world. The origin of all the Moringa species is almost from Indian and African countries. The importance of these species was realized and slowly placed in different nations for large scale cultivation.

In India, Moringa oleifera is widely cultivated for its multiple benefits and varieties are released by the Farm Universities in Moringa and are occupying the daily meals of the citizens of different nation. In this respect understanding the nutritional value of Moringa will be an important one so as to develop value added products from Moringa.

2 Moringa in India

India is the prime producer of Moringa (Drumstick) with an annual production of 2.2 million tonnes of tender fruits from an area of 43,600 ha leading to the productivity of around 51 tonnes per ha. Among the different states, Andhra Pradesh leads in both area and production (15,665 ha) followed by Tamil Nadu (13042 ha) and Karnataka (10,280 ha). In other states, it occupies an area of 4,613 ha. Tamil Nadu is the pioneering state as it has varied genotypes from diversified geographical areas, as well as introductions from Sri Lanka.

In Tamil Nadu, Moringa was cultivated as sole crop in homesteads, around cattle sheds, on farm boundaries, and as isolated plants in fences and as groups of trees on village waste lands. In the early 1990s, in Southern Tamil Nadu, people started growing perennial Moringa types. In Mulanur block of Dharapuram taluk, Moringa is established as an intercrop on field in a large scale and their allies were cropped with vegetables and Sorghum formed a Moringa
based intercropping system. This Moringa based cropping system was evolved as a protection to alley crops from drying winds during summer and Moringa also provided some additional income. With the migration of people from South to North India, and elsewhere in the world, the Moringa cultivation and the demand for Moringa has picked up.

Farmers found that growing Moringa crops during summer season was remunerative. Thus, Moringa gained a foothold as a summer vegetable. Its unique flavour and aroma became very popular. For South Indian any meal without Moringa and pulses is considered as incomplete. The demand for the Moringa pod also increased due to increased urban settlements and migration of people to urban colonies. Based on the significance of Moringa in the human diet, a research study might be more viable focusing marketing, value addition and export practices of Moringa in Tamil Nadu.

Tamil Nadu is one of the largest producers of Moringa with an annual production of 6.71 lakh tonnes of tender fruits from an area of 13042 ha. Among the districts, Theni leads in both area and production (3424 ha) followed by Dindigul (2645 ha), Karur (2070 ha), Thoothukkudi (1465 ha), Tiruppur (1191 ha), Ariyalur (813 ha) and Madurai (536 ha). These details are analyzed and presented in Table 2.

Table 2 revealed that the area under Moringa is skewed to certain districts because of the good soil conditions and becomes good revenue earner among the rural households and hence Moringa cultivation in these districts becomes popular one.

In Tiruppur District, the Mulanur Block had the highest area under Moringa next to Sathankulam of Thoothukkudi District. Sathankulam had become the hub of Moringa cultivation.

Table 2 Area under Moringa in Different Districts of Tamil Nadu

| Sl. No. | Name of the District | Area under Moringa (Ha) | Percentage to Total Area under Moringa in Tamil Nadu | Average Productivity / Position |
|---------|----------------------|-------------------------|-----------------------------------------------------|--------------------------------|
| 01      | Theni                | 3424                    | 26.25                                               | First                          |
| 02      | Dindigul             | 2645                    | 20.28                                               | Second                         |
| 03      | Karur                | 2070                    | 15.87                                               | Third                          |
| 04      | Thoothukkudi         | 1465                    | 11.23                                               | Fourth                         |
| 05      | Tiruppur             | 1191                    | 9.13                                                | Fifth                          |
| 06      | Ariyalur             | 813                     | 6.23                                                | Sixth                          |
| 07      | Madurai              | 536                     | 4.11                                                | Seventh                        |
| 08      | Other Districts      | 898                     | 6.89                                                |                                |
| **Total Area in Ha** | **13042**           | **100.00**              | **51.45**                                           |                                |

Note: Season and Crop Report of Tamil Nadu (2015-16)

3 Problem Focus

Before attaining the sufficiency in production, the policy makers and the administrators should provide appropriate platform for initiating the marketing of horticultural produce like Moringa. Since these are highly perishable, the production, processing, value addition and export related issues need to be addressed. Though the existing arrangements for marketing of farm produce are appreciable, there could be some gap in Institutional linkages, empowering farmers’ organizations and their role in marketing of Moringa. Whether these arrangements are fulfilled by the Government for facilitating marketing and export of Moringa through some institutional arrangement or not is unavailable to the researcher and hence an attempt has been made to assess the existing marketing, value addition and export practices prevalent in respect of farmers and the traders of Western and Southern Tamil Nadu.

Though India had higher market access among the Global partners with regard to the Moringa, still some consignments in fruits are rejected by certain countries for want of sanitary and phytosanitary issues and the specification of the importing country is unmet and hence rejection is visible. In this respect, the role of APEDA is giving an orientation to the exporters through appropriate package of training and the strict adherence of
quality norms is a must. In this respect, an attempt has also been made to document the status of export of Moringa to different countries and the issues connected with the export of Moringa to enhance the trade in horticultural produce. On finding the solutions to the above issues and adoption of the strategies on time that emanated from the study, the horticultural development could be on the dynamic track and the hassle-free marketing and export could be visualized.

