ISSN: 2278-4632
Vol-10 Issue-5 No. 8 May 2020

Climate Change and Pokkali Farming in Kerala

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Abstract

Changing nature of climate affects agricultural activities to a great extent, since agriculture depends on local climatic parameters like temperature, rainfall and humidity. Historically, agriculture has shown high levels of adaptability to climatic variations. Pokkali farming in Kerala is such an agricultural practice, once well known for its climatic resilience and adaptability, is now under the threat of unpredictable climatic conditions. This paper is an attempt to review the existing literature on ecological peculiarities of Pokkali farming and significant climatic challenges it has to face in recent years.

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Funding Information – No external funding is received for writing this paper.
Conflict of Interest – To the knowledge of the author, no conflict of interests are involved.

Introduction

For a long time, climate change has been continuing as a top discussing topic in the world. Food shortage and resource depletion are some of the problematic and significant climatic challenges of the twenty-first century (Rugman, 1998). Climate change is a major shift in weather patterns that take place over periods ranging from decades to millions of years (Rupan et al. 2018). International Panel on Climate Change 2007 defined climate change as any change in the average daily weather pattern over an extended period, whether due to natural variability or as a result of human activity as happening now, and is already affecting many natural systems around the world. Climate change at the national level implies measurable changes, permutations and unknown regional variations in temperature, rainfall, and extreme climatic events and their individual or collective impacts on various agrarian activities (Lasco et al. 2011; Abubaker, 2013; Birthal, 2014). Climate change threatens both developed and emerging economies regarding agricultural production and food security (Edame, 2011). Farming is the cornerstone of any agro-based economy, while being the most vulnerable to extreme climate change. Climate change negatively affects both crop and livestock production systems in most regions and also affects natural resources in the form of water scarcity, pollution and soil degradation (Papers

ISSN: 2278-4632
Vol-10 Issue-5 No. 8 May 2020

2014). In such a way, climate change directly or indirectly is becoming a growing threat to people and their livelihood especially in developing countries like India (Rupan, 2018).

The upcoming severe climatic events such as increased rains, floods, frost, droughts and heat waves have profound impact on the conditions in which agricultural activities are conducted and the whole value chain of crop production (Tairy, 2017). Majority of the developing countries that primarily depend on the agricultural sector are highly vulnerable to the effects of these climate crises (Fazal, 2013). In the short run, climate variability causes fluctuations in agricultural production while in the long term, increasing climatic variability results in low agricultural productivity (Khatri-chhetri, 2016). It affects the agro-based economy seriously, as the activities of the industrial and service sectors depend mainly on the activities of the agriculture and allied sector. Thus agrarian activities have a ripple effect on the whole economy (Fazal, 2013).

Generally, climate change may influence farming activities in different ways:

- Variations in crop quantity and quality.
- Changes in agricultural practices, through varying water use and agricultural inputs
- Changes in soil quality
- Differences in rural space in the form of cultivable land loss and revived cultivable land.
- Changes in adaptation, when species can become more or less competitive, and human beings may develop urgent needs to produce more competitive species, such as flood-resistant or salt-resistant rice varieties (Rupan, 2018).

These significant effects of climate change on agriculture production reveal the relevance of adaptation. IPCC 2007 describes climate change adaptation as the adaptation of natural or human structures in response to real or anticipated climate stimuli or their effects that mitigate harm or exploit beneficial opportunities. Historically, agriculture has shown high levels of adaptability to climate variations. One such agricultural activity practiced in Kerala is Pokkali Farming. This paper is an attempt to review the existing literature on the ecological peculiarities of Pokkali farming and major challenges it has to face due to the climatic changes in recent years. For this purpose, the whole paper is organized into four sections; Section 1 explains about Pokkali Farming; Section 2 focuses ecological features of Pokkali Farming; Section 3 examines climatic challenges faced by Pokkali farming; Section 4 concludes the paper.

Section 1: What is Pokkali farming?

Pokkali rice cultivation is a unique system of farming that has evolved through ages by the farmers of Central Kerala for the maximum utilization of available resources without affecting the ecosystem. Pokkali is a saline tolerant variety of rice. It is cultivated in low lying lands in Alappuzha, Thrissur and Ernakulam districts of Central Kerala. June to early November

