SPATIAL AND TEMPORAL DISTRIBUTION OF GANODERMA WITH RELATION TO SOIL CRITICAL NUTRIENTS IN OIL PALM

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COLLABORATION PROJECT BETWEEN MPOB, UMS, SAWIT KINABALU GROUP AND MPOB INDUSTRY RESEARCH COMMITTEE ON GANODERMA FOR SABAH SARAWAK

OVERVIEW

- INTRODUCTION
- OBJECTIVES
- BACKGROUND OF STUDY AREA
    - RAINFALL
    - SOIL TYPE/TERRAIN
    - YEAR PLANTING
    - MANURING
- PARAMETERS
    - Ganoderma Visual Census
    - Foliar analysis
    - Soil Analysis
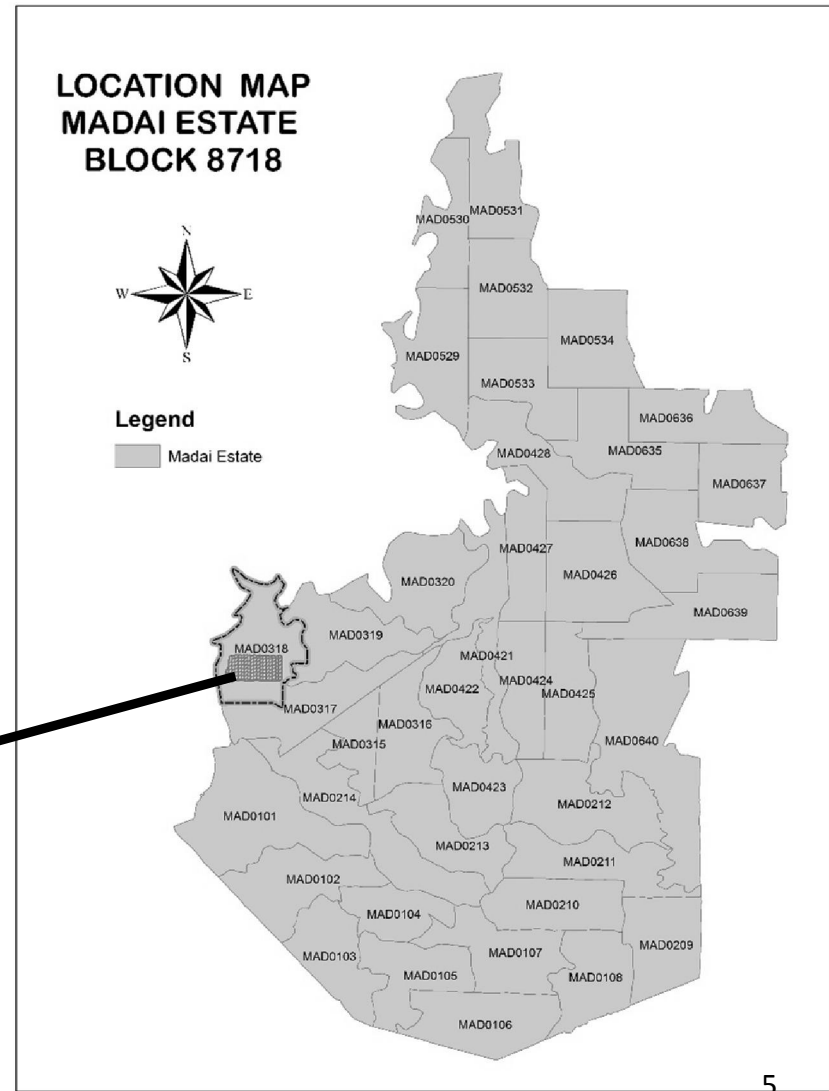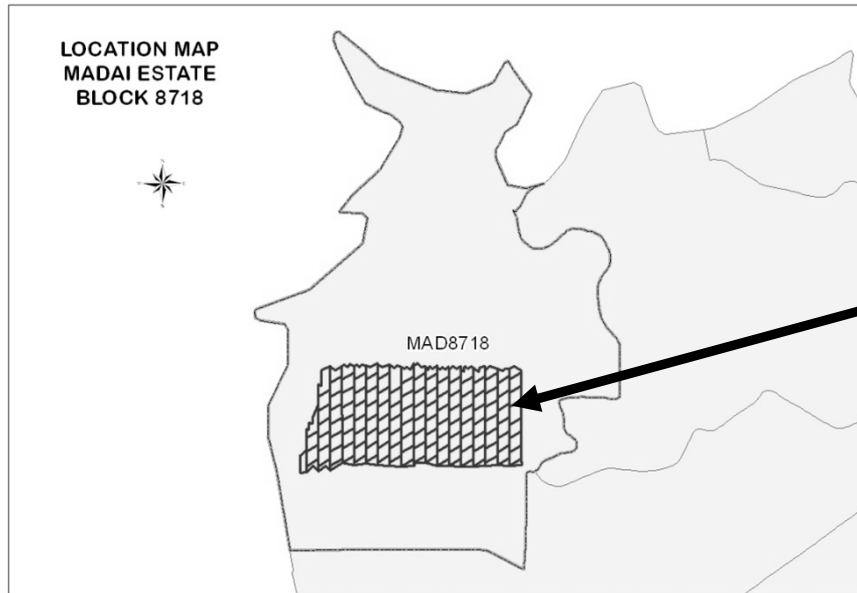- RESULTS
- DISCUSSION
- WAY FORWARD

