

# User Manual

## Fertilizer Recommendation Guide (FRG) – 2018

Version 1.0

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## Preface

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Bangladesh Agricultural Research Council (BARS) have been publishing Fertilizer Recommendation Guide (FRG) from 1979. The salient features of this guide are fertilizer recommendation for different crops, cropping patterns and multiple cropping targeting high yield goals based on updated soil nutrient status information of different AEZs (Agro-ecological zones). They update the FRG in every 5-6 years. In this year (2018), they will publish their seventh edition on September 30.

This software intends to automate the FRG and makes the user to get fertilizer recommendation easily. The software provides fertilizer recommendation based on both soil interpretation and location. In addition, it also provides the feature of calculating nutrient balance sheet.

We would like to thank our supervisor, Dr. Mohammad Shoyaib sir for supervising and motivating us throughout the whole project. Also we would like express our gratitude to Dr. Md. Abdus Satter and Prof. Dr. M. Jahiruddin for providing us with knowledge and helping us throughout the project.

# 1 INTRODUCTION

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Introduction section explains in general terms the system and the purpose for which it is intended.

## 1.1 System Overview

Fertilizer Recommendation Guide – 2018 (FRG – 2018) is an application that provides fertilizer recommendation for different crops, cropping patterns and multiple cropping targeting high goals based on soil nutrient status information of different AEZs of Bangladesh. This application also provides means of calculating nutrients balance sheet based on different cropping patterns and provided nutrients. This application has both android and desktop version. Android version lets the user calculate required fertilizer for different crops based on available nutrient on the soil or district provided by the user and calculate the nutrient balance sheet. Desktop version allows the user to calculate four kinds of balance sheets including nutrient balance sheet, partial nutrient balance sheet, crop balance sheet and partial crop balance sheet.

## 1.2 Organization of the Manual

The user's manual consists of five sections: General Information, System Summary, Getting Started, Using the System, and Reporting.

General Information section explains in general terms the system and the purpose for which it is intended.

System Summary section provides a general overview of the system. The summary outlines the uses of the system's hardware and software requirements, system's configuration, user access levels and system's behavior in case of any contingencies.

Getting Started section explains how to get FRG-2018 and install it on the device. The section presents briefly system menu.

Using The System section provides a detailed description of system functions.

Reporting section describes in what way information collected by the application are presented and how to access the information.

## 2 SYSTEM SUMMARY

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System Summary section provides a general overview of the system. The summary outlines the uses of the system's hardware and software requirements, system's configuration and user access levels.

### 2.1 System Configuration

FRG-2018 operates on both mobile devices with Android operating system and desktops with Windows operation system.

#### 2.1.1 Mobile Configuration

- Android 4.0 Jellybean or higher versions.
- At least 3 megabytes space available in the device.

#### 2.1.2 Desktop Configuration

- Windows 7 or higher version.
- Java 8 or higher version installed.
- At least 4 megabytes space available on the disk.

After installation on any of the device, FRG-2018 can be used immediately without any further configuration.

### 2.2 User Access Levels

Everyone can use the application. It requires no authentication.

## 3 GETTING STARTED

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Getting Started section explains how to get FRG-2018 and install it on the device. The section presents briefly system menu.

### 3.1 Installation

The newest installation version for the android currently available can be downloaded from <https://github.com/aljubaer/FRC-Offline/android> and is an .apk file, which should be installed on the device.

The pc version can be downloaded from <https://github.com/aljubaer/FRC-Offline/desktop>.

After the installation it is ready to use without any further configuration.

### 3.2 System Menu

As FRG-2018 has both android and desktop version, the system menu for both of those are shown separately.

#### 3.2.1 Android Version

Android version of FRG-2018 has three menus that includes-

1. Test Based Fertilizer Recommendation
2. Location Based Fertilizer Recommendation
3. Nutrient Balance Estimation

##### 3.2.1.1 Test Based Fertilizer Recommendation

Test based fertilizer recommendation menu consists of four input so that the desired crop and the texture of the land can be determined. After determining those and hitting proceed, user need to give input the qualitative value (Very Low, Low, Medium or Optimum) or quantitative value for each of the six nutrients (N, P, K, S, Zn, B). User can also see how the value was calculated. After that user will be shown fertilizer in kilograms required for each of the six nutrients per hector. User can also change the value of the land area and also the desired unit for the land area (hector or decimal). The amount will be updated accordingly.

