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Puthuma Joy
Assistant Professor,
Department of Economics
Mar Athanasius College,
Kothamangalam Mahatma
Gandhi University, Kottayam
Ernakulum District, Kerala,
India

Corresponding Author:
Puthuma Joy
Assistant Professor,
Department of Economics
Mar Athanasius College,
Kothamangalam Mahatma
Gandhi University, Kottayam
Ernakulum District, Kerala,
India

Challenges of climate change on spice crops in Kerala

Puthuma Joy

Abstract
Kerala is blessed with a neutral atmosphere. The State has usually two rainy seasons viz. the Southwest monsoon that attains near the end of May or early June, which is known as edavapathi and Northeast season which hits the State during mid-October which is known as thulam. The monsoon rains was a part of the State every year, however, the Southwest season of 2018 had a different impact as the monsoon caused in a disastrous flood. The floods of Southwest season can be comprehended as an evident example of global climate change impact with very heavy rainfall in a short span of time as indicated and forecast by the Fifth Assessment Report published by the Intergovernmental Panel for Climate Change in 2014 (IPCC). The unprecedented heavy rains, storms and floods have affected exorbitant losses to the agriculture sector. Kerala cultivates around 1, 62,660 ha of spice crops across the state with a production of 1,40,000 tonnes. Nearly 62 per cent of the total area covered by Idukki and Wayanad together. Black pepper, cardamom, nutmeg, ginger, turmeric and clove were the major crops considered in the study which contribute additional 90 per cent of the total spice crops produced in the state.

Keywords: Edavapathi, thulam, gobal climate change, spices, agriculture

1. Introduction
Agriculture is a gamble with the monsoons. About 60% of India's farms depend on rains for their existence, so the monsoons are indeed essential to India's agriculture, which accounts for a sixth of the country's economic output. Indian spices have been one of the prime sources of the fabulous wealth and prosperity of the Malabar Coast of India. Fortune seekers and Invaders by overcoming the nature's barriers travel to India with the main object of capturing Spice trade. Then Indian spices travel to Far and wide to traditional destinations to prepare food, beverages and to beautify their women of many countries. Climate is the primary determinant of spice production in India. India has a well-known reputation as a Land of Spices from time immemorial explorers and foreign Invaders from European countries for attractive mainly by the spices of India [1]. Spices are cultivated in varied agro-climatic regions from tropical to temperate. India is blessed with different climatic situations and every state in India promotes one or the other spices and production ability of the state vary. Most of the tree spices such as clove, nutmeg, cinnamon, allspice, curry leaf and vanilla are cultivated in and around Western Ghat region; seed spices are concentrated in Western India; chilli, ginger, turmeric and coriander are cultivated throughout India, almost in all the states; large cardamom is confined to Eastern Himalayas; whereas, saffron grows in Jammu and Kashmir and parts of Himachal Pradesh. Some spices needexact ecological niche and others have wider flexibility. The lion share of spices production of states to all India production is high in Rajasthan (17.1), Andhra Pradesh (13.5%), Madhya Pradesh (13.3%), Gujarat (10.7%) and Telangana (9.7%). More than 50 spices are cultivated in India, we have major contribution towards area and production only for around 20 spices. Spices share 14.8% in area and 2.7% in production of aggregate horticultural crops in India. The global demand for a variability of spices has sustained to rise in the past few years due to the vast increase in the consumption of convenience foods, snacks and confectionary. The expanded market for processed and ready-to-eat food foodstuffs has also had enormous positive influence on the overall world-wide consumption of a variability of spice

1.1 Statement of the problem
Spices are cultivated in different agro-climatic regions from tropical to temperate. Climate change is going to affect major spice crops like Black pepper, Cardamom, Nutmeg, Clove, Ginger, and Turmeric in India. Climate is the least manageable of all resources.

1.2 Objectives of the study
1. To analyse district wise agriculture damage during the year 2018-2019.
2. To identify the consequences of flood on spice crops in that particular year.