4 Design of the Study

Among the Vegetables, Moringa is the one which is used very commonly by the people of South India for its flavour and delicious taste in Sambar and Curry preparation. Besides, it is also a source of several medicinal properties and hence the crop commands significance in cultivation. Every household will be maintaining one or two Moringa tree in their homestead considering its importance and is grown almost in all the districts of Tamil Nadu and South India.

4.1 Sampling design

Among the 31 districts of Tamil Nadu, six to seven districts are excelling in enhancing the area under Moringa and they play a vital role in increasing the productivity of Moringa. Theni district found to be the topper in achieving expansion of area under Moringa followed by Dindigul, Karur, Thoothukkudi, Tiruppur, Ariyalur and Madurai Districts. That is Thoothukkudi District is ranking fourth and Tiruppur District is ranking Fifth in respect of area under Moringa. Though these districts are traditional tracts for Moringa cultivation, its area expansion is found to be poor when compared to Theni and Dindigul Districts which are gaining area under Moringa in recent years and hence special effort has been taken to conduct a study in these traditional tracts for its failure in enhancing the area expansion schemes focusing Moringa.

To assess the marketing practices followed by the farmers cum traders and the traders whom are exclusively dealing the Moringa produce, a separate questionnaire has been designed and the questionnaire has been tested and made fit for survey. Before entering into the survey, the number of traders who are dealing with Moringa marketing were enlisted by conducting inquiries with the officials of Department of Agriculture and the General traders in the villages of Sathankulam Taluk and the Dharapuram Taluks. Besides website sources were also used. From the list, 10 traders in each of the taluk whom are dealing with Moringa and the value-added products of Moringa were selected and interviewed for the study. The details of villages in which the traders selected were presented in Table 3.

Table 3 Details of the Traders Selected for the study

| Sl. No. | Name of the Villages in which Traders Selected in Sathankulam Taluk | Number of Samples | Name of the Villages in which Traders Selected in Dharapuram Taluk | Number of Samples |
|---------|---------------------------------------------------------------|-------------------|---------------------------------------------------------------|-------------------|
| 01      | Sasthavinallur                                               | 02                | Kilangundal                                                   | 02                |
| 02      | Naduvakkurichi                                               | 02                | Komarapalayam                                                 | 02                |
| 03      | Mudhalur                                                     | 02                | Mulayampoondi                                                 | 02                |
| 04      | Arasoor                                                      | 02                | Mulanur                                                       | 02                |
| 05      | Thatchamozhi                                                 | 02                | Puduppai                                                      | 02                |
| Total Samples under Moringa | 10 | Total Samples under Moringa | 10 |

For the study as a whole, the aggregate sampling was one hundred farmers whom are cultivating Moringa in their farms and 20 Traders forming a sum of 120 samples. While Conducting interview, the traders were highly reluctant and hesitant to furnish the information sought by the researcher in respect of value addition and other details as they were very busy with the trading activities. In these circumstances, a trader has paid a visit to Sathankulam to procure Moringa vegetables and they are much interested in organic farms has been approached and expressed the will of the researcher to the trader and he readily accepted and hence the trader was interviewed for the study following a case study approach. The name of the case firm contacted is M/s. Miracletree Life Science has its headquarters at Madurai. The Firm has its own plantation in and around Madurai which are established in an organic way. The firm is involved in the following activities.
(1) Producer of Organic Moringa Produce in a big way
(2) Processing and Value Addition of Moringa Produce and
(3) Manufacturer cum Trader cum Exporter.

In this respect, the activities of the case firm and their products dealt are analyzed and presented in the Results and Discussion chapter to fulfill the status of value addition in Moringa and to document the marketing practices. Though Moringa production and trade is found to be impressive, the documentation of data is yet to develop in the state of Tamil Nadu and India. None of the Government Publications are talking about the status of Moringa and hence a small attempt has been taken to document the value addition practices in Moringa following the defined sampling approaches delineated above.

4.2 Study period
The Primary data were collected from the sample respondents during the months of January to March 2017 and the data were related to the agricultural year of 2016-2017.

4.3 Garrett’s ranking technique
The respondents were asked to rank their problems in production and marketing of Moringa produce. In Garrett’s ranking technique, these ranks were converted into per cent position by using the following formula.

\[
\text{Per Cent Position} = 100 \times \frac{(R_{ij} - 0.50)}{N_j}
\]

Where, \( R_{ij} \) = Ranking given to the \( i^{th} \) attribute by the \( j^{th} \) individual; \( N_j \) = Number of attributes ranked by the \( j^{th} \) Individual

By referring to the Garrett’s table, the per cent positions estimated were converted into scores. Thus, for each factor the scores of various respondents were added and the mean values were estimated. The mean values thus obtained for each of the attributes were arranged in descending order. The attributes with the highest mean value was considered as the most important one and the others followed in that order.