##### 3.2.1.2 AEZ Based Fertilizer Recommendation

AEZ based fertilizer recommendation consists of two input fields in order to determine the district of the user and the desired cropping pattern. Cropping patterns are determined based on AEZ (Agro-ecological zone). In order to determine the AEZ, where the user is currently at, the name of the district is required. After that the user will be shown the amount of different fertilizer required for the desired cropping pattern.

### 3.2.1.3 Nutrient Balance Estimation

Nutrient balance estimation consists of twenty-six input fields to determine the AEZ, land type, name of the three crops in the three seasons, the amount of nutrients applied to these three crops and amount of nutrients that was taken by the crop. After that, nutrient balance sheet graph can be determined and will be shown to the user.

### 3.2.2 Desktop Version

The desktop version only has nutrient balance estimation. The input fields are similar to the android version. The desktop version shows the output in more detail than the android version. Other than nutrient balance sheet, it also shows partial nutrient balance sheet, crop partial balance graph and crop balance graph.



## 4 USING THE SYSTEM

This section provides a detailed description of system functions. The android and the desktop's version is described separately.

### 4.1 Android Version

As described earlier on section 3.2.1, the android version has three menus. Each of those provide different functionality. They are described in details in the following subsections.

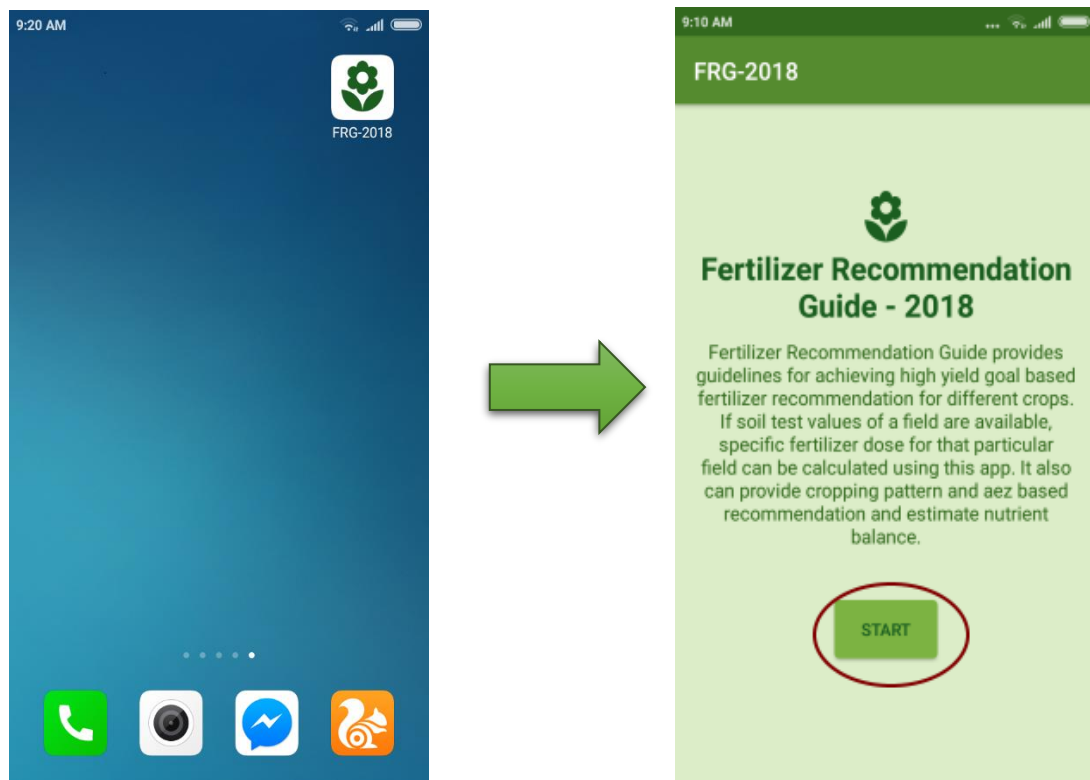


Figure 1: Starting the app

To start the app, first click the icon of the app and then click start. (**Figure 1: Starting the app**)

