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# IITA Rice Breeding Objectives And General Rice Programme For West Africa.

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Rice which used to be food for special occasion in Nigeria is becoming a regular food item in many homes. The production and cultivation of rice have increased considerably the past six years. This trend is true in many other African countries. Thus rice is a crop in which a consolidated research effort is worth while. With this in mind rice improvement is one of the main research in IITA.

The main objectives can be broadly listed under five headings as follows:

Grain yield improvement

Plant type improvement

Resistance to African pests and diseases

Maintenance of high grain quality

Emphasis on upland improvement

In explaining these main objectives it is necessary to discuss factors contributing to each of these. Under yield related factors we consider in our selection

1. Medium to high panicle number
2. Medium to high grains/panicle
3. Medium to high grain weight
4. Non-shattering but easy threshing.

The number of panicles per plant is very important in determining the yield of rice crop. Where soil moisture is adequate a high panicle number which is related to a high productive or effective tillers per plant is desirable. Under some moisture stress a medium number will be satisfactory as filled grain per panicle will be less. Panicles per plant could range from 4-28.

Similarly a medium to high grain panicle is desirable depending on the water regime. Grain number per panicle can vary from 80-170. The 1000 grain weight is an important factor that determines the grain weight of a variety. The 1000 grain weight ranges from 16gm to 47gm, 25-35gm being the usual.

Shattering or grain shedding before harvest is due to the anatomy of the pedicel apex and the spikelet base. When these fit horizontally there is shedding but when there is an oblique joining with an enlarged pedicel apex there is no shedding. In our selection we look for a balance between these two extremes.

Improvement of the rice plant type is a concern not only of the IITA scientists but also the Federal Agricultural Scientists. We are aware of limitations of the present unimproved plant types. Their height and leafiness make them prone to lodging non-Nitrogen fertiliser responsive and poor yields. Selection criteria for morphology improvement include short to medium height stiff strawed plants; tough, slowly senescent and moderate length and fairly upright leaves; good tillering, superior root development and seedling vigour; lastly well exserted panicles.

In most cases shorter plants with stiff stem will lodge much less than tall ones if harvesting is not delayed. A height of not more than a meter is our goal. Slow senescent leaves and good basal wrapping has two advantages. It is able to photosynthesis for a longer period and the chances of lodging are reduced. Moderate length and fairly upright leaves afford maximum exposure to sunlight by reducing mutual shading.

There are many physiological factors considered to achieve our objectives. These are directly or indirectly related to yields, growth period and ability of the crop to withstand some adverse conditions. The criteria include medium to early maturity, Nitrogen responsive tolerant of moisture stress,

tolerant of

deep water high iron absorptive capacity, tolerant of iron and magnesium toxicity and satisfactory embryo dormancy. In many areas for upland crops medium to early maturing (135-100 days) is highly desirable as crop will be able to complete its life cycle under favourable soil moisture content. Tolerance to moisture stress or drought is an essential trait for a good upland variety. It is important that an upland crop be able to withstand five to seven days of no rain.

For a farmer to obtain his money-worth from fertilizer application it is essential that the crop will respond to this in form of increased grain production. Lack of dormancy is selected against as this will cause sprouting of grains before harvest if the moisture condition is right. This is an undesirable situation because the grain quality is spoit and such grains will be useless for planting in the following season.

Physical grain quality factors are related to attractiveness of the grains and total milled rice recovery. In our selection we choose medium to long grain varieties with clear, translucent grain appearance which produces a high total milled rice. A clear, translucent grain will possess neither white belly nor white core which are responsible for grain breakages during milling. Too long a grain (over 8mm milled grain) also produces much breakages during milling unless special precautions are taken.

In determination of chemical grain qualities factors considered are intermediate to high (20-30%) amylose content, medium gelatinisation temperature, high protein content (12%) and favorable amino acid balance. An intermediate to high amylose content produces a well separated fluffy and dry rice on cooking. Amylose starch is the straight chained starch residues in contrast to amylopectin which produces sticky rice on cooking. Most West African rice

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consumers prefer the non-sticky rice except when the rice is used in making a special food preparation known as tuwo. A low gelatinization temperature means shorter time in cooking. Protein is an essential chemical item in our food and the good balance of its amino acids improves the dietary quality of the protein. Therefore these are considered important in our program.

On the question of pests and diseases main emphasis is placed on resistance to Pyricularia oryzae (blast), resistance to leaf scald and brown leaf spot and resistance to stem borer and diopsid fly. On average good soil and water conditions the most devastating rice diseases in West Africa is blast. Therefore we are looking at this problem very closely. Neck rot, grain blast, sheath blast etc are the other forms of expression of the fungus.

In West Africa more than 70% of the rice is grown under upland conditions therefore we are pursuing more vigorously improvement of upland varieties. This is being done in a multi-disciplinary way involving the pathology, entomology, physiology, Agronomy etc. of upland varieties in addition to breeding and selections. This we feel is the best way to achieve our objectives in rice improvement program.

The Institute general programme for West Africa on rice is not laid down as such but our outreach and cooperational programs develop as more cooperators and materials are identified. We are ready to make our facilities, results, expert's advice, seeds available to any desirable groups, Institutes, Universities and Ministries that request for them. Our program outside the Institute premises will depend on the response or request from the various bodies in and out of the country. In carrying out most of our objectives above we shall depend on the cooperations of other researchers and extension workers in West Africa.

We have sent out seeds of many promising varieties for nurseries or trials to many parts of West Africa for on site evaluations. These will help determine among other things their adaptability and acceptability in these areas.

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