



Zoysia matrella :

Best Management Practices (BMP) for Golf Course Greens Maintenance

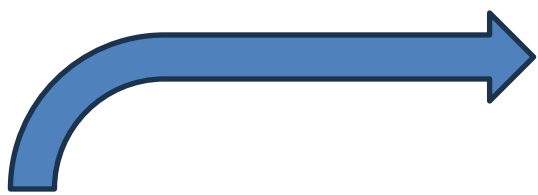
Speaker: JONATHAN J. MANALO

Industry/Academe: GOLF COURSE MAINTENANCE and GROW IN





Types of Turf Philippine Grass 111324_107



Bermuda Grass



Zoysia Grass

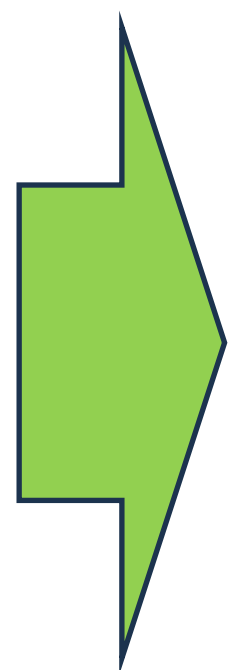


Carabao Grass



ASIAN TURFGRASS CENTER

Micah Woods (Dec. 2024)
Putting greens on Southeast
Asia are usually planted with...



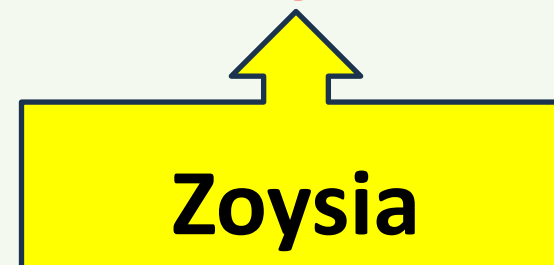
Hybrid Bermuda Grass (*Cynodon Dactylon x C. transnaalensis*)

Seashore Paspalum (*Paspalum vaginatum*)

Zoysia Grass (*Zoysia matrella* or *Z. pacifica*)

General “Zoysia” by Definition

- **Wikipedia** : *Zoysia* (UK: [/ˈzɔɪziə/](#); ^{[3][4]} US: [/ˈzɔɪsiə/](#), -[/ziə/](#), -[/fə/](#), -[/zə/](#)^[3]) is a genus of creeping grasses widespread across much of Asia and Australia, as well as various islands in the Pacific. These species, commonly called **zoysia** or **zoysia grass**, are found in coastal areas or grasslands. The genus is named after the Slovenian botanist Karl von **Zoys** (1756-1799).



Zoysia Matrella : Definition

Zoysia matrella, commonly known as ***Manila grass***, is a species of mat-forming, perennial grass native to temperate coastal southeastern Asia and northern Australasia, from southern Japan, Taiwan, and southern China south through Thailand, Indonesia, Malaysia and the ***Philippines*** to northern Australia, and west to the Cocos Islands in the eastern Indian Ocean. [Wikipedia Wiki](#)

***Zoysia matrella* : Common Names on Different Countries (WorldFloralDB)**

Chinese : 沟叶结缕草, 沟叶结缕草 Gou Ye Jie Lü Cao, 细叶结缕草 Xi Ye Jie Lü Cao, 馬尼拉芝, 高麗芝

English : Australian Zoysia, Korean Grass, Korean Velvet Grass, **Manila Grass, Manila Temple Grass**, Mascarene Grass, Siglap Grass, Temple Grass

French : Chiendent-Gazon, Gazon Haïtien

German : Zoysia-Gras

Hebrew : זואיסיה מנילאית Zoysih Manilit

Japanese : コウシュンシバ Hari Shiba, コウライシバ Kourai Shiba

Korean : 韓國잔디, 고려잔디, 금잔디, 비로드잔디, 한국잔디

Malay : Jukut Kakawatan Hijau, Rumput Siglap

Portuguese : Grama Coreana

Russian : Зойсия Матрелла Zoisiia Matrella, Зойсия Тонколистная Zoisiia Tonkolistnaia, Цойсия Тонколистная Tsoisiia Tonkolistnaia