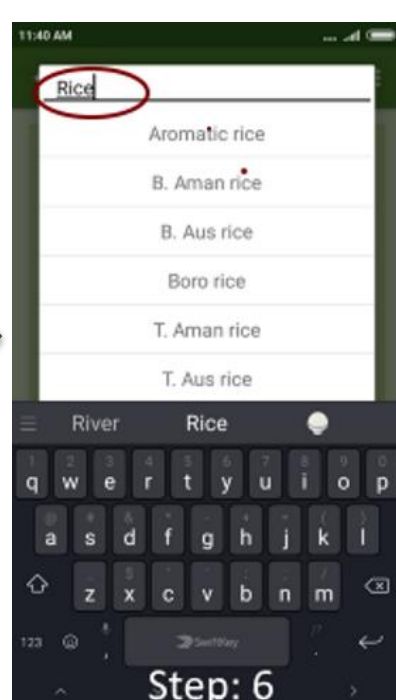
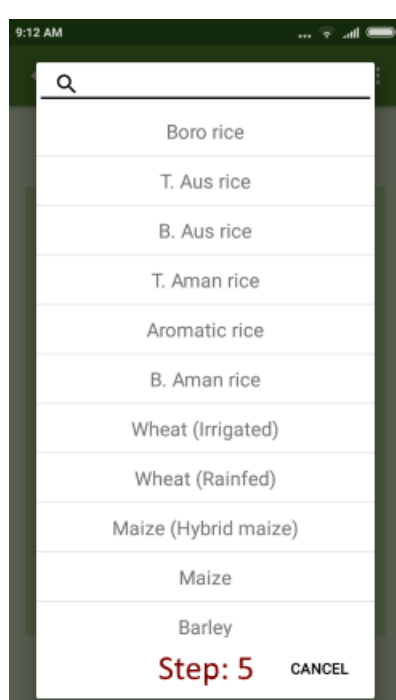
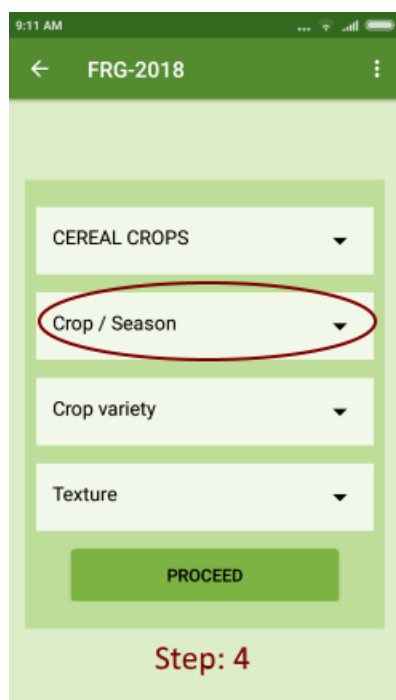
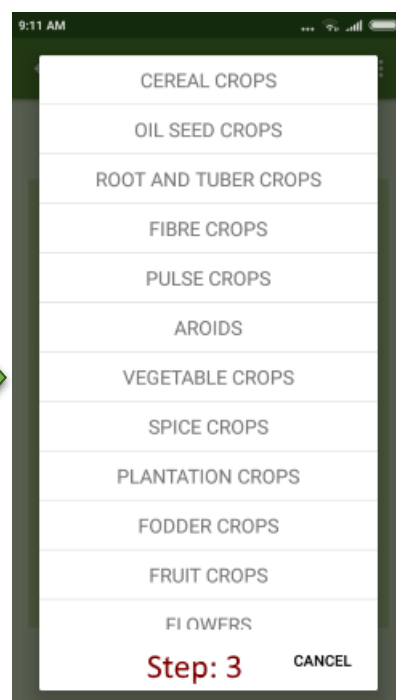
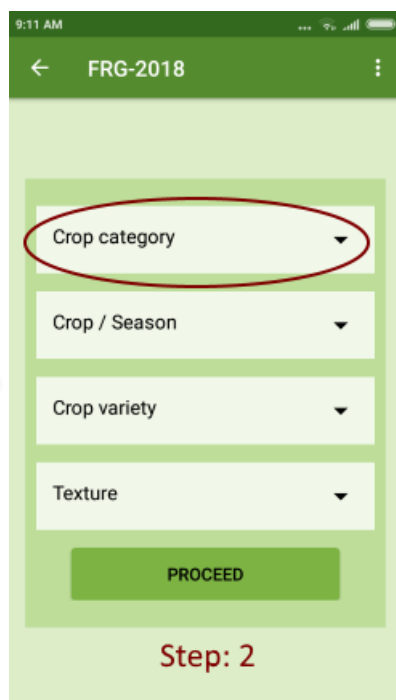
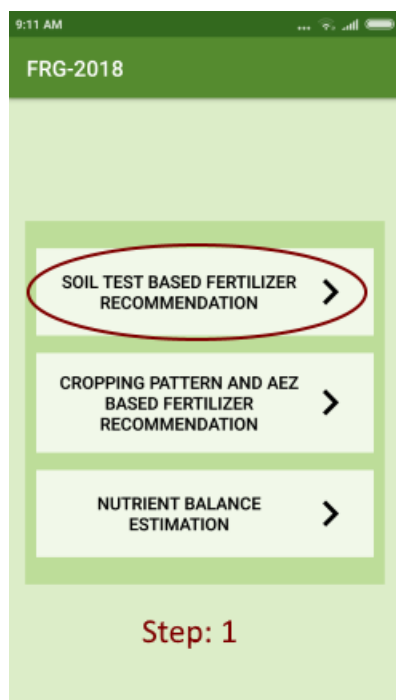
#### 4.1.1 Test Based Fertilizer Recommendation

