

# Rice Cultivation in India – Challenges and Environmental Effects

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## Abstract

Rice is one of the most cultivated grain crops in India as well as in Asian countries. It is a staple food in India. India is the second largest producer of Rice next to China. This crop is grown mainly in tropical and rain fed areas. In this paper, major types of Rice crops cultivated in India, the major challenges of cultivating Rice in India and its adverse effect in the environment are discussed. We have also discussed how the Computer Vision, Natural Language Processing, Mobile Applications and other technologies and research works can help to overcome these issues.

Keywords – Challenges of Rice Cultivation, Environmental Effect of Rice Cultivation, CV and NLP in Rice Cultivation.

## 1 Introduction

Rice is one of the most cultivated grain crops in India as well as in Asian countries. India ranks in the second position next to China in the cultivation and consumption of Rice. Rice grain belongs to the grass family of Graminae. It is cultivated in Rabi and Kharif seasons. In some parts of India Rice is cultivated three times in a year. Nutritional benefits of Rice include:

- A. Good source of energy
- B. Good source of Vitamin D, Calcium, Fiber, Iron, Thiamine, Carbohydrate, etc.
- C. Cholesterol free
- D. Helps in Blood pressure management
- E. Prevents skin disease and chronic constipation
- F. Rice Brand Oil support Cardio Vascular health

Major Rice production states in India are Indo-Gangetic and other River side states like West Bengal, Uttar Pradesh, Bihar, Punjab, Haryana, Odisha, Chhattisgarh, Andhra Pradesh, Telangana,

Tamil Nadu, Kerala, Assam, etc. Punjab has made excellent prosperity in Rice cultivation during the last 60 years since the Green revolution began in 1960's in India. Punjab and Chhattisgarh are the Rice Bowl of India [Chanana (2001)].

Generally, Rice crop requires hot and humid weather, plentiful water supply and abundant sunshine. Ideal temperature ranges from 20°C to 40°C and ideal rainfall ranges from 100 CM to 200 CM. Traditionally, Rice farming requires about 6 inches clogged water for rice transplantation. Rice can be grown on a wide variety of soils such as silts, loams, gravels, acidic as well as alkaline soil, soil with low permeability and PH varying from 5.0 to 9.5. Deep fertile i.e., reach in organic matters clayey or loamy soils with low permeability, free of water logging and sodicity are considered best for Rice cultivation. Major varieties of Rice cultivated in India, their maturity time and average yield production are shown in Table 1.

## 2 Related Works

Dwivedy (2011) has discussed some challenges faced by the Indian agricultural sector such as illiteracy, poor socio-economic background, unawareness of modern technology and equipment, small and fragmented land holdings, natural calamities, etc. Mehta (2014) analyses how agricultural mechanizations and power operated farm equipment play a vital role in progressing cultivation productivity in developing countries over the traditional human and animal power operated equipment. Mandala (2021) focuses on unavailability of proper market and financial problems encountered by the farmers. Dhakshana (2018) criticises the obstacles encountered by the farmers to get the agricultural loans provided by the Govt. banks to buy farm equipment.

Variety Name	Average Maturity Period	Average Paddy Yield
PR 128	111 Days	30.5 Quintals/Acre
PR 129	108 Days	30 Quintals/Acre
HKR 47	104 Days	29.5 Quintals/Acre
PR 111	135 Days	27 Quintals/Acre
PR 113	142 Days	28 Quintals/Acre
PR 114	145 Days	27.5 Quintals/Acre
PR 115	125 Days	25 Quintals/Acre
PR 116	144 Days	28 Quintals/Acre
PR 118	158 Days	29 Quintals/Acre
PR 120	132 Days	28.5 Quintals/Acre
PR 121	140 Days	30.5 Quintals/Acre
PR 122	147 Days	31.5 Quintals/Acre
PR 123	143 Days	29 Quintals/Acre
PR 126	123 Days	30 Quintals/Acre
PR 127	137 Days	30 Quintals/Acre
CSR 30	142 Days	13.5 Quintals/Acre
Punjab Basmati 3	139 Days	16 Quintals/Acre
Punjab Basmati 4	146 Days	17 Quintals/Acre
Punjab Basmati 5	137 Days	15 Quintals/Acre
Pusa Punjab Basmati 1509	120 Days	15.7 Quintals/Acre
Pusa Basmati 1121	137 Days	13.7 Quintals/Acre
Pusa 44	145 Days	6 Quintals/Acre
Pusa Basmati 1637	138 Days	17.5 Quintals/Acre
Hybrid 6201	125 Days	25 Quintals/Acre
Vivek Dhan 62	125 Days	19 Quintals/Acre
Karnataka Rice Hybrid 2	125 Days	35 Quintals/Acre
Ratnagiri 1	115 Days	19 Quintals/Acre
Ratnagiri 2	145 Days	21 Quintals/Acre