INTRODUCTION

- *Ganoderma boninense* the causal of BSR, <u>little known</u> for its actual mechanisms of infection, the origin and longevity within the soil, the entry route into oil palm and the role of basidiopores in disease cycle.
  (Idris, A.S., D., Swinburne, T.R and Watt, T. A., 2000 in MPOB T.T. 102(77a))

- <u>Late symptoms expression</u> in the disease cycle and lack the ability to accurately locate the advancing fungus <u>causing control measures to be ineffective</u>. (Wong, W. C., 2007)

- <u>Visual census assessments</u> and <u>spatial variability of soil properties</u> can *complement each other and support different points of view*. Therefore, **spatial data analysis** play <u>important roles</u>

OBJECTIVE

IDENTIFY RELATIONSHIP BETWEEN INCIDENCE OF GANODERMA EXTERNAL SYMPTOM S WITH SOIL CRITICAL NUTRIENTS IN SUPPORTING THE SEARCH FOR SCIENTIFIC EXPLANATION AND PROBLEM OF MANAGING BSR DISEASE EFFECTIVELY

LOCATION

LOCATION MAP
MADAI ESTATE
BLOCK 8718

MAD8718

LOCATION MAP
MADAI ESTATE
BLOCK 8718

Legend

Madai Estate

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DESCRIPTIONS OF STUDY AREA

ESTATE: MADAI (10 MINUTES FROM KUNAK JUNCTION)

BLOCK: MAD8718

COVERAGE: 20 HA (14.26 USED FOR STUDY)

STANDING PER HA: 93.50 (TRIANGULAR 9.2M)

YEAR PLANTING: 1987

PLANTING MATERIAL: DXP (UDRS)

GENERATION: 1ST GENERATION (EX-JUNGLE)

GPS LOCATION: LAT 4°46'19.35"N, LONG 118°8'18.67"E

TERRAIN: FLAT

SOIL TYPE: BULANAT & LATING (SUB-RECENT ALLUVIUM)

DRAINAGE: EXCESSIVE OR SOMEWHAT POORLY DRAINED SOIL

REMARKS: ADJACENT TO FRESH WATER TINGKAYU RIVER

RAINFALL/RAINDAYS

5 YEARS RAINFALL/RAINDAYS RECORD OF MADAI ESTATE FROM JANUARY
2012 TO DECEMBER 2016

YEAR	2012		2013		2014		2015		2016		AVERAGE	
MONTH	DAYS	MM	DAYS	MM	DAYS	MM	DAYS	MM	DAYS	MM	DAYS	MM
JAN	12	290	14	218	4	111	8	131	6	126	9	175
FEB	11	179	8	97	5	45	0	0	5	87	6	82
MAC	15	239	2	6	4	148	3	64	5	126	6	116
APR	11	219	20	376	7	165	7	142	11	57	11	192
MAY	14	306	9	121	6	108	13	172	17	250	12	191
JUN	8	119	12	181	7	181	13	205	10	212	10	179
JUL	13	164	10	122	8	125	9	67	12	116	10	119
AUG	10	153	9	86	5	75	13	138	14	213	10	133
SEP	12	143	9	49	6	124	4	121	19	311	10	149
OCT	16	266	12	197	6	77	7	145	21	281	12	193
NOV	9	144	9	137	4	51	7	127	13	220	8	135
DEC	10	143	5	55	7	91	6	178	11	113	8	116
	141	2364	119	1644	69	1300	90	1490	144	2110	113	1781

MANURING

YEAR	N	P	K	Mg	B
2012	0.98	0.255	3.80	0.21	0.05
2013	0.70	0.413	2.07	0.34	0.05
2014	0.81	0.495	2.40	0.41	0.09
2015	0.95	0.425	2.70	0.18	0.09
2016	0.86	0.351	2.80	0.24	0.06

- 2016 Manuring equivalent to 4.66kg MOP, 4kg SOA, 1.30kg RP, 1.5kg Kieserite & 0.125kg Borate
- Total sum of 11.59kg per palm

FIELD SITE (MADAI MAD8718)

SPATIAL AND TEMPORAL DISTRIBUTION OF GANODERMA WITH
RELATION TO SOIL CRITICAL NUTRIENTS IN OIL PALM

COLLABORATION PROJECT BETWEEN MPOB,UMS AND SKB
UNDER EMPA

ESTATE   :   MADAI
PH/BLK   :   MAD 8718
HECTARAGE   :   14.26
DATE COMMENCE :   2012
YEAR PLANTED   :   1987

TRIAL OBJECTIVES

Identify relationship between incidence of Ganoderma external visual
symptoms and sub-clinical symptoms with soil critical nutrients.