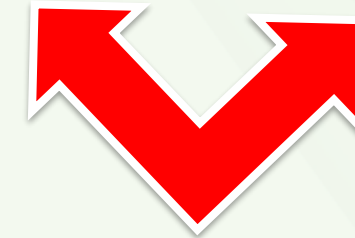
Spanish; Castilian : **Hierba Manilla, Yerba De Manilla**

Sundanese : Jukut Kakawatan Hijau

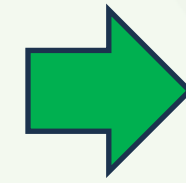
Tagalog : **Barit-Baritan, Damong-Alat**

Thai : Ya Kao Li, Ya Mutkarin, ง้วนน้อย Nguan Noi, หญ้ากำมะหยี่ Ya Kammayi, หญ้านวนน้อย Ya Nuan Noi

Turkish : Japon Tapınak Otu, Japon Çimi



Best Management Practices (BMP)



Golf Course Greens Maintenance



Established *Zoysia matrella*

CULTURAL PRACTICES - 1. Vertical Cutting or Verticutting (Triplex or Walk Behind verticutter)

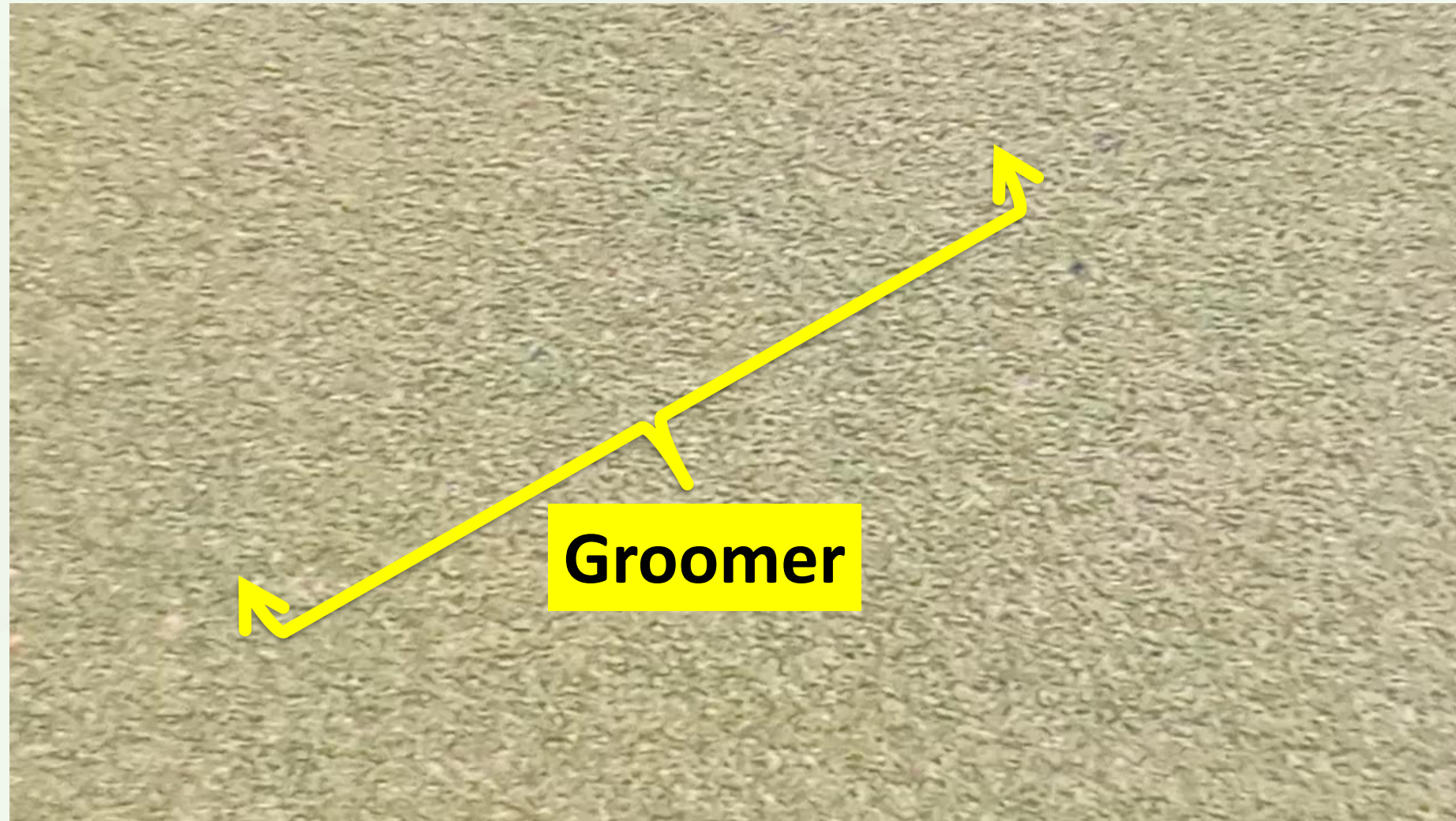


- Frequency : Every 2 weeks, dry season (as needed, wet season)
- Normal Setting : Even to - 2.0 mm
- Deep verticutting : 2x per year
- Setting : -2.5 to -5.0 mm
Weather Permitting



CULTURAL PRACTICES -

2. *Grooming*

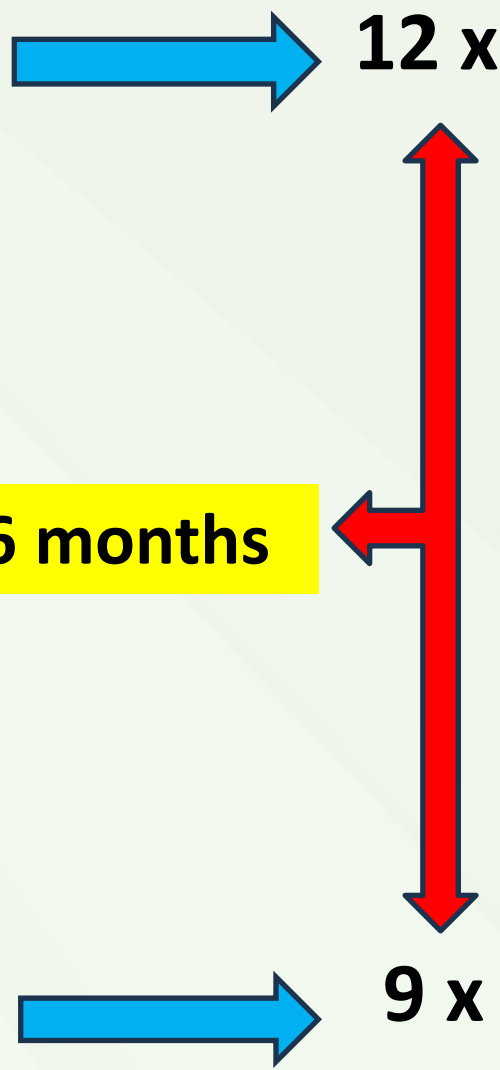


- Frequency : Every 2 weeks or alternative to light verticutting
- Normal Setting : Even to -1.0 mm
- Deep grooming (as needed)
- Setting : -1.50 mm to – 3.0 mm



6-month Activity Report (January to June 2024) – sample only

	2 0 2 4																																
ACTIVITIES on GREENS and Collars	January				February				March				April				May				June												