5 Results and Discussion
Post Globalization era have permitted higher access to the market in different countries. Because of the enhanced access to the market, value added products are emerging into the global scenario and has great foreign exchange earnings to different countries. India has made a big penetration to send the Indian Mango among the fruits followed by several other value-added products are being exported abroad. In this context, Moringa has find a new dent in the international markets and hence the study has focused on the traders whom are involved in promotion of Moringa based value-added products. Though Tamil Nadu is flourished with traders whom are dealing with Moringa products, very few are involved in following different practices. They are enlisted and presented below.

(1) Establishment of Own Moringa Plantations
(2) Establishment of Moringa Based Manufacturing Unit
(3) Procurement of Moringa Produce like Drumstick, Moringa Leaves, Gum, Flowers etc.
(4) Processing and Value-Addition of Moringa Produce
(5) Distribution of Value-Added Products to Regional and National Traders
(6) Export of Value-Added Moringa Products Abroad

All the above enlisted functions are performed by M/S. Miracletree Life Science firm based at Madurai, Madurai District of Tamil Nadu and hence the firm has been approached and considered for the study to gather the trade related information following a case approach. The details of the firm contacted are delineated in Table 4.

Table 4 revealed that the case firm is a registered agribusiness concern in the name of “Miracletree Life Science” was established during the year 2015. A partnership enterprise registered with appropriate authorities and has the validity of registration up to September 2019. Though the head quarter of the company is based at Madurai, it
extends its tentacles to different parts of the state for raw material procurement, processing and value addition and capable of preparing value added products numbering 18 to its credit within a short span of time. They had the banner of “Organic Moringa” (Plate-10). To keep up the promise of “Organic Moringa” they took stringent measures in both production, processing, value addition and distribution functions. These are carefully monitored by several agencies and the “Good Management Practice” certificate had also been received to its credit. The details of value-added produce of Moringa are presented in Table 5.

Table 4 Details of Case Firm Dealing with Value Added Products of Moringa

| Sl. No. | Particulars of Case Firm                  | Name and other Details                                                                 |
|--------|-----------------------------------------|---------------------------------------------------------------------------------------|
| 01     | Name of the Case Firm                   | M/S Miracletree Life Science                                                          |
| 02     | Form of Enterprise                      | Partnership                                                                           |
| 03     | Year of Establishment                   | 2015                                                                                  |
| 04     | Year of Registration and Date           | 24.09.2016                                                                            |
| 05     | Validity of Registration                | 23.09.2019                                                                            |
| 06     | Address of the Firm                     | Chief Executive Officer, Miracle Tree Life Science, Plot Number 07; SF. Number 121 / 2, Milakaranai Bus Stop, Madurai – 625018, Madurai District, Tamil Nadu, India |
| 07     | Type of Activity                        | Producer cum Manufacturing cum Exporting Firm                                          |
| 08     | Nature of Products Dealt                | Organic Moringa and its Value-Added Products                                          |
| 09     | Number of Products Dealt                | 18                                                                                    |
| 10     | Name of the Partners                    | Er. R. Saravanakumaran, Chief Executive Officer, Mr. Murugesh, Senior Agricultural Officer (Retd) from Tamil Nadu Agricultural University, |
| 11     | E-Mail Id                               | miracletree.in@gmail.com                                                              |
| 12     | Contact Numbers                         | +91 73735 06888;                                                                     |
|        |                                         | +91 96777 05310                                                                      |

Moringa trees, from which Moringa products are produced, are originated from India and now found in African, Asian and American countries such as Ghana, Philippines and Haiti. These products are commercially manufactured by processing different parts of Moringa such as leaves, seeds, drumstick, gum and other parts. Common uses of Moringa products are in food and health supplement, pharmaceuticals, cooking and cosmetics. The different types of Moringa products are virgin one and are purely organic in nature depending on the method of growing, harvesting and processing for extraction. The details of processing and value addition was not disclosed by the Chief Executive Officer of the concern and hence the other information were presented. The increasing demand for Moringa products in developing countries like India, USA, China and Brazil is one of the primary drivers.

Moringa has the potential not only as a health food supplement but also a nutritional supplement in the fight against malnutrition. The countries like USA and European Union have developed a standard for regulating Moringa products currently. In order to enter Western Hemisphere health food markets, it is important for the firm to pass food regulations and quality control norms imposed by the Western economies. In this respect, the firm has poised to diversify and to develop different product line to promote Moringa trade by meeting the regulations of Western union. However, the firm is also taking all the efforts to supply its products to demanding nations.

5.1 Value added products of Moringa

Table 5 revealed that the value-added products manufactured out of Moringa products by the case firm is a breakthrough. There were 18 products to their credit manufactured by them which are delineated below.

