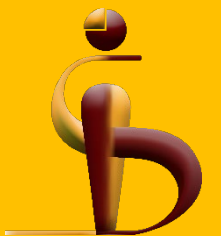




# Realtime survey management and quality assurance and data processing using open- source tools for the modernization of the production of price indices in Belize 2022-2023

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Melvin Perez – Statistician, Economic  
Statistics Department



STATISTICAL INSTITUTE OF BELIZE

## CONTENTS

- ❖ About Belize and the Statistical Institute of Belize
- ❖ Predecessors to the New System
- ❖ New CPI System

# Belize

## Brief Intro



### Geography

Belize is located in Central America, and it is bordered to the north by Mexico, to the south and west by Guatemala and to the east by the Caribbean Sea. The size of the territory totals 8,867 square miles, including 266 square miles of island.



Belize is also known for its extreme biodiversity and distinctive ecosystems. On the coast, there is a swampy coastal plain with mangrove swamps. In the south and interior there are hills and low mountains. Most of our land is undeveloped and is forested with hardwoods. It is a part of the Mesoamerican biodiversity hotspot and it has many jungles, wildlife reserves, a large variety of different species of flora and fauna and the largest cave system in Central America. Some species of Belize's flora and fauna include the black orchid, the mahogany tree, the toucan and the tapir.







# Belize

## Brief Intro

### History

The first people to develop Belize were the Maya around 1500 B.C.E. As shown in archeological records, they established a number of advanced settlements within the country. These include Caracol, Xunantunich, Lamanai, Lubaantun, and many others. The first European contact with Belize occurred in 1502 when Christopher Columbus reached the area's coast. In 1638, the first European settlement was established by England and for 150 years, many more English settlements were set up.



In 1840, Belize became a "Colony of British Honduras" and in 1862, it became a crown colony. For one hundred years after becoming a crown colony, Belize was a representative government of England, however in January 1964, full self-government with a ministerial system was granted. In 1973, the nation's name was changed from British Honduras to Belize and on September 21, 1981, full independence was achieved.





# Belize Brief Intro



## People

We are truly a melting pot of colorful personalities, making our more than 400,000 residents the country's greatest resource for tourism. The Belizean people are made up of Maya, Mestizo, Kriol, Garifuna, East Indian, Mennonite, Arab and Chinese.

A blending of cultures has resulted in one of the happiest and most peaceful countries in the region

**Language** English is the official language of Belize; we are blessed with a rich cultural diversity. Throughout the country you will meet and greet people that speak :

- Spanish
- Belizean Kriol
- Garifuna (African-based)
- Maya-Kekchi, Maya Mopan
- Mandarin,
- Low German
- Hindi
- Etc..



belizo

iz

open

## **About the SIB**

The Statistical Institute of Belize is an autonomous body created to collect, compile, extract, analyze and disseminate official statistics for the country of Belize, regarding the:

- Demography
- Social
- Environment
- Economy

The SIB is established under the Laws of Belize, under the SIB Act, No. 9 of 2006.

### Mission Statement:

“To provide with the highest degree of integrity, quality and with strict adherence to professional and international standards, accurate, reliable and timely statistical information to facilitate effective policy and decision-making for local and international clients.”

### Vision Statement:

“The Statistical Institute of Belize shall be recognized as the leading national statistical agency, operating with professionalism and transparency in providing accurate and timely information that contributes to the development of Belize.”



# Consumer Price Index Belize

## About the SIB CPI Belize

- Historically the SIB/CSO produced Quarterly CPI prior to 2011
  - Fixed basket approach, Regional (urban only)
- From 2011 onward the SIB produces monthly CPI.
  - Fixed basket approach
  - Expanded Regions (urban only)
    - Since October 2020, expanded coverage (some rural)
- Constraints & Limitations for the CPI
  - Manpower
    - Only 1 FT employee for the entire CPI
    - Limited exposure to theoretical training
  - Financial Allocation (Budget)
  - High turnover rate of temporary workers

### CPISYS

Built By CSO 1999, VisualFoxPro

- Produced Forms for data collection (one letter size form per product)
- Program for data entry
- database management and processing in Mysql, Access and Excel

### PIPS

Built by IMF, VisualBasic

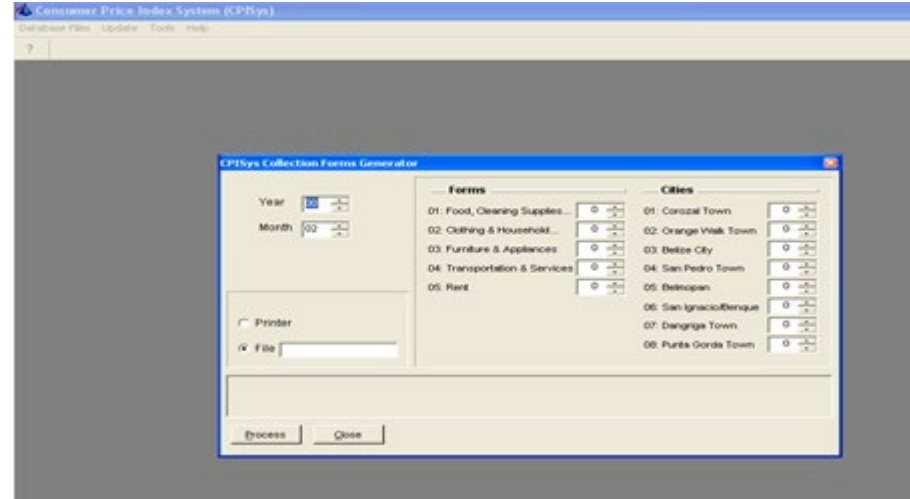
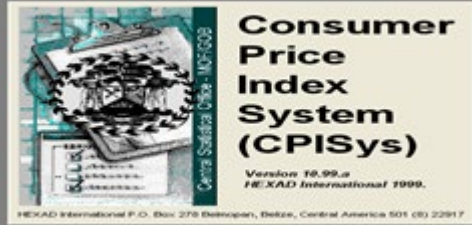
- Generates excel sheets for data collection
  - Sheets printed for collection
  - Data entry through macro excel sheet
  - Database management in Access

### Improvements

SIB, automation for data collection using PIPS

- Google Sheets – distribution via google drive, data collection using google sheets, Tablets
- CPI App v1.0- Android application for data collection, retrieve and export excel sheet using email account

# History- CPISYS



BELIZE: C.S.O. MINISTRY OF FINANCE BELMOPAN FORM 1: FOOD, CLEANING SUPPLIES AND PERSONAL CARE ITEMS

MONTH FEA ITEM \_\_\_\_\_

ESTABLISHMENT CODE \_\_\_\_\_ CPI CITY CODE \_\_\_\_\_

NAME \_\_\_\_\_ ADDRESS \_\_\_\_\_ CITY \_\_\_\_\_ TELEPHONE \_\_\_\_\_

RESPONDENT \_\_\_\_\_

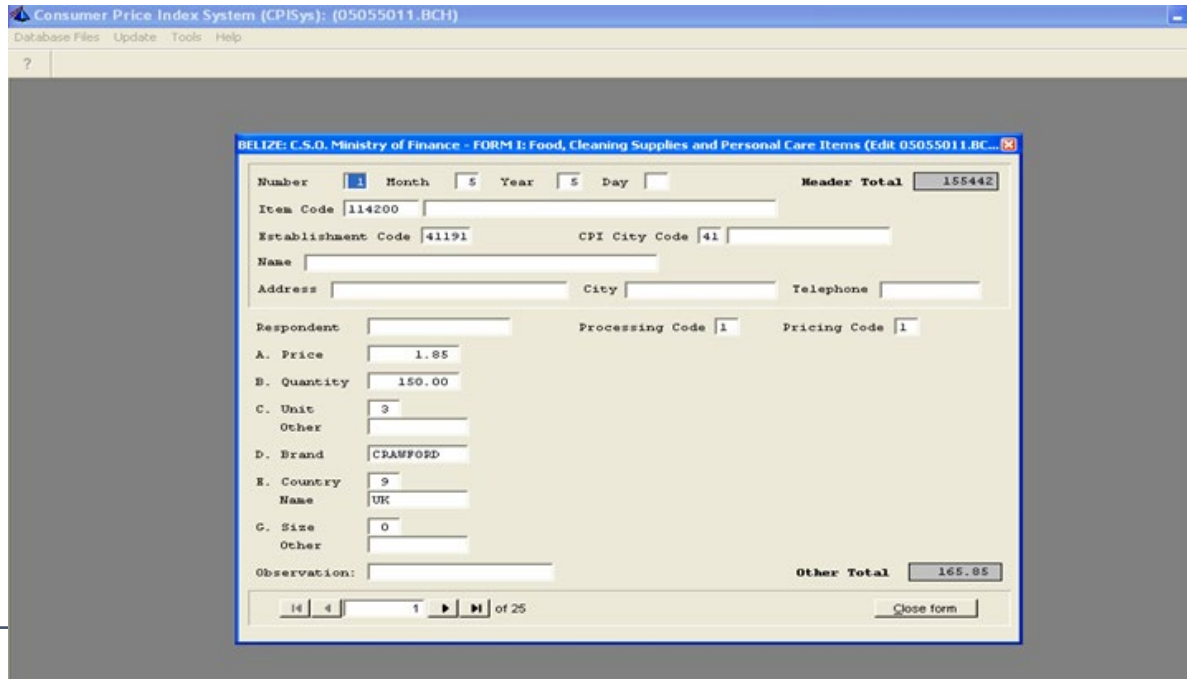
PROCESSING CODE: 1 COMPARABLE 2 NOT COMPARABLE 3 NO PRICE AVAILABLE

PRICING CODE: 1 COMPLETE, NO SPECIFICATION CHANGE 2 COMPLETE, WITH SPECIFICATIONS CORRECTIONS 3 SUBSTITUTION 4 NO SUBSTITUTIVE ITEM AVAILABLE

