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Variable Geographical Situations with subsequent Horticultural Diversities across the State of West Bengal

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ABSTRACT

The state of West Bengal has huge geographical diversities. With respect to the geographical classification the entire bulk area of the state, thus can be divided into many physiographic regions. Each physiographic region has its own distinguished features. The climate, the weather pattern, the soil type and other abiotic factors associated are quiet different in these regions. Therefore as the non living parameters are variable, the change or differences with respect to biotic factors, especially the plants are also very much obvious. These distinguished physiographic regions with different situation increases the potential of our state with respect to cultivation of many type of crops. Horticulture which comprises a huge category of plants like vegetables, fruits, flowers, spices, plantation, medicinal and aromatic plants are very much varying across these geographical and climatic alterations. The paper hence highlights the types of horticultural crops and their variations in these geographical conditions of West Bengal.

1. Introduction

Horticulture is a very important sector which contributes the economy of the country in many ways. Horticulture is an integrated branch containing many smaller divisions under it. Different branches of horticulture are Olericulture (study of vegetable crops), Pomology (science associated with the learning of fruit crops), Floriculture and landscaping (which deals with the study of all sorts of flowers and landscape development) Spices, Plantation, Medicinal and Aromatic Crops (a division which is associated with the education of spice crops like black pepper, ginger, turmeric, cardamom, cinamom etc.; plantation crops which have a high gestation period and their yield requires certain amount of processing before utilization like tea, coffee, rubber, cocoa etc.; medicinal plants like isabgul, swarpagandha etc. and aromatic plants like lemon grass, citronella etc.) and lastly Post Harvest Technology of Horticultural Crops (which deals with the post harvest study of various horticultural crops and how to increase the longevity and shelf life of the commodity after harvest with minimum deterioration in quality). Therefore overall horticulture in a nutshell can be defined as science for development and management of vegetable, fruits, flowers, spices and medicinal and aromatic plants with innovative approaches and modern ways of cultivation helping in providing remunerative returns to different personnel's associated at various steps (Report of the Working Group on Horticulture, Plantation Crops and Organic Farming, 2007).

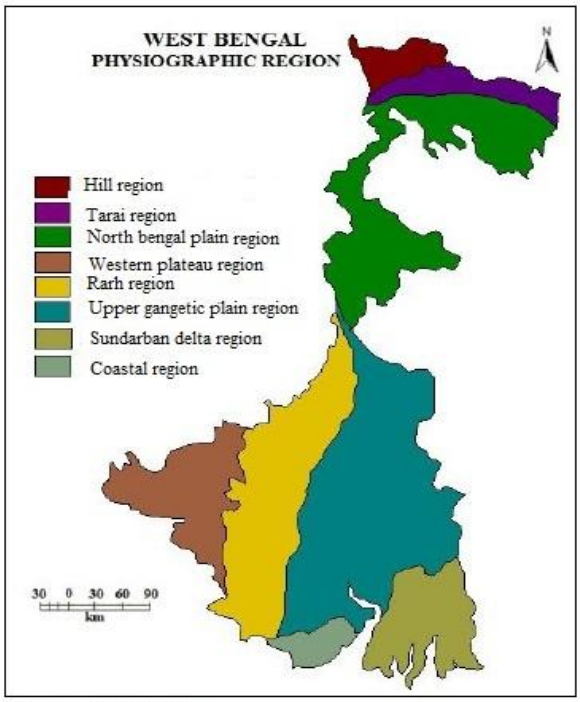
Horticultural plants or crops plays distinctive role in the state economy. Production of these types of crops is basically labour intensive in nature, which helps to generate huge employment opportunities. Apart from the utility of these produces in the local or domestic markets in raw or processed forms, they have tremendous export potential helping in boosting the foreign exchange of our country. The state occupies ninth position in fruit production in our country with an average of 220.6 thousand hectare and 3,172.5 thousand tones of fruits during 2012-13 (State of Environment Report, West Bengal, 2016).West Bengal has highly diversified nature of economy. Agricultural activity alone contributes 20% of its total domestic production and about 62.7% people are directly dependent on this sector. This sector has high impact in terms of economy and employment. More than 8% of the total production of food grain of our country is produced in West Bengal (Economic Review 2017-2018). In our country the state is also the largest producer of vegetables, pineapple, litchi, flower, mango, mandarin orange (Economic Review 2017-2018).