1.3 Methodology
Secondary data is used for the analysis of data

1.4 Period of the Study
The period of the study is 2018-19

2. Present agriculture scenario of Kerala
The number of people engaged in agricultural activities has been reducing in the State due to high returns from other entrepreneurial ventures or business and service sectors. The population of agricultural labourers in Kerala is also decreasing due to migration of labour force to construction, manufacturing and service sectors. On analysing the census population of cultivators and agricultural labourers in the State in 2001 and 2011 years, it is observed that both the number and share of cultivators and agricultural labourers had reduced. The decadal rate of decline of cultivators and agricultural labourers is 7.4% and 18.4% respectively. While a slight increase of female cultivators has been recorded during the decade.Kerala witnessed unprecedented rainfall and flood during June to August months of last two years. The state received 2387 mm of rainfall during this period as against the normal value of 1649.5 mm. Thirty-five dams within the state were opened simultaneously for the first time in history. Around 500 people have lost their lives and over a million people had to be evacuated because of the worst floods witnessed by the state. The flooding has affected hundreds of villages, destroyed an estimated 10,000 km of roads and destroyed thousands of homes. All these created havoc across the state and seriously impacted the state's economy across all sectors [1].

2.1 Damages to agriculture
The unprecedented heavy rains, storms and floods have caused exorbitant losses to the agriculture sector. The details of district wise crop losses are given in Table 1. It may be noted that in Kerala, majority of the farmers are small and medium categories.

Table 1: District wise agricultural damages

District	>33% crop loss extent (ha)
Thiruvananthapuram	1356.96
Kollam	869.73
Pathanamthitta	12085.05
Alappuzha	12095.55
Kottayam	7170.71
Idukki	5745.97
Ernakulam	1296.66
Thrissur	3569.25
Palakkad	6250.43
Malappuram	5275.4
Kozhikode	627.04
Wayanad	1876.8
Kannur	926.53
Kasargode	199.29
Total	59345.37

Source: Disaster Management, Government of Kerala

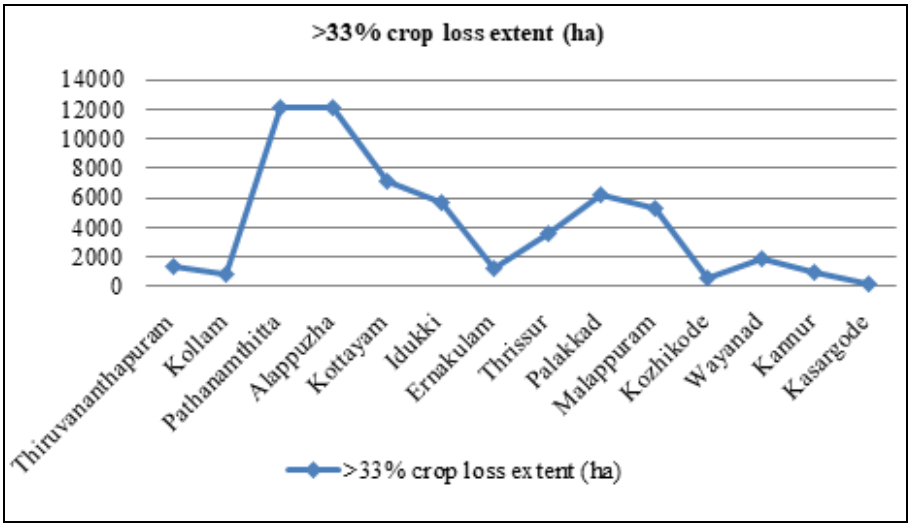

Fig 1: District wise agricultural damages

2.2 Impact of flood on spice crops
The devastating floods have crippled the state's agriculture production in which the plantation and spice crops are the backbone. Kerala cultivates around 1,62,660 ha of spice crops across the state with a production of 140,000 tonnes. However, Idukki and Wayanad together account for nearly 62 per cent of the total area under spices in the state. To gain a quick understanding of the nature and extent of damages caused by rains and floods in spice crops, those districts with high share in area under major spice crops were purposively selected for the study. Incidentally these districts also witnessed a high quantum of south west monsoon. The major crops considered in the study were black pepper, cardamom, nutmeg, ginger, turmeric and clove which contribute more than 90 per cent of the total spice crops cultivated in the state [2].