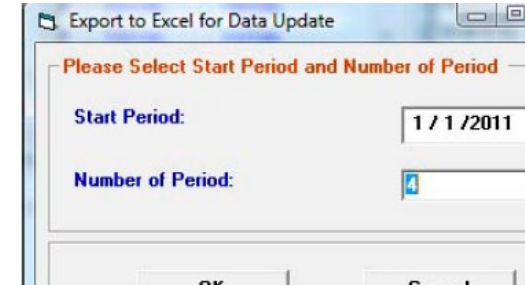
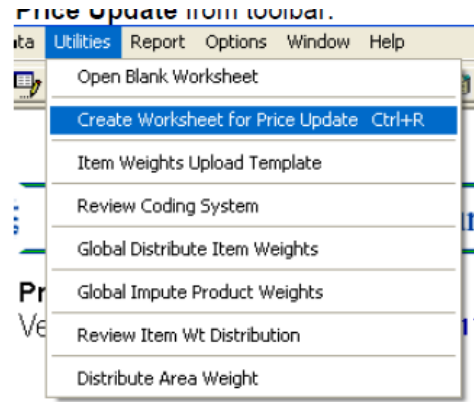
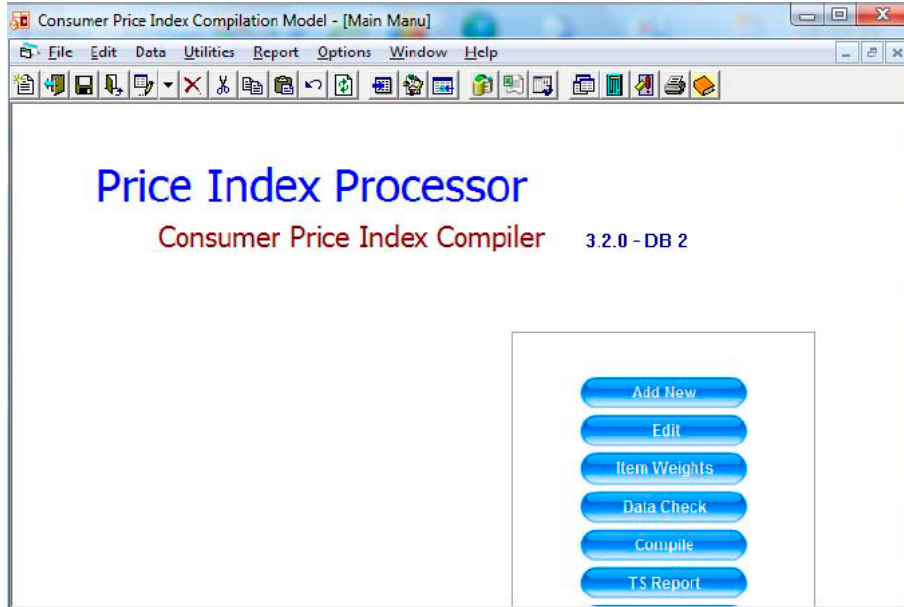
5 REFUSAL 6 NO CONTACT 7 SEASONAL/TEMPORARILY OUT OF STOCK

	PREVIOUS	CURRENT		PREVIOUS	CURRENT
A. PRICE			E. COUNTRY OF ORIGIN		
B. QUANTITY			01. DOMESTIC		01
C. MEASUREMENT UNIT			02. CENTRAL AMERICA		02
01. POUNDS		01	03. MEXICO		03
02. KILOGRAMS		02	04. USA		04
03. GRAMS		03	05. CANADA		05
04. OUNCES		04	06. SOUTH AMERICA		06
05. BOTTLES		05	07. CARICOM		07
06. LITRES		06	08. EUROPE		08
07. QUART		07	09. UNITED KINGDOM		09
08. PINT		08	10. JAPAN/FAR EAST		10
09. US GALLONS		09	11. OTHER		11
10. MILLILITRES		10	G. SIZE		
11. FLUID OUNCES		11	01. SMALL		01
12. PACK		12	02. MEDIUM		02
13. DOZEN		13	03. LARGE		03
14. TIN		14	99. OTHER (SPECIFY)		99
15. UNITS		15			
16. IMPERIAL GALLONS		16			
17. OTHER (SPECIFY)		17			
D. BRAND					

INTERVIEWER OBSERVATIONS



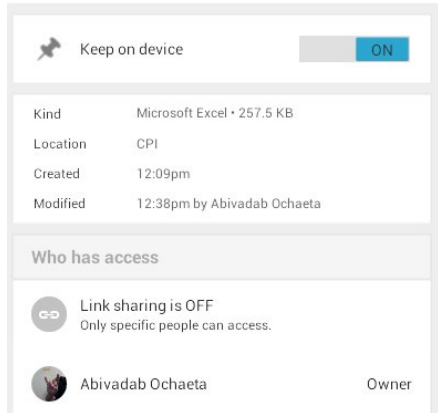
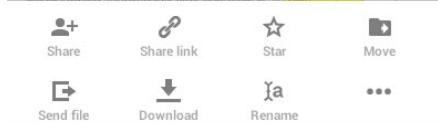
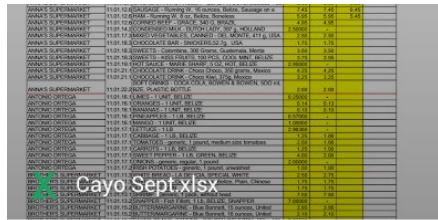
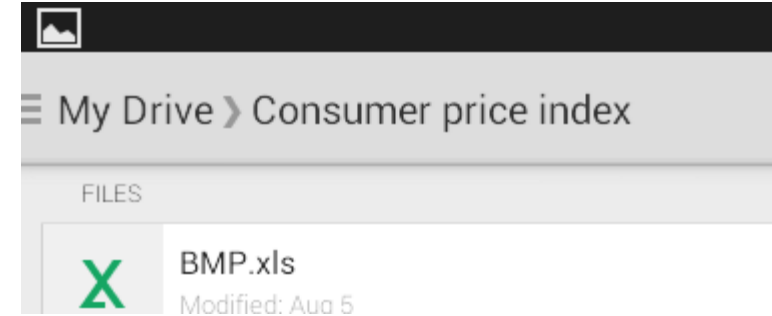
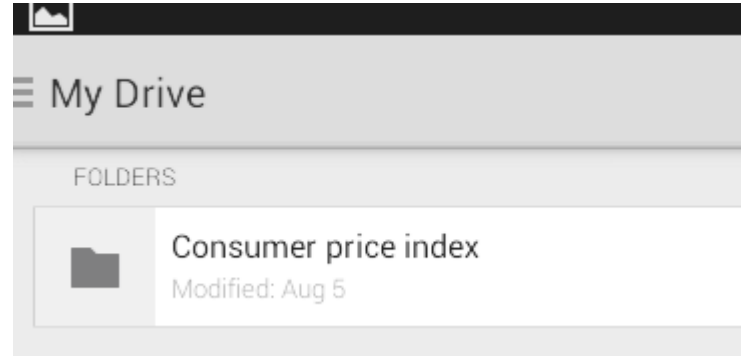
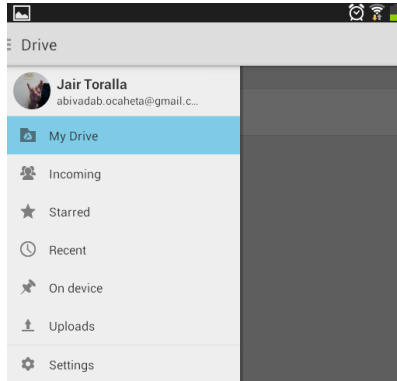
# History- PIPS



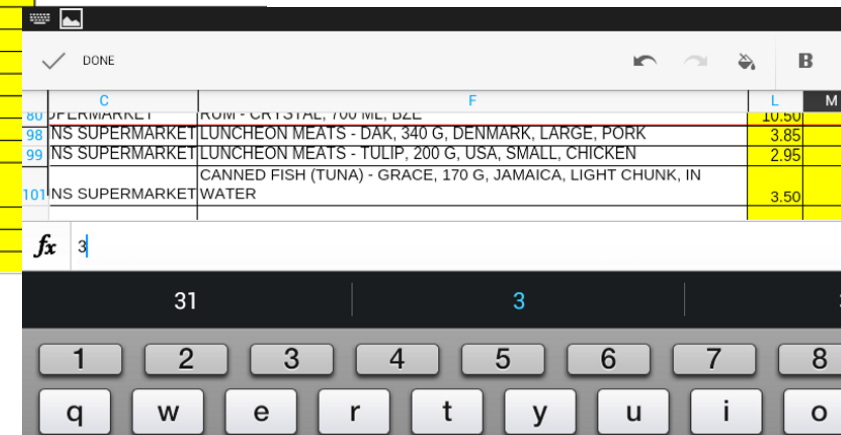
	A	B	C	D	E	F	G	H	I	J	K	L
1	Save Back to CPI Database											
2	Outlet SN	Outlet ID	Outlet Name	IsProd	Code	Description	Unit	Share	Weight	01/2011	02/2011	03/2011
3	195	200.00	Big B Super Center	TRUE	11.01.11.1_01	Rice/RICE		1	0			
4	195	200.00	Big B Super Center	FALSE	11.01.11.1_01a	rice loose 2lbs		0	0	0	0	0
5	195	200.00	Big B Super Center	FALSE	11.01.11.1_01a1	rice loose 2lbs		0	0	0	0	0
6												
7												
8												
9												
10												
11												
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15												
16												
17												
18												



