

## BIOENERGY: FIRST AND SECOND GENERATION BIOFUELS

Government of India initiated mandated biofuel blending programs from 2003 under the National Biofuels Mission. These programs specify blending of biofuels (5%, 10%, 20%) with fossil fuels in a time bound and phased manner across India. The 'National Policy on Biofuels' was released in 2009. Feed stocks identified are molasses for production of ethanol and tree-borne non-edible oil seed crops like Jatropha and Pongamia for production of biodiesel from marginal lands. To increase biofuel production that has larger scope, lignocellulosic liquid fuels from agri-residue and biodiesel from extensive Jatropha/Pongamia cultivation form wastelands are being pursued. These technologies have been estimated to take varying times (2017-2027) to be commercially ready and follow different rates of development across the four levels. As of now, only sugarcane molasses is used in India for bioethanol production. However as the consumption of sugar in India is expected to increase in future, sugarbeet cultivation is envisaged and its molasses is projected to contribute to ethanol production. Sweet sorghum is also considered as a feedstock for bioethanol.

### LEVEL 1

Sugarcane cultivation area is kept constant at 4.5 Mha. Sugarbeet and sweet sorghum cultivation areas are projected to increase gradually to 10,000 ha (by 2047). As for biodiesel from Jatropha/Pongamia, cultivation wasteland is projected to increase to 0.45 Mha (by 2047) and biodiesel production to 0.25 mtoe/year. Lignocellulosic liquid fuels from agri-residue begin to be commercially ready from 2027. The fuel production reaches 2.9 mtoe/year by 2047. Total first and second generation biofuel production reaches 3.5 mtoe/year by 2047.

### LEVEL 2

Sugarcane cultivation area is kept constant at 5 Mha. Sugarbeet and sweet sorghum cultivation areas are projected to increase gradually to 15,000 ha. As for biodiesel from Jatropha/Pongamia, cultivation wasteland is projected to increase to 1.7 Mha (by 2047) and biodiesel production to 1.7 mtoe/year. Lignocellulosic liquid fuels from agri-residue and wasteland biomass begin to be commercially ready from 2022. The fuel production reaches 8.3 mtoe/year by 2047. Total first and second generation biofuel production reaches 10.6 mtoe/year by 2047.

### LEVEL 3

Sugarcane cultivation area is kept constant at 5.2 Mha. Sugarbeet and sweet sorghum cultivation areas are projected to increase gradually to 20,000 ha (by 2047). Total first generation ethanol from sugar crops reaches 0.9 mtoe saturating by 2027. As for biodiesel from Jatropha/Pongamia, cultivation wasteland is projected to increase to 3.5 Mha (by 2047) and biodiesel production to 4.9 mtoe/year. Lignocellulosic liquid fuels from agri-residue residue and wasteland biomass begin to be commercially ready from 2020. The fuel production reaches 21.3 mtoe/year by 2047. Total first and second generation biofuel production reaches 27 mtoe/year by 2047.

### LEVEL 4

Sugarcane cultivation area is kept constant at 5.5 Mha. Sugarbeet and sweet sorghum cultivation areas are projected to increase gradually to 25,000 ha (by 2047). Total first generation ethanol from sugar crops reaches 1.26 mtoe saturating by 2027. As for biodiesel from Jatropha/Pongamia, cultivation wasteland is projected to increase to 5.25 Mha (by 2047) and biodiesel production to 9 mtoe/year. Lignocellulosic liquid fuels from agri-residue and wasteland biomass begin to be commercially ready from 2017. The fuel production reaches 39 mtoe/year by 2047. Total first and second generation biofuel production reaches 50 mtoe/year by 2047.

## Projection of First and Second Generation Biofuels

