

## **CHAPTER 3**

### **MATERIALS AND METHODS**

This research comprises three related sets of studies, which are 1) formal survey of rice production systems in Chiang Mai Valley, 2) on farm trial, and 3) field experiment which was designed to investigate the effects of potassium iodide on rice milling quality and nutritive value. Detail of each study is described as follow.

#### **3.1 Research methodology**

##### **3.1.1 Formal survey**

The formal survey was set for collecting the general information on rice management practices of twenty selected farmers in four districts which were San Pa Tong (5 farmers), San Sai (4 farmers), San Kamphaeng (6 farmers) (Chiang Mai Province) and Ban Thi (5 farmers) (Lam Phun province). The selected farmers were interviewed using pre-designed questionnaires. The propose of field survey was mainly to gather background information and biophysical conditions of rice production such as soil chemical properties, and farmer's practice, especially water and fertilizer management, harvesting time of each selected farmer field.

These primary data were sent to investigated the relationship between rice managing system and yield as well as milling quality and nutritive value of rice of each selected farmers selected.

##### **3.1.2 On farm trial**

The on farm trial was conducted in the farmers selected fields. Twenty selected farmers' paddy lands were selected to investigate the effect of potassium iodide on yield, milling quality and nutritive value of rice. The potassium iodide at concentration of

At maturity, panicle samples from 2 square meters of both KI application and non- KI application plots were taken for analysis of grain physical characteristics, milling quality, nutritive values and yield. Percent moisture content of each grain sample was recorded at each harvesting time.

### 3.1.3 Field experiment

Field experiment was conducted at Multiple Cropping Center Experiment Station, Chiang Mai University (18° 45' N, 99° E), Thailand during June 2000 to May 2001. The experiment consists of three factors, which were rice varieties, rate and frequency of potassium iodide application. They were arranged in the split-split plot design with three replications (Experiment layout is displayed in Appendix D). Main plot was rice variety namely Khoa Dawk Mali 105 (KDML 105), Chai Nat 1 (CNT-1) and Kam Doi Saket (KDS). Sub plot was 3 rates of potassium iodide application i.e. 0.0, 0.1 and 0.2 g%KI. Sub-sub plot was frequency of potassium iodide foliar application. This treatment consists of the following application schedule; (1) once a week (2) twice a week starting from panicle initiation till anthesis stage and (3) only one time at panicle initiation stage (Treatment combinations were shown in Table 1).

Rice seed was sown into wet seedbeds on 19 June 2000. Seedlings were transplanted at 30 days after sowing at spacing of 25x25 cm with three seedlings per hill. The plot size of each experimental unit was 20 m<sup>2</sup> (4m x 5m). The fertilizers were applied with split application. First time was applied at transplanting date with 16-20-0 formula (47 kg per rai) and the second application was applied at panicle initiation stage with urea (46-0-0 formula) 16 kg per rai. Pest control was managed at optimum level.