This state of Bengal is situated in the eastern part of the country. It is decorated by the great Himalayas at its head or the northern region and the foot i.e. the southern province is washed and cooled by the waves of Bay of Bengal (Groundwater Arsenic Contamination Status in West Bengal, 2016). Horticulture is very much predominant in our state of West Bengal. The state with its wide geographic variability becomes a cultivation hub of majority of the horticultural produces. If we consider the exact geographic location of the state with respect to its latitude and longitude we will find that it is in between 85^0 50 minutes and 89^0 50 minutes with respect to the longitude for east and 21^0 25 minutes and 27^0 13 minutes for the latitude of north (Groundwater Arsenic Contamination Status in West Bengal, 2016). The total available space in the state is also quiet enough. The comprehensive area for the state is about 88,752 square kilometers (Statistical Facts about India, 2006). The location of the state and its climatic and environmental pattern is very much congenial for development of an array of crops having diversified morphological and anatomical discrepancy.

2. Physiographic regions and horticultural variation

With respect to the geographic pattern of the state of West Bengal, it is differentiated in many physiographic regions. Each of the regions is having variable soil and climatic condition and

innumerable diversities can also be found with respect to the flora and fauna. Horticulture is also strongly related with these different geographical conditions and land forms. Variability of horticultural crops with respect to the type, their production and productivity, nutrient status (same crop grown in two different condition may show dissimilarity with respect to their nutrient content), post harvest life, cosmetic appearance etc. are seen among the crops grown in these different physiographic region of the state. The horticultural crop diversification and production according to different physiographic region are as follows.



Source: NATMO Maps,

2.1 Hill region

This is one of the important and prevalent regions of the state. If the geographical location is considered, it is in the north western sector. This physiographic region is a part of the ranges of the east Himalayas. The district of Darjeeling (except Siliguri) and Kalimpong comes under this region. High altitude, steep tarrain, heavy rainfall (250-350 Centimeter) is the main facet of this part of West Bengal. It has maximum elevation of about 12,000 feet (4000 metres) above the sea level. This hilly portion mainly entail of brown forest soil which is acidic in nature. Climatic conditions of the region are as such that it favors the growth and development of many temperate horticultural crops. The hills of Darjeeling and Kalimpong district provide exact weather conditions which are required by many winter loving crops. Many temperate fruit crops like apple (*Malus domestica*), pear (*Pyrus* sp.), peach (*Prunus persica*), strawberry (*Fragaria ananassa*), passion fruit (*Passiflora edulis*) etc. are seen to be easily grown here. District of Darjeeling ranks first with respect to area and production of pineapple (Statistical abstract, 2015). Tea (*Camellia sinensis*) and coffee (*Coffea.* sp.) are the main plantation crops cultivated here. Darjeeling tea today is famous not only in India but across the globe for its quality. Furthermore these provinces is the home for majority of Orchids which are having huge demand in the national and international markets. Spices like Large cardamom (*Ammom sabulatum*) are also famous from this region (Joint Inspection Team Report, 2016-17).

2.2 Terai region

This proportion of land form contains high moisture in the soil. The zone is mainly related to the swampy pastoral regions along with tree plantations including forests and the savannas which are present in the foot hills of the Himalayan range. Considering the area of this particular physiographic region, it is extended in the southern part of the Himalayan hilly region for about 38 kilometers. The soils of this area is not completely black in origin, however it is sandy and sandy loam types, porous in nature, consisting of gravels and pebbles and mainly acidic in nature. The rainfall varies 200-300 centimeter per year. High water table of the regions helps in sustaining many horticultural crops which are hydrophilic in nature. The districts of Jalpiguri, Coochbehar and Alipurdwar can be said in accordance to this type of the geographical physiographic region. The district of Jalpiguri have even got its name from a horticultural fruit, olive (*Oliea europea*) commonly called as 'jalpai' (Joint Inspection Team Report, 2016-17). Many important horticultural crops are grown in this district. Jalpaiguri holds highest rank in terms of area and production of jackfruit in our state (Statistical Abstract, 2015). In terms of fruit production olive and citrus (*Citrus* sp.) are very important in this region. Jalpiguri district along with Darjelling, Uttar dinajpur and Coochbehar has also been declared as the export zone for pineapple (*Ananas comosus*) by Agriculture and Processed Food Export Development Authority (APEDA) and State Government (State Agriculture Plan for West Bengal). Vegetable of all sorts are cultivated all round the year. Cauliflower (*Brassica oleracea* var. *botrytis*), cabbage (*Brassica oleracea* var. *capitata*), okra (*Abelmoschus esculentus*) are some of the prevalent crops. Tea (*Camellia sinensis*) and arecanut (*Areca catecheu*) are the predominant plantation crops grown in the district of Jalpiguri. With respect to spices ginger (*Zingiber officinale*), turmeric (*Curcuma longa*), garlic (*Allium sativum*) and black pepper (*Pipper nigrum*) holds the major share. For flowers marigold (*Tagetes* sp.) and jasmine (*Jasminum* sp.) contributes a major proportion to the farmer's income (Joint Inspection Team Report, 2016-17).

