Economic Output and Risk Factors

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What is the relationship between health risk concentrations and economic output?

Calculate correlations between environmental exposures and farm sales (and/or other econ. variables) to understand economic linkages. A p-value of 0 reflects that it is statistically impossible to reach these results under a true null hypothesis.

Correlation Coefficients between predictor X and `Crop Total Sales ($)`

```
## # A tibble: 7 x 4
##    predictor                                    correlation p_value significance
##    <chr>                                              <dbl>   <dbl> <lgl>
## 1 commodity_totals_sales_measured_in_$               0.907       0 TRUE
## 2 commodity_totals_sales_measured_in_$_operati~      0.745       0 TRUE
## 3 income_farmrelated_operations_with_receipts        0.751       0 TRUE
## 4 income_farmrelated_receipts_measured_in_$          0.803       0 TRUE
## 5 income_net_cash_farm_of_operations_net_incom~      0.867       0 TRUE
## 6 income_net_cash_farm_of_operations_net_incom~      0.718       0 TRUE
## 7 income_net_cash_farm_of_operations_operation~      0.443       0 TRUE

## # A tibble: 7 x 4
##    predictor                  correlation p_value significance
##    <chr>                            <dbl>   <dbl> <lgl>
## 1 farm_sales_(less_than_2500_$)    0.211  0.0003 TRUE
## 2 farm_sales_(5000_to_9999_$)      0.0146 0.807  FALSE
## 3 farm_sales_(50000_to_99999_$)    0.383  0      TRUE
## 4 farm_sales_(2500_to_4999_$)     -0.0594 0.32   FALSE
## 5 farm_sales_(25000_to_49999_$)    0.346  0      TRUE
## 6 farm_sales_(10000_to_24999_$)    0.126  0.0344 TRUE
## 7 farm_sales_(100000_or_more_$)    0.830  0      TRUE

## # A tibble: 53 x 4
##     predictor                                  correlation p_value significance
##     <chr>                                            <dbl>   <dbl> <lgl>
##  1 barley_acres_harvested                           0.529       0 TRUE
##  2 barley_operations_with_area_harvested            0.510       0 TRUE
##  3 barley_production_measured_in_bu                 0.536       0 TRUE
##  4 beans_dry_edible_(excl_chickpeas_&_lima)_ac~     0.568       0 TRUE
##  5 beans_dry_edible_(excl_chickpeas_&_lima)_op~     0.510       0 TRUE
##  6 beans_dry_edible_(excl_chickpeas_&_lima)_pr~     0.580       0 TRUE
##  7 corn_grain_acres_harvested                       0.761       0 TRUE
##  8 corn_grain_operations_with_area_harvested        0.802       0 TRUE
##  9 corn_grain_production_measured_in_bu             0.776       0 TRUE
## 10 corn_silage_acres_harvested                      0.346       0 TRUE
## # i 43 more rows

## # A tibble: 19 x 4
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##    predictor                                    correlation p_value significance
##    <chr>                                              <dbl>   <dbl> <lgl>
##  1 animal_totals_incl_products_sales_measured_~     0.378   0       TRUE
##  2 cattle_cows_beef_inventory                       0.0106  0.880   FALSE
##  3 cattle_cows_beef_operations_with_inventory       0.153   0.0098  TRUE
##  4 cattle_cows_milk_inventory                       0.495   0       TRUE
##  5 cattle_cows_milk_operations_with_inventory       0.0297  0.643   FALSE
##  6 cattle_incl_calves_inventory                     0.239   0       TRUE
##  7 cattle_incl_calves_operations_with_inventory     0.145   0.0142  TRUE
##  8 cattle_incl_calves_operations_with_sales         0.178   0.0026  TRUE
##  9 cattle_incl_calves_sales_measured_in_head        0.221   0.0002  TRUE
## 10 chickens_broilers_operations_with_sales         -0.0143  0.854   FALSE
## 11 chickens_broilers_sales_measured_in_head         0.245   0.0368  TRUE
## 12 chickens_layers_inventory                        0.00204 0.974   FALSE
## 13 chickens_layers_operations_with_inventory       -0.190   0.0013  TRUE
## 14 hogs_inventory                                   0.596   0       TRUE
## 15 hogs_operations_with_inventory                  -0.0266  0.670   FALSE
## 16 hogs_operations_with_sales                       0.0394  0.526   FALSE
## 17 hogs_sales_measured_in_head                      0.595   0       TRUE
## 18 sheep_incl_lambs_inventory                      -0.148   0.0201  TRUE
## 19 sheep_incl_lambs_operations_with_inventory      -0.0744  0.219   FALSE

## # A tibble: 8 x 4
##   predictor                                    correlation p_value significance
##   <chr>                                              <dbl>   <dbl> <lgl>
## 1 ag_land_cropland_acres                           0.829   0       TRUE
## 2 ag_land_cropland_number_of_operations            0.627   0       TRUE
## 3 ag_land_cropland_harvested_number_of_operati~    0.601   0       TRUE
## 4 ag_land_incl_buildings_operations_with_asset~    0.443   0       TRUE
## 5 ag_land_incl_buildings_asset_value_measured_~    0.356   0       TRUE
## 6 ag_land_irrigated_number_of_operations          -0.291   0       TRUE
## 7 ag_land_incl_buildings_asset_value_measured_~    0.265   0       TRUE
## 8 ag_land_irrigated_acres                         -0.0869  0.162   FALSE

## # A tibble: 8 x 4
##   predictor                                    correlation p_value significance
##   <chr>                                              <dbl>   <dbl> <lgl>
## 1 area_operated_(1.0_to_9.9_acres)                -0.118   0.0507  FALSE
## 2 area_operated_(10.0_to_49.9_acres)               0.0600  0.313   FALSE
## 3 area_operated_(50_to_179_acres)                  0.378   0       TRUE
## 4 area_operated_(180_to_499_acres)                 0.572   0       TRUE
## 5 area_operated_(500_to_999_acres)                 0.699   0       TRUE
## 6 area_operated_(1000_or_more_acres)               0.567   0       TRUE
## 7 farm_operations_area_operated_measured_in_ac~   -0.0312  0.600   FALSE
## 8 farm_operations_area_operated_measured_in_ac~    0.285   0       TRUE

## # A tibble: 242 x 4
##   predictor                                    correlation p_value significance
##   <chr>                                              <dbl>   <dbl> <lgl>
## 1 Avalanche...Annualized.Frequency                 0.0495  0.642   FALSE
## 2 Avalanche...Expected.Annual.Loss...Building~     0.0146  0.890   FALSE
## 3 Avalanche...Expected.Annual.Loss...Populati~     0.119   0.262   FALSE
## 4 Avalanche...Expected.Annual.Loss...Populati~     0.119   0.262   FALSE
## 5 Avalanche...Expected.Annual.Loss...Total         0.119   0.260   FALSE
## 6 Avalanche...Expected.Annual.Loss.Rate...Bui~    -0.230   0.0281  TRUE
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##  7 Avalanche...Expected.Annual.Loss.Rate...Nat~      -0.293    0.0049 TRUE
##  8 Avalanche...Expected.Annual.Loss.Rate...Pop~      -0.292    0.0049 TRUE
##  9 Avalanche...Expected.Annual.Loss.Score             0.119    0.260  FALSE
## 10 Avalanche...Exposure...Impacted.Area..sq.mi.       0.160    0.131  FALSE
## # i 232 more rows

## # A tibble: 2 x 4
##   predictor                             correlation p_value significance
##   <chr>                                       <dbl>   <dbl> <lgl>
## 1 expense_totals_operating_expense_measured_in~   0.908       0 TRUE
## 2 expense_totals_operating_expense_measured_in~   0.750       0 TRUE

## # A tibble: 11 x 4
##    predictor                            correlation p_value significance
##    <chr>                                      <dbl>   <dbl> <lgl>
##  1 Expected.Annual.Loss...Agriculture.Value...