Table 3.1 Treatments combination used in the field experiment

Potassium Iodide application		varieties		
Frequency	Rate	KDML105 (V1)	KDS (V2)	CNT-1 (V3)
one time at panicle initiation stage (T1)	0.0g%KI (R1)	V <sub>1</sub> R <sub>1</sub> T <sub>1</sub>	V <sub>2</sub> R <sub>1</sub> T <sub>1</sub>	V <sub>3</sub> R <sub>1</sub> T <sub>1</sub>
	0.1 g%KI (R2)	V <sub>1</sub> R <sub>2</sub> T <sub>1</sub>	V <sub>2</sub> R <sub>2</sub> T <sub>1</sub>	V <sub>3</sub> R <sub>2</sub> T <sub>1</sub>
	0.2 g%KI (R3)	V <sub>1</sub> R <sub>3</sub> T <sub>1</sub>	V <sub>2</sub> R <sub>3</sub> T <sub>1</sub>	V <sub>3</sub> R <sub>3</sub> T <sub>1</sub>
once a week *(T2)	0.0 g%KI (R1)	V <sub>1</sub> R <sub>1</sub> T <sub>2</sub>	V <sub>2</sub> R <sub>1</sub> T <sub>2</sub>	V <sub>3</sub> R <sub>1</sub> T <sub>2</sub>
	0.1 g%KI (R2)	V <sub>1</sub> R <sub>2</sub> T <sub>2</sub>	V <sub>2</sub> R <sub>2</sub> T <sub>2</sub>	V <sub>3</sub> R <sub>2</sub> T <sub>2</sub>
	0.2 g%KI (R3)	V <sub>1</sub> R <sub>3</sub> T <sub>2</sub>	V <sub>2</sub> R <sub>3</sub> T <sub>2</sub>	V <sub>3</sub> R <sub>3</sub> T <sub>2</sub>
twice a week **(T3)	0.0 g%KI (R1)	V <sub>1</sub> R <sub>1</sub> T <sub>3</sub>	V <sub>2</sub> R <sub>1</sub> T <sub>3</sub>	V <sub>3</sub> R <sub>1</sub> T <sub>3</sub>
	0.1 g%KI (R2)	V <sub>1</sub> R <sub>2</sub> T <sub>3</sub>	V <sub>2</sub> R <sub>2</sub> T <sub>3</sub>	V <sub>3</sub> R <sub>2</sub> T <sub>3</sub>
	0.2 g%KI (R3)	V <sub>1</sub> R <sub>3</sub> T <sub>3</sub>	V <sub>2</sub> R <sub>3</sub> T <sub>3</sub>	V <sub>3</sub> R <sub>3</sub> T <sub>3</sub>

Note: T refers to frequency of KI application; R is KI application rate and V is variety.

\* applied once a week during panicle initiation till anthesis stage.

\*\* applied twice a week during panicle initiation till anthesis stage.

The following data were collected from the field experiment;

#### Soil sample

The composite soil samples were collected and analyzed for initial soil available nutrients (N, P, K) and pH.

#### Phenological records

Tillering duration, panicle initiation, anthesis, heading and maturity dates were record on the corresponding to the day when 50% of the plants in each treatment were estimated.

**Plant sample**

The above ground plant biomass were destructively collected at every growth stage (transplanting, tillering, panicle initiation, heading and harvesting). Samples were taken from 2 hills in each replication. Plant samples from each replication were separated into leaf sheath, stem and panicle then dried and weighted. Plant parts were dried to constant weight in oven at 50°C for 4 days and weighted.

**Grain yield and yield components**

At maturity stage, grain sample of 1 square meter was harvested from each experimental unit to measure rice yield. Moreover, 2 hills of rice sample in each replication were collected to be measured yield component, i.e. panicle number per square meter, spikelets number per panicle, percentage of filled spikelets and 1,000 grain weight.

**Milling quality**

Panicle samples of each plot were taken at maturity stage. Then, panicle samples were threshed and 250 grams of rough rice were collected. Rough rice samples were subsequently dehulled in a sample sheller (McGrill No.2). Brown rice samples were subsequently milled in a miller and then the milled rice samples were separated in to head rice and broken rice by different size sieve in an automated sizing device. Finally, weights of head rice samples were measured and the percentage of head rice, broken rice, brown rice, and bran were estimated. Ten grains of rice sample in each experimental unit was also measured grain hardness for analysis the grain physical characteristic.

### **Nutritive values**

Grain samples were collected from each experimental unit for analyzed biochemical parameters which included of protein, iodine, and K contents.

- The K content in rice grain was analyzed at The Science Research Instituted of Thailand.
- The nitrogen content in rice grain was analyzed at The Multiple Cropping Center Lab (Chiang Mai University).
- The Iodine content in rice grain was analyzed at Research Institute for Health Sciences (Chiang Mai University).

### **3.2 Data analysis**

To achieve the first and second objective which were aiming at describing in the relationship between various rice managing systems of growers in Chiang Mai Valley and yield, milling quality, and, to investigated the effect of KI application on rice yield, milling quality and nutritive value. The interviewing results from the farmers were analyzed by using descriptive statistics.

The third objective which study the effect of KI rate and frequency of foliar application on yield, milling quality and nutritive value of rice grain. Using the analysis of variance (ANOVA) and linear regression analysis analyzed the results from field experiment.