



Sugar Industry Management Information System



SIMIS Report

Dec 2021 - Oct 2022

Ivan Vias – SIMIS

Sugar Industry Control Board

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DRAFT

List of Abbreviations

ASR	American Sugar Refineries
BSI	Belize Sugar Industry
BSCFA	Belize Sugar Cane Farmers Association
CSCPA	Corozal Sugar Cane Producers Association
CTA	Cane Tons per Acre
EU	European Union
GIS	Geo-Information System
GOB	Government of Belize
IICA	Inter-American Institute for Cooperation
HDMS	Harvest Distribution and Management System
ICT	Information and Communication Technology
NSCGA	Northern Sugar Cane Association
PE	Production Estimate
PSCPA	Progressive Sugar Cane Producers Association
SCPC	Sugar Cane Production Comitée
SICB	Sugar Industry Control Board
SIMIS	Sugar Industry Management Information System
SIRDI	Sugar Industry Resources Development Institute
VPN	Virtual Private Network

SIMIS Report

Introduction

The Belize Sugar Industry Management Information System (S.I.M.I.S) was funded under various projects that were part of the Strengthening of the Northern Sugar Industry of Belize. Primary sponsors include the European Union(E.U.), the Inter Development Bank (I.D.B), and industry stakeholders. Today the system is currently administered by the Sugar Industry Control Board (S.I.C.B) and provides data and analysis of information for the Sugar Industry Research and Development Institute (S.I.R.D.I), and production monitoring information for the Sugar Cane Production Committee (S.C.P.C).

S.I.M.I.S has evolved into the primary tool for the S.C.P.C. to monitor and report member's sugar cane production. It is an integral part for planning of yearly crop quota distribution using Geographic Information gathered across the Northern Sugar Belt. Apart from offering maps and information to farmers, to the different associations and stakeholders it is also designed to be an early warning system for SIRD I's pest and disease management program.

As a central database for the sugar industry, S.I.M.I.S holds information related to cane farmers, cane parcels, sugar cane deliveries and data from pest and disease for sugar cane crop and in 2019 it was also responsible for the distribution of Fuel Subsidy tickets to cane farmers under the fuels subsidy program at the offices of Corozal and Orange Walk towns during crop season.

This aim of this report is to compile a summary of charts and graphs available during sugar cane season. Further information can be requested at the SIMIS department of the SICB.

Farmers by Gender

Since 2014 the S.I.M.I.S. holds information on over 6038 farmers i.e. 3,625 male farmers and 2,2413 female farmers (see Figure 1.)

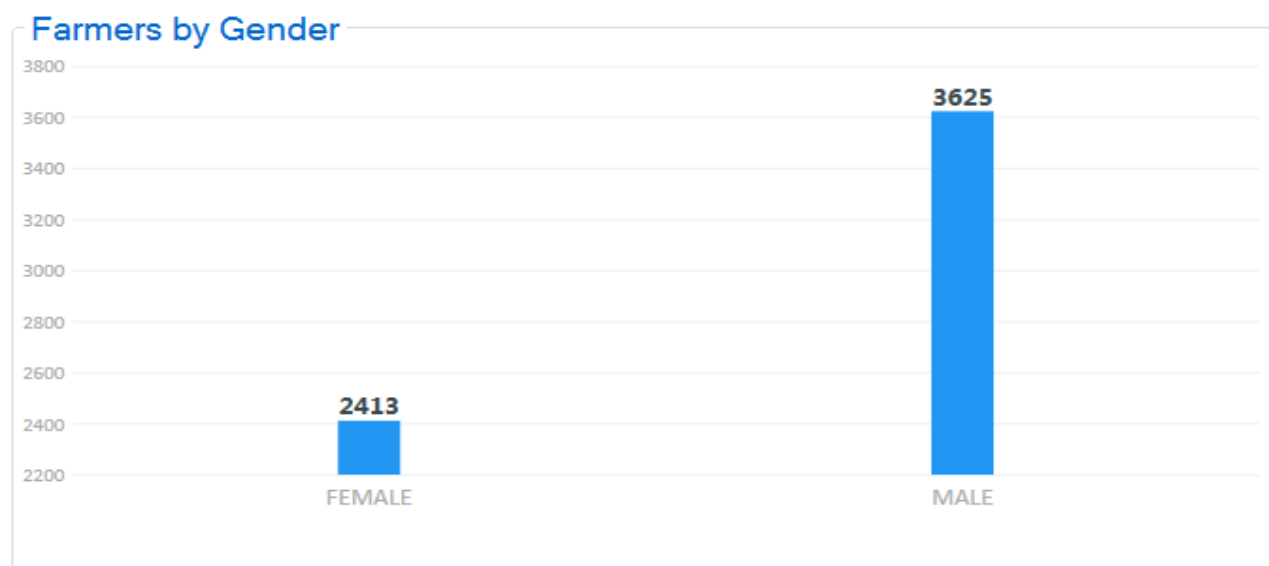
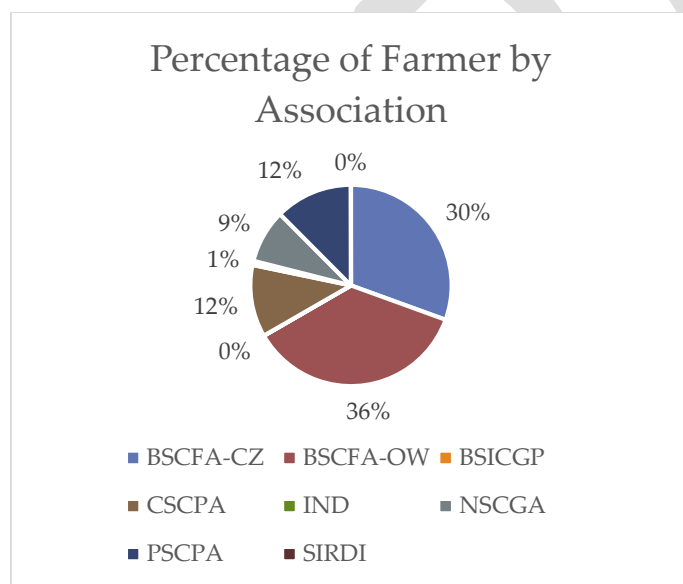


Figure 1 - Farmer Gender Distribution - SIMIS Database December 2021



Association	Members
BSCFA-CZ	1532
BSCFA-OW	1811
BSICGP	2
CSCPA	581
IND	34
NSCGA	431
PSCPA	624
SIRDI	1

Figure 2 - Farmer Distribution by Association – CFR September 2022

Farmers Registered by Year

Currently there are 5007 sugar cane farmers that are registered in the northern that delivered cane this crop. (See Cane Farmer Registry 2021-2022). The graph below shows the amount of farmers registering every year since the inception of the S.I.M.I.S. systems in 2015.

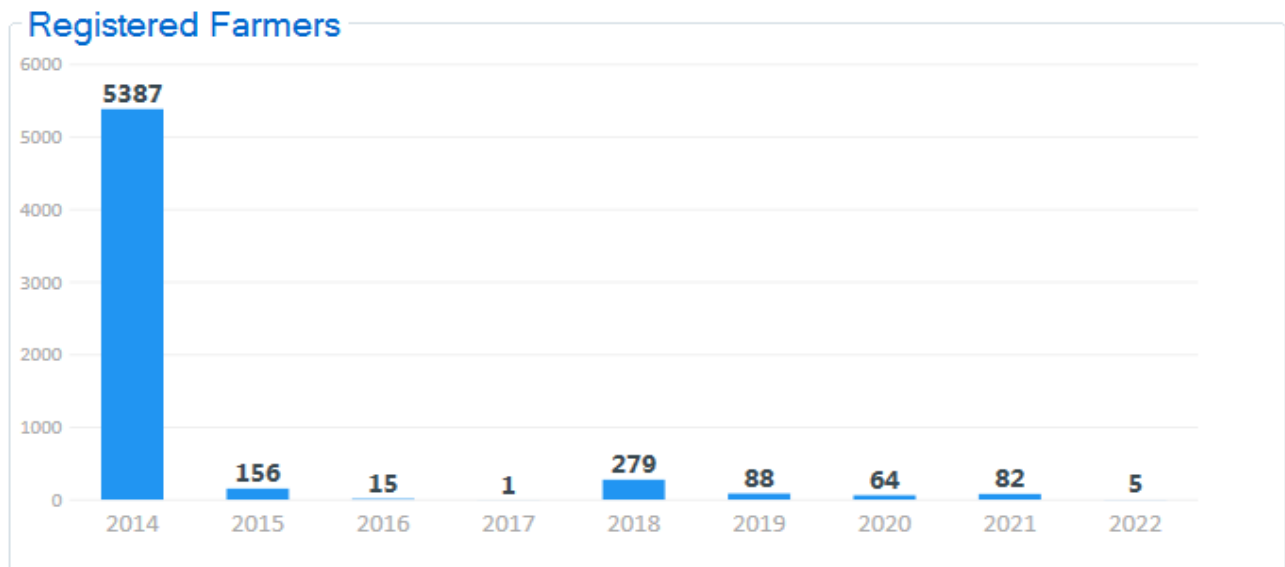


Figure 3 - Registered Farmers per Year - SIMIS September 2021

The COVID19 pandemic (2020-2021) is responsible for a number of increased deaths now visible in the graph below for the years 2019-2021.