(1) Moringa Leaf Powder
(2) Moringa Leaf Tablets
(3) Moringa Capsules
(4) Moringa Oil
(5) Moringa Tea in 4 different tastes to suit the consumer expectation
(6) Mogo Energy Bites
(7) Mogo-Colostrums Organic Energy Bar
(8) Moringa Wunder Mix
(9) Moringa Gum Powder
(10) Moringa Drops
(11) Bio Moringa Instant Soup
(12) Moringa Honey
(13) Moringa Dry Flowers
(14) Moringa Bio Booster as plant growth promoter
(15) Moringa Chips
(16) Moringa Kernel Pepper Fry
(17) Moringa Oil Cake

Table 5 Value Added Products of Moringa Produced by M/S Miracletree Life Science Firm

| Sl. No. | Name of the Value-Added Product | Raw Materials Used | Product in Use for Curing                                                                 |
|--------|---------------------------------|-------------------|------------------------------------------------------------------------------------------|
| 01     | Moringa Oil                     | Moringa Seeds     | Skin Allergies, Moisturizing, Softness to Skin                                           |
| 02     | Moringa Leaf Tablets            | Moringa Leaves    | Vitality and Nutrient Supplement                                                         |
| 03     | Moringa Tea in Four Different Tastes | Moringa Leaves + Lemon or Ginger or Mint or Tulasi | Nourishing and Detoxifying Nutrient-rich Super food, Reduce Body Weight                   |
| 04     | Moringa Leaf Powder             | Moringa Leaves    | Activating Role, Balancing Health, Cleansing Role in the Body (ABC)                      |
| 05     | Mogo Energy Bites               | Moringa Leaves + Padam + Peanut + Almond + Alfalfa + Spirulina + Cardamom + Dry Ginger + Country Sugar | Energy Chocolate and Nutrient Supplement                                                  |
| 06     | Mogo-Colostrums Organic Energy Bar | Colostrums + Groundnut + Almond + Cardamom + Dry Ginger | Energy Chocolate with Nutrient Supplement                                                |
| 07     | Moringa Energy Drops            | Moringa Leaves    | Concentrated Drops for General Health                                                    |
| 08     | Bio Moringa Instant Soup         | Moringa Fresh Pods | ABC Role Plus General Health                                                             |
| 09     | Moringa Kernel – Pepper Fry     | Moringa Seed Kernel + Ghee + Pepper | General Health and Nutrient Supplement                                                   |
| 10     | Moringa Oil Cake                | Moringa Seeds     | Water Purifier                                                                            |
| 11     | Moringa Bio Booster             | Different Parts of Moringa + Other Extracts | Plant Growth Promoter                                                                    |
| 12     | Moringa Wunder Mix              | Moringa Leaves + A Tuber from Nature + Nutmeg + Cashew + Cardamom + Dry Ginger | General Health and Vitality                                                              |
| 13     | Moringa Honey                   | Moringa Flowers   | Medicinal Use                                                                             |
| 14     | Moringa Chips                   | Moringa Pods      | General Health and Protein Supplement                                                    |
| 15     | Moringa Idly Powder             | Moringa Leaves + Blackgram + Redgram + Red Chilli + Salt | General Health                                                                           |
| 16     | Moringa Dry Flowers             | Moringa Flowers   | General Health                                                                            |
| 17     | Moringa Gum Powder              | Moringa Gum       | Diuretic, Astringent, Fever, Dysentery, Asthma, Intestinal Cancer                        |
| 18     | Moringa Capsules                | Moringa Leaves    | General Health                                                                            |

The above products have been tested in consultation with the physician and are being promoted for sale in different regional, national and international markets after getting the FSSAI certificate and other certificates needed for exports and distribution to the consumers and traders. In India, the products are distributed at some fixed retail price and hence some of the products and their retail prices were assessed and the results are presented in Table 6.
Table 6 revealed that M/S Miracle Tree Life Science firm is concentrating international markets by sending some of their products abroad. Among the various products, the Moringa Wunder Mix is exported to Germany and has received good repute to the firm. One hundred gram of Wunder Mix is priced at Rs 700/ which is equivalent to US $ 10.77. The ingredients used are costly one and is being used for general health and vitality in human. Other Products like Moringa oil and Moringa leaf tablets are priced at Rs 370 and Rs 360 per unit respectively. In an interview with the Chief Executive Officer of the firm, he is mostly concentrating on the international markets by ensuring the quality parameters so that the per unit gain will be handsome and the regional markets are also concentrated and supplied with low cost materials to fulfil the demand in the local market. Any trading activity to be carried out without any blemishes, necessarily called for fulfilment of physical, chemical, biological, biochemical and phytosanitary issues satisfactorily. For that certificates from reputed firms are must and hence these details are also analyzed and the results are presented in Table 7.

### Table 6 Details of Products Traded and their Maximum Retail Price with the Case Firm

| Sl. No. | Details of Moringa Products Traded | Grams /ML per Unit | Number of Units in the Box | Maximum Retail Price per Unit in Rs |
|---------|-----------------------------------|-------------------|-----------------------------|-----------------------------------|
| 01      | Mogo Moringa Energy Bites         | 20                | 20                          | 150.00 ($ 2.31)                   |
| 02      | Colostrum Moringa Energy Bar      | 20                | 20                          | 200.00 ($ 3.08)                   |
| 03      | Moringa Oil (ML)                  | 100               | 01                          | 370.00 ($ 5.69)                   |
| 04      | Moringa Tea                       | 02                | 24                          | 210.00 ($ 3.23)                   |
| 05      | Moringa Tablets                   | 500 Mg            | 120                         | 360.00 ($ 5.54)                   |
| 06      | Moringa Gum Powder                | 100               | 01                          | 180.00 ($ 2.77)                   |
| 07      | Moringa Wunder Mix                | 100               | 01                          | 700.00 ($ 10.77)                  |
| 08      | Moringa Powder                    | 120               | 01                          | 140.00 ($ 2.15)                   |

### 5.2 Registration and quality certification

The case firm chosen for the study has fulfilled the formalities of Registration of the business and obtained several quality certificates. In this respect, these certificates and their details are analyzed and the results are presented in Table 7.