~   0.757   0       TRUE
##  2 Expected.Annual.Loss.Rate...Agriculture...C~   0.322   0       TRUE
##  3 Expected.Annual.Loss...Score...Composite       0.286   0       TRUE
##  4 Expected.Annual.Loss...Total...Composite       0.286   0       TRUE
##  5 Expected.Annual.Loss.Rate...Population...Co~   0.254   0       TRUE
##  6 Expected.Annual.Loss.Rate...National.Percen~   0.247   0       TRUE
##  7 Expected.Annual.Loss...State.Percentile...C~   0.220   0.0002 TRUE
##  8 Expected.Annual.Loss...Building.Value...Com~   0.216   0.0002 TRUE
##  9 Expected.Annual.Loss.Rate...Building...Comp~   0.215   0.0003 TRUE
## 10 Expected.Annual.Loss...Population...Composi~   0.0882  0.137  FALSE
## 11 Expected.Annual.Loss...Population.Equivalen~   0.0882  0.137  FALSE

## # A tibble: 2 x 4
##   predictor                        correlation p_value significance
##   <chr>                                  <dbl>   <dbl> <lgl>
## 1 farm_operations_number_of_operations   0.443   0       TRUE
## 2 farm_operations_acres_operated         0.213   0.0003 TRUE

## # A tibble: 3 x 4
##   predictor                             correlation p_value significance
##   <chr>                                       <dbl>   <dbl> <lgl>
## 1 National.Risk.Index...Value...Composite      0.270   0       TRUE
## 2 National.Risk.Index...Score...Composite      0.270   0       TRUE
## 3 National.Risk.Index...State.Percentile...Com~   0.211   0.0003 TRUE

## # A tibble: 7 x 4
##   predictor                            correlation p_value significance
##   <chr>                                      <dbl>   <dbl> <lgl>
## 1 Community.Resilience...Score               0.369   0       TRUE
## 2 Community.Resilience...State.Percentile    0.179   0.0025 TRUE
## 3 Community.Resilience...Value               0.369   0       TRUE
## 4 Community.Risk.Factor...Value             -0.0762  0.200  FALSE
## 5 Social.Vulnerability...Score              -0.0627  0.292  FALSE
## 6 Social.Vulnerability...State.Percentile    0.0616  0.300  FALSE
## 7 Social.Vulnerability.ExpectedLossRate.Adjust   0.231   0.0001 TRUE

## # A tibble: 10 x 4
##   predictor                            correlation p_value significance
##   <chr>                                      <dbl>   <dbl> <lgl>
##  1 machinery_totals_asset_value_measured_in_$   0.918   0       TRUE
##  2 Agriculture.Value....                        0.907   0       TRUE
##  3 govt_programs_federal_operations_with_recei~   0.826   0       TRUE
```

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##  4 machinery_totals_asset_value_measured_in_$_~       0.751  0      TRUE
##  5 govt_programs_federal_receipts_measured_in_$        0.746  0      TRUE
##  6 Shape__Length                                      -0.255  0      TRUE
##  7 Area..sq.mi.                                       -0.241  0      TRUE
##  8 Shape__Area                                        -0.184  0.0018 TRUE
##  9 Building.Value....                                  0.108  0.0684 FALSE
## 10 Population..2020.                                  -0.0447 0.453  FALSE

## Count of Significant (True) and Non-Significant (False) Correlations (p < 0.05)

##
## FALSE   TRUE
##    80    298

## # A tibble: 299 x 2
##    predictor                                           p_value
##    <chr>                                                 <dbl>
##  1 ag_land_cropland_acres                                    0
##  2 ag_land_cropland_number_of_operations                    0
##  3 ag_land_cropland_harvested_number_of_operations          0
##  4 ag_land_incl_buildings_operations_with_asset_value       0
##  5 ag_land_incl_buildings_asset_value_measured_in_$_operation  0
##  6 ag_land_irrigated_number_of_operations                   0
##  7 ag_land_incl_buildings_asset_value_measured_in_$_acre    0
##  8 hogs_sales_measured_in_head                              0
##  9 hogs_inventory                                           0
## 10 cattle_cows_milk_inventory                               0
## # i 289 more rows
```
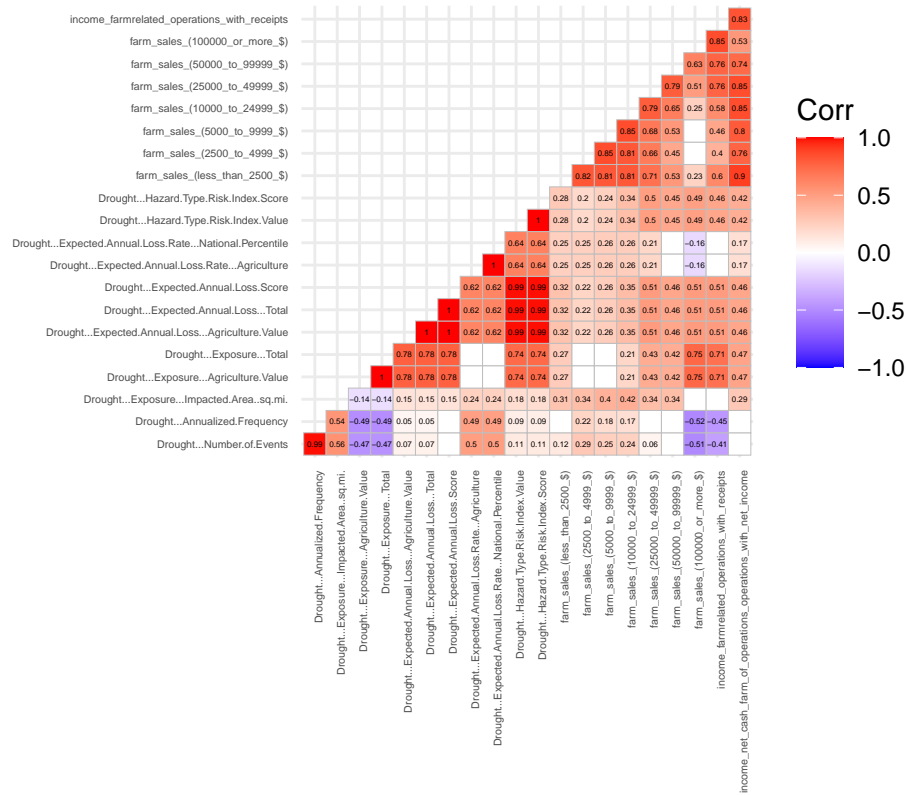
Below are a series of correlation plots between variables of economic output and different weather and natural disaster predictors.
