Few trials have been carried out to examine the effects of mulching on wheat in Thailand. Meechoui (1987) reported that rice straw mulching increased spike numbers and grain yields in wheat. Hanviriyapant et al.(1990) also reported similar effects of rice straw mulching on wheat grain yields. They found that straw mulched plots produced better crop establishment and higher number of spikes/m^2

3. MATERIALS AND METHODS

3.1 Experimental Site and Soil

A field study was conducted during the cool season of 1990-1991 at the research station of Multiple Cropping Center, Faculty of Agriculture, Chiang Mai University (19^0N, 99^0E). Chemical analysis of the surface soil (0-25 cm.) indicated a relatively low organic matter content (1.08-1.11% ; Walkley & Black method) with a soil pH of 5.1-5.2 (Soil:Water = 1:1). Availability of P was 50.0-75.0 ppm.(Bray II method) with exchangeable K of 52.5-67.5 ppm.(1N NH_4OAc, pH 7 extraction). The soil texture was sandy loam containing 58.68-62.68% sand, 21.0-25.0% silt and 16.32% clay (Appendix Table 12). Climatic data for the growing season are given in Appendix Table 13.

3.2 Experimental Design and Procedure

The design of the experiment was split-plot with four levels of irrigation as main plots, three levels of mulching as subplots and with four replications. Irrigation was applied during selected periods of wheat development. The main treatments included : early irrigation,

late irrigation, full irrigation and no irrigation. In early irrigation, water was applied from sowing until booting stage or stage 45 of the Zadoks' scale (Zadoks et al.,1974). Late irrigation was done by applying water from booting stage until maturity. Under full irrigation, water was applied every two weeks throughout the crop cycle (five times during the season). In no irrigation, water was omitted throughout the growing season. To ensure uniform germination at seeding time, pre-sowing irrigation was applied to all plots at 7 days before sowing. A description of irrigation for each treatment is given in Table 1. Mulching treatments which was assigned as subplots consisted of no mulching or bare soil, rice straw mulching at the rate of 3 t/ha and 6 t/ha. Rice straw was applied on a dry weight basis.

After pre-sowing irrigation was applied, a fine seedbed was prepared and plots of 4.0 m.x 6.0 m. were established. Fertilizers to supply 60 kg/ha of N, P_2O_5 and K_2O were broadcasted and mixed into the top soil layer. Fifteen days after sowing, an additional 40 kg/ha of N was applied in all plots. To prevent water leakage to adjacent treatments, each main plot was blocked by a soil ridge of 30 cm. high and irrigation was applied through furrows lined by polyethylene sheet.

The wheat crop (cv. Samoeng 1 or INIA 66) was sown in row, 25 cm. apart at about 5 cm. depth, with a seed rate of 100 kg/ha. The seeding date was December 5, 1990. Pre-emergence herbicide (alachlor) was applied at the rate of 2 liter/ha after seeding and rice straw was imposed immediately after herbicide application.

Table 1. Schedule for each irrigation treatment

Treatments	Irrigation (days after sowing)				
	15	30	45	60	75
Early Irrigation	+	+	-	-	-
Late Irrigation	-	-	+	+	+
Full Irrigation	+	+	+	+	+
No Irrigation	-	-	-	-	-

+ = applying irrigation

- = omitting irrigation

3.3 Data Collection

3.3.1 Soil Temperature

Soil temperature was measured at 5 cm. depth using mercury thermometers embedded at the center of each plot in two replications of each treatment. The data was recorded manually twice daily at 07:00 am. and 03:00 pm. during the growth period. To observe the changes of soil temperature during the daytime period, temperatures were recorded hourly from 07:00 am. to 05:00 pm. during the booting stage.

3.3.2 Soil Moisture

Soil moisture content was determined from two replications of each treatment. The initial soil moisture was determined one day before sowing. Subsequently, soil moisture content was determined the day before each irrigation and at harvest. Soil samples were collected in 25 cm. increments to a depth of 100 cm. by using a tube auger. They were then dried in an oven at 105^{0}C for 48 hours and weighed thereafter.

3.3.3 Seedling Emergence, Tiller Number and Plant Height

Number of seedling emergence was counted from 1.0 m.x 1.0 m. area in each plot at 10 days after sowing. This was considered as the maximum number of seedling/m^2 since no additional seedlings emerged afterwards. Number of tillers/m^2 were counted non-destructively at about tillering stage (35 days after sowing). Plant height was measured from 10 plants in each plot at maturity.

3.3.4 Shoot Dry Matter and Nutrient Uptake

During the crop growth period, wheat samples were taken almost every week for dry matter determination. Crops were cut at ground level from 0.5 m.x 0.5 m. quadrate and dry matter production was determined after oven drying at 65^{0}C for 48 hours. Uptake of nitrogen, phosphorus and potassium by the plants were examined from samples taken at 35 days and 56 days after sowing. Total nitrogen was determined on wet oxidized samples by the Micro-Kjeldahl method (Bremner, 1965). Phosphorus and potassium were determined on samples digested by a dry-ashing technique. Phosphorus was determined with a Molybdovanado-phosphoric acid method and potassium with a flame photometer.

3.3.5 Anthesis, Maturity and Grain Filling Period

Anthesis date was counted from sowing until 50% of spikes in a plot had dehisced anthers (stage 65 of the Zadoks'scale). Physiological maturity was recorded when no green color was left on the spike, grain cracks and kernel loosening in daytime (stage 93 of the Zadoks'scale). The grain filling period was calculated by subtracting