The districts of coochbehar (CRIDA State Wise Plans for Coochbehar, 11) shows growth of horticultural crops like jackfruit (*Artocarpus hetrophyllus*), litchi (*Litchi chinenesis*), guava (*Psidium guajava*), Mango (*Mangifera indica*) and banana (*Musa* sp.) along with vegetables like chilli (*Capsicum annum*), brinjal (*Solanum melongena*), raddish (Raphanus sativus), cabbage (*Brassica oleracea* var. *capitata*) and cauliflower (*Brassica oleracea* var. *botrytis*). Vegetables of solanaceae family like tomato (*Solanum lycopersicon*) have the highest production along with cucurbits in West Bengal (Statistical Abstract, 2015). The district of alipurdwar is also accountable for much horticultural variability. Banana (*Musa* sp.), lemon (*Citrus limon*), guava (*Psidium guajava*), mango (*Mangifera indica*), roseapple (*Syzygium jambos*) and ber (*Zizyphus mauritiana*) are some of the major fruit crops grown in here. Chili (*Capsicum annum*), brinjal (*Solanum melongena*) and plants of cucurbitaceae family like cabbage (*Brassica oleracea* var. *capitata*), knol-khol (*Brassica oleracea* var. *gongylodes*) etc. are very popular. Arecanut (*Areca catecheu*)

again in the category of plantation crops stands first and medicinal plant like sarpaganda (*Rauwolfia serpentina*) is grown by some growers for remunerative returns (Joint Inspection Team Report, 2016-17).

2.3 North Bengal Plains

The region begins from a part of the Terari region, specially the southern end and extends to the left coast of the sacred river of India, the Ganges. Under this region districts of Uttar and Dakshin Dinajpur, Malda and some previously mentioned districts of Jalpiguri, Alipurdwar and Coochbehar comes. The eastern part known as "Barendrabhumi" is an undulating plain consisting of old alluvium and the western part is made of new alluvium. Horticulture is seen to be in a profuse manner in these districts of the state. With respect to the districts of Uttar and Dakshin Dinajpur horticultural fruit crops like papaya (*Carica papaya*), guava (*Psidium guajava*), banana (*Musa* sp.), jackfruit (*Artocarpus hetrophyllus*), mango (*Mangifera indica*), pineapple (*Ananas comosus*) etc. are seen in abundance. For vegetables, brinjal (*Solanum melongena*), cauliflower (*Brassica oleracea* var. *botrytis*), tomato (*Solanum lycopersicon*), chilli (*Capsicum annum*), cabbage (*Brassica oleracea* var. *capitata*), and peas (*Pisum sativum*) are cultivated in maximum. In the category of spices and plantation crops turmeric (*Curcuma longa*), ginger (*Zingiber officinale*), beetelvine (*Piper betle*), arecanut (*Areca catechew*) and coconut (*Cocos nucifera*) hold the maximum share (CRIDA State Wise Plans for Uttar and Dakshin Dinajpur, 11). The district of Malda has its own significance with Horticulture. The first thing which comes to our mind when we talk about malda is mangoes. The district alone have 30,000 hectare of land exclusively for mango (*Mangifera indica*) cultivation with highest production of 375 thousand tons (Statistical Abstract, 2015), Malda along with Murshidabad is the Agri-Export Zone for Mango (State Agriculture Plan for West Bengal). Apart from it litchi (*Litchi chinenesis*), jackfruit (*Artocarpus hetrophyllus*), papaya (*Carica papaya*) and banana (*Musa* sp.) are the other important fruit crops grown here. Medicinal plants like sarpagandha (*Rauwolfia serpentina*), alovera (*Aloe vera*), tulsi (*Ocimum* sp.) and kalmegh (*Andrographis paniculata*) are present and cruciferous vegetables like cauliflower (*Brassica oleracea* var. *botrytis*) and cabbage (*Brassica oleracea* var. *capitata*) are cultivated in the district of malda (CRIDA State Wise Plans for Malda, 11).