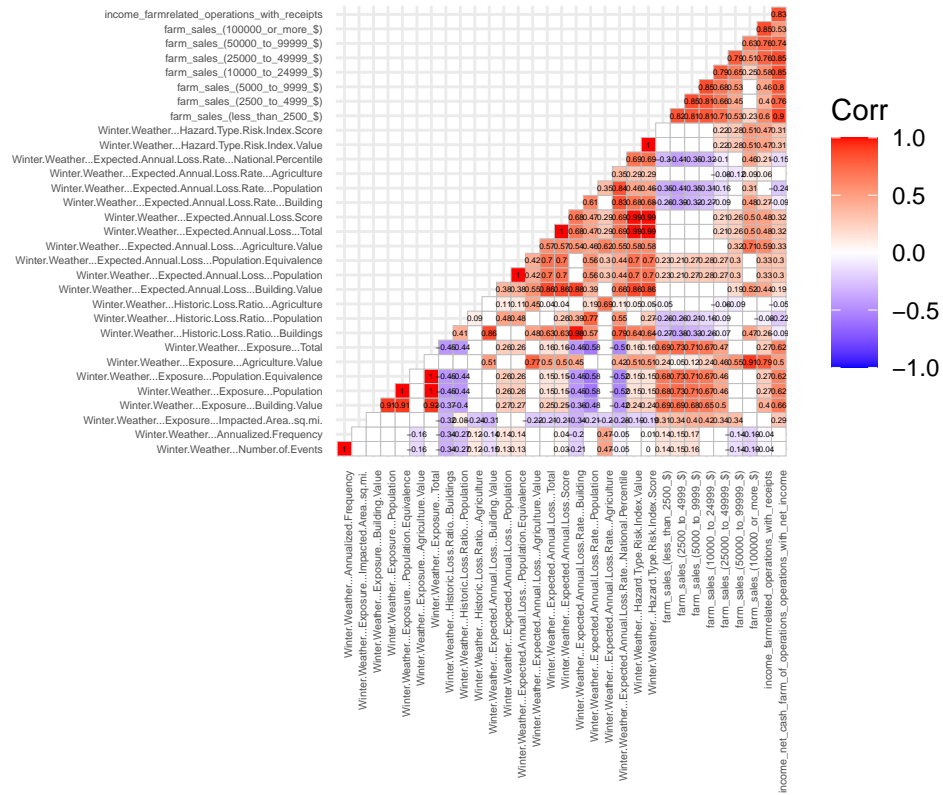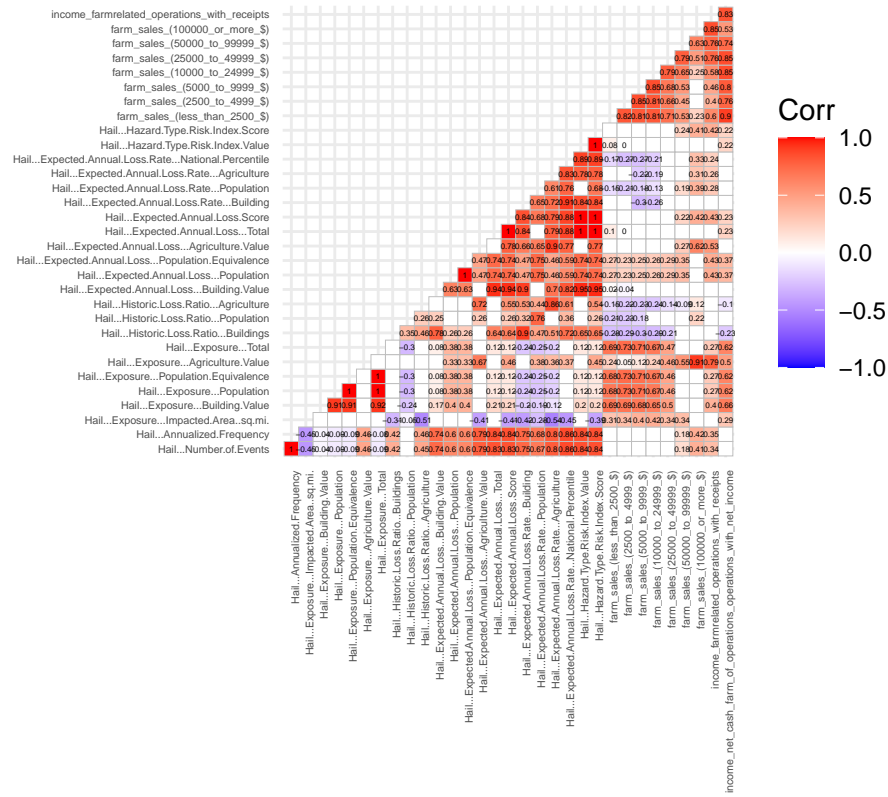
Correlation Plot: drought

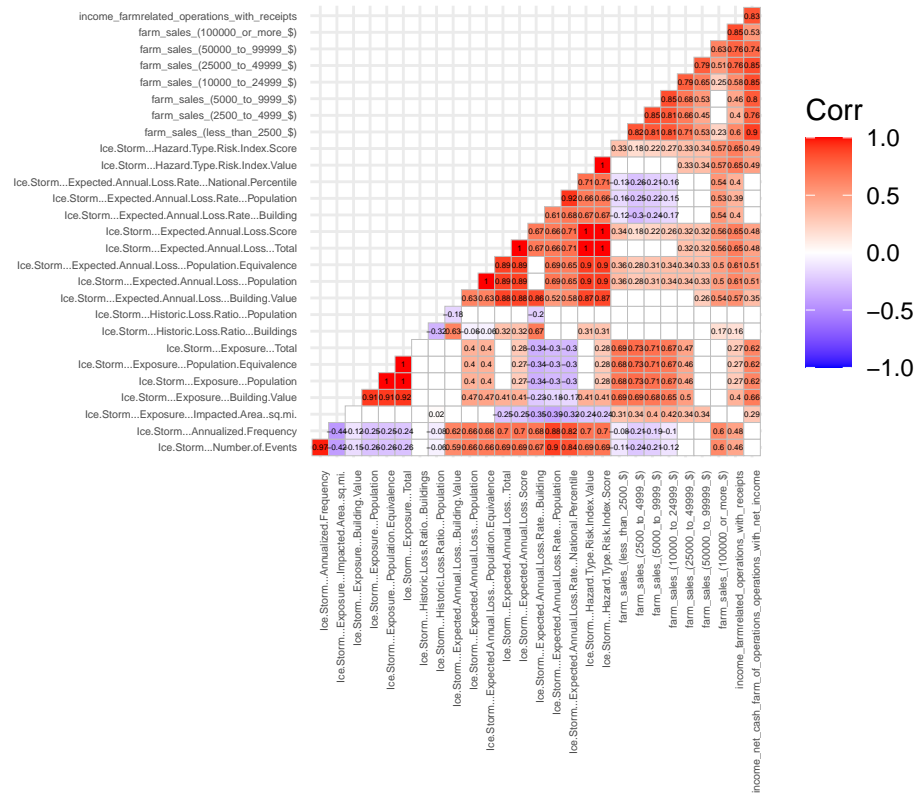