> Verticutting	15th	29th			7th	12th	19th				7th	14th				22nd	29th				13th	27th					24th						
> Aeration	31st				8th	31st					26th					3rd					7th	14th					24th						
> Topdressing					8th	12th					10th					29th											24th						
> Fertilization	30th				16th	19th	28th				8th	21st	28th			13th	23rd				1st	15th	23rd				1st	5th	13th	20th			
> Chemical Application	30th				16th	28th					8th	21st	28th			3rd	13th				1st	7th	14th	15th			1st	13th					
> Weed Control					1st						1st	7th	20th			16th	24th				4th												
> Spiking																29th																	
> Rolling	31st				3rd	14th	17th	21st	24th	29th	7th	30th				5th	13th	17th	20th	24th	30th	4th	8th	10th	11th	16th	18th	25th	28th	3rd	10th	17th	24th
> Brushing																												22nd	23rd				
> Grooming	8th				2nd						21st					1st	15th	25th			6th	20th					19th						



CULTURAL PRACTICES - 3. *Brushing*

- Frequency : once a month or as needed
- Using a push brush
- Purpose : lift and upright turf's leaf blade before mowing for improved clippings collection

Brush attachment



CULTURAL PRACTICES - 4. *Rolling*



- Frequency : once a week or as needed
- Using greens iron
- Purpose : Improves greens putting surface



