

Farm Level Evaluation of Drainage Technology for Mungbeans Grown Prior to Lowland Rice

R. Pernito and D.P. Garrity

The International Rice Research Institute
Los Baños, Laguna, Philippines
P.O. Box 933, Manila, Philippines



There is substantial potential to expand the area planted to pre-rice upland crops on rainfed lowland ricelands if practical surface drainage methods can be used to reduce waterlogging during the early rains. Previous agronomic research found substantial yield advantages in pre-rice mungbean performance with simple ridging technology. We conducted studies in cooperation with farmers from 1987 to 1990 to evaluate these tractor-ridging and animal-ridging methods on a field scale. Heavy rainfall caused natural surface flooding on 7 to 25 days in broadcast-seeded plots. Tractor-ridging elevated the upper root zone 11 cm above the soil surface, and maintained free-water levels below the ridge surface. The ridge height with animal ridging was half that obtained with tractor-ridging, and protection from surface flooding was intermediate. Grain yields were significantly higher across farms ($n=7$) with tractor ridging compared to broadcast-seeding (360 kg/ha vs 166 kg/ha). Comparative net returns with ridging were ₱2150/ha vs ₱149/ha. In a season without waterlogging, yields among planting systems were comparable (672 kg/ha vs 602 kg/ha). The greatest advantages of ridging were exhibited in fields subject to moderate waterlogging stress. Simple surface drainage techniques tend to stabilize yields, and enable expanded pre-rice mungbean production on waterlog-prone ricelands.

Keywords: waterlogged, pre-rice, ridging, flooding, crop establishment, furrows

There are approximately 30 million ha of rainfed lowland riceland in Asia. In the Philippines about 40% of the rice area is rainfed lowland. Only a small fraction of this enormous rice area is planted to more than a single crop of transplanted rice per year. In many rainfed lowland rice growing areas the production of a pre-rice crop offers a real possibility to increase farm income (Godilano and Carangal, 1981). The early rains can be used to successfully grow a short-maturing upland crop, since the rice crop is transplanted later in the wet season when the rains intensify.

The pre-rice growing period is characterized by periodic excessive wetness, a high probability of drought stress, a growing period of at least 60 to 90 days, and a lengthening photoperiod (Zandstra et al, 1981). Under these conditions there are 3 major problems in upland crop production early in the rainy season: (1) Waterlogging due to intermittent heavy rains on poorly drained ricelands, (2) drought due to erratic rainfall, and (3) pests and diseases on some crops, particularly legumes. Of these constraints, waterlogging is the predominant yield limiting problem in many situations.

Two-thirds of the riceland in Cagayan Province, Philippines, is rainfed and most of this is located on

alluvial river terraces (Baquiran et al, 1983). A single rice crop is transplanted in August and the land lies predominantly fallow due to waterlogging during the long dry-wet transition period beginning in April. A survey of farmers who cultivated mungbean for more than 15 years on the alluvial terraces of the Cagayan River indicated that their crops escaped or were not heavily damaged by temporary waterlogging in only 3 years out of 15 (Solana Outreach Staff, 1983). In most years their mungbean yields varied from zero to 0.16 t/ha. Therefore, mungbean production is practiced as a low investment/high risk enterprise on only the better drained landscape positions of the alluvial rice terraces.

In the rainfed lowland ricelands of Southern Thailand the production of pre-rice crops is not attractive to farmers due to waterlogging problems. Few farmers (<3%) grow mungbean during the early rainy season. In 3 out of 4 years the crops are seriously damaged by waterlogging (Crozat, 1985). During the 1984 dry-wet transition period, which was considered representative of the expected rainfall distribution at 80% probability for the area, only 5 out of 22 fields planted with mungbean yielded more than 0.1 t/ha. In 24% of the cases, no harvest was possible because waterlogging led to complete plant mortality (Crozat, 1985).