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Unique Properties, Broad Application across Multiple Rice Products

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Abstract

Rice is grown in more than 100+ countries spread across six continents and in a wide range of environments. Globally rice is grown on a total area, producing annually. About rice in the world is grown in Asia, with China and India as the lead producers.

Keywords: Sub-humid and humid; Soil water; Sheath blight; Fertilizer; Leaf; Cultivating environments

Introduction

Africa and Latin America produce about 25 million tons each. In Asia and sub-Saharan Africa, almost all rice is grown on small farms of per household. Rice is produced in many different environments and in many ways. The rice production systems were classified by different scientists, in different countries, and in different ways at different times, depending on the context [1]. The environmental and socioeconomic conditions of rice production vary greatly from country to country as well as from location to location which affected the performance of rice production in the past and influences the potential of improving future rice production. Rice is cultivated under temperate, subtropical, and tropical climatic conditions with the weather varying from arid and semiarid to sub-humid and humid. Based on soil water conditions, rice production ecosystems include irrigated lowland, irrigated upland, rain-fed lowland, rain-fed upland, and deep water/floating ecosystems [2]. Socioeconomically, farm size cultivated by a household in South Asia, Southeast Asia, East Asia, and Africa is generally small, which varies from less than few hectares. In the developed countries, the farm size is larger. A study in tropical Asia covering a wide range of lowland rice-cultivating environments revealed that the injury profiles were dominated by stem rot and sheath blight; bacterial leaf blight, plant hoppers, and leaf folder; and sheath rot, brown spot, leaf blast, and neck blast. Stem rot and sheath blight were associated with high fertilizer inputs, long fallow periods, low pesticide use, and good water management in transplanted rice crops of a rice–rice rotation. Bacterial leaf blight, plant hoppers, and leaf folder were more prevalent in direct-seeded rice–rice production system with poor water management and lower fertilizer and pesticide input use or with adequate water management and higher fertilizer and pesticide input usage. Sheath rot, brown spot, leaf blast, and neck blast correspond to low-input, labour intensive rice crops in a diverse rotation system with uncertain water supply.

Discussion

Weed infestation is an omnipresent constraint. The high weed pressure, severe iron deficiency, and nematode infestation coupled with higher irrigation water inputs were reported to be the reasons for getting rice yields lower than the transplanted rice by the adoption of dry-seeded rice with most frequent irrigations on coarse- and medium-textured soils. The rice production systems were reported to differ in the incidence and losses caused due to the pests. A Korean study revealed higher population densities of green rice leafhopper and leaf folders in machine-transplanted than in direct-seeded rice, while abundance of brown plant hopper and small brown plant hopper was more in dry-DSR. However, incidence of the Asiatic rice borer or striped rice stem borer, white-backed plant hopper, and rice stem maggot did not differ among machine-transplanted and direct-seeded rice production systems [3]. In India, the leaf folder incidence was higher in the bed-transplanted and wet-seeded rice than that in rice grown using the other crop establishment methods. The incidence of stem borer causing dead heart damage was significantly higher in the WSR system, while that of whitehead damage was higher in the BT and WSR plots than in other rice production systems. In Korea, sheath blight incidence was not affected by different rice production systems, while the incidence of rice blast was affected and favoured by unbalanced nutrient contents in the rice plants and high leaf area index. The challenges vary with the rice production systems. The main factors that limit the yield in irrigated areas include poor management of inputs and resources; losses from weeds, pests, and diseases; inadequate land and water scarcity; and resulting salinity and alkalinity. In rain-fed lowlands the challenges include adverse climate, drought, submergence, poor soils, pests, weeds, and absence of appropriate soil, water, crop management technologies, or strategies to suit the farmers' needs and which economically increase rice productivity. In upland dry-DSR environment, the major challenges are the biological constraints such as weeds, nematodes, and diseases, poor soil fertility, socioeconomic constraints, and lack of productive varieties to suit the microenvironment of uplands and the drought. In TPR production systems, inappropriate management of problem soils, non-judicious use of fertilizers and water, and resulting pest proliferations and increasing cost of cultivation are major challenges [4]. In aerobic rice production systems, lack of fine-tuned need-based technologies suited to different rice ecosystems across globe, non-availability of suitable varieties, micronutrient deficiencies, soil and water management optimization, adaptive weed menace, and pest problems are major challenges. The future research efforts on rice production systems should ultimately result in evolving practical integrated crop management strategies that improve rice productivity and production efficiently, effectively, and economically in different rice production systems across the globe and improving the food security and livelihood of the farmers and farming community of rice and rice-based cropping systems globally [5]. The classifications