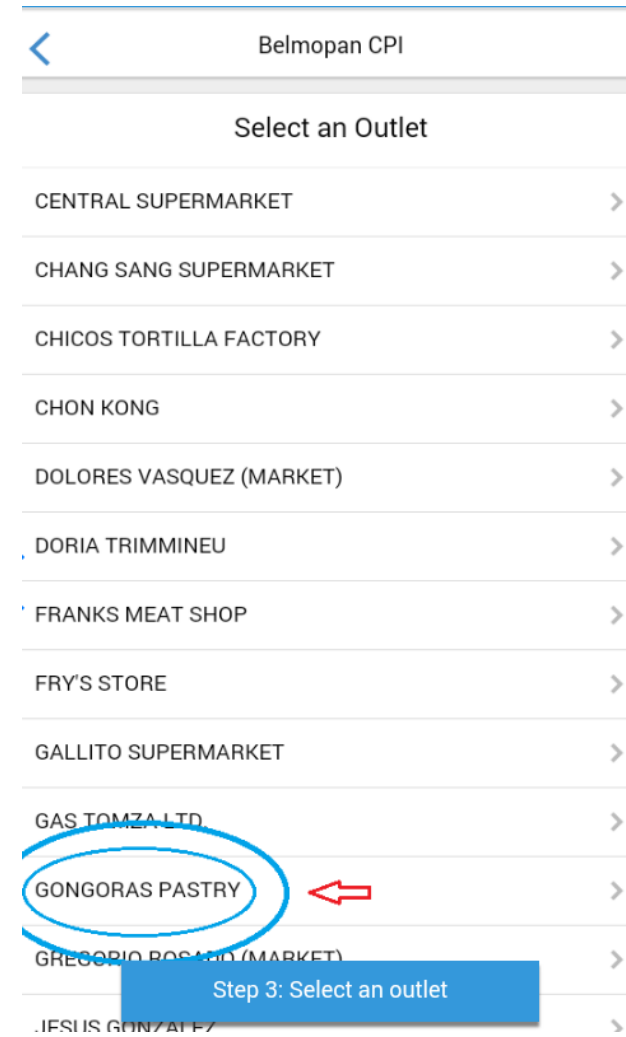
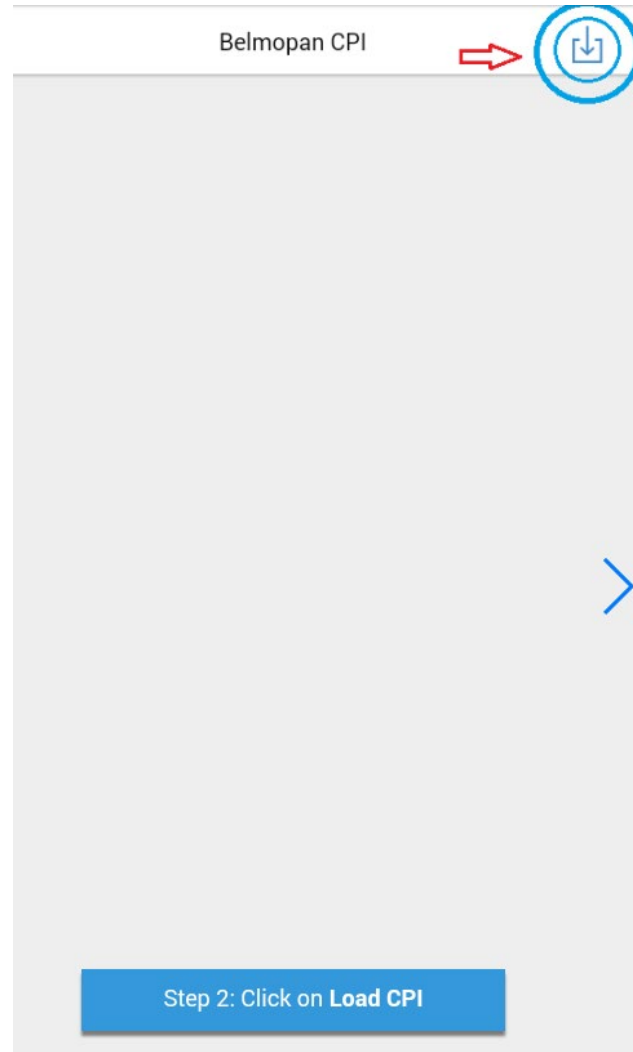
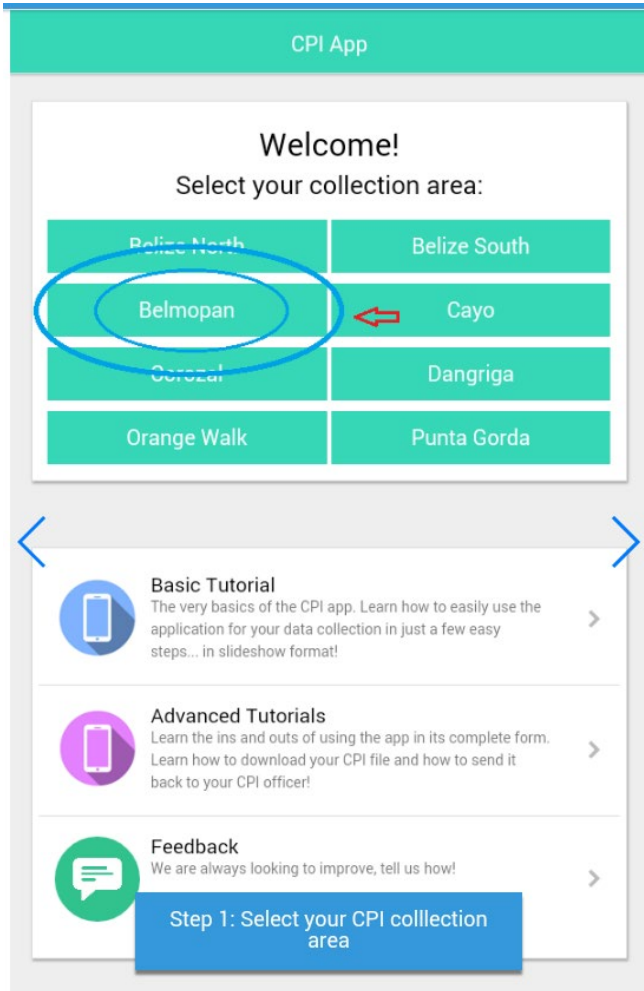
# History- Google Sheets



	C	F	L	M	N
80	NS SUPERMARKET	ROMY - CRYSTAL, 700 ML, DZL	10.50		
98	NS SUPERMARKET	LUNCHEON MEATS - DAK, 340 G, DENMARK, LARGE, PORK	3.85		
99	NS SUPERMARKET	LUNCHEON MEATS - TULIP, 200 G, USA, SMALL, CHICKEN	2.95		
101	NS SUPERMARKET	CANNED FISH (TUNA) - GRACE, 170 G, JAMAICA, LIGHT CHUNK, IN WATER	3.50		
102	NS SUPERMARKET	CANNED FISH (TUNA) - BUMBLE BEE, 142 G, USA, 5 OZ, LIGHT CHUNK	2.50		
104	NS SUPERMARKET	NATURAL MILK - RAINBOW STERILIZED FULL CREAM, 397 g, HOLLAND	2.50	3.00	
105	NS SUPERMARKET	NATURALMILK - 1 UNIT, 1 PINT, WD, LOCAL, BZE	2.25		
107	NS SUPERMARKET	EVAPORATED MILK - Grace, 410 Grams, Jamaica, 14.4 Oz	2.50		
108	NS SUPERMARKET	EVAPORATED MILK - CARNATION, 378 G, MEXICO, LARGE	2.25		
111	NS SUPERMARKET	CHEESE - WESTERN DAIRIES, 1 LB, BELIZE, CHEDDAR	12.85		
114	NS SUPERMARKET	BUTTER/MARGARINE - BLUE BONNET, 1 LB, USA, 4 STICKS	2.50		
115	NS SUPERMARKET	BUTTER/MARGARINE - WOOD & DUNN, 454 G, NEW ZEALAND	15.95		
117	NS SUPERMARKET	RAISINS - SUNMAID, 1.5oz(42.5g), USA	-		
119	NS SUPERMARKET	RAISINS - DELMONTE, 1 LB, RETAIL	5.00		
121	NS SUPERMARKET	PEANUTS - PROMOS, HONEY ROASTED, 9oz, USA	-		
124	NS SUPERMARKET	BAKED BEANS, CANNED - Heinz, 840 grams, England	-		
125	NS SUPERMARKET	MIXED VEGETABLES, CANNED - GRACE, 425 G, JAMAICA, COUNTRY STYLE, 15 OZ	2.75		
126	NS SUPERMARKET	MIXED VEGETABLES, CANNED - DELMONTE, 411 G, USA	2.50		
128	NS SUPERMARKET	SUGAR - WHITE, 1 LB, BELIZE	0.50		
130	NS SUPERMARKET	SUGAR - BSI, 1 LB, BELIZE, BROWN	0.50		



# History- CPI App V1.0



# History- CPI App V1.0

Belmopan CPI

GONGORAS PASTRY Input prices Back

CAKES - MILK CAKE WITH CHOCOLATE ICING, 1 SLICE, BZE  
1.75

CAKES - TRES LECHES CAKE, 1 SLICE  
2.50

CAKE - 1 SLICE, CHOCOLATE, BZE  
last month: 2

Submit

Step 4: Fill out the prices and **Submit**

Belmopan CPI → ✓

Select an Outlet

- DORIA TRIMMINEU
- FRANKS MEAT SHOP**
- FRY'S STORE
- GALLITO SUPERMARKET
- GAS TOMZA LTD.
- GONGORAS PASTRY**
- GREGORIO ROSADO (MARKET)
- JESUS GONZALEZ
- J'S MIRASOL
- KIDDIES RAINBOW ICE CREAM PARLOUR
- KUYLEN'S GAS SERVICE
- LAN'S ST

Step 5: When finished with all outlet, **Submit All**

Done 1 selected

Download Time

CPI\_041...P.xlsx 111.6 KB  
04-09-20...8:34 AM

Share via

- Add to Dropbox
- Bluetooth
- ChatON
- Drive
- Email
- Gmail
- Samsung Link
- Skype
- Wi-Fi Direct

Movies 10-18-20...12:33 PM

Music b6d5d9...b8.jpg 188.2 KB  
10-03-20...7:50 PM

### About the Project:

- Specialized tools for CPI production are expensive and hard to find, especially for developing countries like Belize.
- ICT is essential for optimizing production
  - reducing personnel
  - time requirements
  - improving data quality
- Donor software lack ongoing maintenance and development.
- The new system integrates all processes involved
  - data collection
  - survey administration
  - data processing
  - index construction
- Open-source technologies key for tool's sustainability and shareability



# New CPI System

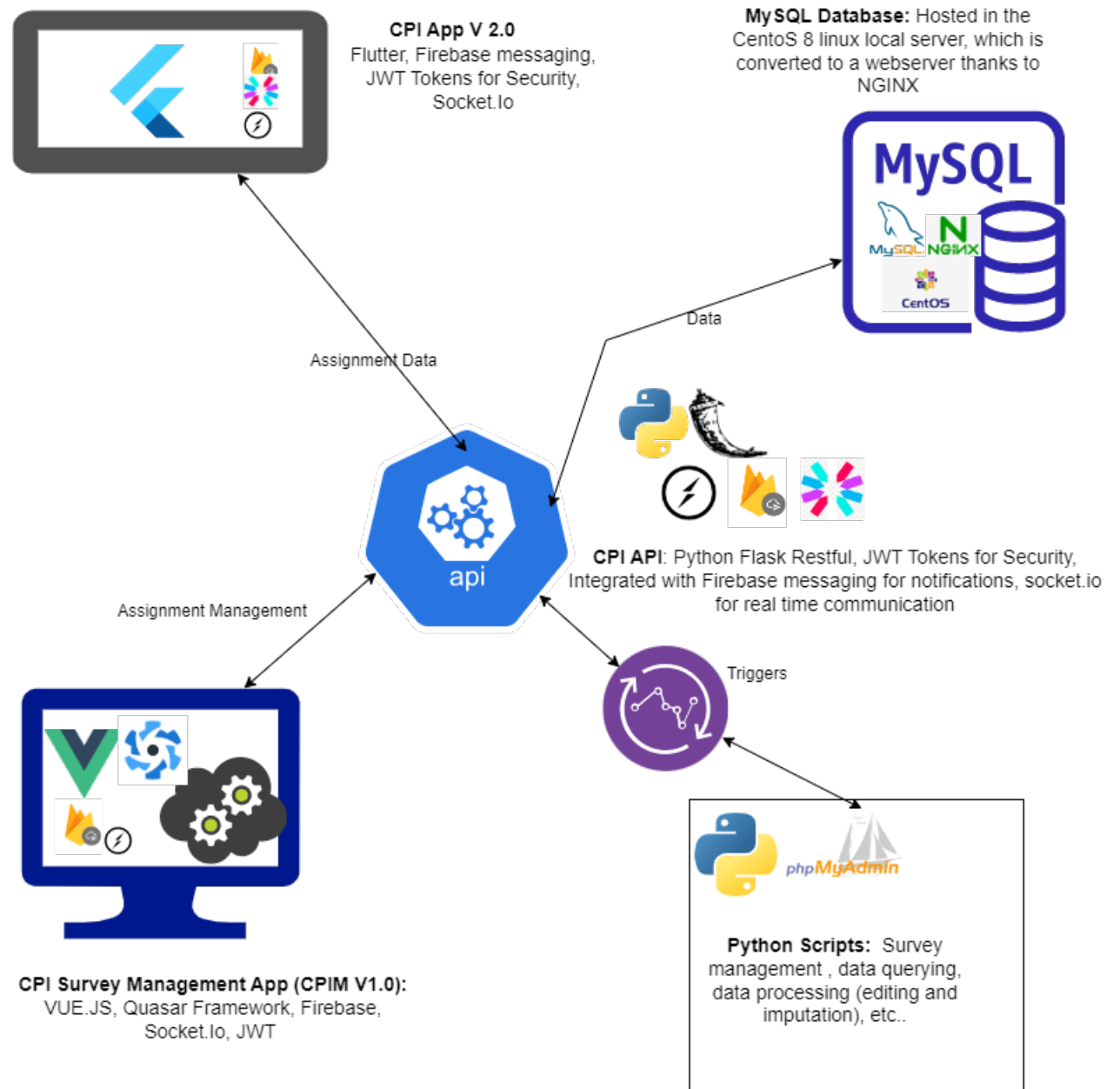
## Introduction

- About the Project:
  - Project duration: (8 – 12 months)
    - Phase 1 (July 2022 – January 2023)
    - Phase 2 (ongoing)
- Core Developer Team:
  - Jefte Ochaeta- Project Lead, Statistician I, National Accounts Unit, Economic Statistics Department, Statistical Institute of Belize
  - Steven Palma- Software Developer, IT Department, Statistical Institute of Belize
  - Melvin Perez- Statistician II, Price Statistics Unit, Economic Statistics Department, Statistical Institute of Belize