FIELD SITE (MADAI MAD8718)
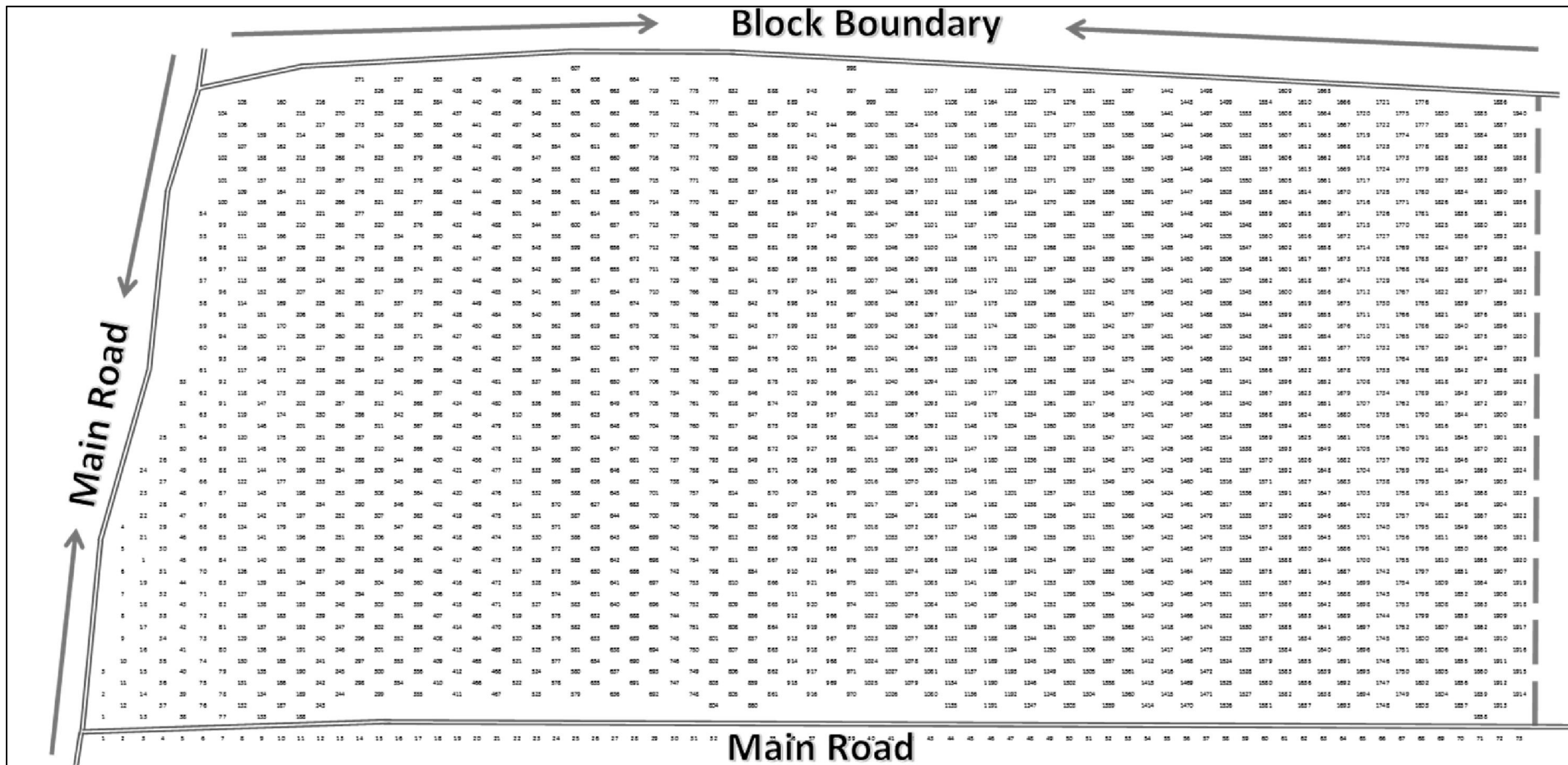
SOIL MAP
MADAI ESTATE
BLOCK 8718

Legend

BLOCK
BOMBALAI
BULANAT
CAREY
INANAM
KG.PUSU
LUMISIR
LATING
PALIU
PERMATANG
STP
TABLE
TONGKANG
TANJUNG TIPAT
TEPUS
TALISAI
TEBUAN

BULANAT
LATING
MAD8718

METHODOLOGY-PLOTTING

METHODOLOGY-PLOTTING

METHODOLOGY-PLOTTING

METHODOLOGY

GANODERMA VISUAL CENSUS
- RATING (MPOB Rating at 6 month interval)
- Ganoderma rating include infected palm, collapse, vacant points
- Healthy Palm