2.4 Western plateau region

This particular region is present at an edge of Chota Nagpur plateau at the eastern side. The region is composed from igneous rocks which are believed to be of Archean period and quartzite type rocks of Carboniferous era. It has the tropical dry sub humid type of climate where rainfall is low (110-150 centimeter) and seasonal in nature which makes the region highly draught prone. The water table content in the area is very low and the district of Purulia, Bankura and Jhargram falls under the mentioned physiographic region. Horticultural crops and the varieties seen to be developed here can tolerate minimum water situation. Overall in these districts guava (*Psidium guajava*), papaya (*Carica papaya*), jackfruit (*Artocarpus hetrophyllus*), mango (*Mangifrea indica*) are cultivated. Date palm (*Phoenix dactylifera*) is also extensively seen to be grown. In the category of vegetables brinjal (*Solanum melongena*), cabbage (*Brassica oleracea* var. *capitata*), okra (*Abelmoschus esculentus*), cucurbits, tomato (*Solanum lycopersicon*) etc. are grown (CRIDA State Wise Plans for Purulia and Bankura, 11,).

2.5 Rarh Region

It's a very broad physiographic region containing a bigger part of the state of west Bengal. This particular zone lies in between the Delta (created by river Ganges) and the Vajjabhumi. Birbhum, Purba and Paschim Bardhaman, Murshidabad and Peschim Medinipur falls under this region. The elevation of the region is around 50-100 msl. This region is mainly covered with red lateritic soil. The horticultural situation of the given physiographic region also varies accordingly. For the districts of Purba and Paschim Bardhaman vegetables of cucurbitaceae family, ranks first in consideration to area (Statistical Abstract, 2015) and okra (*Abelmoschus esculentus*) and tomatoes (*Solanum lycopersicon*) are also profusely grown. No such plantation, medicinal and aromatic plants are cultivated in commercial scale but fruit crops like guava (*Psidium guajava*), papaya (*Carica papaya*) and banana (*Musa* sp.) are grown (CRIDA State Wise Plans for Bardhaman, 11). In Murshidabad district horticultural fruit mango (*Mangifera indica*) is again abundantly grown and cultivated. Here mango holds a share of 16.1 thousand hectare of the cultivable land. Mursidabad have the highest position in terms of area and production (29 thousand tons) of Litchi (*Litchi chinenesis*) in our state (Statistical Abstract, 2015) and guava (*Psidium guajava*) are some of the other major fruit grown here. Cucurbits and cruciferous group of vegetable plants are the other majorly cultivated horticultural vegetable crops (CRIDA State Wise Plans for Murshidabad, 11). Vegetables like cabbage (*Brassica oleracea* var. *capitata*) and cauliflower (*Brassica oleracea* var. *botrytis*) have the maximum share in accordance to area and production for the district of Murshidabad (Statistical Abstract, 2015). In Birbhum district brinjal (*Solanum melongena*) is grown in an area of 9.9thousand hectare and cucurbits holds the second share of 9.3thousand hectare of land. Apart from the vegetables some common fruit crops as mentioned earlier are cultivated in this region (CRIDA State Wise Plans for Birbhum, 11). In the district of Peschim Medinipur mango holds the principle share of land (5.63thousand hectare) followed by banana (1.49thousand hectare). Among vegetables, brinjal (*Solanum melongena*) is cultivated in 9.35 thousand hectare of land and cucurbits in 9.11thousand hectares (CRIDA State Wise Plans for Paschim Medinapur, 11) and onion (*Allium cepa*) holds the highest share with respect to the area in West Bengal (Statistical Abstract, 2015).

