Objective1\_Monika

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# Load Required Libraries  
library(readxl)

## Warning: package 'readxl' was built under R version 4.3.3

library(dplyr)

##   
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':  
##   
## filter, lag

## The following objects are masked from 'package:base':  
##   
## intersect, setdiff, setequal, union

library(ggplot2)

## Warning: package 'ggplot2' was built under R version 4.3.3

library(psych)

## Warning: package 'psych' was built under R version 4.3.3

##   
## Attaching package: 'psych'

## The following objects are masked from 'package:ggplot2':  
##   
## %+%, alpha

library(FactoMineR) # Advanced EDA tools

## Warning: package 'FactoMineR' was built under R version 4.3.3

library(Factoshiny) # Interactive visualization

## Warning: package 'Factoshiny' was built under R version 4.3.3

## Loading required package: shiny

## Warning: package 'shiny' was built under R version 4.3.3

## Loading required package: FactoInvestigate

## Warning: package 'FactoInvestigate' was built under R version 4.3.3

library(corrplot) # Correlation heatmap

## Warning: package 'corrplot' was built under R version 4.3.3

## corrplot 0.95 loaded

library(dplyr)

# Load the Dataset

data <- read\_excel("C:\\Users\\hp\\Documents\\GitHub\\PRERNA\\SurveyData.xlsx",sheet=1)

# View Data Structure

str(data)