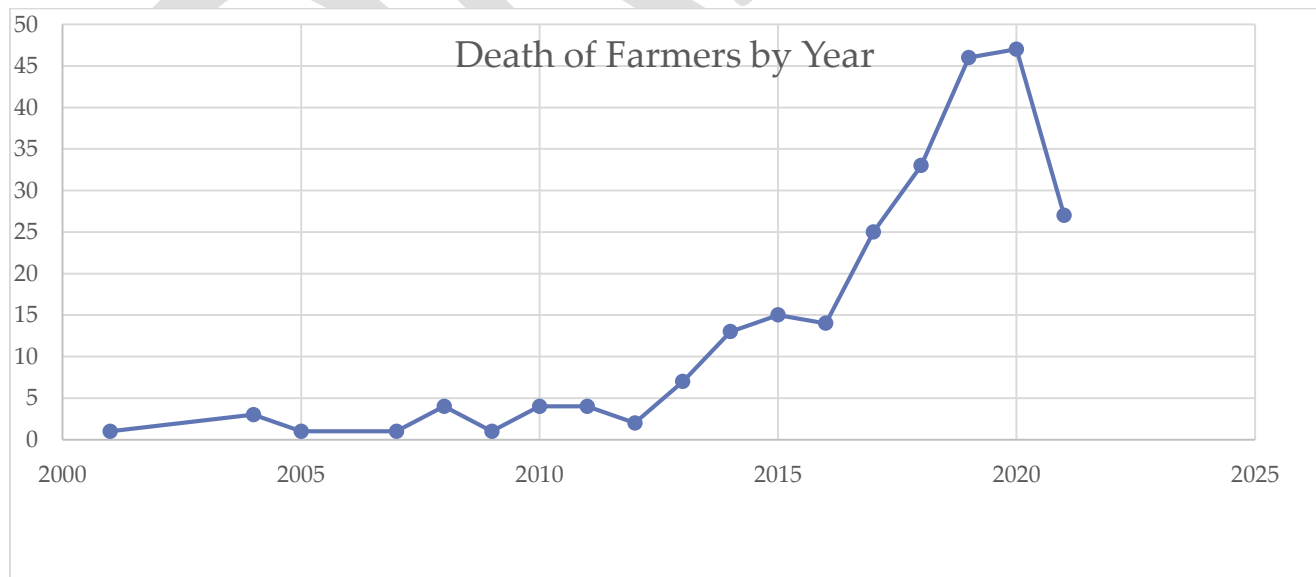
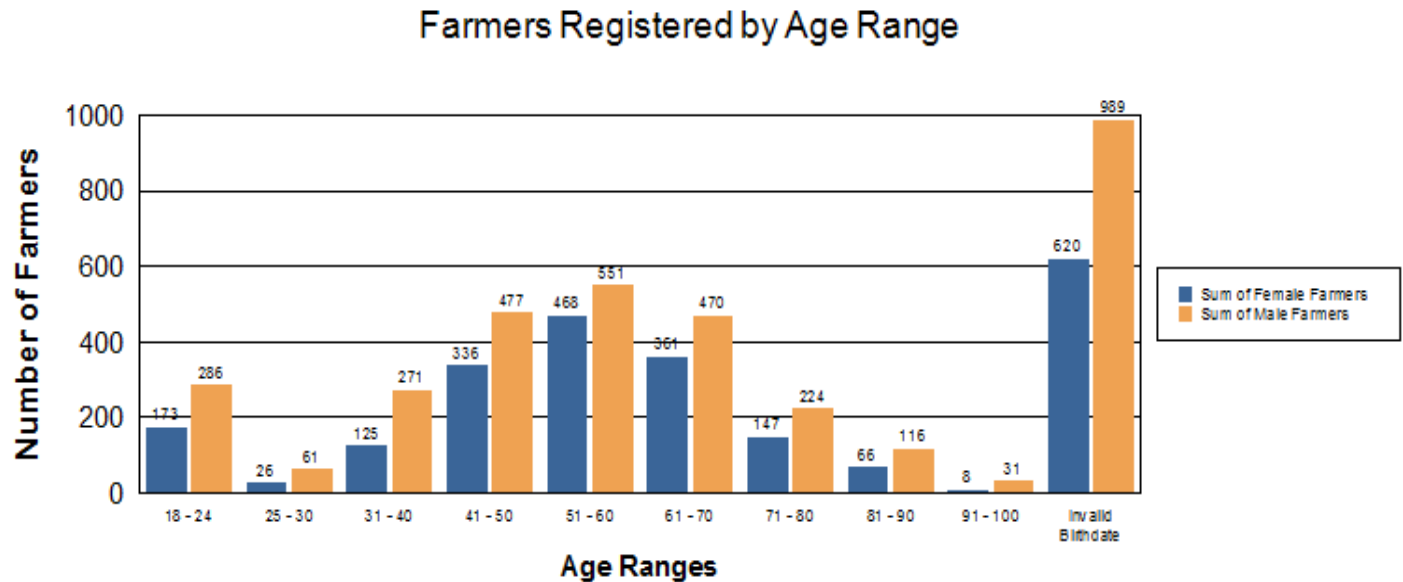


Figure 4 – Death of Farmers Registered by Year - SIMIS December 2021

Farmers – Age Range Distribution

The chart below shows the distribution of the farmers by age range. Interesting to note is the number of farmers that is between the ages 18 to 24 is now more than the range of 25 to 40. Also illustrated in the graph that 1,609 – farmers have an invalid birthday which means we do not have the birthdate of those farmers as yet. Their ages are recorded below 18 or over 100 years of age and this considered invalid.



<u>Age Groups</u>	<u>Male Farmers</u>	<u>Female Farmers</u>	<u>Total Farmers</u>
18 - 24	286	173	459
25 - 30	61	26	87
31 - 40	271	125	396
41 - 50	477	336	813
51 - 60	551	468	1,019
61 - 70	470	361	831
71 - 80	224	147	371
81 - 90	116	66	182
91 - 100	31	8	39
Invalid Birthdate	989	620	1,609
Total	3,476	2,330	5,806

Figure 5. Farmer Age Range Distribution – SIMIS September 2022

Farmers – Tonnage Distribution

Every year a list of farmers that will be delivering cane is issued with individual quota. The chart below illustrates the tonnage distribution (Projected Estimate) amongst farmers for crop season 2021-2022.

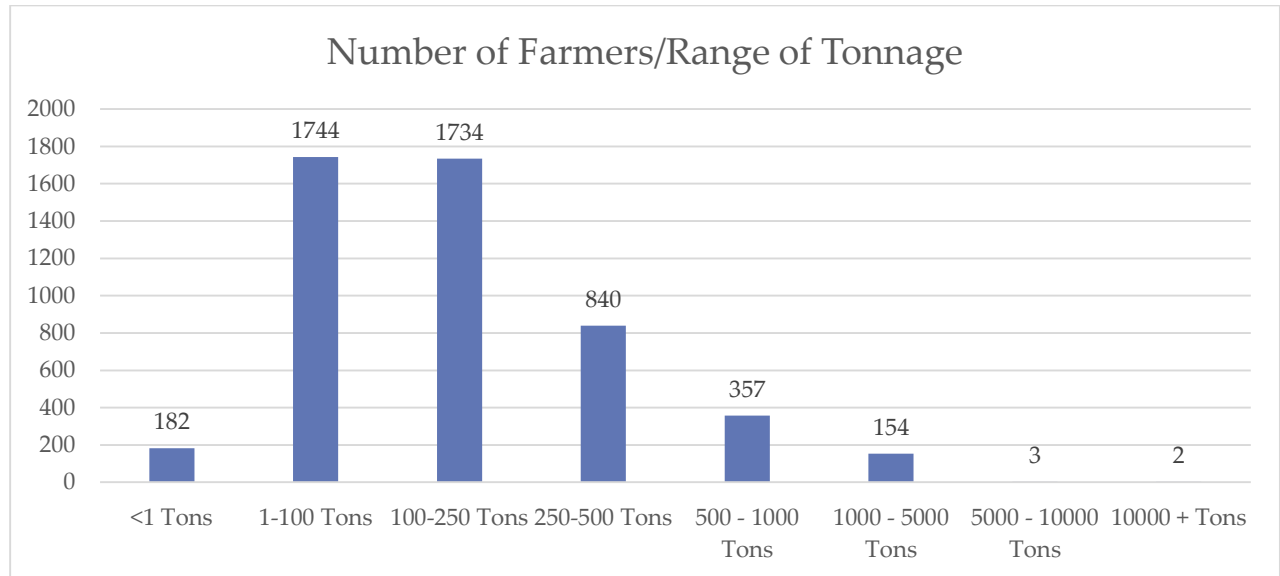


Figure 6 - Farmer Projected Tonnage Distribution based on (PE) - CFR 2021-2022

Range of Tonnage	Number of Farmers
<1 Ton	182
1-100 Tons	1744
100-250 Tons	1734
250-500 Tons	840
500 - 1000 Tons	357
1000 - 5000 Tons	154
5000 - 10000 Tons	3
10000 + Tons	2

Cane Parcel – Acreage Ranges

Currently our SIMIS Cane Parcel Database holds information on 23,341 individual parcels on the northern sugar belt of Corozal and Orange Walk districts. The chart below breaks down the acreage range of parcels currently in our system. Quite notably 16,415 Parcels or 69.01% are in the range of 1-5 Acres.

