Farming yield and efficiency

The agriculture sector contributed 4% to the country's total GHG emissions in 2014. The major agricultural crops in Malaysia are paddy (planted), coconut and cocoa. To ensure the growths of these crops are aligned with the country's sustainable development goals, it is imperative to increase crop yield to meet growing food demand and reduce agricultural emissions intensity to achieve the country's NDC.

In the base year 2016 in the MCAS model, the emissions intensity of agricultural processes is 11.081 MtCO2e.

Level 1
Level 1 assumes that by 2050, farming yield increases by 10% and emissions intensity of agricultural processes remain unchanged.

Level 2
Level 2 assumes that by 2050, farming yield increases by 20% and emissions intensity of agricultural processes decreases by 5%.

Level 3
Level 3 assumes that by 2050, farming yield increases by 28% and emissions intensity of agricultural processes decreases by 11%.

Level 4
Level 4 assumes that by 2050, farming yield increases by 35% and emissions intensity of agricultural processes decreases by 16%.

Interaction with other choices
With greater crop yield, it is possible to meet the growing demand due to increase in populations while freeing up unproductive lands for oil palm cultivation or afforestation.

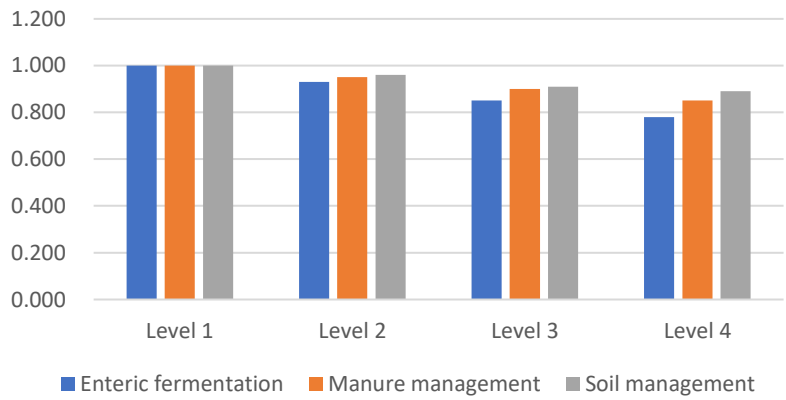

Fig 1. Expected emissions intensity for each agricultural category, for each level.

Livestock and poultry

The vegetarian and vegan movement is gaining popularity globally. It is possible that healthy eating will gain greater traction in Malaysia as well, leading to reduced livestock demand and subsequently livestock production. According to health experts, the recommended daily protein intake of 56.2g. It is assumed that the reduction percentage in protein consumption will lead to equal reduction percentage in livestock production.

In the base year 2016 in the MCAS model, the average daily protein intake is 69.3 g, met by a domestic production of 734,827 cattles, 119,133 buffaloes, 416,529 goats, 138,479 sheeps, 4,228 horses, 1,654,381 swines, 289,666,002 chickens and 9,633,185 ducks. .

Level 1
Level 1 assumes that by 2050, there is no change to the average daily protein intake: leading to a production of 1,201,000 cattles, 196,000 buffaloes, 352,000 goats, 130,000 sheeps, 4,000 horses, 7,150,000 swines, 604,000,000 chickens and 21,000,000 ducks, that equals to 110% increase in livestock and poultry population.

Level 2
Level 2 assumes that by 2050, there is a 10% reduction to the average daily protein intake, leading to a production of 1,080,900 cattles, 176,400 buffaloes, 316,800 goats, 117,000 sheeps, 3,600 horses 6,435,000 swines, 543,600,000 chickens and 18,900,000 ducks, that equals to 89% increase in livestock and poultry population.

Level 3
Level 3 assumes that by 2050, there is a 18% reduction to the average daily protein intake, leading to a production of 984,820 cattles, 160,720 buffaloes, 288,640 goats, 106,600 sheeps, 3,280 horses, 5,863,000 swines, 495,280,000 chickens and 17,220,000 ducks, that equals to 72% increase in livestock and poultry population.

