Sustainable Recultivation and Land Use on Karst Regions--Shrub System

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Introduction The karst area because of its special geological structure creates a number of environmental problems including water loss , drought , thin soils , desertification , and soil collapse , resulting in a fragile and unstable environment . The karst area in Guangxi spreads across the entire province . Carbonate rock is distributed 40% of and accounts for 17% of China's karst region . Some of it is degrading like the stony deserts , thus it is urgent to select suitable plants for re-vegetating it .

Material and methods We screened a large number of shrubs in order to make selections for re-establishing the shrub system . Nine cultivars have been tested including shrub fodder types , flowering shrubs and fruit trees et al , among them 3 strains of Japanese camellia , 6 strains of Japanese and Chinese chestnut , Japanese peach blossom and including 6 native species , two strains of mountain grapes , *Zenia* , *Morrus* , *Broussonetia* , *Leuceana* and *Cinnamomum* . We used five reforestation methods to plant seedlings only , branches , seedlings with soil , nutrition cup seedlings and directly seeding with seed .

Results Three foreign varieties have shown good adaptability . They are the Japanese prunus and Japanese camellia . Six domestic species did well : *Zenia* grew the fastest , reaching a height of 220cm in 10 months , the large seedlings of camellia planted with the soil grew relatively slowly , only 14cm in height over the same period . Growth rate were in the following order : *Zenia*> *Leucaena*> grapes> *Broussonetia*> *Morus*> *Cinnamomum spp* et al . Reforestation results were strongly influenced by soil preparation . Plowing prior to planting loosened the soil and the young shrubs had adequate water , fertility of soil , sun light , and heat to promote rapid growth . At the same time , the planting-hole method had the poorest results . For example , *Zenia* grew 285cm tall in all ploughed areas and was 2. 2 times taller than shrubs placed in planting holes . The basal diameter (BD) of trees was 2 .58 cm and 2 .1 times bigger when planted on ploughed land . Biomass aboveground was 840 g and 3 .8 times heavier , and the belowground biomass was 520 g and 4 .3 times heaver for the planting-hole method . For grapes , height was 138 cm in ploughed areas , 2 .5 times higher than for the planting-hole method , BD was 0 .5 cm , or 7% greater . To chestnut , height was 106 cm in all plough , 1 .4 times higher than in planting-hole method , BD was 1 .80 cm , 25% bigger than the planting-hole method (Table 1) .

Table 1 *Different soil preparation and biomass of trees (cm) (Average for all species) .*

Soil preparation	Main root		Side root			Canopy of root	Biomass (g)	
	Length	BD	Length	No	Mean		Branch	Root
Tractor-plough	67	2 .2	284	5	1 .12	80	840	520
Planting-hole	60	1 .2	147	4	0 .87	65	220	120

Conclusions The better shrubs for recultivation were *Zenia* , *Leuceana* and *Broussonetia* . The best soil preparation was planting-hole method as it protects the soil surface from eroding and reduces water lose . This method of reforestation is expected to provide better results , even though initial plant growth is not as great as is shown in this research .