Research Progress on Conservation Tillage Project in Guangdong, China

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Guangdong Province is an important agricultural region in southern China. Agricultural non-point source pollution problems there have been extreme in recent years, due to the increasing population that has followed the rural economic growth. Research and demonstrations, supported by the World Bank agriculture non-point source pollution control-conservation tillage project, have been undertaken in Guangdong Province since late 2014, to discover and examine methods for the effectiveness of reducing agricultural non-point source pollution through the use of conservation tillage. The planned total area for the project is 113 hm^2, among which 53 hm^2 is paddy rice, and 60 hm^2 is sweet corn. The project has been implemented in two paddy rice and two sweet corn sites using 4 models of crop management:

Model 1—No-till, machine transplanting synchronously with fertilization.
Model 2—No-till, direct seeding synchronously with fertilization.
Model 3—Less till, direct seeding synchronously with fertilization.
Model 4—Less till, machine transplanting synchronously with fertilization.

More than 50 sets of agricultural machines, including laser-controlled paddy field levelers, precision direct rice seeders with synchronous fertilizer application, rice transplanters with synchronous fertilizer application, direct corn seeders, and corn transplanters, have been tested at the sites. Typical scenes and machine operations are shown in Figure 1.

a. b.

Figure 1. (a) Transplanting and direct seeding in a paddy; (b) transplanting and direct seeding in a corn field.

The crop yields and economic effects (cash returns) results from the experiments in 2015 at the four sites (Table 1) show that the conservation tillage technology was effective in southern areas of China having high temperatures and humidity. For the paddy rice, Model 3 (less till, direct seeding) and Model 4 (less till, transplanting) had significant effects, while for sweet corn, Model 1 (no-till, transplanting) and Model 2 (no-till, direct seeding) had significant effects. Most of the selected farm machines were applicable. However, some of the northern dry-land machines need to be improved.

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Table 1. Yields and cash returns for the two crops with 4 different models.

	Crop yields for different models (ton/hm^2)					**Cash return for different models** (ten thousand yuan/hm^2)				
Paddy rice	M1	M2	M3	M4	CK	M1	M2	M3	M4	CK
early crop, site1			6.78	8.85	6.72			1.41	2.04	1.16
late crop, site 1	6.12		5.45	5.52	5.33	0.77		0.51	0.53	0.20
early crop, site 2	5.93	6.00	6.77	7.26	6.21	1.01	1.22	1.43	1.37	1.06
late crop, site 2	7.07		5.52	7.55	5.25	1.45		1.11	1.60	0.87
Sweet corn										
early crop, site 1	14.04	14.07	12.51	12.21	12.27	0.49	0.49	0.44	0.43	0.43
late crop, site 1	13.53	13.94	13.01	12.11	13.26					
early crop, site 2			5.25	7.25	6.11					
late drop, site 2										

The experiments indicated that for no-till in paddy rice fields, grass (stubble, straw and weeds) treatment was the most important issue. The ideal conditions were: stubble is short (5-10 cm), straw after threshing has been moved out from the field, and less weeds present. Figure 2 shows a no-till direct seeder operated in a paddy field, where the stubble was short and most straw had been moved from the field. The new seedlings grew well in the stubble field here.

Figure 2. No-till precision dry hill drop seeding in a stubble field.

It is also necessary to put emphasis on crop rotations, precision planting, injurious insect control, optimizing fertilizer utilization, making overall arrangement on crop cultivation models, production technology and a complete set of supporting equipment systems for the whole process mechanization.

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