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Constraints of Rainfed Rice Production in Eastern India

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SUMMARY

The wide gap in yield performance between India and major rice growing countries of world is probably due to one of the important reasons such as lower rice yield in eastern India where rice is grown mainly under rainfed condition. While modern rice technology has made tremendous contribution for irrigated rice farmers, little impact has been made on rainfed rice farmers. The average yield of rice in eastern India is comparatively low as against the productivity in the states like Punjab, Haryana, Tamil Nadu, Andhra Pradesh etc. Hence enhancement of rice yields in rainfed agro-ecosystems in general and in eastern India in particular is of prime importance. A number of biotic and abiotic factors affects rice yield adversely and hence, needs a special attention through research and policy intervention so that the growing demand of burgeoning population of this poor lagging region can be met.

INTRODUCTION

Rice is an important staple food crop grown in a diversified range of climatic and agro-ecological situations in almost all parts of the world. Rainfed rice based systems of eastern India are home to hundreds of millions of the India's poorest people. Eastern India alone accounts for nearly 60% of India's 43 million hectare of rice, of which 80% is rainfed. An estimated 450 million people in this region depend on rainfed rice as their major source of livelihood (IRRI, 1996). But it was observed that the green revolution had bypassed the rainfed ecosystem which still holds true and raising the predominantly rural population of eastern India out of poverty will require a major increase in agricultural productivity as the final engine of development. A majority of these rice areas are characterized by the resource poor farmers growing traditional varieties with very low level of modern inputs in high risk prone conditions (Sakarung, 1995). Due to limited success in developing suitable modern rice varieties against prevailing natural and climatic conditions *viz*. drought, flood, soil salinity etc., the rainfed regions have not got much advantages even after three decades of Green Revolution. Therefore, the first and foremost step in the direction of improving rice production in eastern India is proper identification of various constraints that may limit rice yield.

Major Constraints

Constraints to high yield can be classified into two categories; those that affect the potential of the crop under farmer's environment and those that affect farmer's ability and willingness to achieve the yield potential on his farm. The first category of constraints is related to the development of new production technology and hence the organization of the production potential, given the existing technology and physical environment, and on the other with the degree and equity among farmers and landless workers in access to resource and inputs. Different production constraints are classified into six broad categories by Mahapatra (1994):

- Biophysical constraints
- Socioeconomic constraints
- Administrative constraints
- Institutional constraints
- Procedural constraints
- Technological constraints

Biotic Constraints

Insect Pests

- Insect pests are serious yield reducing constraints for rainfed rice production in the eastern India.
- Damage caused by the insect pests is one of the major components of yield gap accounting nearly 30 per cent of the difference between potential and actual farm yield.
- On an average, 30 to 40 per cent of the total yield loss in eastern India is caused by different insect pests.

- Stem borer, Gundhi bug, brown plant hopper, armyworm, leaf folder, case worm etc. are major insect pests which are found in eastern India.
- Since damages from these insect pests are widespread and there is limited natural resistance in locally cultivated varieties of rice, varietal improvement through biotechnology offers critical alternatives to insecticide use.
- This has a twofold advantage: it serves to increase yields and reduces the dependency of resource poor farmers on insecticides, thereby addressing environmental issues.

Diseases

- Varieties which are unsuitable for cultivation on rainfed lands and favourable moist weather conditions harbour a number of diseases.
- An average yield loss of 25-30 per cent per annum due to diseases is a regular feature in eastern India.
- It was found that occurrence of bacterial leaf blight, brown leaf spot and narrow brown leaf spot were severe in years of poor rainfall.
- Other important diseases are blast, sheath rot and sheath blight.
- Bacterial leaf blight and rice blast was found most serious diseases in eastern India.
- Varietal resistance to diseases, particularly bacterial leaf blight and rice blast, are needed against which there is currently no effective genetic resistance.
- Chemical and cultural controls need to be maintained and search for genetic resistance should be continued.

Weeds

- Weeds are other important constraint as they compete with rice and lead to a substantial loss in production.
- The yield loss due to weeds in rainfed ecosystems was found to be greater than that of irrigated ecosystems.
- In rainfed lowland areas, moist aerobic conditions or shallow water for extended period of flooding during early crop growth, followed by prolonged periods of flooding to variable depths favour the growth of a more diverse weed flora and more competitive weed species and their population.
- Weeds compete severely with rice, reducing yield by 10-15 per cent depending on factors like weed species and their population.
- Development of fast growing weed tolerant varieties and effective weed management techniques are essential for increasing the rice yield in eastern India.