Test based fertilizer recommendation provides fertilizer recommendation for a particular crop based on the nutrients value of the soil and land type. The steps are given below.

1. Select **Test Based Fertilizer Recommendation**.
2. Click **Crop Group**.
3. Select the desire crop group.
4. Click **Crop/Season**.
5. Select a crop.
6. You can also search for the crop in the search bar.

7. Click **Crop variety**.
8. Select a variety. You can also search for a variety in the search bar.
9. Click **Texture**.
10. Select a texture.
11. Click **PROCEED**.
12. In short, the description says that you can either put qualitative value (very low, low, medium or optimum) or any quantitative value of the nutrient residing in the soil. Click **OK**.
13. Select any fertilizer and enter the quantitative value. If the value is not correct, it will show invalid input. After that you can click **See details** to see how the value was calculated.
14. Click **Done**.
15. If you don't know the quantitative value, click any of the four qualitative value.
16. After providing the input for all the nutrients, click **APPLY FOR LAND**.
17. Provide land area and unit of your land area.
18. You can see the required amount and the cost then.

The processes are described in **Figure 2: Getting Test Based Fertilizer Recommendation**.



11:47 AM

← FRG-2018

CEREAL CROPS ▼

Boro rice ▼

Crop variety ▼

Texture ▼

PROCEED

Step: 7

9:12 AM

Q|

BRRI dhan29

Binadhan-6

BRRI hybrid dhan1

BRRI hybrid dhan2

BRRI hybrid dhan3

BR3

BR8

BR9

BR14

BR16

BR17

Step: 8 CANCEL

9:12 AM

← FRG-2018

CEREAL CROPS ▼

Boro rice ▼

BRRI dhan29 ▼

Texture ▼

PROCEED

Step: 9

9:12 AM

← FRG-2018

Sandy

Sandy Clay Loam

Sandy Loam

Sandy Clay

Loamy

Clay Loam

Silty Clay Loam

Silty Loam

Clayey

CANCEL

Step: 10

9:12 AM

← FRG-2018

CEREAL CROPS ▼

Boro rice ▼

BRRI dhan29 ▼

Silty Loam ▼

PROCEED

Step: 11

9:13 AM

← FRG-2018

Crop season: Boro rice

Variety: BRRI dhan29

Yield goal: -

Texture: Silty Loam

Land type: Wetland

Provide quantitative or qualitative soil test values for specific nutrient. For quantitative values, provide the value in specific nutrient field. If you don't know the quantitative value check the quality you know for the specific nutrient.

