Quality Assurance Testing for the Crop BMP Dataset: FDACS_UFGA8201_peanut.94.xlsx

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1. Introduction

In preparing datasets based on the BMP data template, researchers need to check that their data are entered correctly, that the dataset is formatted as intended, and that variables are correctly defined. The goal of this report is to allow users to conduct a series of quality assurance (QA) tests on a dataset prior to submitting the data to a repository or funding agency. The underlying R script reviews crop BMP datasets according to the "four C's", whereby a dataset is:

1. *Correct*: The values are accurate within the expected range of measurement error. We emphasize that the main error-checking should be done as a part of the normal data management pipeline prior to loading into the BMP template.
2. *Complete*: The dataset is complete enough to enable further analysis without researchers having to seek guidance on how the crop was grown, weather conditions, etc.
3. *Coherent*: Identifiers (keys) used to link data across sheets are used consistently.
4. *Compatible*: By linking the BMP terminology to the ICASA standards, we expect that datasets can be used with a wide range of tools including artificial intelligence, machine learning and either simulation or statistical models.

This document (the exported PDF) is produced by running the knit command within RStudio. It alternates between text (such as this section), blocks of the R script, and blocks of output from R. Users who are familiar with R and R Markdown should feel free to modify the markdown file as needed.

1.1. Checking that the file is read as expected

We first list all sheets in the file FDACS_UFGA8201_peanut.94.xlsx. The list includes sheets that are defined but have no data.

```
 [1] "START HERE"                  "Terminology"
 [3] "List of sheets and keys"     "M1. Experiments"
 [5] "M2. Sites"                   "M3. Experimental Design"
 [7] "E1. Treatments"              "E2. Fields"
 [9] "E3. Plots"                   "E4. Crop Information"
[11] "E5. Planting"                "E6. Irrigation"
[13] "E7. Fertilizer"              "E9. Tillage"
[15] "E8. Organic Amendments"      "E10. Chemical Applications"
[17] "E11. Harvest"                "E12. Preplant Soil"
[19] "O1. Analysis Methods"        "O2. Yield Summary"
```

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[21] "O3. Crop Growth"              "O4. Crop Health"
[23] "O5. Soil Surface Properties"  "O6. Soil Layer Properties"
[25] "O7. Water"                    "S1. Soil Metadata"
[27] "S2. Soil Layer Properties"    "W1. Weather Station Metadata"
[29] "W2. Daily Weather Data"       "Z1. Dictionary Metadata"
[31] "Z2. Dictionary Observations"  "Z3. Dictionary Soils Weather"
```

2.0. Correct and Complete?: Summarizing the Content of Individual Sheets

Summaries are generated for the contents of each sheet except for the first three sheets, which contain instructions, and the last three, which are the dictionaries. If sufficient numeric data are present, boxplots are created for any numeric variables, including management levels.

Results for each sheet should be checked to make sure they match expectations for all variables. The QA tool is *not* meant as the primary means of detecting incorrect values. We assume the researchers have already conducted extensive quality control.

2.1. Summaries for each sheet (Tabular summaries first, then box plots of numeric variables).

If numeric data appear in tables of frequencies, this means the data for the variable has been interpreted as text (character sting). This can arise if there are any non-numeric values such as "." in the original data. Be sure to check rows below the actual data in case a character has inadvertently been entered below the main data.

Depending on the amount of data in the sheets, the corresponding group of box plots may appear after the summary of the next sheet (i.e., the box plots will be slightly out of order).

```
START processing M1..Experiments

 Variable                    Value                                          Frequency
 Experiment name             Peanut cultivars x four N rates                        1
 Experiment ID               UFGA8201                                               1
 Research data owner         Selamat and Gardner                                    1
 Institutional data owner    University of Florida                                  1
 Publication journal & volum Agronomy J 77:862-867                                  1
 Link to document            https://acsess.onlinelibrary.wiley.com/doi/ab          1
 Publication DOI             abs/10.2134/agronj1985.00021962007700060009x           1
 Should data be anonymized?  N                                                      1

End of processing for M1..Experiments
*            ================================================            *

START processing M2..Sites

 Variable                    Value         Frequency
 Site                        UFGA                  1
 Local name for experiment s Agronomy Farm         1
 State                       FL                    1
 County                      Alachua               1
 Town or other               Gainesville           1

End of processing for M2..Sites
*            ================================================            *

START processing M3..Experimental.Design

 Variable            Value              Frequency
 Experiment ID       UFGA8201                   1
```

```
 Site                UFGA                       1
 Treatment structure RCBD                       1
 Type of experiment  Station experiment         1
 Main effect 1       Cultivar                   1
 Main effect 2       Nitrogen                   1

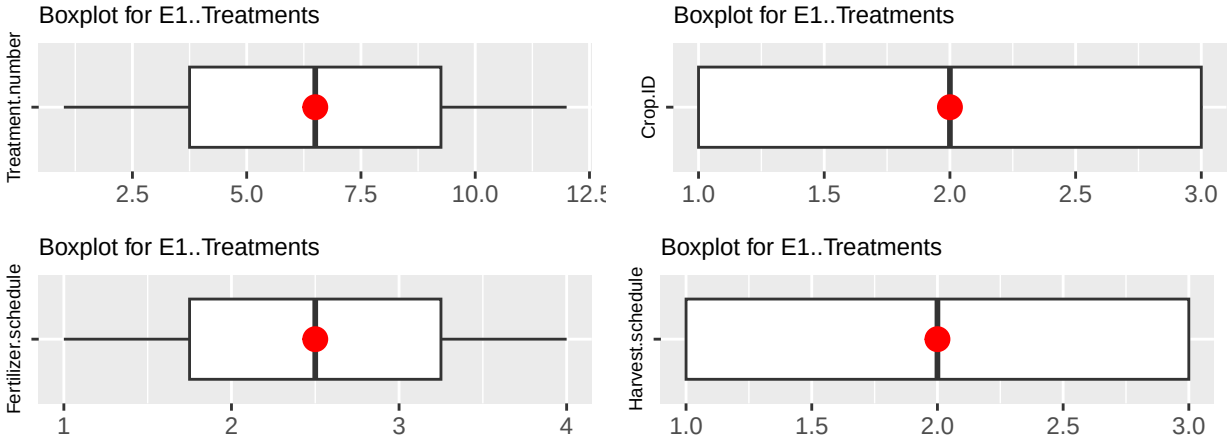
End of processing for M3..Experimental.Design
*            ================================================            *

START processing E1..Treatments

 Variable       Value                Frequency
 Treatment name Early Bunch, 0kg N           1
 Treatment name Early Bunch, 60kg N          1
 Treatment name Early Bunch,120kg N          1
 Treatment name Early Bunch,240kg N          1
 Treatment name Florunner, 0kg N             1
 Treatment name Florunner, 60kg N            1
 Treatment name Florunner,120kg N            1
 Treatment name Florunner,240kg N            1
 Treatment name Non-nod (M4-2), 0kgN         1
 Treatment name Non-nod (M4-2), 60kg         1
 Treatment name Non-nod (M4-2),120kg         1
 Treatment name Non-nod (M4-2),240kg         1
 Experiment ID  UFGA8201                    12
 Site           UFGA                        12

 Treatment.number    Crop.ID  Fertilizer.schedule Harvest.schedule
 Min.   : 1.00    Min.   :1   Min.   :1.00        Min.   :1
 1st Qu.: 3.75    1st Qu.:1   1st Qu.:1.75        1st Qu.:1
 Median : 6.50    Median :2   Median :2.50        Median :2
 Mean   : 6.50    Mean   :2   Mean   :2.50        Mean   :2
 3rd Qu.: 9.25    3rd Qu.:3   3rd Qu.:3.25        3rd Qu.:3
 Max.   :12.00    Max.   :3   Max.   :4.00        Max.   :3

No id variables; using all as measure variables
```



```
End of processing for E1..Treatments
*            ================================================            *

START processing E2..Fields

 Variable           Value      Frequency
 Experiment ID      UFGA8201           1
 Site               UFGA               1
 Field location     1                  1
 Soil ID            IBPN910015         1
 Weather station ID UFGA               1

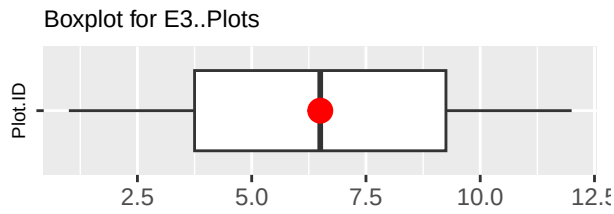
End of processing for E2..Fields
*            ================================================            *

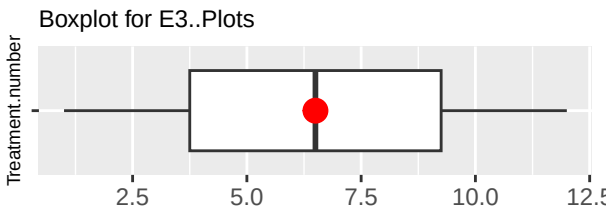
START processing E3..Plots

 Variable      Value    Frequency
 Experiment ID UFGA8201        12
 Site          UFGA            12

    Plot.ID      Treatment.number
 Min.   : 1.00   Min.   : 1.00
 1st Qu.: 3.75   1st Qu.: 3.75
 Median : 6.50   Median : 6.50
 Mean   : 6.50   Mean   : 6.50
 3rd Qu.: 9.25   3rd Qu.: 9.25
 Max.   :12.00   Max.   :12.00

No id variables; using all as measure variables
```






```
End of processing for E3..Plots
*            ================================================            *

START processing E4..Crop.Information

 Variable           Value                    Frequency
 Experiment ID      UFGA8201                         3
 Site               UFGA                             3
 Crop species       Peanut                           3
```

```
 Cultivar            EARLY BUNCH                      1
 Cultivar            FLORUNNER, std                   1
 Cultivar            Non-Nodulated                    1
 Intended crop usage Cash crop                        1
 Intended crop usage Cover crop                       1
 Intended crop usage Seed                             1
 Cultivar notes      M4-2, non-nodulating line        1

End of processing for E4..Crop.Information
*            ================================================            *

START processing E5..Planting

 Variable              Value    Frequency
 Experiment ID         UFGA8201         1
 Site                  UFGA             1
 Planting material     dry seed         1
 Planting distribution row              1

End of processing for E5..Planting
*            ================================================            *

START processing E6..Irrigation

 Variable                    Value                                          Frequency
 Experiment ID               UFGA8201                                               1
 Site                        UFGA                                                   1
 Type of irrigation          sprinkle                                               1
 Notes related to irrigation Paper reports two irrigations, but original f          1

End of processing for E6..Irrigation
*            ================================================            *