Rodents

- Apart from insects, diseases and weeds, losses incurred by the rodents are substantial.
- The damages made by the rodents in rice fields and in storage accounts for about 10 to 18 per cent of the total production.
- In eastern states where rice is cultivated under rainfed conditions, production losses due to rodents are significantly high.
- Control of rodents is only possible through community approach, which requires more reliable Integrated Pest Management practices and creation of awareness among the peasants.

Abiotic/Technical constraints

Non-adoption/Poor adoption

- Non-adoption of modern varieties as well as their component technologies is a crucial hindrance in case of rainfed rice ecosystem.
- Almost all constraint studies reveal that the average rice yield achieved on farmers' fields, especially in rainfed rice ecosystem are lower than those commonly obtained in experimental plots.
- It was documented that the actual yield of rainfed rice in eastern India is 86 per cent lower than its potential farm yield.

Scarcity of Suitable Package of Practices

- The component technologies developed so far has failed to satisfy the expectations of rainfed rice farmers.
- There is a huge need for development of more doable, problem based, cost effective and area specific technologies for rainfed rice production.

Temperature and Radiation

- Temperature and radiation are the two important factors which play crucial role in production of rainfed rice in eastern India.
- The high minimum temperature and radiation during monsoon seriously limit the yield potential of wet season rice in eastern India unless it is harvested late in the year.
- Occurrence of cold at anthesis affects the rice production seriously.
- A majority of rice areas in eastern India experiences severe cold in winters and thus observes cold at the time of anthesis in the late transplanted rice.
- From high altitudes in north eastern India where low temperature is a constraint to low altitudes where high night temperature limits yield, temperature becomes one of the important production constraints.
- Therefore, it is important to develop rice varieties, which may withstand vagaries of high and low temperatures, which are phenomenal in eastern states in India.

Recurrent Floods and Droughts

- Occurrence of recurrent floods and droughts are the regular features in most of the parts of eastern India.
- A majority of rice area, mostly rainfed, in Assam, North Bihar, Orissa and West Bengal experiences either floods or droughts or even both every year.
- Nearly 10 million hectares of lowlands in Bihar, Orissa and West Bengal are affected with flash flood and water logging/submergence.
- In contrary, drought and moisture stress are the major limiting factors in upland rainfed rice in these state.
- The problem of flood and droughts cannot be solved merely through conventional technologies.
- Biotechnology embraces a range of technical possibilities.
- Basic research on transfer of drought and flood tolerant genes is distinct possibility.

Water Management

- The production of rice can be increased up to 20 per cent with the help of suitable water management technology.
- Indiscriminate use of canal irrigation and drainage is affecting the rice yield adversely.
- Introduction of new and efficient water management techniques for rainfed rice production might be helpful in enhancement of rice yield in eastern India.

Problem Soils

- Poor soil fertility is common in rainfed uplands where yields are constrained by lateritic soils with high iron and low nitrogen content, and a pH occasionally below five.
- Soil problem in other rainfed areas includes salinity, alkalinity and zinc deficiency.
- Apart from coastal saline soils of West Bengal and Orissa a majority of rainfed lands in Bihar and Assam are suffering from the adverse effect of saline soils.
- While some of these problems may be efficiently solved with affordable soil amendments, other constraints such as alkalinity and salinity cause greater yield losses, which might be partially averted through tolerant HYVs.

Inadequate Input Use

- Due to fear of crop failure or other input related constraints like, high input costs, unavailability of input on time in required quantity and other technical and socioeconomic constraints, inadequate input use is common in rainfed ecosystem of eastern India.

- Application of fertilizer is positively correlated with the availability of irrigation water but uncertainty of rainfall and accumulation of water in fields hinder fertilizer use in rainfed rice.
- High cost of agro-chemicals limits the use of these chemicals and pesticides on the farm.
- Thus policies are needed to encourage the use of potential biological substitutes to the agrochemicals besides ensuring timely supply of critical inputs.
- Finally development agencies should make a concerted effort to develop irrigation potential through water harvesting.

CONCLUSION

Rice is one of the most important crops in eastern India and it will continue to enjoy its leading position so long as it remains the staple food of almost entire population of this region. Under the influence of increasing population pressure the demand for rice is expected to rise persistently in coming years. As the land frontier has already been exhausted the future source of growth in this region lies in raising the productivity of rice crop. Even to sustain food grains production, it is important to give due attention to the eastern India in general and to accord high priority to the constraints of rice production in this region in particular. This can be achieved if rice research helps to reduce production losses due to various biotic and abiotic constraints in rainfed rice ecosystems. Since elimination or partial solution of these constraints would have a major impact on rice production in eastern India because the yield gaps are very high, the major constraints to rice production in eastern India require more concerted efforts while addressing them. It requires further strengthening of linkages between research and extension that facilitates feedbacks and disseminates technical information.

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