



AgPractices&Domains Platform
**MODELING DATA
INPUTS AND
OUTPUTS:
Case in Nueva Ecija**

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A person wearing a white long-sleeved shirt, a light-colored cap, and a face covering is walking through a lush green rice field. The field is filled with tall, healthy rice plants. In the foreground, a wooden fence runs horizontally across the frame. The background shows a dense line of trees and foliage under a bright sky.

OBJECTIVE:

Estimate the **yield potential of the selected rice cropping area through crop modeling simulations**



OVERVIEW

Data Management and Modeling



1 - Raw Data



2 - Crop Model



3 - Calibration



4 - Evaluation



**5 - Large-scale
model**



Data Collection and Management

RAW DATA

Preliminary step : Site Selection





Among regions of high contribution to the country's total rice production, Central Luzon (1st) and Bicol Region (5th) were selected for Luzon.

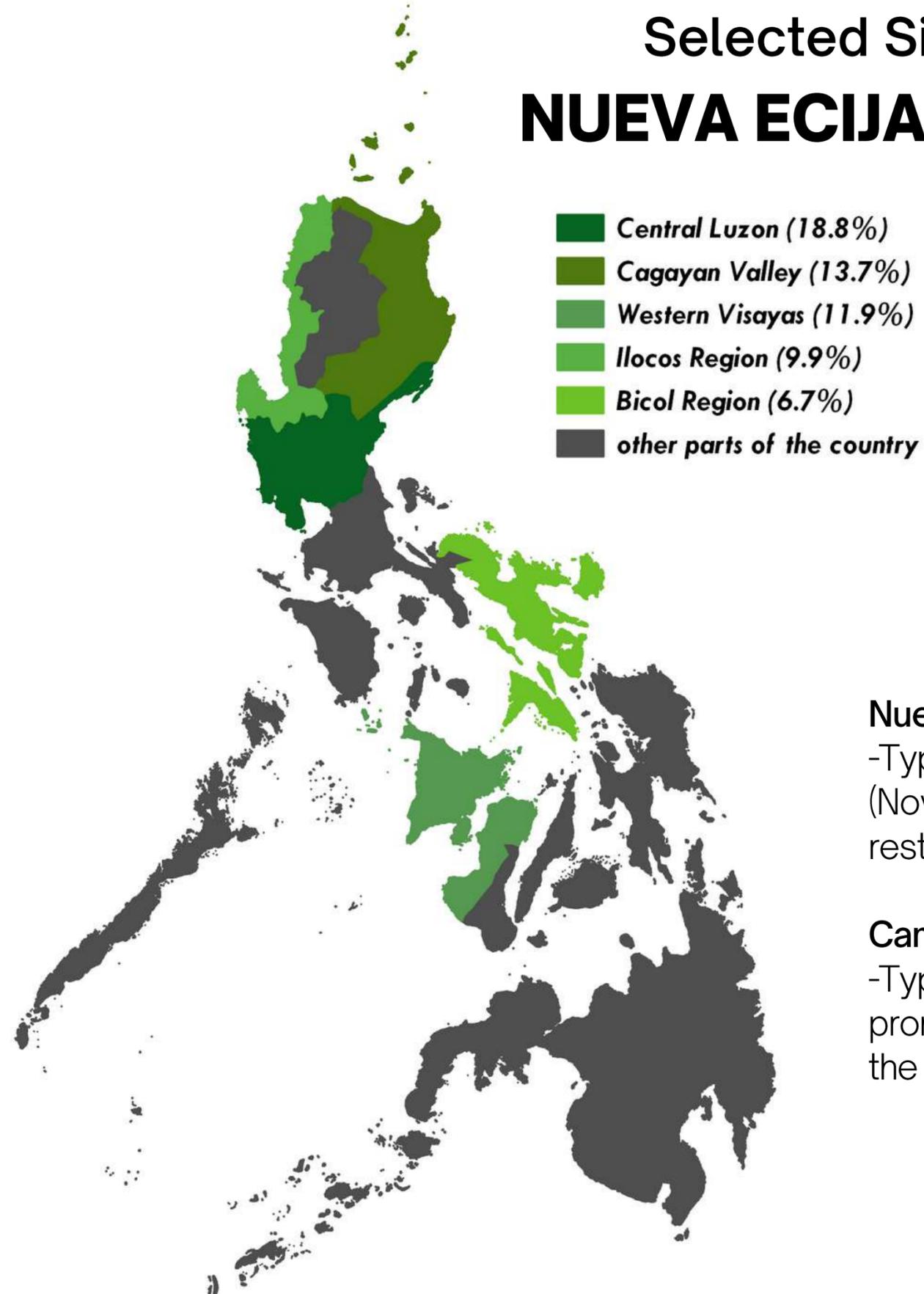
Nueva Ecija

- contributes 69.9% of Central Luzon's production in the 2nd quarter of 2020

Camarines Sur

- contributes 50.23% of Bicol Region's production in the 1st semester of 2020

Selected Site for the Philippines: **NUEVA ECIJA & CAMARINES SUR**

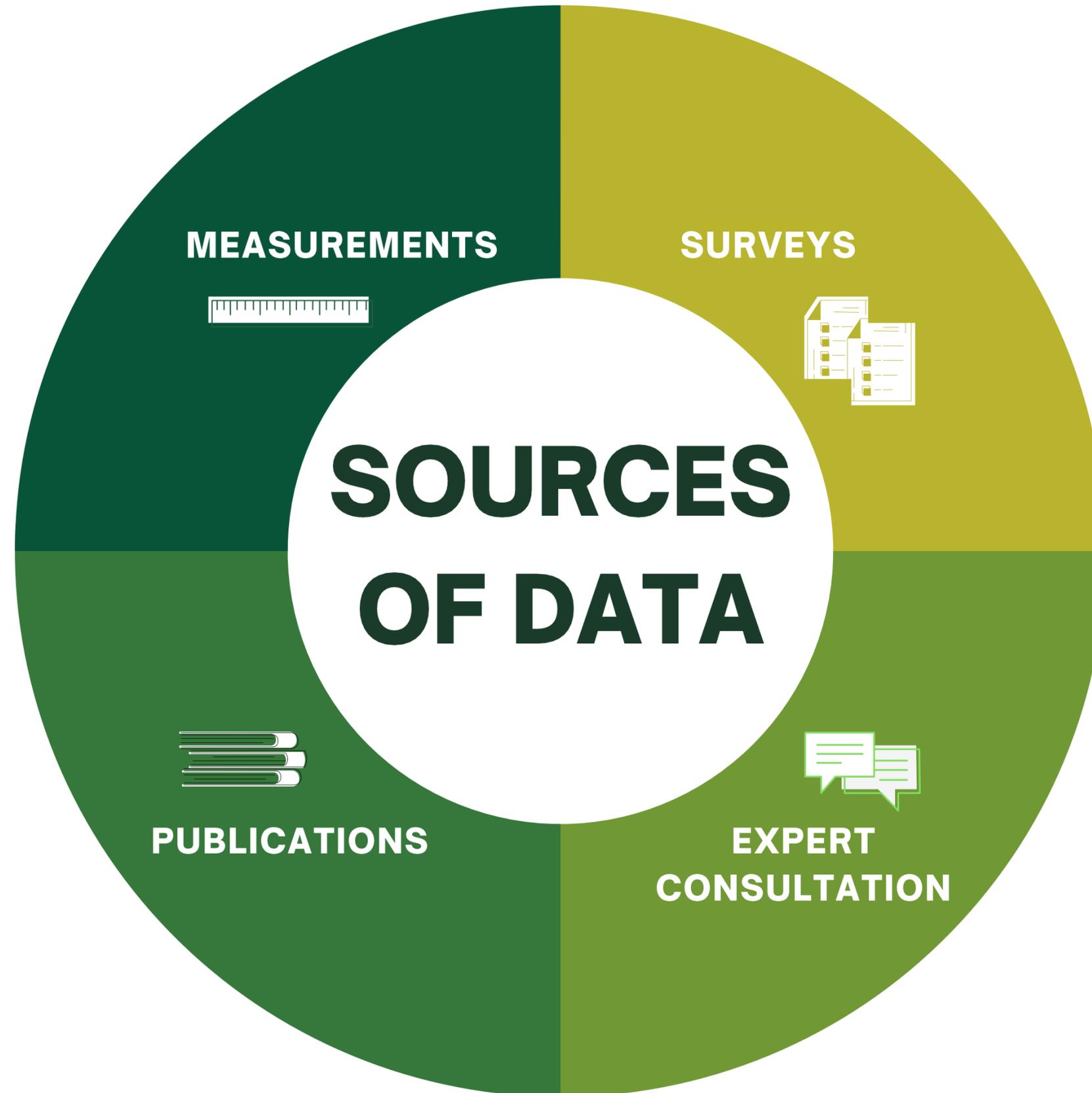


Nueva Ecija

-Type I : Two pronounced seasons dry (November to April) and wet during the rest of the year

Camarines Sur

-Type II : No dry season with a very pronounced maximum rainfall during the months of November to December





DATA MANAGEMENT

Employed in Nueva Ecija (MISTIG) and Camarines Sur Survey Data

DATA CLEANING

Exclude incomplete dataset, unreasonable values, and outliers

FILTERING

Separation of farmer's practice according to cropping season and method of crop establishment
Transplanted

SELECTING A VARIETY

Selection of variety whose crop performance is desired to be modelled
NSIC Rc 222

CLASSIFYING PERFORMANCE

Identifying top, average and least performing farmers based on yield
P(10) - top
P(90) - least

GEOREFERENCING

Mapping of participating farmers using their specified parcel location using Geographic Information System (GIS)





DATA MANAGEMENT

MISTIG SURVEY DATA (RAW DATA) - SAMPLE

	B	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
4	HHID	Plot_ID	Plot_list	Problems_encountered	season_plot	Name_Crop	Area	Unit_area_crops	Variety_Name	Crop_Type	Quantity_	unit_production	plot_lcu	plot_unit_lcu	plot_unit	note_plot_list	method_est
5	8001	1	1		Dry season/Rabbi/Boro	Rice	0.60	Hectare	NSIC Rc152	Inbred	94.00	Cavan	55.00	kg	kg		Transpl
6	8001	1	2		Wet Season/Kariff/Amman	Rice	0.60	Hectare	NSIC Rc216	Inbred	86.00	Cavan	55.00	kg	kg		Transpl
7	8002	1	1		Dry season/Rabbi/Boro	Rice	0.50	Hectare	NSIC Rc222	Inbred	52.00	Cavan	50.00	kg	kg		Transpl
8	8002	1	2		Wet Season/Kariff/Amman	Rice	0.50	Hectare	NSIC Rc222	Inbred	38.00	Cavan	50.00	kg	kg		Transpl
9	8003	1	1		Dry season/Rabbi/Boro	Rice	2.00	Hectare	IL 300	Inbred	247.00	Cavan	54.00	kg	kg	DS;;	Transpl
10	8003	1	2		Wet Season/Kariff/Amman	Rice	2.00	Hectare	NSIC Rc216	Inbred	212.00	Cavan	55.00	kg	kg	WS;	Transpl
