

## THE IMPORTANCE OF QUALITY PROTEIN MAIZE (QPM)

### What is Quality Protein Maize (QPM)?

Quality Protein Maize or QPM is maize that has improved protein quality in the grain, so that the food value of the grain for humans and monogastric animals (e.g., poultry and pigs) is significantly better than normal maize. QPM does not have more protein than normal maize, but the protein is of better quality, since it has a 60-100 % more of the essential amino acids, lysine and tryptophan, than normal maize. Lysine and tryptophan are required for building proteins in the body. In all other respects, QPM is similar to normal maize, and it is a naturally occurring characteristic in maize, but one that required research to identify and incorporate into improved varieties.

### What are essential amino acids?

Amino acids are the building blocks of proteins. There are approximately 20 different amino acids that are used to make proteins. These amino acids are constituents of the proteins in the food we eat, but different foods have different quantities of the 20 amino acids.

Amino acids can be divided into two groups:

- Essential, and
- Non – essential

Some of the essential amino acids are used to produce non-essential amino acids. There are eight essential amino acids, and almost all human proteins contain all the essential amino acids. The body cannot use existing amino acids to produce the essential amino acids. These have to be obtained directly from the food eaten. If the body is deficient in essential amino acids, a protein deficiency, such as Kwashiorkor, will occur.

Tryptophan and Lysine are two of the essential amino acids. Normal maize is deficient in tryptophan and lysine. Consequently, if a diet is principally based on normal maize, protein deficiencies may arise.

### Benefits of QPM

Although maize is a good source of energy, it is deficient in two essential amino acids, lysine and tryptophan, and therefore has low quality protein. Thus, diets predominated by normal maize without supplementing with other high quality protein sources may lead to protein malnutrition. Severe protein deficiency in children may cause kwashiorkor, a disease sometimes called “weaning disease” when infants are weaned onto maize-based diets without supplementation with high quality protein sources. Many rural and urban poor people cannot afford high quality protein diets and subsist mostly on maize and vegetables

Replacing normal maize with QPM will improve the diets of people whose staple food is maize. Normal maize and QPM contain, on average, equal protein content but it is the quality of the protein that differs between them. The BV (Biological Value) of the protein of QPM is about 90 % that of milk whilst that of normal maize is about 40 %. QPM grain is not observably different from normal maize grain, and it has been shown to produce equally palatable foods to normal maize. It has been estimated by researchers that children consuming about 100 g of QPM per day would receive sufficient lysine for healthy growth.

Quality Protein Maize also has promise in monogastric animal diets. Numerous studies have shown that poultry and pigs had greater growth rates when fed QPM than normal maize. Consequently, it is expected that rural small-holder pig and poultry producers would significantly benefit from the use of QPM, especially where access to high quality protein supplements is lacking.

#### How is QPM produced?

QPM contains a recessive gene (opaque-2) which produces increased protein quality in the endosperm of the maize grain. Early attempts to develop varieties with the opaque-2 gene were not particularly successful, because the plants were found to be low yielding, while the grain was soft and chalky, and did not store well. Breeders had to expend much effort in developing varieties that had higher yield and improved grain hardness. Breeders selected kernels that had modifier genes that produced a normal endosperm without reducing the protein quantity or quality.

The opaque-2 gene is a recessive gene, and therefore the breeding system for its incorporation into maize is somewhat difficult. The gene may be “masked” if the QPM plant is cross-pollinated with normal maize.

#### Is QPM genetically modified?

QPM is not genetically modified. The genes found in QPM are naturally occurring in maize. Breeders have selected maize that contains the recessive gene in the homozygous state and also for maize that contains modifier genes which increases the viability of the plant as a crop.

#### Where is QPM available?

Improved QPM varieties are available in a number of countries either through seed companies or NGOs. Both hybrid and open-pollinated varieties are available, and farmers should purchase certified seed of QPM varieties, rather than buying seed from neighbors. Hybrid seed has the following advantages over open-pollinated varieties:

- Higher yield potential and better performance
- Greater uniformity of kernel modification
- Easier to monitor the protein quality

#### Is QPM necessary?

There is controversy about the real value of QPM. There are nutritionists who argue that increased consumption of other food crops or protein sources would be a more practical way of improving nutrition than producing and consuming QPM. However, where maize is the primary source of dietary protein, the advantage of QPM is tremendous and unquestionable. This is particularly true for rural and urban poor, who cannot afford or access other high-quality protein sources, such as fish, eggs, meat and beans. Furthermore, QPM may play a significant role in improving the production of small-scale poultry and pig enterprises where maize forms the principle diet or where costly protein concentrates are not easily available. Thus, QPM has the potential to enhance the livelihoods of African farmers and urban dwellers.