OK

Select MOP/SOP for Potassium

MOP SOP

Select Gypsum/Ammonium Sulphate for Sulphur

Gypsum Ammonium Sulphate

Step: 12

12:18 PM

← FRG-2018

Texture: Silty Loam  
Land type: Wetland

Select Urea/Guti urea for Nitrogen

1 Urea

Enter Total N (%)

2 0.15

Very Low Low Medium Optimum

Req. Urea: 304.836 (kg/ha)

3 See details

Step: 13

9:14 AM

← FRG-2018

Calculation

St = 0.150  
Interpretation = Low  
Uf = 180.000  
Cs = 60.000  
Ci = 0.089  
Ls = 0.091

$$N(\text{kg/ha}) = 180.0 - \frac{0.089}{60.0} \times (0.15 - 0.091) = 140.225$$

Nitrogen composition of Urea = 46.00%

Req. Urea =  $140.225 \times \frac{100.00}{46.00} = 304.836$

Method of Application

Will be implemented later.

Step: 14

12:05 PM

← FRG-2018

Crop season: Boro rice  
Variety: BRRI dhan29  
Texture: Silty Loam  
Land type: Wetland

Select Urea/Guti urea for Nitrogen

Urea

Enter Total N (%)

Very Low Low Medium Optimum

Req. Urea: 456.522 (kg/ha)

See details

Select TSP/DAP for Phosphorus

TSP DAP

Step: 15

9:15 AM

← FRG-2018

Zinc Sulphate(Mono) Zinc Sulphate(Hepta)

Enter Available Zn(ug/g)

Very Low Low Medium Optimum

Req. Zinc Sulphate Mono: 9.028 (kg/ha)

See details

Select Boric Acid/Solubor for Boron

Boric Acid Solubor

Enter Available B(ug/g)

Very Low Low Medium Optimum

Req. Boric Acid: 0.000 (kg/ha)

See details

APPLY FOR YOUR LAND

Step: 16

12:41 PM

← FRG-2018

Land Area

5 hector

Fertilizer Req. Dose(kg) Cost

Urea	2282.61	45652
TSP	700.00	15400
MoP	1330.00	19950
Gypsum	487.64	5852
Zinc Sulphate Mono	45.14	7674
Boric Acid	0.00	0

Step: 17

12:42 PM

← FRG-2018

Land Area

5 decimal

Fertilizer	Req. Dose(kg)	Cost
Urea	9.24	185
TSP	2.83	62
MoP	5.38	81
Gypsum	1.97	24
Zinc Sulphate Mono	0.18	31
Boric Acid	0.00	0

Step: 18

Figure 2: Getting Test Based Fertilizer Recommendation

### 4.1.2 AEZ Based Fertilizer Recommendation

AEZ based fertilizer recommendation gives fertilizer recommendation based on the user's district and the cropping pattern. The steps are given below-

1. Select **District**, provide **Land Area** and unit of the land area (hector or decimal).
2. Select any of the cropping pattern.
3. You can click done to have the next query.

The details are shown in **Figure 3: Fertilizer recommendation based on AEZ**.

The figure consists of three screenshots of a mobile application interface, showing the process of selecting parameters for fertilizer recommendation.

**Screenshot 1 (Left):** The interface shows the 'FRG-2018' screen. The 'District' field is set to 'Mymensingh' (labeled 1). The 'Land Area' field is set to '1.3' (labeled 2) and the unit is 'hector' (labeled 3). The 'Cropping patterns' section shows 'Rabi - Kharif-I - Kharif-II'.

**Screenshot 2 (Middle):** The interface shows the 'FRG-2018' screen. The 'District' field is set to 'Mymensingh'. The 'Land Area' field is set to '1.3' and the unit is 'hector'. The 'Cropping patterns' section shows a list of patterns: 'Boro rice - T.Aus rice - T.Aman rice', 'Boro rice - Fallow - T.Aman rice', 'Boro rice - Jute - T.Aman rice', 'Wheat - Jute - T.Aman rice', 'Wheat - Jute - Fallow', 'Potato - Jute - T.Aman rice', and 'Potato - Jute - Fallow'.

**Screenshot 3 (Right):** The interface shows the 'FRG-2018' screen. The 'Cropping patterns' section shows a table of fertilizer recommendations for various nutrients across different seasons.