11	8004	1	1	Insects	Dry season/Rabbi/Boro	Rice	0.50	Hectare	NSIC Rc216	Inbred	98.00	Cavan	55.00	kg	kg	0.4ha. is not use for rice planting due t	Transpl
12	8004	1	2	Insects	Wet Season/Kariff/Amman	Rice	0.90	Hectare	NSIC Rc216	Inbred	110.00	Cavan	60.00	kg	kg		Transpl
13	8005	1	1		Dry season/Rabbi/Boro	Rice	0.70	Hectare	NSIC Rc216	Inbred	71.00	Cavan	52.00	kg	kg		Transpl
14	8005	1	2		Wet Season/Kariff/Amman	Rice	0.70	Hectare	NSIC Rc152	Inbred	70.00	Cavan	52.00	kg	kg		Transpl
15	8006	1	2	Disease (tungro)	Wet Season/Kariff/Amman	Rice	1.00	Hectare	NSIC Rc222	Inbred	150.00	Cavan	55.00	kg	kg		Transpl
16	8006	2	2	Disease (tungro)	Wet Season/Kariff/Amman	Rice	0.80	Hectare	NSIC Rc216	Inbred	73.00	Cavan	55.00	kg	kg		Transpl
17	8007	1	1	Insect (stemborer)	Dry season/Rabbi/Boro	Rice	0.40	Hectare	NSIC 2013 Rc328	Inbred	52.00	Cavan	55.00	kg	kg		Transpl
18	8007	1	2	Insect (stemborer)	Wet Season/Kariff/Amman	Rice	0.40	Hectare	NSIC Rc222	Inbred	37.00	Cavan	53.00	kg	kg		Transpl
19	8008	1	1	Insects	Dry season/Rabbi/Boro	Rice	0.50	Hectare	NSIC Rc222	Inbred	86.00	Cavan	57.00	kg	kg		Transpl
20	8008	1	2	Insects	Wet Season/Kariff/Amman	Rice	0.50	Hectare	NSIC 2012 Rc300	Inbred	49.00	Cavan	55.00	kg	kg		Transpl
21	8009	1	1		Dry season/Rabbi/Boro	Rice	0.80	Hectare	NSIC Rc222	Inbred	165.00	Cavan	50.00	kg	kg		Transpl
22	8009	1	1		Wet Season/Kariff/Amman	Rice	0.80	Hectare	NSIC 2014 Rc29	Inbred	132.00	Cavan	53.00	kg	kg		Transpl
23	8010	1	1	Snails	Dry season/Rabbi/Boro	Rice	1.00	Hectare	NSIC Rc222	Inbred	100.00	Cavan	50.00	kg	kg		Transpl
24	8010	1	1	Snails	Wet Season/Kariff/Amman	Rice	1.00	Hectare	PSB Rc10	Inbred	79.00	Cavan	52.00	kg	kg		Transpl
25	8011	1	1	Snails	Dry season/Rabbi/Boro	Rice	0.80	Hectare	NSIC Rc222	Inbred	149.00	Cavan	53.00	kg	kg		Transpl
26	8011	1	1	Snails	Wet Season/Kariff/Amman	Rice	0.80	Hectare	NSIC 2011 Rc238	Inbred	89.00	Cavan	54.00	kg	kg	sold to seed grower	Transpl
27	8012	1	1	Snails	Dry season/Rabbi/Boro	Rice	0.50	Hectare	NSIC Rc222	Inbred	75.00	Cavan	52.00	kg	kg		Transpl
28	8012	1	1	Snails	Wet Season/Kariff/Amman	Rice	0.50	Hectare	PSB Rc18	Inbred	55.00	Cavan	55.00	kg	kg		Transpl
29	8013	1	1		Dry season/Rabbi/Boro	Rice	0.95	Hectare	NSIC 2012 Rc300	Inbred	117.00	Cavan	55.00	kg	kg		Transpl
30	8013	1	1		Wet Season/Kariff/Amman	Rice	0.95	Hectare	NSIC 2012 Rc300	Inbred	117.00	Cavan	55.00	kg	kg		Transpl
31	8014	1	1	Insects	Dry season/Rabbi/Boro	Rice	0.95	Hectare	Double Diamond	Inbred	138.00	Cavan	50.00	kg	kg		Transpl
32	8014	1	1	Insects	Wet Season/Kariff/Amman	Rice	0.95	Hectare	NSIC 2012 Rc304	Inbred	78.00	Cavan	56.00	kg	kg		Transpl
33	8015	1	1	Snails	Dry season/Rabbi/Boro	Rice	0.80	Hectare	NSIC Rc216	Inbred	110.00	Cavan	50.00	kg	kg		Transpl
34	8015	1	1	Snails	Wet Season/Kariff/Amman	Rice	0.80	Hectare	NSIC Rc152	Inbred	85.00	Cavan	52.00	kg	kg		Transpl
35	8016	1	1		Dry season/Rabbi/Boro	Rice	0.80	Hectare	DEZO300	Inbred	119.00	Cavan	57.00	kg	kg		Transpl
36	8016	1	2		Wet Season/Kariff/Amman	Rice	0.80	Hectare	NSIC 2012 Rc298	Inbred	95.00	Cavan	57.00	kg	kg		Transpl
37	8017	1	1	Snails and Insects	Dry season/Rabbi/Boro	Rice	1.50	Hectare	NSIC Rc222	Inbred	208.00	Cavan	52.00	kg	kg		Transpl