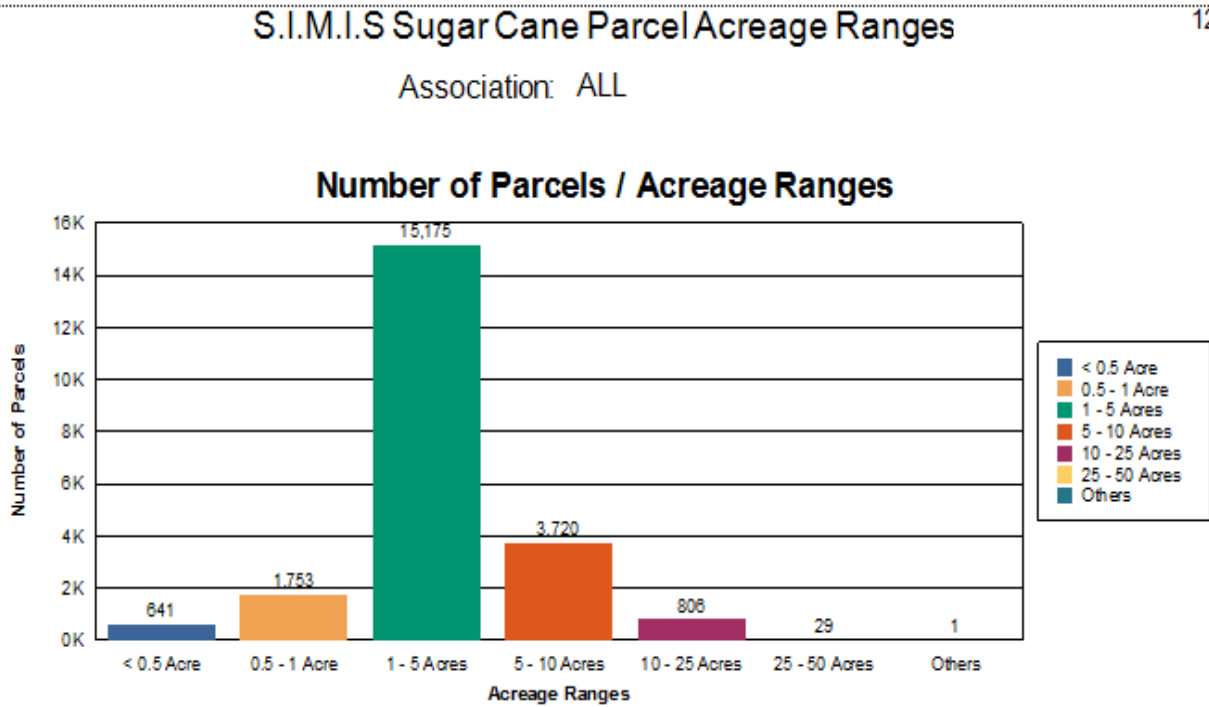


Figure 7 - Acreage Range of Parcels – SIMIS September 2022

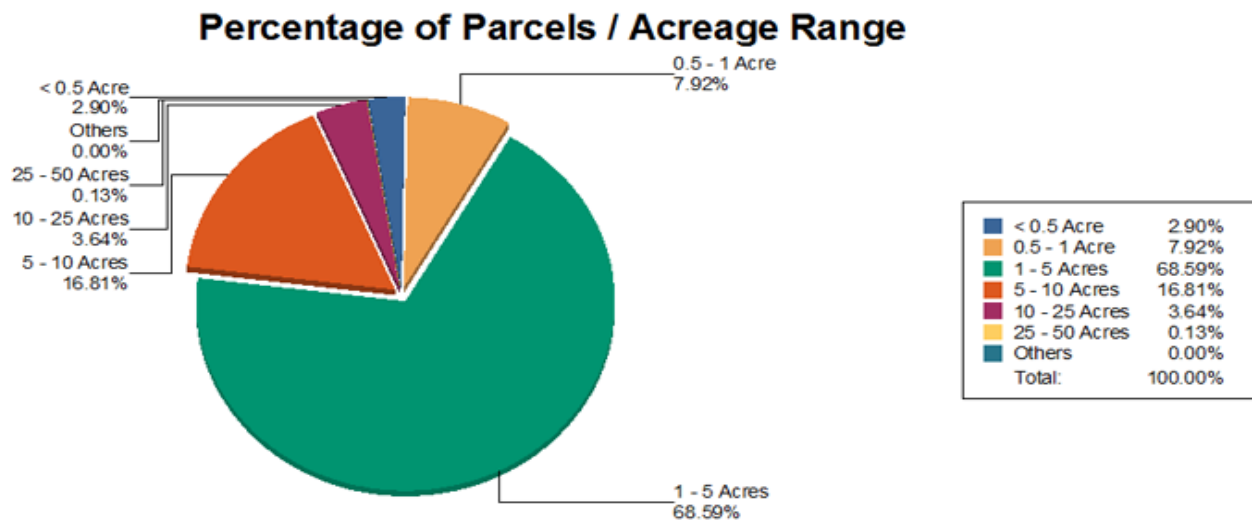
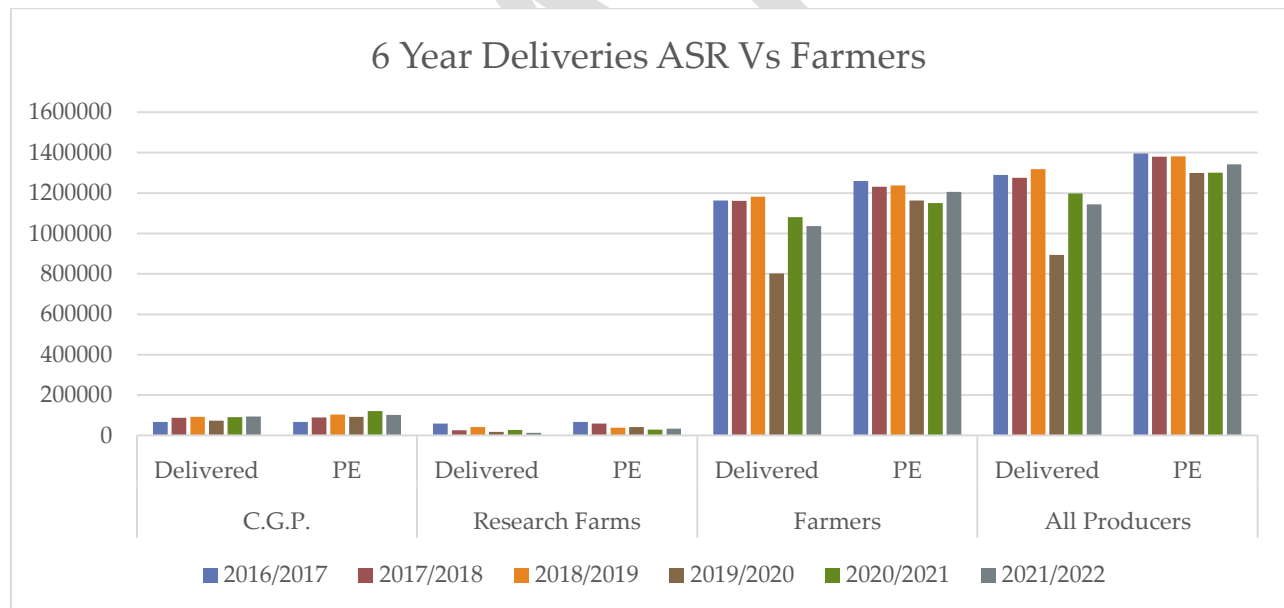


Figure 8 - Percent of Parcels in Different Acreage Ranges – SIMIS September 2022

Production Monitoring – Past 6 Year Deliveries

For the past 6-year SIMIS has been monitoring deliveries at the ASR mill. Below is the data for actual deliveries in long tons versus what was the projected estimate at the beginning of crop for those years.

Year	C.G.P.		Research Farms		Farmers		All Producers	
	Delivered	PE	Delivered	PE	Delivered	PE	Delivered	PE
2016/2017	67777	67861	59426	67861	1162853	1259976	1290056	1395698
2017/2018	88038	88540	25819	59425	1161140	1231572	1274997	1379537
2018/2019	92735	104194	42427	39370	1182463	1237890	1317625	1381454
2019/2020	73970	92775	17242	42373	802450	1163442	893662	1298590
2020/2021	90784	121275	27195	28971	1080089	1150472	1198068	1300718
2021/2022	94499	101652	13456	33619	1036245	1206241	1144269	1341512



Production Monitoring – Methodology

Production monitoring involves the process of tracking sugar cane deliveries to the mill from individual parcels. SIMIS contains information for over **89,641.17** acres of cane in the northern sugar belt of Corozal and Orange Walk districts. Each parcel has been assigned a unique code (FIELD_ID) in 23,610 parcels. These parcels were ground-truth and data such as variety, location, acreage, and crop class has been assigned.

Production Monitoring Process:

- 1. Cane Farmer arrives with cane.
- 2. SCPC personnel help identify where the cane is coming from (SIMIS Cane Parcel ID/Field ID)
- 3. Once the field is identified a **SIMIS ticket** is issued.
- 4. Data is scanned and entered at the **SCPC booth** and later processed at SIMIS.
- 5. Information is available at stakeholders and associations through portal.

Production Monitoring Ticket


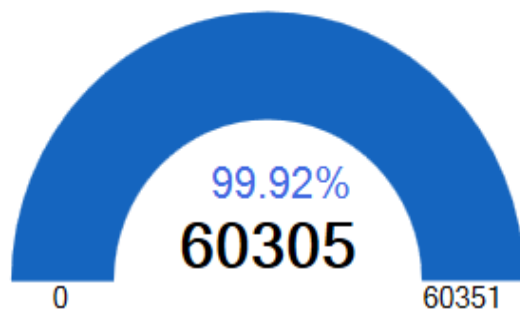
Name: WIELER, JOHAN		No.	
BSI Code: 0.00	Open	In Progress	Close
Field Id:	Acreage: 24.83		
License:	Total Grabs:		
Location: HILL BANK			
			

Figure 9 - Production Monitoring Ticket – SIMIS 2021

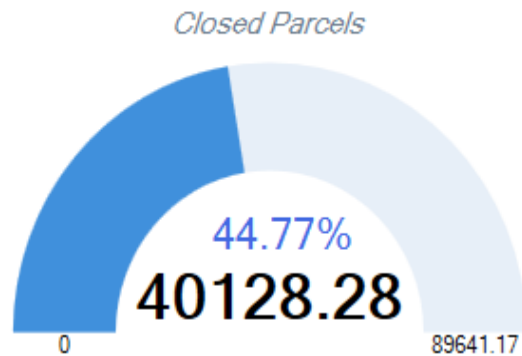
Production Monitoring – Results 2021-2022

This year there was a total of **60,348** deliveries at the Mill of these were monitored representing **100%** of the sugar cane delivered. In relation to our SIMIS cane parcel database in which we have mapped a total of **89641.17** acres - the deliveries marked as “**closed**” (harvested fields) only accounted for **44.77%** or **40128** acres reported as closed. It is important to note that this these graphs represent monitored deliveries from all the associations and the mill.

Total Deliveries Monitored

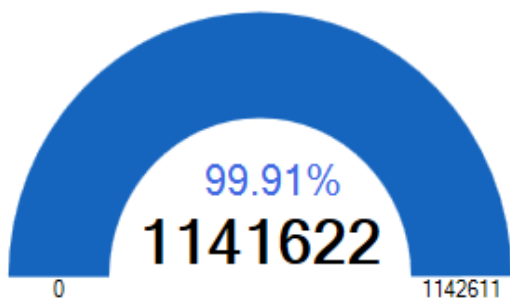


Total Acreage Monitored

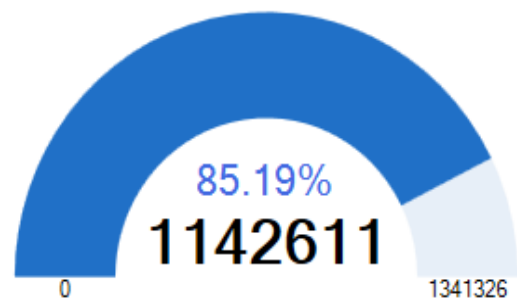


From the deliveries we can say we monitored **1,142,611** Tons of cane which represents **99.91%** of the tonnage that what was delivered up to July 29th 2022. At the end of crop **85.19%** of the projected estimate of **1,341,326** was delivered.

Total Tons Monitored



Total Tons Delivered vs PE 2021/2022



Production Monitoring – Tons Cane Per Acre for 2021-2022

From the deliveries monitored we get an average TCA for plant cane as **29.01** and ratoon **27.52**. The total tonnage reported as closed is **1,117,079.90** tons which represents for **91.98%** of the total tons monitored. See previous page.