Season	Rabi	Kharif-I	Kharif-II
Crop	Boro rice	Fallow	T.Aman rice
Yield goal (t/ha)	7.5	0	5
Urea (kg)	423.9	0.0	254.3
TSP (kg)	130.0	0.0	65.0
MoP (kg)	169.0	0.0	91.0
Gypsum (kg)	130.0	0.0	86.66
Magnesium (kg)	0.0	0.0	0.0
Zinc Mono (kg)	4.694	0.0	3.611
Solubor(kg)	0.0	0.0	0.0
Molybate (kg)	0.0	0.0	0.0
Cowdung(ton)	0.0	0.0	0.0

The 'DONE' button is visible at the bottom right of the table.

Figure 3: Fertilizer recommendation based on AEZ

### 4.1.3 Nutrient Balance Estimation

Nutrient balance estimation provides the balance sheet of the three nutrients (N, P and K) based on cropping pattern, AEZ and provided nutrients. The steps are given below-

1. Select **AEZ No**, **Land Type**, crops for the three seasons and which manure was provided in the three season. (If no manure was not provided, select any manure and give rate 0).
2. Provide the necessary values in the remaining empty field.
3. Click **GENERATE GRAPH**.
4. You can hit done for your next query.

The details are shown in **Figure 4: Nutrient Balance Estimation**.

12:52 PM

← FRG-2018

AEZ No 1

Land Type HL

Season	Robi	Kharif-I	Kharif-II
Crop	Fallow	Fallow	Fallow
Yield (kg)			
N (kg/ha)			
P (kg/ha)			
K (kg/ha)			
Manure	Cow.	Cow.	Cowd.
Rate (t/ha)			
Residues removed(%)			

12:55 PM

← FRG-2018

AEZ No 25

Land Type MLL

Season	Robi	Kharif-I	Kharif-II
Crop	Chick.	T.Aus.	T.Am.
Yield (kg)			
N (kg/ha)			
P (kg/ha)			
K (kg/ha)			
Manure	Cow.	FYM	Poult.
Rate (t/ha)			
Residues removed(%)			

12:58 PM

← FRG-2018

Land Type MLL

Season	Robi	Kharif-I	Kharif-II
Crop	Chick.	T.Aus.	T.Am.
Yield (kg)	1000	3000	4820
N (kg/ha)	90	70	90
P (kg/ha)	15	15	35
K (kg/ha)	40	35	66
Manure	Cow.	FYM	Poult.
Rate (t/ha)	5	2	3
Residues removed(%)	100	90	80

GENERATE GRAPH

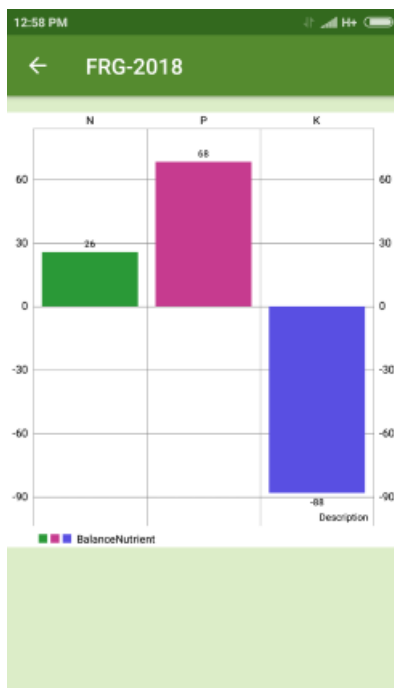


Figure 4: Nutrient Balance Estimation



## 4.2 Desktop Version

As described earlier, desktop version has only Nutrient Balance Estimation menu but in detail. After extracting it from zip file (you can extract it using winrar or 7-Zip). Then it can be used without further configuration. The steps are given below –

1. Select AEZ no, land type and crops and manure of Rabi, Kharif – I and Kharif – II seasons. Default AEZ is 1 and all values are 0.
2. Enter the value for each of field containing 0. (0 is a default value).
3. Select **Input**, **Output**, **Partial Balance Sheet** or **Balance Sheet** to see information in detail.
4. You can also click **Partial Balance Graph**, **Balance Graph**, **Crop Partial Balance Graph** and **Crop Balance graph** to see the graphical view of the data.

The details are given in **Figure 5: Desktop Version of Nutrient Balance Estimation**.