Stimpmeter – tool used in measuring greens speed

Sample Stimpmeter readings of Zoysia matrella greens

Hole by Hole Greens Speed Reading (June 12 – August 03, 2025)

Green #	June 12		June 26		June 27		June 29		July 5		July 12		July 13		July 18		July 31		August 2		August 3	
1	9.5	9.25	9	9	9	8.75	9.25	8.75	9.25	9	9.5	9	9	9.5	9	8.5	8.75	9	10	10.25	9.5	9.5
2	8.5	9.25	8.75	8.75	9	8.75	8.75	9.25	8.5	8.5	8.75	8.5	9	9	8.5	8.5	8	8	8	8.5	9.5	9
3	8.5	9	8.75	9.25	9.5	9.5	9	9.5	8	9	9.5	8.75	10	10.5	8	9	9	8.5	8.75	8.75	9	9.5
4	9.75	7.75	8.5	8.5	10.5	9	8.75	8.5	9	8	9	10	9.75	9.5	9	9.25	8.5	8.75	9	9.25	10.25	8.5
5	9.25	9.5	8.5	8.25	9.25	8.5	8.75	8.5	8.5	8.25	9	9	9.25	8.75	8.25	8	8	8.5	8.5	8.25	9	8.5
6	8.5	9.25	8.5	8.5	9.5	9	8.5	8.5	8	8.5	8.25	8.25	9.25	9	8.5	8.25	8	8	8	8	8.75	8.75
7	8.5	9	8.75	9	9	9	8.75	9.25	8	8.75	8.5	8.75	9	9.75	8.5	8.5	8.5	8.25	9	8.75	9	8.5
8	9.25	10.5	8.75	8.5	9	10.5	8.75	9.25	8.75	8.75	9	8.75	9.5	10.5	8.5	8.5	8.5	8	8.25	8.5	9	9.75
9	9.5	9.75	9	8.75	9	9	8.75	8.75	9	9	9	9	9	9.25	8.25	8.5	9	8	9.5	9	9	8.5
10	8.5	9.25	9.25	9	9.5	9	8.75	9.25	8.75	9	10	9.5	10	10	9	9	8	8	9.25	9	10	10.5
11	8.5	9	8.75	8.75	9	9	8.75	9.25	8.5	8	9.75	9.5	8.75	9	9	9	8.5	8.75	8.75	8.75	10	8.5
12	9	8.5	8.25	8.25	9	8.5	8.25	8.5	8	8	8.5	9.25	8.75	9	8.5	8.5	8.75	8	8.5	8	8.5	8
13	8.5	9.5	9	8.75	8.5	9	8.75	8.75	9	8.5	9.5	8.75	8.5	9	8.75	8	8.5	8	8	8	8	8.25
14	9.75	9	8.75	8.5	9	10.5	8.5	8.5	8	8	8	8.5	8.5	9	8	8.5	8	8	8	8.25	8	8
15	9	9	8.5	8.75	8.5	9	8.75	9	8	8	8	9	8.5	9	8.75	8	8.25	8.25	8.5	8.75	8.75	8.25
16	9.5	8.5	8.75	9.25	9.5	9	8.75	8.75	8	8.75	8.5	8.5	8.5	9	8.25	8.25	8	8	8	8	8.25	9
17	9	9	8.5	8.5	9	8.5	8.5	8.5	8.5	8.25	9	8.5	8.5	8.5	8.5	8.25	8	8.5	8	8	8	8.25
18	8.5	9	8.5	8.75	8.75	9.5	8.75	9	9	8.5	9.25	8.75	9	9	8.75	8.25	8.75	8.75	8.25	8.5	9.25	8.5
Total	161	164	156.5	157	164.5	164	157	159.75	151.3	151.8	161	160.3	162.8	167.3	154	152.8	150	148.3	154.3	154.5	161.8	157.8
Ave(1)	8.97	9.11	8.69	8.72	9.14	9.11	8.72	8.88	8.40	8.43	8.94	8.90	9.042	9.29	8.56	8.49	8.33	8.24	8.57	8.58	8.99	8.76
Ave(2)	9.04		8.71		9.13		8.80		8.42		9.17		9.17		8.52		8.28		8.58		8.88	

1977 USGA Stimpmeter Reading of Notable Courses

USGA STIMPMETER READINGS, 1977.

