Technical Education on Trail : A Case of Rice Seed Hybridiztion for Food Security in Nepal

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Abstract

Nepal government has implemented the technical education stream in secondary level schooling and included agriculture as the one of the major subjects. SSRP has envisioned the quality of technical education in trial. The program may be successful if we deliver the quality service with enough competencies of teachers to deliver the content. Rice is one of the major crops growing in different low lands including hills and Terai in Nepal. The traditional Nepali rice varieties possess low yield potentialities, in spite of suitable varietal characteristics like disease and pest resistance, tolerance to local conditions, and local taste. In this article the

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Introduction

Nepal is a developing country. It has a long experiences and history in civilization. Nepal government has implemented the technical education stream in secondary level schooling and included agriculture as the one of the major subjects. SSRP has envisioned the quality of technical education in trial. The program may be successful if we deliver the quality service with enough competencies of teachers to deliver the content.

Rice is one of the major crops growing in different low lands including hills and Terai in Nepal. The way the crops grown also includes the high land like in Jumla where the traditional marshy rice seeds are planted. The rice seeds quality is one of the factors of deciding the production quality. Most of the market available rice seeds are hybrid rice produced from different sources. It is the matter of fact the food security problem can be controlled through hybridization of rice seeds.

Country Situation

Out of total land in Nepal, only 20 percent is cultivable land. Rice, the staple food and the major crop, is grown from mountain areas to Terai regions. The rice cultivation area is 1.53 million hectares with annual production of 5.07 million tons and the productivity is 3.31 average yield /ha (MOAC, 2012).

The traditional Nepali rice varieties possess low yield potentialities, in spite of suitable varietal characteristics like disease and pest resistance, tolerance to local conditions, and local taste. Hence, high yielding, exotic rice varieties were introduced since 1950s.Nepal Agricultural Research Council (NARC) has recommended more than 38 rice varieties suitable to cultivate in the various parts of the country, bred by National Rice Development Program (NRDP). These improved varieties possess high yield potentialities under good agronomical practices and optimum use of inputs like high quality assured seeds, irrigation, chemical fertilizers and plant protection services. These varieties have potentiality to produce 3-4Mt/ha under proper management in irrigated conditions. This has accelerated to increase the rice yield substantially by 1 Mt per hectare and contributed to increase total rice production from 2.6 Mt per hectare in 1975-76 to 3.34 Mt per hectare in 2012. However, it was not adequate for the population of 27 million growing at 1.4% in 2010 and anticipated to be 30.5 million by 2020. Agricultural Perspective Plan (APP) of 1995 foresees the need of 6 million tons of rice production by 2020.

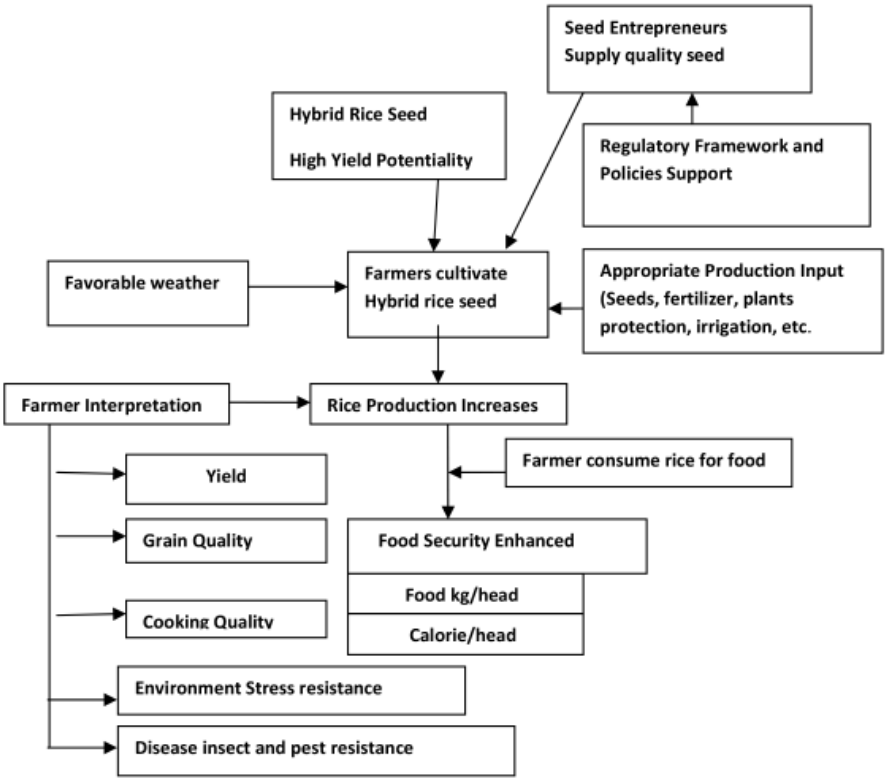
Hybrid rice varieties, successfully developed in 1974 in China, is the presently available technological intervention to boost up rice harvests, according to International Rice Research Institute (IRRI).Many rice

