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Alternative seedbed methods for t. aman rice under drought prone conditions, NW-Bangladesh

SUMMARY:
The agriculture sector in Bangladesh is highly sensitive to climate variability and climate change. Agriculture-based subsistence economy employs almost two thirds of the population, and adaptation to climate change is vital to maintain sustainable development. In Northwestern Bangladesh adaptation practices need to target transplanted aman rice, the most important crop in the Barind Tract under rain fed situations. In order to improve its resilience to increased drought frequencies and to inadequate availability of water for irrigation at critical cropping stages, alternative seedbed methods have been developed.

KEYWORDS:
Adaptation [1]
Seedbed preparation [2]
Rice [3]
Drought resistance [4]

CATEGORY:
Climate change and disaster risk reduction [5]
Natural Resources Management [6]

COUNTRIES:
Bangladesh

DESCRIPTION:

Introduction

In the northwestern Barind Tracts of Bangladesh, summer monsoon starts in mid-June and ends in the last week of September. Intra-seasonal rainfall variability in monsoon rainfall distribution often creates water scarcity situations at critical cropping stages, and delayed onset of rains shortens the length of the growing period. The transplanted *aman* (t. *aman*) rice crop, which is usually planted during monsoon season under rain fed conditions, is frequently affected by drought spells at different growth stages.

Timely transplanting of rice helps good crop establishment as well as increasing its yield. Farmers start preparing seedbeds with the first rains in early June and transplant the seedlings in early July. Transplanting is often delayed by a few weeks and up to a month due to delayed monsoon onset, putting the crop under risk of terminal drought in October/November. In this situation, farmers require an alternative dry seedbed method in order to start producing seedlings in June/July, even in the event of delayed onset of monsoon. Seedlings produced from dry seedbeds are known to have greater resistance to drought. In addition, the roots of seedlings from dry seedbeds are longer than those from wet seedbeds. Farmers recognized that seedlings from dry seedbeds can withstand dry spells of up to 12 rainless days compared to seven days for seedlings produced from wet seedbeds.

The technology was tested in the agro ecological zone of warm humid tropics in mixed irrigated and rainfed farming systems in northwestern Bangladesh.

Objective

The objective of this technique is to reduce the exposure of t. *aman* rice crop to rainfall variability at the beginning of the monsoon season and to increase the yield.

Implementation of the Technology

a. Dry bed method:

This system of nurseries is prepared in dry soil conditions. Seedbeds of convenient dimensions are prepared by raising the soil to a height of about 5-10 cm. A layer of half-burnt paddy husk or saw dust may be distributed on the nursery bed mainly to facilitate easy uprooting. In this method, dry paddy seeds that just sprouted are sown in the dry nursery bed in rows about 10 cm apart. Random (broadcast) sowing should be discouraged as weed control is difficult. The site should be free of shade and should have irrigation facilities. Nursery area should be about 1/10 of area to be transplanted. Seeds are sown after a thorough ploughing of the soil and are covered with soil. This is different from the wet seedbed method, whereby the seeds are exposed. Seed rate should be higher than for wet-beds (about 40 kg/ha) because the germination could be lower. Uprooting of seedlings should be done between 15 and 21 days after germination. The nursery should be without any moisture stress.

Resources required:	seed bed of convenient size, layer of half-burnt husk, paddy seeds.
Potential mal-adaptation:	high soil temperature before monsoon onset may reduce the germination percentage
Non-climatic benefits:	seedlings are short and strong, have longer root system than wet bed and are ready in 25 days.

The dry seedbed methods, however, pose some difficulties: under dry conditions pulling seedlings is strenuous and can require twice as much labor as a conventional wet seed bed. Besides, if soil moisture is insufficient, root systems can be damaged when pulling seedlings. These deficiencies may be minimized by adopting a new dry seedbed preparation method. By adding more fine red earth, farmyard manure or compost, and sand it is possible to produce healthy seedlings and reduce the damage.

b. Raising mat-type seedling in trays:

With this method, seedlings are raised in 48 x 22 x 1.5 cm trays. The quantity of soil required to fill one tray is 1.5 kg. Ten trays cover an area of 1 m2 square meter of nursery. For one ha, 20 m² are required. With a seed rate of about 100 to 125 gm/tray, the seed rate for raising nursery for one ha is 25-30 kg. The procedure for raising nursery is as follows.

- Treat dry clean seeds with fungicides.
- Fill each tray with 1.5 kg of dry powdered soil mixed with organic manure (Farm Yard Manure and compost).
- Fill trays with soil up to 10-12 mm depth.
- Spread the treated seeds (100 to 125 gm/tray) uniformly in the soil and cover them with 2 to 3 mm of soil layer.
- The trays need to be kept in a field that is clean, properly leveled and near a water source.
- Sprinkle the trays regularly with water. Initially one jerry can of water is sufficient to cover 1 m² of seedling trays. Water application depends on the age of seedlings. Generally, 25-day-old seedlings are used for transplanting. Therefore, watering of trays is to be planned according to the transplanting schedule.
- Stagger sow according to time of transplanting in the main field by manual transplant.

The advantages of raising rice seedlings by this method over other methods are:

- seedlings can be prepared with less seed, water, labour and seedbed area,
- seedlings will be healthy and uniform in growth,
- uprooting of seedlings is very easy with less labour and cost involved,
- Seedlings can be protected from early season drought.
- The initial cost for the trays needed for this technique amounts to US$7.00 for raising enough seedlings for one *bigha* (1330 m²). However, these trays may be used for more than five years. Locally available trays may be used to reduce the cost.

Resources required:	plastic trays, soil and manure mixture and paddy seeds.
Potential mal-adaptation:	none.
Non-climatic benefits:	saving seeds, low water requirement, low labour costs for seedling establishment.

c. Dapog method:

Dapog nurseries can be located on a flat surface. However, if lowland paddy field is used, water supply/control should be very reliable. The area needed is about 10 m² for 1 ha of the transplantable land which is much smaller than conventional nurseries. Seed rate is about 125 kg/ha. Seed bed should be leveled with the centre slightly higher than the edges to permit water to drain off the surface. The surface should be covered with banana leaves with the mid-rib removed, polyethylene sheets or any flexible material to prevent seedling roots from penetrating to the bottom soil layer. Cemented floors can also be used for this purpose. Cover the seed bed with about 1/4" layer burnt paddy husk or compost or well decomposed Farm Yard Manure (FYM). Sow pre-germinated seeds uniformly on the seed bed to a thickness of two to three seeds. Splash the germinating seeds with water and press down by hand or with a flat wooden board in the morning and afternoon for three to four days to prevent uneven growth. Excessive watering should be prevented. The seedlings should be transplanted 12-14 days after the germination of seeds.

Resources required:	banana leaf, polythene sheet, paddy husk, manure and paddy seeds.
Potential maladaptation:	none
Non-climatic benefits:	less area is needed and the cost of uprooting seedlings is minimal. Very young seedl from dapog nurseries have less transplanting shock than the ones from other nurseri making them more suitable for short duration varieties.

References and Further Reading

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