Rice (Oryza sativa, L.) is one of the strategic crops worldwide, and improvement of its productivity is an essential requirement to ensure food security. Therefore, the study's objective was to investigate the importance of metabolic, morphological, and phenotypic plasticity parameters for water stress tolerance in different rice varieties and exogenous application of different nutrients either alone or in combination. Although the internal resistance of the plants to water shortage, the harmful effects of drought can be reduced by providing adequate and balanced supplies of mineral nutrients. Under low soil nutrient concentrations, plants have to absorb more water to be able to absorb the same amount of mineral nutrients for their metabolism as they would get from soils of satisfactory fertility. Water deficiency greatly affects the uptake of nutrients by the roots and their movement towards the shoots, which is why rice growth often does not respond to nutrient inputs. These nutrients are integral components of organic compounds such as amino acids, nucleic acids, phospholipids, and proteins. Drought stress leads to reduced transpiration flow due to interference with absorption and discharge mechanisms which may result in reduced nutrient uptake. Optimal nutrition greatly influences water circulation within plants, which is a very effective way to combat water deficit. It is worth mentioning that recently released water stress-tolerant rice varieties may respond better to nutrient inputs, and growth and yield may be enhanced under water stress, compared to susceptible varieties. Sustainable production in drought-affected areas can only be achieved through developing drought-tolerant varieties. Therefore, plant nutrients such as phosphorus, potassium, calcium, magnesium, etc.