ISSN: 2278-4632
Vol-10 Issue-5 No. 8 May 2020

is rice cultivation period, at that time level of salinity is less in the field. When the salinity is high, from mid-November to mid-April prawn, cultivation is carried out in the same field. During this period, the prawn seedlings swim in from the backwaters after paddy harvest, and the residues of the paddy become feast for them. Wooden sluice gates are used to control the water flow into the fields. For the rice crop, the farmers do not use any fertilizer or manure (Sathiadhas, 1989). It draws nutrients from the prawns' excrement and other leftovers. The seedlings grow naturally since the tidal flows make the soil fertile. So there is no need for manure or fertilizer (Sasidharan, 2012). The Pokkali rice plants grow up to two meters to survive in the waterlogged field. However, when they get matured, they lean over backwards and collapse. Only the panicles stand right. By the last week of October, it is harvested with the help of canoes. After panicles are cut the rest are left to decay in the water. It becomes feed for the prawns that would arrive in November - December. Then, the prawn filtration, which is the second phase of Pokkali cultivation, starts (Sudhan et al., 2016). Thus the Pokkali field is said to be a peculiar ecosystem having rich biodiversity and ability to generate alternatively organic salinity resistant paddy and prawn (Anson, 2014)

Pokkali is well known for its taste and its high protein content. Farmers claim that in the early days, because of several medicinal properties of the rice, fisherman could stay in the water all day. Its grains are large compared to other rice variety. For its geographical uniqueness, Pokkali rice variety got the Geographical Indication (GI) tag in 2008. The Pokkali farmers received the Plant Genome Savior Award in 2011 for breeding such a special variety.

Section 2: Ecological features of Pokkali farming

Efficient use of the ecological process occurs in Pokkali farming making it environmentally friendly. Absence of chemical inputs ensures an organic rice production system with less cost compared to usual paddy cultivation. In this farming system, the major ecological concerns such as loss of diversity, natural resource depletion and coastal degradation are comparatively less (Abraham, 2004). Following are major ecological features of Pokkali farming.

1. Diversity

eBird, an online citizen science platform, where birdwatchers upload their daily bird watching data, has listed 174 bird species out of 430 birds' checklist since 2011 in Pokkali fields near the Kadamakkudy rice field. A total of 100 species of aquatic macrophytes were noticed in and around the Pokkali wetland area. They include wetland macrophytes, mangroves and mangrove associates and terrestrial plants. Pokkali wetland contains 50 species of fishes belonging to 29 families and 11 orders. The most dominant order was Perciformes, followed by Siluriformes. The least represented orders were Cypriniformes, Mugiliformes, Gonorynchiformes, Tetraodontiformes, Synbranchiformes and Clupeiformes with one species. Among these, 26 species were very common, 20 common and 4 were rare (Deepa, 2014).

2. Synergies

ISSN: 2278-4632
Vol-10 Issue-5 No. 8 May 2020

While harvesting, only the panicles of the Pokkali are cut and the rest are left to decay in the water, which in turn become feed for the shrimps stocked over the field (Gayatri &Raveendra, 2009). The use of fertile bottom mud of Pokkali field as manure for the coconut plantation is common (Sudhan et al. 2016). Pokkali varieties possess excellent medicinal properties due to the high content of iron, zinc, potassium and antioxidants (oryzanol, tocopherol and tocotrienol etc.) and (Anson, 2014)

3. Recycling

The rice- prawn system in the Pokkali lands ensures continuous recycling of crop wastes, which in turn helped to cultivate paddy and prawn sustainably. The Pokkali seedling grows naturally without the addition of any inorganic fertilizers except organic within the field supports nutrient cycling and eradication of unwanted weedy plants and fishes, respectively (Deepa, 2014).

4. Resilience

The Pokkali variety of saltwater-resistant rice, mostly grown in the coastal areas of Alappuzha, Ernakulam and Thrissur districts in Kerala, has emerged triumphant over the devastating floods that swallowed large swathes of farmland in the state (The Hindu, 2018).

5. Efficiency

Pokkali farming system does not require any external inputs. Absence of fertilizer application and pesticide spray make the system less expensive (Shylaraj, 2005). Time-bound operations performed in the Pokkali farms can realize the better performance of both rice and prawn in the wonderful environment (Renjith et al., 2018). Farming calendar, which is being followed by the Pokkali farmers, is given below:

Farming Calendar	
Activity	Dates
Drying up the lands. Strengthening of field bunds	April last week
Leveling the top of the mounds and sowing depends upon the rain	June first week
Transplanting of rice	July (After 28 to 30)
Weeding	August
Rice harvesting to be carried out based on maturity	October / November
Prawn filtration starts and sluices fixing activity to be carried out	First fortnight of November
Prawn siblings are to be introduce into the rice field	Last week of November
Harvest of White prawn (Naran) to be carried out	After 70 days of stocking of prawn fry

Harvest of Tiger prawn (Kara) to be carried out	After 90 days of stocking of prawn fry
Final harvest of Prawns to be carried out	Before April first week

In recent years this time bounded farming is being disturbed by several factors, especially the climatic variations. The next section explains the upcoming challenges of Pokkali farming.