***Please Note:** The average TCA shown below is only for deliveries that have a status of 'Closed'

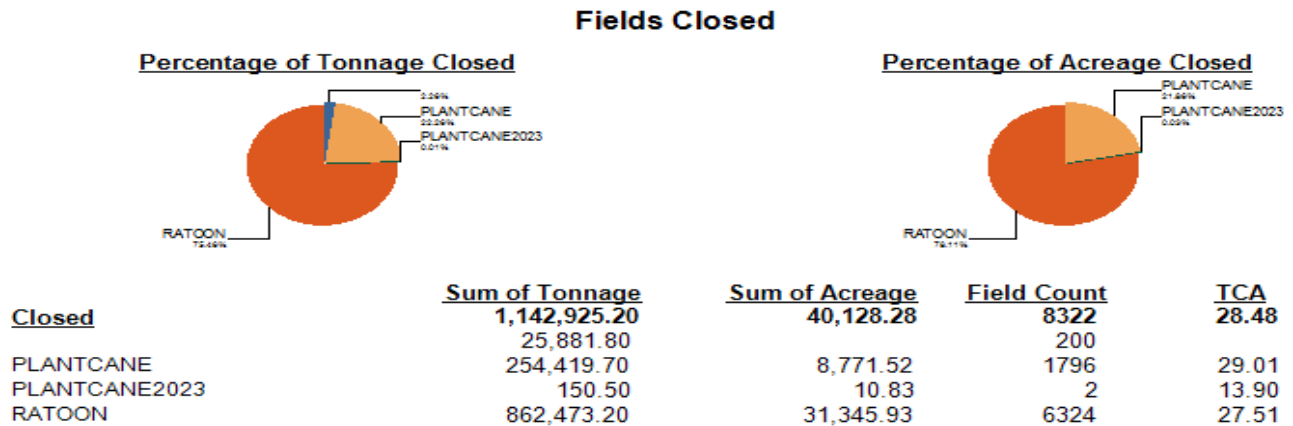



Figure 10 – Industry wide TCA – SIMIS September 2022 – Closed Parcels

	2021			2022		
Crop Class	Sum of Tonnage Harvested	Sum of Acreage Harvested	Number of Fields Harvested	Sum of Tonnage Harvested	Sum of Acreage Harvested	Number of Fields Harvested
PLANTCANE	223,111	18,036.72	1549	254,579	8,771.52	1796
RATOON	901,794.2	31,787.4	7147	862,499	31,345.9	6324
UNKNOWN				25,881	Unknown	200
TOTAL	1,124,905	49,824.12	8,696	1,142,925	40,128.28	8,322

Table 1 - Total Tonnages and Acreages harvested for Crop Season – 2020-2022 by crop class based on Closed Parcels and based on Raw SIMIS Delivery Data

Production Monitoring – Acres Not Monitored Vs Monitored

Methodology: From deliveries we know which farmers (with a unique id – BSI Code) have delivered cane to the mill. From the cane parcel layer each field is associated with this id (BSI Code). We select all fields of the farmers that delivered and summarize their acreages to get the total acreage harvested.

<p>Using data from SIMIS – Cane Parcel Layer</p> <p>Total Acres Mapped: 89,641</p> <p>Total Acres Harvested: 76,158</p> <p>Acreage Not Harvested: 13,483</p> <p>*Please note: Acres not harvested include all the parcels that did not match with a bsi code and that have been mapped but the production owner is unknown ie. doesn't have a bsi code. Thus, there might be some of these parcels that made a delivery but we cannot track them until they are identified and we can associate them with a bsi code.</p> <p>A breakdown of acreage not harvested by association is also below. These would be parcels that have a bsi code but did not match hence they did not deliver cane to the mill.</p>	
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Association	Acreage Harvested	Acreage Not Harvested
BSCFA-CZL	18,225	968
BSCFA-OW	24,543	1,416
BSICGP	6,179	0
CSCPA	8,974	522
NSCGA	5,852	204
PSCPCA	12,325	149
SIRDI	27.7	0
Total	76,125	3258

Unknow Acreage Not Harvested (Has not been associated with a BSI code nor association)	10,219 Acres
Total Acreage Not Harvested (Total Acres Mapped – Acreage Harvested)	13,477 Acres

Production Monitoring – Varieties Monitored

The chart below illustrates the total amount of fields monitored by variety. **B79474** represents 59.2 percent of the cane that was monitored.

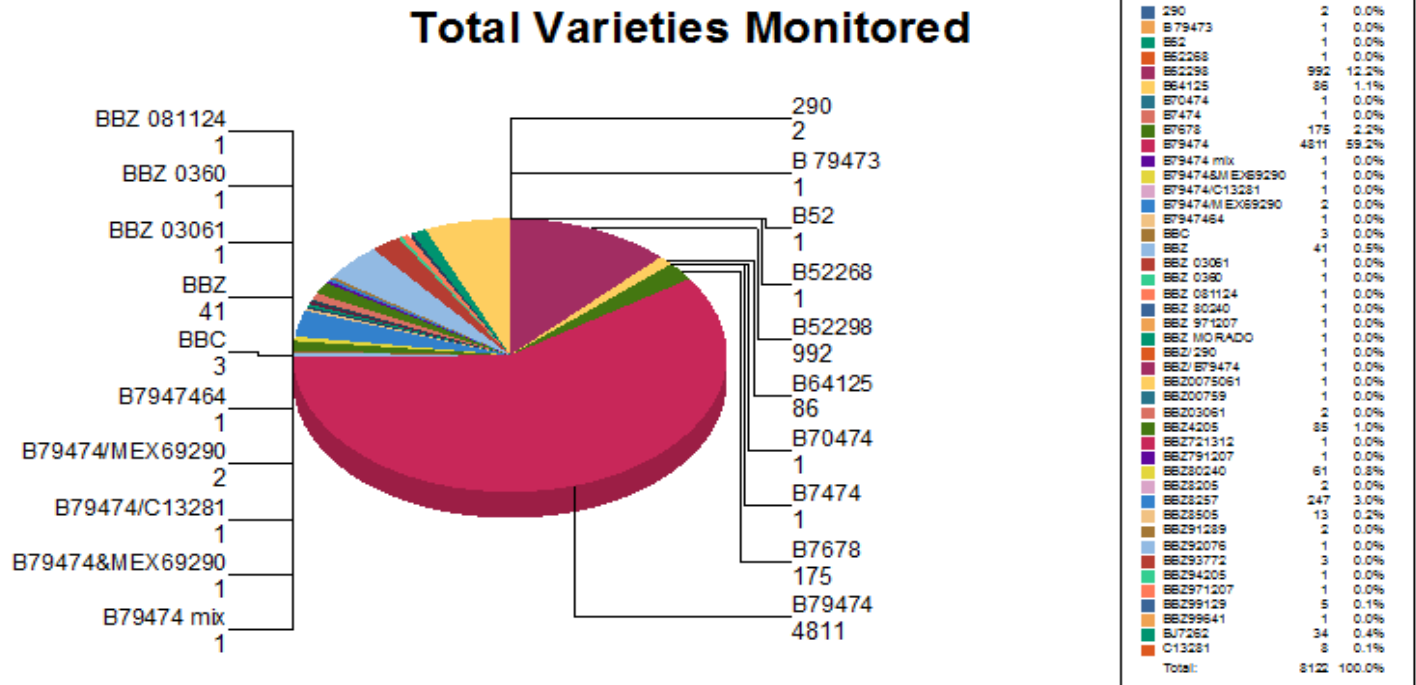


Figure 11 – Varieties Monitored – SIMIS Oct 2022

SIMIS Report

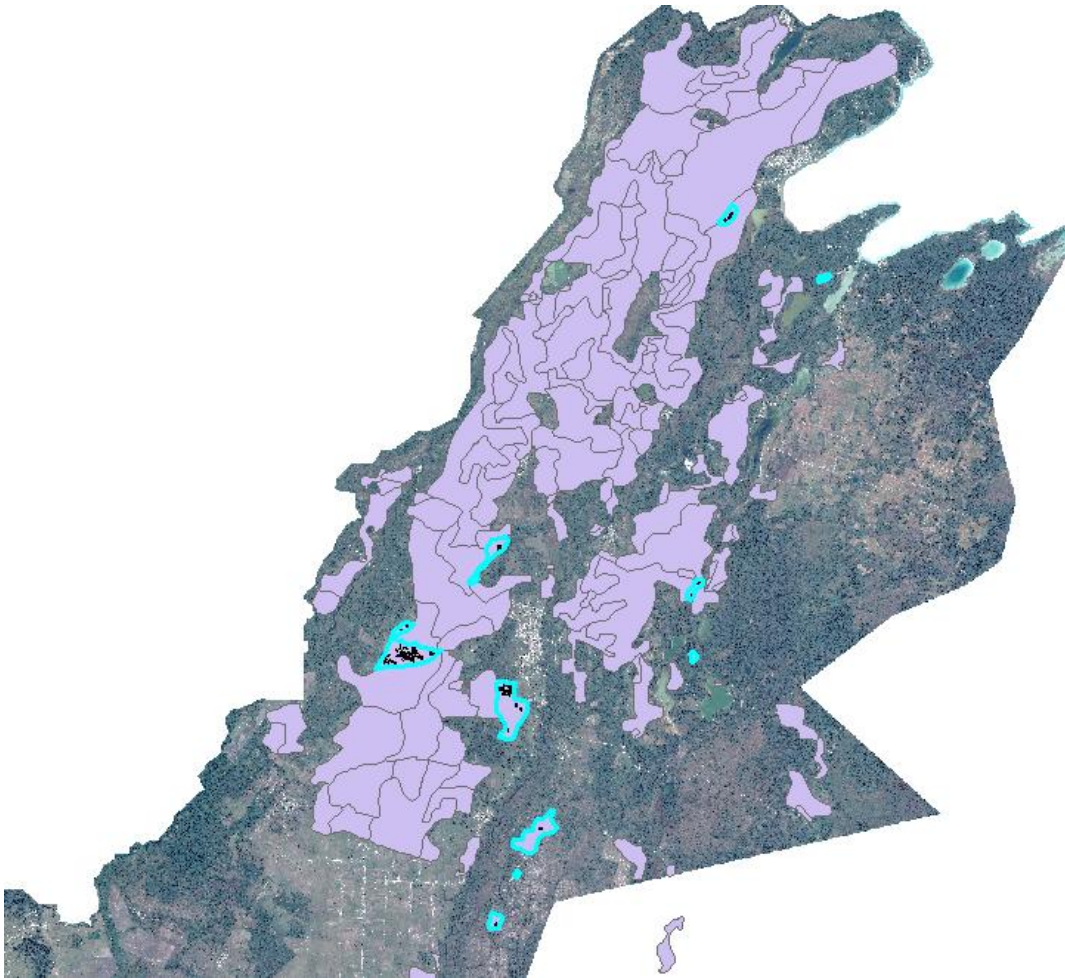
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Table 1 – Count of Individual Field Varieties Monitored

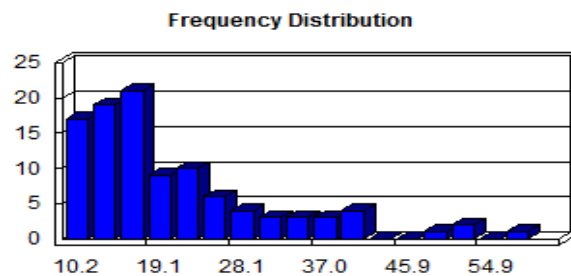
<u>Variety</u>	<u>Total</u>
B79474	4,811
B52298	992
UNKNOWN	525
MEX69290	352
BBZ8257	247
MIX	196
B7678	175
CP722086	117
RD7511	90
B64125	86
BBZ4205	85
CP721312	67
BBZ80240	61
BBZ	41
PR1048	40
BJ7262	34
MEX5932	23
POJ2878	22
CP	20
MEX 69290	19
MEX	16
BBZ8505	13
CP 722086	10
PR1117	10
C13281	8
BBZ99129	5
JA6417	4
UCW5465	3
BBC	3
MEX 290 & CP	3
BBZ93772	3
BBZ91289	2
BBZ03061	2
290	2
Mex290	2
B79474/MEX69290	2
BBZ8205	2
BBZ MORADO	1