START processing E7..Fertilizer

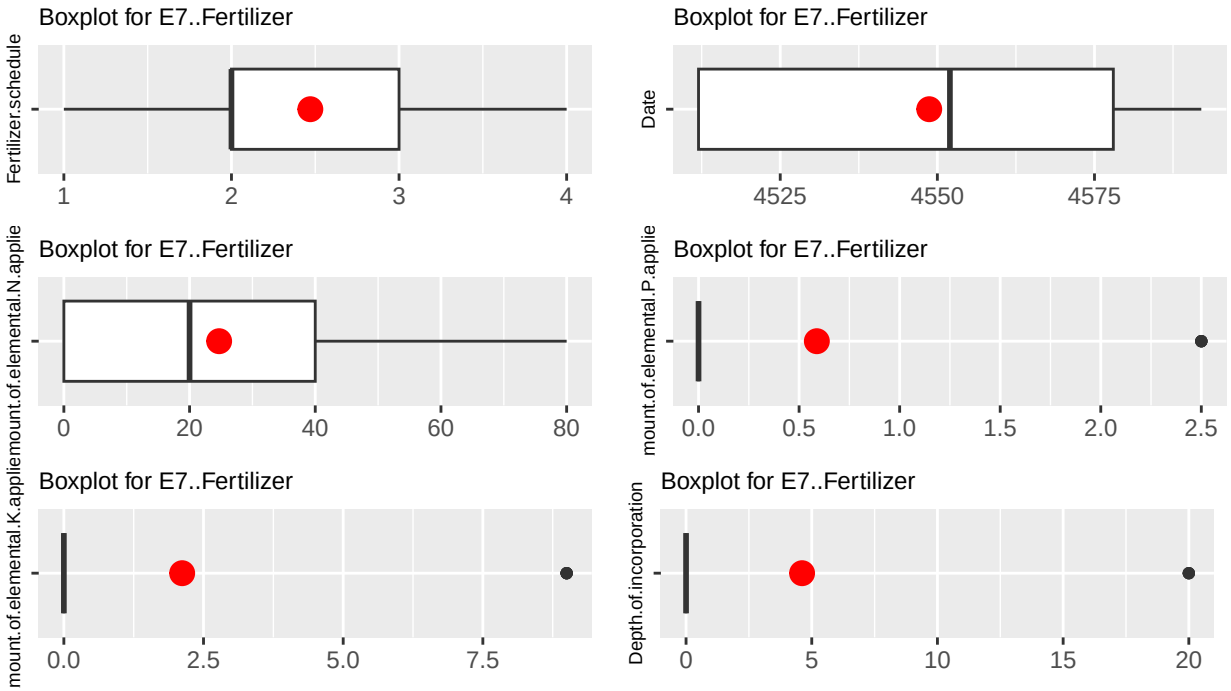
 Variable                    Value                                        Frequency
 Experiment ID               UFGA8201                                            17
 Site                        UFGA                                                17
 Nutrient Source             Ammonium nitrate                                     9
 Nutrient Source             compound fertilizer                                  4
 Nutrient Source             gypsum                                               4
 Placement                   broadcast                                            8
 Placement                   side-dressed                                         9
 Analysis                    ?                                                    4
 Analysis                    34:0:0                                               9
 Application timing          40 d                                                 3
 Application timing          80 d                                                 3
 Application timing          planting                                             3
 Application timing          pod initiation                                       4
 Application timing          preplant                                             4
 Notes related to applicatio 700 kg/ha. Date not given. Assuming 60 DAP.          4
 Notes related to applicatio Date not given                                       4

 Fertilizer.schedule      Date            Amount.of.elemental.N.applied
```

```
Min.   :1.000       Min.   :1982-05-10   Min.   : 0.00
1st Qu.:2.000       1st Qu.:1982-05-10   1st Qu.: 0.00
Median :2.000       Median :1982-06-19   Median :20.00
Mean   :2.471       Mean   :1982-06-15   Mean   :24.71
3rd Qu.:3.000       3rd Qu.:1982-07-15   3rd Qu.:40.00
Max.   :4.000       Max.   :1982-07-29   Max.   :80.00

 Amount.of.elemental.P.applied Amount.of.elemental.K.applied Depth.of.incorporation
Min.   :0.0000                Min.   :0.000                 Min.   : 0.000
1st Qu.:0.0000                1st Qu.:0.000                 1st Qu.: 0.000
Median :0.0000                Median :0.000                 Median : 0.000
Mean   :0.5882                Mean   :2.118                 Mean   : 4.615
3rd Qu.:0.0000                3rd Qu.:0.000                 3rd Qu.: 0.000
Max.   :2.5000                Max.   :9.000                 Max.   :20.000
                                                            NA's   :4
```

```
No id variables; using all as measure variables
```




```
End of processing for E7..Fertilizer
*            ==================================================            *

START processing E9..Tillage

 Variable                  Value                                        Frequency
 Experiment ID             UFGA8201                                             3
 Site                      UFGA                                                 3
 Type of tillage operation broadcast fertilizer application                     1
 Type of tillage operation broadcast fertilizer application, gypsum             1
```

```
 Type of tillage operation  row planting with initial nitrogen                    1
 Notes related to operation "Preplant" but date not given. No information        1
 Notes related to operation 700 kg/ha. Date not given. Assuming 60 DAP.          1
 Notes related to operation Assuming one pass planting and side-dress            1

End of processing for E9..Tillage
*            ================================================            *

START processing E8..Organic.Amendments

[1] Variable  Value     Frequency
<0 rows> (or 0-length row.names)

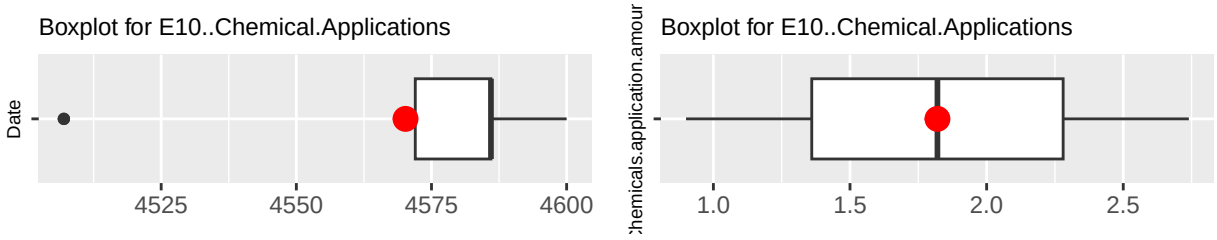
End of processing for E8..Organic.Amendments
*            ================================================            *

START processing E10..Chemical.Applications

 Variable                    Value                                        Frequency
 Experiment ID               UFGA8201                                            10
 Site                        UFGA                                                10
 Name of chemical applied    Balan (N-buthyl-N-ethyl-a-a-a-trifluro-2,6-di         1
 Name of chemical applied    Bravo (tetrachloroisothalonitrile)                   4
 Name of chemical applied    Sevin (1-naphyl N-methyl-carbamate)                  4
 Name of chemical applied    Vernam (S-propyl dipropylthio-carbamate)             1
 Chemicals application metho broadcast                                            2
 Chemicals application metho sprayed                                              8
 Notes related to applicatio  biweekly from 60 DAP to maturity                    8
 Notes related to applicatio "preplant", date is guess                            2

     Date            Chemicals.application.amount
 Min.   :1982-05-05   Min.   :0.90
 1st Qu.:1982-07-09   1st Qu.:1.36
 Median :1982-07-23   Median :1.82
 Mean   :1982-07-07   Mean   :1.82
 3rd Qu.:1982-07-23   3rd Qu.:2.28
 Max.   :1982-08-06   Max.   :2.74
                      NA's   :8