Total number of raw data : 1439





DATA MANAGEMENT

MISTIG SURVEY DATA (SUMMARIZED) - SAMPLE

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	See	
1	HHID	Plot ID	Plot list	season plot	Area (ha)	Variety Name	Crop Type	Quantity (Cavan)	plot_lcu	plot_unit_lcu	plot_unit	note_plot_list	Crop Establishment	Est Transplanting Date	Est Harvesting Date	Est Sowing Date	Transplanting Date	Harvest Date	Sowing Date	Growth Duration (DAT)	Days in seedbed	Total Growth Duration (DAS)		
2	8071	1	1	Dry season/	2.00	NSIC Rc2	Inbred	380.00	56.00	kg	kg		Transplanting	08/12/2014	22/03/2015	13/11/2014	14342	15081	14317	104	25	129	2	
3	8008	1	1	Dry season/	0.50	NSIC Rc2	Inbred	86.00	57.00	kg	kg		Transplanting	01/01/2015	01/04/2015	04/12/2014	15001	15091	14338	90	28	118		
4	8027	1	1	Dry season/	1.20	NSIC Rc2	Inbred	210.00	53.00	kg	kg		Transplanting	08/01/2015	08/04/2015	14/12/2014	15008	15098	14348	90	25	115	1	
5	8846	1	1	Dry season/	2.80	NSIC Rc2	Inbred	385.00	56.00	kg	kg		Transplanting	08/12/2014	15/03/2015	14/11/2014	14342	15074	14318	97	24	121	2	
6	8887	1	1	Dry season/	1.00	NSIC Rc2	Inbred	130.00	56.00	kg	kg		Transplanting	15/01/2015	15/04/2015	21/12/2014	15015	15105	14355	90	25	115		
7	8017	1	1	Dry season/	1.50	NSIC Rc2	Inbred	208.00	52.00	kg	kg		Transplanting	08/01/2015	15/04/2015	14/12/2014	15008	15105	14348	97	25	122	1	
8	8545	1	1	Dry season/	1.00	NSIC Rc2	Inbred	120.00	60.00	kg	kg		Transplanting	01/01/2015	01/04/2015	07/12/2014	15001	15091	14341	90	25	115	1	
9	8387	1	1	Dry season/	1.00	NSIC Rc2	Inbred	130.00	55.00	kg	kg		Transplanting	01/01/2015	08/04/2015	02/12/2014	15001	15098	14336	97	30	127		
10	8394	1	1	Dry season/	2.00	NSIC Rc2	Inbred	250.00	57.00	kg	kg		Transplanting	01/01/2015	01/04/2015	02/12/2014	15001	15091	14336	90	30	120	2	
11	8892	1	1	Dry season/	1.00	NSIC Rc2	Inbred	142.00	50.00	kg	kg		Transplanting	08/01/2015	08/04/2015	19/12/2014	15008	15098	14353	90	20	110		
12	8353	2	1	Dry season/	3.00	NSIC Rc2	Inbred	390.00	54.00	kg	kg	DS	Transplanting	22/01/2015	22/04/2015	28/12/2014	15022	15112	14362	90	25	115	2	
13	8120	1	1	Dry season/	1.50	NSIC Rc2	Inbred	180.00	57.00	kg	kg		Transplanting	08/12/2014	08/03/2015	10/11/2014	14342	15067	14314	90	28	118	1	
14	8353	1	1	Dry season/	1.50	NSIC Rc2	Inbred	176.00	54.00	kg	kg	DS	Transplanting	15/01/2015	15/04/2015	21/12/2014	15015	15105	14355	90	25	115		
15	8851	1	1	Dry season/	1.00	NSIC Rc2	Inbred	110.00	55.00	kg	kg		Transplanting	01/01/2015	01/04/2015	12/12/2014	15001	15091	14346	90	20	110		
16	8099	2	1	Dry season/	0.50	NSIC Rc2	Inbred	53.00	55.00	kg	kg		Transplanting	15/01/2015	15/04/2015	23/12/2014	15015	15105	14357	90	23	113		
17	8099	1	1	Dry season/	1.00	NSIC Rc2	Inbred	99.00	55.00	kg	kg	drought	Transplanting	08/01/2015	08/04/2015	16/12/2014	15008	15098	14350	90	23	113	1	
18																								
19																								
20																								
21																								

Total number of observations for dry season transplanted Rc 222 : 16





DRY SEASON

Values obtained from the
MISTIG Farmer Survey
conducted by IRRI in 2014

FARMERS PERFORMANCE

HHID	Rank	Growth Duration	Yield (tons/ha)	Classification
8071	1	130	10.64	Top
8008	2	119	9.80	Performing
8027	3	116	9.28	
8846	4	122	7.70	
8887	5	116	7.28	
8017	6	123	7.21	
8545	7	116	7.20	
8387	8	128	7.15	
8394	9	121	7.13	
8892	10	111	7.10	
8353	11	116	7.02	
8120	12	119	6.84	
8353	13	116	6.34	
8851	14	111	6.05	
8099	15	114	5.83	Least
8099	16	114	5.45	Performing



WET SEASON

Values obtained from the
MISTIG Farmer Survey
conducted by IRRI in 2014

FARMERS PERFORMANCE

HHID	Rank	Growth Duration	Yield (tons/ha)	Classification
8017	1	116	8.33	Top Performing
8887	2	116	7.70	
8022	3	116	7.42	
8532	4	123	6.56	
9035	5	123	6.48	
8887	6	116	6.33	
8394	7	123	6.29	
8373	8	128	6.18	
8372	9	121	6.02	
9035	10	123	5.94	
8387	11	121	5.83	
9012	12	116	5.81	
8988	13	128	5.60	
8858	14	121	5.60	
9015	15	126	5.56	
8545	16	116	5.50	
9006	17	123	5.46	
8877	18	130	5.41	
8353	19	116	5.37	
9015	20	126	5.34	
8858	21	121	5.32	
9034	22	116	5.28	
9034	23	116	5.28	
8091	24	123	5.17	
8120	25	119	4.76	
9001	26	121	4.67	
8365	27	123	4.64	
8049	28	121	4.64	
8964	29	128	4.55	
8987	30	116	4.29	
9039	31	116	3.77	Least Performing
8987	32	116	3.12	
8992	33	119	2.94	