AUGUSTA NATIONAL	7'11"
CONGRESSIONAL	6'4"
CYPRESS POINT	7'8"
HARBOUR TOWN	5'1"
MEDINAH	7'8"
MERION	6'4"
OAKLAND HILLS	8'5"
OAKMONT	9'8"
PINE VALLEY	7'4"
PINEHURST #2	6'10"
SAN FRANCISCO GC	7'2"
SHINNECOCK HILLS	7'2"
WINGED FOOT	7'5"

USGA Stimpmeter Readings 
1977 - NOTABLE COURSES

AUGUSTA NATIONAL GC	7'11"
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CULTURAL PRACTICES - 5. *Spiking*



- Frequency : once a month during dry season; every 2 weeks during wet season (weather permitting)
- Sandpro/Traprake spiker attachment
- Purpose : Promotes lateral growth and improves water infiltration rate

CULTURAL PRACTICES (AERATION) - *6.1 Solid Tine Aeration*



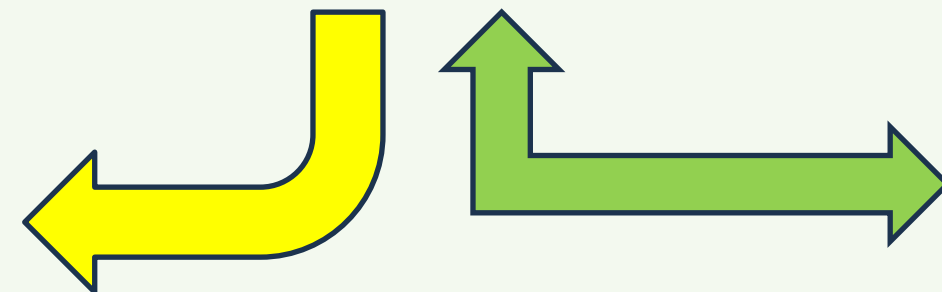
- Frequency : at least once a month (wet season); once every 2 months (dry season)
- Depth : 3-4 inches
- Solid tine size range : $1/4(0.25\text{'})$ to $5/16(0.3125\text{'})$
- Purpose : Introduces Oxygen on turf's root zone, improves infiltration rate, lessen compaction

CULTURAL PRACTICES (AERATION) - 6.2 Core/Hollow Tine Aeration



- Frequency : 2x a year
(before wet and dry season)
- Depth : 3-4 inches
- Tine Type : Hollow, Side eject
- Purpose : Introduces Oxygen on turf's root zone, improves infiltration rate, lessen compaction

CULTURAL PRACTICES - 7.1 *Topdressing (Heavy) and Brushing*



- Frequency : 2x a year (every after core tine aeration)
- Setting : Heavy
- Purpose : Fills in core holes and spiker/slicer passes

Brushing after topdressing

- At least 4 directions
- Purpose : Fill in core holes and for even sand distribution

CULTURAL PRACTICES - 7.2 *Light Topdressing/Dusting and Brushing*



- Frequency : at least once a month (every after solid tine aeration and/or spiking)
- Setting : light to very light
- Purpose : Fills in solid tine holes and/or spiking, and verticutting/groomer passings; improves quality and uniformity of putting surface

Brushing after topdressing

- At least 2 directions
- Purpose : Even distribution of sand on turf's surface

CULTURAL PRACTICES - Push brushing after topdressing, *a closer look*



CULTURAL PRACTICES *8.Fertilization*

8.1 Granular



- Frequency : Every 8-10 weeks
- Using rotary fertilizer spreader
- Fertilizer granule specifications : greens grade, slow release fertilizer
- ***Application rate per application:*** at least...
 - 0.50 kg Nitrogen(N) per 100 sqm
 - 0.35 kg Phosphorus(P) per 100 sqm
 - 0.50 kg Potassium (K) per 100 sqm
 - Micronutrients (as needed)