Table 7 revealed that the firm is recipient of the following certificates from national and international organizations for promotion of agribusiness.

1. **Moringa Powder- Proximate Analysis Certificate** – This certificate was received by the firm from Indian Institute of Crop Processing Technology, Government of India, Thanjavur, Tamil Nadu. It had highlighted the contents and nutritional aspects of Moringa powder which is reflected in the produce packaging.

2. **Food Safety License – FSSAI Certificate**: This license was obtained from Tamil Nadu Food Safety and Drug Administration Department, Madurai and the symbol is reflected in the samples prepared and sent to different user agencies

3. **Good Management Practice Certificate** – The certificate of Registration was received from Quality Council of International Certification, London, United Kingdom. After rigorous checking the quality parameters, the certificate was issued to the firm by the agency.

4. **HALAL Certificate** – This certificate is also issued by the Quality Council of International Certification, London, United Kingdom after checking the use of any unwanted non-vegetarian based resources used in the produce or not. After the rigorous analysis, the Halal certification was issued to the firm.

5. **ISO 20002** – Getting the certificate from International Standards Organization has been initiated by the firm. Shortly, the firm will become the recipient of ISO-20002 certification.

6. **Organic Verification Certificate** – The produce produced by the firm is organic origin or not has been monitored by the firm and after thorough checking through tracenet, International Organic Monitoring Agency based at Bengaluru has issued the certificate to the firm.

Using the above certificates, the firm is operating in the Regional, National and International markets without any hassles. The organization is poised to expand their infrastructural and capacity utilization in a big way after
finding the convenient location with appropriate labor force for different technical and administrative requirements.

Table 7 Details of Certificates Owned and Manned by the Case Firm of Tamil Nadu

| Sl. No. | Name of the Certificate                          | Details of Certifying Authority                   | Name of the Authorized Firm                                      | Head Quarter of the Certifying Firm               |
|---------|------------------------------------------------|-------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------|
| 01      | Moringa Powder – Proximate Analysis Certificate | Quality Manager, Food Testing Laboratory         | Indian Institute of Crop Processing Technology                  | Thanjavur – 613005, Tamil Nadu                   |
| 02      | Food Safety License from FSSAI                  | Designated Officer, FSSAI Certificate            | Tamil Nadu Food Safety and Drug Administration Department       | Madurai                                          |
| 03      | Good Management Practice Certificate            | Certificate of Registration, Authorized Signatory, QCIC | Quality Council of International Certification (QCIC) | London, United Kingdom                           |
| 04      | HALAL Certificate                               | Certificate of Registration, Authorized Signatory, QCIC | Quality Council of International Certification | London, United Kingdom                           |
| 05      | ISO 20002 Certificate                           | To be Obtained                                   | International Organization for Standardization                  | Geneva, Switzerland                               |
| 06      | Verification / Organic Certificate              | Through Tracenet                                 | International Organic Monitoring Agency                         | Bangalore, India                                  |

5.3 Details of products exported abroad

Using the above certificates, the products which are currently exported to different destinations abroad is presented in Table 8.

Table 8 Details of Products which are exported to Different Countries

| Sl. No | Particulars of Moringa Products | Name of the Country to which Exported | Name of the Places in India                                      |
|--------|---------------------------------|--------------------------------------|------------------------------------------------------------------|
| 01     | All Value-Added Products of Moringa | Malaysia, Germany, Zurich, Canada | Gujarat, Kerala, Andhra Pradesh, Tamil Nadu, Karnataka, Pondicherry |
| 02     | Moringa Tea                     | New Zealand                         | Gujarat, Kerala, Andhra Pradesh, Tamil Nadu, Karnataka, Pondicherry |
| 03     | Moringa Oil                     | Nigeria                             | Gujarat, Kerala, Andhra Pradesh, Tamil Nadu, Karnataka, Pondicherry |
| 04     | Mogo Energy Bites               | Ceylon                              | Gujarat, Kerala, Andhra Pradesh, Tamil Nadu, Karnataka, Pondicherry |
| 05     | Fresh Moringa (Drumstick)       | Ceylon                              | Mumbai, New Delhi, Gujarat, Kerala, Andhra Pradesh, Tamil Nadu, Karnataka, Pondicherry |

Table 8 revealed that the Moringa Tea is exported specifically to New Zealand while the Moringa oil is exported to Nigeria exclusively. But all the Moringa based value added products were exported to Malaysia, Germany, Zurich and Canada. But the Mogo Energy Bites is specifically sent to Ceylon and they have the plan to provide the same to the Children in schooling for their nourishment. The World food and nutritional supplement producing companies are predicting that the Moringa shall acquire more than 10 per cent market share of the industry in the coming years. However, how much of the value added products of Moringa is exported from India is another important aspect and hence these details are discussed in the export section.

