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Preliminary Study on the Stripped Cropping with Forest Plantation in Ywa-Ngan Township Southern Shan State

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ရှမ်းပြည်နယ်ရွာငံဒေသ သီးနှံနှင့် သစ်တောအတန်းလိုက်စိုက်ပျိုးနည်းစနစ်ကို ပဏာမလေ့လာခြင်း။

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စာတမ်းအကျဉ်းချုပ်

ရွှေ့ပြောင်းတောင်ယာစနစ်ကို မိရိုးဖလာစိုက်နည်းအဖြစ် အသုံးပြုနေသော ရှမ်းပြည်ယ် ရွာငံဒေသနှင့် အခြားအလားတူနေရာများတွင် မြေဆီလွှာ ထိန်းသိမ်းရန်နှင့် သီးနှံအထွက်နှုန်းများ တည်ငြိမ်စေရန် အတွက် သစ်တောစိုက်ခင်းနှင့်သီးနှံစိုက်ခင်းများကိုတကန့်စီစိုက်ပျိုးရန်ထောက်ခံချက်များ ပေးသင့်ပါသည်။

Preliminary Study on the Stripped Cropping with Forest Plantation in Ywa-Ngan Township Southern Shan State

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Abstract

Recommendation should be to made to introduce stripped cropping with forest plantation in those similar area where shifting cultivation and fallow land customarily practiced in order to conserve soil fertility and to sustainable yield.

Contents

1. Introduction

Since Myanmar Naing Ngan is basically rich in forest resources and annually earns about 60% of total incomes, forest sector is very important for state economy. Infect, forest are not only the sources of exploitation but also crucial for the multiple benefits of soil and water conservation, flood and landside prevention erosion control and restoration of environment.

Although it is no doubt that reforestation play a key role in soil and water conservation, its effectiveness are not as good as it should be unless stripped cropping is acclimatized.

By virtue of attaining cash before the forest plantation is mature, improving soil fertility and preventing soil erosion through stripped cropping, technical observation with forest plantation should be made in Shan State.

In this paper, yearly net incomes from crops and fuelwoods, tree growth and soil analysis data were described to make an observation on stripped cropping with forest plantation in Ywa - ngan township, Shan State.

2. Objective

This preliminary study was conducted with following objectives; -

1. To study the fertility changes as affected by the cropping and forest plantation.
2. To evaluate the unit incomes crop yields and fire wood production.

3. Study Area

Two location , Nyaung -gone and Lay- Ywa from Ywa-ngan Township, Shan State were selected to make an observation in this study. Some characteristics of the study area are described in the following table.

Location	Topography a.s. 1.m	Annual rainfall mm	Temperature min-max .C
Nyaung-gone and Lay-ywa Ywa-ngan Township	130	1500	17-26

4. Materials and Methods

A field observation was carried out at Nyaung-gone village and Lay-ywa village in Ywa-Ngan Township, Shan State from 1986 to 1993.

At Nyanung-gone site forest plantation and crop were assigned as alternate pattern on total 30 acres. (Appendix II). Of total observation are, 136 day -old, Aurisha (*Acacia auriculiformis)* were planted with 6' x 9' spacing on 7 acres while among the lines; rice, soybean, peanut , sweet potato and safflower were grown on 23 acres. Farmers in the study area have dependently selected crop types based on their knowledge. Yearly crop yields and plant height were measured. Number of fire wood stocks (6' x6' x 6') estimation was made 8 years after transplantation. Random soil samples from both of cropping area and forest area were collected to study the fertility changes.

At Layywa site, total observation area is 10 acres. Pine (*Pinus kesiya)* and Aurisha (*Acacia auriculiformis)* were planted on 3 acrea while rice, soybean, rice bean, wheat and safflower were, grown for 5 years on 7 acres, spacing and plantation diagram were shown in Appendix (I). Crop yields were recorded every year to analyse for income comparison.

Fig. I. Strip Cropping Pattern in Naung gone with *Acacia auriculiformis*

Fig. II. Strip Cropping Pattern in Naung gone with *Acacia auriculiformis*

Fig. III. Strip cropping Pattern in Lay ywa with *Pinus keslya*

Fig. IV. Strip Cropping Pattern in Lay ywa with *Pinus kesiya*

Fuelwood stacks estimation and plant height were measured 5 years age. Random soil samples were taken from both cropping area and forest plantation area to observe the fertility changes.