Production Monitoring – SOIL Productivity 2020-2021

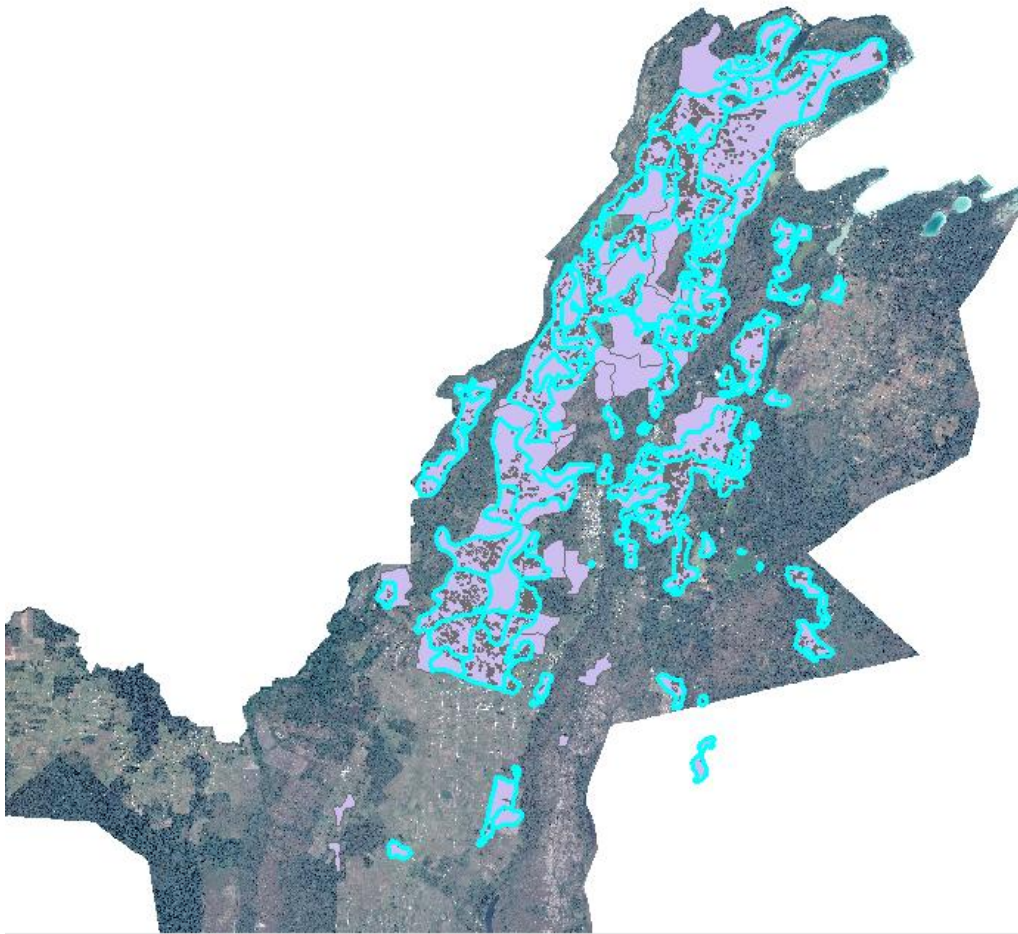
Maps showing fields selected with a TCA(Tons Cane per Acre) >10 < 60 in highlighted areas known to be **Alfisols** for 2020's production monitoring program.



Count of Fields = 101
Minimum TCA = 10.19
Maximum TCA = 59.05
Average TCA for **Alfisol** = 21.73

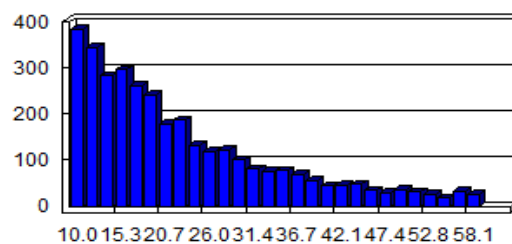


Maps showing fields with a TCA(Tons Cane per Acre) >10 < 60 in highlighted areas known to be
Inceptisols for 2020's production monitoring program

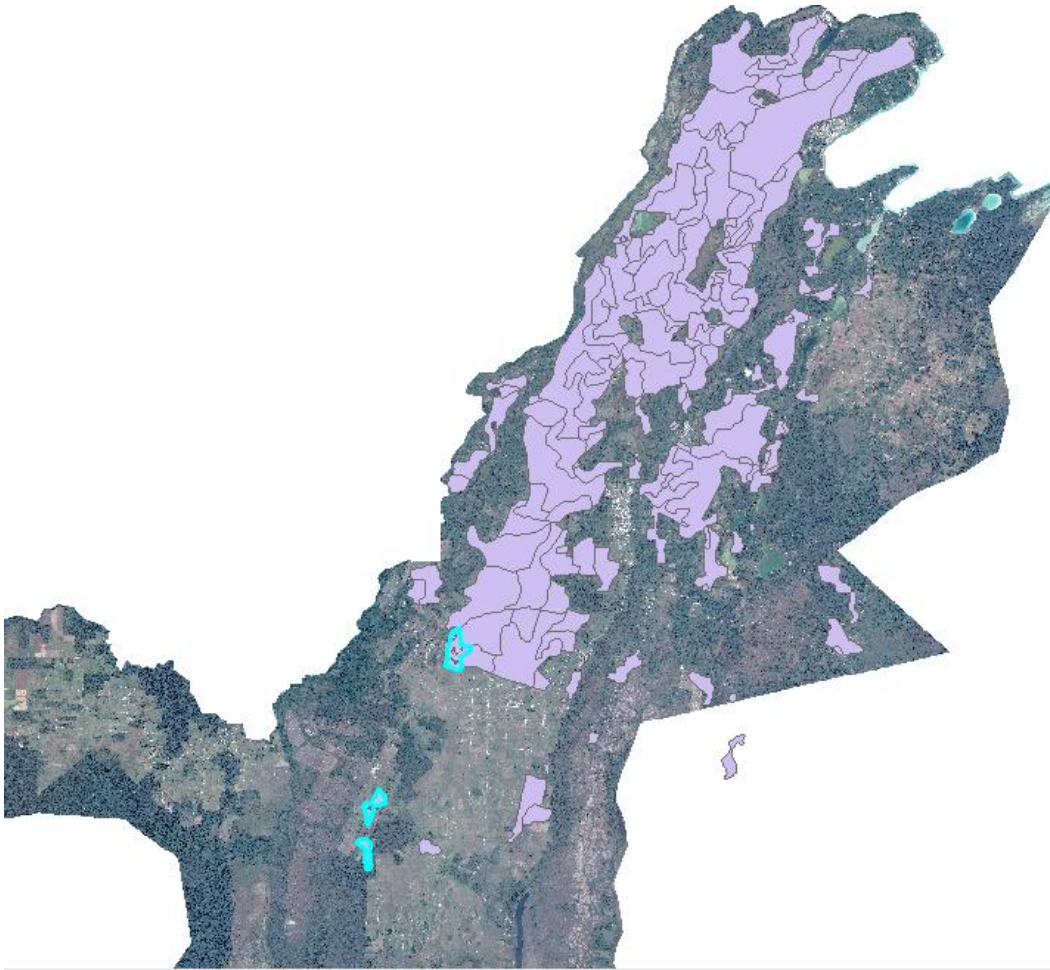


Count of Fields = 3372
Minimum TCA = 10
Maximum TCA = 59.87
Average TCA for **Inceptisol** = 23.36

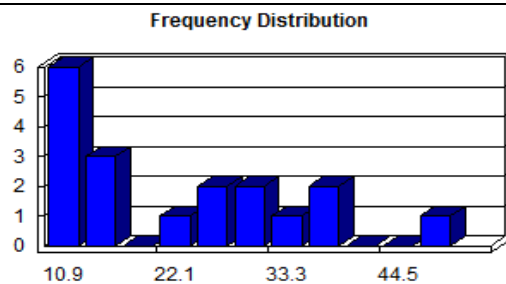
Frequency Distribution



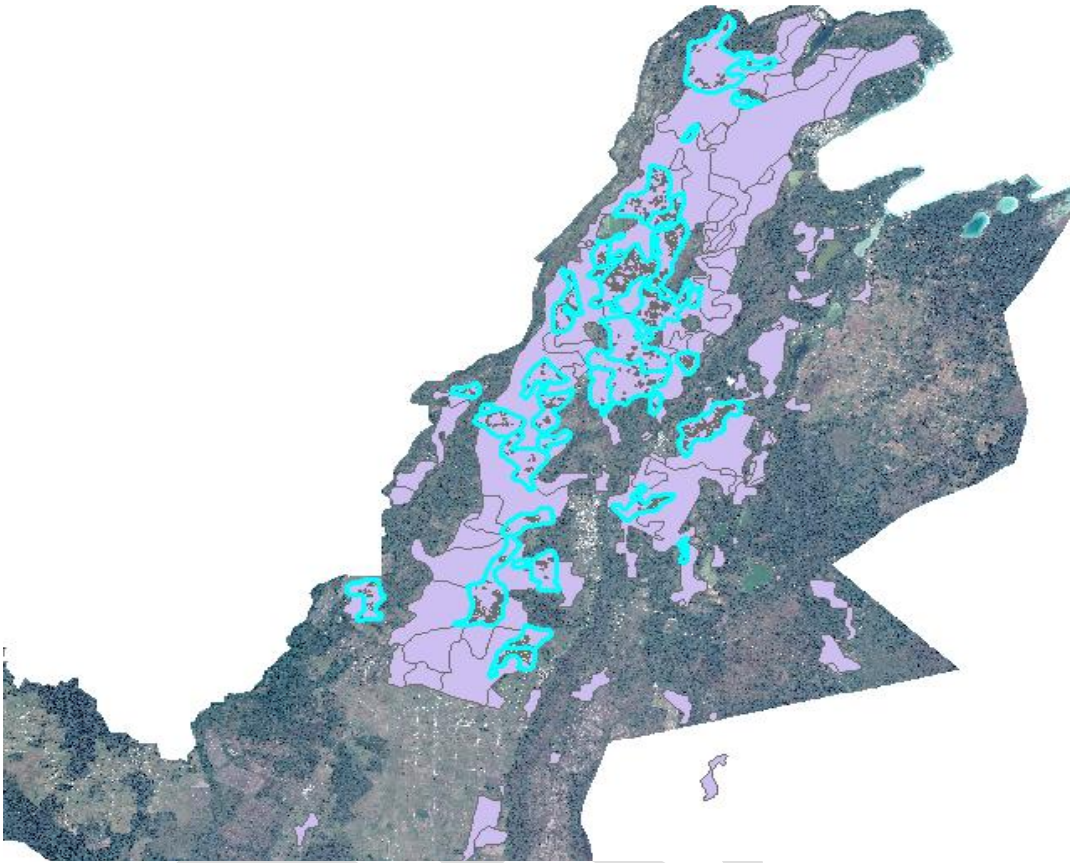
Maps showing fields with a TCA(Tons Cane per Acre) $>10 < 60$ in highlighted areas known to be **Mollisols** for 2020's production monitoring program