Level 4
Level 4 assumes that by 2050, there is a 25% reduction to the average daily protein intake, leading to a production of 900,750 cattles, 147,000 buffaloes, 264,000 goats, 97,500 sheeps, 3,000 horses, 5,362,500 swines, 453,000,000 chickens and 15,750,000 ducks, that equals to 57% increase in livestock and poultry population.

Interaction with other choices
None.

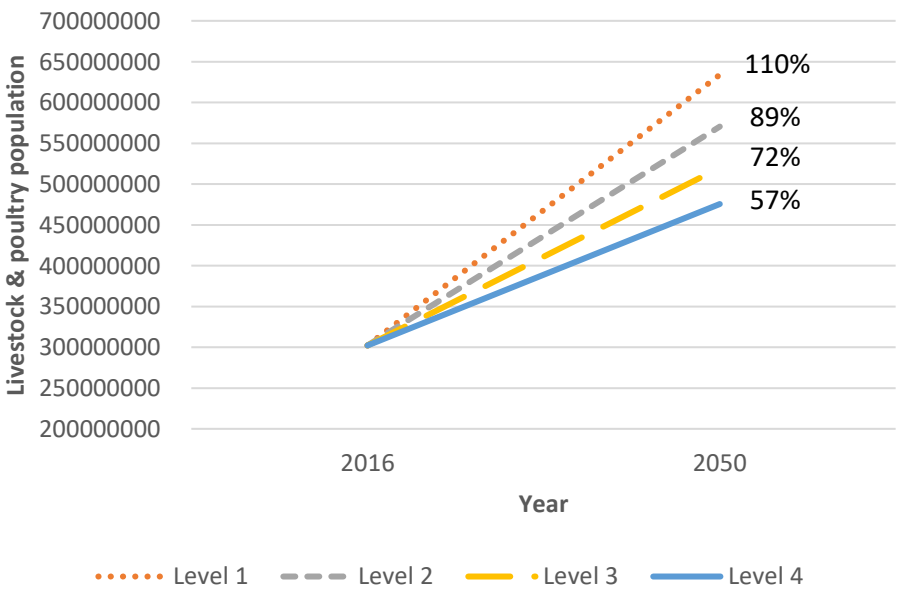

Fig 2. Projection of livestock and poultry population for each level.

Plantation Yield

As the world's second largest palm oil producer, Malaysia has abundant raw materials, especially in the form of crude palm oil, for biofuel production. To make the transition away from fossil fuel, increasing palm oil yield to meet the growing biofuel demand is a practical strategy, without having to convert more lands into oil palm plantations.

In the base year 2016 in the MCAS model, the average palm oil yield is around 3.1 tonnes per hectare.

Level 1
Level 1 assumes that by 2050, there is no improvement to the average palm oil yield: 3.1 tonnes per hectare.

Level 2
Level 2 assumes that by 2050, there is improvement in oil palm management and harvest practices, leading to an average palm oil yield of 8.0 tonnes per hectare.

Level 3
Level 3 assumes that by 2050, the use of high-yield germplasm is common, leading to an average palm oil yield of 15.0 tonnes per hectare.

Level 4
Level 4 assumes that by 2050, the use of advanced germplasm, coupled with improved management and processing method, is common, leading to an average palm oil yield of 40.0 tonnes per hectare.

Interaction with other choices
With higher oil palm yield, it is possible to meet the growing demand due to increase in populations while freeing up unproductive oil palm lands for afforestation.

