C0697

Re-improvement method of old pasture grassland developed by improved stabilizer and stone crusher in coral islands of Okinawa, Japan

International Conference of Agricultural Engineering
AgEng 2014 Zurich 6-10 July

Yoshiharu Hosokawa, University of Miyazaki, Japan

Key words: coral island, grassland development method, re-improvement, improved stabilizer, stone crusher

Introduction

- In coral islands of Okinawa (***Fig.1***), Japan, beef cattle production had been carried for a long time by traditional grazing system. So, it had been low grassland and cattle production (***Fig.2***).
- A large scale of grassland development was started from 1984 by "**Process 1**" using "Improved stabilizer", improved road stabilizer, for digging 30**cm depth** against hard coral-bedrock of Ryukyu Limestone (upheaval).
- In "**Process 2**", "Stone crusher" was used instead of **man-hand picking stones** on surface after working improved stabilizer.

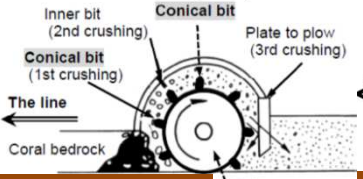
Fig.1 **Maps of the site**

Improved stabilizer for 30 cm depth against coral bed

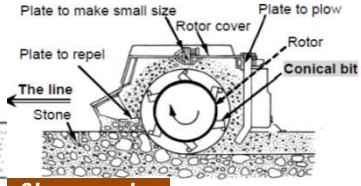
Stone crusher for 30 cm depth

Fig.2

Wild pasture with coral stones before development



Improved Stabilizer



Stone crusher

Process 1 : method by using the improved stabilizer

Lumbering	Gathering & lighting	Treatment of stones	Treatment of pushing or scraping	Leveling ground	Crushing coral bed
Man power	Man power	Bulldozer	Ripper-dozer, Back hoe	Bulldozer	Stabilizer
		Work of cutting & filling field ground			

Crushing soil	Spread material improving soil	Crushing soil	Compaction, seeding & soil covering	Compaction
Disk harrow	Spreader	Disk harrow	Roller, Grain drill	Roller
	Picking stones Manpower			

Process 2 : method by using the improved stabilizer and stone crusher

Lumbering	Gathering & lighting	Treatment of stones	Treatment of pushing or scraping	Leveling ground	Crushing coral bed
Man power	Man power	Bulldozer	Ripper-dozer, Back hoe	Bulldozer	Stabilizer
		Work of cutting & filling field ground			

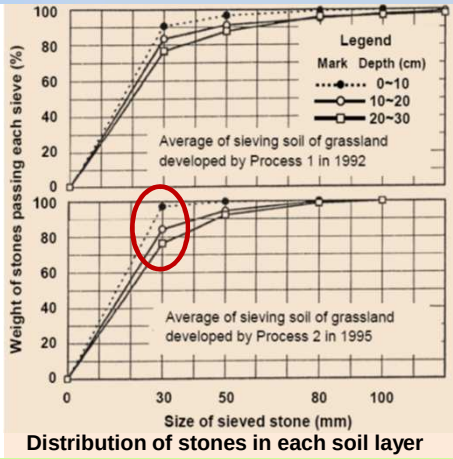
Crushing stone	Spread material improving soil	Crushing soil	Compaction, seeding & soil covering	Compaction
Stone crusher	Spreader	Disk harrow	Roller, Grain drill	Roller

Methods

- Investigation of stone distribution each 10cm soil layer and grass root **(March,2013)** in grassland after **Processes 1 and 2** (Kuro-shima Island).
- Investigation of stones on grassland surface **(March,2013)** after **re-improvement** of old grassland was worked by **stone crusher only** in 2009 (Kobama Island).

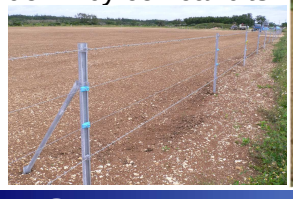
Results

- Stone content was 11.0% in Process 1 and 9.3% in Process 2. Stone content of 10~20 cm and 20~30 cm layers were almost similarly, however, the different in the top layer was obviously measured 1.9% in Process 2 against 6.2% in Process.
- Grass root weight (dry) in Process 1 was 57.8 g against 41.2 g in Process 2. Averaged percentage in Process 1 was 91.1% in 0~10 cm layer, being slightly large against 82.3% in Process 2. However, in 10~20 cm and 20~30 cm layers, the average percentages in Process 2 indicated larger than in Process 1.

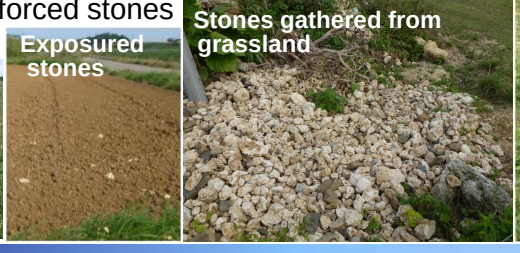


Distribution of stones in each soil layer

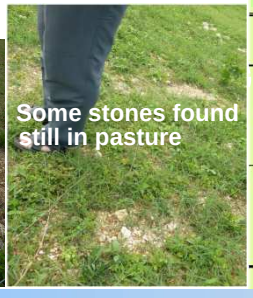
- Stones on grassland after working stone crusher up to 30cm depth were in no small way found. They were dug up from the bottom layer, where stone crusher forced stones down by conical bits.



Exposured stones



Stones gathered from grassland



Some stones found still in pasture

Comparison of grass root weight (dry)

Site of method	Depth (cm)	1st Point (g)	1st Point (%)	2nd Point (g)	2nd Point (%)	Average (g)	Average (%)
Stabilizer	0~10	62.0	91.2	43.3	91.0	52.7	91.1
	10~20	4.3	6.3	4.0	8.4	4.2	7.2
	20~30	1.7	2.5	0.3	0.6	1.0	1.7
	Total	68.0	100.0	47.6	100.0	57.8	100.0
Stabilizer & Stone crusher	0~ 10	31.2	79.4	36.6	85.1	33.9	82.3
	10~20	5.2	13.2	4.0	9.3	4.6	11.2
	20~30	2.9	7.4	2.4	5.6	2.7	6.5
	Total	39.3	100.0	43.0	100.0	41.2	100.0

* Kind of the grass was Giant Star Grass in both sites

Conclusion

Re-improvement method of old pasture grassland is recommended to work the stone crusher up to 10 cm depth (desirable, maximum 15 cm), to make fine soil with less stones in a top layer for better grass growing.