2.6 Upper gangetic plain region

This physiographic region is associated with the districts of Nadia, Hoogly, Kolkata and North 24 Parganas. District of Nadia is a vegetable hub of our state. It is the leading producer of many vegetables including of different families. The district of Nadia (also including the districts of Murshidabad and North 24 Parganas) is an Agri Export zone for vegetables (State Agriculture Plan, West Bengal). Many major fruit crops and vegetables are grown and cultivated here (CRIDA State Wise Plans for Nadia, 11). The district of Nadia according to Statistical Abstract, 2015 ranks first with respect to the area and production of banana (*Musa* sp.) and okra (*Abelmoschus esculentus*). In the districts of North 24 Parganas fruits for

example mango (*Mangifrea indica*), jackfruit (*Artocarpus hetrophyllus*), papaya (*Carica papaya*), guava (*Psidium guajava*) and vegetables like tomato (*Solanum lycopersicon*), peas (*Pisum sativum*), cabbage (*Brassica oleracea* var. *capitata*), brinjal (*Solanum melongena*), cauliflower (*Brassica oleracea* var. *botrytis*) etc. can be extensively seen (CRIDA State Wise Plans for North 24 Parganas, 11). In the district of Hoogly, Onion (*Allium cepa*) ranks highest with respect to its production (Statistical Abstract, 2015) and fruit crops like litchi (*Litchi chinenesis*), papaya (*Carica papaya*) and mango (*Mangifera indica*) are grown (CRIDA State Wise Plans for Hooghly, 11).

2.7 Sundarban delta region

It is the lower portion of the gangetic plains. The region has very high water table. The main geographical attraction of this physiographic region is the Sunderban delta which is the home of countless species of plants and animals. The district of South 24 Parganas and a part of Howrah comes under this type of region. The sunderban delta is famous for having the biggest mangrove accumulation of the world. In these mention districts horticultural fruit crops like guava (*Psidium guajava*) and sapota (*Manilkara zapota*) are grown. South 24 pargana gets highest rank for area and production of Sapota (*Manilkara zapota*) fruit in our state (Statistical Abstract, 2015). Apart from this other fruit crops like papaya (*Carica papaya*), litchi (*Litchi chinensis*) and mango (*Mangifera indica*) are also cultivated. This district of South 24 Parganas associated with districts of North 24 Parganas, Malda and Murshidabad is the Agri Export zone for Litchi (State Agriculture Plan for West Bengal) Vegetable like raddish (*Raphanus sativus*) and peas (*Pisum sativum*) have the highest area and production in the district of South 24 Parganas (Statistical Abstract, 2015). Also vegetables of cucurbitaceae family like, cabbage (*Brassica oleracea* var. *capitata*), brinjal (*Solanum melongena*), cauliflower (*Brassica oleracea* var. *botrytis*) etc are seen to be cultivated in the district of South 24 parganas (CRIDA State Wise Plans for South 24 Parganas, 11).

2.8 Coastal region

This physiographic region contains limited area and is located at the southern end of West Bengal. Considering the district wise classification some portion Purba Medinipur comes under it. Those horticultural crops are grown which can tolerate the climatic conditions prevalent in these areas. Vegetables crops of solanaceae family like tomato (*Solanum lycopersicon*) and brinjal (*Solanum melongena*) and those of cruciferae family like cauliflower (*Brassica oleracea* var. *botrytis*) and cabbage (*Brassica oleracea* var. *capitata*) are grown. The area for cucurbits is 10.55 thousand hectare in Purba Medinipur (CRIDA State Wise Plans for Purba Medinapur, 11). Fruit crops like, papaya (*Carica papaya*), banana (*Musa*. Sp.), mango (*Mangifera indica*) and citrus (*Citrus* sp.) are popular in here (CRIDA State Wise Plans for Purba Medinapur, 11). Beetle vine (*Piper betle*) and cashew (*Anacardium occidentale*) cultivation in some portions are also seen.

3. District wise horticultural scenario in West Bengal

The production status of horticultural crops in different districts of West Bengal is mentioned hereunder. With respect to the vegetable production for the year 2014-15 (Fig. 1) the districts of South and North 24 Parganas, Nadia and Murshidabad have highest production. Considering fruit production of year 2014-15 (Fig. 2) districts of Nadia, Murshidabd and North 24 Parganas holds the maximum share.