# Correlation Plot: wildfire
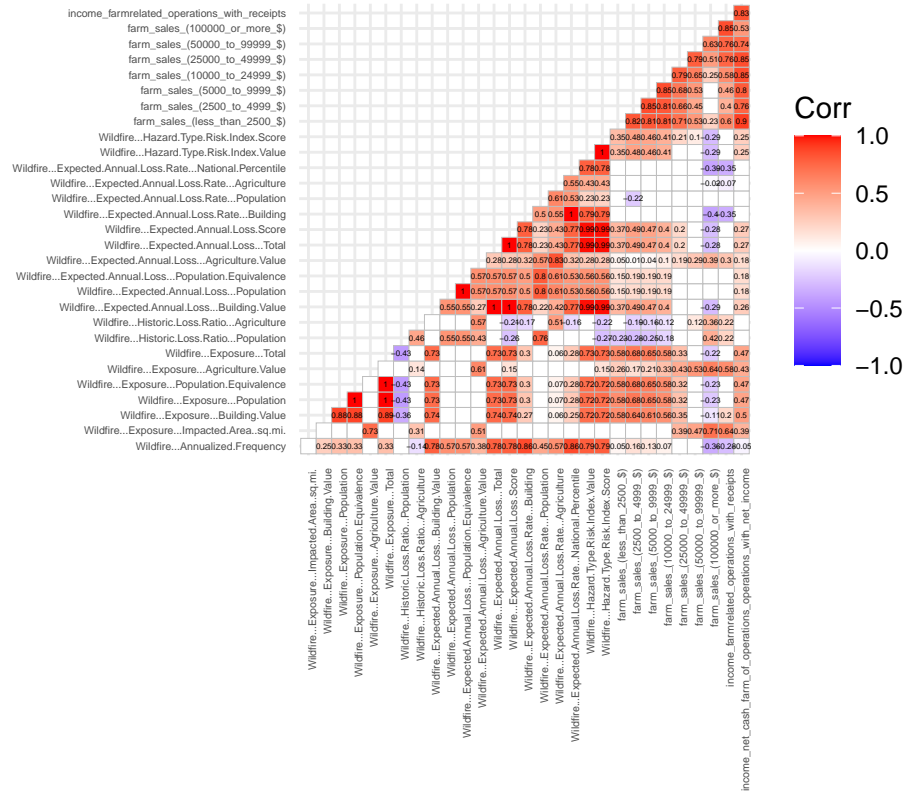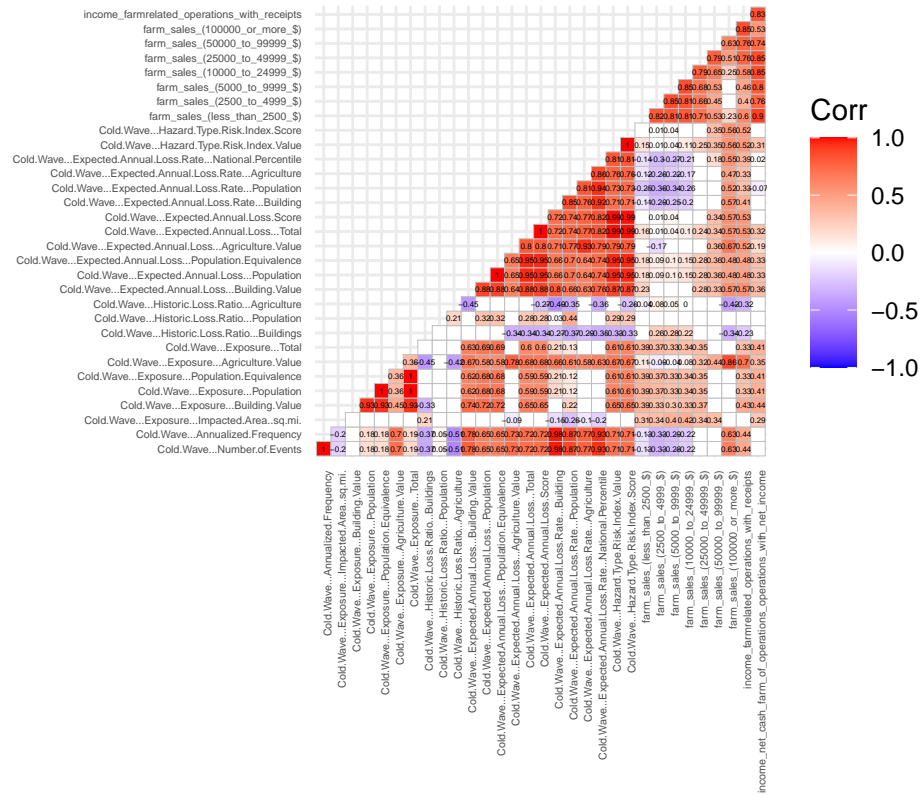
