Chapter 5

Discussion

Diversity of rice varieties in field survey

Diversity of local rice existed in four villages, Ladthahea and Houyleung village of Pak Ou district and Houyman and Thapho village of Phonxay districts, Luang Prabang province with upland environment. The surveys revealed that there was high diversity of traditional rice varieties in both village and household levels. A total 63 samples representing 47 rice varieties were found, most varieties are characterized as glutinous rice due to their consuming and traditional preference. Number of varieties grown per village ranged from 13 to 17 with two or three different maturity varieties per household every season. Other reasons why farmers grow several varieties due to minimized the risks of the damaging from insects or diseases, lack of labor for harvest, insufficient rice consumption annually as well as conserve for next season and the extent of yield loss due to climatic constraints. In addition, some farmers preferred special varieties of rice to make noodle, and Kao Kum for making rice wine (Roder, 2001; Mounmeuangxam, 2003).

Different patterns of varieties were found between districts. The most popular varieties found in Pak Ou district was Phae pee, the glutinous rice variety. The large numbers of households planted Phae pee was 71% in Ladthahea and 48% in Houyleung of Pak Ou district. As farmers know that Phae pee is well adapted to the fluctuated agro-climatic condition especially Phae pee can grow well on poor soils. Therefore, high percentage of farmers planted Phae pee variety because the current

upland conditions where shortened fallows have resulted in declining rice yields (Trosch, 2003). In Phonxay district, more popular varieties were found than Pak Ou district. Most of farmers preferred large grain size glutinous rice varieties (Songyikhangsuthor *et al*., 2002). Farmers of Houy man village preferred Mak khuea yai (MKY) variety with 59%, Do deng (DD) 52% and 48% for Mai hok (MH), whereas farmers of Tha pho village preferred Kao chuk (KCH) with 52% and 48% for Luem phouw (LP). Most of farmers preferred because of their eating quality, grain yield, large grain, long panicles, thick stem, long seeds, perform well in the drought tolerant and wide soil fertility adaptation (Phengchanh, 2007). Furthermore, farmers report that milling recovery of large grain size varieties is also better and perceived to have high market value.

Farmers in four villages normally grown early, medium and late maturity rice varieties per household covered 36, 35 and 29%, respectively. Reasons why farmers planted early maturing variety was for early rice supply to the members of his/her household. Furthermore, it ensures them for labor availability especially at harvest time, and financial source in hiring labor for weeding, harvesting or exchanging rice for labor. Planting medium and late maturing varieties would ensure them of food supply for the period after rice growing season and they can be harvested immediately after early varieties. Some farmers believe that medium and late maturing varieties can produce higher yields than early maturing varieties.

Seed exchange and selection by farmers play a significant role in local rice varieties. There was a large level of varietal seed exchange within village covered 69% and between villages at 31% in four villages. The seed exchange in these communities was in the form of gifts from relatives and friends, or seed payment for

labor wage in planting, weeding or harvesting; and as new introduced varieties from recently resettled members and from men who have collected seeds from their trips.

Genetic diversity of local rice varieties

The differentiation between and within samples of local rice varieties were demonstrated in morphological, physiological and DNA level. The wide range of morphological diversity in local rice varieties within and between samples were found such as leaf blade color, basal leaf sheath color, leaf blade pubescence, auricle color, collar color, stigma color, awning, apiculus color, husk color, pericarp color, husk pubescence and days to flowering. Some morphological characters were not diverse both within and between samples i.e., ligule color and ligule shape. Relationship among 63 samples based on thirteen morphological characters was classified into three main groups by UPGMA methods. The first cluster consisted of samples showed the presentation of anthocyanin on many parts of the plant such as leaf-blade, leaf-sheath, auricle, collar and stigma. The second group consisted of samples showed colorless stigma; leaf blade and husk pubescence, green leaf blade and leaf sheath and same group of KDML105 and RD6. The last group consisted of samples showed the presentation of anthocyanin on husk color, colorless stigma, green and light purple leaf sheath, leaf blade and husk glabrous and big grain. Most of cultivated rice within each local rice variety in this study is visually uniform and they are identifiable. Between villages within province similar local rice varieties pattern were grown within the local communities in this study.

DNA analysis indicated that local rice varieties were genetically variable at all six microsatellite loci. In addition, genetic variation between samples with the same name was also detected. At village level, most genetic variation among villages was

apportioned between individuals within village (72%) and only 28% was the variation between villages. In addition, considering the partitioning of total genetic diversity of all samples 72% was partitioned within sample while the rest 28% was between samples. The results demonstrated that high genetic diversity within and between samples, together with high level of genetic differentiation among villages was found even within one variety name. Similarly, genetic variation was also found within one local rice variety name Bue Chomee analyzed using 6 microsatellite markers (Pusadee *et al*., 2005). These indicated that local rice varieties maintain genetic variation and local rice shared the same name may not have the same genetic composition. Because local rice is genetically diverse, and is grown under variable environmental and agricultural condition, local rice varieties has the potential be a dynamic system that can undergo genetic changes in response to evolutionary forces. Farmer's seed selection is strongly influenced by local preferences, customs and culture, shaped by economics and allows for differentiation between varieties from the same farmer or between farmers (Parzies *et al*., 2004). The different ethic groups maintain and grow their own varieties with highly specific uses (noodle and brewing) some groups such as Tai lue, Lao Lum, and Khamu, have elaborate rules about how family's rice varieties are inherited and conserved among siblings, and how they are shared or not shared. All these practices, rooted in the varying practices and cultures of traditional farmers, results in genetic variation for local rice varieties.

In this study has been demonstrated that traditional Lao varieties encompass a wide range of diversity and display characteristics, which are important sources of germplasm for breeding programs. For example, some local rice varieties show variation in traits conferring adaptation to fluctuation biotic and abiotic stress, e.g.

tolerance to the pest, gall midge (Douangboupha *et al*., 2006). Given the importance of landrace germplasm for enhancing crops and the essential role of farmer's practices in maintaining the variation within landraces, on-farm, *in situ* conservation is an essential strategy for future breeding programs.