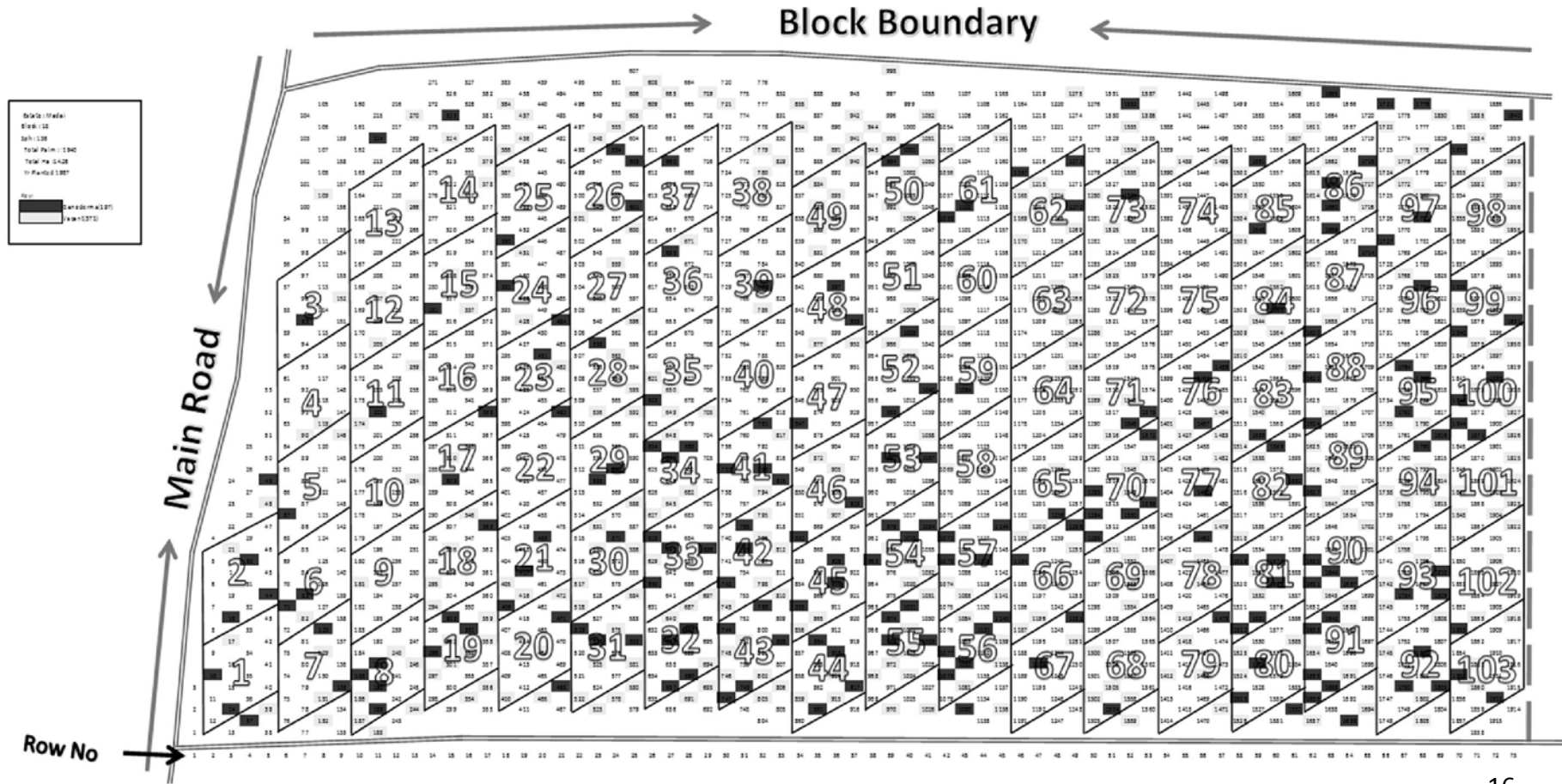**FOLIAR SAMPLING**
- Composite of 16 palms per sample
- Frond 17
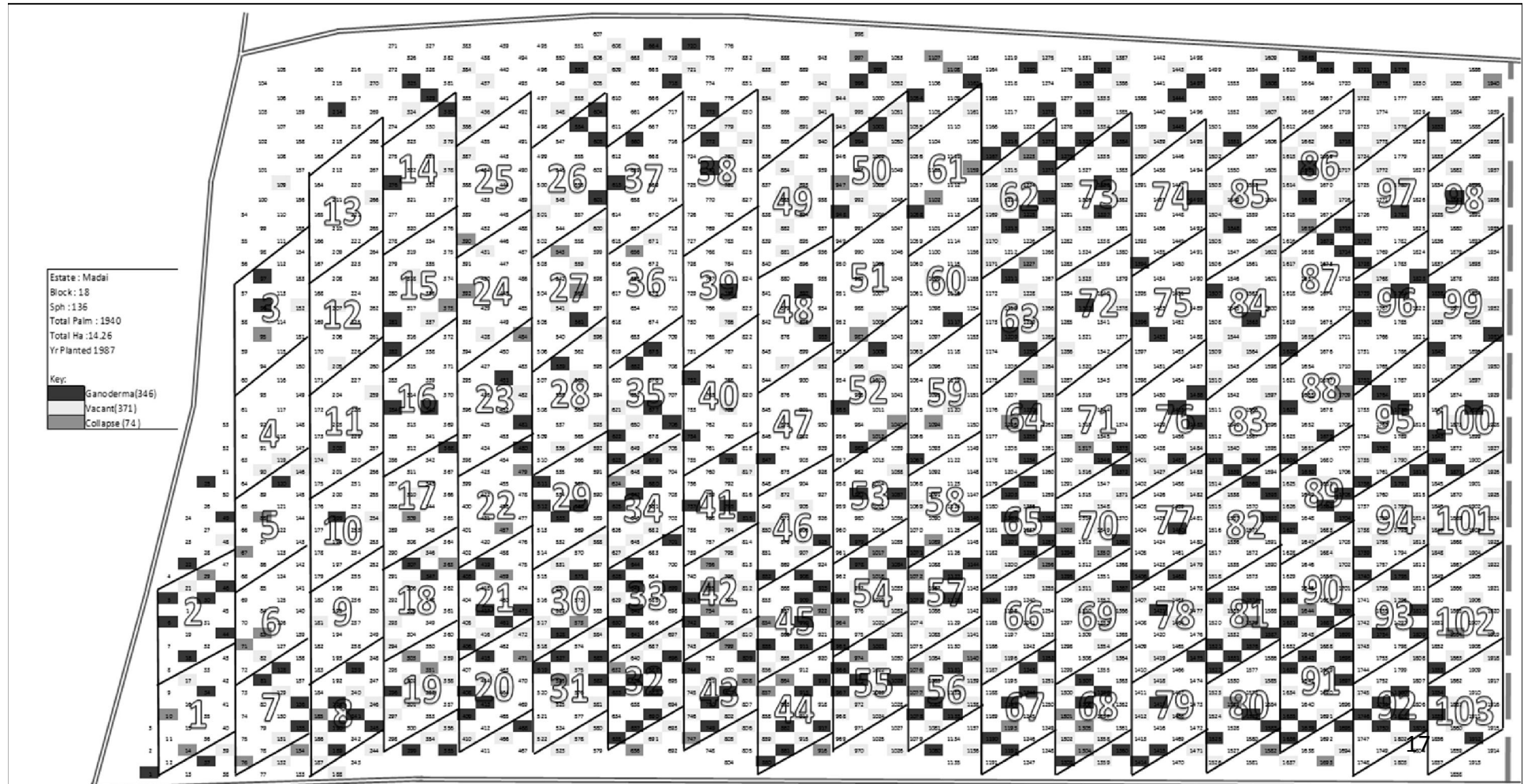- Analysis for: N, P, K, Mg, Ca, B, Mn, Cu, Zn, & Fe

