



# Four Revolutions of Plant Breeding



Selective Breeding	Mutation Breeding	Transgenic Breeding	Genome Editing
Thousands of years	Since 1920s	Since 1980s	Since 2000s
Desired gene is incorporated along with many other genes, which then have to be bred out	Desired mutation is incorporated along with many other random mutations, which may need to be bred out	Only the desired gene is incorporated, but randomly inserted	Wider range of genetic changes achievable, potentially in all crop species
Random, slow, crossing only works within species	Random, unpredictable, but relatively fast	Random insertion, inserts foreign genes	Precise, fast, leaves no trace