5. Results and Discussion

Yearly, survival percent and plant height of Aurisha at Nyanug -gone site were presented in table .1. Survival percent of Aurisha were decreased year after year. Average survival percent of Aurisha was 92 at one after establishment which 61 percent was observed at 8 years after establishment. However, survival percent are not remarkably different between 1991 and 19993 crop year.

Plant heights of Aurisha were generally increased with age. However stunted growth was observed at 6 years after establishment. Survival percent and plant height indicate that Aurisha should be cut at years old when fuel woods are concerned.

Yearly survival percentage and height of Aurisha and pine at Lay- ywa are shown in table 2. Survival percentage of either pine of Aurisha are decreasing up to 40 years after establishment. Height of Aurisha and Pine are increased year after year up to 1993.

Fuelwood out turn from both Nyaung- gone and Lay - ywa are mentioned in table 3. One hundred and sixty five fuelwood stacks (6' x6' x 6') can be obtained within 8 years from Nyaung-gone site. Fuelwood stocks from Lya - ywa can be establishment as 76, comprising both of the pine and Aurisha after 4 years establishment.

Profit comparison between cropping and forest plantation is shown in table 4. At Nyaung-gone site, greater profit from cropping was noted as compared to forest plantation. However, higher profit from forest plantation was observation in comparison with cropping at Lay - ywa site. Profit per acre from cropping at Naung-gone was higher than of Lay - ywa. It is likely to be the different management practives of local farmers. Profit per acre from forest plantation at Lay - ywa was greater than that of Naung -gone site. On account of higher survival percent at Lay - ywa site. Crop yields and quantity can be sustained up to 8 years maintaining stripped cropping with forest plantation. Otherwise, crop yields will be decreased year after year and land will be leaf as abandoned area. This table indicates that forest plantation was needed to prevent soil erosion as well as sustainable yield and quality control.

Comparison of soil properties between cropping and forest plantation was shown in tables 5. It is obvious soil fertility changes in forest plantation is relatively very small due to natural nutrient recycling. However continuos cropping is contributed to gradual elevation in soil fertility.

In this study, organic matter and other plant nutrients content were more or less the same in cropping and forest plantation. It is clear that the maintenance of soil fertility under stripped cropping is mainly attributed to conservation of forest plantation.

6. Conclusion

Recommendation should be made to introduce stripped cropping with forest plantation in those similar areas, where shifting cultivation is customarily practised in order to conserve the soil and sustainable yield.

Table 1. Yearly survival percent and height

Location - Nyaung Gone
Species - *Acacia auriculiformis*
Plant Year - 1985
Planted Trees - 6090

Particular	Year						
	1986	1987	1988	1989	1990	1991	1993
Survival trees	5650	5277	4831	4367	3978	3830	3755
- Survival %	92	86	79	71	65	63	61
- Maximum height (Ft)	3.3	4.67	10.42	19.75	21.00	30.0	37.0
- Maximum height (Ft)	0.25	0.25	0.5	0.50	2.00	2.00	5.00
- Average height (Ft)	1.08	1.67	4.08	7.00	10.15	15.42	21.01

Table 2. Yearly survival percent and height

Location - Lay ywa
Species - *Acacia auriculiformis*
- *Pinus kesiya*
Planted Year - 1989
Planted trees - 1704

Particular	Year		
	1990	1991	1993
Survival trees	1472	1443	1163
Survival	86	84	68
Maximum height (ft)	7.5	10.00	24.00
Minimum height (ft)	0.5	1.0	1.3
Average height (ft)	4.0	4.80	10.66

Table 3. Estimation of Fuelwood out turn and income

Location	Out turn No. of stacks (6' x6' x 6')		Total cost	income
			(Kyats)	
Nyaung -gone	Aurisha 165		24775	33000
Lay ywa	Aurisha 50 Pine 26	76	12150	15200

Table 4. Comparison of unit profit between cropping and forest plantation

Location	Type of Plantation	Acres	Total profit (kyats)	Unit profit (kyat/ ac/ yr)
Nyaung-gone	Crop	73.6	40771	544
	Forest	7	8225	147
Lay ywa	Crop	33.0	4390	133
	Forest	3	3050	203