producing countries have obtained bumper crop introducing hybrid varieties.

Conceptual Model of Hybrid Rice Development

A conceptual model of hybrid rice cultivation has been developed for the study. It is based on the theory that HRS has high yield potentialities over the improved varieties and the farmers adopting HRS can increase rice production by 15- 20 percent, thereby reducing family food deficiency. The different factors affecting in the production process are Seed Entrepreneurs supplying HRS, technological inputs natural calamities, legal framework, and finally farmers adopting HRS. The farmers interpretation of the effectiveness of hybrid seed cultivation are the grain yield, grain quality ,cooking quality ,taste, disease, insect and pest resistant and environmental stress resistant.

The operationalization of above theory is presented for the proposed research in following conceptual framework:



The farmers interpret rice in terms of yield, grain quality, cooking quality, environment stress resistant and disease insect and pest resistance. On the other hand, food security has considered food kg per head and calorie per head as they consume rice for food. appropriate input of quality seed, fertilizer and irrigation.

Problem Situation

The research and development of hybrid rice in Nepal is at initial stage. There is no hybrid rice variety officially released, recommended, approved or registered by National Seed Board for commercial cultivation in Nepal. However, the significant high yield potentiality of the hybrid rice varieties over the existing popular inbred rice varieties has attracted Nepali farmers. Since last few years, they have started

to plant imported hybrid rice seed for higher rice production and food security. Farmers purchase the imported seed especially from India and china, either from the private seed entrepreneurs or purchasing the seed across the border in India. The impact of this newly acquired technology in the farm household is yet still unclear. So, the statement of the proposed research problem is: "to what extent the hybrid rice seed has influenced the food security in Nepal".

Hybrid Rice in Nepal

In Nepal, the research and development as well as legal framework and policies on Hybrid Rice (HR) is still at initial stage while farmers are always in search of high yielding varieties and since last few years, farmers in Terai and hills too, have adopted Hybrid Rice Seed (HRS) to increase the rice crop output. The farmers are growing Hybrid Rice using the seeds imported from China and India by the seed entrepreneurs. Hybrid rice is a type of rice, bred from two very different parents. It can significantly out yield other rice varieties. It is a key technology that meets the increasing global demand for rice.(IRRI). In 2011, China Daily reported that a new HR has been bred that yields 13.9 tons of rice per hectare. In Nepal, the area under HR and import of HRS is increasing every year. A discussion with the farmers adopting HRS in Nepal reported that HR varieties have yield potentialities as high as 17-18 tm from 2kg of HRS. HRS have been adopted globally in many rice producing countries like Indonesia, Myanmar, Sri Lanka, Brazil, U.S.A, Thailand, Philippines, Korea, Vietnam, Bangladesh, Pakistan , China and India.