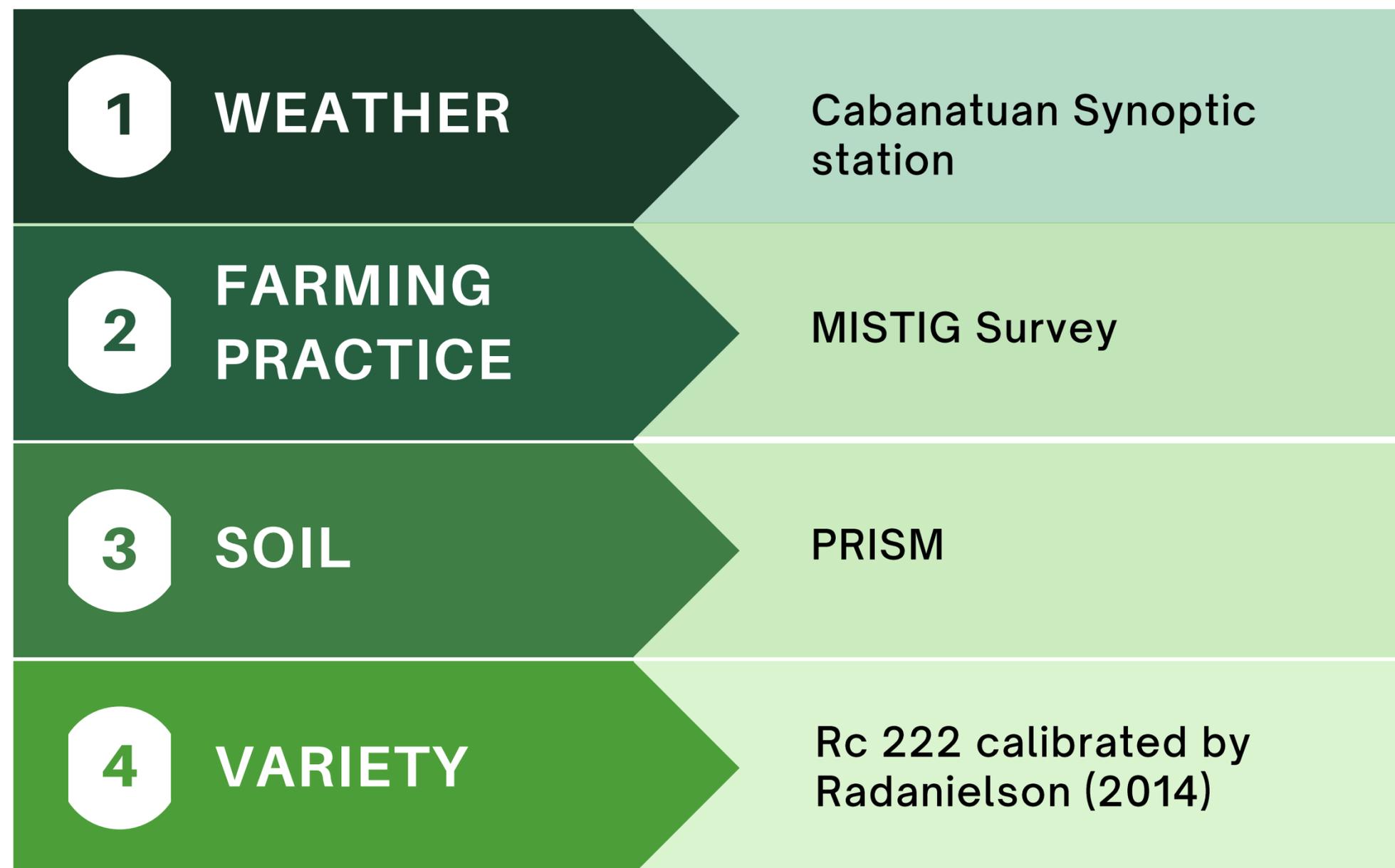
CROP MODELING





ORYZA v3 INPUTS

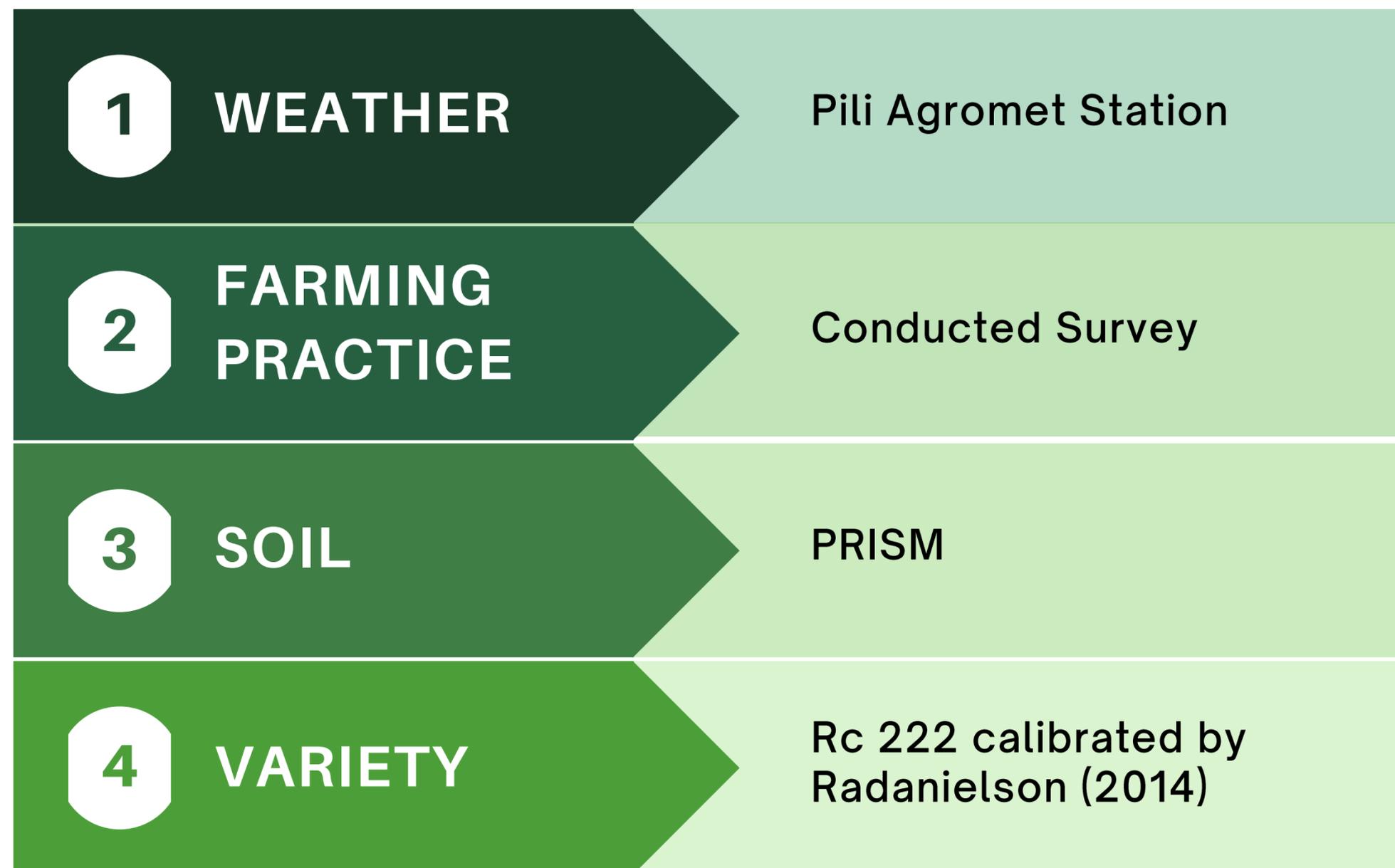
NUEVA ECIJA





ORYZA v3 INPUTS

CAMARINES SUR





CROP MODEL

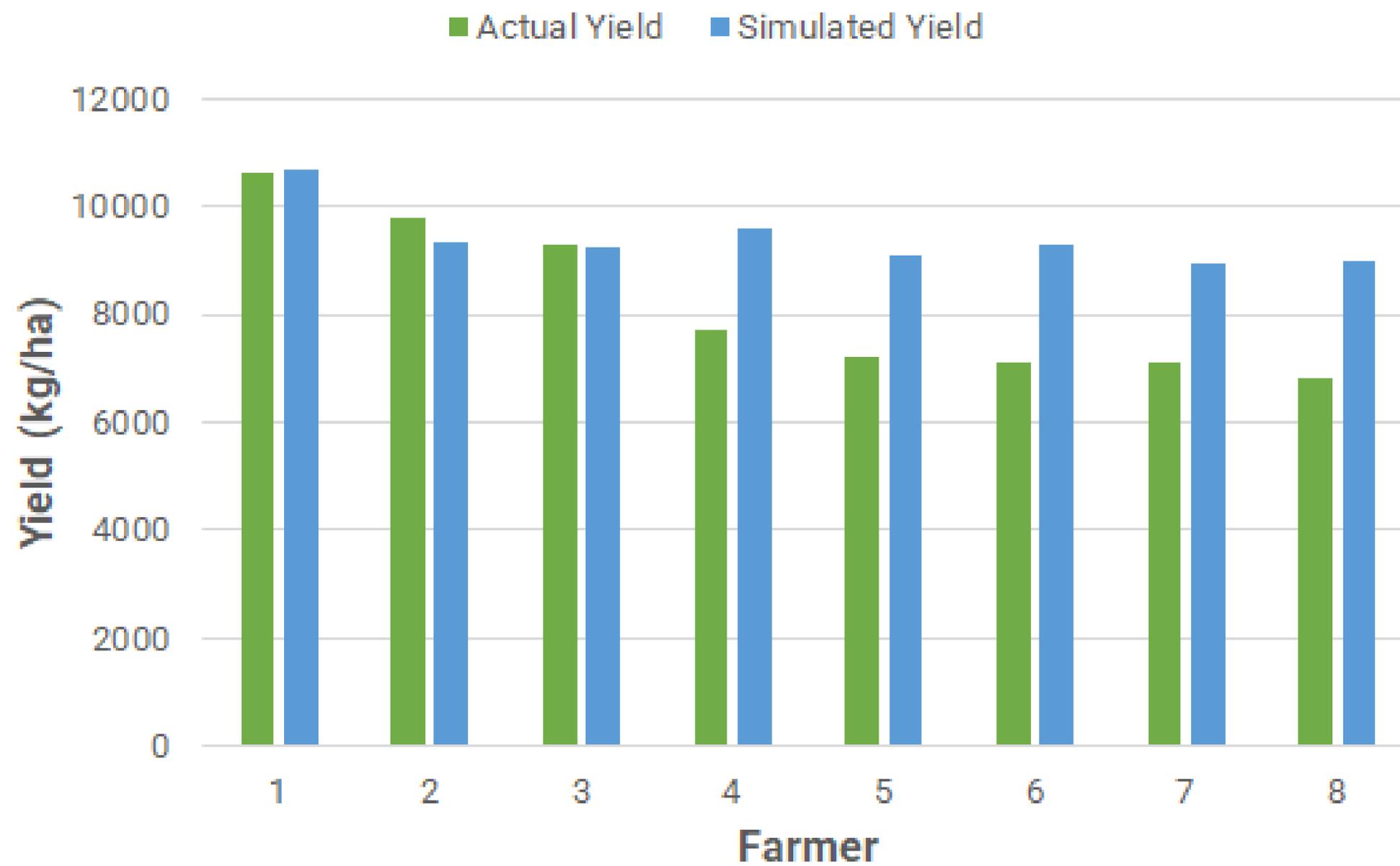
CALIBRATION

NUEVA ECIJA





COMPARISON OF DRY SEASON YIELD



Dry Season

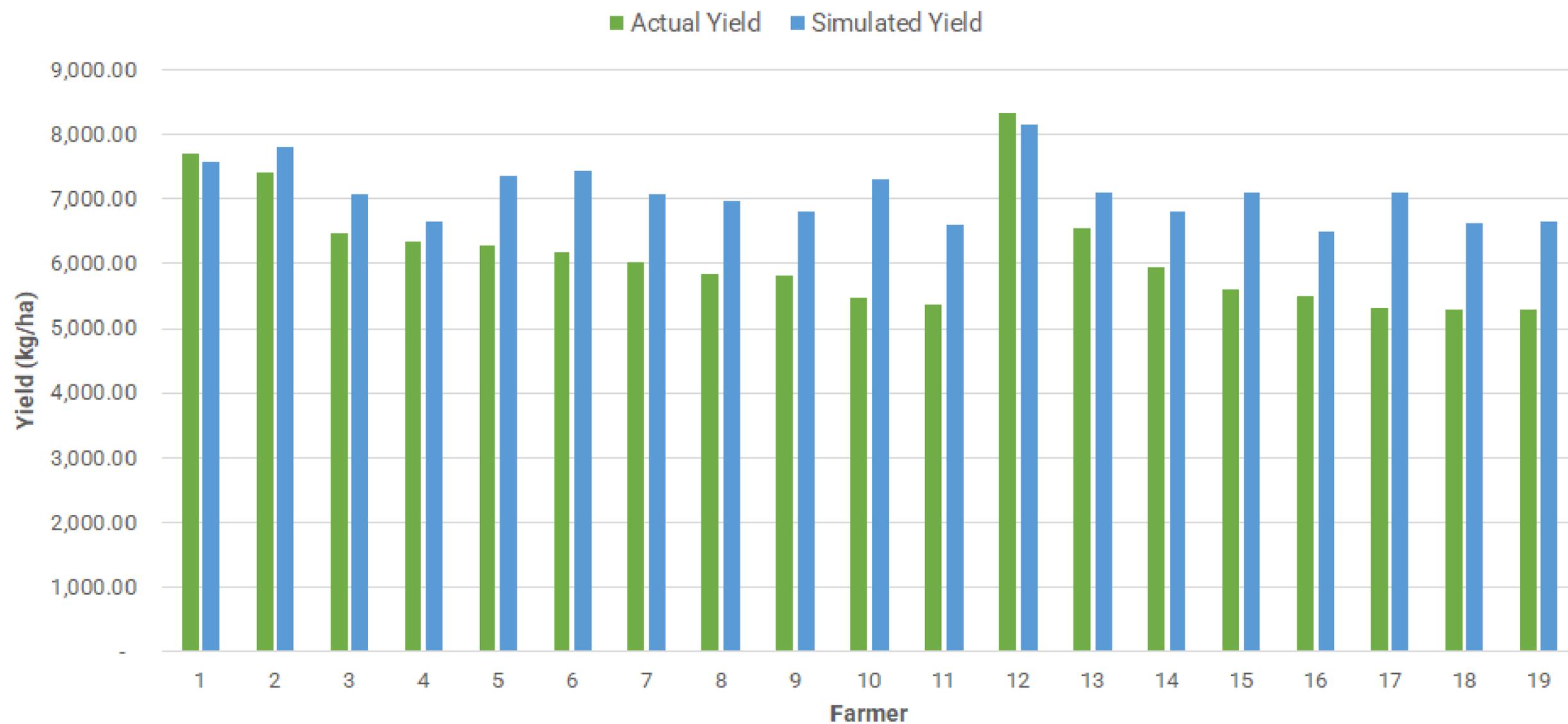
RMSE = 1575.92kg/ha

RMSEn = 19.19 %

Overestimation of yield = 12.01%



COMPARISON OF WET SEASON YIELD USING THE CALIBRATED RC 222 VARIETY



Wet Season

RMSE = 1,100.47 kg/ha
RMSEn = 17.92%
Overestimation of yield = 14.11%



CROP MODEL EVALUATION





DIFFERENT SCENARIOS OF FERTILIZER APPLICATION (120 N kg/ha)