SOIL SAMPLING
- Before and after
- 2 depth of 0-15cm and 16-45cm
- Analysis for: pH, conductivity, Total N, Total P, Available P, Exc Al+H, Exc Na, Mg, K, Ca, Fe, Mn, Organic C, CEC, Ash & Soil Physical Properties

RESULTS- GANODERMA CENSUS 2013

RESULTS- GANODERMA CENSUS 2016

RESULTS- GANODERMA CENSUS FOR THE PERIOD BETWEEN 2013 TO 2016

PALM CATEGORY	2013		2014		2015		2016	
	PALM	%	PALM	%	PALM	%	PALM	%
HEALTHY	1158	70.27	1123	68.14	977	60.50	978	59.34
GANODERMA	186	11.29	224	13.59	300	18.20	300	18.20
VACANT	304	18.45	304	18.45	304	18.45	304	18.45
COLLAPSE	0	0	0	0	47	2.85	66	4.0
TOTAL PALM POINT	1648	1648	1648	1648	1648	1648	1648	1648

RESULTS- GANODERMA CENSUS FOR THE PERIOD BETWEEN 2013 TO 2016

- Healthy palm number reduced from 70.27% to 59.34% or equivalent to almost 15 palms loss (based on SPH 136) in four years

- Ganoderma infection rate increase by 6.91% in four years mostly between 2014 and 2015 during low annual rainfall received in Madai Estate

- Collapse palm of 4% were either from healthy palm or standing Ganoderma infected palm in 2015, about the same time skirting palm phenomenon in mature stage affecting most plantation in Tawau Region

