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Developing Biomass Engineering Technology and Application for Low Carbon Agriculture in China

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Introduction

For meeting the demand of reducing C emission intensity by 40%-45% per unit of GDP, low carbon agriculture has been received much attention for reducing GHGs emission from agriculture.Totally, 0.7 Gt of crop straw is produced in croplands annually in China.

Biomass engineering technology

At Sanli Biomass Engineering Corporation, great efforts have been dedicated for the last 5 years to developing new and high technology for waste biomass conversion from crop straw to new energy and biochar as well as biogases with totally 15 techniques and devices patented The large production system can treat per hour 1 metric tons of straw and produce biogas of 800 cubic metre for gas electricity of 600 kw, 300 kg of biochar and 50 kg of biofuel. By the end of 2009, a small scale carbonizing pool system has been developed for local use treating per hour 30kg of straw and producing 10 cubic meter of biogas, 10-12 kg of biochar. With this system, 30 farmer households could be facilitated with biogas for heating and cooking. In 2010 is available a total straw treatment capacity of 400,000 metric tons per year, producing 240,000 tons of char based fertilizer (CBF, char at 45%, urea at 45% and bi-ammonium phosphate at 10%).

Field experiments in agriculture

A networking field experiments at 8 sites has been established of across China, which covers rice paddies, wheat and corn croplands, vegetable lands and fruit gardens as well as herbs fields. Changes in crop yield and greenhouse gases emission with biochar application are monitored using closed chamber systems. In an experiment in Yixiang, Jiangsu, under biochar application at 10 t/ha and 40 t/ha, rice grain yield was increased by 12% and 10% without N fertilization and by 11% and 8% with N fertilization respectively compared to no biochar amendment. A significant yield increase at 8.8% was observed under biochar application at 10t/ha compared to N fertilization at 300kg N/ha. Application of biochar at 10 t/ha and 40 t/ha in rice season increased grain weight by 5% and 18%, and wheat yield by 60% and 230% compared to no biochar amendment. N_2O emission was greatly reduced while CH_4 emission increased significantly under biochar application in the rice season. Moreover, biochar application at 10t/ha may offset a normal N fertilization at 300 kg/ha for a normal rice yield. Therefore, application of biochar from straw may be expected to enhance soil C, increase crop productivity and reduce N use in croplands.

Figure 1. A large scale treatment system

Results and Discussions

Thus, a national demonstration project on biochar application in agriculture is suggested. Total C balancing is being to assess with biochar conversion and application in croplands. Some policy briefing is being addressed for extending biochar application in agriculture for low carbon technology in China.

Conclusions

An effective biomass engineering system is available for biochar production with crop straw. Biochar application may enhance soil C, increase crop yield as well as reducing GHgs emission in agriculture of China.