5.4 Export of value-added Moringa produce from India

Though there were around 18 products were manufactured and value added from Moringa, very few products are found to attract foreign countries for the products of Moringa and hence these details are analyzed and presented
in Table 8. According to SVM exports from Thoothukkudi, the export of Moringa products are growing at a rate of 26 to 30 per cent annually. The major countries which import Moringa leaves are China, United States of America, Germany, Canada, South Korea and European countries.

Table 9 Details of Moringa Seed Produce Exported from India during the year 2016

| Sl. No. | Particulars of Produce | Quantity Exported in Kgs | Percentage to Total |
|---------|------------------------|--------------------------|---------------------|
| 01      | Moringa Seed           | 27730.00                 | 84.09               |
| 02      | Moringa Seed Kernel    | 5003.00                  | 15.17               |
| 03      | Moringa Seed Powder    | 02.00                    | 00.01               |
| 04      | Moringa Seed Cake Powder | 200.00          | 00.61               |
| 05      | Moringa Seed Oil       | 40.00                    | 00.12               |
|         | **Total**              | **32975.00**             | **100.00**          |

Table 9 revealed the details of export of Moringa seed and seed based value-added products. Around 33 tonnes of seed and seed based Moringa products are exported from India specifically from Tamil Nadu through Thoothukkudi Port. In that Moringa Seed alone accounted for 84 per cent to the total export of Moringa seed based products followed by Moringa Seed Kernel which is accounted for 15 per cent to the total. The Moringa Seed Oil and Moringa Seed Cake Powder are the other products manufactured out of Moringa seed and are exported for different purposes abroad. Another important product of Moringa exported abroad is Moringa Leaf Powder which is exported to around 12 major destinations from Tamil Nadu. These details are analyzed and the results are presented in Table 10.

Table 10 Quantity of Moringa Leaf Powder Exported to Different Countries from India During the Year 2016

| Sl. No. | Name of the Country     | Quantity of Moringa Leaf Powder Exported in Kgs | Percentage to Total |
|---------|-------------------------|-------------------------------------------------|---------------------|
| 01      | Austria                 | 7300.00                                         | 01.38               |
| 02      | Australia               | 4786.00                                         | 00.90               |
| 03      | Canada                  | 25343.00                                        | 04.77               |
| 04      | China                   | 6450.00                                         | 01.21               |
| 05      | Germany                 | 28498.00                                        | 05.37               |
| 06      | Malaysia                | 9497.00                                         | 01.79               |
| 07      | Singapore               | 6096.00                                         | 01.16               |
| 08      | South Korea             | 37068.00                                        | 06.98               |
| 09      | United Arab Emirate     | 7525.00                                         | 01.42               |
| 10      | United Kingdom          | 14862.00                                        | 02.80               |
| **11**  | United States of America| **359069.00**                                   | **67.63**           |
| 12      | Other Countries         | 24387.00                                        | 04.59               |
| **Total**|                         | **530881.00**                                   | **100.00**          |

The export of Moringa leaves is a big business in Tamil Nadu, Andhra Pradesh, Karnataka and Odisha. The major countries which import Moringa leaves are United States of America, South Korea, Germany, Canada, United Kingdom and other European countries. The export market has been increasing at the rate of over 30 per cent. Moringa leaves have applications in neutraceutical, pharmaceutical and cosmetics industries (agriexchange.apeda.gov.in).

Table 10 revealed that United States of America is the single major country which is capable of absorbing to the tune of 359 tonnes of Moringa Leaf Powder during the year 2016 which is accounted for 68 per cent to the total export of Moringa leaf powder followed by South Korea which is able to absorb 3.70 tonnes of Moringa leaf powder which is accounted for around 7 per cent to the total leaf powder exported from Tamil Nadu. India had exported Moringa leaves worth Rs 14.60 Crores in 2015. The present volume of trade of Moringa products in the International Market is estimated more than US$ 4 billion, which is expected to cross US$ 7 billion by the year 2020 (Anon, 2015).
The countries like United States and European Union have developed a standard for regulating Moringa products. Hence, it is a huge task to dry the leaves in a controlled condition. Usually these leaves are dried in the direct sun light. But there are chances of contamination and discoloration. The Moringa leaves exporting companies in Tamil Nadu are now using the solar drying facility to overcome the hurdles. The solar drying is superior to open drying because of the better quality, maintenance of colour and hygiene.

The fresh Moringa vegetables is being dispatched to different places of India viz., Mumbai, New Delhi, Gujarat, Kerala, Andhra Pradesh, Tamil Nadu, Karnataka and Pondicherry. All the above enlisted products of Moringa are also sent to the above states and the consumers in different states had realized that the products are quality and nutritionally viable according to the certificates and hence the Chief Executive Officer of the firm has to find the ways and means of expanding the business after identifying the required and competent labor force without any negative interventions. The CEO in his words reiterated that there were few constraints in distribution of the value-added produce of Moringa.