SCENARIO 1

3 splits (40-30-30)
Basal at transplanting, Mid-tillering,
Panicle initiation

SCENARIO 2

2 splits (50-50)
Mid-tillering and panicle initiation

SCENARIO 3

2 splits (70-30)
Mid-tillering and Panicle initiation

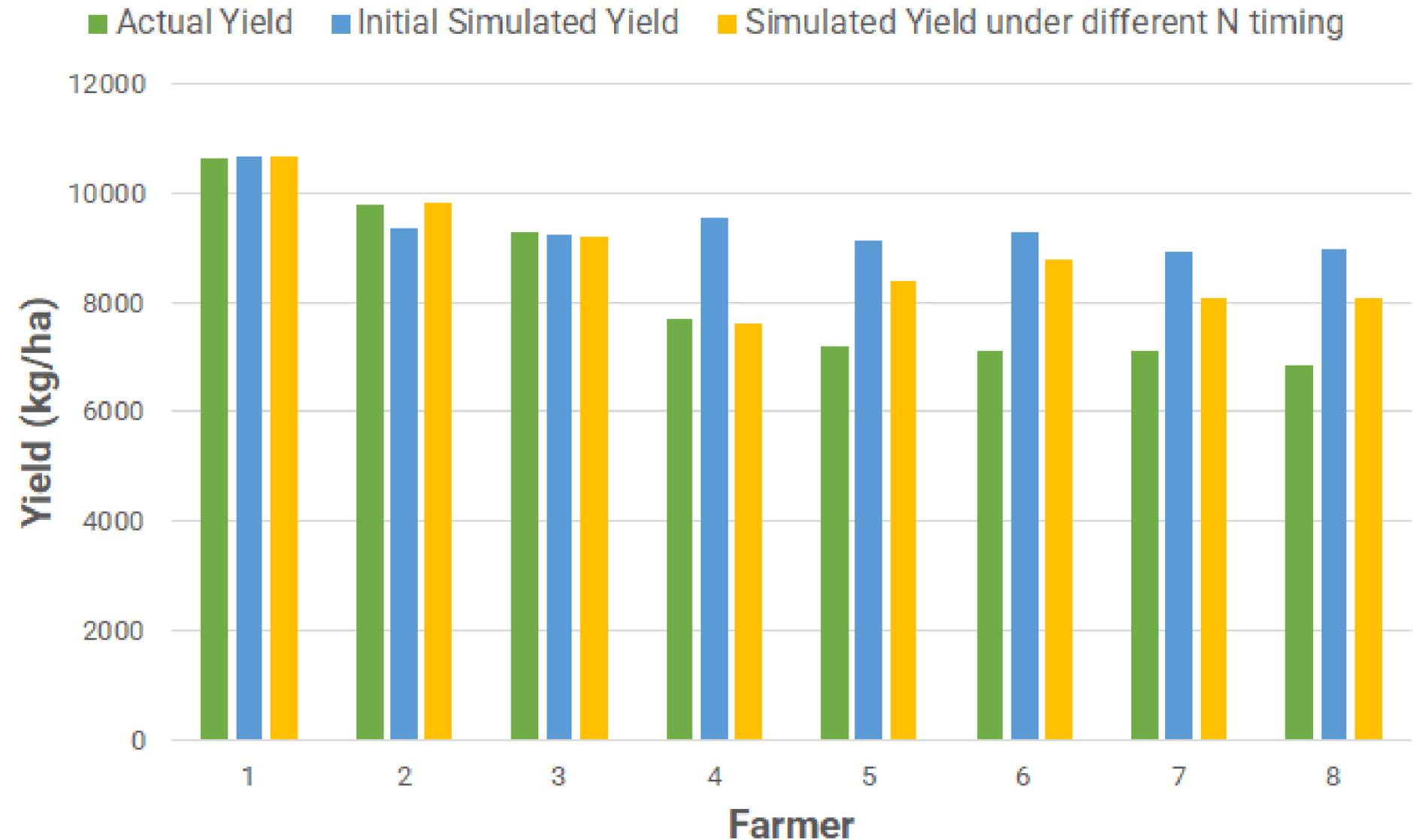




UNDER DIFFERENT TIMING AND SPLITS OF NITROGEN FERTILIZER APPLICATION

Timing of fertilizer is a factor that drives the differences in yield among farmers

