

## **Chapter 1**

### **Introduction**

Mandarin is one of the popular and high demand fruits for both domestic and international consumers. Thus mandarin trees have been cultivated widely in several regions of Thailand. Previously, important cultivated areas of mandarin were in Nonthaburi, Thonburi, Pathum Thani provinces in the central region, Phetchabun and Chanthaburi provinces in the eastern region and Nan and Phrae provinces in the north. However, there were seriously plant disease problems in those areas, caused the mandarin cultivated areas reduced and finally diminished. Currently, new mandarin cultivated areas have been moved to Kamphaengphet, Chiang Mai and Chiang Rai (Nasongkra, 2001 cited in Srisaart, 2002). Furthermore, tentatively, those mandarin cultivated areas are going to move to other areas because of the same problems.

In Chiang Mai province, Fang, Mae Ai and Chaiprakarn districts are the largest and the last productive mandarin cultivated areas in Thailand. Due to the suitable climatic conditions, mandarin peels in those districts are mostly golden yellow color which is an attractive characteristic of the mandarin fruits produced from Chiang Mai province. Such the unique characteristic, they are common named as “Sai Nam Pueng”.

Regarding the area, previously, farmers used the lands mainly for growing paddy rice, field crops and orchards mostly litchi. Some of orchards used to be forest

areas. In 2000, mandarin was introduced to this area. Therefore, the fruit tree has been spread out widely and become one of the cash crops for this area in 2002 (Paradornnuwat, 2009). Many farmers changed their paddy fields and some litchi orchards to be mandarin growing areas. Consequently, mandarin trees had increased rapidly in the following period.

However, according to the Chiang Mai Agricultural Office (2009), mandarin growing areas in Chiang Mai province presently had a trend to reduce since the productive year of 2007/2008 and they were gradually and continuously decreased. The productive area in 2009/2010 had reduced more than 30% compared to those in 2007/2008. There were many factors involved to the reduction of mandarin growing areas and the degradation of mandarin productivity. Some of those factors are concerned to topographic conditions, location, soil properties, planting materials, and orchard management. There were relationships among those factors. They influence on mandarin production causing the orchard degradation at various stages.

Interestingly, mandarin growers' management has produced unexpectedly the orchard degradation in long term. Generally, mandarin growers would like to obtain the production as many as possible. In consequence, regarding to the orchard management based on their experiences and investment costs, most of the growers dump the input factors as much as they can especially water, chemical fertilizers, and pesticides, without knowledge and the consideration of soil conditions and nutrients balance. For instance, urea fertilizer is usually applies at the high rate resulting in increasing soil acidity, and the deterioration of physical and chemical soil properties. In addition, continuous applications of mixed fertilizers containing N, P, and K could

generate imbalance of soil and plant nutrients. Due to the deterioration of physical soil properties, soil aeration and drainage were reduced. Regarding the soil conditions, root system of the mandarin trees become weak and cannot generate new more roots, resulting in ineffectively plant nutrients uptake and consequently less productivity. These conditions cause easily plant diseases infection. Under these circumstances, mandarin trees cannot anymore be productive and nothing to be harvested from the mandarin orchard, finally to be demolished. With regard to Mae Soon sub-district as the study area, obviously, the worse soil conditions currently can result in unhealthy mandarin trees with the low productivities can be found in various geographical areas.

With regard to the topographical factors, Geo-informatics technology is comprehensively introduced to study and analyze in the context of spatial data concerned to mandarin orchards and the area. Technically, Geo-informatics system consisted of Remote Sensing, Geographic Information System (GIS), and Global Positioning System (GPS) were implemented to develop spatial database of mandarin growing areas in Mae Soon sub-district. The spatial database was analyzed and characterized for the situation of mandarin production, land use change, risk of mandarin orchard degradation. Moreover, regarding to various areas of mandarin, the spatial information can also be exploited to propose the suitable managing approaches as a guideline for mandarin growers in different topographical areas. Accordingly, this study is conducted academically to meet the following objectives.

- 1) To analyze and characterize the current situation of mandarin orchards concerned to some physical and managing factors in the study area.

- 2) To assess and clarify spatially the physical and managing factors affecting on the degradation and the levels of mandarin orchards degradation.
- 3) To find out some approaches to produce various spatial scenarios of the mandarin orchard degradation and characterize comprehensively from the scenarios to obtain the scientific and academic benefits for mandarin growers in the area.