GHG mitigation in Agriculture, Forestry and Other Land Use (AFOLU) sector in Thailand

Achiraya Chaichaloempreecha[1], Bijay Bahadur Pradhan[1], Bundit Limmeeechokchai[1]

[1]Sirindhorn International Institute of Technology, Thammasat University, Thailand

INTRODUCTION

Asia has the highest share in the global AFOLU emission. The increasing emissions are mainly due to deforestation and agricultural emissions. In the context of climate change, the agriculture sector is crucial because it should not be opposed to United Nations Framework Convention on Climate Change (UNFCCC) objective of a stable food supply, as food is a must for human survival. Therefore, mitigation policies in the agriculture sector should reflect a win-win strategy (ONEP, 2010). Thailand submitted its Intended Nationally Determined Contributions (INDC) to the UNFCCC, but the INDC targets are mainly focused on energy related emission reduction targets and not on the AFOLU sector. However, Thailand has stated in its INDC an intent to maintain a forest area of 40% of the total land area (ONEP, 2015) but there is no quantifiable emission reduction target in case of agriculture sector.

OBJECTIVES & SCOPES

The objective of this study is to assess the GHG emissions from the AFOLU sector in the Business-as-usual (BAU) scenario during 2015–2050 by using the AFOLUB model. In addition, it also identifies the optimal (i.e., profit maximizing) set of GHG mitigation/sequestration options from the sector at wide ranging values of the carbon prices and estimates their corresponding GHG mitigation potential during the period.

METHODOLOGY

The study employs the Agriculture, Forestry and Other Land Use Bottom-up (AFOLUB) model for the analysis. The AFOLUB model was developed by the joint effort of Kyoto University, Japan, and the National Institute for Environmental Studies (NIES), Japan (Hasegawa & Matsuoka, 2012). Figure 1 presents the framework of the AFOLUB model. The AFOLUB model consists of two modules. The first module includes analysis for the agricultural sector, called the "AG/Bottom-up model", and the second for Land-use, land-use change and forestry (LULUCF) sector, which is called the "LULUCF/Bottom-up model". These two models used two different objective functions in order to determine the countermeasure options.

The study has considered nine scenarios for the analysis. The scenarios include one BAU scenario, one No Climate Policy (NCP) scenario and seven carbon price scenarios.