Table 1: Major Rice Varieties Cultivated in India

Zaveri (2016) points out how ground water overuse leads to threatening decrease in ground water resources which in turn results in declining agricultural production. This also has drastic effects on climate change. Gandhi (1999) examine the role of agroindustries in India in the context of rural and small farmers' development.

Dhakshana (2017) focuses on a number of challenging factors of direct marketing faced by the farmers. The scarcity of cold storage results in heavy competition and makes direct marketing even more complicated. Azam (2019) explores the challenges of marketing faced by the conventional and organic farmers such as inadequate storage, unawareness of market price, inequality between demand and supply of crop,

transportation problem, price variation in different markets, lack of Govt. support, etc.

Patel and Patel (2016) analyses how android apps of agricultural serviced influence the Indian farmers in their crop cultivation. Mahapatra (2020) provides views of how smartphone apps work as an important tool for agricultural information during the Covid' 19 lockdown period in India.

### 3 Challenges Faced by the Rice Farmers in India

Being a third world country majority of population belongs to the rural India. Here, agriculture is the livelihood of most of the rural people. Although Rice is a staple food crop of India, Rice cultivation is not a profitable job for Indian farmers. In this section, we point out some of the major challenges encountered by the Rice farmers.

#### A. Poor Economic condition of Farmers

Agriculture is the primary livelihood of majority of the Indian rural people. 80% farmers are marginal and small in yield production. They work 80 hours per week along with their family members to earn their livelihood. They often take loans from money lenders at high interest for buying seed, machine, fertilizer, insecticide, pesticide, and so on. The interest paid to the money lenders is always higher than the interest taken by the loans provided by the Govt. organizations. But due to unavailability or unawareness of the Govt. initiatives they go for these high interest payers. These causes severe impact on farmers including suicide.

#### B. Unavailability of Good Quality of Seeds

As the good quality seeds are expensive and have scarcity in the market poor and marginal farmers can not afford them. Most of the seed manufacturers are private companies. Poor farmers have no other options than to buy poor quality seeds which are less productive.

#### C. Lack of modern Equipment and Technology

Due to the lack of awareness of the modern technology majority of India farmers do not use modern agricultural equipment. They highly depend on traditional tools like bullock drawn plough, sickle, etc. It takes more energy, manpower and labour cost. In return it provides less profit.

Rich farmers use machines in irrigation, harvesting and transportation. But these machines are dependent on continuous power supply.

#### D. Poor Irrigation Facility

Paddy cultivation needs high quantity of water. The regions having 100-200 CM average rainfall are suitable for Rice cultivation. Many regions of India lacks the required rainfall. So the farmers depend on irrigation facilities essential for growing crops. India has the second largest irrigated land next to USA. But only one third of the irrigated land has proper irrigation facility. Punjab has about 98% irrigated land because of abundance of water from the snow melt rivers and dams throughout the year. But the condition of the other parts of India is quite different. In central India rivers are rain fed. They don't carry water throughout the year. So, in this region farmers have to wait for the monsoon which is uncertain.