COMPARISON OF YIELD ESTIMATES AFTER EVALUATION



Dry Season

RMSE = 917.57 kg/ha

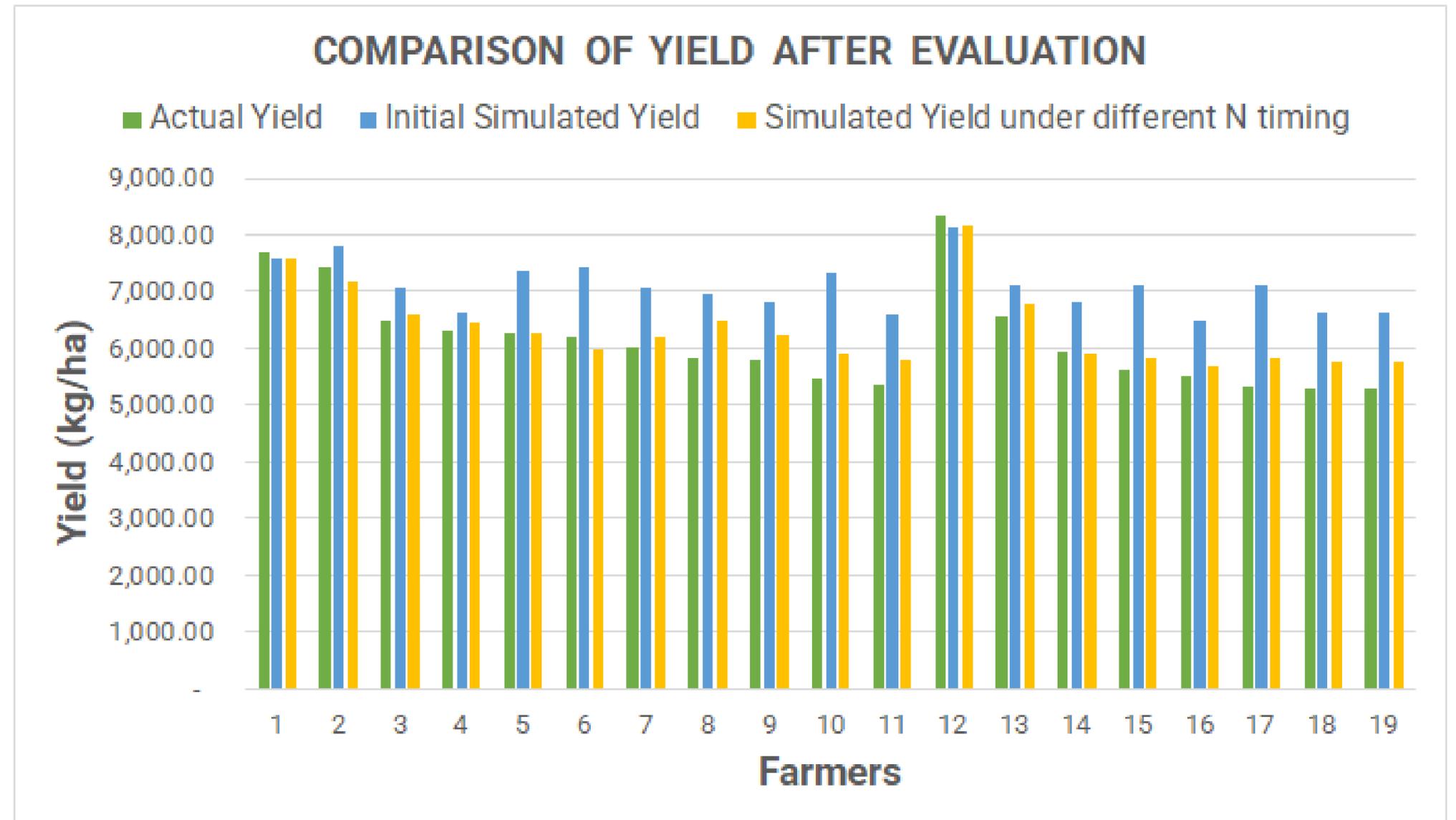
RMSEn = 11.18%

Overestimation of yield = 6.39%



UNDER DIFFERENT TIMING AND SPLITS OF NITROGEN FERTILIZER APPLICATION

Timing of fertilizer is a factor that drives the differences in yield among farmers



Wet Season

RMSE = 331.80 kg/ha

RMSEn = 5.40%

Overestimation of yield = 2.73%



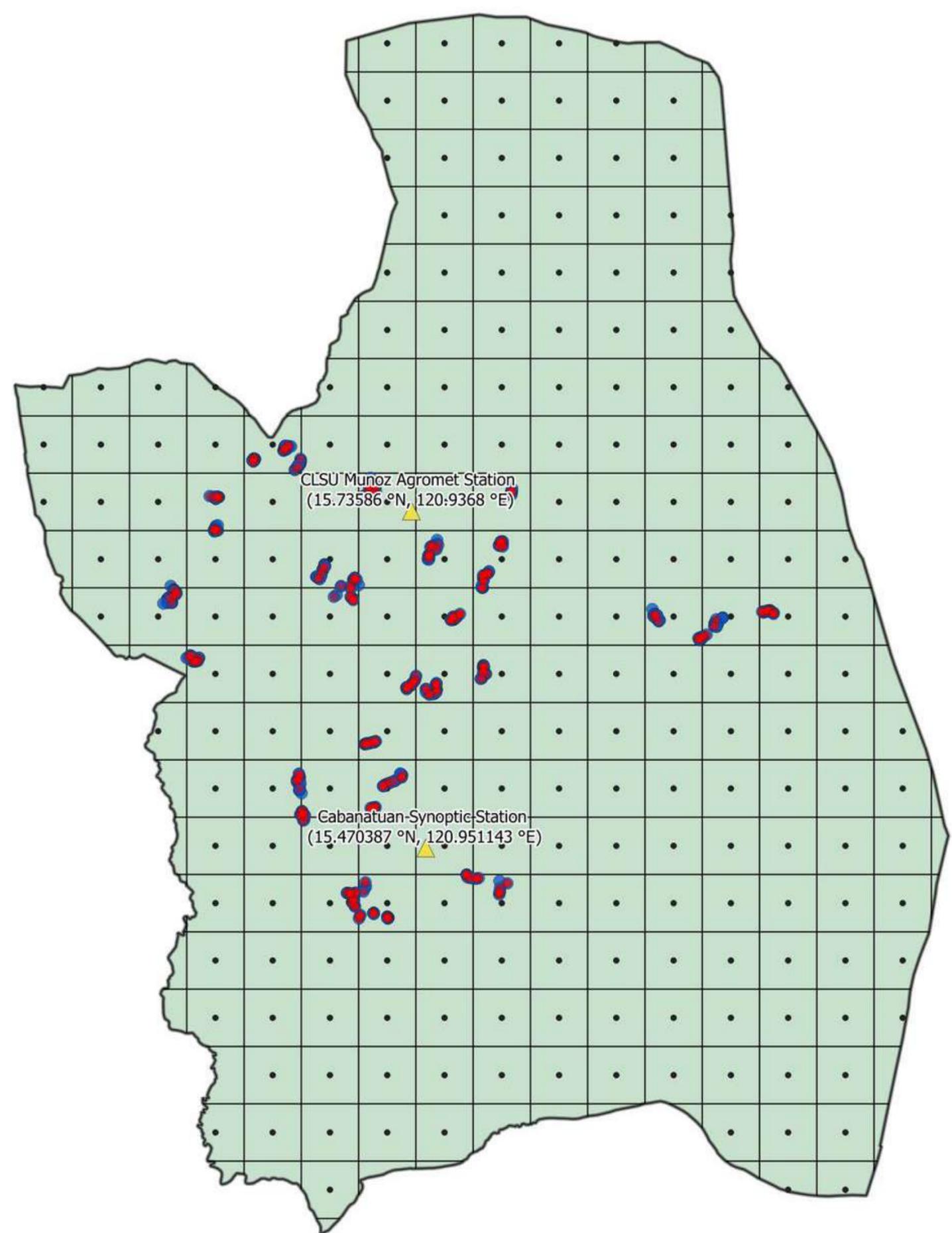
YIELD POTENTIAL ESTIMATION
LARGE-SCALE
MODEL





SECONDARY DATA

Large-scale simulation makes use of spatial data for soil and climate obtained from the Homogenized Soil World Database and Power NASA, respectively.

