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Introduction to Agriculture and Rice Breeding in Ghana

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Ghana is located in West Africa on the coast of the Gulf of Guinea. Ghana covers an area of 238,535 km^2 and the population size is about 32.8 million inhabitants, with 83.3% aged below 45. The economy of Ghana largely relies on farming, and the share of Agriculture to the Gross Domestic Product (GDP) is 22.1% after the Services (45.8%) and Industry (32.1%). Among all major food crops cultivated in Ghana, rice is the second most important after Maize. Other food crops include cassava, plantain, yam, groundnut, cowpea, beans, cocoyam, and vegetables. Rice is cultivated in rainfed lowland (78%), irrigated (16%), and rainfed upland (6%) cropping systems, covering 300,000 ha (2022). The total rice production in 2022 was about 1.23 million MT. However, rice consumption per capita nearly reached 63 kg per year. The annual rice consumption is about 1.5 million MT and is expected to increase by 8.8% every year with the persistent increase in population growth, urbanization, and changes in consumer habits. The major challenges in rice production in Ghana include low productivity and quality of rice varieties used by farmers, poor soils, low fertilizer usage, inadequate agricultural machinery, high inputs and labor cost, and uneven rainfall.

Rice breeding in Ghana aims at developing rice varieties for yield improvement, disease resistance (Rice yellow mottle virus (RYMV), blast, neck blast, etc.), drought, salinity or submergence tolerance, and reduced postharvest losses of high-shattering rice varieties. In addition, aromatic rice varieties and intermediate amylose content (20–24%) are desired grain qualities. Growing demand for long slender and early-maturing rice has been also observed. To date, 35 rice varieties have been developed using conventional breeding and released to the farmers in Ghana. These varieties were improved for traits such as high yield (3–9 MT ha^{-1}), RYMV resistance, and resistance to lodging, nitrogen use efficiency. Despite the potential for developing new varieties, the introduction of elite rice lines from abroad is commonly used as a source of diversification of genetic resources in Ghana. Although there is no well-established plant molecular breeding system in Ghana, the Ghanaian breeding system is currently employing molecular breeding techniques such as marker-assisted selection and Marker-assisted backcrossing, in collaboration with other research partner Institutions, to develop new rice varieties that may help address major challenges in rice production in Ghana, in the context of climate change.

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