List of Figures

Figure 1.1	Structure of FiT for RE Technologies Using Bioenergy	3
Figure 1.2	Existing Capacity of COD Biomass Power Plant	ϵ
Figure 2.1	Map of Rubberwood Plantation in Thailand	ç
Figure 2.2	Rubberwood Plantation	10
Figure 2.3	Output of Felled Rubber Trees (1 Rai)	10
Figure 2.4	Life Cycle of Biomass from Rubberwood	12
Figure 2.5	Stumps, Roots, and Branches	13
Figure 2.6	Offcuts	13
Figure 2.7	Rubberwood Logs	14
Figure 2.8	Rubberwood Processing Plant	15
Figure 2.9	Production Process of Sawmills	16
Figure 2.10	Rubberwood Slabs Used as Fuel in Boilers	18
Figure 2.11	Simple Charcoal-making Stove	18
Figure 2.12	Production of Rubberwood Residues and Sawdust in Furniture	20
Figure 2.13	Cutting Edge of Rubberwood	21
Figure 2.14	Biomass Production in the Plywood Factory	22
Figure 2.15	Biomass Production in the Particle Board Factory	23
Figure 2.16	Production Process of the MDF	24
Figure 3.1	Provinces in Southern Thailand (14 Provinces)	30
Figure 3.2	Rubberwood for Power Generation	31
Figure 3.3	Four Types of Rubberwood for Energy	32
Figure 3.4	Electricity Demand in the Three Southern Border Provinces	33
Figure 3.5	Plantation and Felling Areas of Rubber Trees in Southern Thailand (2017)	35
Figure 3.6	Supply of Rubberwood in the Three Border Provinces	38
Figure 4.1	Palm Pattana Southern Border Co., Ltd. and Gulf Yala Green Co., Ltd.	40
Figure 4.2	Supply Chain of Biomass for Power Generation (from Field Survey)	40
Figure 4.3	Supply Chain of Biomass for Power Generation	41
Figure 4.4	Production of Biomass from Rubberwood	42
Figure 4.5	Cost of Wood Processing (Chopping)	43
Figure 4.6	Location of Large Sawmills Supplying Biomass to Power Plants	44
Figure 5.1	Spot Market of Wood Pellets (90-day Index cif, US\$/ton)	51

Figure 5.2	LCOE Results of Fuel Cost Scenarios (25 Years of Plant Lifetime)	54
Figure 5.3	LCOE Results of Biomass Power Generation, Various Studies	55
Figure 5.4	Results of LCOE Study Compared with Current FiT	55
Figure 6.1	Cost of wood processing from rubber wood (THB/ton)	58

List of Tables

Table 1.1	Adder Rates for the VSPP	2
Table 1.2	FiT Rate for Electricity Generated from Bioenergy Sources	4
Table 1.3	Status of Renewable SPPs and VSPPs in Southern Thailand	5
Table 2.1	Ratio of Rubberwood Biomass Production and its Heating Value	25
Table 3.1	Nine Operational Biomass Power Plants (COD and SCOD)	34
Table 3.2	Plantation and Felling Areas in Three Groups of Provinces in Southern Thailand	35
Table 3.3	Biomass from Rubber Supply Potential	36
Table 3.4	Estimate of the 2017 Demand of Biomass from Rubberwood (excluding Power Plant)	37
Table 4.1	Field Survey Results	39
Table 4.2	Buying Prices of Raw Materials of Gulf Yala Green Co., Ltd.	41
Table 4.3	Share of Rubberwood and Sources	42
Table 4.4	Logistic Cost	44
Table 4.5	Assessment of Labour through the Supply Chain	45
Table 4.6	Cost of Biomass through the Supply Chain	45
Table 4.7	Barriers and Suggestions on the Biomass Supply Chain	46
Table 4.8	Investment Cost of Biomass-fired Power Plant (Capex)	47
Table 4.9	Fuel Cost of Biomass-fired Power Plant	47
Table 4.10	O&M Cost of Biomass-fired Power Plant	47
Table 5.1	Feed-in Tariff for Electricity Generated from Biomass Power Plant	50
Table 5.2.1	Price of Biomass (January to June), baht/ton	51
Table 5.2.2	Price of Biomass (Price of Biomass (July to December), baht/ton	51
Table 5.3	Key Assumptions Adopted from a Biomass Power Plant in Southern Thailand	53
Table 6.1	Biomass Potential of Rubberwood (ton)	57
Table 6.2	Assessment of Labour through Supply Chain	58
Table 6.3	Cost of Biomass through Supply Chain	59