Global agriculture faces growing demand for food due to increasing population and predicted 70% increased food production by 2050 has to come from shrinking land, water and other natural resources (Foley et al 2011). Recent trends in the productivity of major food crops suggest that current productivity growth (Ray et al 2013) will not be sufficient to meet the predicted growth in demand. Further, emerging climate change (Thornton and Ceamer, 2012) poses a major threat to global agricultural productivity. In this context, improving yield potential and resilience in major staple crops such as rice is important. Efforts through conventional breeding, led to designing and development of semi-dwarf and “new plant type” rice varieties but thereafter, no substantial progress has been made in improving rice yield due to its ineffectiveness for quantitative traits. Over the past decade, molecular marker and transgenic technology, genomics and genome engineering have accelerated the development of high yielding and resilient rice through precise tailoring of yield and resilience related traits. Advances in marker technology accelerated QTL discovery and allele mining of complex traits and precisely combining favourable alleles into mega varieties. QTLs/genes controlling plant architecture (sd1, HTD2, DLT, MOC1, TAC1), days to heading (Hd1-6, qDTH), panicle traits (panicle architecture, grain number, grain size, grain weight), tolerance to abiotic (drought, salinity, submergence, phosphorus deficiency) and biotic (BLB, Blast, BPH) stresses have been mapped and deployed in molecular breeding. Breeding by design in India using QTLs (qDTY, Sub 1, Xa13, Xa21 etc.,) have resulted in improved mega varieties like Swarna, MTU 1010, IR 64, CR 1009, Samba Mahsuri etc., and have been disseminated to the farmers through National Agricultural Development Program (NADP) and Stress Tolerant Rice for Asia and South Africa (STRASA) programs. In TNAU, improved genotypes IR 20, CO 43, White Ponni, ADT 43 etc., tolerant to drought, submergence and biotic stresses have been developed by molecular breeding and are in the R&D pipeline. Recent advancements in genotyping and bioinformatics enabled to design breeding strategies like multiparental advance generation intercrossing (MAGIC) and Genomic selection (GS) to pyramid multiple traits in desired genetic backgrounds. Further, it is realized that combining transgenic technology with MAB will enable introduction of novel traits. Non-existing genetic variations like beta carotene accumulation, elimination of disease susceptibility genes etc., can now be precisely manipulated using genetic engineering and genome editing tools. In India, several GE rice lines improved for several agronomic and quality traits are in development. In TNAU, efforts are being made to develop rice genotypes exhibiting enhanced tolerance against drought, pests, enhanced nutrient content (Vitamin A and high iron) and therapeutic properties using breeding by designing. Status on development and dissemination of improved rice genotypes bred by design using conventional and modern breeding methods will be discussed.