# New CPI System Introduction

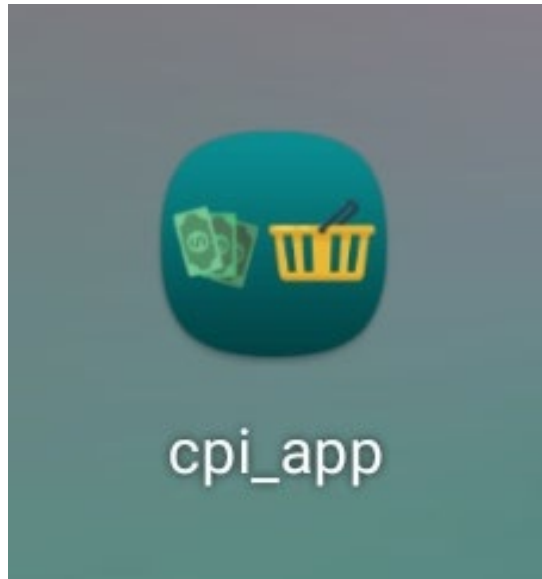
## Integrated Survey Management System:

- Data Collector App (CPI App v 2.0)
- CPI Survey Management App (CPIM V1.0)



# Data collector App (CPI App v2.0)

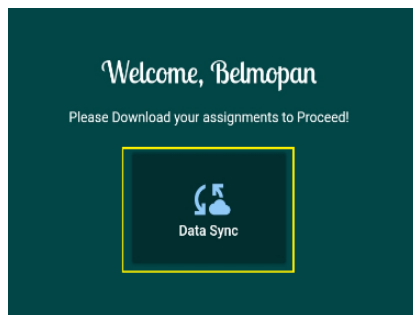
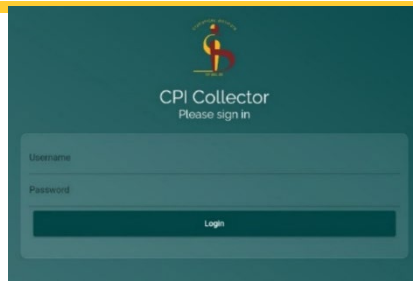
## Overview



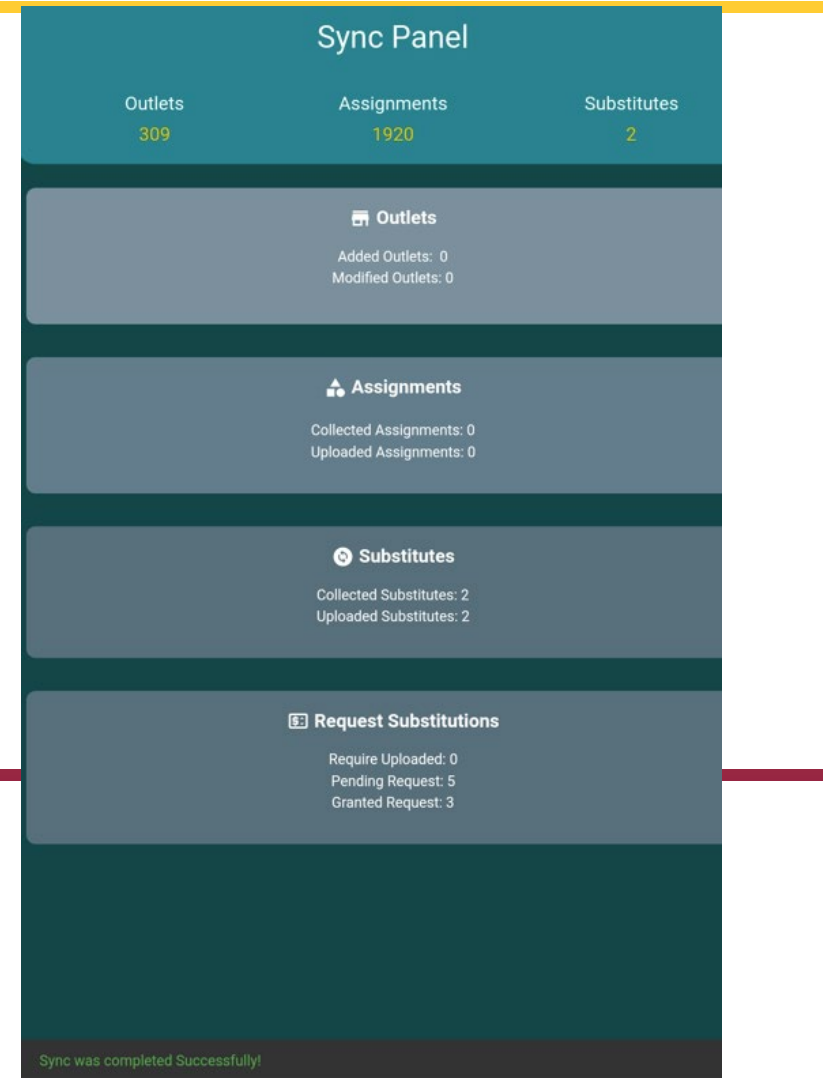
- **Self-contained:** No need to download any extra files or apps.
- **User-friendly:** The simplicity in the design makes it easy to use.
- **Quality Assurance:** validation on prices, location of price collection. Validation for product replacements. Realtime data communication two-way survey management process.
- **Data Encryption:** local stored on device db

# CPI App v2.0

## Walkthrough- Self Contained



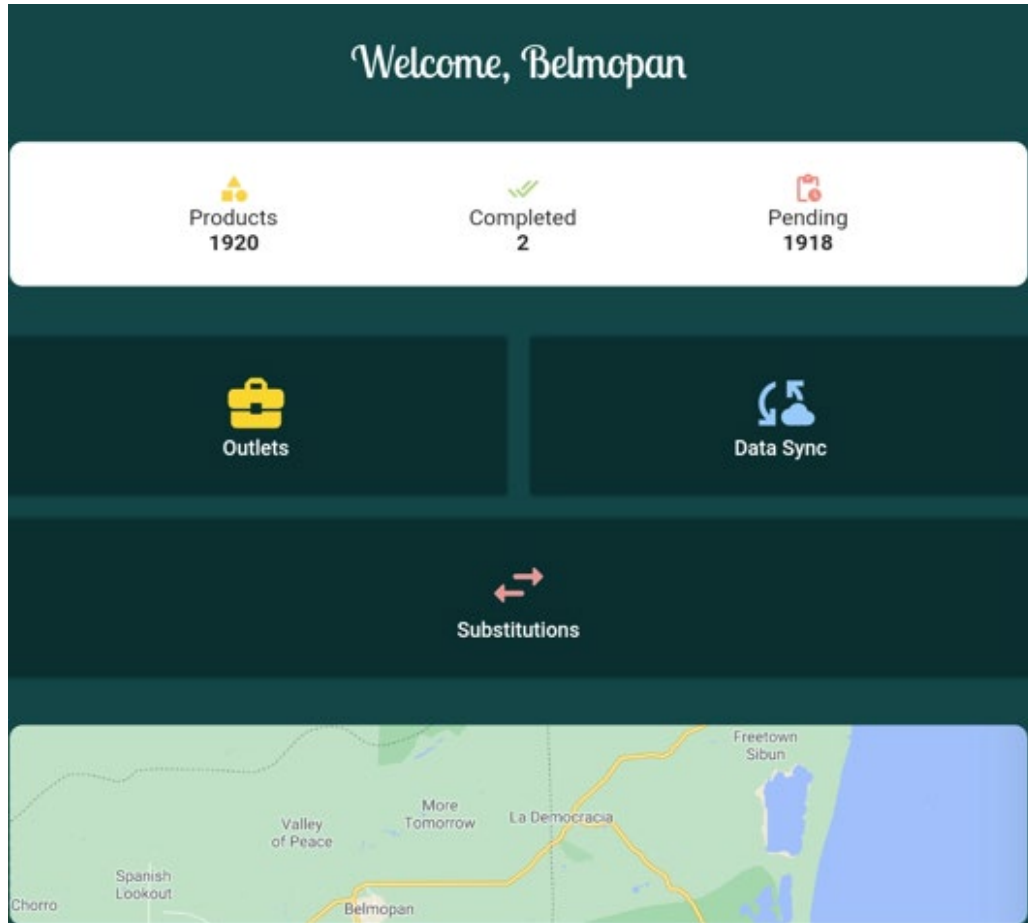
- APK Installer
- Sign In required.
- Data Sync button.
  - Internet access