No id variables; using all as measure variables
```




```
End of processing for E10..Chemical.Applications
```

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*            ================================================            *

START processing E11..Harvest

 Variable               Value    Frequency
 Experiment ID          UFGA8201         3
 Site                   UFGA             3
 Crop species harvested peanut           3
 Harvest component      seed             3
 Harvest method         hand             3

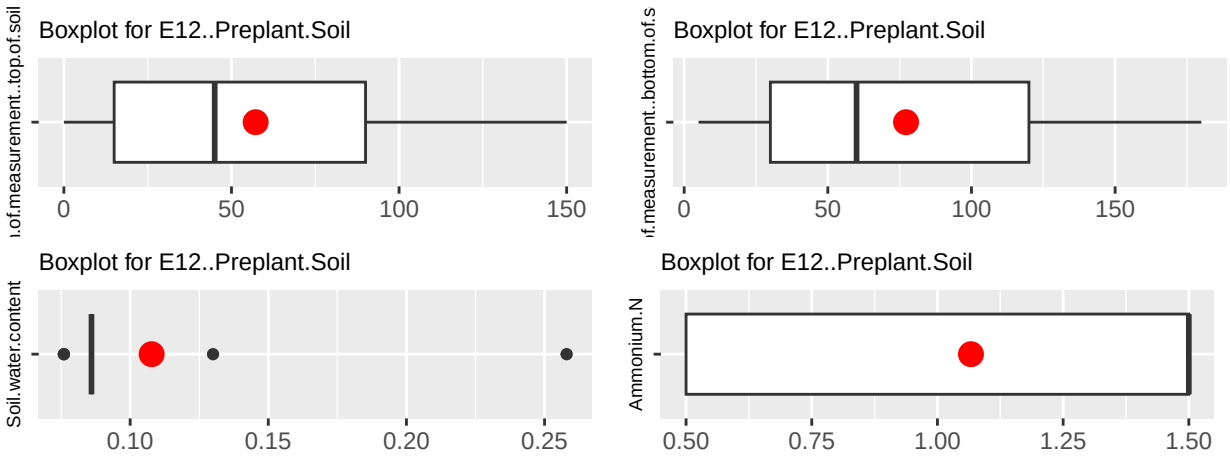
End of processing for E11..Harvest
*            ================================================            *

START processing E12..Preplant.Soil

 Variable      Value    Frequency
 Experiment ID UFGA8201         9
 Site          UFGA             9

 Depth.of.measurement..top.of.soil.layer Depth.of.measurement..bottom.of.soil.layer
 Min.   :  0.00                          Min.   :  5.00
 1st Qu.: 15.00                          1st Qu.: 30.00
 Median : 45.00                          Median : 60.00
 Mean   : 57.22                          Mean   : 77.22
 3rd Qu.: 90.00                          3rd Qu.:120.00
 Max.   :150.00                          Max.   :180.00
 Soil.water.content   Ammonium.N
 Min.   :0.0760     Min.   :0.500
 1st Qu.:0.0860     1st Qu.:0.500
 Median :0.0860     Median :1.500
 Mean   :0.1078     Mean   :1.067
 3rd Qu.:0.0860     3rd Qu.:1.500
 Max.   :0.2580     Max.   :1.500

No id variables; using all as measure variables
```



```
End of processing for E12..Preplant.Soil
*            ================================================            *

START processing O1..Analysis.Methods

[1] Variable  Value     Frequency
<0 rows> (or 0-length row.names)

End of processing for O1..Analysis.Methods
*            ================================================            *

START processing O2..Yield.Summary

 Variable      Value    Frequency
 Experiment ID UFGA8201        12
 Site          UFGA            12

    Plot.ID      Treatment.number   Seed.yield   Single.seed.wt    Seed.per.m2
 Min.   : 1.00   Min.   : 1.00    Min.   : 680   Min.   :0.3560   Min.   :191.0
 1st Qu.: 3.75   1st Qu.: 3.75    1st Qu.:1811   1st Qu.:0.4195   1st Qu.:238.8
 Median : 6.50   Median : 6.50    Median :2108   Median :0.5820   Median :321.5
 Mean   : 6.50   Mean   : 6.50    Mean   :1941   Mean   :0.6378   Mean   :317.8
 3rd Qu.: 9.25   3rd Qu.: 9.25    3rd Qu.:2251   3rd Qu.:0.9187   3rd Qu.:383.2
 Max.   :12.00   Max.   :12.00    Max.   :2714   Max.   :0.9470   Max.   :455.0

    LAI.max       Tops.dry.wt      Pod.dry.wt   Harvest.index    Pod.harvest.index
 Min.   :3.930   Min.   :10400   Min.   :1068   Min.   :0.0620   Min.   :0.0980
 1st Qu.:4.207   1st Qu.:11600   1st Qu.:2570   1st Qu.:0.0865   1st Qu.:0.1227
 Median :5.025   Median :16050   Median :2882   Median :0.1255   Median :0.1605
 Mean   :5.220   Mean   :15350   Mean   :2664   Mean   :0.1331   Mean   :0.1837
 3rd Qu.:6.037   3rd Qu.:18050   3rd Qu.:3024   3rd Qu.:0.1855   3rd Qu.:0.2597
 Max.   :6.900   Max.   :21900   Max.   :3453   Max.   :0.2050   Max.   :0.2870
 NA's   :8
 Threshing.percent Tops.nitrogen   Seed.nitrogen.tot Seed.nitrogen.conc.
 Min.   :62.60     Min.   : 98.6   Min.   : 20.20    Min.   :2.970
 1st Qu.:69.75     1st Qu.:190.9   1st Qu.: 65.62    1st Qu.:3.600
 Median :71.65     Median :215.7   Median :105.70    Median :4.750
 Mean   :72.18     Mean   :214.7   Mean   : 88.33    Mean   :4.353
 3rd Qu.:76.83     3rd Qu.:259.3   3rd Qu.:110.50    3rd Qu.:4.935
 Max.   :78.70     Max.   :301.3   Max.   :126.00    Max.   :5.240


No id variables; using all as measure variables
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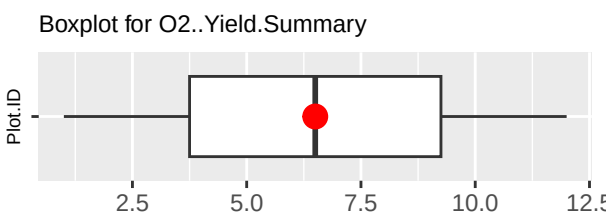
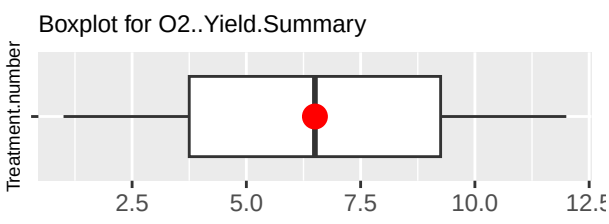
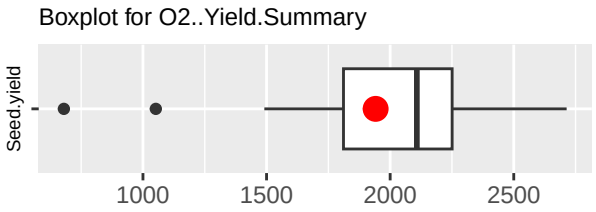
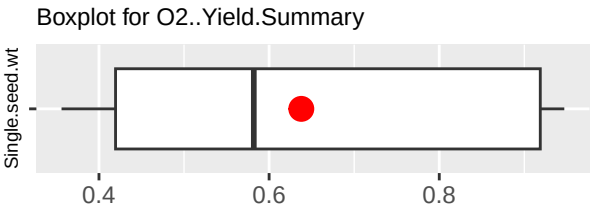
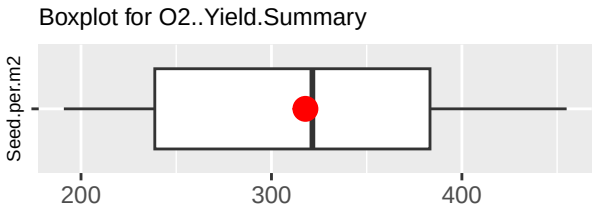
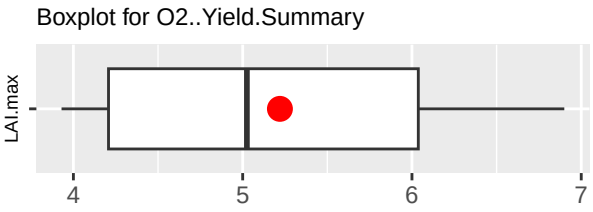


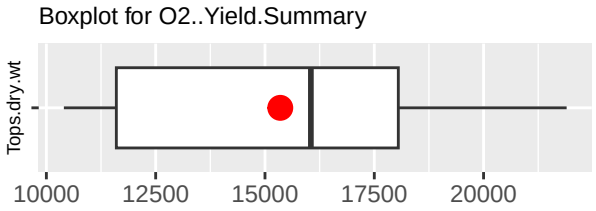


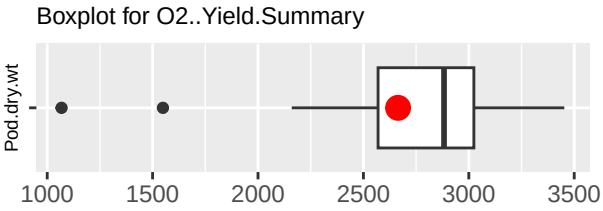


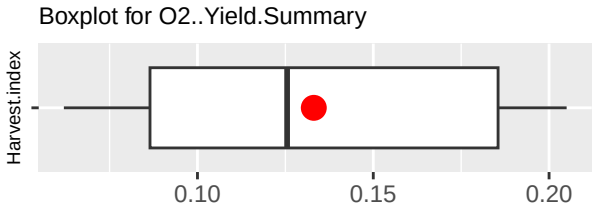


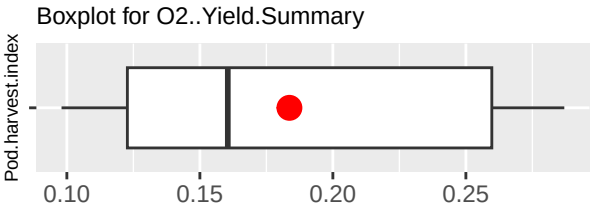


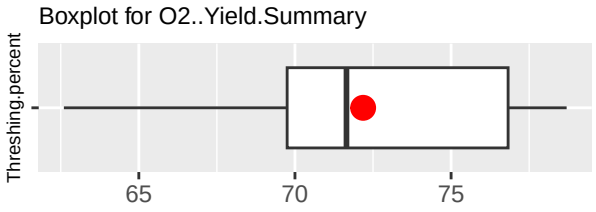


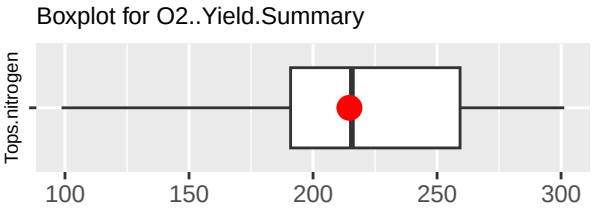


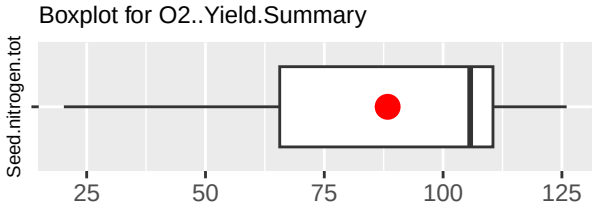


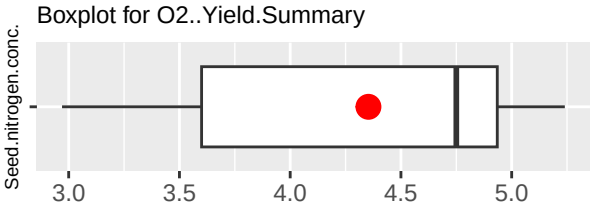













```
End of processing for O2..Yield.Summary
*           ================================================           *