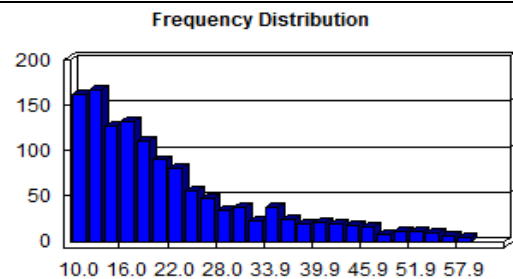
Count of Fields = 18
Minimum TCA = 10.91
Maximum TCA = 50.46
Average TCA for **Mollisols** = 23.45



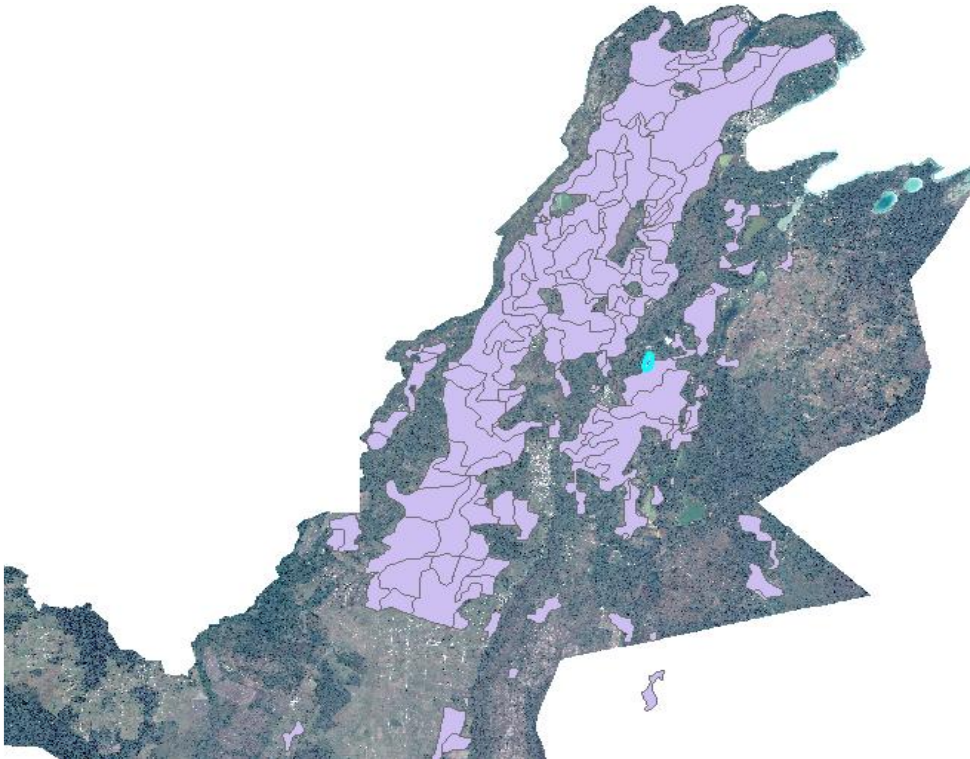
Maps showing fields with a TCA(Tons Cane per Acre) >10 < 60 in highlighted areas known to be **Vertisols** for 2020's production monitoring program



Count of Fields = 1276
Minimum TCA = 10
Maximum TCA = 59.39
Average TCA for **Vertisols** = 22.28

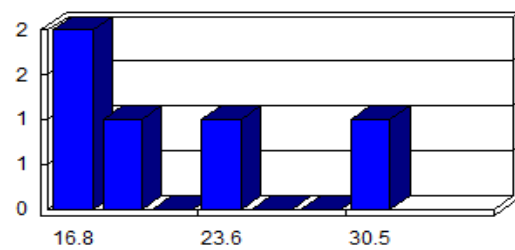


Maps showing fields with a TCA(Tons Cane per Acre) >10 < 60 in highlighted areas known to be **Vertic Hap** for 2020's production monitoring program.



Count of Fields = 5
Minimum TCA = 16.78
Maximum TCA = 31.24
Average TCA for **Vertic Hap** = 22.04

Frequency Distribution

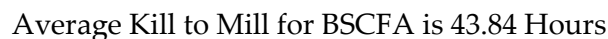


Tracking the time between when the sugar cane is burnt to when it is delivered has always been of interest to be able to compare with quality. The production monitoring process now allows us to be able to tell the time difference in hours throughout the cane season from the time cane is burnt to the time it is delivered. The charts below show the average time difference in hours for parcels that were monitored. On average the Kill to Mill for the entire crop is **42.07 Hours** for all deliveries.

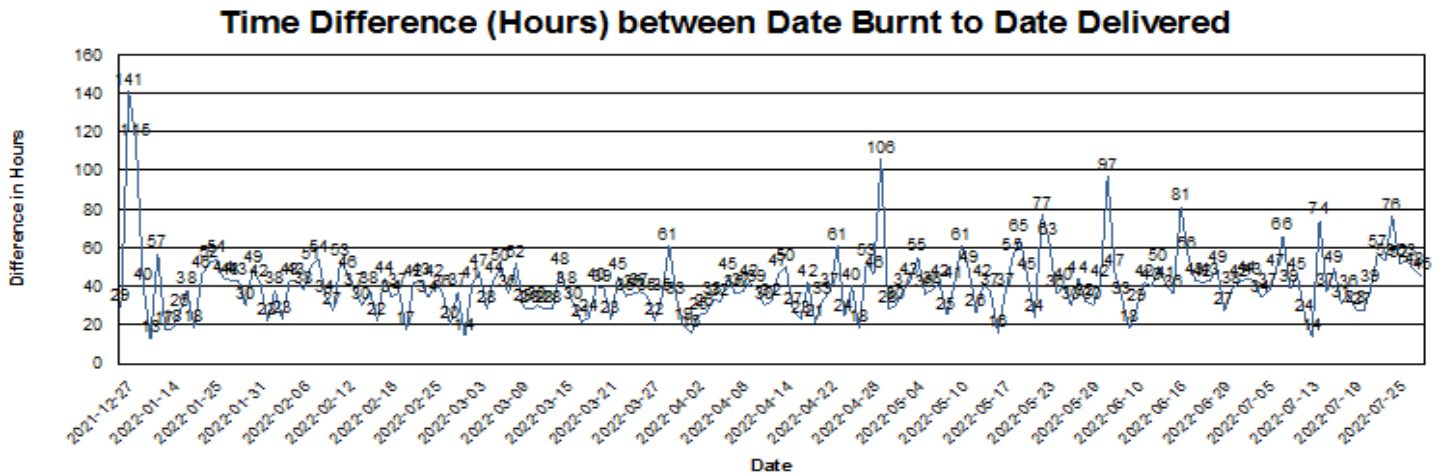
Time Difference (Hours) between Date Burnt to Date Delivered