Section 3: Climatic Challenges of Pokkali Farming

The total area under Pokkali cultivation has been reducing from 25,000 ha to 5,500 ha for the last few decades. The latest concerns in Pokkali cultivation include both climatic and non-climatic issues. Lack of farm labour and inadequate farm equipment are two major non-climatic factors questioning the economic viability (Ranga, 2006). It makes the farmers reluctant to practice the centuries-old system of Pokkali cultivation and is being modified by intensive shrimp farming by ignoring paddy for more yield and income (Roshni, 2016). The situation is further aggravated by development projects in the area of cultivation such as International Container Trans-shipment Terminal (Vallarppadam Terminal). It destroys the natural flow of tidal waves into the Pokkali fields, which is the backbone of Prawn farming. The real estate motivation in this region encourages many farmers to stop the practice of Pokkali-Rice cultivation (Renjith et al., 2018).

Adaptable capacity and salinity resistance are the most significant features of Pokkali rice. The recent climatic variations are negatively affecting these features. By reviewing recent newspaper reports, it can be understood that the extreme climatic events like flood and drought are recurring in Pokkali region in recent days, threaten the very existence of the particular cultivation. Usually during the monsoon, the water height in the Pokkali Rice fields rises to the height of 100 to 110 cm and in response to this the Pokkali Rice grows above the water level throughout the season and floats over the surface with a height of 130 to 140 cm by the time of flowering (Renjith et al., 2018). It shows the adaptable capacity of Pokkali variety. Even though the flood experienced by Kerala in 2018 ravaged the whole agriculture sector, some Pokkali fields were relatively unaffected by the flood. A massive drought followed the devastating flood in the farming region and lack of enough rain to wash out salinity in the Pokkali fields delayed the sowing process. At the same time, some of the farmers sowed in time without considering high salinity in the water, resulted in a loss of seeds. The heavy down pouring and flood situation after drought took away all the seedling of those who waited for low salinity of the water. These unpredictable monsoons and higher temperature are emptying the granary of the traditional farmers. Therefore, farmers have to depend on modified varieties of Pokkali rice that are being delivered by the concerning Krishi Bhavans. However, it is a fact that these varieties cannot be perfect substitutes for the traditional saline resistant and more nutritional Pokkali seeds. There are so many institutional incentives to reduce the economic burden of the farmers and to recover the fallow fields, but coming to the recent climatic challenges of the particular farming, these institutions also remain silent.

Section 4: Conclusion

Climate change is a global phenomenon. As climatic pattern changes, the character of agro-ecological systems of a geographical area also changes and it will have a significant influence on agro based industry and food security of that area. In addition, the accelerated change in climatic pattern questions resilience and adaptability of every farming system. Following agroecological principles in farming activity is the solution to the cascading effect of increasing climate crises. Pokkali farming system in Kerala is a system of farming which possesses agroecological features like farm diversity, farm synergies, recycling of wastes, organic farming, production of more food at a lower cost and farming systems' resilience to climate disruption. But nowadays, this agroecological farming system is becoming vulnerable to the extreme climatic changes due to a number of both internal and external factors. Considering the wide range of symbiotic benefits and ability to endure under severe climatic conditions, conservation of the Pokkali farming system is becoming critical in promoting climate-resilient agriculture. Otherwise, the vanishing of such eco-friendly cultivation may not be far from reality.

References

1. AathiraPerumchery. (2019, January 01) Pokkali rice is going places, The Hindu, Kochi, Retrieved from https://www.thehindu.com/news/national/kerala/pokkali-rice-is-going-places/article25883722.ece
2. Abraham, S. (2004). Economic Valuation of Coastal Wetlands, A Study of Cochin Backwaters in Kerala.
3. Anson C. J., & Pavithran K. B., (2014). Pokkali Rice Production under Geographical Indication Protection: The Attitude of Farmers, *Journal of Intellectual Property Rights, Vol 19*.
4. Birthal, P.S., Digvijay S, . Negi, Shiv Kumar, Shaily Aggarwal, A. Suresh and Md. Tajuddin Khan., (2014). How Sensitive is Indian Agriculture to Climate Change?, *Indian Journal of Agriculture Economics*, Vol.69, No.4,
5. CGDP Kerala, (2015). Promotion of Integrated Farming System of Kaipad and Pokkali in Coastal Wet Lands of Kerala 2015-2016 to 2018-2019, Detailed Project Report for National Adaptation Fund.
6. Deepa, K. M. (2014). Seasonal variation in Avifauna with respect to habitat changes in Pokkali field of Ernakulam District Kerala, Retrieved from http://hd1.handle.net/10603/96279
7. Edame, G. E., State, C. R., Ekpenyong, B., &Fonta, W. M. (2011). *Climate Change, Food Security and Agricultural Productivity in Africa : Issues and policy directions.1*(21), 205–223.
8. Fazal, S A., & Wahab, S A., (2013) Economic Impact of Climate Change on Agricultural Sector: A Review, *Journal of Transformative Entrepreneurship* Vol. 1, Issue 1, pp: 39-49