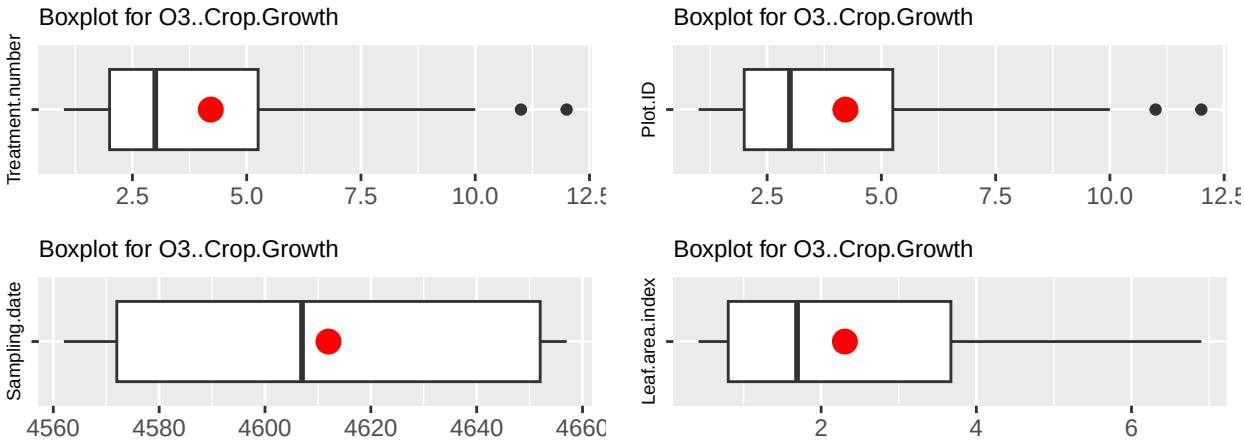
START processing O3..Crop.Growth

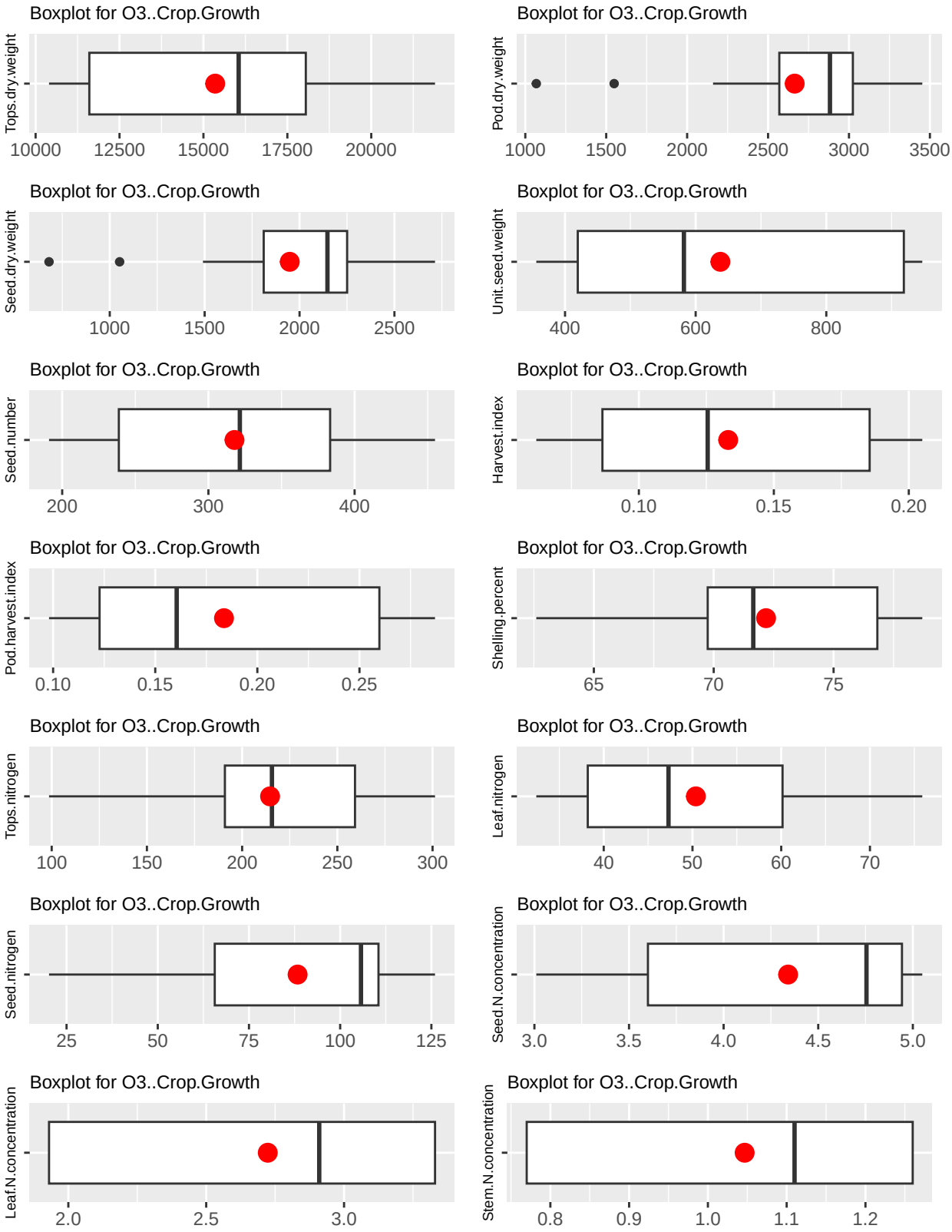
 Variable      Value    Frequency
 Experiment ID UFGA8201        28
```

```
Site          UFGA            28

 Treatment.number    Plot.ID       Sampling.date        Leaf.area.index  Tops.dry.weight
 Min.   : 1.000   Min.   : 1.000   Min.   :1982-06-29   Min.   :0.4200   Min.   :10400
 1st Qu.: 2.000   1st Qu.: 2.000   1st Qu.:1982-07-09   1st Qu.:0.8025   1st Qu.:11600
 Median : 3.000   Median : 3.000   Median :1982-08-13   Median :1.6900   Median :16050
 Mean   : 4.214   Mean   : 4.214   Mean   :1982-08-18   Mean   :2.3065   Mean   :15350
 3rd Qu.: 5.250   3rd Qu.: 5.250   3rd Qu.:1982-09-27   3rd Qu.:3.6725   3rd Qu.:18050
 Max.   :12.000   Max.   :12.000   Max.   :1982-10-02   Max.   :6.9000   Max.   :21900
                                                        NA's   :8        NA's   :16
 Pod.dry.weight Seed.dry.weight Unit.seed.weight  Seed.number    Harvest.index
 Min.   :1068   Min.   : 680    Min.   :356.0    Min.   :191.0   Min.   :0.0620
 1st Qu.:2570   1st Qu.:1811    1st Qu.:419.5    1st Qu.:238.8   1st Qu.:0.0865
 Median :2882   Median :2147    Median :582.0    Median :321.5   Median :0.1255
 Mean   :2664   Mean   :1948    Mean   :637.8    Mean   :317.8   Mean   :0.1331
 3rd Qu.:3024   3rd Qu.:2251    3rd Qu.:918.8    3rd Qu.:383.2   3rd Qu.:0.1855
 Max.   :3453   Max.   :2714    Max.   :947.0    Max.   :455.0   Max.   :0.2050
 NA's   :16     NA's   :16      NA's   :16       NA's   :16      NA's   :16
 Pod.harvest.index Shelling.percent Tops.nitrogen   Leaf.nitrogen   Seed.nitrogen
 Min.   :0.0980    Min.   :62.60    Min.   : 98.6   Min.   :32.40   Min.   : 20.20
 1st Qu.:0.1227    1st Qu.:69.75    1st Qu.:190.9   1st Qu.:38.20   1st Qu.: 65.62
 Median :0.1605    Median :71.65    Median :215.7   Median :47.30   Median :105.70
 Mean   :0.1837    Mean   :72.18    Mean   :214.7   Mean   :50.38   Mean   : 88.33
 3rd Qu.:0.2597    3rd Qu.:76.83    3rd Qu.:259.3   3rd Qu.:60.15   3rd Qu.:110.50
 Max.   :0.2870    Max.   :78.70    Max.   :301.3   Max.   :75.90   Max.   :126.00
 NA's   :16        NA's   :16       NA's   :16      NA's   :16      NA's   :16
 Seed.N.concentration Leaf.N.concentration Stem.N.concentration
 Min.   :3.010        Min.   :1.930        Min.   :0.770
 1st Qu.:3.600        1st Qu.:1.930        1st Qu.:0.770
 Median :4.755        Median :2.910        Median :1.110
 Mean   :4.341        Mean   :2.723        Mean   :1.047
 3rd Qu.:4.942        3rd Qu.:3.330        3rd Qu.:1.260
 Max.   :5.050        Max.   :3.330        Max.   :1.260
 NA's   :16           NA's   :16           NA's   :16

No id variables; using all as measure variables
```




Boxplot for O3..Crop.Growth
Tops.dry.weight
10000
12500
15000
17500
20000
Boxplot for O3..Crop.Growth
Pod.dry.weight
1000
1500
2000
2500
3000
3500
Boxplot for O3..Crop.Growth
Seed.dry.weight
1000
1500
2000
2500
Boxplot for O3..Crop.Growth
Unit.seed.weight
400
600
800
Boxplot for O3..Crop.Growth
Seed.number
200
300
400
Boxplot for O3..Crop.Growth
Harvest.index
0.10
0.15
0.20
Boxplot for O3..Crop.Growth
Pod.harvest.index
0.10
0.15
0.20
0.25
Boxplot for O3..Crop.Growth
Shelling.percent
65
70
75
Boxplot for O3..Crop.Growth
Tops.nitrogen
100
150
200
250
300
Boxplot for O3..Crop.Growth
Leaf.nitrogen
40
50
60
70
Boxplot for O3..Crop.Growth
Seed.nitrogen
25
50
75
100
125
Boxplot for O3..Crop.Growth
Seed.N.concentration
3.0
3.5
4.0
4.5
5.0
Boxplot for O3..Crop.Growth
Leaf.N.concentration
2.0
2.5
3.0
Boxplot for O3..Crop.Growth
Stem.N.concentration
0.8
0.9
1.0
1.1
1.2

```
End of processing for O3..Crop.Growth
*            ================================================            *

START processing O4..Crop.Health

[1] Variable  Value     Frequency
<0 rows> (or 0-length row.names)

End of processing for O4..Crop.Health
*            ================================================            *

START processing O5..Soil.Surface.Properties

[1] Variable  Value     Frequency
<0 rows> (or 0-length row.names)

End of processing for O5..Soil.Surface.Properties
*            ================================================            *

START processing O6..Soil.Layer.Properties

[1] Variable  Value     Frequency
<0 rows> (or 0-length row.names)

End of processing for O6..Soil.Layer.Properties
*            ================================================            *

START processing O7..Water

[1] Variable  Value     Frequency
<0 rows> (or 0-length row.names)

End of processing for O7..Water
*            ================================================            *

START processing S1..Soil.Metadata

 Variable                   Value                                 Frequency
 Soil ID                    IBPN910015                                    1
 Soil name                  Millhopper Fine Sand                          1
 Soil classification        Loamy,silic,hyperth Gross. Paleudults         1
 Soil classification system USDA                                          1
 Source of soil data        DSSAT                                         1
 Anonymize                  N                                             1