Time Difference (Hours) between Date Burnt to Date Delivered

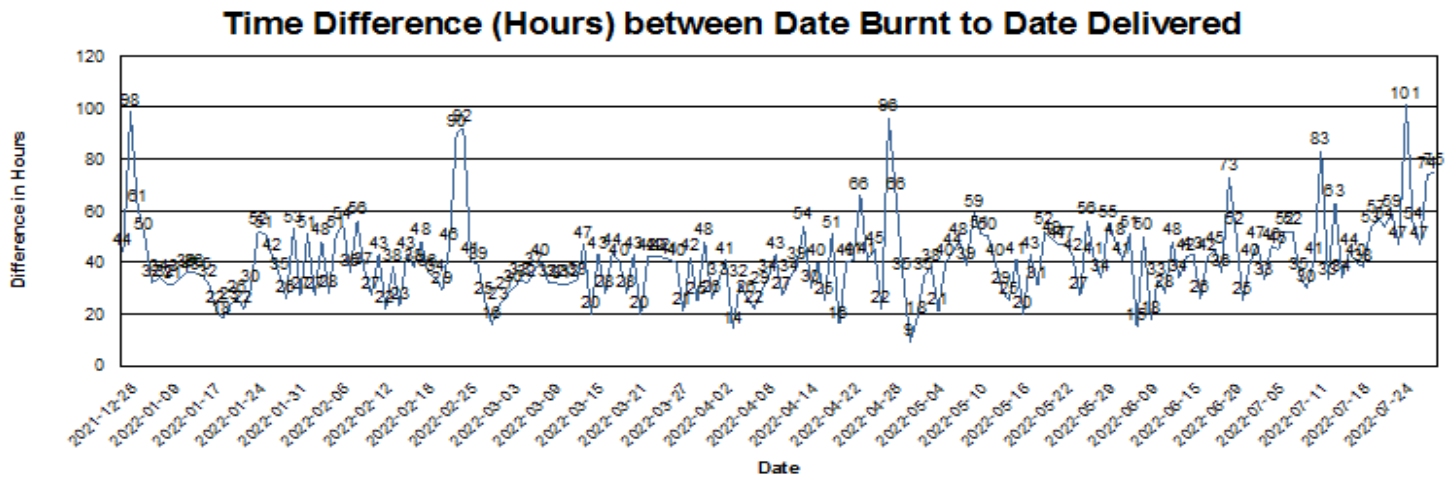


Kill to Mill Factor for **CSCPA**



Average Kill to Mill for CSCPA is 40.08 Hours

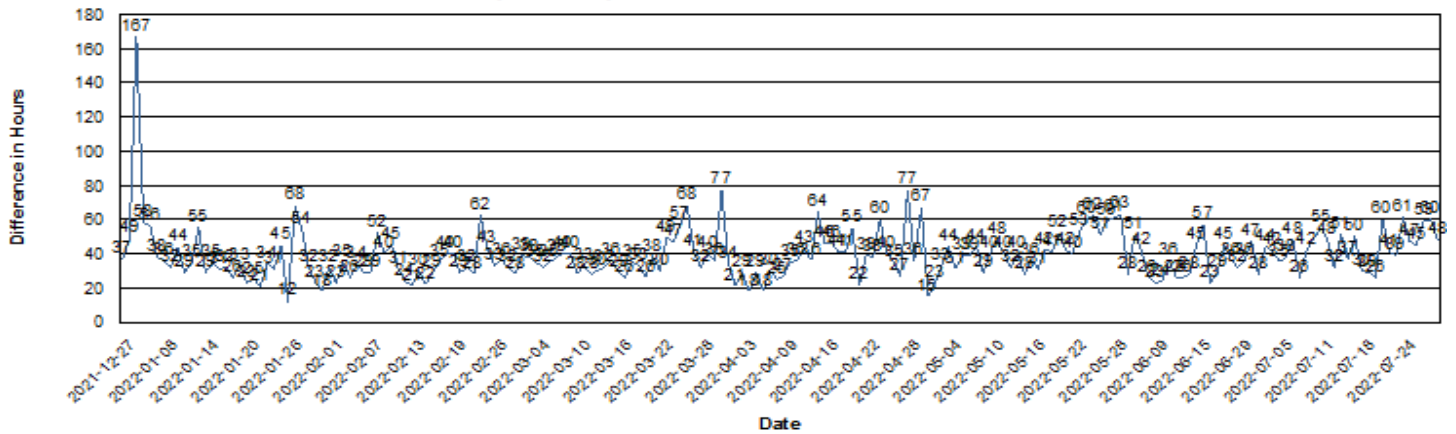
Kill to Mill Factor for **PSCPA**



Average Kill to Mill for PSCPA is 40.12 Hours

Kill to Mill Factor for **CGP**

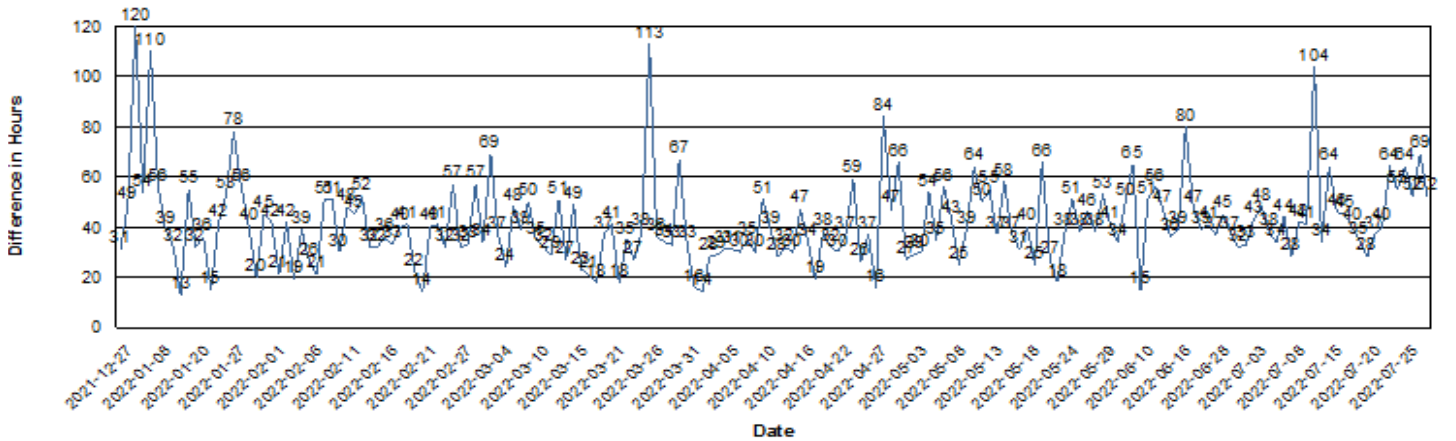
Time Difference (Hours) between Date Burnt to Date Delivered



Average for CGP is 38.79 Hours

Kill to Mill Factor for **NSCGA**

Time Difference (Hours) between Date Burnt to Date Delivered



Average for NSCGA is 41.27 Hours

Year	ALL	BSCFA	NSCGA	PSCPA	CSCPA	CGP
2022	42.07	43.84	41.27	40.12	40.08	38.79
2021	41.15	41.38	43.76	41.47	43.76	36.96
2020	39.88	40.63		39.77	40.42	35.88
2019	40.01	44.5		42	39.4	39.72
2018	39.95	38.16		23		39.97

5 Year Kill to Mill Factor

Cane Reporting 2019-2020

One of the main benefits of SIMIS is the ability to conduct Sugar Cane Reporting at the various associations. Cane farmers would visit their association to report left over cane, cane used for seed, plant cane new land and cane that was burnt. By just stating their name the SIMIS would look up the farmer's parcels and that farmer could point out the parcel and how much was left. A marker would indicate the parcel/parcels. These markers would then be used to do the Cane Verification process. This system can also be used throughout the year to report any activity from association members which can then lead to verification and updates of the Sugar Cane Parcel Information.

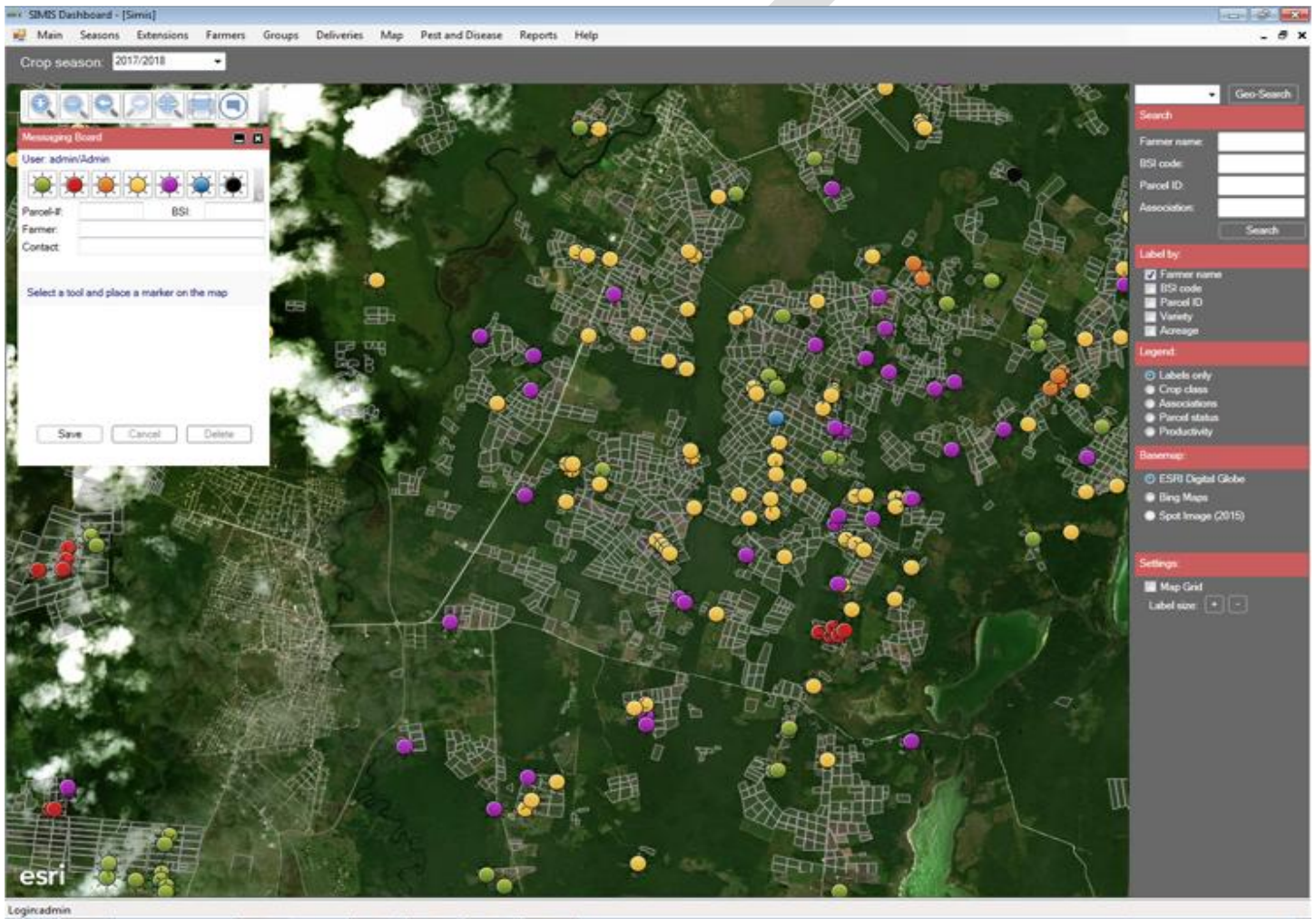
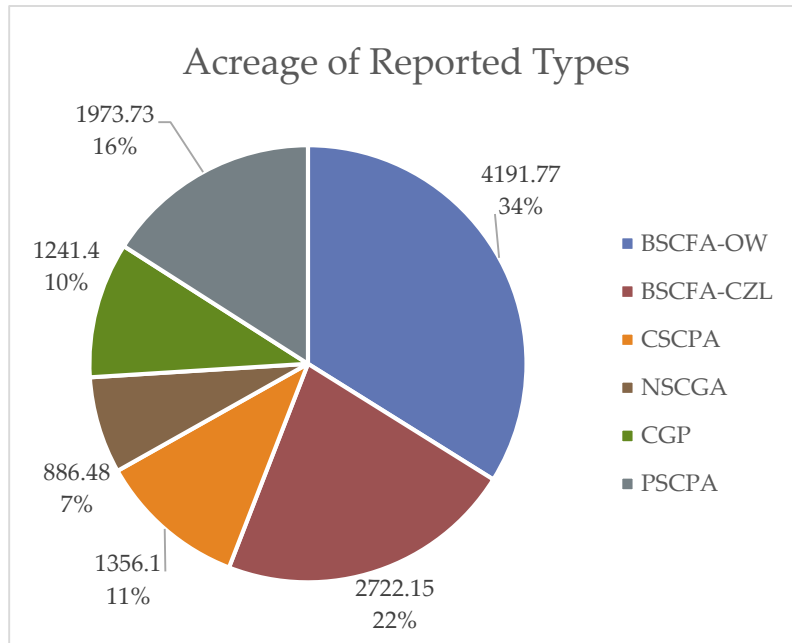


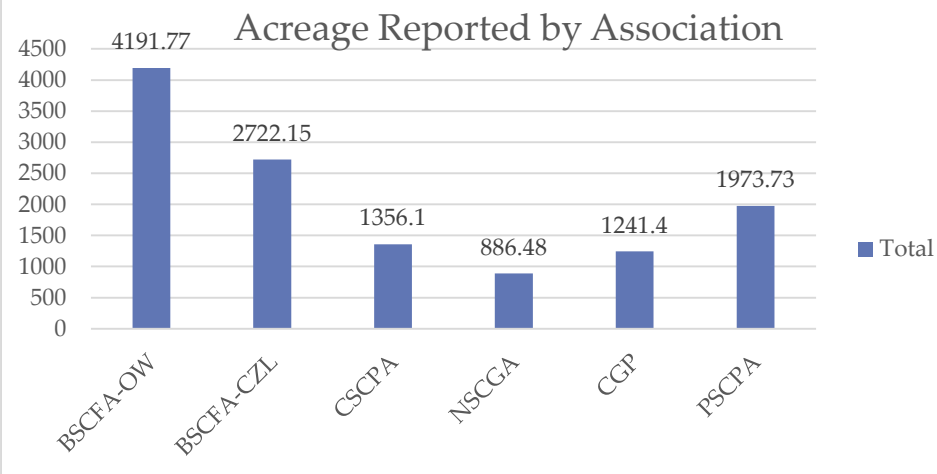
Figure 14 - SIMIS Cane Reporting Tool

Cane Reporting Results 2022

For the period of August 13th to September 1st 2022 cane farmers made 2,722 reports. Totaling **12,371.63** Acres.

