



UPLAND RICE PRODUCTION IN KWAZULU-NATAL

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The cultivation of rice in this Province is not a recent phenomenon. Records show that the first attempts were made in the 1920s. Then, in the mid-1950s, rural communities surrounding Port Edward on the KZN South Coast commonly cultivated dryland rice for home consumption. Subsequently, paddy rice was cultivated with limited success on the Makhathini Flats in the 1970s and 1980s.

In January 2005, Prof Lin Zhanxi, together with his Juncao Team from Fuzhou, Peoples' Republic of China, were invited to introduce Juncao Technology to KwaZulu-Natal. This technology embodies the interlinked and sustainable use of upland rice, mushrooms and Juncao fodder as a basis for poverty alleviation.

Prof Lin selected and brought with him a cultivar of upland rice which he deemed suitable for our province.

Golden Mountain #1 has a broad genetic base with a strong tendency to ratoon repeatedly under good management and environmental conditions. It has been known to produce 13 successive grain crops (over 4 years and 2 months) **without replanting** in Papua New Guinea.

However, upland rice, (when compared to maize) has relatively high water, temperature and management requirements. It is also highly sensitive to weed infestation immediately after planting – and the grain is highly palatable to seed-eating birds, in particular quelea. It is therefore necessary that careful thought and planning precede the decision to cultivate upland rice on a large scale. The following basic guidelines are therefore set out for consideration.



Figure 1: Upland Rice Production

Site selection

Bearing in mind the Upland rice water requirement (800-900 mm/annum, evenly distributed over the production season) it is important that supplementary irrigation of some sort is available. Upland rice however, does not tolerate prolonged flooding. Night (air) temperatures of less than 15°C over more than three days in succession during flowering adversely affect pollination.

Establishment and management

Planting date

Two interrelated factors are extremely important in this regard: a) what night temperatures are anticipated at flowering (about 80 days after planting) and b) whether multiple harvests are anticipated. As mentioned above, (air) temperatures of less than 15°C for more than three days in succession adversely affect pollination and therefore grain yield. For multiple harvests, the earliest planting date possible should be selected.

Soil fertility requirements

- * **Basal dressing:** Soil samples should be taken in advance of the planting operation to ensure that adequate amounts of phosphorus and potassium are present throughout the soil profile to ensure good growth – especially immediately after planting. If, however, soil test results are not available a basal dressing of 2:3:2 (30) should be applied at 300 kg/ha and worked into the soil profile to a depth of 200 mm.
- * **Top dressing:**
All top dressings should be applied evenly, just before rain or irrigation and at the following growth stages:
 - At initiation of three leaf stage: 70 kg nitrogen per hectare
 - At piping (once the stem becomes round and the first node appears): 150 kg 2:3:4 (30) per hectare
 - Two weeks before first harvest: 100 kg nitrogen per hectare.
 - At piping (about 28 days): 300 kg 2:3:4 (30) per hectare.
 - Two weeks before second harvest: 100 kg nitrogen per hectare.
 - At piping (about 28 days): 300 kg 2:3:4 (30) per hectare.
 - Two weeks before third harvest: 100 kg nitrogen per hectare.



Figure 2: A stand of upland rice approaching harvest time

Seedbed requirements

It is absolutely essential that a firm, fine, weedfree seedbed is prepared. Currently, only one herbicide is registered for use in rice – and this is for a post-planting, pre-emergent situation. Any weeds which appear after planting must therefore be controlled manually - at great cost in time and effort. When inexperienced rice producers hand-weed an area, significant damage to the rice seedlings takes place – and this impacts directly and negatively on the ultimate plant population of rice plants and therefore the grain yield.

Seed treatment prior to planting

The seed is soaked for 48 hours prior to planting. This has two benefits: a) Infertile/empty seed rises to the surface and is easily removed, and, b) germination is initiated immediately as opposed to 5-7 days if unsoaked/dry seed is planted. The sooner the rice seedling emerges after planting the better it is able to compete with the weed seedlings.

Planting depth

The seed should be placed no deeper than 15 mm below the soil surface, once planting operations are completed and the soil has “settled”. If the land is to be rolled after planting (as is normally the case with machine planting), the seed should be initially placed no deeper than 10 mm at planting.

Planting

- * **Hand planting.**
A plant spacing of 26 cm within the row and with a row spacing of 26 cm between rows is recommended. Five pre-soaked seeds are placed together in a depression (30 mm deep) roughly the size of an egg-cup and covered to a depth of no more than 15 mm.



Figure 2: Hand planted rice

* Machine planting

The most effective machine for this purpose is a wheat planter set to plant in 27 cm rows. A seeding rate of 35 kg (dry) seed per hectare is recommended. It should be noted that soaked seed will increase in mass by about 40%. This should be taken into account when the machine is calibrated. As mentioned earlier, the seed should be placed no deeper than 15 mm and then rolled with a Cambridge roller. If a press-wheel is fitted to the planter, rolling should not be necessary. Care should be taken, however, to set the press wheel such that the germinated seed is not subjected to physical damage (breaking off the radicle and/or coleoptile). Irrigation should follow immediately.

Water application

The soil profile should always be kept moist to a depth of 25 mm below the root zone. It is critically important that adequate soil moisture is available during the following four growth phases: at the 3-leaf stage, when the plant is actively tillering, at heading and at grain filling.

In practical terms, natural rainfall should be supplemented to at least 25 mm irrigation per week during the growing season. The more sandy the soil, the more frequently the supplementary irrigation should be applied. As with all irrigated crops, rainfall of less than 3 mm per event should be ignored. Flood irrigation should take place weekly and in terms of the above-mentioned principles.

Weed management

Only one herbicide is registered for use in rice production in South Africa. This herbicide is costly and often difficult to obtain. It is therefore likely that the area will require hand-weeding until such time as the rice canopy "closes" between the rice plants and suppresses weed growth.

Harvesting

Once the grain in the panicle has matured to 25% moisture content (roughly one-third of the seedhead has turned a light yellow in colour), the grain should be harvested. A variety of harvesting options are available. The rice can be harvested mechanically using a combine harvester with the appropriate header, spike-tooth threshing drum and concave sieve for rice. Cutting height should be set at 50 mm above ground. Alternatively, it can be cut by hand (also at 50 mm above ground), gathered into sheaves and hand threshed against the inside of a 200ℓ drum from which the one end has been removed.



Figure 3: Harvesting by hand

It is also possible to manufacture a mechanical (foot powered) thresher which, to date, has proved to be ideal for small producers who cultivate areas of less than 5 ha in extent. Once threshed, the grain should be sun-dried. It can then be hulled and polished (with purpose-built equipment), thereby rendering the product available for consumption.

It is important that a portion (roughly one-third) of the rice-straw be returned to the harvested area (to serve as an organic cover) after threshing. The soil surface between the rice plants should be covered to a depth of 50 mm. This practice serves not only to conserve moisture, but also to counteract (as far as possible) the germination of weed seeds.

Storage

As with any grain product, rice should be stored in a cool, dry environment with adequate ventilation. It is important that the crop be protected against attack by insects and vermin (snout beetles, weevils and rats).

Further information

While every effort has been made to cover the basic requirements necessary in cultivating Golden Mountain # 1 Upland Rice, it is possible that further information may be required by prospective producers.

Requests for further information can be made to any of the authors at the following address:

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