## tibble [229 × 322] (S3: tbl\_df/tbl/data.frame)  
## $ farmer\_id : chr [1:229] NA NA NA NA ...  
## $ farmers\_name : chr [1:229] "नारायण रामलाल माळी" "शिवाजी नथ्थू महाजन" "दीपक आत्माराम पाटील" "नरेंद्र भिकन पाटील" ...  
## $ village : chr [1:229] "वडगाव बु" "कजगाव" "मळगाव" "कजगाव" ...  
## $ taluka : chr [1:229] "भडगाव" "भडगाव" "भडगाव" "भडगाव" ...  
## $ age : num [1:229] 37 44 48 50 25 21 40 36 69 43 ...  
## $ gender : chr [1:229] "male" "male" "male" "male" ...  
## $ marital\_status : chr [1:229] "married" "married" "married" "married" ...  
## $ education : chr [1:229] "primary" "primary" "secondary" "primary" ...  
## $ religion : chr [1:229] "हिंदू" "हिंदू" "हिंदू" "हिंदू" ...  
## $ caste : chr [1:229] "फुलमाळी" "माळी" "कुणबी" "राजपूत" ...  
## $ subcaste : chr [1:229] "ओबीसी" "OBC" "ओबीसी" "VJNT" ...  
## $ mother\_tongue : chr [1:229] "मराठी" "मराठी" "मराठी , अहिराणी" "मराठी" ...  
## $ family\_type : chr [1:229] "nuclear" "joint" "nuclear" "nuclear" ...  
## $ head\_of\_family : chr [1:229] "सोनाली नारायण माळी" "सरला शिवाजी महाजन" "सुनंदा दीपक पाटील" "छायाबाई नरेंद्र पाटील" ...  
## $ relation\_with\_farmer : chr [1:229] "पत्नी" "पत्नी" "पत्नी" "पत्नी" ...  
## $ total\_family\_members : num [1:229] 5 5 4 3 4 3 5 4 15 3 ...  
## $ income\_sources : chr [1:229] "agriculture labour" "agriculture labour" "agriculture" "agriculture labour" ...  
## $ income\_sources/agriculture : num [1:229] 1 1 1 1 1 0 1 0 1 1 ...  
## $ income\_sources/labour : num [1:229] 1 1 0 1 1 1 1 1 0 1 ...  
## $ income\_sources/job : num [1:229] NA NA NA NA NA NA NA NA NA NA ...  
## $ income\_sources/business : num [1:229] 0 0 0 0 0 0 0 0 0 0 ...  
## $ income\_sources/Privatejob : num [1:229] 0 0 0 0 0 0 0 0 0 0 ...  
## $ income\_sources/GovernmentJob : num [1:229] 0 0 0 0 0 0 0 0 0 0 ...  
## $ income\_sources/Pension : num [1:229] 0 0 0 0 0 0 0 0 0 0 ...  
## $ income\_sources/Other : num [1:229] 0 0 0 0 0 0 0 0 0 0 ...  
## $ otherincome : chr [1:229] NA NA NA NA ...  
## $ traditional\_business : chr [1:229] "शेती" "शेती" "शेती" "शेती" ...  
## $ annual\_income : chr [1:229] "below\_50k" "below\_50k" "below\_50k" "below\_50k" ...  
## $ bpl\_status : chr [1:229] "no" "no" "no" "yes" ...  
## $ ration\_card : chr [1:229] "orange" "orange" "orange" "yellow" ...  
## $ FarmersGroup : chr [1:229] NA NA NA NA ...  
## $ SHGroup : chr [1:229] NA NA NA NA ...  
## $ land\_type : chr [1:229] "own" "own" "own" "own" ...  
## $ irrigated\_land : chr [1:229] "0" "-" "0" "0" ...  
## $ dry\_land : chr [1:229] "3 बिघे" "02" "3" "1" ...  
## $ total\_land : chr [1:229] "0" "02" "0" "1" ...  
## $ SoilTesting : chr [1:229] NA NA NA NA ...  
## $ SoilTestedYear : num [1:229] NA NA NA NA NA NA NA NA NA NA ...  
## $ water\_sources : chr [1:229] "none" "neighbor\_water" "none" "none" ...  
## $ water\_sources/none : num [1:229] 1 0 1 1 1 1 1 1 1 1 ...  
## $ water\_sources/river : num [1:229] 0 0 0 0 0 0 0 0 0 0 ...  
## $ water\_sources/well : num [1:229] 0 0 0 0 0 0 0 0 0 0 ...  
## $ water\_sources/canal : num [1:229] 0 0 0 0 0 0 0 0 0 0 ...  
## $ water\_sources/borewell : num [1:229] 0 0 0 0 0 0 0 0 0 0 ...  
## $ water\_sources/farm\_pond : num [1:229] 0 0 0 0 0 0 0 0 0 0 ...  
## $ water\_sources/reservoir : num [1:229] 0 0 0 0 0 0 0 0 0 0 ...  
## $ water\_sources/dam : num [1:229] 0 0 0 0 0 0 0 0 0 0 ...  