# CPI App v2.0

## Walkthrough- User friendly

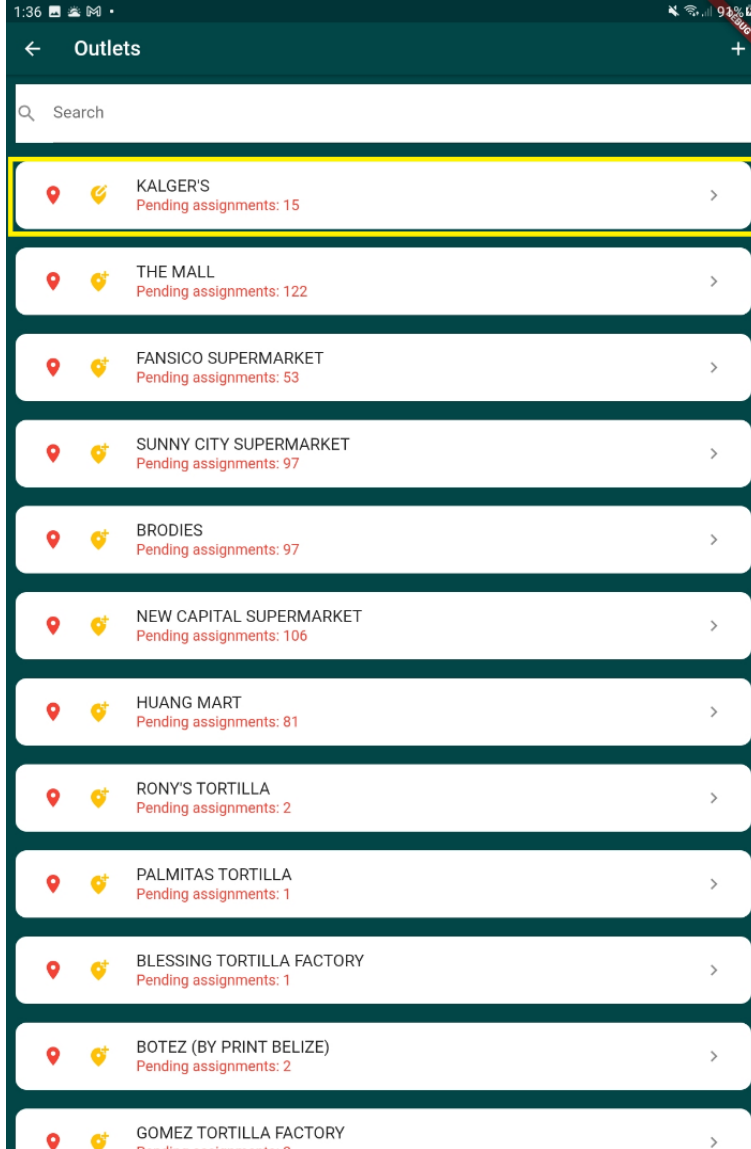


### Home Screen

- Progress Summary Dashboard
- Outlets
- Substitutions
- Map
- Data Sync

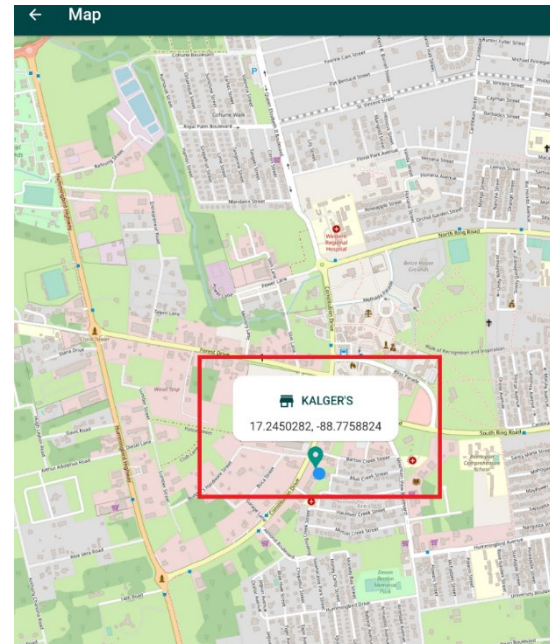
# CPI App v2.0

## Walkthrough- User friendly (Outlet)



## Outlets

- Displays all the outlets that are required to be visited by the collector to collect prices.
- User can search through the outlet list
- Geolocation of outlet displayed on map
  - Capture/Adjust GPS if required
- Allows user to Add/Edit Outlets when needed



# CPI App v2.0

## Walkthrough- User friendly (Substitution)

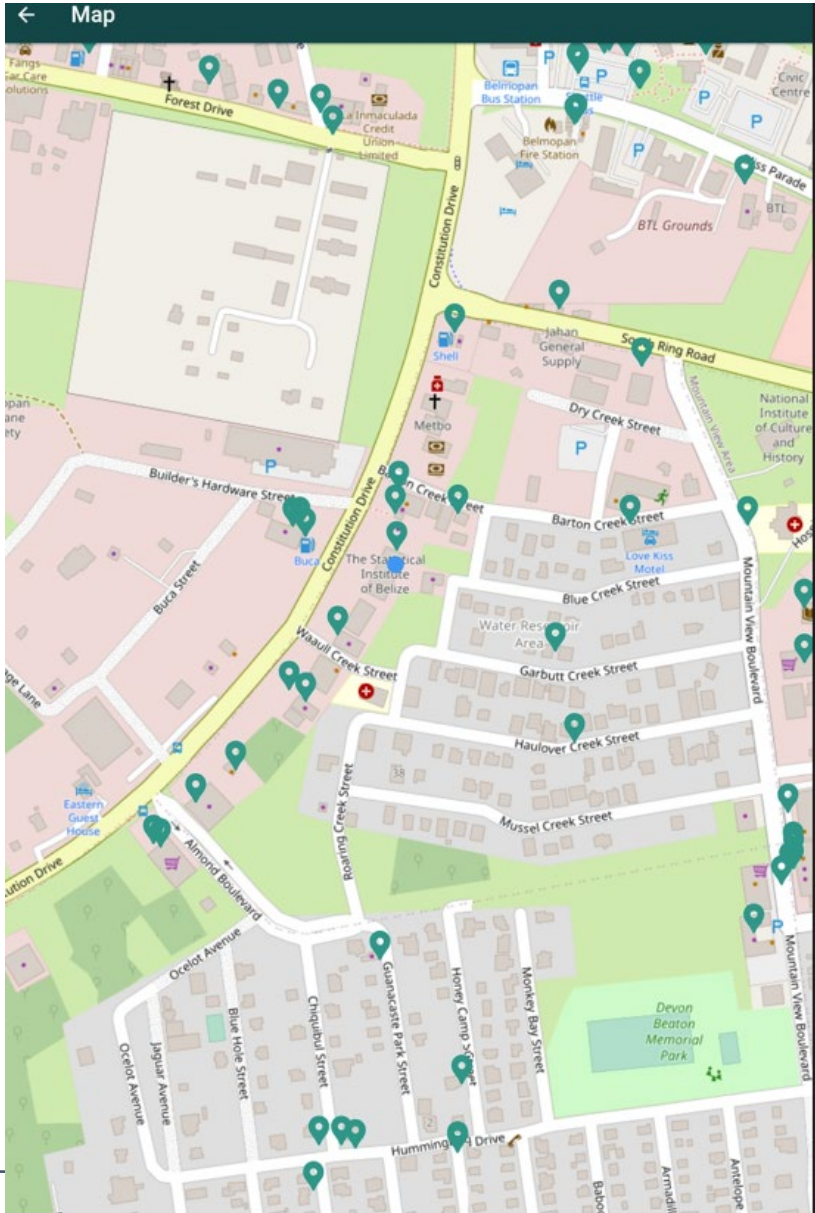


### Substitution

- Displays all the required product replacements/substitution as designated by the HQ
- Displays all the requested product replacement by the user
- User can search through the substitution list

# CPI App v2.0

## Walkthrough- User friendly (Map)



### Map

- Displays all the outlet location.
- Can zoom in on specific coordinate
- User can orient based on current device location



# CPI App v2.0

## Walkthrough- User friendly (Outlet-Assignment)



The screenshot shows the 'KALGER'S' app interface. At the top, there's a header with the store name and location (yow 655825). Below the header, there are three summary statistics: 'Total Items 17', 'Completed 2', and 'Pending 15'. A search bar is highlighted with a yellow border. The main content is a list of products, each with a status icon and a description. The products are: RICE - CIRCLE R, 2 LBS BAG, BZE (Substituted: RICE - jade r, 2 lbs, BZE); FLOUR - BEBE AGUA, 1 LB, RETAIL (Substituted: FLOUR - FLOUR 2K TESTING, LB, 23.0, ARGENTINA, TESTING BRANDED); CORN FLAKES - KELLOGS CORNFLAKES, 500G, MEXICO; MACARONI - VESTA, 160 G, MEXICO; BEEF STEAK - ROUND STEAK, RUNNING W, 1lb; PIGTAIL - 1 LB, RETAIL; VIENNA SAUSAGE - PICNIC, 142 G, HOT, USA; NATURAL MILK - OMELA 386 ML HOLLAND; CREAMER - Red and white, 11oz, USA; EGGS - 1 UNIT.

### Outlets- Assignment

- Displays all the products to be collected at the selected outlet
- User can search through the product list
- Keeps track of completion in summary
- Indicates type of product assignment:

Missing Regular Assignment

 Substitution

 Substitution Request

# CPI App v2.0

## Walkthrough- User friendly (Outlet-Assignment)



KALGER'S  
YOW  
655825

Total Items: 17, Completed: 2, Pending: 15

Search

\$3.00 RICE - CIRCLE R, 2 LBS BAG, BZE  
Substituted: RICE - jade r, 2 lbs, BZE

\$12.00 FLOUR - BEBE AGUA, 1 LB, RETAIL  
Substituted: FLOUR - FLOUR 2K TESTING 1B, 28 O, ARGENTINA TESTING BRANDED

Substitute this item

CORN FLAKES - KELLOGS CORNFLAKES, 500G, MEXICO

New Price \$ 4.6

Comment

Save ✓

1 2 3

4 5 6 Done

7 8 9 .-

0 ,

### Outlets- Assignment- Collection form

- Displays previous price per item
- Allows for replacement of item
- Data entry of price and comments