9. Hertel, T. W., & Rosch, S. D. (2010). *Climate Change, Agriculture and Poverty*. (November).
10. IPCC, 2007: *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change,* M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 976pp.
11. Khatri-chhetri, A., Aryal, J. P., Sapkota, T. B., & Khurana, R. (2016). *Economic benefits of climate-smart agricultural practices to smallholder farmers in the Indo-Gangetic Plains of India*.Current Science, Vol. 110, No. 7.
12. Kumar, S., & Devadas, V. (2016). Integrated Planning for Sustainable Development of Kuttanad Wetland Region, Kerala State. *Procedia Technology*, *24*, 1660–1667. https://doi.org/10.1016/j.protcy.2016.05.185
13. Lasco RD, Habito CMD, Delfi no RJP, Pulhin FB, Concepcion RN. 2011. Climate Change Adaptation for Smallholder Farmers in Southeast Asia. World Agroforestry Centre, Philippines. 65p.
14. M S Abubakar & M L Attanda (2013) , The Concept Sustainable Agriculture: Challenges and Prospects 5th International Conference on Mechatronics (ICOM'13) Conf.Series: Materials Science and Engineering doi:10.1088/1757-899X/53/1/012001
15. Martin, K. A. (2018, September 07). Pokkali fields triumph over floods, *The Hindu.*
16. Papers, F. (2014). Agriculture and Climate Change : Towards Sustainable, Productive and Climate-Friendly Agricultural Systems. (70).
17. Pillai, J & Patel, Lavkush. (2011). Climate change impact - A novel, initiative for Kerala. *Indian Journal of Geo-Marine Sciences*. 40. 483-486.
18. Ranga, M., (2006). *Transformation of Coastal Wetland Agriculture and Livelihoods in Kerala , India*. (January).
19. Ranjith. P., Karunakaran, R. K., & Sekhar, C. (2018). Economic and environmental aspects of PokkaliRice-Prawn production system in central Kerala, *International Journal of Fisheries and Aquatic Studies, 6(4):* 08-13
20. Rugman A, Verbeke A (1998). Corporate strategies and environmental regulations: An organizational framework. Strategies management journal 19(4): 363-375
21. Rupan, R., Saravanan, R. and Suchiradipta, B. 2018. Climate Smart Agriculture and Advisory Services: Approaches and Implication for Future. MANAGE Discussion Paper 1, MANAGE-Centre for Agricultural Extension Innovations, Reforms and Agripreneurship (CAEIRA), National Institute of Agricultural Extension Management, Hyderabad, India.
22. Sasidharan, N.K., Abraham, C.T., & Rajendran, C.G. (2012). Spatial and temporal integration of rice, fish, and prawn in the coastal wetlands of central Kerala, India, *Journal of Tropical Agriculture* 50 (1-2) : 15-23
23. Sathiadhas, R., Panikkar, K.K.P., Satyavan U.K. & Jacob, T. (1989). Economic valuation of Paddy - Prawn Integrated Farming in Kerala. *Sea Food Export journal*, 9-21. *Science and Research*, *7*(4), 719–730.
24. Shylaraj, K.S. &Sasidharan, N.K. (2005). VTL 5: A High Yielding Salinity Tolerant Rice Variety for the Coastal Saline Ecosystems of Kerala. *Journal of Tropical Agriculture,* 43 (1-2): 25-28.

25. Sudhan, C, Mogalekar H. S., Ranjith Kumar, K. (2016). Paddy Cum Prawn Farming (Pokkali fields) of Kerala. *International Journal for Innovative Research in multidisciplinary field, 2(7), 42-46*
26. Taiy, R. J., Onyango, C., & Nkurumwa, A. (2017). Smallholder Potato Production : The Case ofMauche Ward In Nakuru County, Kenya. *International Journal of Agricultural*
27. Thapa , P L., (2015).Climate Change and The Agriculture Crisis : Agroecology as a Solution, Focus India Publication, New Delhi.
28. Vijayan, Roshni. (2016). Pokkali rice cultivation in Kerala, *Agriculture Update, 11(3):* 329-333