Appendix (II). Yearly net income from different crop-grown

Location	Year	Species	Planted acres	Yield (basket)	Cost	Income	Profit
					(---- kyats -----)		
Layywa	1986	Salflower	0.50	0.63	200	126	-84
	1987	Rice	0.40	1.00	55	80	25
		Soybean	0.40	0.20	88	29	-59
		Ricebean	1.50	0.50	225	75	-150
		Safflower	6.50	1.13	900	226	-674
							-942
	1988	Rice	4.5	32.00	1010	2560	1550
		Salflower	4.5	3.0	600	600	-
	1989	Rice	3.0	28.0	712	2100	1388
		Wheat	1.0	-	225	-	-225
							1163
		Salflower	3.5	2.0	550	880	250
		Ricebean	1.5	1.0	180	150	-30
	1990	Rice	6.0	40.0	1600	4000	2400
							2620
						Grand total	4390
Nyaung gone	1986	Rice	4.8	72	785	2160	1375
		Soybean	1.4	1.3	200	195	-5
		Peanut	1.0	1.0	180	80	-100
							1270
	1987	Rice	13.4	108	3666	3240	574
		Sweet	25.0	3675	10100	36750	26650
							27224
	1989	Rice	4.0	69	775	5175	4400
	1990	Rice	6.0	80	1600	8000	6400
		Sailflower	18.0	12.0	2950	4875	1925
							12725
						Grand Total	40071

Rice	=	*Oriza satival* (Linn.)	=	461bs/ basket
Soybean	=	*Glycine soja*	=	72l bs/basket
Peanut	=	*Arachis hypogaea* (Linn.)	=	28l bs/ basket.
Safflower	=	*Carthamus tinchorius* (Linn.)	=	72l bs/ basket
Wheat	=	*Triticum vulgare*	=	72l bs/ basket
Ricebean	=	*Phaseolus calcaratus*	=	72l bs/ basket
Sweet Potato	=	*Ipomoes batats* (poir)		

Appendix (III) Some Physical and Chemical Properties of Study Area

No.	Depth	P^H		Total N %		O.M %		P%(mg/100gm)		K %(mg/100gm)		Texture	
		Forest	Crop	Forest	Crop	Forest	Crop	Forest	Crop	Forest	Crop	Forest	Crop
I	0-20	5.08	5.19	0.085	0.074	5.33	5.33	Trace	0.32	0.9	0.5	Sandy loam	Sandy Laom
	20-60	5.17	4.654	0.084	0.06	5.33	4.74	0.07	0.34	0.2	0.2	Sandy loam	Sandy Laom
	60	4.92	4.48	0.058	-	4.74	4.74	0.35	0.32	Trace	0.1	Sandy loam	Sandy Laom
	0-20	5.23	4.82	0.119	0.08	4.14	4.14	.0.11	0.34	0.4	0.6	Sandy loam	Sandy Laom
	20-60	5.03	4.72	0.038	0.002	4.14	2.96	0.12	0.47	Trace	0.2	Sandy loam	Sandy Laom
	60	4.76	4.43	0.038	0.002	5.92	2.96	nil	0.46	Trace	0.2	Sandy loam	Sandy Laom
	0-20	5	4.91	0.098	0.068	6.51	4.74	0.23	0.48	Trace	0.7	Sandy loam	Sandy Laom
	20-60	4.96	4.82	0.078	0.047	0.7	4.14	0.25	0.48	Trace	0.2	Sandy loam	Sandy Laom
	60	4.82	4.8	0.002	0.001	7.69	2.96	0.22	0.48	0.3	0.1	Sandy loam	Sandy Laom
II	0-20	5.16	5.02	0.121	0.074	7.7	5.33	0.22	0.54	Trace	0.7	Sandy loam	Sandy Laom
	20-60	5.51	4.95	0.073	0.05	4.74	5.33	0.32	0.52	0.5	0.1	Sandy loam	Sandy Laom
	60	5.26	4.55	0.049	0.049	2.96	4.74	0.27	0.53	0.1	Trace	loam	Sandy Laom
	0-20	5.12	4.77	0.143	0.095	4.74	5.92	0.32	0.66	0.5	0.5	Loam	Clay Loam
	20-60	5.05	4.43	0.099	0.05	4.14	4.14	0.32	0.57	Trace	0.3	Loam	Clay Loam
	60	4.78	4.38	0.042	0.003	0.55	4.74	0.34	0.6	Trace	Trace	Loam	Clay Loam
	0-20	5.23	4.68	0.128	0.084	4.74	5.33	0.31	0.6	0.7	0.8	Sandy loam	Clay Loam
	20-60	4.98	4.48	-	0.039	5.55	1.18		0.6	Trace	0.1	loam	Clay
	60	4.93	4.47	0.046	0.032	3.55	2.96	0.33	0.58	0.1	Trace	Sandy Clay Loam	Caly Loam

Appendix III Contd.