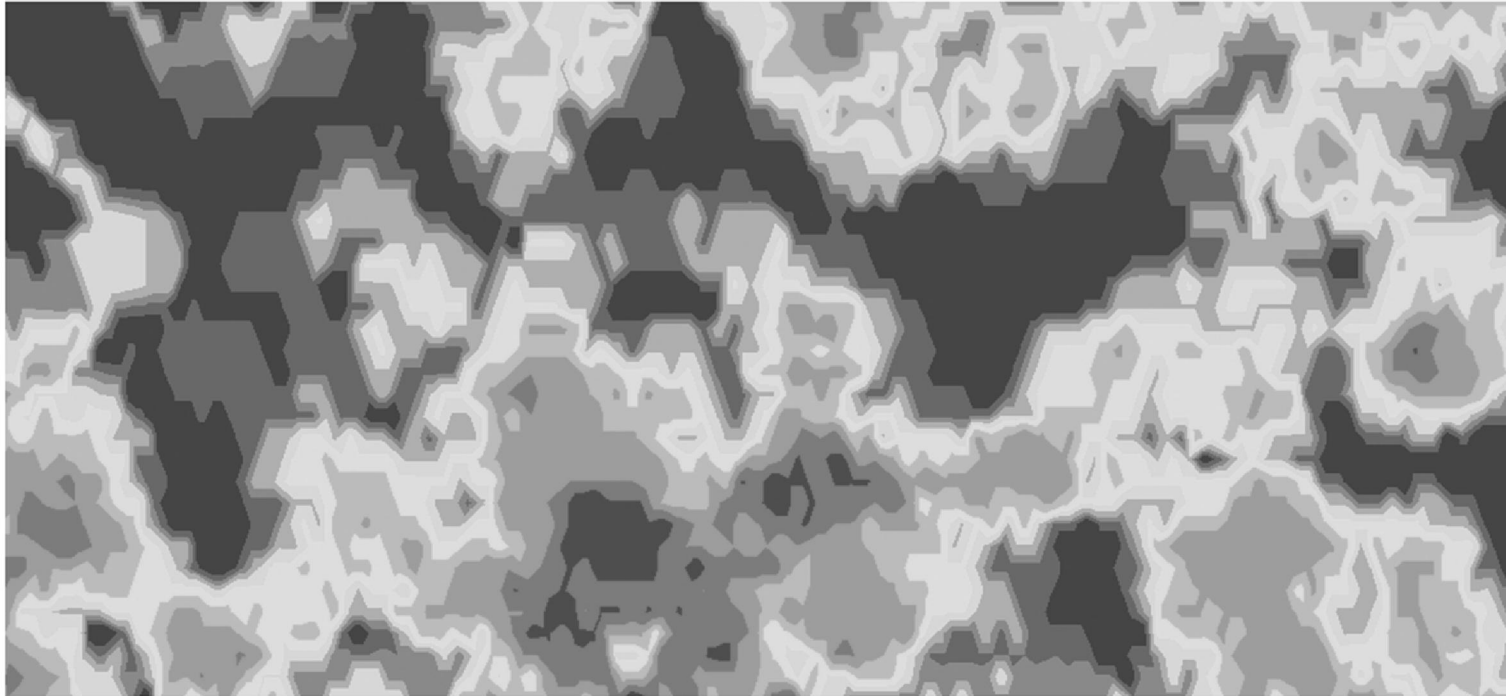GANODERMA CENSUS PROBABILITY MAP
MADAI ESTATE (2013)
BLOCK 8718
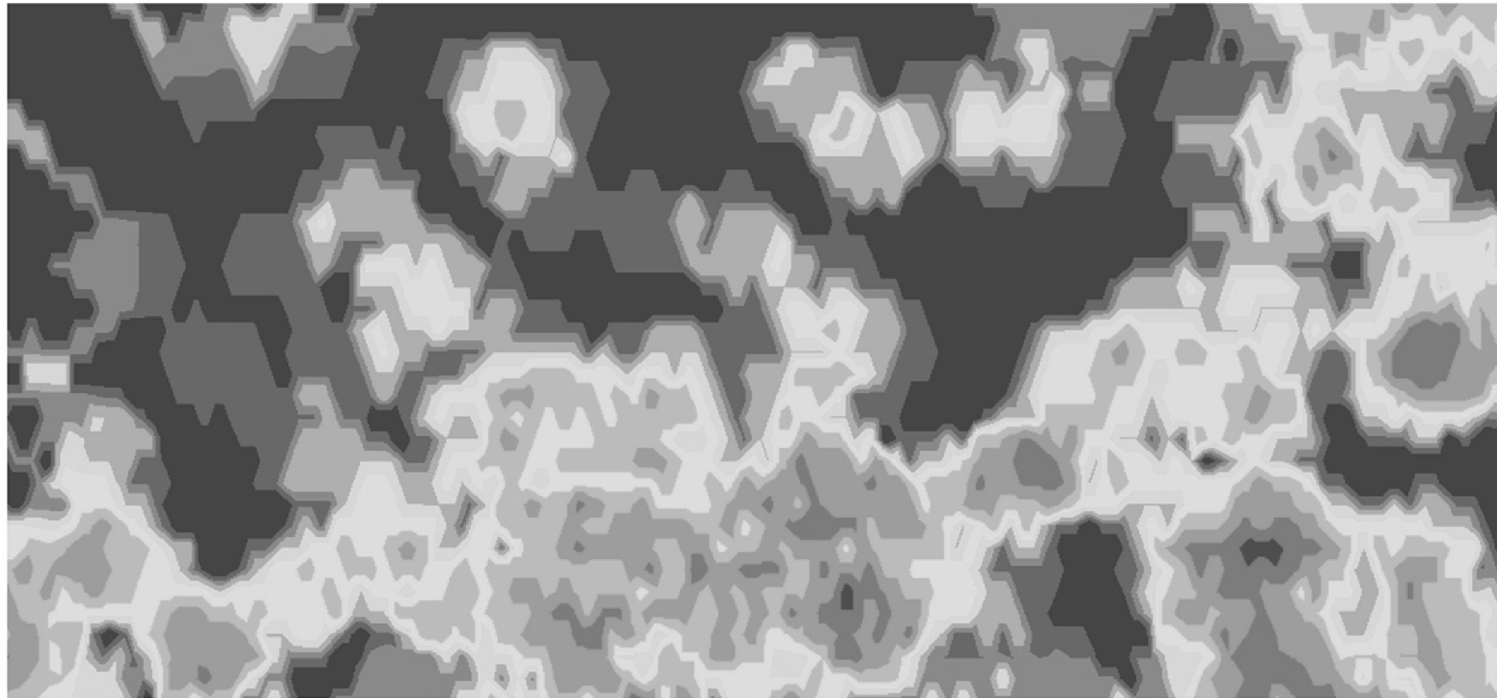
Legend

Probability Map

0.00 – 0.03	0.13 – 0.17
0.03 – 0.06	0.17 – 0.22
0.06 – 0.08	0.22 – 0.28
0.08 – 0.10	0.28 – 0.36
0.10 – 0.13	0.36 – 0.45