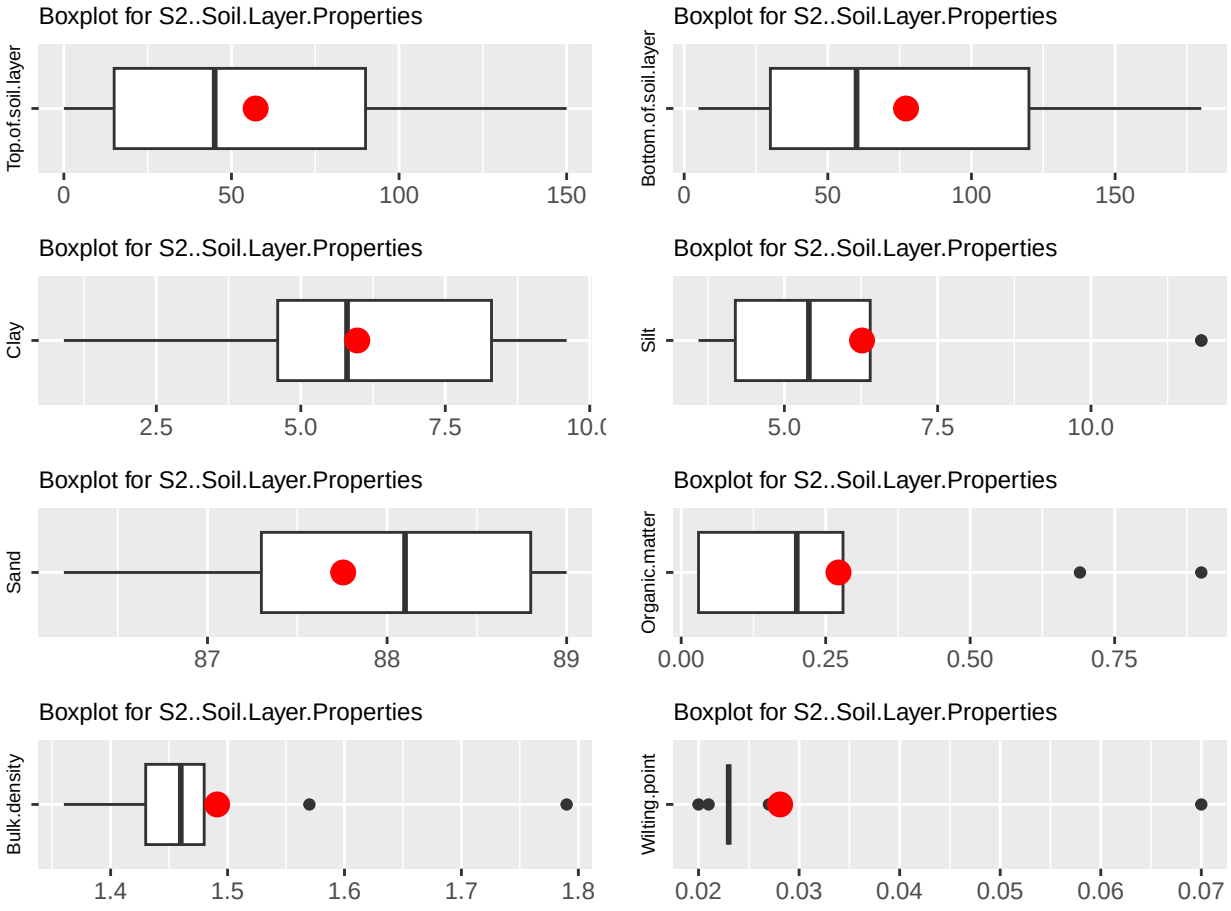
End of processing for S1..Soil.Metadata
*            ================================================            *

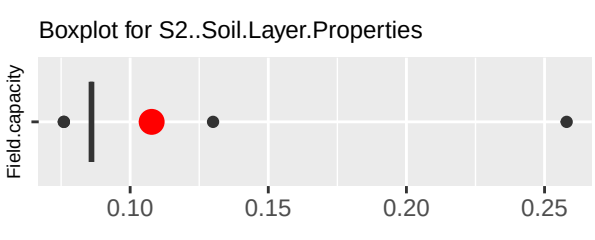
START processing S2..Soil.Layer.Properties

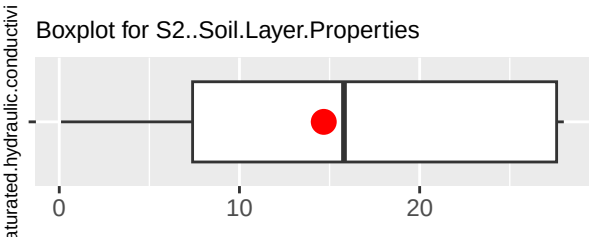
 Variable Value      Frequency
  Soil ID IBPN910015         9
```

```
 Top.of.soil.layer Bottom.of.soil.layer      Clay            Silt            Sand
 Min.   :  0.00    Min.   :  5.00       Min.   :0.900   Min.   : 3.600   Min.   :86.20
 1st Qu.: 15.00    1st Qu.: 30.00       1st Qu.:4.600   1st Qu.: 4.200   1st Qu.:87.30
 Median : 45.00    Median : 60.00       Median :5.800   Median : 5.400   Median :88.10
 Mean   : 57.22    Mean   : 77.22       Mean   :5.978   Mean   : 6.267   Mean   :87.76
 3rd Qu.: 90.00    3rd Qu.:120.00       3rd Qu.:8.300   3rd Qu.: 6.400   3rd Qu.:88.80
 Max.   :150.00    Max.   :180.00       Max.   :9.600   Max.   :11.800   Max.   :89.00
 Organic.matter    Bulk.density   Wilting.point     Field.capacity
 Min.   :0.0300   Min.   :1.360   Min.   :0.02000   Min.   :0.0760
 1st Qu.:0.0300   1st Qu.:1.430   1st Qu.:0.02300   1st Qu.:0.0860
 Median :0.2000   Median :1.460   Median :0.02300   Median :0.0860
 Mean   :0.2722   Mean   :1.491   Mean   :0.02811   Mean   :0.1078
 3rd Qu.:0.2800   3rd Qu.:1.480   3rd Qu.:0.02300   3rd Qu.:0.0860
 Max.   :0.9000   Max.   :1.790   Max.   :0.07000   Max.   :0.2580
 Saturated.hydraulic.conductivity
 Min.   : 0.10
 1st Qu.: 7.40
 Median :15.80
 Mean   :14.68
 3rd Qu.:27.60
 Max.   :28.00
```

```
No id variables; using all as measure variables
```








```
End of processing for S2..Soil.Layer.Properties
*            ================================================            *

START processing W1..Weather.Station.Metadata

 Variable             Value                    Frequency
 Weather station ID   UFGA                            1
 Weather station name Gainesville,Florida,USA         1
 Anonymize            N                               1

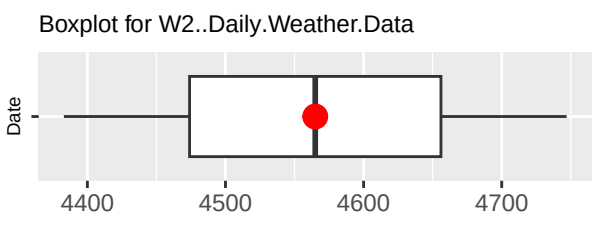
End of processing for W1..Weather.Station.Metadata
*            ================================================            *

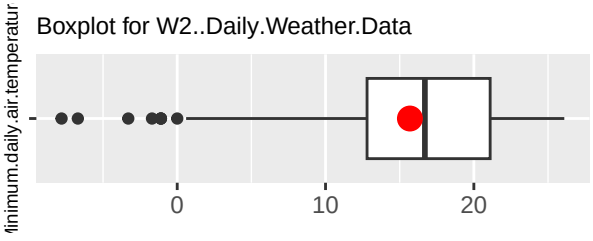
START processing W2..Daily.Weather.Data

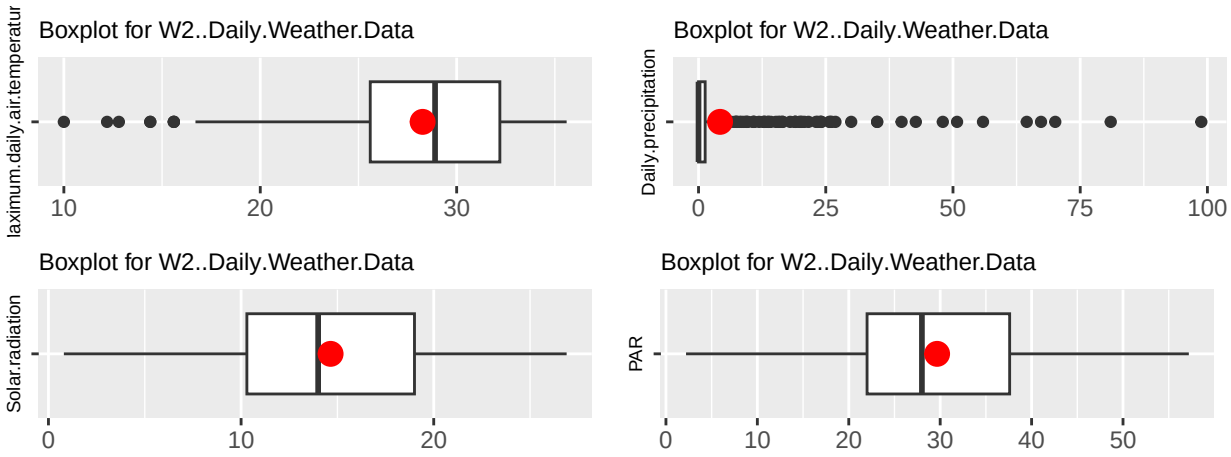
 Variable           Value Frequency
 Weather station ID  UFGA       365

     Date            Minimum.daily.air.temperature Maximum.daily.air.temperature
 Min.   :1982-01-01   Min.   :-7.80                 Min.   :10.00
 1st Qu.:1982-04-02   1st Qu.:12.80                 1st Qu.:25.60
 Median :1982-07-02   Median :16.70                 Median :28.90
 Mean   :1982-07-02   Mean   :15.69                 Mean   :28.27
 3rd Qu.:1982-10-01   3rd Qu.:21.10                 3rd Qu.:32.20
 Max.   :1982-12-31   Max.   :26.10                 Max.   :35.60
 Daily.precipitation Solar.radiation      PAR
 Min.   : 0.000      Min.   : 0.80   Min.   : 2.20
 1st Qu.: 0.000      1st Qu.:10.30   1st Qu.:22.00
 Median : 0.000      Median :14.00   Median :28.00
 Mean   : 4.232      Mean   :14.65   Mean   :29.66
 3rd Qu.: 1.300      3rd Qu.:19.00   3rd Qu.:37.60
 Max.   :98.800      Max.   :26.90   Max.   :57.20