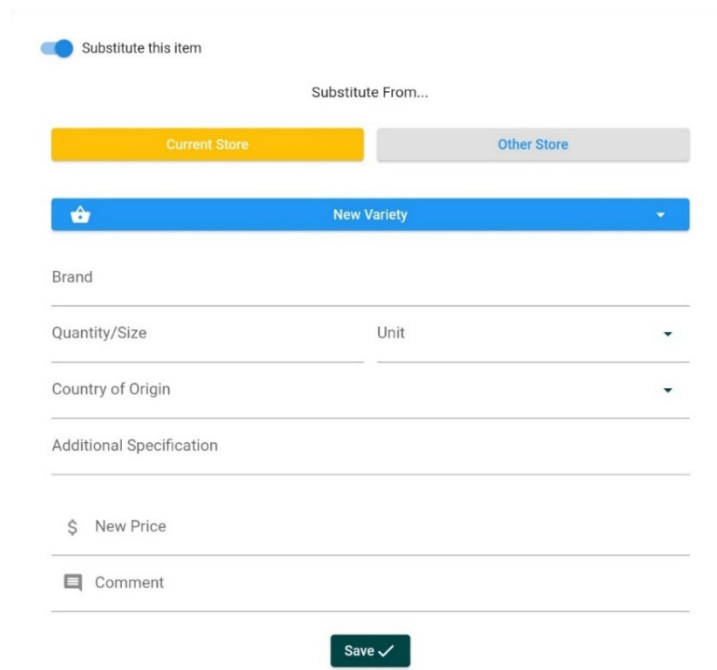
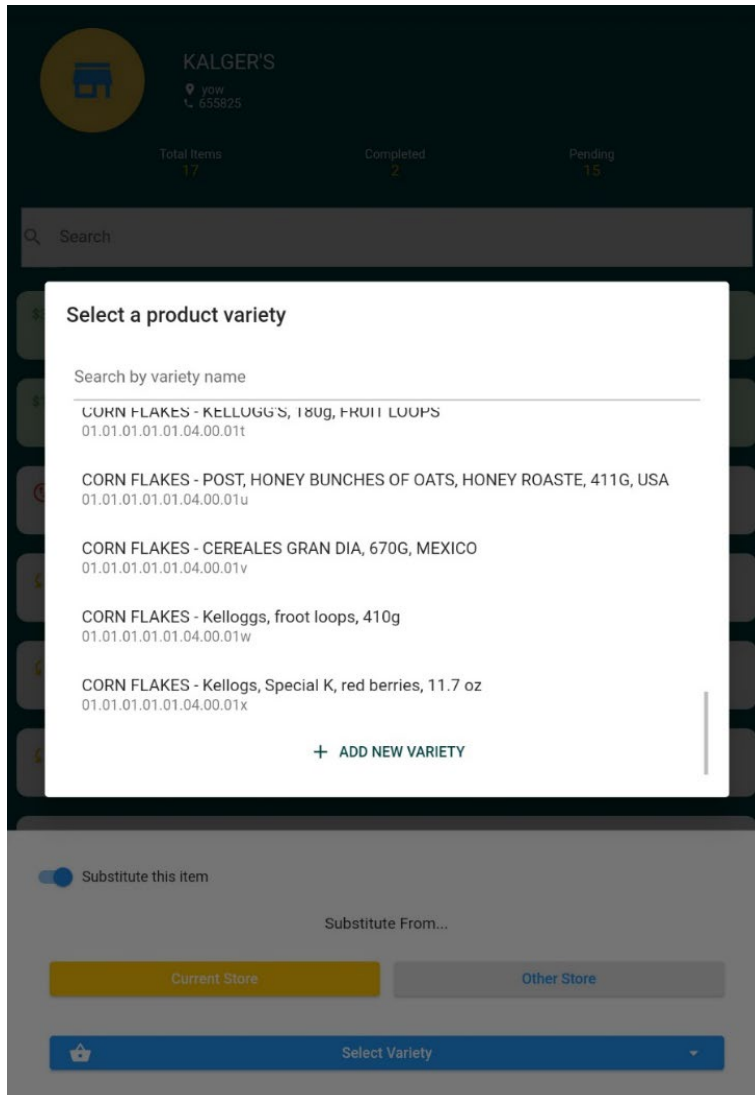
# CPI App v2.0

## Walkthrough- User friendly (Outlet-Assignment)



### Outlets- Assignment- Replacement of item

- User can select from product variety in database
- User can add new product variety to database
  - Same Outlet
  - Different Outlet



# CPI App v2.0

## Walkthrough- Quality Assurance



### Prices

- Flags user if entered price is beyond specified threshold
- Prompts user to investigate further the deviation and provide justification
- Records GPS location for each price entered

### Real Time communication (two-way)

- Actions from user to server
  - Saved price
  - Substitution/Substitution request, etc...
- Notifications on device from server actions to user
  - Assignment creation
  - Assignment rejection, etc..

Request Substitution

CREAMER - Red and white, 11oz, USA

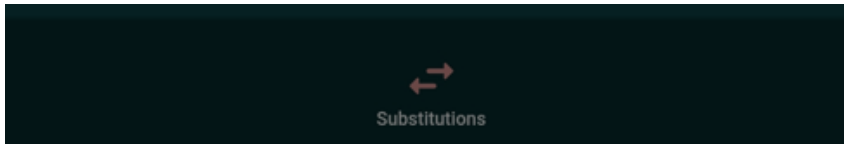
New Price  
\$ 8

Comment

Price is inconsistent by 39.13%, field is required!

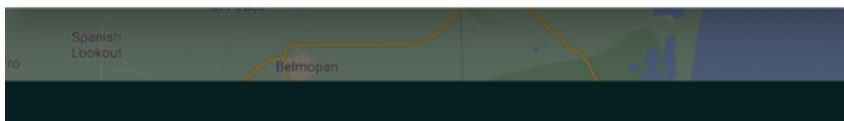
Save ✓

1 2 3



#### Assignment rejected!

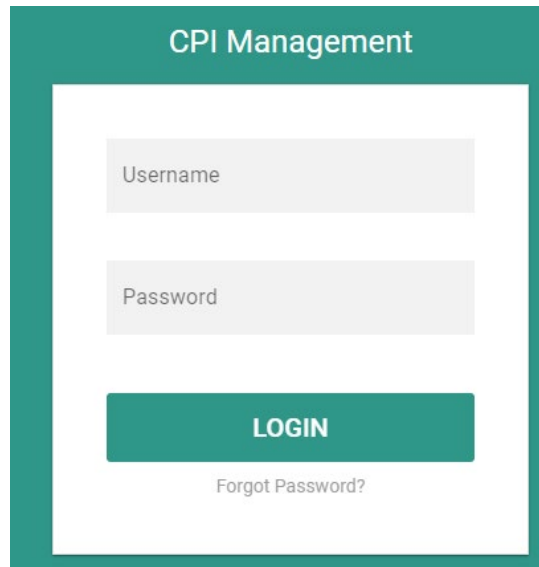
Assignment MASA - 1LB from outlet MOLINO AHORO (AMIN HEGAR STADIUM AREA) was rejected! Please collect a price for that assignment!





# CPI Survey management system

## Overview



The screenshot shows a login form titled "CPI Management". It features two input fields: "Username" and "Password". Below these fields is a green "LOGIN" button. Underneath the button is a link that says "Forgot Password?".

- **User Management:** Through the portal HQ or Admin creates and manages users for the CPI APP v2.0 and for the CPI Survey management system
- **Assignment Management:** through portal, creation of assignments by periodicity and user
- **Summary Dashboard:** summary of data collection by area
- **Automated collection:** automate some assignments with data
- **Quality Assurance:** provides overview and manage data from field collection
- **Data Processing:** data preparation for index computation

<https://cpi.sib.org.bz>

# The CPI Survey management system

## User Management



The screenshot shows the 'CPI Management' dashboard. On the left is a navigation menu with options: Home (Dashboard), Users (Users), Collection (All Field Collection, Automated Collection, Quality Assurance), and a star icon for Quality Assurance assignment management. The main content area is titled 'Users' and lists three users: JEFTE OCHAETA (HQ - jochaeta), JULISSA TREJO (SP) (COLLECTOR - SanPedro), and ADELE LONGSWORTH (CZL) (COLLECTOR - Corozal).

**User Management:** create and manage users, levels of users:

- Collector - the user type for the CPI Collector App
- ES - the user with restricted access to the CPI Data Management System
- HQ - the user with complete access to the CPI Data Management System
- Admin – database system administrator

Julissa Trejo (SP)



Name	Julissa Trejo (SP)
Email	sibcpisp@gmail.com
Username	SanPedro
Type	collector
Area	San Pedro Town

UPDATE USER

# The CPI Survey management system

## Assignment Management



### Creation and management of assignments

- User and periodicity
- This is a one-time setup
- But can add/modify new assignments and new areas if desired

#### Manage Assignments

**+ NEW**

Collector: All | Region: All | Status: active

id	Outlet Name	Variety Name	Collector	Region	Is Headquarter	Is Monthly
3	DICKERSON SUPERMARKET	RICE - CIRCLE R, 2 LBS BAG, BZE	Romalda (OWK)	Orange Walk Town	No	Yes
4	GAS PLUS SUPERMARKET	RICE - CIRCLE R, 2 LBS BAG, BZE	Romalda (OWK)	Orange Walk Town	No	Yes
5	THE NEW WHITE HOUSE	RICE - CIRCLE R, 2 LBS BAG, BZE	Romalda (OWK)	Orange Walk Town	No	Yes
6	THE PEOPLE STORE	RICE - CIRCLE R, 2 LBS BAG, BZE	Romalda (OWK)	Orange Walk Town	No	Yes
7	SUPER BUY, IN TOWN	RICE - CIRCLE R, 2 LBS BAG, BZE	Julissa Trejo (SP)	San Pedro Town	No	Yes
9	KALGER'S	RICE - CIRCLE R, 2 LBS BAG, BZE	Bernadine Ruano (BMP)	Belmopan City	No	Yes
10	THE MALL	RICE - CIRCLE R, 2 LBS BAG, BZE	Bernadine Ruano (BMP)	Belmopan City	No	Yes
11	YVONNE GROCERY STORE	RICE - CIRCLE R, 2 LBS BAG, BZE	Marisol (BNQ)	Benque Viejo Del Carmen Town	No	Yes

#### New Assignment

Area: Orange Walk Town

Outlet: ISRAEL GONZALEZ |

Variety: RICE - Circle r, kids ,2lb, Belize

Collector: Allison (BZN)

Automated Assignment: None

#### Collected Basket:

Small Basket  Big Basket

#### Collected by:

HQ  Collector

**SAVE ASSIGNMENT**

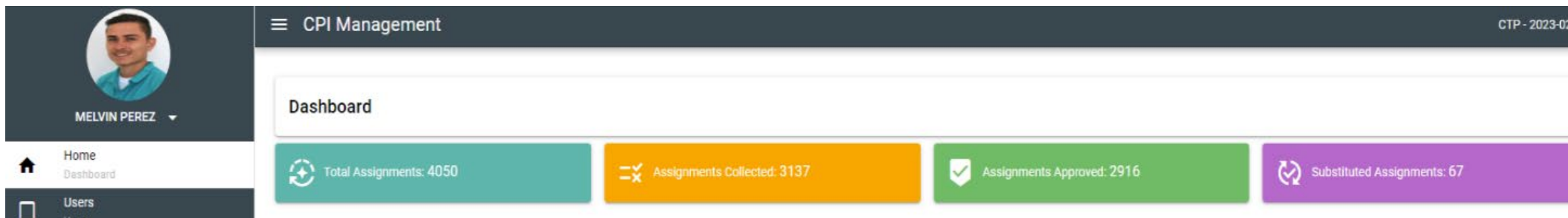
# The CPI Survey management system

## Summary Dashboard

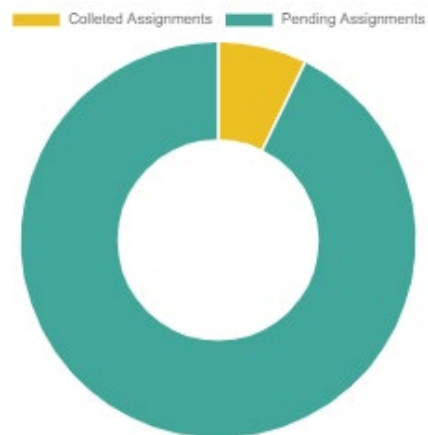


The system provides a visual presentation of the progress in the data collection by the use:

- Summary Total:
  - Overview of total collection, total assignments, total collection, assignment approvals, substituted assignments



