



Ministry of Agriculture, Livestock and Irrigation

Department of Agriculture



Effect of different types of organic manures application on growth and yield of Elephant Foot Yam under immature rubber plantation



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- *Amorphophallus* - found in certain Pacific islands and much of Asia.
- Konjac production in China dating back 2000–3000 years.
- Its commercial value is greatest in Japan.

Source: Vegetables of Tropical Climates, Edible Aroids S.K. Ohair, D.N. Maynard, in Encyclopedia of Food Sciences and Nutrition (Second Edition, 2003)

❑ Global konjac market is poised to grow at stupendous pace during 2019-2028.

Key factors ;

- Health benefits - decreasing cholesterol levels, minimizing the obesity risks
- increased demand from food and beverage sectors and other various end-user industries.

The global konjac market is spread across five key regions;

- **North America, Europe, Latin America, Asia Pacific and Middle East and Africa**

Of them, **Asia Pacific** is one of the prominent regions .

Key reason is the **rising demand for konjac from Japan.**

Source: Konjac Market – Global Industry Analysis, Size, Share, Trends, Growth, and Forecasts, 2019-2028,
<https://www.transparencymarketresearch.com/konjac-market.html>

Export Mainly Export to China 85% and Japan 15% (Source: MoC, 2019)

- Signed MoU at 12.6.2019 - 500 tons of dried EFY/year will be exported to China.
(Source: Myanmar Alinn Daily newspaper, 13.6,2019)

Price increasing

- ✓ Tubers price increases from 300 to 2000 kyat/viss
- ✓ Oven dried WaU price - 7000 kyat in 2018
 - 10700 kyat in 2019
 - 15000 kyat in 2020

(Source: Ministry of Commerce, June 2019
The Farmer Myanmar Journal, 12.9.2019)

**Strong Market
and
High Demand**

Factories increasing

- 7 elephant drying foot yam factories in Chin State
- 5 factories in Mon State

Source: MYANMAR TIMES 29 Jan 2020



Planted area and Yield in Myanmar (2018-2019)

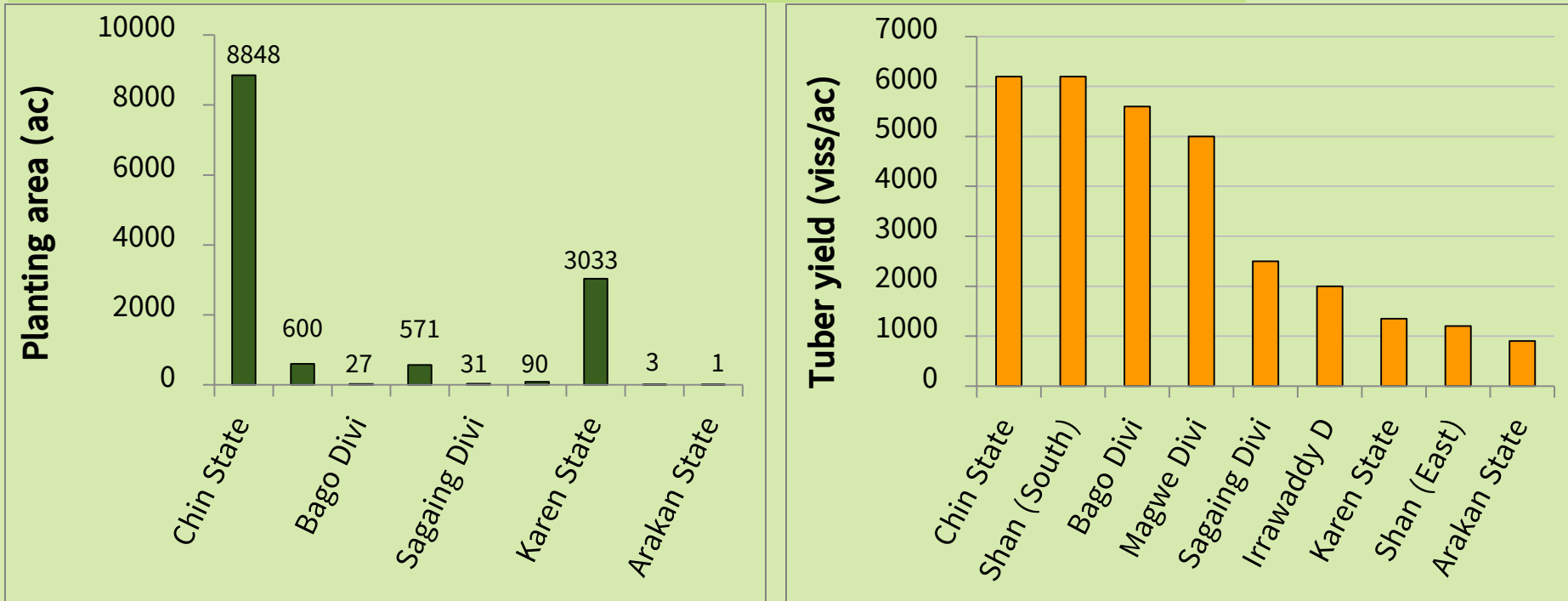


Fig 1. Planted area (left) and yield (right) in different regions of Myanmar (2018-2019)