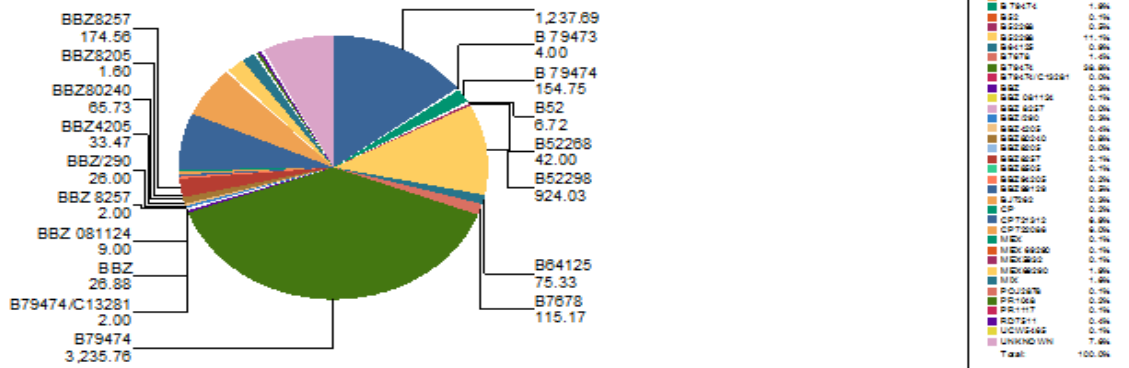


Plant Cane Rehab	3290.69
Plant Cane New Land	1179.89
Stand Over Ratoon	6807.15
Used for Seed	269.7
Parcel Burnt	636.5
Flooded	26
Other	161.7

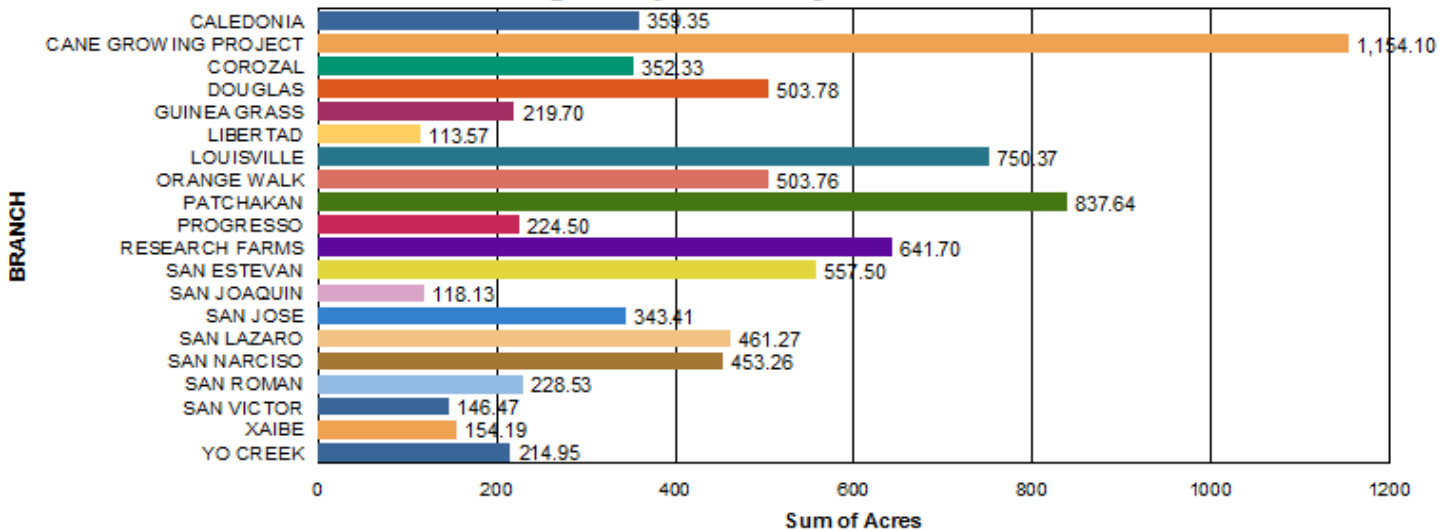


BSCFA-CZ	2722.15
BSCFA-OW	4191.77
CSCPA	1356.1
PSCPA	1973.73
NSCGA	886.48
BSICGP	1241.4

Acreage of Reported Varieties



Acreage Reported By Branches



Fuel Subsidy Program

Since 2020 SIMIS is now responsible for deployment of fuel subsidy tickets. This year (2022) a total of 1,144,292.08 gallons of fuel were issued to the cane farmers. Below are the gallons issued by branch and amount of fees collected.

S.I.M.I.S**Sugar Industry Control Board**

08/09/2022

FUEL SUBSIDY REPORT

<u>Location</u>	<u>Branch</u>	<u>Tonnage</u>	<u>Gallons</u>	<u>Issued</u>	<u>Remaining</u>	<u>% Collected</u>	<u>Fees Collected</u>	<u>Not Collected</u>
		<u>Delivered</u>	<u>Allocated</u>					
CZ	CALEDONIA	49,575.74	44603	44504	99	99.78	4,450.40	9.90
CZ	COROZAL	59,948.96	91860	91860		100.00	9,186.00	
CZ	LIBERTAD	13,610.80	15083	15010	73	99.52	1,501.00	7.30
CZ	LOUISVILLE	104,567.28	115098	114774	324	99.72	11,477.40	32.40
CZ	PATCHAKAN	129,118.07	159112	159080	32	99.98	15,908.00	3.20
CZ	SAN JOAQUIN	14,891.64	19916	19884	32	99.84	1,988.40	3.20
CZ	SAN NARCISO	58,870.49	61295	61218	77	99.87	6,121.80	7.70
CZ	SAN VICTOR	33,485.24	27055	26996	59	99.78	2,699.60	5.90
CZ	XAIBE	14,803.95	20547	20482	65	99.68	2,048.20	6.50
OW	DOUGLAS	49,829.14	49331	49277	54	99.89	4,927.70	5.40
OW	GUINEA GRASS	47,748.19	44607	44568	39	99.91	4,456.80	3.90
OW	ORANGE WALK	164,278.51	110357	110196	161	99.85	11,019.60	16.10
OW	PROGRESSO	33,349.96	39006	38645	361	99.07	3,864.50	36.10
OW	SAN ESTEVAN	157,622.05	134737	134423	314	99.77	13,442.30	31.40
OW	SAN JOSE	23,951.80	17702	17672	30	99.83	1,767.20	3.00
OW	SAN LAZARO	111,164.70	129593	129492	101	99.92	12,949.20	10.10
OW	SAN LORENZO	7,882.85	5517	5517		100.00	551.70	
OW	SAN ROMAN	23,764.10	15685	15535	150	99.04	1,553.50	15.00
OW	YO CREEK	45,828.61	31800	31653	147	99.54	3,165.30	14.70
Totals		1,144,292.08	1,132,904	1,130,786	2,118	99.74	\$ 113,078.60	\$ 211.80

Gallons Issued by Association

<u>Association</u>	<u>TonDel</u>	<u>Gallons</u>	<u>Gallssu</u>	<u>GalRemain</u>	<u>FeeCol</u>	<u>FeeNotCol</u>	<u>pct_GalCol</u>
BSCFA-CZ	250476.30	281642	280945	697	28094.50	69.70	99.75
BSCFA-OW	366597.65	343940	343075	865	34307.50	86.50	99.75
CGP	94499.62	60477	60477	0	6047.70	0.00	100.00
CGPCZL	5664.09	5153	5153	0	515.30	0.00	100.00
CGPOW	7882.85	5517	5517	0	551.70	0.00	100.00
CSCPA	115899.42	136787	136490	297	13649.00	29.70	99.78
IND	7290.26	9737	9737	0	973.70	0.00	100.00
NSCGA	88173.49	104405	104334	71	10433.40	7.10	99.93
PSCPA	207725.94	185155	184967	188	18496.70	18.80	99.90
SIRDI	82.45	91	91	0	9.10	0.00	100.00
	1144292.08	1132904	1130786	2118	113078.60	211.80	99.91

Status of Simis Services

Currently the **SIMIS** is responsible for the Fuel subsidy program of the SICB (Sugar Industry Control Board) and for creating Production Monitoring reports needed for the SCPC (Sugar Cane Parcel Committee. The current system is primarily available to the SICB via a local area network and is available as view only for stakeholders and associations.

While there has been an effort to provide the associations with Virtual Private Network access there is still a lack of usage scenarios primarily due to non-technical staff workers. Thus, the SIMIS is more of an administrative system used to provide services under the SICB. Nevertheless, there has been the need to manage farmer data – such as the case for the PSCPA where they had requested an interface to manage their farmer information. Other services such as map printing and extraction of delivery information have also been requested by stakeholders and associations.

Future development of the SIMIS would involve custom development of reports and data access of farmer deliveries for the associations and stakeholders as their needs be.

PRIMARY USES OF SIMIS under the Sugar Industry Control Board.

1. **Fuel Subsidy** - Weekly ticket processing and distribution. Weekly Fuel Subsidy Reports.
2. **Production Monitoring** – Collecting delivery information from ASR MILL, Production Monitoring Reports.
3. **Sugar Cane Parcel / Maps** – Update Sugar Cane Parcel GIS Information after verification exercise and provide maps for farmers.
4. **Sugar Cane Verification program** – Collect farmer reports on left over cane for verification exercise. Provide GPS coordinated of fields that need to be verified.
5. **SIRDI Replanting Program** – Issue SIRDI replanting program forms.
6. **Farmer Information Database** – Collect new sugar cane farmer data – dob, phone number etc.

Status of IPDM Early Warning System

What is an Early Warning System?

- A system that provides a person or persons relevant or timely information prior to a disaster in order to make informed decisions and plan to take action.
- In general, the main functions of an early warning system are to provide risk analysis, monitoring and warning; dissemination and communication; and a response capability.

IPDM Integration

- Funded by the European Union
- Implemented by SIRD I project on Northern Sugar Belt
- Involved Integration of Frog hopper Monitoring Sites Data into SIMIS Platform (Core Database)
- Development of new Views, Forms and Database Tables into the Sugar Industry Management Information System – a custom software tool built for industry stakeholders containing farmer information, production monitoring data for displaying geographic information data across satellite imagery of northern belt.

How it works?

- 1. Establish Monitoring Site by SIRD I Field Officers
- 2. Setup Traps
- 3. Collect Frog hopper (Pest) data.
- 4. Input data into SIMIS Core Database
- 5. Analyze data geographically
- 6. Send text warnings to farmers using associated cell numbers in database.

Status of IPDM Early Warning System

At the moment the Early Warning System is not currently in use. However, a database exists that requires data to be fed in order to be able to send SMS via Text Messaging services. Currently SIRD I is recording information into a spread sheet that needs to be input into the SIMIS IPDM forms platform either by reading the data in a formatted excel file or manually input via the system front end.

At the moment no standardized excel spread sheet has been provided and there are constant changes in data collected leading to more custom software development that cannot be funded. There also exist a cost per message sent to farmer which needs to be addressed by the organization.