GANODERMA CENSUS PROBABILITY MAP
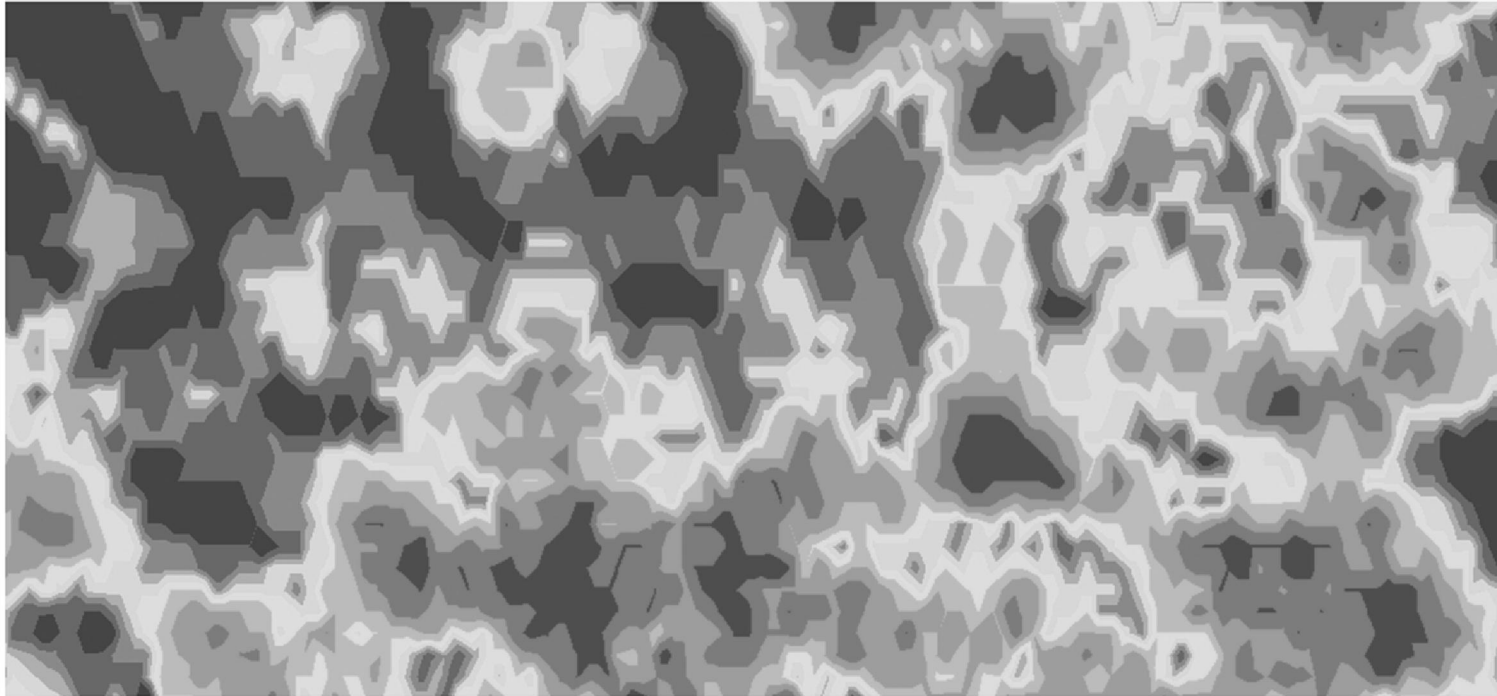MADAI ESTATE (2014)
BLOCK 8718

Legend

Probability Map

0.00– 0.03	0.14 – 0.18
0.03 – 0.06	0.18 – 0.24
0.06 – 0.08	0.24 – 0.30
0.08 – 0.11	0.30 – 0.39
0.11 – 0.14	0.39 – 0.50

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GANODERMA CENSUS PROBABILITY MAP
MADAI ESTATE (2015)
BLOCK 8718

Legend

Probability Map

0.00 – 0.05	0.17 – 0.20
0.05 – 0.09	0.20 – 0.25
0.09 – 0.11	0.25 – 0.31
0.11 – 0.14	0.31 – 0.39
0.14 – 0.17	0.39 – 0.50