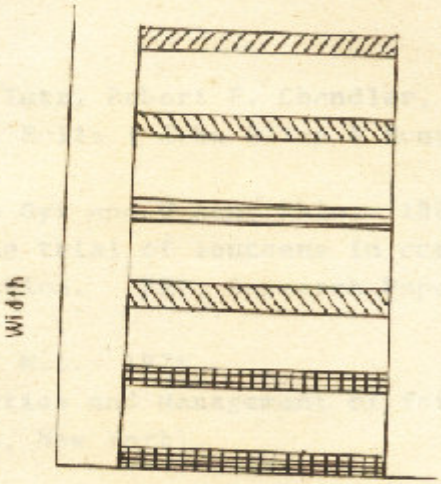
No.	Depth	P^H		Total N %		O.M %		P% (mg/100gm)		K %(mg/100gm)		Texture	
		Forest	Crop	Forest	Crop	Forest	Crop	Forest	Crop	Forest	Crop	Forest	Crop
III	0-20	5.37	5.27	0.088	0.176	5.33	4.14	0.34	2.22	0.5	1.4	Loam	Clay
	20-60	4.95	4.92	0.046	0.067	4.74	3.55	0.36	0.64	0.3	0.4	Loam	Clay Loam
	60	5.01	4.71	0.046	0.84	2.96	5.33	0.32	0.28	0.1	0.4	Loam	Clay Loam
	0-20	5.22	4.72	0.156	0.134	4.74	5.33	0.36	0.2	0.1	0.6	Sandy Clay Loam	Loam
	20-60	5.11	4.69	0.12	0.099	4.74	4.14	0.38	0.24	0.1	0.8	Sandy Clay Loam	Clay Loam
	60	4.78	4.5	0.003	0.053	5.33	2.36	0.38	0.16	0.5	0.4	Sandy loam	Clay Loam
	0-20	5.26	4.79	0.096	0.14	4.74	2.96	0.38	0.14	0.6	0.4	Sandy loam	Sandy Clay Loam
	20-60	5	5.03	0.046	0.67	4.74	2.96	0.36	0.18	0.5	0.6	Sandy loam	Clay Loam
	60	5	5.48	-	0.049	5.33	2.96	0.3	0.12	0.6	0.3	Sandy Loam	Clay Loam
	Nyaung- gone												
III	0-20	4.05	4.28	0.13	0.106	2.96	4.74	0.12	Trace	0.9	0.4	Clay Loam	Clay Loam
	20-60	4.28	4.35	0.073	0.081	3.55	3.55	0.04	Trace	0.5	0.6	Clay Loam	Clay Loam
	60	4.25	4.94	0.039	0.035	2.37	3.55	0.05	Trace	0.03	0.6	Clay Loam	Clay
	0-20	4.18	4.61	4.147	0.106	2.96	4.14	0.06	Trace	0.8	1	Sandy Clay Loam	Clay Loam
	20-60	4.21	4.43	0.064	0.032	2.7	3.55	0.02	0.13	0.4	0.4	Clay	Clay Loam
	60	4.23	5	0.064	0.068	2.37	2.37	3.02	0.17	0.4	0.2	Clay Loam	Clay Loam
	0-20	4.99	4.7	0.088	0.127	2.37	4.14	0.04	0.17	0.8	0.7	Clay Loam	Clay Loam
	20-60	4.5	4.43	0.047	0.057	2.37	2.96	Trace	0.13	0.5	0.5	Caly Loam	Silt Loam
	60	4.4	4.89	0.022	0.047	1.18	2.37	Trace	0.14	0.4	0.2	Clay Loam	Clay

Appendix III Contd.

