The importance of waste grassland for potential biomass and bio-energy production in China

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Abstract The waste grassland (WGL) is the most important reserved land resources in China , up to 56.8% in total amount and has the greatest exploitation potential . The area of WGL that is distributed in large scale with the greatest probability for arable land was 3.61×10^6 ha . If this part of WGL is used for bio-ethanol energy plants , the yearly potential bio-ethanol production will be 11.21×10^6 t that can substitute 23.1% present gasoline consumption of China .
The production of bio-energy requires land . Because of the vast population and shortage of agricultural land in China , as less impact as possible on food and other agricultural production supply is the fundamental principle to develop the biomass and bio-energy industry . As the major marginal land , the reserved land (RL) use for energy plants growth is an important way of potential biomass and bio-energy production in China .

Quantity of WGL WGL is the largest part of RL resources . According to the statistics of updated overall land resources investigation by the Ministry of Land Resources , up to the end of 2002 , the total quantity of RL of China was 88.74×10^6 ha . In which , WGL was 50.37×10^6 ha and occupied 56.8% of the total amount , followed by saline land , other unutilized land and tidal flat (Figure 1) . Meanwhile , some of RL are distributed in large scale with the greatest potential for arable land exploitation . It is estimated as 7.34×10^6 ha , in which , WGL was 3.61×10^6 ha and occupied 49.2% (Figure 2) .

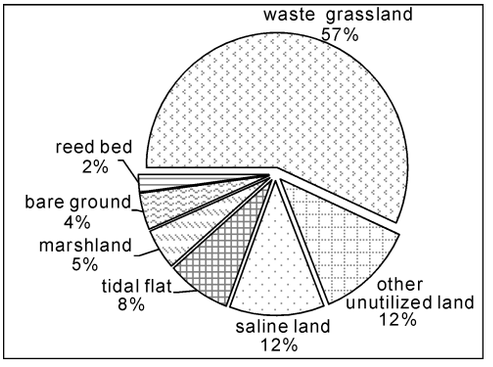

Figure 1 *the composing of reserved land resources of China .*

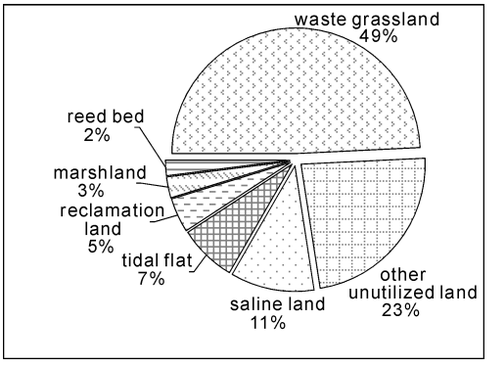

Figure 2 *the composing of reserved land with the greatest potential for arable land exploitation .*

Estimate of WGL for potential of bio-energy crops The 3.61×10^6 ha part of WGL with the greatest potential for arable land exploitation is regarded as the most productive among all RL and suitable for bio-energy crops . Bio-ethanol crops are regarded as the most feasible plants , such as sweet sorghum , sweet potato , cassava , sugar cane and Jerusalem artichoke , and so on . Field experiments indicated that the bio-ethanol production ratio by these bio-ethanol crops is 3.1～4.9 t ha^{-1} y^{-1} . If the minimum ratio of 3.1 t ha^{-1} y^{-1} is adopted for calculation , 11.21×10^6 t can be produced yearly and can substitute 23.1% present gasoline consumption in China . These bio-ethanol yields would be 11 times of present bio-ethanol yields of 1.02×10^6 t y^{-1} by corn , wheat and other grain based raw materials in China . If all of WGL suitable for bio-ethanol crops are used for this purpose , no matter WGL is distributed in large scale or sporadically , the amount of the land would be more than 6.5×10^6 ha and the relevant bio-ethanol yields by energy crops would increase to more than 20×10^6 t y^{-1} .

Discussion of other for biomass production Besides of the part of WGL suitable for bio-energy crops planting , the other parts of WGL could be used for woody oil plants or fuelwood production in long term . The potential of 31.43×10^6～36.04×10^6 t y^{-1} oily fruits for biodiesel by woody oil plants and 83.80×10^6～96.08×10^6 t y^{-1} fuelwood is estimated . These fuelwood is equivalent to 54.47×10^6～62.45×10^6 t y^{-1} standard coal .

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