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GANODERMA CENSUS PROBABILITY MAP
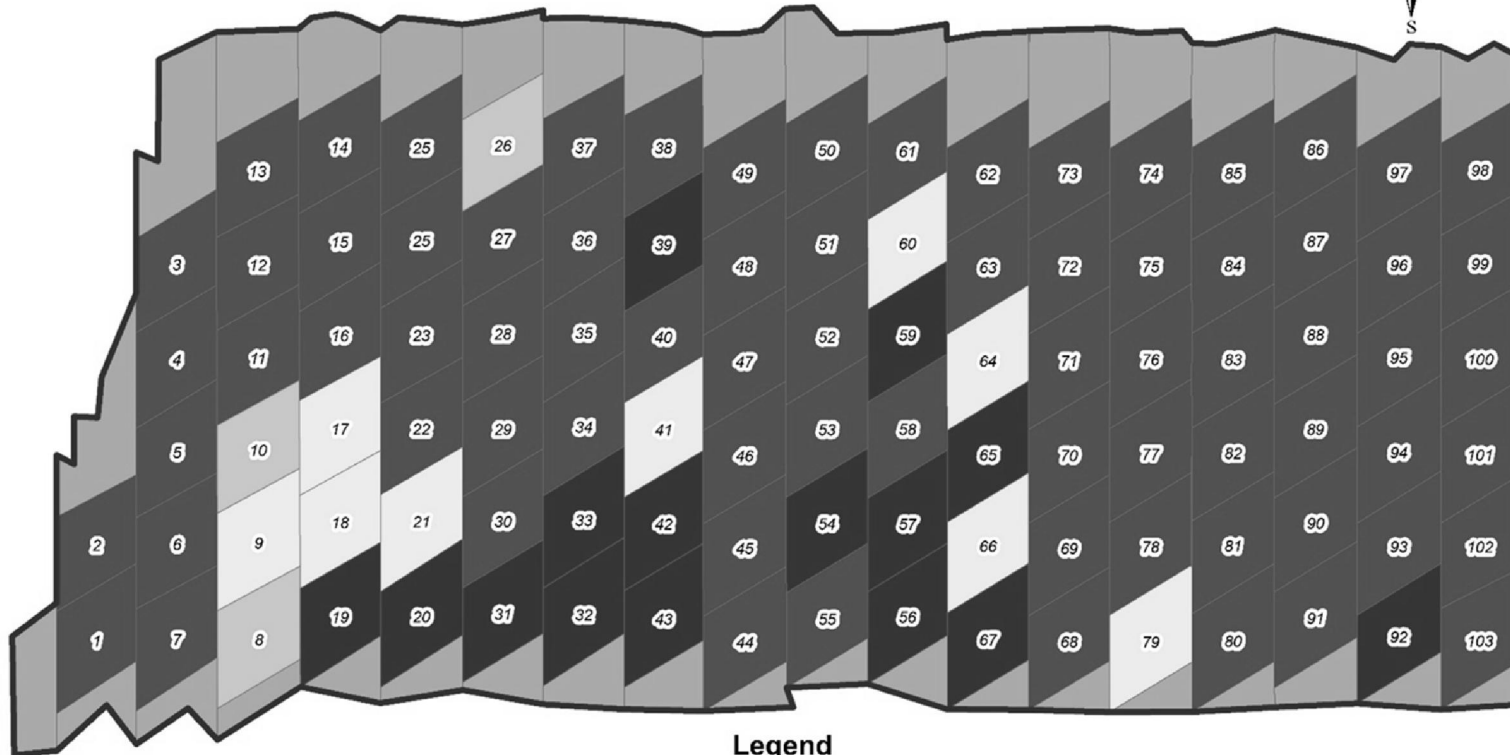MADAI ESTATE (2016)
BLOCK 8718
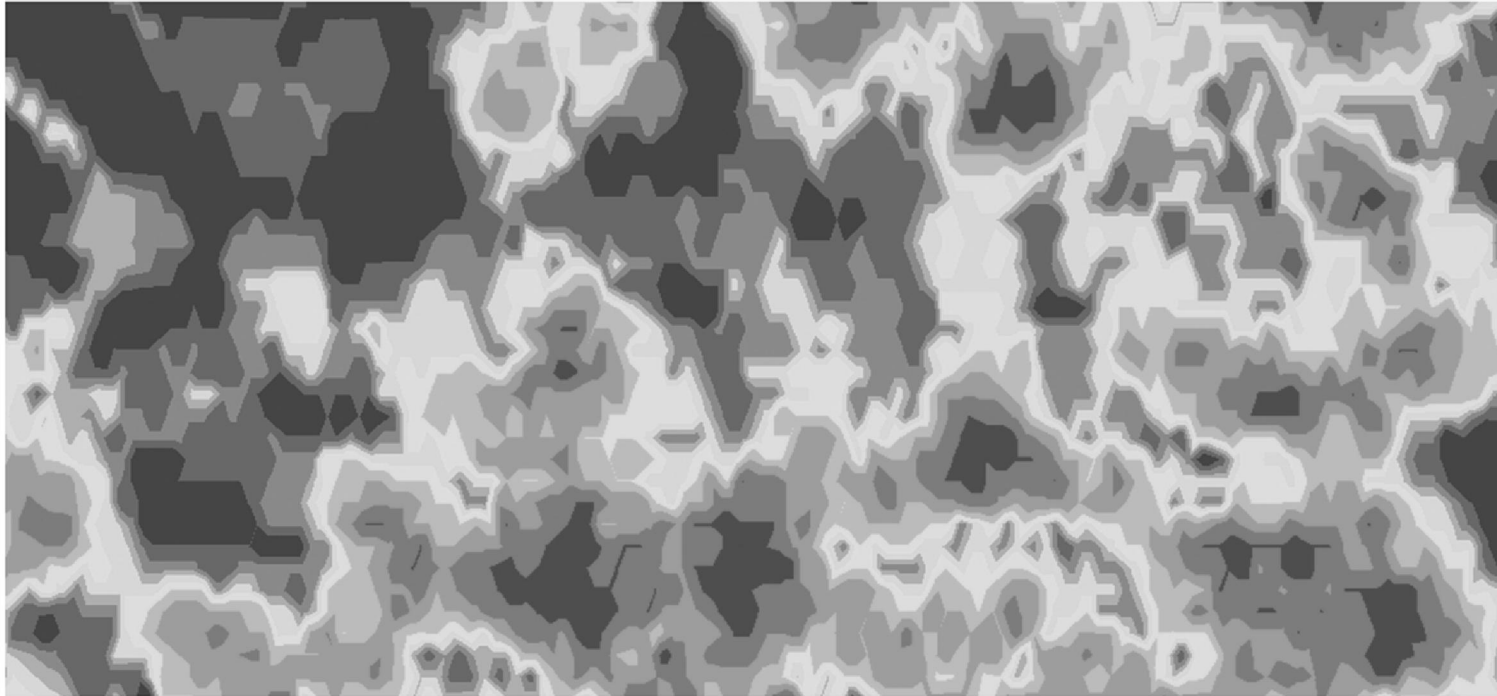
Legend
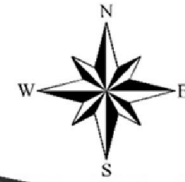
Probability Map

■	0.00 – 0.05	□	0.17 – 0.20
■	0.05 – 0.09	▨	0.20 – 0.25
▨	0.09 – 0.11	▨	0.25 – 0.31
▨	0.11 – 0.14	▨	0.31 – 0.39
□	0.14 – 0.17	■	0.39 – 0.50

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WATER TABLE MAP
MADAI ESTATE
BLOCK 8718

Legend
- Guard_Palm
- Less than 0.25 meter
- 0.25 - 0.50 meter
- 0.50 meter - 0.75 meter
- 0.75 - 1.00 meter

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GANODERMA DISTRIBUTION HOT SPOT FROM 2013 TO 2016

- Ganoderma hot-spot started as cluster and expanding to nearby palm from initial point

- Northwestern to middle part of study area are less likely infected with Ganoderma (green area). Most of this area are deep soil with more > 0.75 m hitting water table.

- Foliar/Soil Analysis- (currently in lab analysis)

CHALLENGE

- Some foliar and soil nutrients need to be carry out at different Lab that have the capability to analyze:
  - Mo, Si,

- Analysis of nutrient? Assistance