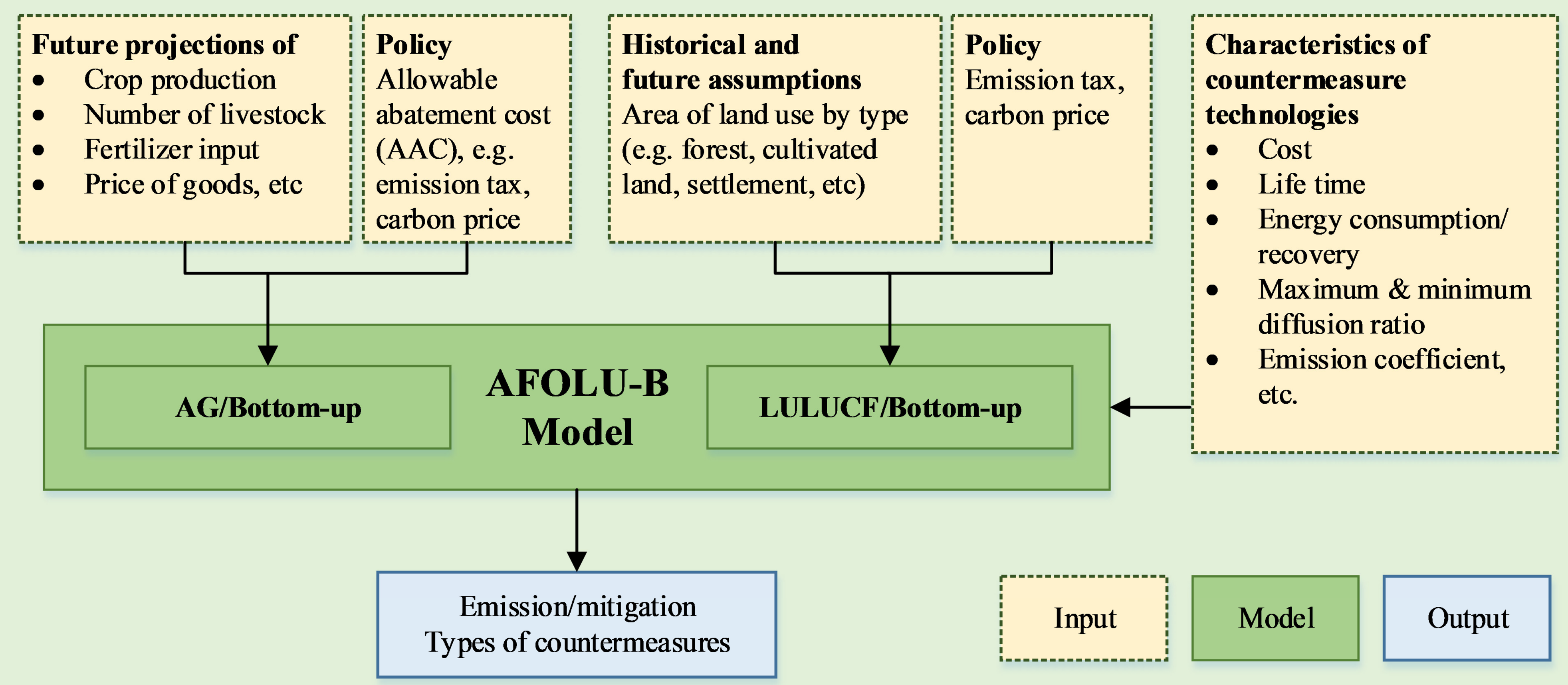

Figure 1 Framework of AFOLUB model

RESULTS

GHG emission in agriculture sector in the BAU scenario would increase from 47.1 $MtCO_2eq$ in 2015 to 58.6 $MtCO_2eq$ in 2050. Rice cultivation is the major source of GHG emission in the agriculture sector in 2015 with nearly 60% share, and it would remain the major source of GHG emission during 2015 to 2050. Net sequestration from LULUCF would decrease from 92.8 $MtCO_2eq$ in 2015 to 89.7 $MtCO_2eq$ in 2050 (see Figure 2).

The NCP scenario shows that improved feed to livestock, dome digesters in manure management and incorporation of off-season straw in rice cultivation are optimal solutions even without the carbon price. In 2030, the NCP scenario would have mitigation potential of 8.0 $MtCO_2eq$ from the agriculture sector. Likewise, in 2050, mitigation potential from the agriculture sector in the NCP scenario would be 8.0 $MtCO_2eq$. In the carbon price scenario, the mitigation potential would be in the range between 16.3 $MtCO_2eq$ at \$5/tCO_2eq and 20.9 $MtCO_2eq$ at \$500/tCO_2eq (see Table 1).

In the BAU scenario, net sequestration or sink capacity in the LULUCF sector would be nearly 90 $MtCO_2eq$ during 2020-2050. In the NCP scenario, no countermeasure is found to be a no-regret option. In 2030, sequestration potential at \$5 and \$10 per tCO_2eq would be 12.9 $MtCO_2eq$ and 20.0 $MtCO_2eq$, respectively. At \$25 per tCO_2eq and higher carbon prices, sequestration potential would be negligibly higher than in \$10 per tCO_2eq, it would be 20.1 $MtCO_2eq$. At \$5/tCO_2eq, cost-effective measures include conservation of existing protection forests, afforestation/reforestation and plantation of long-rotation timber trees. At \$10/tCO_2eq, sustainable management of production forest areas would also become a cost-effective measure in addition to other measures in prior scenarios. In 2050, sequestration potential would be 23.6 $MtCO_2eq$ at \$5/tCO_2eq, 38.8 $MtCO_2eq$ at \$10/tCO_2eq and 39.8 $MtCO_2eq$ at higher carbon prices (see Table 1).