No id variables; using all as measure variables
```







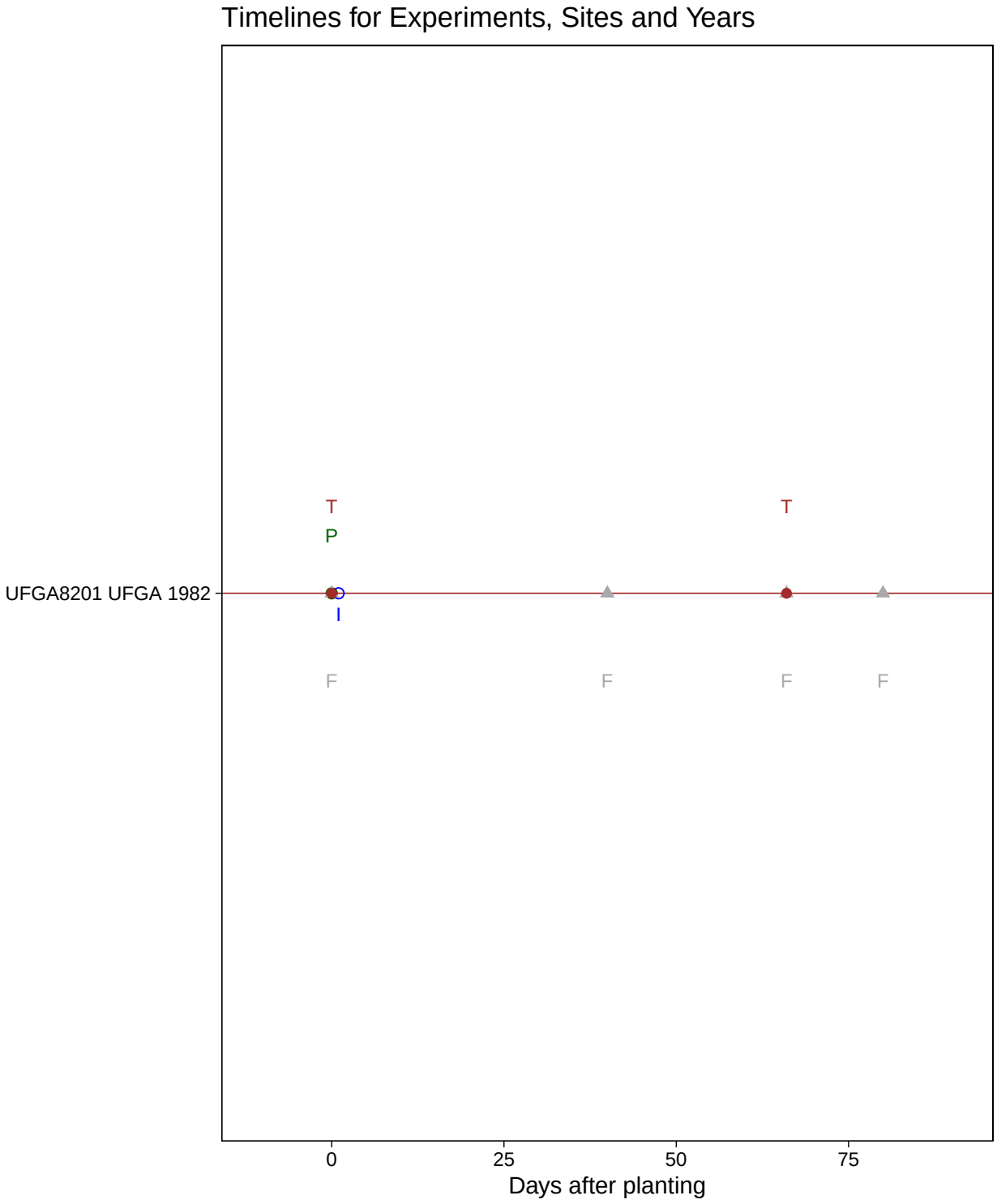

```
End of processing for W2..Daily.Weather.Data
*            ==================================================          *
```

2.2. Correct Dates? Are events sequenced as expected?

Dates of key management events such as plantings, irrigations and harvests are sometimes entered incorrectly. A common problem is inversion of days and months (is '3/5' "March 5" or "3 April"?). To check dates, we plot management events for each combination of Experiment, Site and Year along a timeline. To reduce the potential number of plots, data from different treatments and replicates are pooled together. This means some timelines may include multiple instances of plantings, fertilizer applications, harvests or other events. We currently do not consider crop phenology such as flowering or maturity dates.

```
Warning: Removed 1 row containing missing values or values outside the scale range
(‘geom_point()‘).
```

```
Warning: Removed 1 row containing missing values or values outside the scale range
(‘geom_text()‘).
```



Replicates or treatments having identical event dates are shown as a single line.

2.3. Correct geocoordinates? Are locations mapped as expected?

Experience shows that datasets often have errors in location data. This section checks that any reported geocoordinates are roughly correct by mapping. Geocoordinates may appear in four sheets:

- M2. Sites
- E2. Fields
- S1. Soil Metadata
- W1. Weather Station Metadata

To facilitate processing, we extract the geocoordinates and the location name, and add as 'Source' the name of the individual sheet containing the data.

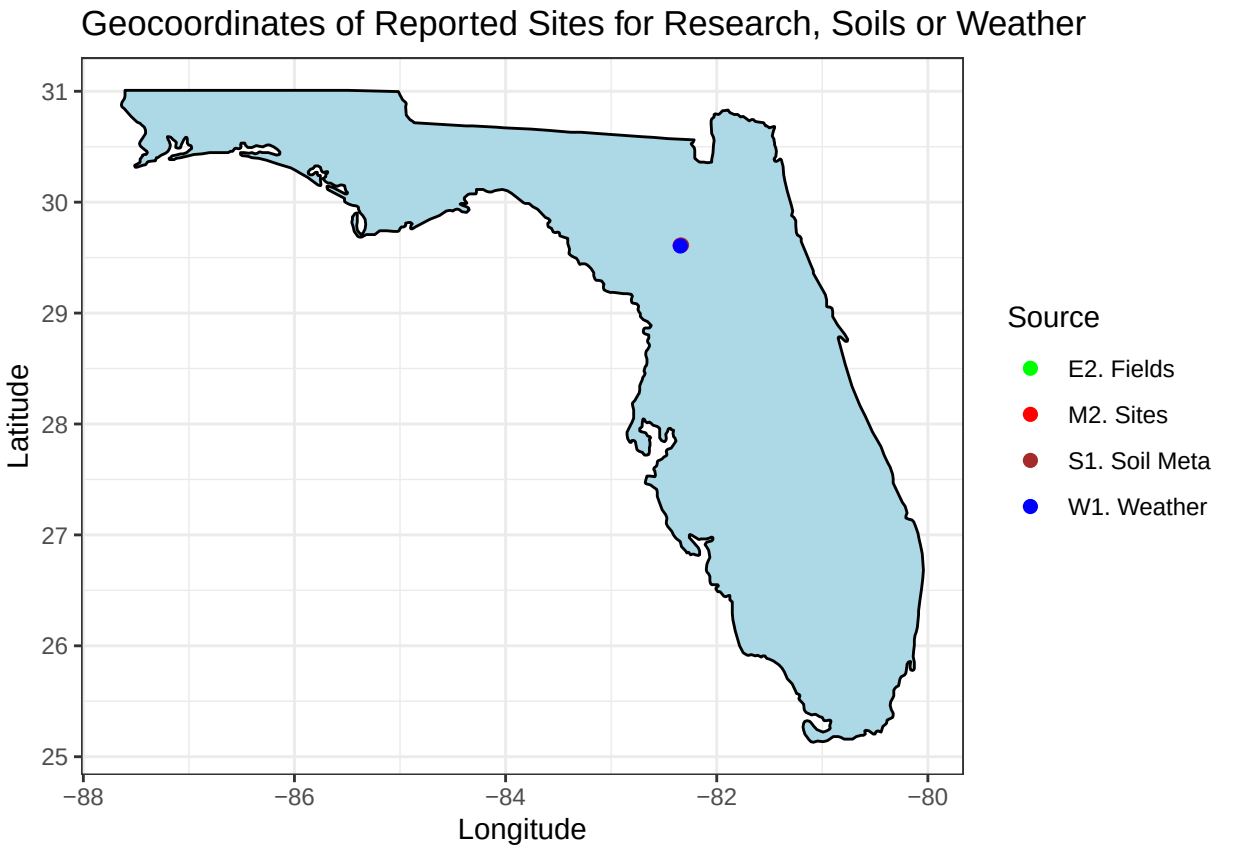
2.3.1. List of all expected geocoordinates

Source	Location	Lat	Long
M2. Sites	UFGA	29.63696	-82.37041
E2. Fields	1	NA	NA
S1. Soil Meta	IBPN910015	29.63000	-82.37000
W1. Weather	UFGA	29.63000	-82.37000

2.3.2. Displaying the reference map of Florida with any reported locations

Here we use a map of Florida as the base. If latitude or longitude values are very far off (e.g., if the values are reversed or longitude is assigned a positive value for anywhere in the Americas), the map will display, but it may be distorted and not look like the expected base map of Florida.

```
Warning: Removed 1 row containing missing values or values outside the scale range
(‘geom_point()‘).
```



The option position = position_jitter is used so that if there are a large number of points with nearly identical locations, these are spread out slightly.

2.4. Completeness of sheets: Checking whether sheets present in the template are missing from the dataset

Users may add sheets as needed but are discouraged from deleting sheets.

```
The sheet names match.
```

2.5. Completeness of data in individual sheets

To assess completeness, we need to know whether most of the variables actually have data values (e.g., are not empty cells). Below is a count of total values for variables used in each sheet. To avoid the output being split into two sections, variable names that are longer than 30 characters are truncated.