Total Collected Assignments



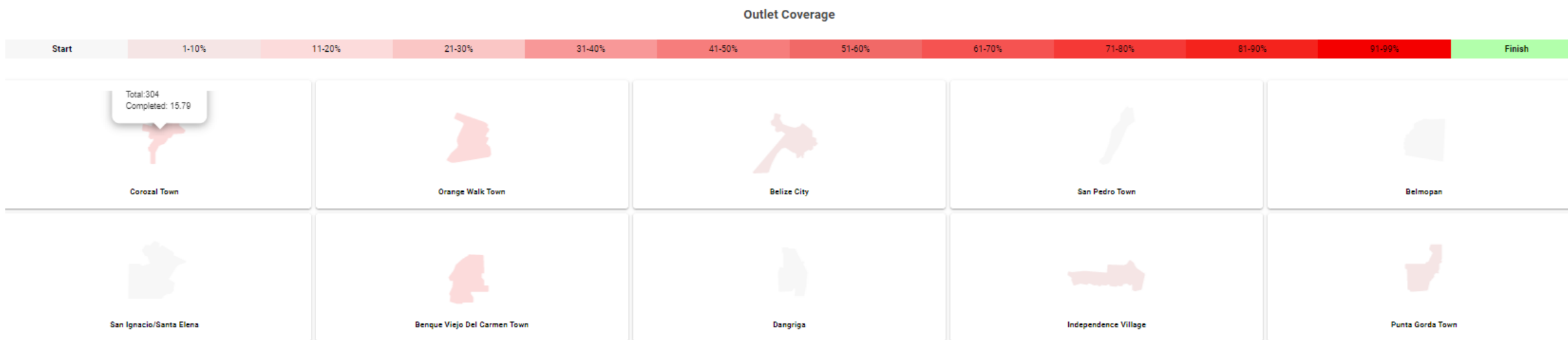
# The CPI Survey management system

## Summary Dashboard



The system provides a visual presentation of the progress in the data collection by the use:

- Outlet Coverage:
  - The system provides a visual presentation of the level of outlet coverage in each data collection area. An outlet is considered complete only when all assigned tasks have been returned.
  - Select area to get exact percentage





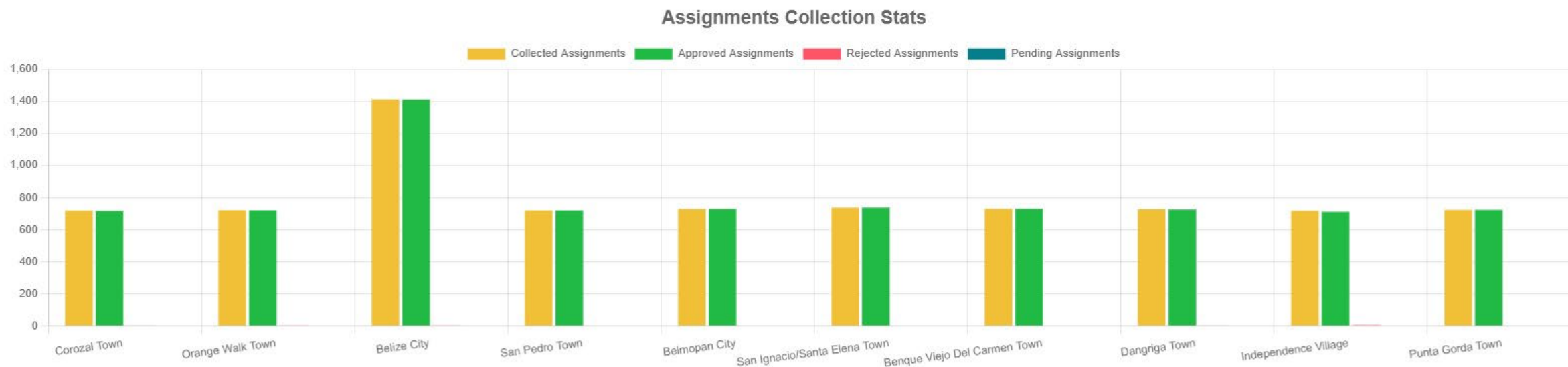
# The CPI Survey management system

## Summary Dashboard



The system provides a visual presentation of the progress in the data collection by the use:

- Assignments Collection Status- The system provides a visual presentation of the number of assignments per area, categorized by their status.



# The CPI Survey management system

## Summary Dashboard



The system provides a visual presentation of the progress in the data collection by the use:

- Assignments by Area: detailed data collection summary by area.
  - Collected
  - Substitutions
  - Missing %

Assignments By Area								
Area	Collected	Substitutions	Pending Approval	Rejected	Approved	Missing Prices	Missing %	Total
Corozal Town	131	6	0	0	0	13	0.65%	2004
Orange Walk Town	498	3	0	0	0	24	1.20%	2008
Belize City	137	9	0	0	0	41	1.27%	3239
San Pedro Town	0	0	0	0	0	0	0%	1976
Belmopan City	0	0	0	0	0	0	0%	2042
San Ignacio/Santa Elena Town	0	0	0	0	0	0	0%	2054
Benque Viejo Del Carmen Town	286	0	0	0	0	9	0.47%	1917
Dangriga Town	0	0	0	0	0	0	0%	2027
Independence Village	272	199	0	0	0	54	3.13%	1727
Punta Gorda Town	197	1	0	0	0	43	2.18%	1976

1-10 of 10

# The CPI Survey management system

## Automated collection



- With this module, prices not found in one area are set to be obtained from the nearest neighbouring area
  - Initial setup required but can be modified depending on collection

The screenshot shows the 'Automated Collection' dashboard. On the left is a dark sidebar with navigation options: Home (Dashboard), Users, Collection (All Field Collection), Automated Collection (Sync and get automated assignments), Quality Assurance (Quality assurance assignment management), Outlets (Manage Outlets), Varieties (Manage Varieties), Assignments (Manage Assignments), Price Process (Working Price Generation), and Export Data (csv data export). The main content area is titled 'Automated Collection' and features four summary cards: 'Automated Assignments: 495' (teal), 'Incomplete Assignments: 0' (orange), 'Completed Assignments: 495' (green), and 'Substituted Assignments: 0' (purple). Below these is a table titled 'Automated Assignments' with a search icon. The table has columns for id, Outlet Name, Variety Name, Previous Price, New Price, and Collected At. The data rows show various outlets and their assigned varieties with prices. At the bottom right of the table, it says 'Records per page: 25' and '1-25 of 495'.

id	Outlet Name	Variety Name	Previous Price	New Price	Collected At
1233	SOUTHSIDE - JUN'S MEAT SHOP (FROM BELIZE)	MUTTON MEAT - 1 LB, SHEEP MEAT	\$9.50	\$0.00	2023-02-27 13:51:40
1234	SOUTHSIDE - Mckeysey Meats (FROM BELIZE)	MUTTON MEAT - 1 LB, SHEEP MEAT	\$8.95	\$0.00	2023-02-27 13:51:40
1223	MEAT STALL 1, OLD MARKET (FROM PG)	MUTTON MEAT - 1 LB, SHEEP MEAT	\$7.00	\$7.00	2023-02-27 13:51:40
1225	MEAT STALL 1, OLD MARKET (FROM PG)	MUTTON MEAT - 1 LB, SHEEP MEAT	\$7.00	\$7.00	2023-02-27 13:51:40
1224	GARAY MEAT STALL 2, OLD MARKET (FROM PG)	MUTTON MEAT - 1 LB, SHEEP MEAT	\$8.00	\$9.00	2023-02-27 13:51:40
1226	GARAY MEAT STALL 2, OLD MARKET (FROM PG)	MUTTON MEAT - 1 LB, SHEEP MEAT	\$8.00	\$9.00	2023-02-27 13:51:40
1218	CASTILLO'S MEAT SHOP (FROM CAYO)	MUTTON MEAT - 1 LB, SHEEP MEAT	\$8.50	\$8.00	2023-02-27 13:51:41

# The CPI Survey management system

## Quality Assurance – Field Collection



Realtime access to data in the field

☰ CPI Management

142
CTP - 2023-05-0

### Field Collection

🔍 FILTER BY COLLECTOR
🔄 NEW

Collector  
Adele Longsworth (CZL)

Price Status  
Collected

Region  
All

Outlet  
All

**Assignments** 🗑️ UNSELECT ALL WITH SELECTED ▼

Outlet Name	Variety Name	Code	Price
CHULA VISTA TORTILLA FACTORY (6213094)	MASA - 1LB	01.01.01.01.01.02.06.01a	\$0.8
TORTILLERIA SAN NARCISO	MASA - 1LB	01.01.01.01.01.02.06.01a	\$0.9
GONGORAS PASTRY	CAKE - Milky Way, chocolate, 1 slice	01.01.01.01.01.03.09.03a	\$2.8
GONGORAS PASTRY	CAKE - 1 SLICE, MILK CAKE	01.01.01.01.01.03.09.03g	\$1.7
FRY'S STORE	BACON - RUNNING W, 12oz BACON BUTCHE...	01.01.01.01.02.03.02.01b	\$10.
ROSADO BROTHERS	PIBIL - 1 LB, Belize	01.01.01.01.02.03.02.05b	\$12.

- ✉️ **Collector Synced!** 11 minutes ago  
Adele Longsworth (CZL) just synced their device verify changes!
- ✉️ **Collector Synced!** 12 minutes ago  
Yesenia Lisbey (SI/SE) just synced their device verify changes!
- ✉️ **Collector Requested Substitutions!** 12 minutes ago  
Yesenia Lisbey (SI/SE) just requested 1 Substitution!
- ✉️ **Collector Synced!** 29 minutes ago  
Rhea Reyes (DGA) just synced their device verify changes!
- ✉️ **Collector Synced!** 31 minutes ago  
Arlette (BZS) just synced their device verify changes!
- ✉️ **Collector Requested Substitutions!** 31 minutes ago  
Arlette (BZS) just requested 2 Substitution!
- ✉️ **Collector Synced!** 38 minutes ago  
Adele Longsworth (CZL) just synced their device verify changes!
- ✉️ **Collector Synced!** 15 hours ago  
Adele Longsworth (CZL) just synced their device verify changes!
- ✉️ **Collector Synced!** 21 hours ago  
Marisol (BNQ) just synced their device verify changes!
- ✉️ **Collector Synced!** a day ago  
Marisol (BNQ) just synced their device verify changes!
- ✉️ **Collector Synced!** a day ago  
Marisol (BNQ) just synced their device verify changes!
- ✉️ **Collector Synced!** a day ago  
Marisol (BNQ) just synced their device verify changes!
- ✉️ **Collector Synced!** a day ago  
Marisol (BNQ) just synced their device verify changes!
- ✉️ **Collector Synced!** a day ago  
Marisol (BNQ) just synced their device verify changes!

# The CPI Survey management system

## Quality Assurance – Field Collection



Realtime access to data in the field - Filter (Collector, Status, etc...)