## NUTRIENT ESTIMATION BALANCE CALCULATOR

AEZ No:

Land Type:

Avg Rainfall:

Fertility Class:

Season	Crop	Yield	Fertilizer				Manure	Rate	Residues Removed (%)
			N	P	K				
Rabi:	<input type="text" value="Select Variety"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="Select Manure"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	
Kharif I:	<input type="text" value="Select Variety"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="Select Manure"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	
Kharif II:	<input type="text" value="Select Variety"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="Select Manure"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	

▶ Input

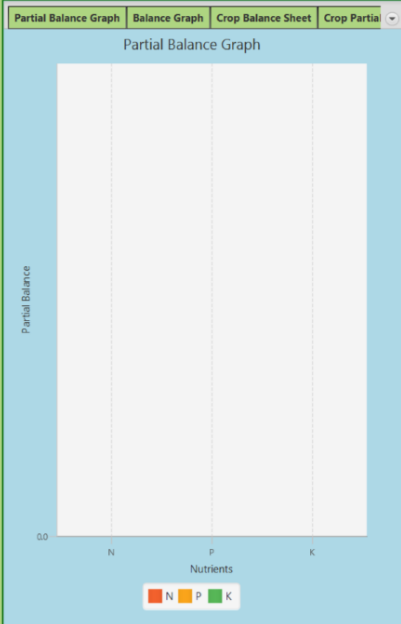
▶ Output

▶ Partial Balance Sheet

▶ Balance Sheet

Partial Balance Graph | Balance Graph | Crop Balance Sheet | Crop Partial

Partial Balance Graph





## NUTRIENT ESTIMATION BALANCE CALCULATOR

AEZ No:

Land Type:

Avg Rainfall:

Fertility Class:

Season	Crop	Yield	Fertilizer				Manure	Rate	Residues Removed (%)
			N	P	K				
Rabi:	<input type="text" value="Chickpea"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="Cowdung"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	
Kharif I:	<input type="text" value="T.Aus rice"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="PYM"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	
Kharif II:	<input type="text" value="T.Aman rice"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="Crop residues (..."/>	<input type="text" value="0"/>	<input type="text" value="0"/>	