They are furnished as follows.

1. Demonetization has resulted in poor circulation of Money for business promotion
2. Introduction of Goods and Services Tax is another major constraint and
3. The transportation and drying problems are visible in almost all the places and hence introduction of solar drier in the leading market centers or in the cities like Madurai, Thoothukkudi, Tiruppur, Karur, Dindigul, Theni etc. where Moringa is cultivated in larger areas become important.

5.5 Role of goods and services tax on Moringa products

The Goods and Services Tax details imposed on the Value-added products of Moringa is analyzed and the results are presented in Table 11.

Table 11 Goods and Services Tax (GST) imposed on the Value-Added Products of Moringa

| Sl. No. | Particulars of Produce | Details of Tax during 2016 (%) | Details of GST charged during 2017 (%) |
|---------|------------------------|-------------------------------|--------------------------------------|
| 01      | Moringa Leaf Tablets   | NIL                           | 12.00                                |
| 02      | Moringa Seed Oil       | NIL                           | 12.00                                |
| 03      | Moringa Drugs / Capsules | NIL                           | 18.00                                |
| 04      | Moringa Leaf Powder    | NIL                           | 05.00                                |
|         | Average                |                               | 12.00                                |

Table 11 revealed that the Moringa products are not commanding any tax during the year 2016. After the introduction of Goods and Services Tax (GST), the Manufacturer is in a position to incur different tax rate for the different products of Moringa. The Moringa leaf tablets and Moringa seed oil had commanded 12 per cent tax while the drugs prepared from Moringa has commanded 18 per cent tax and the Moringa leaf powder alone has low tax which is arrived at 5 per cent. From this one could understand that the yesterday beneficiary has become the looser to certain extent today due to GST. Being the producer cum manufacturer of value added products of Moringa, he could incur higher cost per unit of production and distribution due to the nature of higher margin demanded by the dealers and higher input cost for establishing the plantations under organic situation. The Processing cost of leaves and other products is little high but the details could not be furnished by the CEO considering the secrecy of the business.

5.6 Marketing constraints

Problems or the constraints are inevitable in any production or distribution system. The manufacturers cum Exporter of Moringa produce are much interested in solving their constraints which are enlisted, and they are ranked using the Garrett’s ranking technique and the details are furnished in Table 12.
Table 1 revealed that the major constraints faced by the traders are Demonetization. The demonetization of Indian currency has resulted in poor circulation and hence it affected the business heavily and this constraint stood in the first place among the traders with the score of around 70 in both the districts. The second important constraint is found to be the Goods and Services Tax which is not imposed on the farm produce during the yester years but today it had attracted on an average of 12 per cent tax. It is an impediment to the traders of new entrant into the business. The tax holidays are must for this type of business to promote the trade of Moringa globally especially the agribusiness.

Table 12 Marketing Constraints Faced by the Producer cum Traders

| Sl. No. | Constraints                                                                 | Thoothukkudi District | Tiruppur District |
|---------|------------------------------------------------------------------------------|-----------------------|-------------------|
| 01      | Demonetization has resulted in Poor flow of Money                            | 68.27 Mean Score      | 70.90 Garrett's Mean Score |
| 02      | Higher Tax due to Goods and Services Act                                     | 62.50 Mean Score      | 62.55 Garrett's Mean Score |
| 03      | Transportation Problems                                                      | 46.63 Mean Score      | 66.48 Garrett's Mean Score |
| 04      | Lack of Solar Drying Facility                                                | 61.93 Mean Score      | 55.45 Garrett's Mean Score |
| 05      | Higher Margin to the Dealers                                                 | 48.20 Mean Score      | 49.68 Garrett's Mean Score |
| 06      | Lack of Storage Facilities in the Production Zone                            | 61.10 Mean Score      | 48.26 Garrett's Mean Score |
| 07      | Lack of Price Information                                                    | 35.57 Mean Score      | 36.13 Garrett's Mean Score |
| 08      | Indirect Threats from Government Departments                                | 32.43 Mean Score      | 34.63 Garrett's Mean Score |

Note: Primary Survey from Traders

The third major constraint was the lack of solar drying facility in the production zone. This was reiterated by the leading exporters like SVM Exports of Thoothukkudi District. They opined that the Solar Drying is superior to open drying because of the better quality, colour and hygiene of the Moringa leaves. Due to solar drying, the Chlorophyll content is maintained to the recommended level of around 6.70 per cent and hence the solar drying facility should be erected in major production and trading zone to maintain the quality.

Another important constraint is the demand of higher margin to the dealers and distributors of Moringa based products. Though it is inevitable, large scale operation and maintenance of product quality alone could reduce the margin due to consumer acceptance and demand among the consumers by pronouncing the brand of Moringa products. Hence brand promotion becomes important in this context of growing business on Moringa.