Source: Ministry of Commerce, June 2019)

Major reasons of yield difference;

- Varieties difference
- Weather and soil difference
- Management difference
- Fertilization difference
- Luck of researching
- so on....

**EFY prefers
organic manure.**

Rubber Plantation

Immature stage

EFY grows well under 60-70% shade..

Ueda S (1937), Wakabayashi S (1963), Douglas et al. (2005), Santosa et al. (2006), Harjoko et al. (2016), Qin et al. (2019)

Objectives

- ❑ To know the effect of different types of organic manures application on growth and yield of EFY and income.
- ❑ To know its effect on growth of rubber

Materials and Methods

Treatments

1. Control (no fertilizer)
2. NPK
3. FYM
4. Goat manure
5. Organic manure (OM)
6. Burnt soil (BS)
7. FYM + sawdust (S)
8. FYM + BS
9. FYM + BS + S



Polybag size : 25 cm diameter x 35 cm height (6 pyi volume)

Rubber spacing: 9' x 22'

Polybag spacing: 2' x 3'

Rubber clone: BPM 24 planted in 2015

Treatment : 9

Replication : 4

Design : RCB

Plot size : 20 plants

Planted tubers size : 50 – 70 g

Total area : 0.5 ac

Planting date: 1.5.2020

Harvesting date : 21.11.2020

Study duration:

7 months

(May-Nov), 2020

Materials and Method

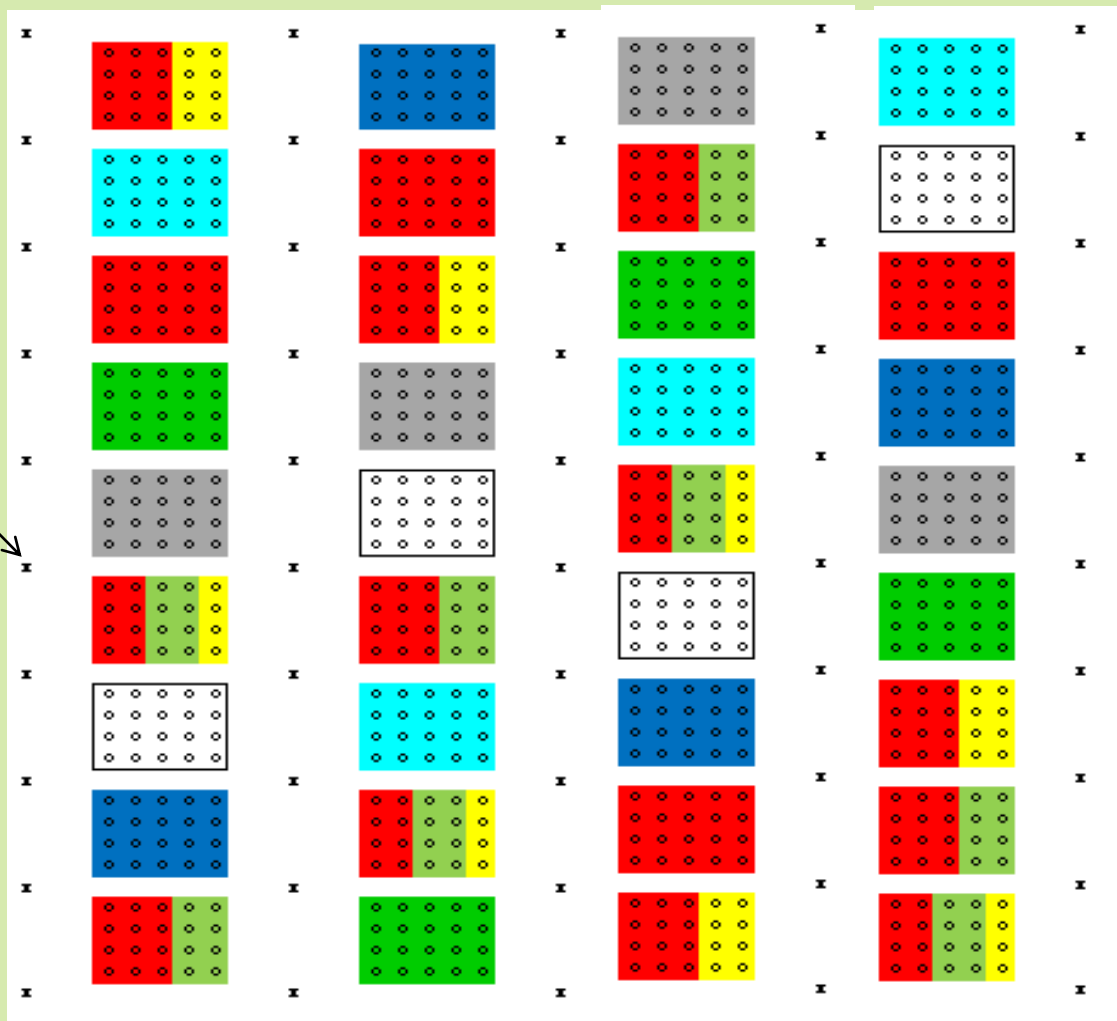


Experimental Layout

rubber

Legend

- Control
- NPK
- FYM
- Goat manure
- Organic manure
- Burnt soil (BS)
- FYM + Saw dust (S)
- FYM + BS
- FYM + BS + S



Rep 4

Rep 3

Rep 2

Rep 1

Materials and Method

Table 1. The detail of soil amendments applied in each treatment

No.	Treatments	Dosage (per bag)	Remark
1	Control (no fertilizer)		only soil (6 pyi)
2	NPK	2.9:3.5:5.9 g N:P ₂ O ₅ :K ₂ O	(2 split)
3	FYM	2.5 L (1 pyi)	
4	Goat manure	2.5 L	
5	Organic manure (OM)	200g(10:0.3:4.5:45% N:P ₂ O ₅ :K ₂ O:OM)	Vedagro, Co. Ltd., Vietnam
6	Burnt soil (BS)	4 L (1.5 pyi)	
7	FYM + Sawdust (S)	2.5 L + 4 L	
8	FYM + BS	2.5 L + 4 L	
9	FYM + BS + S	2.5 L + 4 L + 4 L	

Table 2. Nutrients contents in soil and soil amendments

No.	Soil amendments	Organic matter (%)	Total N (%)	P ₂ O ₅	K ₂ O
1	FYM	24.79	1.46	2.08 %	1.18 %
2	Goat manure	25.03	2.63	3.23 %	1.86 %
3	Burnt soil	3.45	0.13	35.29 (ppm)	29.39 (mg/100 g)
4	Sawdust	26.67	0.74	0.84 %	0.86 %
5	Soil	4.91	0.10	4.41 (ppm)	1.52 (mg/100 g)

Materials and Method

Measurement parameters

- Plant height and girth
- Above ground biomass production
- Bulbils yield
- Tuber yield
- Cost and benefit
- Growth of rubber trees