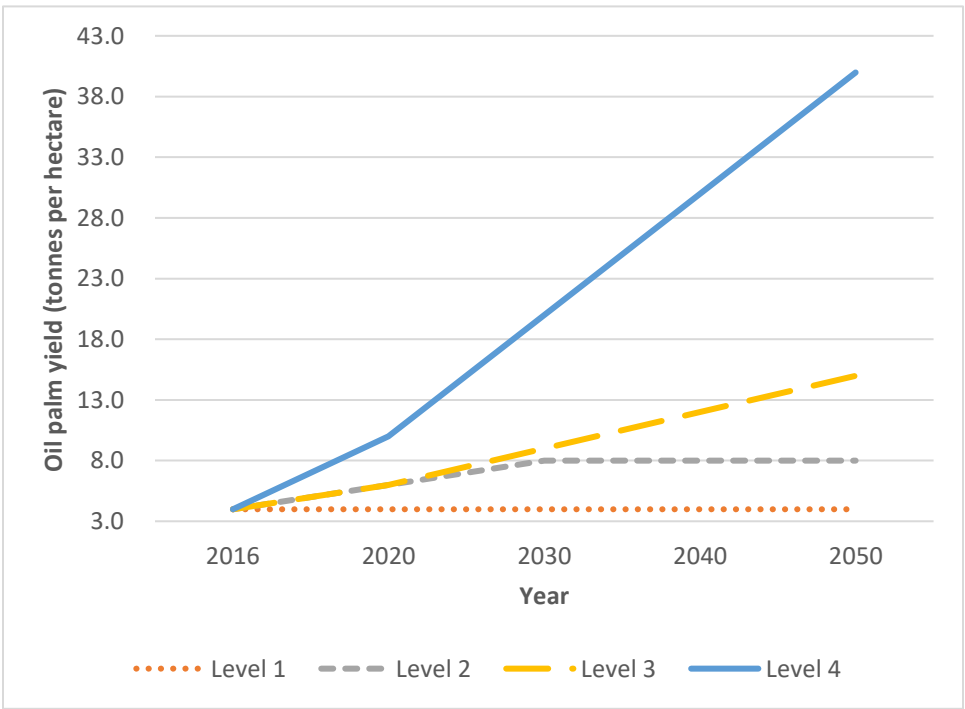

Fig 3. Projected oil palm yield for each level.

Plantation Area

Among the major commodity crops in Malaysia, oil palm is the largest when it comes to planted area. As a matter of fact, Malaysia is the world's second largest palm oil producer. The issue of oil palm sustainability has always been a key concern to the nation. Converting abandoned or less productive agricultural lands into oil palm plantations is one of the sound strategies to increase the higher palm oil demand (as feedstocks for biofuel production).

In the base year 2016 in the MCAS model, the total oil palm area is 5.74 million hectare.

Level 1
Level 1 assumes that by 2050, the total oil palm area is 6.50 million hectare, which is the expansion cap set by the government in 2019.

Level 2
Level 2 assumes that by 2050, the total oil palm area is 6.00 million hectare.

Level 3
Level 3 assumes that by 2050, the total oil palm area is 5.75 million hectare, assuming that the total oil palm area remains relatively unchanged.

Level 4
Level 4 assumes that by 2050, the total oil palm area is 5.50 million hectare.

Interaction with other choices
Increasing oil palm area will require lands to be freed up from agricultural activites.