No.	Depth	P^H		Total N %		O.M %		P%(mg/100gm)		K %(mg/100gm)		Texture	
		Forest	Crop	Forest	Crop	Forest	Crop	Forest	Crop	Forest	Crop	Forest	Crop
III	0-20	5.04	4.5	0.109	0.113	0.55	4.14	Trace	0.2	0.6	1.5	Clay Loam	Clay Loam
	20-60	4.79	4.49	0.068	0.067	2.37	4.14	Trace	0.9	0.4	0.4	Clay Loam	Clay Loam
	60	4.36	5.07	0.043	0.113	2.37	4.74	0.11	0.11	0.8	0.2	Clay Loam	Clay Loam
	0-20	5.34	4.94	0.039	0.116	4.74	4.14	Trace	0.16	0.6	0.11	Clay Loam	Clay Loam
	20-60	4.96	4.81	0.042	0.092	2.37	3.55	Trace	0.1	0.4	0.6	Clay Loam	Clay Loam
	60	5.15	43.97	0.039	0.077	2.96	3.55	Trace	0.15	0.6	0.7	Clay Loam	Clay Loam
	0-20	4.84	5.1	0.078	0.099	4.14	3.55	Trace	0.16	0.6	0.11	Clay Loam	Loam
	20-60	4.95	4.66	0.032	0.06	3.55	3.55	Trace	0.13	0.4	0.8	Clay	Clay Loam
	60	4.65	4.39	0.033	0.54	2.37	2.96	Trace	0.16	0.4	0.4	Clay	Clay
III	0-20	5.27	4.92	0.109	0.154	3.55	4.14	Trace	0.16	1	1.2	Clay Loam	Clay
	20-60	4.68	4.85	0.022	0.119	2.37	5.55	Trace	0.13	0.6	0.8	Clay	Loam
	60	4.72	4.56	0.039	0.105	2.37	3.55	Trace	0.14	0.6	1.1	Clay	Clay Loam
	0-20	5.04	4.95	0.098	0.089	3.55	3.55	Trace	0.12	0.7	2.1	Clay	Loam
	20-60	5.08	4.42	0.039	0.091	2.37	4.14	Trace	0.12	0.5	0.6	Clay	Loam
	60	4.84	4.38	0.036	0.89	3.55	2.96	Trace	0.17	0.4	0.5	Silty Clay Loam	Clay
	0-20	5.31	5.1	0.103	0.99	3.55	3.55	Trace	0.16	0.4	1.9	Silty Clay Loam	Clay Loam
	20-60	5.17	5.08	0.068	0.102	3.55	3.55	Trace	0.16	1.4	0.7	Silty Clay Loam	Clay Loam
	60	4.64	5.1	0.042	0.096	3.55	3.55	Trace	0.18	0.6	0.7	Silty Clay Loam	Clay

Appendix I

Diagram of Crop and Forest Plantation (Lay ywa)



Pine (5.8 1/2)

Crop

Pine (8.8 1/2)

Aurisha (6.8 1/2)

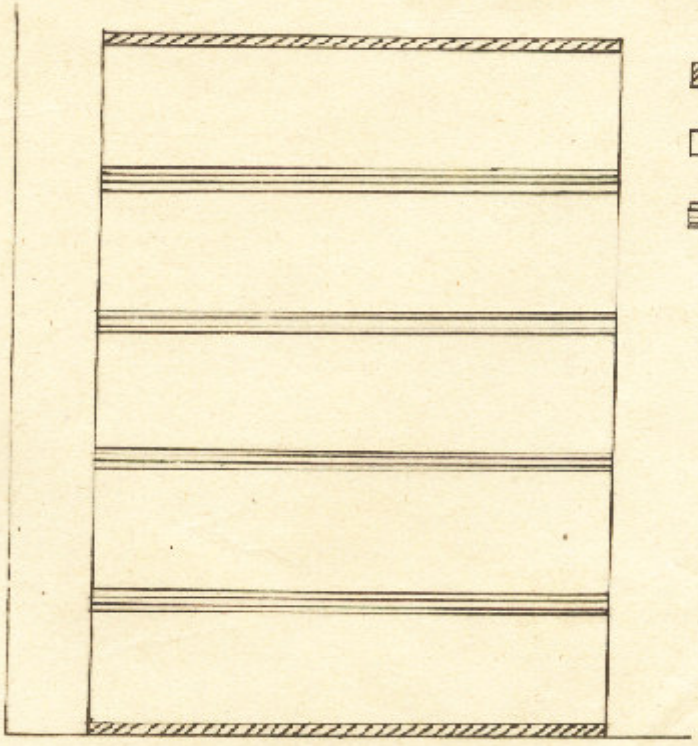
Aurisha (6.3, 6.6, 6.9)

Crop - 24 ft.

Forest tree - 100 ft.

Crop and Foest tree

Diagram of Crop and Forest Plantation (Nyaung gone)



Aurisha - 30 ft.

Crop - 150 ft.

Aurisha - 42 ft.

Crop and Forest tree

References

1. Harold J. Lutz, Robert F. Chandler, JR 1966. Forest Soils (John Wiley & Sons, New York).
2. Mehn Ko Ko Gyi and UAung Khin . 1983-84. Spacing trial of leucaena in correlation with fuel wood production . F.R.I Research Paper, Leaflet No. 4/83-84.
3. Pritichett, W.L. 1978. Properties and Management of forest soils. (John Wiley & Sons, New York).
4. Zhu Zhaohua, Cai Mantang,Wangshij and Jiang Youxu , 1991. Agroforestry systems in China. (The Chinese Academy of Forest People's Republic of China).