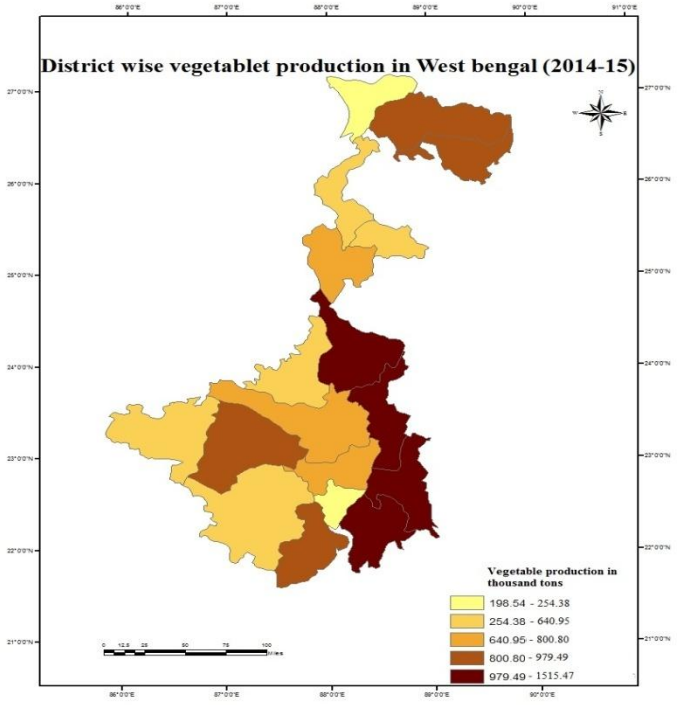


Fig. 1 (*Source: Statistical Abstract, 2015*)

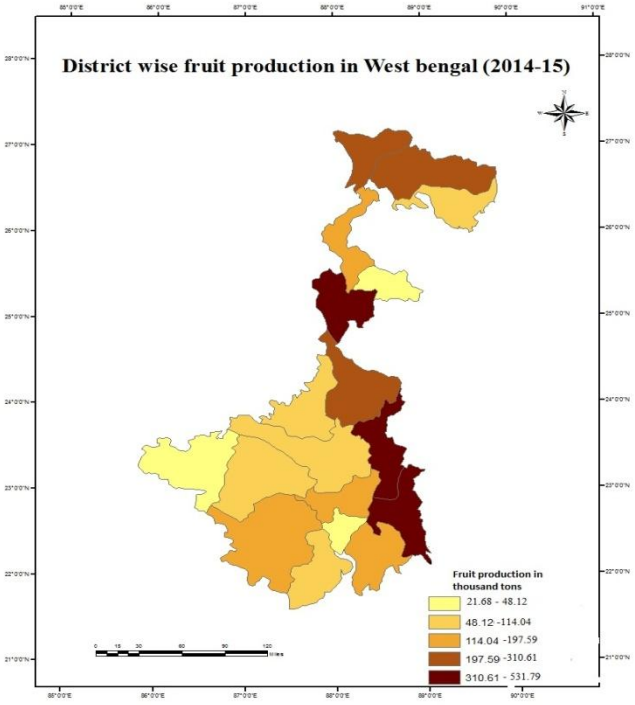


Fig. 2 (*Source: Statistical Abstract, 2015*)

The following figures (Fig. 3, 4, 5 & 6) show the district wise leading area (thousand hectare) and production (thousand ton) of fruits and vegetables (2014-15) of West Bengal.

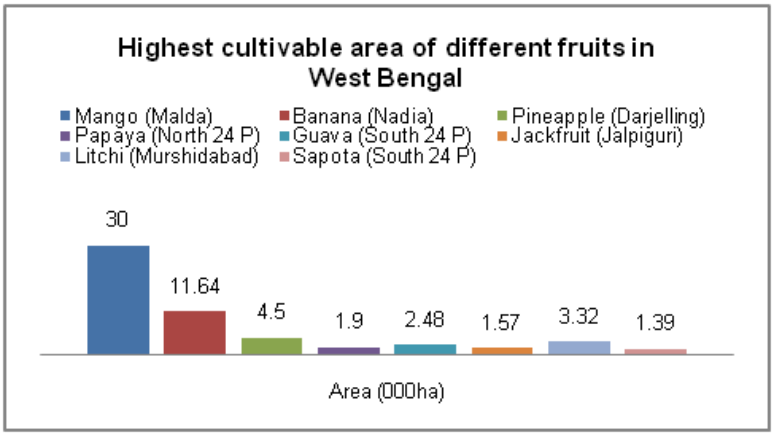


Fig. 3 (Source: Statistical Abstract, 2015)