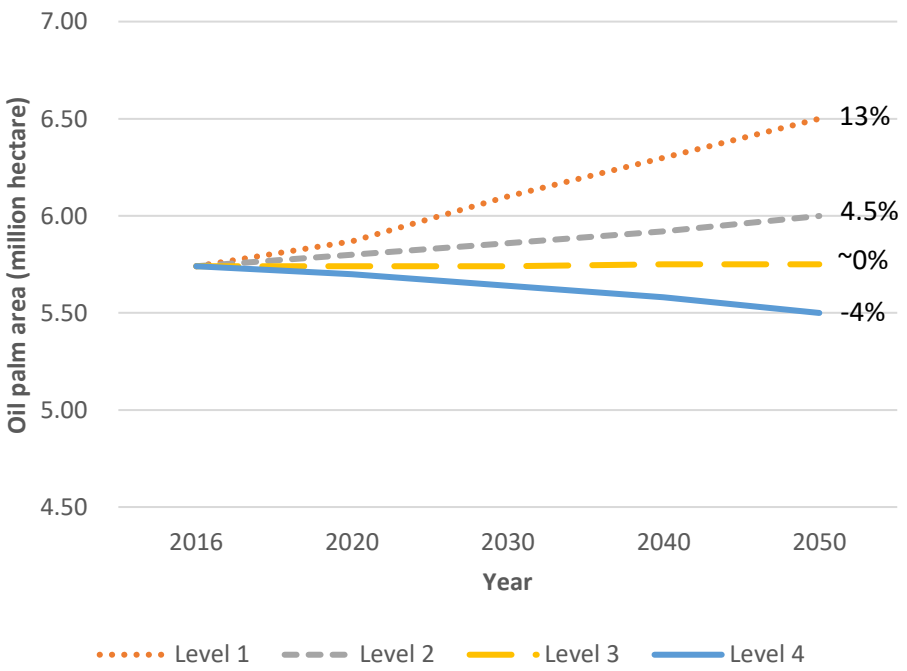

Fig 4 . Projected oil palm area for each level.

Forest cover

Forest lands are the country's major carbon sink sources, responsible for the country's relatively low total GHG emissions over the years. Maintaining a minimum of 50% forest cover through sustainable forest management is one of the country's major environmental commitments and strategies to achieve its NDC.

In the base year 2016 in the MCAS model, the total forested area is 18.24 million hectare (55.3% forest cover).

Level 1
Level 1 assumes that by 2050, the total forested area is 17.26 million hectare (52% forest cover), assuming that Malaysia manages to halt deforestation by 2030.

Level 2
Level 2 assumes that by 2050, the total forested area is 18.24 million hectare (55% forest cover), assuming that Malaysia manages to maintain its forest cover since 2016.

Level 3
Level 3 assumes that by 2050, the total forested area is 19.16 million hectare (58% forest cover), assuming that Malaysia manages to increase its forest cover slightly.

Level 4
Level 4 assumes that by 2050, the total forested area is 20.48 million hectare (62% forest cover), which requires substantial forest conservation commitments from state governments and national reforestation initiatives.

Interaction with other choices
Increasing forest cover will require lands to be freed up from agricultural lands and oil palm plantations.

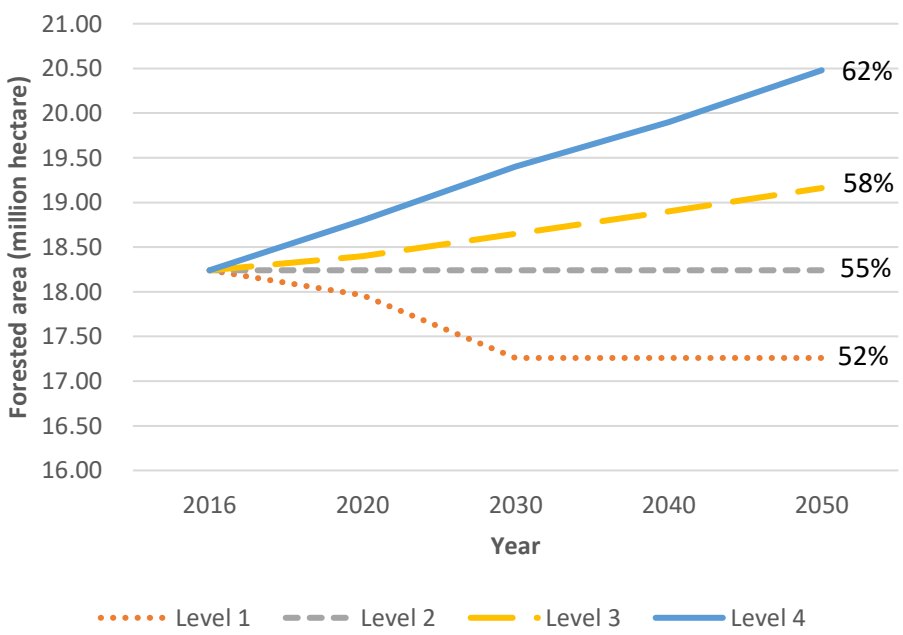

Fig 5. Projected forested area for each level.