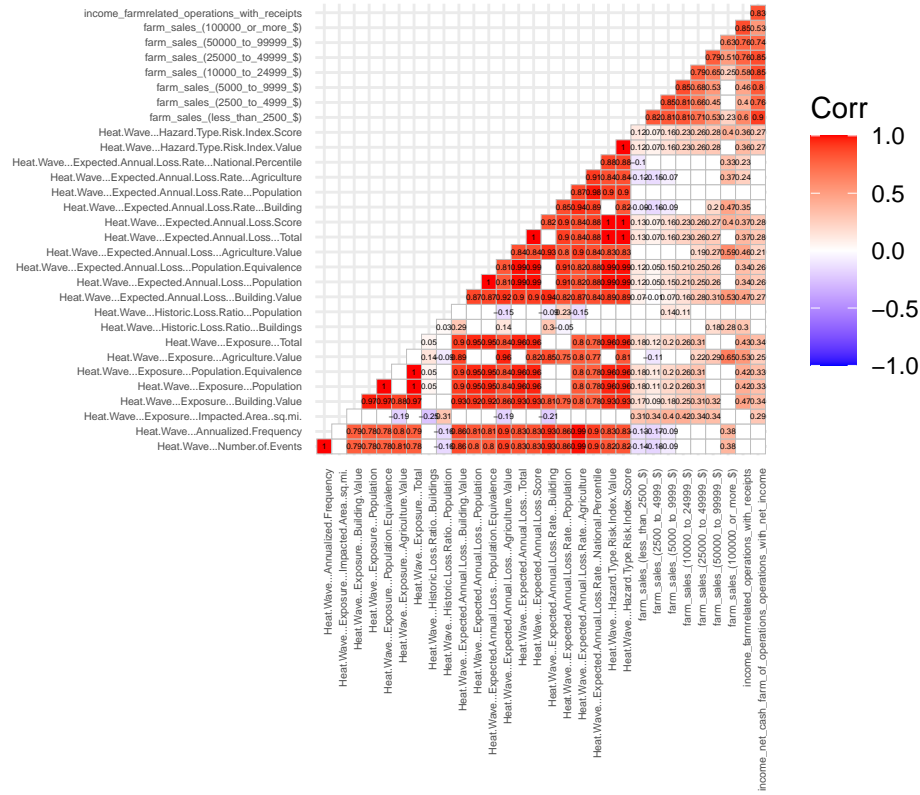# Correlation Plot: winter.weather
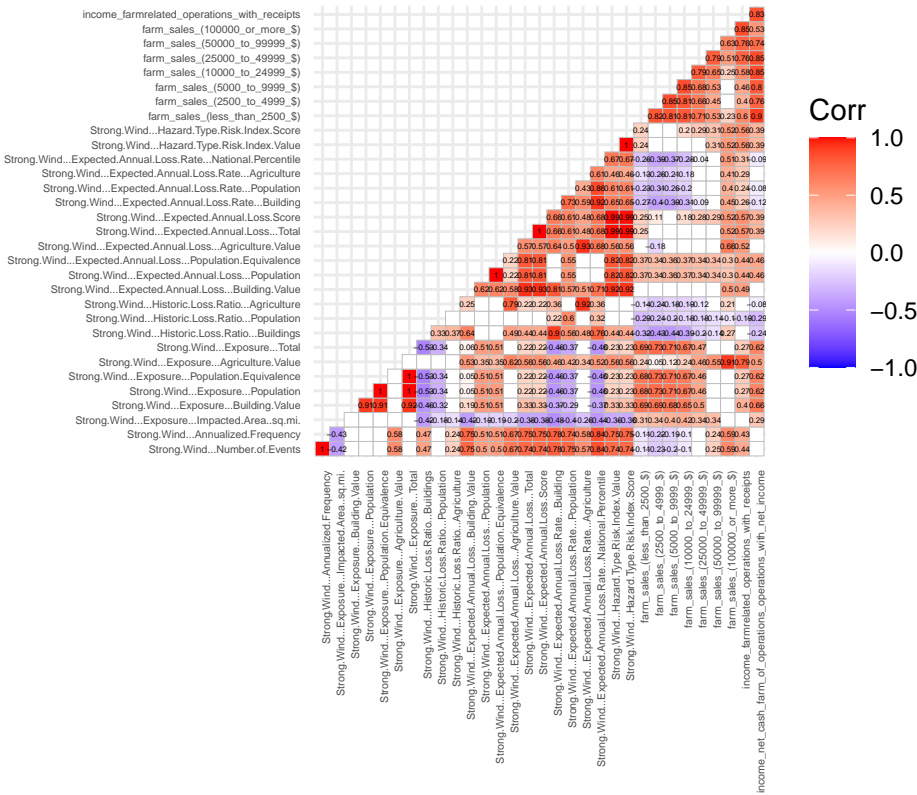
Correlation Plot: hail