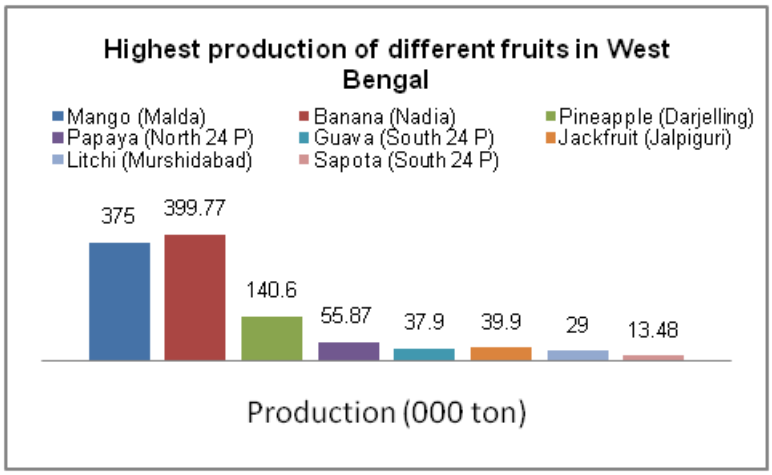


Fig. 4 (Source: Statistical Abstract, 2015)

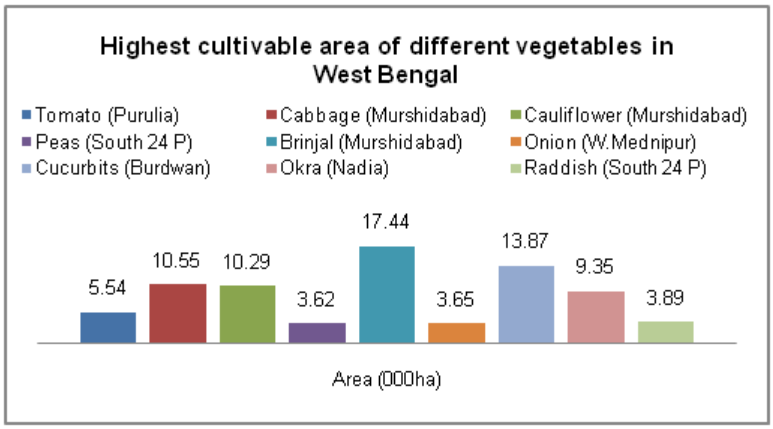


Fig. 5 (*Source: Statistical Abstract, 2015*)

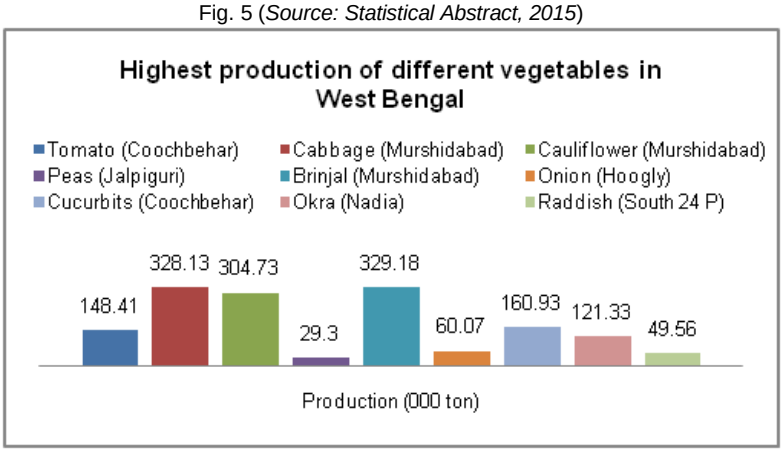


Fig. 6 (*Source: Statistical Abstract, 2015*)

4. Conclusion

Thus from the review it can be seen that how different types of horticultural crops are flourishing according to the variable geographical situations. So considering the fact that horticulture is a principle sector today, more innovative practices should be developed for the growth and development of different crops in these physiographic regions. Care should be taken that the technology adopted should be environment friendly and the crops cultivated should be able to cope up with the environmental pattern of an area or the given physiographic region.

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