Chapter I: Introduction

I.1 Importance of cost-effective feedstock for the production of biodiesel and other important applications of non-edible vegetable oils/ 2

I.2 Potential feedstock in North-east India for biodiesel production/ 8

I.3 Transesterification of fats and oils in the production of biodiesel/ 11
   I.3.1 Transesterification reaction by homogeneous catalysts/ 12
      I.3.1.1 Homogeneous base catalyzed transesterification/ 12
      I.3.1.2 Homogeneous acid catalyzed transesterification/ 13
   I.3.2 Transesterification reaction by heterogeneous catalysts/ 15
      I.3.2.1 Heterogeneous base catalyzed transesterification/ 16
         a) Basic zeolites/ 16
         b) Hydrotalcites/ 17
         c) Single metal oxides/ 18
         d) Doped and mixed metal oxides/ 21
         e) Supported alkali and alkali earth metal oxides/ 23
      I.3.2.2 Heterogeneous acid catalyzed transesterification/ 25
         a) Zeolite solid acid catalysts/ 25
         b) Heteropoly acids/ 26
         c) Functionalized oxides/ 27
I.3.3. Enzyme catalyzed transesterification/ 28

I.3.4. Transesterification by biomass-derived catalysts/ 30

I.4 Physicochemical properties of oils and fatty acid methyl esters/ 32

I.5 Chemical composition of oils and fatty acid methyl esters/ 34

I.6 Objectives/ 37

References/ 38

Chapter II: Identification of source and extraction of oil

II.1. Introduction/ 54

II.2. Results and Discussion/ 54

II.3. Conclusion/ 68

II.4. Experimental section/ 68

II.4.1. Materials/ 68

II.4.2. Oil extraction/ 68

References/ 69

Chapter III: Transesterification of the oils to corresponding Fatty Acid Methyl Esters (FAMEs)

III.1. Introduction/ 70

III.2. Results and Discussion/ 71

III.3. Conclusion/ 72

III.4. Experimental section/ 73

III.4.1. Materials/ 73

III.4.2. Methods/ 73
Chapter VB: Study of the changes in catalyst composition and surface morphology during transesterification

VB.1. Introduction/ 147
VB.2. Results and Discussion/ 147
VB.3. Conclusion/ 151
VB.4. Experimental section/ 151

References/ 154

Chapter VI: Transesterification of soybean oil with metal-based Lewis acid catalysts

VI.1. Introduction/ 155
VI.2. Results and Discussion/ 156
VI.3. Conclusion/ 159
VI.4. Experimental section/ 159
    VI.4.1. Materials/ 159
    VI.4.2. Method/ 159

References/ 161

Summary/ 163

Publications and Poster presentations/ 165