## $ water\_sources/neighbor\_water : num [1:229] 0 1 0 0 0 0 0 0 0 0 ...  
## $ cotton : num [1:229] 0 1 0 1 133 5 3 NA 3 2 ...  
## $ maize : num [1:229] 3 1 3 NA 1 NA NA 7 0 0 ...  
## $ jowar : num [1:229] 0 NA 0 NA NA NA NA NA 0 0 ...  
## $ bajra : num [1:229] 0 NA 0 NA NA NA NA NA 0 0 ...  
## $ pulses : num [1:229] 0 NA 0 NA NA NA NA NA 0 0 ...  
## $ soybean : num [1:229] 0 NA 0 NA NA NA NA NA 0 0 ...  
## $ wheat : num [1:229] 0 NA 0 NA NA NA NA NA 0 0 ...  
## $ gram : num [1:229] 0 NA 0 NA NA NA NA NA 0 0 ...  
## $ sorghum : num [1:229] 0 NA 0 NA NA NA NA NA 0 0 ...  
## $ maize2 : num [1:229] 0 NA 0 NA NA NA NA NA 0 0 ...  
## $ groundnut : num [1:229] 0 NA 0 NA NA NA NA NA 0 0 ...  
## $ melon : num [1:229] 0 NA 0 NA NA NA NA NA 0 0 ...  
## $ sesame : num [1:229] 0 NA 0 NA NA NA NA NA 0 0 ...  
## $ banana : num [1:229] NA NA 0 NA NA NA NA NA 0 0 ...  
## $ pomegranate : num [1:229] NA NA 0 NA NA NA NA NA 0 0 ...  
## $ citrus : num [1:229] NA NA 0 NA NA NA NA NA 0 0 ...  
## $ vegetables : num [1:229] NA NA 0 NA NA NA NA NA 0 0 ...  
## $ other\_crops : chr [1:229] "0" "इतर पीक घेतलं नाही" "0" "नाही" ...  
## $ \_\_001 : chr [1:229] "No" "Yes" "No" "Yes" ...  
## $ text\_qi3tf85 : chr [1:229] NA NA NA NA ...  
## $ text\_pu6bd80 : chr [1:229] NA NA NA NA ...  
## $ bullocks : num [1:229] 0 0 0 0 0 0 1 1 1 0 ...  
## $ cow : num [1:229] 1 0 0 0 0 0 0 0 1 0 ...  
## $ buffalo : chr [1:229] "0" "0" "0" "0" ...  
## $ goat : chr [1:229] "0" "0" "0" "0" ...  
## $ sheep : chr [1:229] "0" "0" "0" "0" ...  
## $ poultry : num [1:229] 0 0 0 0 0 0 0 0 0 0 ...  
## $ text\_cu6dv88 : chr [1:229] NA NA NA NA ...  
## $ sprayer : num [1:229] 0 0 0 0 0 0 0 0 1 0 ...  
## $ motor : num [1:229] 0 1 0 0 0 0 0 0 0 0 ...  
## $ thresher : num [1:229] 0 0 0 0 0 0 0 0 0 0 ...  
## $ tractor : num [1:229] 0 0 0 0 0 0 0 1 0 0 ...  
## $ other\_001 : chr [1:229] NA "नाही" "0" NA ...  
## $ farm\_income : chr [1:229] "below\_50k" "below\_50k" "below\_50k" "below\_50k" ...  
## $ monthly\_expense : chr [1:229] "4500" "10000" "4500" "10000" ...  
## $ select\_one\_ld4vw19 : chr [1:229] NA NA NA NA ...  
## $ secondary\_business : chr [1:229] "no" "no" "no" "no" ...  
## $ business\_type : chr [1:229] "labor" "labor" "labor" "labor" ...  
## $ business\_type/labor : num [1:229] 1 1 1 1 1 1 1 1 0 1 ...  
## $ business\_type/dairy : num [1:229] 0 0 0 0 0 0 0 0 0 0 ...  
## $ business\_type/poultry : num [1:229] 0 0 0 0 0 0 0 0 0 0 ...  
## $ business\_type/job : num [1:229] 0 0 0 0 0 0 0 0 0 0 ...  
## $ business\_type/cottage : num [1:229] 0 0 0 0 0 0 0 0 0 0 ...  
## $ business\_type/goat\_farming : num [1:229] 0 0 0 0 0 0 0 0 0 0 ...  
## $ business\_type/other : num [1:229] 0 0 0 0 0 0 0 0 1 0 ...  
## $ text\_yx7ko73 : chr [1:229] NA NA NA NA ...  
## $ text\_cu8jm42 : chr [1:229] NA NA NA NA ...  
## $ loan\_status : chr [1:229] "yes" "yes" "yes" "yes" ...  
## $ loan\_amount : chr [1:229] "75k\_1lakh" "50k\_75k" "below\_50k" "below\_50k" ...  
## $ loan\_purpose : chr [1:229] "agriculture\_inputs debt\_repayment" "agriculture\_inputs debt\_repayment household\_needs" "agriculture\_inputs debt\_repayment" "agriculture\_inputs crop\_loss debt\_repayment household\_needs" ...  
## $ loan\_purpose/agriculture\_inputs : num [1:229] 1 1 1 1 1 1 1 1 1 NA ...  
## [list output truncated]