▶ Input

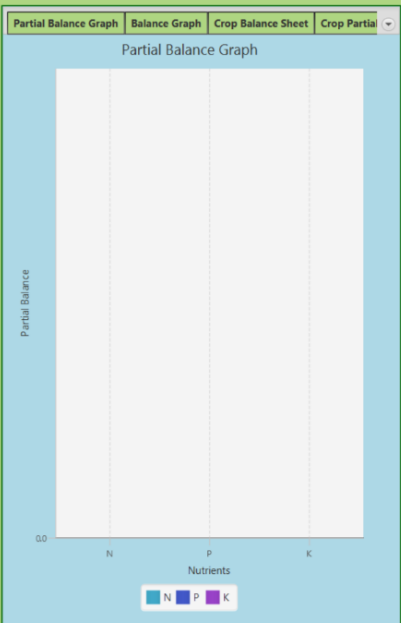
▶ Output

▶ Partial Balance Sheet

▶ Balance Sheet

Partial Balance Graph | Balance Graph | Crop Balance Sheet | Crop Partial

Partial Balance Graph



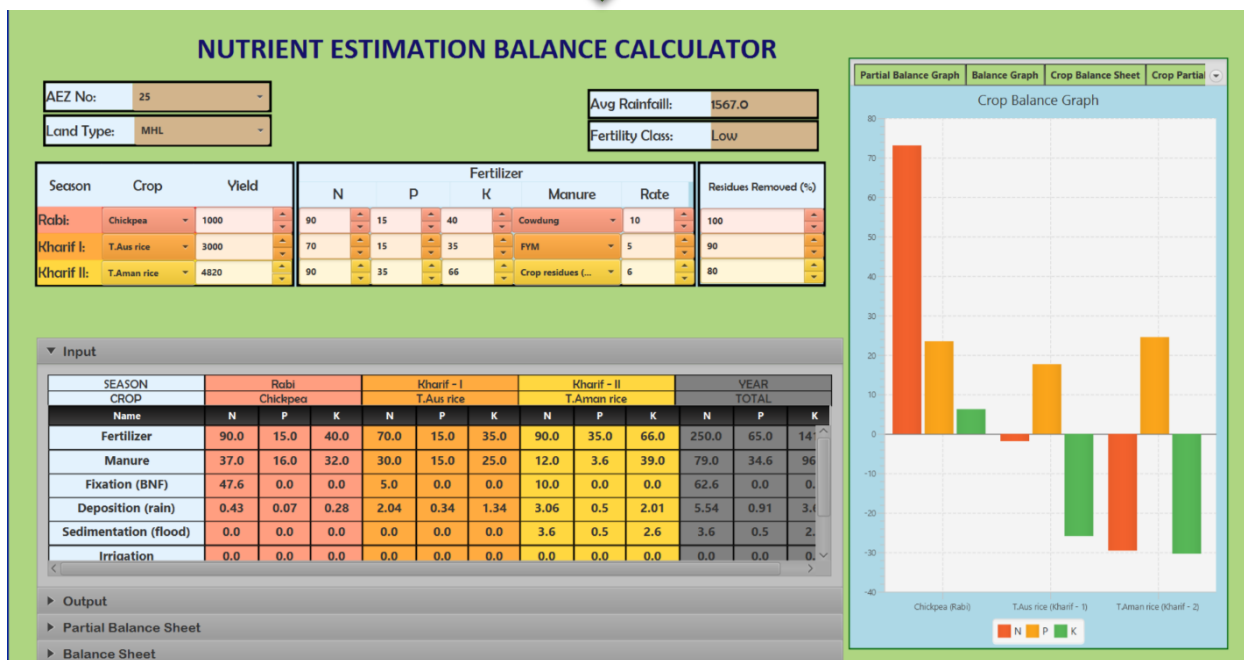
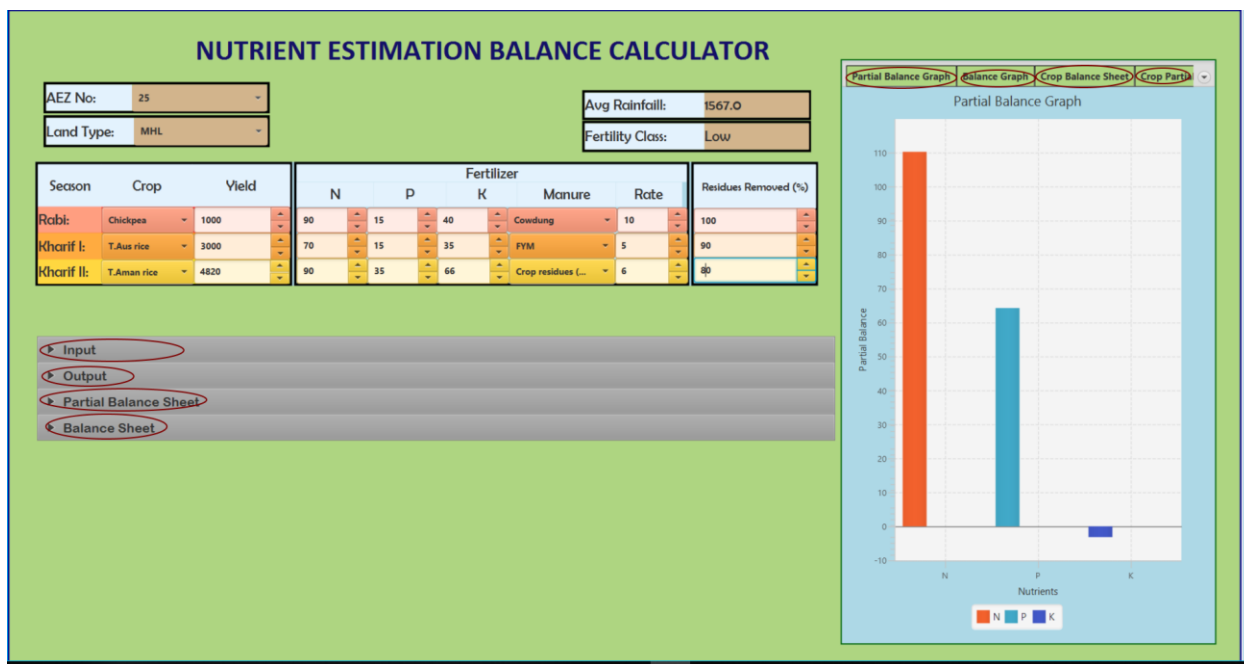


Figure 5: Desktop Version of Nutrient Balance Estimation