Table 2: Production loss in spices

Crop	Area affected (ha)	Production loss in 2018-19 (tonnes)	Value (Million INR)
Black pepper	26613	10700	4027
Cardamom	15655	6600	6795
Nutmeg	4400	2749	1018
Clove	160	13	9.3
Ginger	1030	4100	605
Turmeric	395	976	86.8
Total	48,253	25138	12541.1

Source: Indian Institute of spice research

The crop loss data collected and compiled by the state agricultural department was further firmed up by to taking

into account the crop specific indirect damage due to biotic and abiotic factors to arrive at the production impact of the natural calamity. In black pepper a production loss of about 10,700 tonnes valued at 4,027 million INR is estimated at the prevailing average price for the year 2018-19. The production loss in cardamom is estimated as 6,600 tonnes valued at 6,795 million INR which is around 38.5% crop loss. In a perennial tree spices like nutmeg and clove, the loss in quantitative terms is pegged at 2,749 tonnes of nutmeg valued at 1,018 million INR and 13 tonnes of clove with a value of 9.3 million INR. Meanwhile, ginger and turmeric, the two biannual rhizomatous spice crops, have met with a crop loss of 20% and 15%, respectively. In total, around 48,253 ha have been affected leading to a production loss of 25,138 MT of spices having a value of 12,541 million INR [3-4].

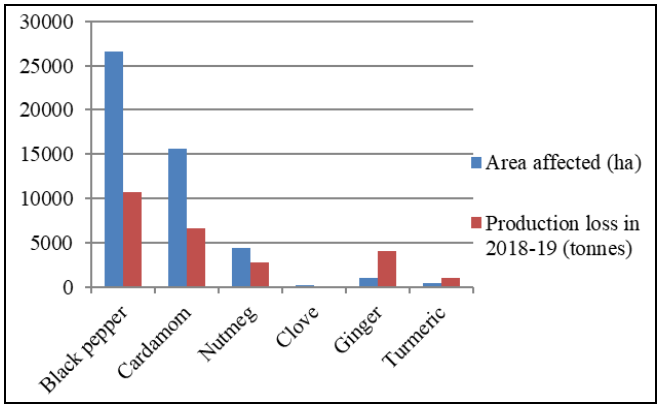

Fig 2: Production loss in 2018-19 (tonnes)

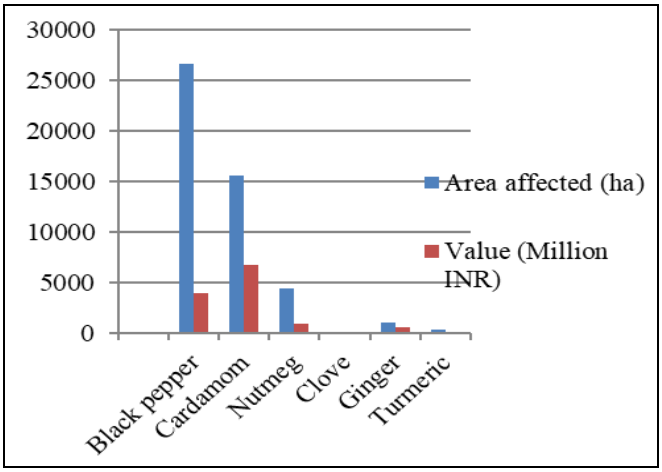

Fig 3: Value loss in spices 2018-19 (Million INR)

2.3 Strategies for facing the challenge

Specific measures can offer a successful adaptive response if they are accepted in appropriate situations. Important approaches include:

- Provide training and general education to farmers dependent on agriculture.
- Research on new high yielding variety development
- Infrastructure facilities like transportation, communication and proper marketing need to be improved.
- Practice of inter cropping system instead of monocroping system.
- To provide institutional support in the form of crop insurance
- Adopting water harvesting schemes

3. Conclusion

Climate is the least controllable factor of all resources. Hence, to avoid the ill effects of climate change, more consideration has to be paid to other resources and technologies viz. soil, irrigation water, nutrients, crops and their management practices, to retain the productivity and to ensure food and environmental safety to the country. Long term and short term variations in climate and weather are most sensitive to agriculture crop. Crop yield is the culmination of a differentpara meters like soil, seed, pest and diseases, fertilizers and agronomic practices exercisemajorstimulus on crop yield. Climate change will have an economic effect on agriculture, including changes in farm productivity, prices, supply, demand and trade. Climate change could thus have far reaching effects on the patterns of trade between nations, development and food security. Adaptive methods are to be taken in a timely fashion, both at the farmers' level (backed by strong agriculture/climate research and application oriented outputs) as well as at the policy makers' level to enable the small and marginal farmers to cope with the adversities of climate change.

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