

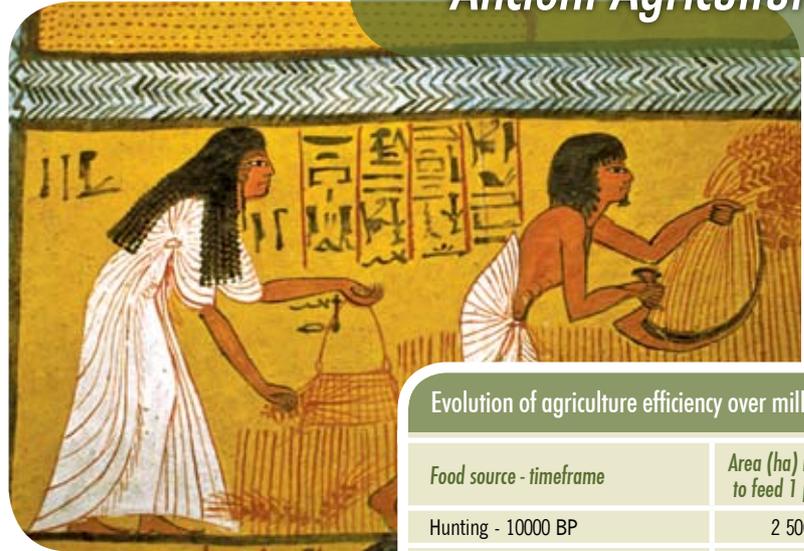


The World population has passed 6.8 billion people and continues to grow. Hunger is one of the major challenges to humankind at present and likely will be even more in the future as food production requirements rise. Technology advances in agriculture and food production need to continue to meet these challenges.

Agriculture began about 12 000 years ago, as the early farmers sowed and harvested plants that had previously been gathered in the wild. Since then population increased very rapidly and agriculture has become more efficient in feeding human populations.

With agriculture, humans started the domestication of the crop species we use today as food, feed, fiber and fuel. Domestication was an empirical breeding process carried out over millennia, that resulted in today's agronomic species.

Ancient Agriculture



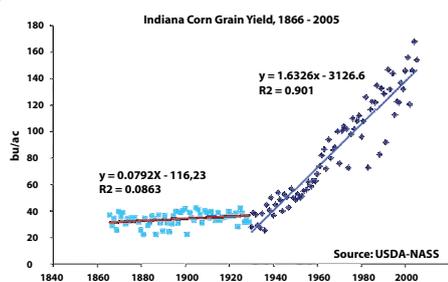
Evolution of agriculture efficiency over millennia

Food source - timeframe	Area (ha) needed to feed 1 person
Hunting - 10000 BP	2 500
Grazing - 5000 BP	250
Scattered plots - 2000 BP	84
Rudimentary agriculture - 500	0.333
Mid 19th Century agriculture - 1840	0.070
Modern agriculture - from 1970s	0.035

Source: Adapted from Stork e Teague (1952) and Borlaug (1972)

Plant Breeding

Corn grain yields in Indiana, USA from 1866 to about 1930 changed very slowly. With plant breeding technologies, such as the adoption of hybrid seed corn in the 1930's, and better crop management coming to farmers' fields, yield increased substantially.



Historical corn grain yields for Indiana (USA) from 1866 to 2008. Source of yield data: USDA-NASS (2008).

Plant breeding is the art and science of genetically improving plants for the benefit of humankind. Plant breeding can be accomplished through many different techniques ranging from simply selecting plants with desirable characteristics for propagation, to more complex molecular techniques. Plant breeding has a proven track record in increasing crop productivity.



Plant Breeding: solutions for producing food even in unfavorable environments

Crop Productivity

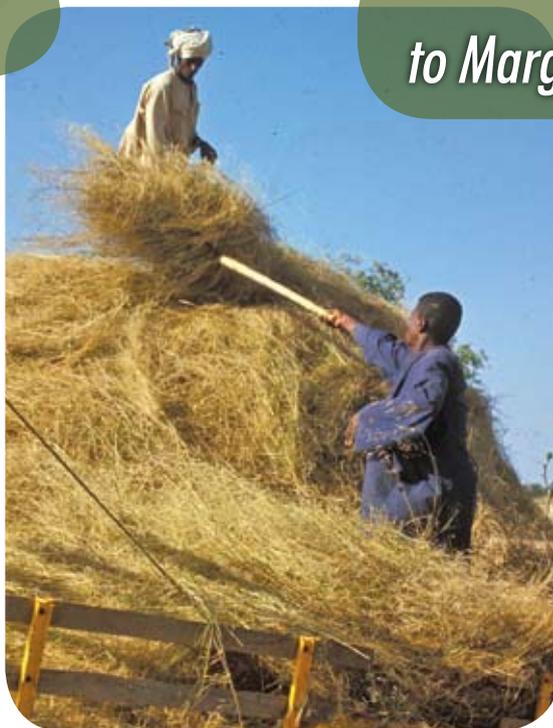
Plant breeders have provided remarkable contributions in increasing grain yield in cereals. The Green Revolution, one of the best known examples, was also accomplished by introducing dwarf genes

Increase in cassava average yield in Thailand (ton/ha), with adoption of new improved varieties and better agronomy.

1990	13.9
1997	14.7
2007	22.9

Source: FAOSTAT and CIAT

into wheat varieties responsive to fertilizer. Many other striking contributions of plant breeding helped alleviate starvation.



Crop Adaptation to Marginal Environments

Varieties tolerant to drought, flood, heat, cold, or aluminum toxicity can be grown in areas that otherwise would be unfit for farming. For example, the selection of corn varieties having the ALMT1 gene has made it profitable to grow corn in aluminum-rich soils of the Brazilian savannas.

Plant breeders are also developing varieties tolerant to pests, with better nutritional quality and with many other value-added traits.

Return on Investment in Plant Breeding

- *Food security: developing varieties with higher productivity and better yield stability.*
- *Social benefits: developing more profitable varieties for poverty alleviation.*
- *Economic benefits: developing drought resistant varieties that help reduce production costs, improving viability in marginal agribusinesses. A more profitable agribusiness results in more revenues and higher gross domestic product.*
- *Environmental benefits: developing varieties less dependent on pesticides or more efficient in water and nutrient use.*

Current Challenges of Plant Breeding

- *Global food production has grown faster than population over the last century, due largely to improved varieties. With the continuous decrease in food prices, the role of plant breeding was taken for granted in many countries, leading to a sharp decline in plant breeding activities.*
- *Plant breeding pursues continually moving targets in developing adequate varieties for climate change pressures and many other stresses.*

Plant Breeding Relevant Facts

- *Plant Breeding is responsible for about 50% of crop productivity increase over the last century, while the remainder of the yield increase comes from better crop management (e.g., fertilization, irrigation, weeding).*
- *Development of improved varieties for food security and sustainable agriculture is a major element in tackling poverty and rural displacement.*
- *The sciences supporting Plant Breeding, e.g. molecular biology, are advancing rapidly and plant breeding will provide even greater contributions in the near future.*
- *Plant Breeding must be one of the highest priorities of government, policy makers, and donors to ensure food in quality and quantity available to an each day hungrier world.*