#### E. Small and Fragmented Land

The size of farming land per farmer is decreasing every year. This is due to the system of inheritance law of India. For example, a person having 4 children each having 2 children when dies his land is distributed in 4 parts which in turn is divided into 8 parts. Due to this system, most of the farmers have small amount of fragmented lands. Small portion of land has more irrigation problems because the irrigated water often flows to surrounding fields.

#### F. Absence of Proper market

Often farmers do not get reasonable selling price of their crops. This happens due to the unavailability of proper market and lack of storage facility. Farmers sell crops to middlemen at a lower price which is sold to market at higher price. Thus the impact of market price does not reach to the end farmers.

#### G. Transportation Problem

Transportation is a major problem in Indian agriculture. There are many villages which are not properly connected to city. Many roads are either broken or narrow. During and after the monsoon these roads become muddy. That time the transportation is at stalemate. The transportation between two places which are separated by water is more challenging.

## 4 Adverse Effects of Rice Cultivation upon Environment

Here, we discuss some adverse effects of Rice cultivation in our environment.

### A. Emission of Green House Gasses

Rice is often grown in flooded areas. Rice fields needs to be submerged in waters. These clogged water generated greenhouse gasses such as Carbon Dioxide, Methane, Nitrogen Oxide, Nitrogen Dioxide, Nitrous Oxide, etc. Release of these greenhouse gasses increase global warming.

### B. Climate Change

After the cultivation Rice is stored into granary. The straws and husks are left out. Farmers often burn these left out straws and husks in the field. This emits Carbon Dioxide and other greenhouse gasses and causes global warming. It also causes soil depletion and soil pollution.

### C. Spread of Mosquitos and Other Insects and Bacteria

As Rice requires much water, the clogged water produces mosquitos, other insects and bacteria. This is due to the fact that stagnant water is the ideal place giving birth of mosquito Larva. These causes spread of malaria, dengue, other life threatening diseases.

### D. Misuse of Water Resources

Rice cultivation needs average 100 to 200 CM rainfall. It is highly water consuming crop. Most of the time because of poor irrigation system and delayed monsoon a large amount of underground water is used Rice cultivation. Deep tube wells are used for drawing underground water. These deep tube wells need high electricity consumption. A great amount of water resources is wasted in this way.

## 5 MS Word STREAM Tools

Usage of technologies in agricultural sector has replaced human efforts. Farming functions such as use of machinery, use of fertilizers and production of raw products have been successfully automated. Some of such technologies and their appropriate usage in Rice cultivation are discussed here.

A large number of Android apps provide latest market price, weather prediction, Govt. policies

and skims for farmers, latest technologies, videos, and news related to agriculture. They have used Computer Vision and Natural Language Processing research works for different tasks. The functionalities of some of these apps are mentioned below.

**Agri App:** It is an online farming platform which provides Chat interface between farmers and experts. This app includes video messages for farmers.

**Iffco Kisan App:** It provides latest information, latest market price, various farming tips, weather forecast in 10 different Indian languages.

**Agri Media Video App:** It is an online marketplace. It provides chat service for farmers with the option of uploading images of crops.

**Farm Bee RML Farmer:** This app available in 10 Indian languages provides informative agriculture content at every stage of the crop life cycle. It provides market price and weather forecast based on a user location. Farmers can choose from 450 crop varieties and 1300 markets.

**Kisan Yojana:** It provides information about Govt. schemes to farmer (Kisan).

**Pusa Krishi:** It is launched by Ministry of Agriculture and Farmers welfare, Govt. of India in 2016. It provides information on crop varieties developed by ICAR and latest technology developed by IARI.

## 6 Conclusion

Insufficient soil moisture, poor soil fertility, soil erosion, draught, flood, flash flood, water logging, uncertain monsoon, and inefficient use of fertilizer are major challenges in Rice cultivation. Rice cultivation adversely effects in climate change. In turn, Rice cultivation itself is affected by the climate change by reducing production. In this paper, we have analyzed the challenges faced by the Indian farmers and the adverse effects of overall Rice cultivation. This will help the farmers to get aware of the issues regarding Rice cultivation. We have also provided some important aspects of technologies and research works which may benefit the farmers if they use them intensively.

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