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of rice environments are based on altitude and water source. Irrigated lowland rice system produces global rice production. Asia has world's all crops in total irrigated area. Rice occupies irrigated area in Southeast Asia, East Asia, and South Asia, respectively. The countries with the largest areas of irrigated lowland rice are China, India, Indonesia, and Vietnam. Irrigated lowland rice production system is the most important rice production system for food security of Asian countries. The most common method of establishment of this production system is transplanting. Rice is also established by direct wet or water seeding in irrigated lowland production systems. In transplanting method of rice establishment, rice seedlings are raised in a rice seedling nursery for few days prior to their manual or mechanical transplanting into the flooded field. Irrigated rice is grown in bundled fields or paddies, which are surrounded by a small levee that keeps the water surrounded. The farmers, who have small holding of land, normally maintain in the field a water layer during the major period of the cropping cycle. One or more rice crops can be grown per year as the water supply is assured. Rice–rice and rice-upland cropping systems are followed. Rice is grown under irrigated systems in temperate climatic conditions of Australia, Bhutan, Central Asia, Chile, China, Japan, Korea, Nepal, Russia, Turkey, the USA, and Uruguay [6]. In Bhutan, Nepal, and part of China, rice is established by transplanting. In the irrigated lowlands of Korea, rice is mostly established by machine transplanting method with hand transplanting practiced on marginal rice land. However, with decreased labour availability and rising labour cost, farmers are motivated to shift from transplanting to direct seeding as is practiced in other temperate rice-growing countries. In temperate climatic regions where a single irrigated rice crop is grown per year, productivity is achieved. The system of rice cultivation in any region depends largely on factors such as situation of the land, types of soil, irrigation resources, availability of labours, intensity and distribution of rainfall patterns etc [7]. Dry or semi -dry upland cultivation is generally carried out by broadcasting seeds or sowing behind the plough or drilling by seed drill machine. Crop depends entirely on rains, and thus farmers grow drought tolerant varieties such as Khumal, Hardinath, CH, Ghaiya and local landraces. Land ploughed after harvest of winter crops, clods broken and soils pulverized and field well levelled. This operation ensures to control weeds and improves water holding capacity of soil. Seed broadcasted in soil after field preparation and cover with soil using local plough or disc harrow. Seed rate depends on varieties. Planting is done by transplanting in puddle soil or by broadcasting of sprouted seeds in puddle soil [8]. Wet or lowland condition: This is the most dominant rice cultivation in Nepal. Sprouted seeds directly sown in puddle field or seedlings raised in a nursery are transplanted. This is practiced where there is assured and adequate supply of water, however, farmers of most parts of the country still use this rice culture under rain-fed condition. Broadcasting of sprouted seeds in puddle soil: This method is generally applied where there is shortage of labour or labour is very expensive for transplanting and also in case of limited time for rising of seedling in nursery. Seed are soaked in water and pre germinated before broadcast. The sprouted seeds with radicle length are uniformly broadcasted in puddle field. This is common practice in terai region with assured irrigation [9]. Transplanting by hand is the age old practice in rice cultivation. This is easy method, but requires experience of maintaining plant spacing. Manual transplanting is being slowly replacing by machine due to increase labour cost and shortage of manpower. Machine transplanting day due to mechanization in rice, transplanted is used for planting rice. This is just in the early adoption stage. Field preparation is crucial in establishing the seedling in field. The field should be left undisturbed after the final paddling for the soil to settle down then only rice transplanted can be effectively use for planting [10]. If transplanting is done is freshly prepared field seedling will not remain stick to mud and float on the surface.

Conclusion

Though rice husk ash finds largest and most commercially viable markets in cement, concrete and steel industries, constraints to the expansion of this market is due to the health issues associated with using crystalline ash and hence there is a great potential for use of amorphous rice husk ash in these area.

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Conflict of Interest

None

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