Results and Discussion

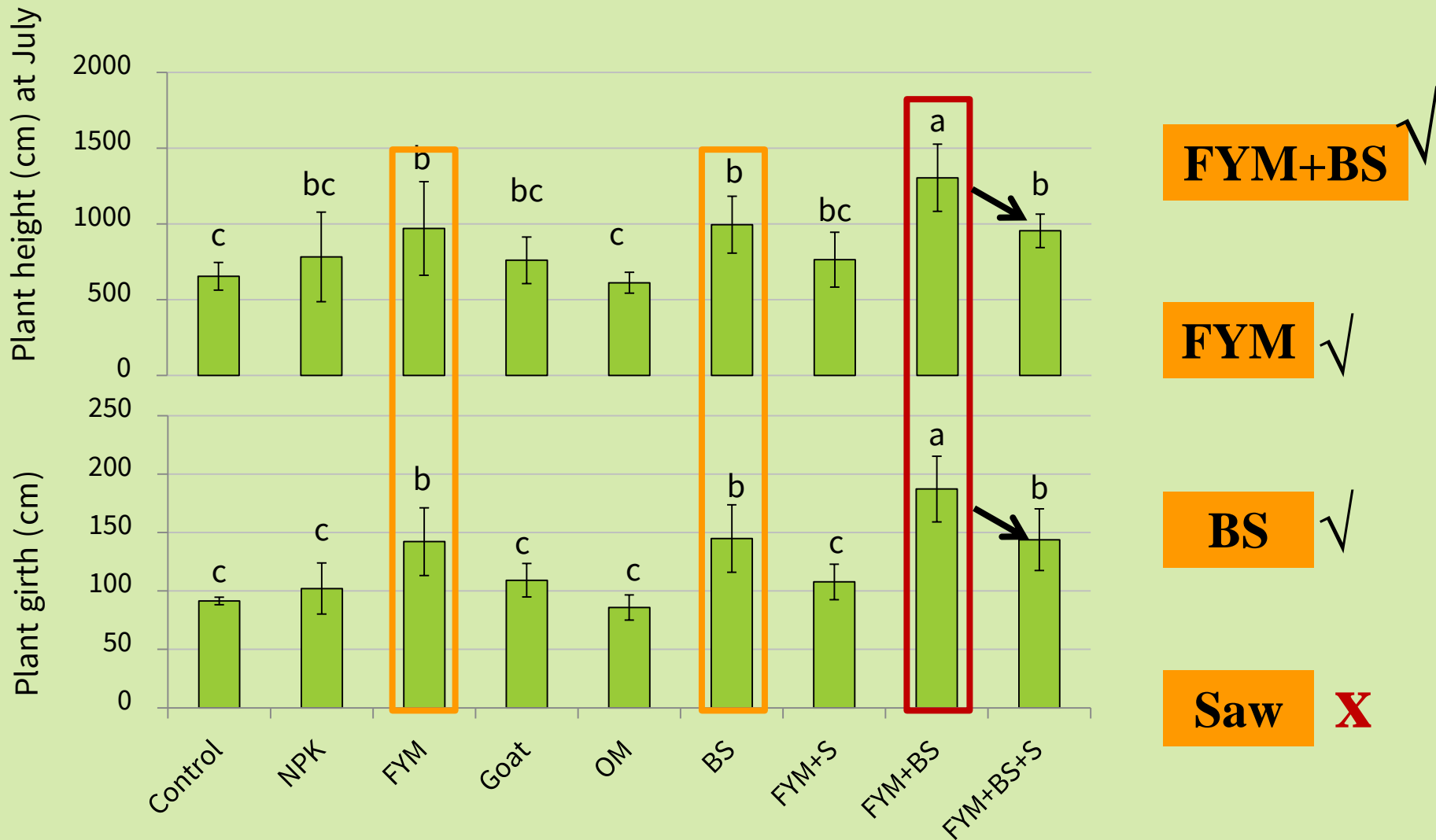


Fig 2. Plant height (above) and plant girth (below) among the treatments