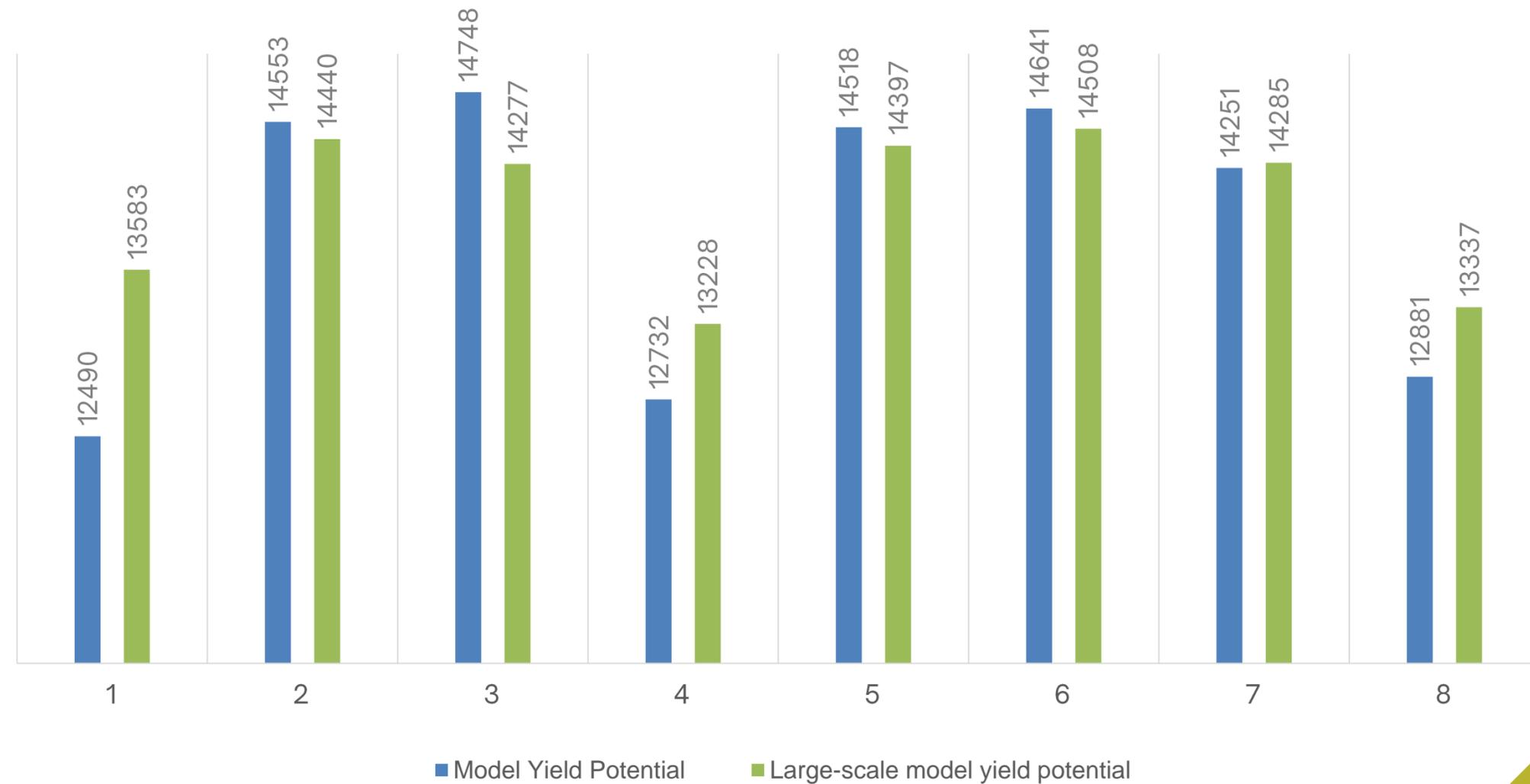




QUANTIFYING DOWNSCALED MODEL ERROR NUEVA ECIJA

Dry Season

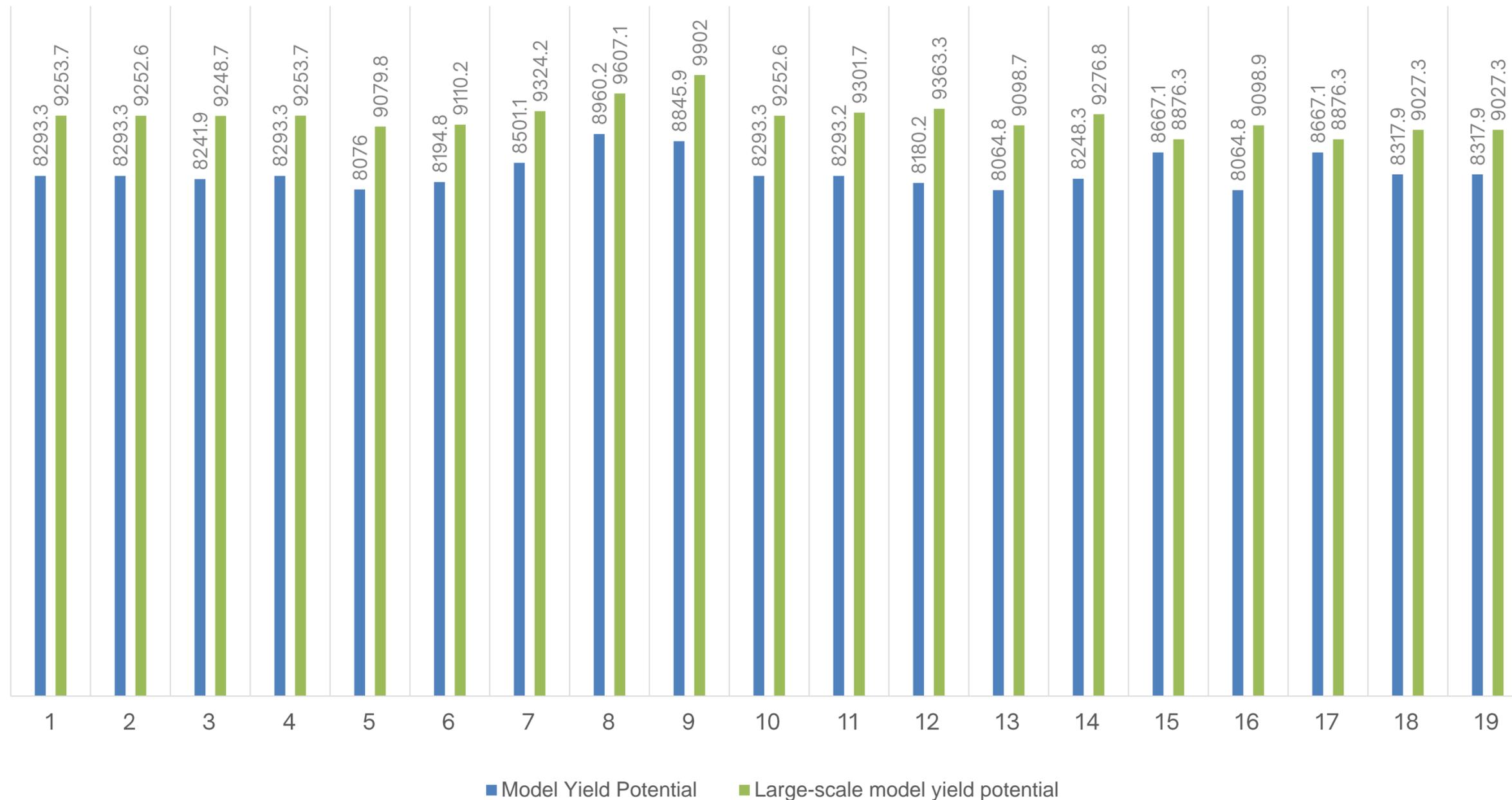
RMSE = 489.48kg/ha
RMSEn = 3.53%
Overestimation = 0.91%





QUANTIFYING DOWNSCALED MODEL ERROR

NUEVA ECIJA



Wet Season

RMSE = 902.12kg/ha
RMSEn = 10.79%
Overestimation = 10.27%



END OF PRESENTATION
THANK YOU!





This case study is guided and made in collaboration with

Dr. Ando Radanielson (*University of Southern Queensland*)
Dr. Ruben M. Lampayan (*University of the Philippines Los Baños*)
Engr. Kristine S. Pascual (*Philippine Rice Research Institute*)
Ms. Emma Quicho (*International Rice Research Institute*)
Dr. Lalaine Lastrollo (*Camarines Sur Polytechnique Colleges*)
Dr. Jose Yorobe (*University of the Philippines Los Baños*)
Dr. Lanie A. Alejo
Engr. Lea S. Caguiat

Visit IRRI's website to access the ORYZA crop model at <https://www.irri.org/oryza>