CULTURAL PRACTICES *8.Fertilization*

8.2 Foliar Spray

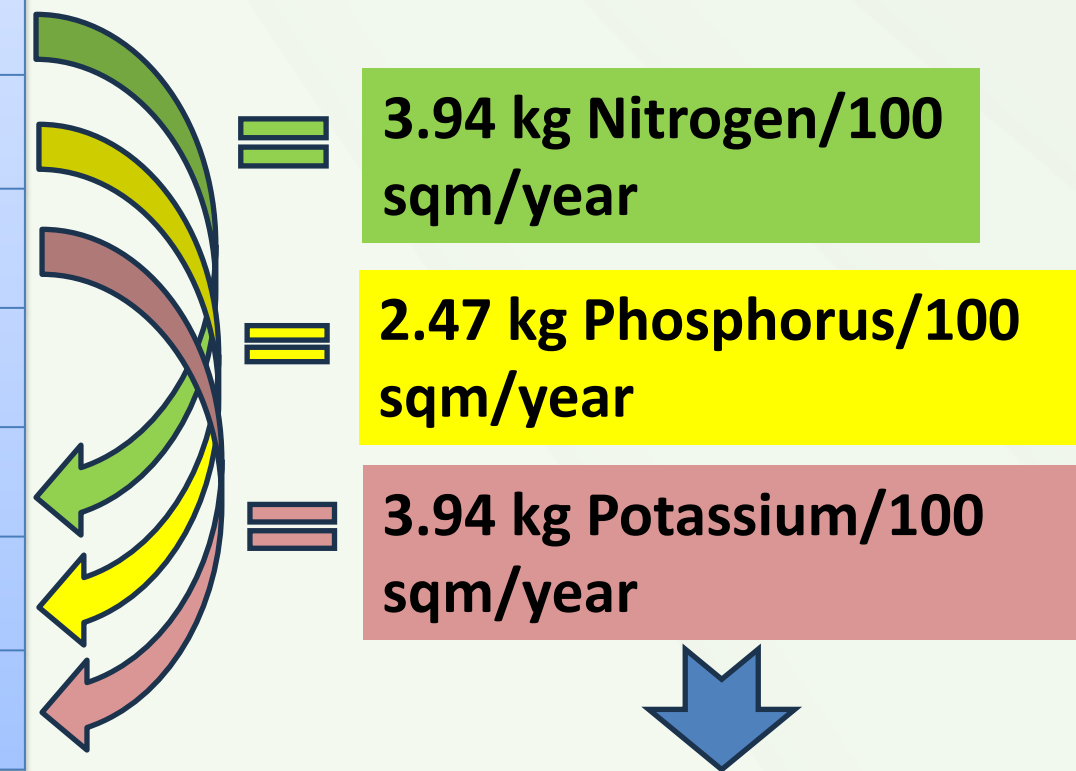


- Frequency : once a week (or as needed)
- Using boom sprayer
- Recommending fertilizer specifications: liquid form, at least 90% water soluble, miscible with other common fertilizer and chemicals
- ***Application rate per application :***
 - > 30-50 grams Nitrogen (N) per 100 sqm
 - > 15-30 grams Phosphorus (P) per 100 sqm
 - > 30-50 grams Potassium (K) per 100 sqm
 - > Micronutrient (as needed)

ANNUAL NUTRIENT INTAKE

Nutrient	Granular Fertilization			kg Nutrient/100 sqm (Yearly)
	RR per Appln (grams/100 sqm)	Total Annual Appln (Frequency)	Total Annual Nutrient Intake (grams/100 sqm)	
N	500	5	2500	2.5
P	350	5	1750	1.75
K	500	5	2500	2.5
Foliar Spray Fertilization				
N	30	48	1440	1.44
P	15	48	720	0.72
K	30	48	1440	1.44

Bermuda greens
Annual Nutrient Requirement
6 kg Nitrogen/100 sqm
3 kg Phosphorus/100 sqm
3 kg Potassium/100 sqm



CULTURAL PRACTICES *9. Chemical Application (Pesticides and other chemicals – wetting agent and growth regulator)*



- Frequency : as needed
- Using boom sprayer or knapsack sprayer
- Chemical to use : specified for turf's use, traditional pesticide proven effective for turf use without any phytotoxicity
- Recommending Rate of Application based on what is indicated on the label

TECHNICAL MAINTENANCE SPECIFICATIONS – *Zoysia matrella*

Description	Specifications/Requirements
Mowing frequency	Daily
Height of Cut (HOC)	2.20 - 3.20 mm
Greens Speed (Regular Play)	8.50 - 9.50 Feet
Greens Speed (Tournament)	9.50 - 10.50 Feet
<i>Macro Nutrient Requirement</i>	<i>at least</i>
Nitrogen (N)	3.0 kg N per year
Phosphorus (P)	2.0 kg P per year
Potassium (K)	3.0 kg K per year
<i>Water Requirement (during dry season)</i>	0.75 - 1.50 inches per week

END



Thank
YOU
So Much

ATION

LEASE