Results and Discussion



Fig 3. Number (above) and weight (below) of bulbils among the treatments

Results and Discussion

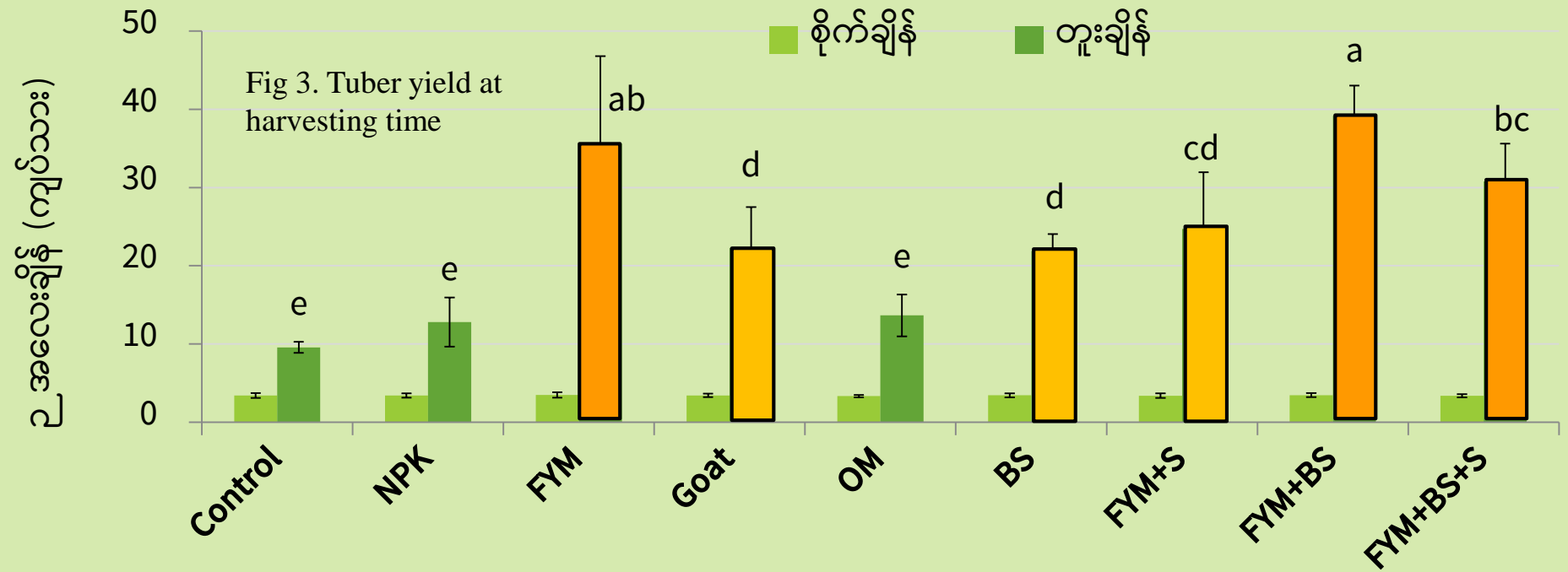
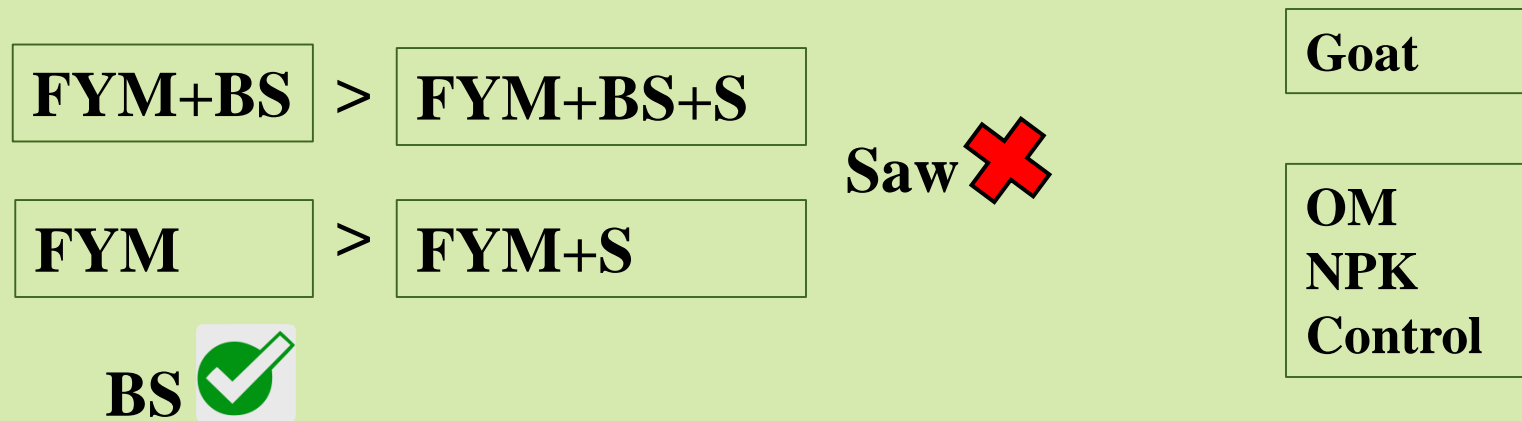
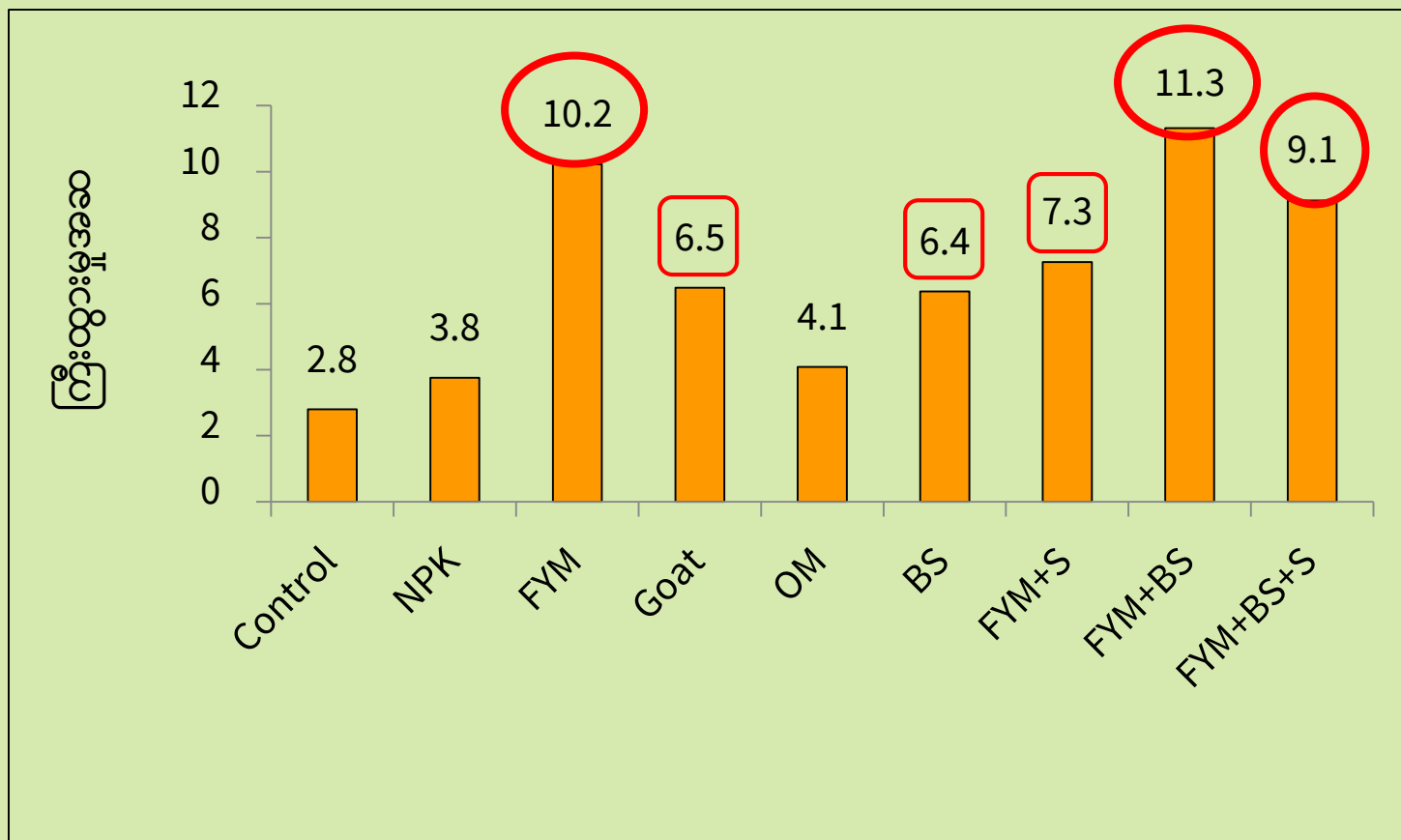