The key partners in hybrid rice farming are hybrid rice researchers, seed production and technology transfer agencies, graduate students in plant breeding and seed technology National Hybrid Rice Research and Development Center of China, Hunan (China) is the key institute devoted to the development of hybrid rice.

The development of HR is enhanced by new technology like marker assisted selection of genotypes which enable to develop new hybrid varieties, with higher yield, grain quality, resistant to biological and environmental stress. However, developing varieties to increase rice productivity to meet increasing food demand and climate change are still challenges to the hybrid rice research. There are problems in yield heterosis, seed production, grain quality, seed cost, field management and pubic private partnership.

In Nepal, the Research and Development on HR is yet in infant stage. The seed entrepreneurs import HRS from China and India. The amount of seeds imported is increasing every year. In the fiscal year 2070-71, it is reported that seven hundred and sixteen (716) Mt of rice hybrid seed was imported in beginning of the rice plantation season. The imported Hybrid Rice Seed may be unsuitable to Nepal. Hybrid rice varieties need different agronomical practices than what Nepali farmers traditionally used to. In 2013, the failure of HR was reported in Kabhrepalanchok and Bhaktapur districts. So it is important to know that to what extent farmers are benefitted by growing imported hybrid rice.

In view of above context, this research aims to analyze, and evaluate the effectiveness of hybrid rice cultivation in Nepal from the perspectives of the farmers' access to food security through increased rice productivity and rise in income in the hill and Terai districts of Nepal.

Contribution of NARC

A review of NARC Research highlights (2008) shows that NARC has developed 213 varieties of 43 different crops over last 47 yrs. But there is no hybrid rice variety developed and /or introduced and recommended yet although a variety of tomato has been developed. It is further supported by Notified Varieties (2012) published by National Seed Board. Basnet (2007) reviewed the list of crop varieties developed by NARC from1960 to 2007 and there was no rice hybrid variety found to be developed by NARC during that period. Shah (2013) conducted experiment testing of 34 Indian hybrid rice in the regional agricultural research Station in Parwanipur, and Bara. He concludes that Hybrid rice variety Indam 20017 (yield 6409 kg/ha) and ford140 (5849) produced higher grain yield in 2011 whileRashi1119 (5795) and DRH 748(5556kg/ha) produced highest grain yield in 2012 and these varieties need to be tested at farmers field foe official recommendation. Hence, Thapa (2013) concludes that research and

development of hybrid rice is still at infant stage in Nepal.

Recently, National Seed Vision 2015-2025 is prepared in 2013 by the Ministry of Agriculture in Nepal. It is a holistic long term strategy relating to every stake holders in the seed sector. It has relished that the demand for hybrid seed is soaring including rice. So policy guidelines should direct that NARC should develop hybrid rice varieties through research and development in Nepal for food security, increasing 8 million tons of edible food and Hybrid rice is one of them. Reducing Import of Hybrid rice is not possible without in country developed hybrid varieties.

According to Research and Development Hybrid Rice in India by Viraktamath, Ramesha, Ahmad, Prasad, Rani, Neeraja & Sundaram (2009), hybrid rice research and development was initiated in India in 1989 as a part of National Food Security Mission. It envisages to increase rice production by 10 million tons at the end of 2012 contributing to national food security. Hybrid rice varieties out yielded 12 to 40% (1.5 to 2 ton/hector) popular inbred varieties.

Accelerating Hybrid Rice Development, a book by Xie and Hardy (2009) give an account of hybrid rice seed development and compilation of the papers presented in the Fifth International Hybrid Rice symposium (2008). First International symposium in Hybrid Rice (1986) was held in Hunan, China and it was reported in the meeting that HRS covered 8.5 million hectares of rice growing area and that is only in china. However, the Fourth International Symposium in Hybrid Rice (2002), reported that major rice producing countries are investing in the hybrid rice research and development and the area under hybrid rice is estimated to be19.8 million hectares in 2007, of which 2.8 million hectares to be outside China. When same kind of symposium was held in the same place in 2008, 430 hybrid rice research scientists from 21 rice growing countries were participating.