Another constraint pronounced by the Traders with little hesitant and at the same time they stress the constraint also. The constraint is ‘Indirect Threats from the Government Departments’. In all the countries, the Government supports the Farmer-Producer and the exporters of agribusiness by helping them to find easy ways of doing export business. Whereas in India, the exporters of farm produce are facing multiple threats from various departments.

The Government Organizations like FSSAI are demanding the exporters of farm produce to renew the business every year with the Food Unit of FSSAI and the excess money other than the renewal charges become mandatory and hence this has to be checked. Besides this, the private organic certification agency is also demanding money in lakhs for getting organic certification in addition to the regular certification fee. These issues have to be redressed by permitting the existing Government Departments to do the Organic Certification following the USDA / EU standards and by appointing more number of Inspectors. Currently only one Inspector is available for 15 Districts. This had become a big constraint and hence the redressal mechanisms are to be coined by the Government for promotion of Moringa Trade.

6 Conclusions and Policy Implications

The case firm is a registered agribusiness concern in the name of “Miracle tree Life Science” was established during the year 2015. A partnership enterprise registered with appropriate authorities and has the validity of registration up to September 2019. Though the head quarter of the company is based at Madurai, it extends its tentacles to different parts of the state for raw material procurement, processing and value addition and capable of
preparing value added products numbering 18 to its credit within a short span of time. They had the banner of “Organic Moringa”. To keep up the promise of “Organic Moringa” they took stringent measures in both production, processing, value addition and distribution functions. These are carefully monitored by several agencies and the “Good Management Practice” certificate had also been received to its credit.

Among the various products, the Moringa Wunder Mix is exported to Germany and has received good repute to the firm. One hundred gram of Wunder Mix is priced at Rs 700/. The ingredients used are costly one and is being used for general health and vitality in human. Other Products like Moringa oil and Moringa leaf tablets are priced at Rs 370 and Rs 360 per unit respectively. India had exported Moringa leaves worth Rs 14.60 Crores in 2015. Among the Value-added products of Moringa, Products like Wunder Mix, Moringa oil and Moringa leaf tablets are priced at Rs 700, 370 and Rs 360 per unit respectively. When one could listen to the export of Moringa leaf powder, the United States of America is the single largest country is capable of absorbing 68 per cent of the total Moringa leaf powder dispatched from Tamil Nadu followed by South Korea. Being the producer cum manufacturer of value added products of Moringa, he could incur higher cost per unit production and distribution due to the nature of higher margin demanded by the dealers and higher input cost for establishing the plantations under organic situation.

7 Recommendations
The need of Value added products of Moringa is growing alarmingly both in Regional, National and International Markets and hence the technology and infrastructure support must be provided by establishing a “National Research Centre for Moringa” or a Commodity Board on the lines of “Tea Board” may be established and pronounced as a “Moringa Board” for tapping its potentials both in production, processing and Export.

Quality Certification should be given by Agricultural and Processed Food Products Export Development Authority (APEDA) and it can empower some more organizations to do quality certification to avoid bribe and it should impart competition into the certification issues and the manufacturer should be provided with doorstep service to maintain the quality without any hassle.

References
Anwar F., Ashraf M., Bhanger MI., 2005, “Interprovenance Variation in the Composition of Moringa oleifera Oilsseeds from Pakistan”, Journal of American Oil Chemists Society, 82: pp. 45-51
https://doi.org/10.1007/s11746-005-1041-1

Anwar F., Bhanger MI., 2003, “Analytical Characterization of Moringa oleifera Seed Oil Grown in Temperate Regions of Pakistan”, J Agric Food Chemistry, 51: pp. 6558-6563
https://doi.org/10.1021/jf0209894

D’souza J., Kulkarni A.R., 1993, “Comparative Studies on Nutritive Values of Tender Foliage of Seedlings and Mature Plants of Moringa oleifera Lam”, Journal of Ecology, Taxonomy and Botany, 17; pp. 479-485

Dillard C.J., German J.B., 2000, “Phytochemicals: Nutraceuticals and Human Health: A Review. Journal of Science, Food and Agriculture, 80: pp. 1744-1756
https://doi.org/10.1002/1097-0010(20000915)80:12%3C1744::AID-JSFA725%3E3.0.CO;2-W

Estrella M.C.P., Mantaring J.B.V., David G.Z., 2000, ”A Double Blind, Randomized Controlled Trial on the use of Malunggay (Moringa oleifera) for augmentation of the volume of Breastmilk among Non-Nursing Mothers of Preterm Infants, Philippines Journal of Pediatrics, 49: pp. 3-6

Government of Tamil Nadu (2012), “Season and Crop Report of Tamil Nadu”, (Chennai: Directorate of Economics and Statistics), pp. 148-150

Government of Tamil Nadu (2016), “Season and Crop Report of Tamil Nadu”, (Chennai: Directorate of Economics and Statistics), pp. 139-140

Siddhuraju P., Becker K., 2003, Antioxidant Properties of Various Solvent Extracts of Total Phenolic Constituents from three Different Agro-Climatic Origins of Drumstick Tree (Moringa oleifera Lam.), J Agric Food Chem, 15: 2144–2155
https://doi.org/10.1021/jf020444t