### Field Collection

FILTER BY COLLECTOR NEW VARIETY SUBSTITUTIONS

Collector: Adele Longsworth (CZL) Price Status: Collected Region: All Outlet: All Collection Process: Substitution Substitution Request: All

### Assignments

UNSELECT ALL WITH SELECTED

Search

Item Name	Variety Name	Code	Previous Price	New Price	% Difference	Collected At	Comment	Requested Substitution	Substitution	Action
RTS LIMITED CZL	PERSONAL COMPUTERS - HP laptop/14"/Na...	01.01.08.01.03.01.00.02h	\$1981.92				Free gift		↑	MORE
VARIETY: SOFAS/COUCHES - ARUNDEL, 12 , LSHAPE		OUTLET: COURTS LIMITED CZL		PRICE: \$1499.00		COMMENT: Free gift				
RTS LIMITED CZL	NIGHT STAND - Quattro night stand /1 drawer	01.01.05.01.01.01.04.03a	\$119.20				20%off		↓	
RTS LIMITED CZL	SOFAS/COUCHES - Portofino	01.01.05.01.01.01.01.01q	\$4998.75				On deal		↓	MORE
RTS LIMITED CZL	REFRIGERATORS - Masterech Refrigerator /1...	01.01.05.03.01.01.02.01f	\$821.67				Silver		↓	MORE
RTS LIMITED CZL	SOFAS/COUCHES - Monaco Sabina 2 piece s...	01.01.05.01.01.01.01.01ap	\$3983.39				Gray		↓	MORE
RTS LIMITED CZL	TELEVISION - Sony Smart tv/50"/4k/GoogleTv	01.01.08.01.04.00.00.01an	\$5285.64				Save 600		↓	MORE

- Edit
- Approve
- Reject



# The CPI Survey management system

## Quality Assurance – Field Collection



### Data collection physical Path of work

**CPI Management** 143 CTP - 2023-05-0

Region  
Dangriga Town

REMOVE TRACE ↻ PREVIOUS ⏪ NEXT ⏩ COMPLETE TRACE ✓

Hummingbird Highway  
Long Bank  
Dangriga Airport  
North Stann Creek  
Dangriga  
George Price Drive  
Gra Gra

© OpenStreetMap, Leaflet, Mapbox © 2023 Inrix, Mapbox

# The CPI Survey management system

## Quality Assurance – In person verification



- Sample generated from submitted field data
- In person verification through CPI App
- Comparison between enumerator and verifier

CPI Management									
Quality Assurance Assignments									
Collector Jefte Ochaeta				Area All		GENERATE		APPROVE	
id	Outlet Name	Variety Name	Collector Price	HQ Price	% Difference	Collector collected At	HQ collected At	Collector Comment	HQ Comment ↓
5588	BRODIES	POTATO CHIPS - LAYS, CLASSIC, 184.2 G, USA	\$10.5	\$100.0	852.38%	2023-05-13 11:35:46	2023-05-15 10:19:03		was an issue
1223	Hyde meat shop	MUTTON MEAT - 1 LB, SHEEP MEAT	\$7.5	\$10.0	33.33%	2023-05-13 10:01:56	2023-05-15 10:14:21		sheep on demand
15541	CARDINAL STORE	BICYCLE PURCHASE -BICYCLE PURCHASE-...	\$525.0	\$600.0	14.29%	2023-05-13 12:19:50	2023-05-15 10:13:47		reduced price was due to mother day sale
4430	MIRA	PUMPKINS - 1 LB	\$2.5	\$1.5	-40.00%	2023-05-13 10:44:10	2023-05-15 10:14:50	Increase	price hasnt changed
4784	MIRA	GARLIC - 1 PACK OF 3	\$2.5	\$1.5	-40.00%	2023-05-13 10:46:01	2023-05-15 10:15:06		price hasnt changed
6255	BRODIES	INFANT FORMULA - ENFAMIL, 400 G, GUATE...	\$27.0	\$28.0	3.70%	2023-05-13 11:20:49	2023-05-15 10:19:17	Decrease	is correct price
14224	BRODIES	FABRIC SOFTENER - GAIN, 1.47 L, MEXICO	\$25.5	\$28.95	13.53%	2023-05-13 11:42:53	2023-05-15 10:20:05		increase
1555	THE MALL	PIGTAIL - 1 LB, RETAIL	\$6.5	\$7.5	15.38%	2023-05-12 15:10:20	2023-05-15 10:16:56		hike in price

# The CPI Survey management system

## Data Processing



- Initializing Working Prices
  - Copy of approved prices

The screenshot displays the 'CPI Management' interface. On the left is a dark sidebar with a user profile for 'MELVIN PEREZ' and a navigation menu including Home, Users, Collection, Automated Collection, Quality Assurance, Outlets, Varieties, Assignments, Price Process, and Export Data. The main content area is titled 'Data Processing' and lists four processes, each with a description and a play button icon:

- Initialize Working Prices** *Last Processing: 2023-02-23 09:21:38 by Melvin*  
At the end of each time period this process creates a copy of the current time period prices. Every time this process is executed the time period records are recreated.
- Outlier Detection** *Last Processing: 2023-02-23 09:22:35 by Melvin*  
Once we have generated the working prices we can now start with looking for prices that do not look correct by performing outlier detections on the working prices. This will allow the correction and approval of the prices for final processing
- Substitution Back history** *Last Processing: 2023-02-23 09:26:32 by Melvin*  
After the prices have been initialized for the current time period, substitutions require historical prices to be created for the previous time periods. This process requires the first process (Initialize Working prices) to be executed.
- Generate Imputations** *Last Processing: 2023-02-27 13:28:14 by Melvin*  
This step requires outlier detection to be done before generating imputations. Please make sure that all outliers have been resolved before executing this step.

Below the list is a dark bar with a play button icon and the text 'Current Working Prices'.

# The CPI Survey management system

## Data Processing



- Outlier detection
  - Generic, IQR, Z-Score
    - Approval, Rejection

Price Status: All | Region: All | [GENERATE OUTLIERS](#)

Outliers | UNSELECT ALL | WITH SELECTED | Search

Outlet	Variety	Previous Price	Current Price	Generic Outlier	IQR Outlier	Z-Score Outlier	Outlier Status	Comment	Action
<input checked="" type="checkbox"/> LADYVILE - SKY GROCERY STORE	RICE - TROPICAL RICE, WHITE, 2LB BAG, BZE, G...	\$2.27	\$3.25	43.17%	43.17	2.98	pending	IMPORTED	
<input type="checkbox"/> LADYVILE - U MALL	RICE - TROPICAL RICE, WHITE, 2LB BAG, BZE, G...	\$2.95	\$3.25	10.17%	10.17	0.50	pending	IMPORTED	
<input type="checkbox"/> THE MALL	RICE - TROPICAL RICE, WHITE, 2LB BAG, BZE, G...	\$2.95	\$2.85	-3.39%	3.39	-0.81	approved	IMPORTED	
<input type="checkbox"/> AARON'S SUPER STORE	RICE - STAR RICE, GRADE B, 2LBS	\$3	\$2.85	-5.00%	5.00	-1.43	approved	IMPORTED	
<input checked="" type="checkbox"/> TIM'S STORE (BULLET TREE ROAD)	RICE - TROPIC RICE, PREMIUM WHITE RICE, QU...	\$2.95	\$3.25	10.17%		0.39	pending	IMPORTED	
<input checked="" type="checkbox"/> NEW FLAGS (FORMERLY THREE FLAGS)	RICE - TROPIC RICE, PREMIUM WHITE RICE, QU...	\$2.65	\$2.95	11.32%		0.49	pending	IMPORTED	

3 records selected. | Records per page: 10 | 1-10 of 1510

# The CPI Survey management system

## Data Processing



- Substitution Back History
  - Chaining of New Variety with Old Variety Information
- Imputation
  - Missing prices, rejected outliers, rejected substitutions
    - Nearest Neighbor
      - Area
      - National



# The CPI Survey management system

## Data Processing



- Final clean prices

Current Working Prices

REFRESH SATISFIED?

Region: All Search

Outlet	Variety	Area	Flag	Current Price	Previous Price
NEW BRIDGE SUPERMARKET	RICE - CIRCLE R, 2 LBS BAG, BZE	Corozal Town		\$3	\$3
NEW WORLD	RICE - CIRCLE R, 2 LBS BAG, BZE	Corozal Town		\$3	\$3
GMART(FORMERLY NEW CHINESE STORE)	RICE - STAR RICE, GRADE B, 2LBS	Corozal Town		\$2.75	\$2.75
GALLITO SUPERMARKET	RICE - STAR RICE, GRADE B, 2LBS	Corozal Town		\$3	\$3
GALLITO SUPERMARKET	RICE - Circle r, kids ,2lb, Belize	Corozal Town		\$3	\$3
FRY'S STORE	OATS - RED & WHITE, 18 OZ, CANADA, 100% WHOLE GRAIN, INSTANT	Corozal Town		\$4.5	\$4.5
GMART(FORMERLY NEW CHINESE STORE)	OATS - QUAKER OATS, 18OZ, USA,WHOLE GRAIN (old fashion), USA	Corozal Town		\$6.75	\$6.75
GALLITO SUPERMARKET	OATS - Avena rivero, Mexico, 500g	Corozal Town		\$3.58	\$3.5
NEW WORLD	OATS - Avena rivero, Mexico, 500g	Corozal Town		\$3.5	\$3.5

Records per page: 10 1-10 of 20968

# The CPI Survey management system

## Data Processing



- COICOP 2018 summary of average Ln prices

Price Averages By Area and Product X

Region: All EXPORT

Coicop	Area	Current Price	Previous Price
0111121	Corozal Town	1.081210013270184	1.081210013270184
0111401	Corozal Town	1.578027134420757	1.578027134420757
0112242	Corozal Town	1.5847970307904515	1.584390168237443
0112243	Corozal Town	1.0444727885190335	1.0655448916505987
0112325	Corozal Town	2.3180445881011913	2.3180445881011913
0112402	Corozal Town	1.72104081374779	1.72104081374779
0112403	Corozal Town	1.4909439898728003	1.4909439898728003
0112522	Corozal Town	1.6224725295109177	1.6086739552135274
0114811	Corozal Town	1.3651327197193952	1.2115856178406421
0116693	Corozal Town	2.616953173410848	2.7228311230701574
0117121	Corozal Town	0.6931471805599453	0.6931471805599453
0117421	Corozal Town	0.7977968093128549	0.7167037876912221
0117431	Corozal Town	0.936426245424844	0.936426245424844
0118511	Corozal Town	0.6931471805599453	0.6931471805599453
0118601	Corozal Town	0.40546510810816444	0.40546510810816444
0119211	Corozal Town	2.747822825780949	2.7539353558629824

Records per page: 20 1-20 of 4345

# The New CPI System Future



## Phase 2: One Stop Shop

### ML in Processing

- ML for Anomaly detection
  - One-Way SVM, etc..
- ML for Imputation
  - SVM, KKN, Prophet, etc..

### Survey Weight Processing

- Computation of CPI Basket from Survey data
- Distribution of CPI Basket at National or Regional

### Configuration Files

- Mechanism to do weights
- Classification Systems
- Outlets handling
- Product handling
- Variety handling
- Multiple base periods

### Index Computation

- Short Term
- Long Term
- Chained

# Contact Us



## Question Submitted to:

- Jefe Ochaeta- Project Lead, Statistician I, National Accounts Unit, Economic Statistics Department, Statistical Institute of Belize

[The visionary- contact](#)

- Steven Palma- Software Developer, IT Department, Statistical Institute of Belize

[The enforcer-contact](#)

- Melvin Perez- Statistician II, Price Statistics Unit, Economic Statistics Department, Statistical Institute of Belize

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