On the impact of hybrid rice in China, Grain (2007) viewed negatively about yield ,grain quality, taste, cost of production as well as disease, insect, pest and environmental adjustment.

Desk Study

The first Hybrid Rice was developed in 1974 for cultivation in China. In India, research and development of hybrid rice was started in 1989 .So the literature review has been carried out collecting the relevant documents over last 20 years and beyond.

The secondary information from relevant documents were collected and reviewed from National Rice Development Program, Pawanipur, National Agricultural Research Council (NARC) ,Seed Research Directorial, Khumaltar ,NARC, Seed Quality Control Center(SQCC), Harihar Bhawan, National Seed Board Secretariat, Harihar Bhawan Seed Entrepreneur Association of Nepal (SEAN), District Agricultural Development Office (DADO) of Kathmandu, Kabhrepalanchok, Bhaktapur, Banke and Bardiya, NGOs like Li-BIRD, CEAPRED. Review of district profiles to identify VDCs growing HRS. Inception report was prepared based on secondary information. Check list questionnaire and sampling criteria were prepared to carrying out the field study for primary data gathering.

Field study

The field study was carried out in the selected VDCs in Kabhre, and Bhaktapur in Central development region and Banke Bardia in Mid western development region. Kabhre and Bhaktapur represents ecological conditions of Mid Hills while Banke and Bardia represent Terai environments.

1. A walk-through can be undertaken along the rice fields in VDC and prepared agriculture mapping of the HR growing areas.

2. 280 HHs, (about 70 HHs per district) can be surveyed applying detailed questionnaire intended to collect data on Hybrid Rice. Equal number of the households from HR growers and non growers can be selected randomly for interview. However the number of households for interview can depend on the area of cultivation of Hybrid RICE seeds.

3. Check list was used for Focus group discussion, Farmers interaction meeting and interview with key farmers.

Data analysis was carried out through statistical tools tests frequency and graphic representation. Qualitative data were transcribed through coding and decoding. Reliability and Validity were controlled through multiple source of data, pretest and post test of tools. Representative and methodological validity was applied.

Research Utility

This kind of research on Hybrid Rice provides information to agricultural extension to create awareness on continuous improvement on the use of hybrid rice seed among farmers. The policy makers may realize the urgent need to adopt rice hybrid seed to boost up rice production to reduce trade deficit in food grain while encouraging research scientists to undertake research and development activities on rice hybrid technologies to develop new hybrid varieties and their seed production within the country for import substitute .Rice hybrid seed production may create employment to biotechnologists as hybridization requires skilled and trained biotechnologists.

New hybrid rice varieties bred in Nepal can increases accountability of the research scientists, seed entrepreneurs, and extension workers and transparency of the quality of the seed sold to the farmers. Rice hybrid seed developed in Nepal can be culturally, and environmentally tolerable and tested. Research can contribute on policy formulation and necessary amendment on legal framework to promote Hybrid Rice varieties as envisaged in the seed vision 2025.

Conclusion

The scope of the hybrid rice yield depends on the focus hybrid rice varieties and review of its status with respect to varietal development, seed production under NARC and other related institutions, and seed marketing by the private entrepreneurs in the Terai and hill districts. The study needs review of the yield potentiality and varietal characteristics of hybrid varieties over the conventional improved rice seed varieties, and analyze the rice production with and without hybrid varieties in the selected study districts. The study may focus on the food security of the farmers adopting hybrid rice verities and increased income in the study areas.

The technical education in agronomy in earlier grades in school provides the opportunity of awareness of the hybrid rice use and its utility in food security. The beneficial impacts and adverse effects of the use of hybrid rice varieties and examine to what extent the seed should be used in order to raise food security in Nepal. Geographically, the research need to cover Hill and Terai areas evaluate the Hybrid seeds imported from Chinese and Indian seed companies.

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