CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The first two steps of BCR sequential extraction procedure (BCR1 and 2) have been applied to soil and sugarcane from contaminated area at Mae Sot District, Tak province in order to evaluate the potential mobility and possible transfer of Cd to sugarcane. Total digestion was performed to determine the metal content in the soil. The determination of major metals (Cd, Cu, Fe, Mn, Pb and Zn) partitioning by the BCR sequential extraction procedure allowed us to identify the main fraction solubilized in each step: exchangeable and reducible fraction, respectively. Portions of metals found in exchangeable fraction (BCR1) are weakly absorbed and can easily be solubilized and become readily available to plants. This may be harmful for ecosystem and for transfer in the food chain, while the reducible fraction (BCR2) is the next important metal containing fraction.

Of the elements studies, cadmium has a highest mobility since it presented at the highest content in the first fraction (BCR1) followed by Mn, Zn, Pb Cu and Fe, respectively. This indicated that Cd formed weak complex and easily removed at the initial stages of the extraction. The results of this study showed that, except Cu and Fe, large fraction of metals associated with exchangeable and reducible fraction (BCR1+2) accounted more than 40 % of the total metals concentration. The concentrations of all metals found in each extraction stage of the sequential extraction procedure used increased generally from step 1 to step 2. The extraction yields in the second step (BCR2), with hydroxylamine hydrochloride extraction, were high for all the elements studied in most soils as compared to the first step (BCR1) extracted with acetic acid. The concentrations of metals in different fractions were found to vary with sites.

Plant uptake is of primary importance in the evaluation of environmental contamination arising from heavy metals in soils. Metals in different parts of sugarcane (root, bagasse, and juice) were then investigated in this study and results revealed that metals were accumulated most in root rather than bagasse and

juice. This may provide us the concept which is worthy of further protection and management of the studied area.

Principal component analysis (PCA) together with correlation analysis has been conducted in order to demonstrate relationships between available Cd and the presence of interested six metals and soil properties. The results showed supporting outcomes to each other that available Cd (BCR1) in soil were correlated with total Cd, total Zn, and total Pb; and available of Zn and available Pb, implying that some interactions and/or relations existed between these metals (Cd, Pb and Zn).

This work intends to give a helpful contribution in this field as mentioned earlier that the soil in Mae Sot appears to have been oppressed by cadmium content. The finding from this study can be used further for the safety of the environment and for reducing the risks associated with the introduction of trace metals into the food chain. The knowledge of the uptake, the level and bioavailability of cadmium in sugarcane and also the effects of soil properties and the presence of other metals is very essential for providing the data for further protection, remediation and reduction of the adverse impact.

5.2 Recommendations

Since, the background Cd and other metals concentration (Cu, Fe, Mn, Pb and Zn) were not taken into consideration due to high background metal concentration in this area. The estimation of bioavailability of Cd could be improved if other soil parameters (sorption pattern, soil solution composition) are included in the predictions. Moreover, the estimation of total metal in sugarcane (root, underground stem, bagasse, juice, top and leaves) has been carried out for the end crop (O52-81) samples only. The interpretation of availability Cd uptake to sugarcane (root, underground stem, bagasse, juice, top and leaves) could be more reliable if more samples were performed, since the sample size is very important for statistically analysis.

Cadmium in this particular area would be taken in account for discussion since the unusually high concentration was observed in some of locations. There is a need for monitoring and assessment. Where levels of heavy metals are high, intensive monitoring is needed and possibly remediation. The easiest form of

remediation is to convert the land to non-edible food crops; however, this may not be acceptable to farmers. Another approach is phytoremediation, so that plant can be cut, burned and treated as solid phases. The finding from this study could be help somehow for providing the fundamental knowledge that may lead to further site specific management because the change of soil parameters could be serious principal of plant pollution management and control. Therefore, information is a vital asset for stakeholders in this area.