```
Total Non-Missing Values across all sheets: 4286
```

```
Total Missing Values across all sheets: 811
```

Sheet_name	Variable	Non_NA	Missing
M1. Experiments	Experiment name	1	0
M1. Experiments	Experiment ID	1	0
M1. Experiments	Research data owner	1	0
M1. Experiments	Institutional data owner	1	0
M1. Experiments	Contributor e-mail	0	1
M1. Experiments	Publication journal & volume	1	0
M1. Experiments	Link to document	1	0
M1. Experiments	Publication DOI	1	0
M1. Experiments	Should data be anonymized?	1	0
M1. Experiments	Data release date	0	1
M2. Sites	Site	1	0
M2. Sites	Local name for experiment site	1	0
M2. Sites	State	1	0
M2. Sites	County	1	0
M2. Sites	Town or other	1	0
M2. Sites	Latitude	1	0
M2. Sites	Longitude	1	0
M3. Experimental Design	Experiment ID	1	0
M3. Experimental Design	Site	1	0
M3. Experimental Design	Rate treatments	1	0
M3. Experimental Design	Replicates	1	0
M3. Experimental Design	Treatment structure	1	0
M3. Experimental Design	Type of experiment	1	0
M3. Experimental Design	Main effect 1	1	0
M3. Experimental Design	Main effect 2	1	0
M3. Experimental Design	Plot width	0	1
M3. Experimental Design	Plot length	1	0
E1. Treatments	Treatment number	12	0
E1. Treatments	Treatment name	12	0
E1. Treatments	Experiment ID	12	0
E1. Treatments	Site	12	0
E1. Treatments	Field location	12	0
E1. Treatments	Study year	12	0
E1. Treatments	Crop ID	12	0

E1. Treatments	Planting schedule	12	0
E1. Treatments	Irrigation schedule	12	0
E1. Treatments	Fertilizer schedule	12	0
E1. Treatments	Organic amendments schedule	12	0
E1. Treatments	Chemical applications schedule	12	0
E1. Treatments	Tillage schedule	12	0
E1. Treatments	Harvest schedule	12	0
E1. Treatments	Soil initial conditions ID	12	0
E1. Treatments	Comments about treatment	0	12
E2. Fields	Experiment ID	1	0
E2. Fields	Site	1	0
E2. Fields	Field location	1	0
E2. Fields	Latitude	0	1
E2. Fields	Longitude	0	1
E2. Fields	Soil ID	1	0
E2. Fields	Weather station ID	1	0
E2. Fields	Distance to weather station	0	1
E2. Fields	Field area	0	1
E2. Fields	Field length to width ratio	0	1
E2. Fields	Field slope	0	1
E2. Fields	Drainage type	0	1
E2. Fields	Water table depth	0	1
E2. Fields	Type of organic matter	0	1
E2. Fields	Dry mass of surface organic ma	1	0
E2. Fields	Nitrogen concentration in surf	1	0
E2. Fields	Phosphorus concentration in su	1	0
E2. Fields	Portion of residue incorporate	1	0
E2. Fields	Depth of residue incorporation	1	0
E3. Plots	Plot ID	12	0
E3. Plots	Experiment ID	12	0
E3. Plots	Site	12	0
E3. Plots	Field location	12	0
E3. Plots	Treatment number	12	0
E3. Plots	Replicate	12	0
E4. Crop Information	Experiment ID	3	0
E4. Crop Information	Site	3	0
E4. Crop Information	Year	3	0
E4. Crop Information	Crop ID	3	0
E4. Crop Information	Crop species	3	0
E4. Crop Information	Cultivar	3	0
E4. Crop Information	Intended crop usage	3	0
E4. Crop Information	Cultivar notes	1	2
E5. Planting	Experiment ID	1	0
E5. Planting	Site	1	0
E5. Planting	Year	1	0
E5. Planting	Planting schedule	1	0
E5. Planting	Planting date	1	0
E5. Planting	Row spacing	1	0
E5. Planting	Planting density	1	0
E5. Planting	Plant density at emergence	0	1
E5. Planting	Planting material	1	0
E5. Planting	Planting distribution	1	0
E6. Irrigation	Experiment ID	1	0
E6. Irrigation	Site	1	0

E6. Irrigation	Year	1	0
E6. Irrigation	Irrigation schedule	1	0
E6. Irrigation	Date of irrigation	1	0
E6. Irrigation	Type of irrigation	1	0
E6. Irrigation	Amount of irrigation	1	0
E6. Irrigation	Notes related to irrigation	1	0
E7. Fertilizer	Experiment ID	17	0
E7. Fertilizer	Site	17	0
E7. Fertilizer	Year	17	0
E7. Fertilizer	Fertilizer schedule	17	0
E7. Fertilizer	Date	17	0
E7. Fertilizer	Nutrient Source	17	0
E7. Fertilizer	Amount of elemental N applied	17	0
E7. Fertilizer	Amount of elemental P applied	17	0
E7. Fertilizer	Amount of elemental K applied	17	0
E7. Fertilizer	Placement	17	0
E7. Fertilizer	Depth of incorporation	13	4
E7. Fertilizer	Analysis	13	4
E7. Fertilizer	Application timing	17	0
E7. Fertilizer	Notes related to application	8	9
E9. Tillage	Experiment ID	3	0
E9. Tillage	Site	3	0
E9. Tillage	Year	3	0
E9. Tillage	Tillage schedule	3	0
E9. Tillage	Date	3	0
E9. Tillage	Type of tillage operation	3	0
E9. Tillage	Depth of incorporation	3	0
E9. Tillage	Notes related to operation	3	0
E8. Organic Amendments	Experiment ID	0	0
E8. Organic Amendments	Site	0	0
E8. Organic Amendments	Year	0	0
E8. Organic Amendments	Organic amendments schedule	0	0
E8. Organic Amendments	Date	0	0
E8. Organic Amendments	Type of organic matter	0	0
E8. Organic Amendments	Amount of organic matter	0	0
E8. Organic Amendments	Placement	0	0
E8. Organic Amendments	Depth of incorporation	0	0
E8. Organic Amendments	N concentration	0	0
E8. Organic Amendments	Notes related to application	0	0
E10. Chemical Applications	Experiment ID	10	0
E10. Chemical Applications	Site	10	0
E10. Chemical Applications	Year	10	0
E10. Chemical Applications	Chemical application schedule	10	0
E10. Chemical Applications	Date	10	0
E10. Chemical Applications	Name of chemical applied	10	0
E10. Chemical Applications	Chemicals application amount	10	0
E10. Chemical Applications	Chemicals application method	10	0
E10. Chemical Applications	Depth of application	10	0
E10. Chemical Applications	Chemicals application target	0	10
E10. Chemical Applications	Notes related to application	10	0
E11. Harvest	Experiment ID	3	0
E11. Harvest	Site	3	0
E11. Harvest	Year	3	0
E11. Harvest	Harvest schedule	3	0

E11. Harvest	Harvest date	0	3
E11. Harvest	Crop species harvested	3	0
E11. Harvest	Harvest component	3	0
E11. Harvest	Harvest method	3	0
E11. Harvest	Main product harvested	3	0
E11. Harvest	By-product harvested	3	0
E12. Preplant Soil	Experiment ID	9	0
E12. Preplant Soil	Site	9	0
E12. Preplant Soil	Year	9	0
E12. Preplant Soil	Soil initial conditions ID	9	0
E12. Preplant Soil	Sampling date	9	0
E12. Preplant Soil	Depth of measurement, top of s	9	0
E12. Preplant Soil	Depth of measurement, bottom o	9	0
E12. Preplant Soil	Soil water content	9	0
E12. Preplant Soil	Nitrate N	9	0
E12. Preplant Soil	Ammonium N	9	0
E12. Preplant Soil	Stable organic C	0	9
O1. Analysis Methods	Experiment ID	0	0
O1. Analysis Methods	Full parameter name	0	0
O1. Analysis Methods	Header name (in data file)	0	0
O1. Analysis Methods	Unit	0	0
O1. Analysis Methods	Matrix	0	0
O1. Analysis Methods	Analytical laboratory	0	0
O1. Analysis Methods	Analysis method	0	0
O1. Analysis Methods	EPA method	0	0
O1. Analysis Methods	Computation method	0	0
O2. Yield Summary	Experiment ID	12	0
O2. Yield Summary	Site	12	0
O2. Yield Summary	Year	12	0
O2. Yield Summary	Plot ID	12	0
O2. Yield Summary	Treatment number	12	0
O2. Yield Summary	Replicate	0	12
O2. Yield Summary	Seed yield	12	0
O2. Yield Summary	Single seed wt	12	0
O2. Yield Summary	Seed per m2	12	0
O2. Yield Summary	LAI max	12	0
O2. Yield Summary	Tops dry wt	12	0
O2. Yield Summary	Pod dry wt	12	0
O2. Yield Summary	Harvest index	12	0
O2. Yield Summary	Pod harvest index	12	0
O2. Yield Summary	Threshing percent	12	0
O2. Yield Summary	Tops nitrogen	12	0
O2. Yield Summary	Seed nitrogen tot	12	0
O2. Yield Summary	Seed nitrogen conc.	12	0
O3. Crop Growth	Experiment ID	28	0
O3. Crop Growth	Site	28	0
O3. Crop Growth	Year	28	0
O3. Crop Growth	Treatment number	28	0
O3. Crop Growth	Replicate	28	0
O3. Crop Growth	Plot ID	28	0
O3. Crop Growth	Sampling date	28	0
O3. Crop Growth	Leaf area index	28	0
O3. Crop Growth	Tops dry weight	28	0
O3. Crop Growth	Pod dry weight	28	0

03. Crop Growth	Seed dry weight	28	0
03. Crop Growth	Unit seed weight	28	0
03. Crop Growth	Seed number	28	0
03. Crop Growth	Harvest index	28	0
03. Crop Growth	Pod harvest index	28	0
03. Crop Growth	Shelling percent	28	0
03. Crop Growth	Tops nitrogen	28	0
03. Crop Growth	Leaf nitrogen	28	0
03. Crop Growth	Seed nitrogen	28	0
03. Crop Growth	Seed N concentration	28	0
03. Crop Growth	Leaf N concentration	28	0
03. Crop Growth	Stem N concentration	28	0
04. Crop Health	Experiment ID	0	0
04. Crop Health	Site	0	0
04. Crop Health	Year	0	0
04. Crop Health	Treatment number	0	0
04. Crop Health	Replicate	0	0
04. Crop Health	Plot ID	0	0
04. Crop Health	Sampling date	0	0
04. Crop Health	Field notes	0	0
05. Soil Surface Properties	Experiment ID	0	0
05. Soil Surface Properties	Site	0	0
05. Soil Surface Properties	Year	0	0
05. Soil Surface Properties	Treatment number	0	0
05. Soil Surface Properties	Replicate	0	0
05. Soil Surface Properties	Plot ID	0	0
05. Soil Surface Properties	Sampling date	0	0
05. Soil Surface Properties	Type of organic matter	0	0
05. Soil Surface Properties	Dry mass of surface organic ma	0	0
05. Soil Surface Properties	Nitrogen concentration in surf	0	0
05. Soil Surface Properties	Phosphorus concentration in su	0	0
05. Soil Surface Properties	Potassium concentration in sur	0	0
06. Soil Layer Properties	Experiment ID	0	0
06. Soil Layer Properties	Site	0	0
06. Soil Layer Properties	Year	0	0
06. Soil Layer Properties	Treatment number	0	0
06. Soil Layer Properties	Replicate	0	0
06. Soil Layer Properties	Plot ID	0	0
06. Soil Layer Properties	Sampling date	0	0
06. Soil Layer Properties	Depth of measurement, top of s	0	0
06. Soil Layer Properties	Depth of measurement, bottom o	0	0
06. Soil Layer Properties	Soil water content	0	0
06. Soil Layer Properties	Nitrate N	0	0
06. Soil Layer Properties	Ammonium N	0	0
06. Soil Layer Properties	Total mineral N	0	0
06. Soil Layer Properties	pH	0	0
06. Soil Layer Properties	Cation exchange capacity	0	0
06. Soil Layer Properties	Extractable P	0	0
06. Soil Layer Properties	Potassium	0	0
06. Soil Layer Properties	Magnesium	0	0
06. Soil Layer Properties	Exchangeable Ca	0	0
06. Soil Layer Properties	Potassium base saturation	0	0
06. Soil Layer Properties	Magnesium base saturation	0	0
06. Soil Layer Properties	Calcium base saturation	0	0

O6. Soil Layer Properties	Hydrogen base saturation	0	0
O7. Water	Experiment ID	0	0
O7. Water	Site	0	0
O7. Water	Year	0	0
O7. Water	Treatment number	0	0
O7. Water	Replicate	0	0
O7. Water	Plot ID	0	0
O7. Water	Sampling date	0	0
O7. Water	Sampling depth	0	0
O7. Water	Row position	0	0
O7. Water	Sampling method	0	0
O7. Water	NO3-N conc	0	0
O7. Water	Ammonium-N conc	0	0
O7. Water	Total Kjeldahl N conc	0	0
O7. Water	Water sample notes	0	0
S1. Soil Metadata	Soil ID	1	0
S1. Soil Metadata	Soil name	1	0
S1. Soil Metadata	Soil classification	1	0
S1. Soil Metadata	Soil classification system	1	0
S1. Soil Metadata	Source of soil data	1	0
S1. Soil Metadata	Latitude	1	0
S1. Soil Metadata	Longitude	1	0
S1. Soil Metadata	Elevation	1	0
S1. Soil Metadata	Anonymize	1	0
S1. Soil Metadata	Slope	0	1
S1. Soil Metadata	Soil surface color	0	1
S2. Soil Layer Properties	Soil ID	9	0
S2. Soil Layer Properties	Top of soil layer	9	0
S2. Soil Layer Properties	Bottom of soil layer	9	0
S2. Soil Layer Properties	Clay	9	0
S2. Soil Layer Properties	Silt	9	0
S2. Soil Layer Properties	Sand	9	0
S2. Soil Layer Properties	Gravel	9	0
S2. Soil Layer Properties	Organic matter	9	0
S2. Soil Layer Properties	Bulk density	9	0
S2. Soil Layer Properties	Wilting point	9	0
S2. Soil Layer Properties	Field capacity	9	0
S2. Soil Layer Properties	Saturated hydraulic conductivi	9	0
W1. Weather Station Metadata	Weather station ID	1	0
W1. Weather Station Metadata	Weather station name	1	0
W1. Weather Station Metadata	Latitude of station	1	0
W1. Weather Station Metadata	Longitude of station	1	0
W1. Weather Station Metadata	Elevation of weather station	1	0
W1. Weather Station Metadata	Anonymize	1	0
W1. Weather Station Metadata	Weather station temperature se	1	0
W1. Weather Station Metadata	Weather station link	0	1
W2. Daily Weather Data	Weather station ID	365	0
W2. Daily Weather Data	Date	365	0
W2. Daily Weather Data	Minimum daily air temperature	365	0
W2. Daily Weather Data	Maximum daily air temperature	365	0
W2. Daily Weather Data	Daily precipitation	365	0
W2. Daily Weather Data	Solar radiation	365	0
W2. Daily Weather Data	Temperature, dewpoint	0	365
W2. Daily Weather Data	Wind speed, daily	0	365

W2. Daily Weather Data	PAR	365	0

3.0. Coherent Identifiers?

Index variables ('keys' in database terminology) from pairs of data frames are compared to make sure that the index values are identical across the sheets. This is fundamental to allowing different types of data to be linked across sheets. For example the values of 'Field location' should be the same in the sheets 'E1. Treatments' and 'E2. Fields'.

The basic approach for testing:

1. Create two temporary data frames.
2. Merge the data frames based on identifiers given as a list in the argument 'TestVar'.
3. Reduce the two data frames to just the columns corresponding to 'TestVar'.
4. Extract the unique combinations of values for each data frame.
5. Add flag variables, 'from_df1' and 'from_df2', to make it easier to detect problems.
6. Merge the the two data frames to create 'dfMerged'.
7. Compare the length of the two data frames. The lengths should be identical.
8. Print the merged test dataset 'dfMerged' to allow inspection by the users.

If the two frames are of different lengths, then there is a problem. If the two data frames are of the same length, one should still review 'from_df1' and 'from_df2' to see whether there are mismatches, which would be indicated by 'NA' in one of the two columns.

Common sources of mismatches include:

- Inconsistent use of spaces such as 'Blk 1' vs. 'Blk1'.
- Simple spelling errors ('Fred' vs. 'Frred')
- Experiments, treatments or plots that were either never planted or not harvested.
- Extra rows being read in a given sheet, leading to an empty cell being assigned a value of NA. This may arise if a stray character appears outside of the intended range of data.

In the third case, it is helpful to provide a comment or note in the appropriate sheets.

3.1. Comparing identifiers used in M1. Experiments, E1. Treatments, E2. Fields and E3. Plots