Fig 4. Growth increment from growing to harvesting



Results and Discussion



FYM+BS

FYM

**FYM
+ BS
+ S**

Fig 5. Growth increment from growing to harvesting

Saw ❌

Results and Discussion

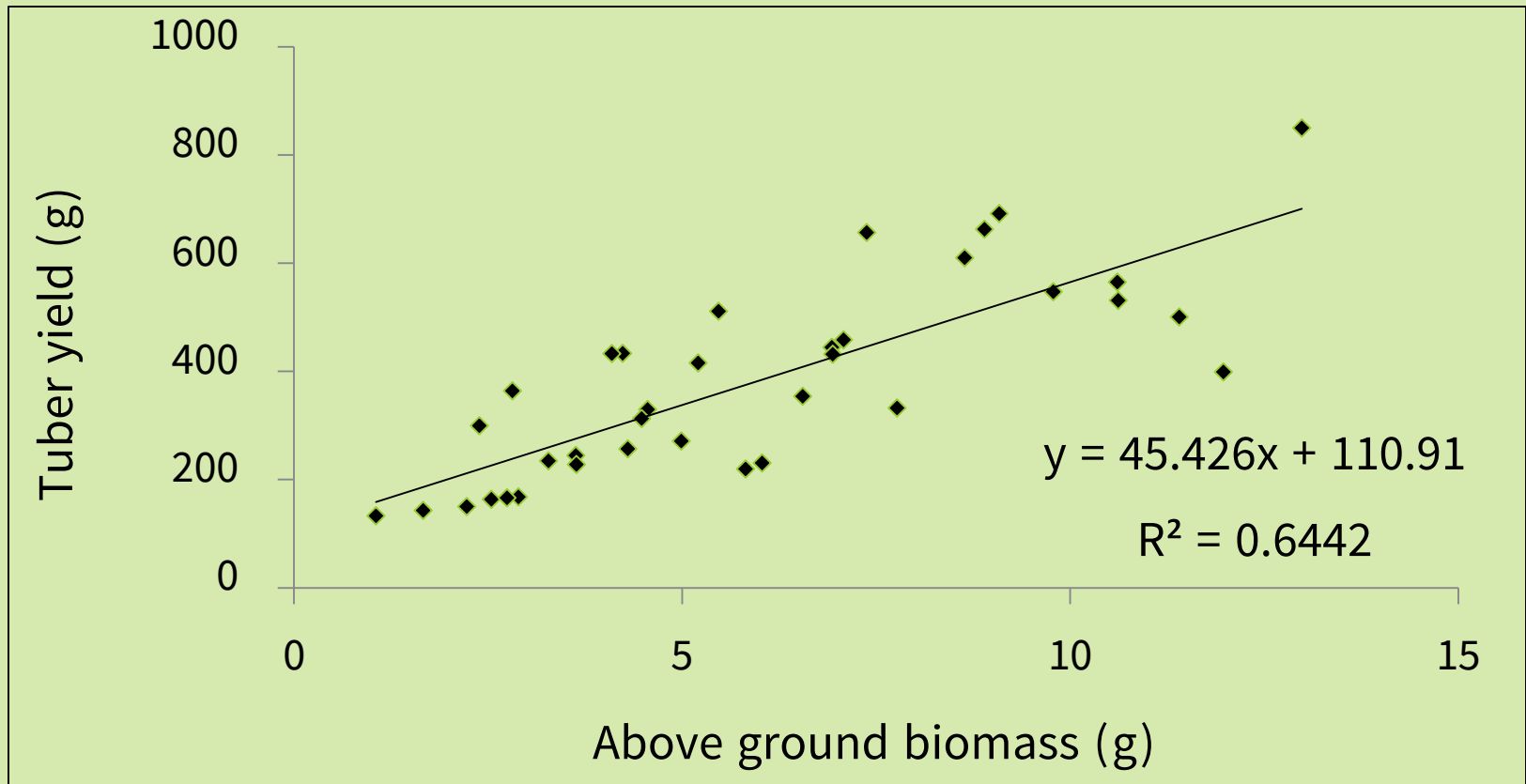


Fig 6. Correlation between above and below ground biomass

Miura K & Osada A (1981)

High correlation between above ground plant growth and tuber yield

Table 3. Cost calculation for each treatment

Cost and Benefit

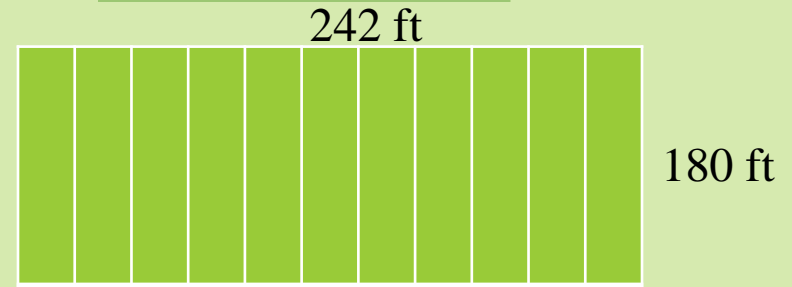
Treatment	Dosage	Fertilizer/ soil amendments + transportation		polybag	filling bag	arranging bag	Tuber cost	planting	weeding	harvesting	Total cost (kyat/plant)
1. Control		.	.	75	75	15	120	5	60	10	360
2. NPK		13	13	75	75	15	120	5	60	10	373
3. FYM	1 pyi	80	80	75	75	15	120	5	60	10	440
4. Goat	1 pyi	80	80	75	75	15	120	5	60	10	440
5. OM	200 g	115	115	75	75	15	120	5	60	10	475
6. Burnt soil	1.5 pyi	23	23	75	75	15	120	5	60	10	383
7. FYM + S	1, 1.5 pyi	80+12	92	75	75	15	120	5	60	10	452
8. FYM + BS	1, 1.5 pyi	80+23	103	75	75	15	120	5	60	10	463
9. FYM+BS+S	1, 1.5, 1.5	80+23+12	104	75	75	15	120	5	60	10	464

Table 4. Cost, income and Profit in each treatment

Treatment	Total cost	Income from		Total income	Profit (kyat)
		tuber	bulbils		
1. Control	360	191	82	273	87
2. NPK	373	256	81	338	35
3. FYM	440	712	201	913	473
4. Goat	440	445	135	580	140 ←
5. OM	475	273	112	385	90
6. Burnt soil	383	438	134	571	188 ←
7. FYM + Saw	452	494	134	628	176 ←
8. FYM + BS	463	783	191	974	511
9. FYM+BS+S	464	616	183	799	335