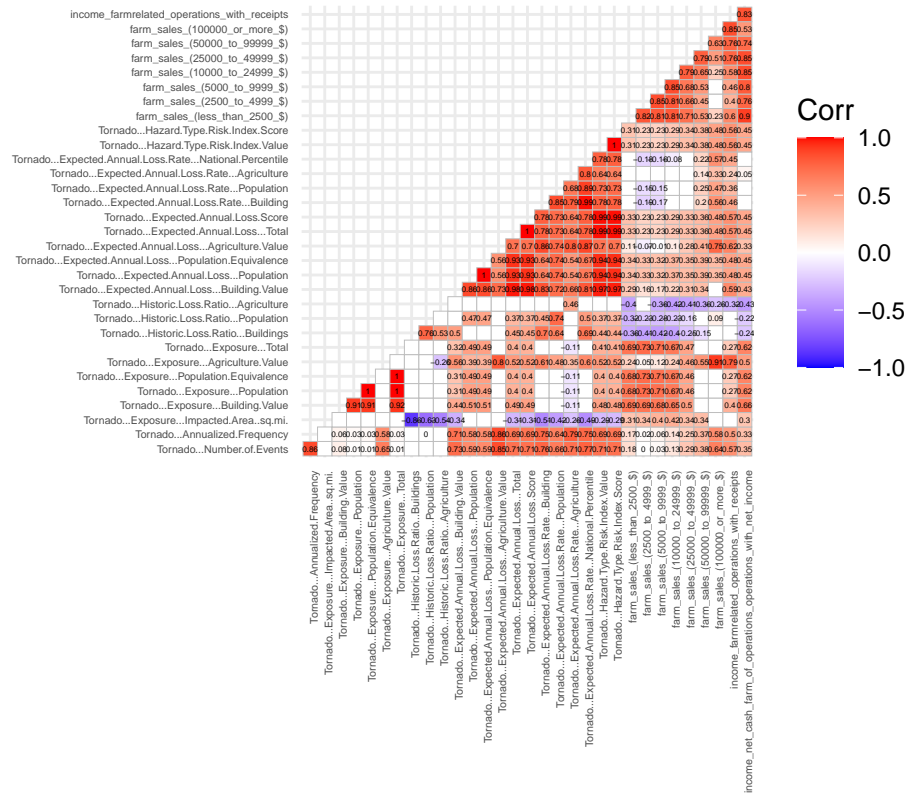
Correlation Plot: ice.storm

Correlation Plot: Cold.Wave
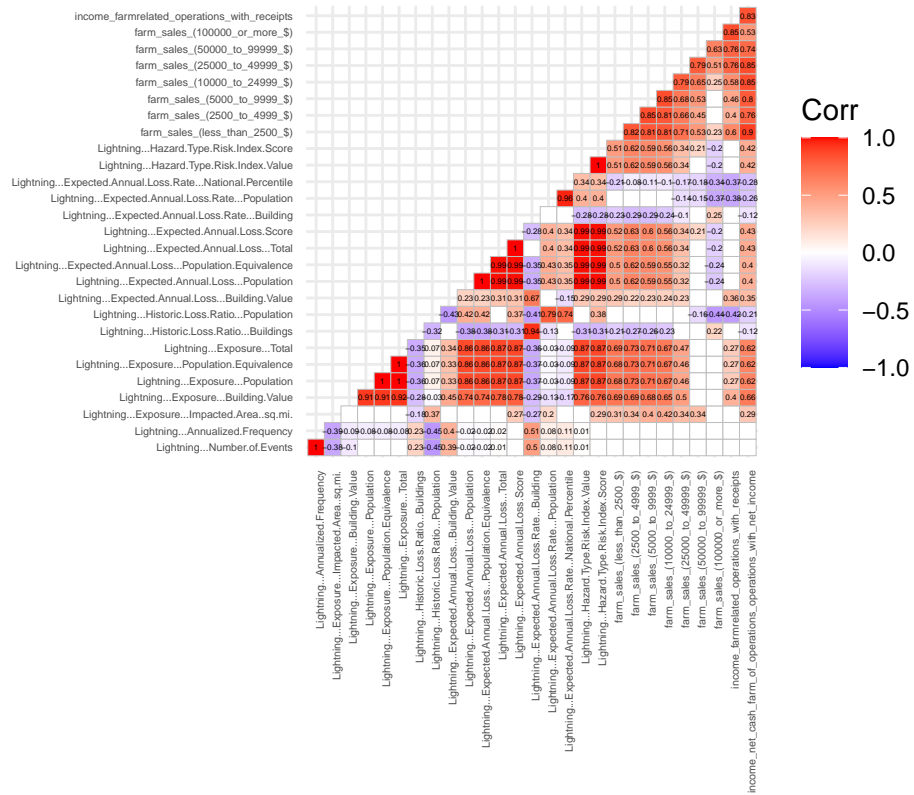
Correlation Plot: heat.wave

Correlation Plot: strong.wind

Correlation Plot: tornado

Correlation Plot: lightning

Correlation Plot: avalanche