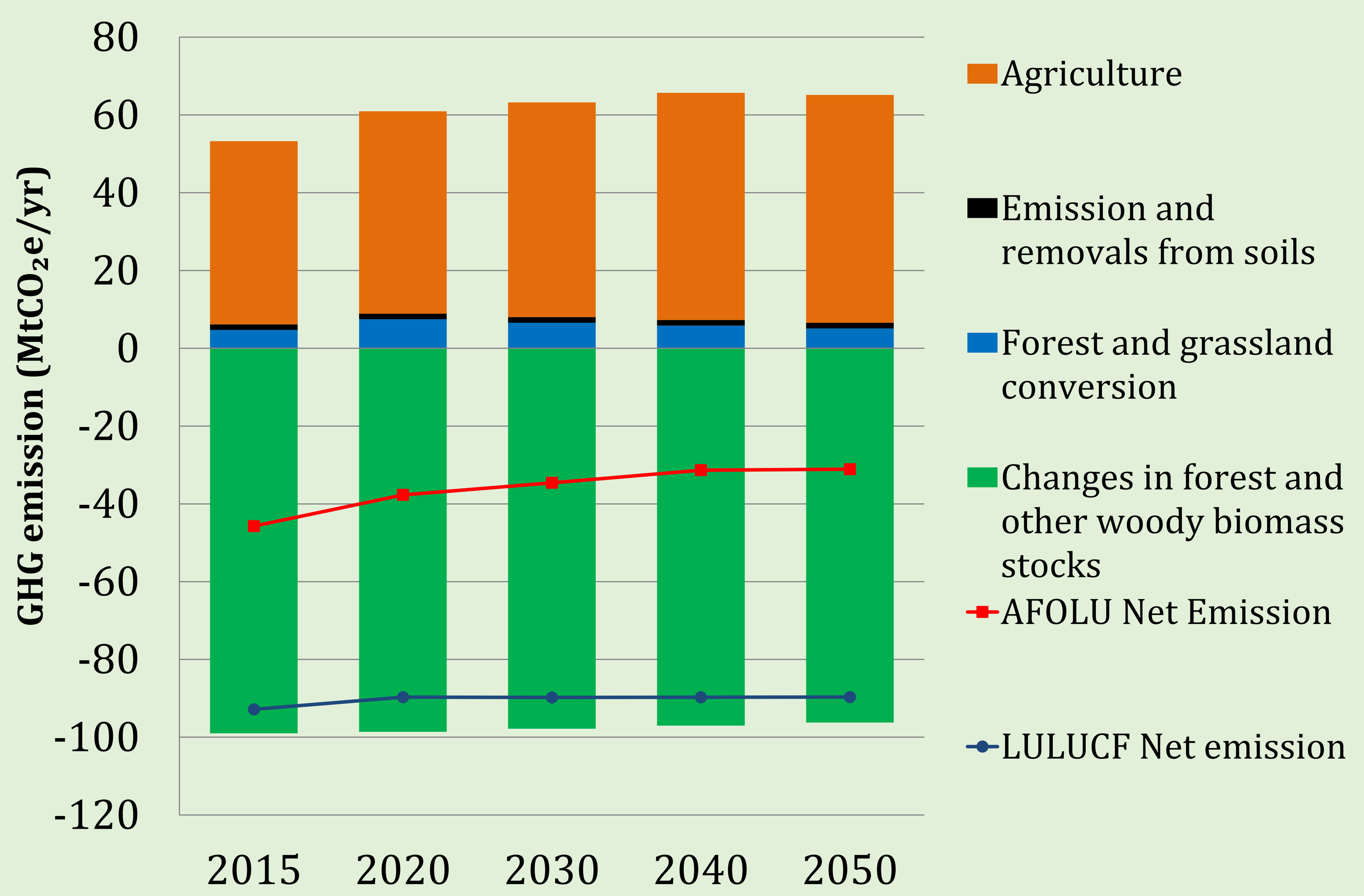

Figure 2 Emissions from the AFOLU sector in Thailand during 2015–2050

Table 1 Emissions/sequestration in 2030 and 2050 from Agriculture, LULUCF and AFOLU in Thailand

Year	Emissions	BAU	NCP	Carbon price \$/tCO_2e				
				5	10	25	100	500
2030	Agriculture	55.2	47.2	39.9	38.7	38.5	37.6	37.0
	LULUCF	-89.8	-89.8	-102.7	-109.8	-109.9	-109.9	-109.9
	AFOLU	-34.6	-42.6	-62.8	-71.1	-71.4	-72.3	-72.8
2050	Agriculture	58.6	50.6	42.3	41.1	40.8	39.9	37.7
	LULUCF	-89.7	-89.7	-113.3	-128.5	-129.5	-129.5	-129.5
	AFOLU	-31.1	-39.1	-71.0	-87.4	-88.7	-89.6	-91.7

CONCLUSION

In 2050, no-regret options could reduce total AFOLU emissions by 25.9%. Increasing carbon price above \$10/tCO_2eq does not increase the mitigation potential significantly. Net sequestration (i.e., higher carbon sequestration than GHG emissions) in AFOLU sector would be possible with the carbon prices. In 2050, net sequestration would be 71.0 $MtCO_2eq$ at carbon price of \$5 per tCO_2eq, 87.4 $MtCO_2eq$ at \$10 per tCO_2eq and 91.7 $MtCO_2eq$ at \$500 per tCO_2eq.

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