**FYM+BS can
earn net profit
2500,000
kyat/ac.**

	Spacing	plants/ac
Rubber	22 x 9	220 (20 trees x 11 L)



Rubber field

	Spacing	EFY plants/ac	Profit/ac
EFY	2 x 3	4950	25 latt

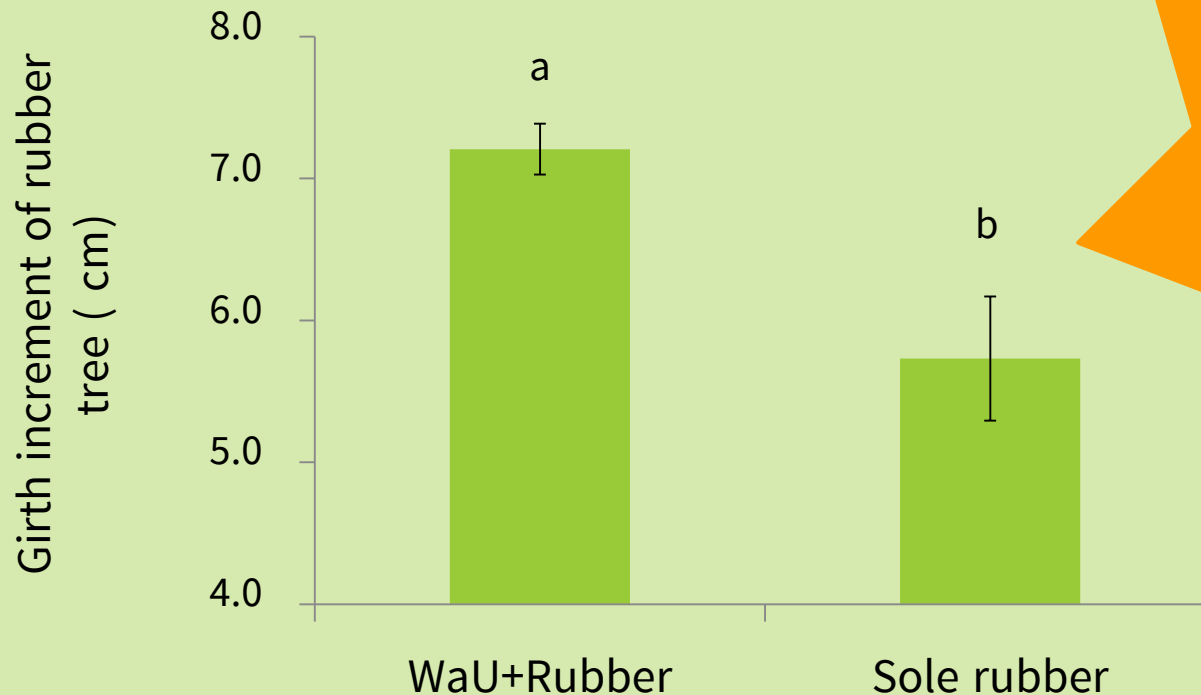
Open field

EFY spacing		Plant/ac	Profit-Shade cost	Net Profit (kyat)
2 x 3	(90 p x 81 L)	7290	37 - 13	24 latt
1.5 x 2.5	(120 p x 121 L)	111640	59 - 13	46 latt

Opportunity to earn net profit 25-45 latt/ac

Effect on Rubber Growth

From 17.6.2020 to 12.12.2020 (6 months)



**EFY cultivation
increased
growth of
rubber tree**

Fig 7. Girth increment of rubber tree between rubber rows with and without EFY cultivation during 6 months period

Photos Record



Arranging polybags at April



3 months after planting



Above ground biomass and bulbils collecting at 6 months after planting

Photos Record



3 months after planting



Rubber roots

Rubber roots







Photos Record

Inspection by Prime Minister at 16.8.2020



Inspection by Dy. DG (Technology) at 29.7.2020

Conclusion

- ❑ FYM give the highest growth 
- ❑ Oven soil should be added if available 
- ❑ Saw dust should not be used 
- ❑ Higher plant growth gives higher tuber growth (Info)
- ❑ Rubber farmer has opportunity to earn 25 latt/ac from EFY cultivation under immature rubber plantation 
- ❑ Rubber growth was increased from EFY intercropping. 
- ❑ But EFY should not be grown under closed canopy of rubber trees (Info)
- ❑ General farmers can get 25-45 latt/ac from EFY cultivation 

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**Thank You for
your kind attention!**