

LIST OF TABLES

Table No.	Title	Page
Table 3.1	Characterization factors for different emissions	43
Table 4.1	Sugarcane molasses, ethanol production, gasoline consumption and fuel ethanol requirement in India	50
Table 4.2	Inventory of sugarcane farming for sugarcane production of 111.4 ton in NR and 88.2 ton in WR to produce 1 ton of ethanol	56
Table 4.3	Inventory of sugarcane (111.4 and 88.2 ton), molasses (5.0 and 4.0 ton) and ethanol (1 ton) transport in NR and WR	57
Table 4.4	Inventory of sugar production for processing 111.4 (NR) and 88.2 (WR) ton sugarcane in mill to produce 1 ton of ethanol	58
Table 4.5	Inventory of ethanol production of 1 ton, blending 1 ton ethanol with gasoline	59
Table 4.6	GHG emission factors and energy equivalent factors used for inputs in LCI	61
Table 4.7	Mass, energy and market price for estimating product and co-products allocation factor, for producing 1ton of ethanol	62
Table 4.8	Process wise GHG emissions (kg CO ₂ eq/ton of ethanol) in NR and WR	64
Table 4.9	Process wise energy consumption (MJ/ton of ethanol) in NR and WR	69
Table 4.10	Percent GHG emissions reduction and NER using E5 and E10 blends	72
Table 5.1	Pretreatment methodologies for conversion of biomass to ethanol	76
Table 5.2	Process parameters and recovery in ethanol production process	83
Table 5.3	Life cycle inventory for biomass to ethanol conversion process using DA and SE pretreatment technologies	85
Table 5.4	GHG emission and energy factors for input used in LCI	87
Table 5.5	Comparison of ethanol NER and NEB with gasoline	93
Table 5.6	GHG emissions (gCO ₂ eq.MJ ⁻¹ ethanol) and NER of cellulosic ethanol from different feedstock	98
Table 6.1	Details of pretreatment scenarios	105

Table 6.2	Chemical composition of untreated and pretreated rice straw using conventional and modified method	106
Table 6.3	Inventory of feedstock acquisition (S1) and transport (S3)	108
Table 6.4	Inventory of ethanol production (S2)	108
Table 6.5	Parameters and process efficiencies of different scenarios for ethanol production	109
Table 6.5	Price used in economic evaluation of ethanol	110
Table 6.6	Environmental impact of each scenario for producing 1L ethanol (FU)	110
Table 7.1	Annual production, use and surplus rice straw in major rice producing states of India	121
Table 7.2	Inputs in Life Cycle Inventory (LCI) of rice straw utilization systems	125
Table 7.3	Output from rice and wheat production in northern India	126
Table 7.4	Emission factors used in various on farm and off farm activities	127
Table 7.5	Emission factors for energy production from different sources	130
Table 7.6	Impacts on global warming potential (kg CO ₂ eq. /ton of dry rice straw) of four rice straw utilization systems in India	132