```
[1] The sheets  M1..Experiments  and  E1..Treatments  have the same length
 Experiment ID From_df1 From_df2
      UFGA8201        1        1

[1] The sheets  E1..Treatments  and  E2..Fields  have the same length
 Experiment ID From_df1 From_df2
      UFGA8201        1        1

[1] The sheets  E1..Treatments  and  E2..Fields  have the same length
 Experiment ID Site From_df1 From_df2
      UFGA8201 UFGA        1        1

[1] The sheets  E1..Treatments  and  E2..Fields  have the same length
 Experiment ID Site Field location From_df1 From_df2
      UFGA8201 UFGA              1        1        1

[1] The sheets  E1..Treatments  and  E3..Plots  have the same length
 Experiment ID Site Field location From_df1 From_df2
      UFGA8201 UFGA              1        1        1
```

3.2. Comparing identifiers used in E2. Fields vs. E3. Plots

```
[1] The sheets  E2..Fields  and  E3..Plots  have the same length
 Field location From_df1 From_df2
             1        1        1

[1] The sheets  E2..Fields  and  E3..Plots  have the same length
 Experiment ID Field location From_df1 From_df2
      UFGA8201              1        1        1
```

3.3. Comparing identifiers used for soil and weather data

Note that the same soil profile or weather data may be used for several experiments or nearby sites.

```
[1] The sheets  E2..Fields  and  S1..Soil.Metadata  have the same length
    Soil ID From_df1 From_df2
 IBPN910015        1        1

[1] The sheets  S1..Soil.Metadata  and  S2..Soil.Layer.Properties  have the same length
    Soil ID From_df1 From_df2
 IBPN910015        1        1

[1] The sheets  E2..Fields  and  W1..Weather.Station.Metadata  have the same length
 Weather station ID From_df1 From_df2
               UFGA        1        1
```

3.4. Comparing identifiers in E1..Treatments and the various management sheets

Testing for matches is extended to sheets for irrigations, fertilizers, etc. Because not all sheets will have data, we first create a list of sheets with data (number of rows > 0).

```
Comparing E1..Treatments to E3..Plots for Experiment ID
[1] The sheets  E1..Treatments  and  test_df  have the same length
 Experiment ID From_df1 From_df2
      UFGA8201        1        1

Comparing E1..Treatments to E4..Crop.Information for Experiment ID
[1] The sheets  E1..Treatments  and  test_df  have the same length
 Experiment ID From_df1 From_df2
      UFGA8201        1        1

Comparing E1..Treatments to E5..Planting for Experiment ID
[1] The sheets  E1..Treatments  and  test_df  have the same length
 Experiment ID From_df1 From_df2
      UFGA8201        1        1

Comparing E1..Treatments to E6..Irrigation for Experiment ID
[1] The sheets  E1..Treatments  and  test_df  have the same length
 Experiment ID From_df1 From_df2
      UFGA8201        1        1

Comparing E1..Treatments to E7..Fertilizer for Experiment ID
[1] The sheets  E1..Treatments  and  test_df  have the same length
 Experiment ID From_df1 From_df2
      UFGA8201        1        1

Comparing E1..Treatments to E9..Tillage for Experiment ID
[1] The sheets  E1..Treatments  and  test_df  have the same length
 Experiment ID From_df1 From_df2
      UFGA8201        1        1

Comparing E1..Treatments to E10..Chemical.Applications for Experiment ID
[1] The sheets  E1..Treatments  and  test_df  have the same length
 Experiment ID From_df1 From_df2
      UFGA8201        1        1

Comparing E1..Treatments to E11..Harvest for Experiment ID
[1] The sheets  E1..Treatments  and  test_df  have the same length
 Experiment ID From_df1 From_df2
      UFGA8201        1        1
```

4. Compatible?: Checking That Variables Are Properly Described And Linked

We check whether all variables given in the various sheets appear in one of the three dictionary sheets. The dictionaries include variable names and definitions from the ICASA standards, so correct matching is needed to allow a dataset to be read by tools that use the ICASA standards.

A common source of mismatches is when a variable is added to crop or soil measurements but is not added in the dictionary sheets. When variables are present in both sources, possible causes of mismatches include:

- Differences in capitalization or punctuation
- Names with trailing blank spaces

We also check whether all variables have definitions and are linked to ICASA short names. The processing works from the list of data frames, ls_sheets, but excludes the first three sheets and the three dictionaries.

4.1. Comparing the number of variables either used in the sheets or defined in the dictionaries

The initial check is whether the data sheets have roughly the same number of variables as the three dictionary sheets.

```
Total variables in the spreadsheet:  305
```

```
Total variables in the three dictionaries:  305
```

4.2. Compare lists of variables used in data sheets vs. the dictionaries

The second, more extensive check uses variable-by-variable matching. Mismatched variables are listed below. The columns InVUsed ("Included in Variables Used") and InDict ("In the Dictionaries") have a value of 1 if the variable is present in the respective source, the data sheets or the dictionaries. A value of NA means there is a mismatch.

The script displays only mismatches, 'VariableName' is truncated to 35 characters so that each comparison will appear on a single line.

```
[1] "[All variables used are preseent in the Dictionary worksheets.]"
```

4.3. Checking whether all variables used in the data sheets are defined.

The list below contains all variables that lack a definition ('var_defined' = 0).

```
[1] "[All variables used have associated definitions.]"
```

4.4. Checking whether all variables are linked to an ICASA short name.

The list below contains all variables that are *not* associated with an ICASA variable.

```
[1] "[All variables used have associated ICASA short name.]"
```

4.5. Checking the Workbook for Formulas, Merged Cells or Commented Cells

One concern with use of spreadsheets is that , merged cells, comments attached to specific cells, or other features might cause problems in subsequent use of the data. We test first for use of formulas and merged cells, then test for comments attached to specific cells. The checking script only returns the cell address (e.g., 'B17') or range ('B5:C2'). To save space in the report, only first 20 cases are displayed.

4.5.1. Checking spreadsheet for formulae or merged cells

Use of formulas is dangerous in datasets that are redistributed because they may results in values being updated incorrectly.

When read by software expecting complete rows and columns, values of merged blocks of cells are typically assigned only to the upper left cell of a merged block, and other cells are assumed to have missing values. To avoid possible misinterpretation of data, all merged cells should be un-merged.

```
> For  E3. Plots  merged cells found at:
[1] "I1:K1,"

 (Only the first 20 cell ranges are displayed.)
```

4.5.2. Checking for cells with attached comment

If specific comments are attached to cells, the information may be lost in subsequent processing. The preferred way to record comments is in note or comment variables on the respective sheet.

If no sheets are listed above, then no comments attached to cells were found.

End of analysis for

FDACS_UFGA8201_peanut.94.xlsx

Please send questions or feedback to Jeffrey W. White.

Users who are familiar with R and Rmarkdown are encouraged to modify the script as needed.