summary(data)

## farmer\_id farmers\_name village taluka   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## age gender marital\_status education   
## Min. : 5.00 Length:229 Length:229 Length:229   
## 1st Qu.:37.00 Class :character Class :character Class :character   
## Median :44.00 Mode :character Mode :character Mode :character   
## Mean :44.79   
## 3rd Qu.:52.00   
## Max. :76.00   
##   
## religion caste subcaste mother\_tongue   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## family\_type head\_of\_family relation\_with\_farmer  
## Length:229 Length:229 Length:229   
## Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## total\_family\_members income\_sources income\_sources/agriculture  
## Min. : 1.000 Length:229 Min. :0.000   
## 1st Qu.: 3.000 Class :character 1st Qu.:1.000   
## Median : 4.000 Mode :character Median :1.000   
## Mean : 4.568 Mean :0.917   
## 3rd Qu.: 5.000 3rd Qu.:1.000   
## Max. :32.000 Max. :1.000   
##   
## income\_sources/labour income\_sources/job income\_sources/business  
## Min. :0.0000 Min. :0.0000 Min. :0.00000   
## 1st Qu.:0.0000 1st Qu.:0.0000 1st Qu.:0.00000   
## Median :1.0000 Median :0.0000 Median :0.00000   
## Mean :0.7249 Mean :0.0119 Mean :0.01747   
## 3rd Qu.:1.0000 3rd Qu.:0.0000 3rd Qu.:0.00000   
## Max. :1.0000 Max. :1.0000 Max. :1.00000   
## NA's :145   
## income\_sources/Privatejob income\_sources/GovernmentJob income\_sources/Pension  
## Min. :0.0000 Min. :0.00000 Min. :0.000000   
## 1st Qu.:0.0000 1st Qu.:0.00000 1st Qu.:0.000000   
## Median :0.0000 Median :0.00000 Median :0.000000   
## Mean :0.0531 Mean :0.01327 Mean :0.004425   
## 3rd Qu.:0.0000 3rd Qu.:0.00000 3rd Qu.:0.000000   
## Max. :1.0000 Max. :1.00000 Max. :1.000000   
## NA's :3 NA's :3 NA's :3   
## income\_sources/Other otherincome traditional\_business  
## Min. :0.00000 Length:229 Length:229   
## 1st Qu.:0.00000 Class :character Class :character   
## Median :0.00000 Mode :character Mode :character   
## Mean :0.03097   
## 3rd Qu.:0.00000   
## Max. :1.00000   
## NA's :3   
## annual\_income bpl\_status ration\_card FarmersGroup   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## SHGroup land\_type irrigated\_land dry\_land   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## total\_land SoilTesting SoilTestedYear water\_sources   
## Length:229 Length:229 Min. :2.000 Length:229   
## Class :character Class :character 1st Qu.:2.500 Class :character   
## Mode :character Mode :character Median :3.000 Mode :character   
## Mean :3.333   
## 3rd Qu.:4.000   
## Max. :5.000   
## NA's :226   
## water\_sources/none water\_sources/river water\_sources/well water\_sources/canal  
## Min. :0.0000 Min. :0.0000 Min. :0.000 Min. :0.0000   
## 1st Qu.:0.0000 1st Qu.:0.0000 1st Qu.:0.000 1st Qu.:0.0000   
## Median :1.0000 Median :0.0000 Median :0.000 Median :0.0000   
## Mean :0.5328 Mean :0.0131 Mean :0.345 Mean :0.0131   
## 3rd Qu.:1.0000 3rd Qu.:0.0000 3rd Qu.:1.000 3rd Qu.:0.0000   
## Max. :1.0000 Max. :1.0000 Max. :1.000 Max. :1.0000   
##   
## water\_sources/borewell water\_sources/farm\_pond water\_sources/reservoir  
## Min. :0.0000 Min. :0 Min. :0.000000   
## 1st Qu.:0.0000 1st Qu.:0 1st Qu.:0.000000   
## Median :0.0000 Median :0 Median :0.000000   
## Mean :0.0917 Mean :0 Mean :0.004367   
## 3rd Qu.:0.0000 3rd Qu.:0 3rd Qu.:0.000000   
## Max. :1.0000 Max. :0 Max. :1.000000   
##   
## water\_sources/dam water\_sources/neighbor\_water cotton   
## Min. :0 Min. :0.00000 Min. : 0.000   
## 1st Qu.:0 1st Qu.:0.00000 1st Qu.: 2.000   
## Median :0 Median :0.00000 Median : 3.000   
## Mean :0 Mean :0.04803 Mean : 3.833   
## 3rd Qu.:0 3rd Qu.:0.00000 3rd Qu.: 4.000   
## Max. :0 Max. :1.00000 Max. :133.000   
## NA's :43   
## maize jowar bajra pulses   
## Min. : 0.000 Min. :0.00 Min. :0.000 Min. :0.0000   
## 1st Qu.: 0.000 1st Qu.:0.00 1st Qu.:0.000 1st Qu.:0.0000   
## Median : 1.000 Median :0.00 Median :0.000 Median :0.0000   
## Mean : 1.941 Mean :0.56 Mean :0.122 Mean :0.3095   
## 3rd Qu.: 3.000 3rd Qu.:0.75 3rd Qu.:0.000 3rd Qu.:0.0000   
## Max. :17.000 Max. :5.00 Max. :3.000 Max. :3.0000   
## NA's :144 NA's :179 NA's :188 NA's :187   
## soybean wheat gram sorghum   
## Min. :0.0000 Min. : 0.000 Min. : 0.000 Min. :0.0000   
## 1st Qu.:0.0000 1st Qu.: 0.000 1st Qu.: 0.000 1st Qu.:0.0000   
## Median :0.0000 Median : 0.000 Median : 1.000 Median :0.0000   
## Mean :0.1707 Mean : 1.582 Mean : 1.525 Mean :0.3415   
## 3rd Qu.:0.0000 3rd Qu.: 2.000 3rd Qu.: 2.000 3rd Qu.:0.0000   
## Max. :3.0000 Max. :20.000 Max. :17.000 Max. :3.0000   
## NA's :188 NA's :174 NA's :170 NA's :188   
## maize2 groundnut melon sesame   
## Min. : 0.000 Min. :0.0000 Min. :0.0000 Min. :0   
## 1st Qu.: 0.000 1st Qu.:0.0000 1st Qu.:0.0000 1st Qu.:0   
## Median : 1.000 Median :0.0000 Median :0.0000 Median :0   
## Mean : 1.862 Mean :0.1714 Mean :0.2857 Mean :0   
## 3rd Qu.: 3.000 3rd Qu.:0.0000 3rd Qu.:0.0000 3rd Qu.:0   
## Max. :11.000 Max. :5.0000 Max. :6.0000 Max. :0   
## NA's :171 NA's :194 NA's :194 NA's :196   
## banana pomegranate citrus vegetables   
## Min. :0.0000 Min. :0 Min. :0.00000 Min. :0   
## 1st Qu.:0.0000 1st Qu.:0 1st Qu.:0.00000 1st Qu.:0   
## Median :0.0000 Median :0 Median :0.00000 Median :0   
## Mean :0.4737 Mean :0 Mean :0.09091 Mean :0   
## 3rd Qu.:0.0000 3rd Qu.:0 3rd Qu.:0.00000 3rd Qu.:0   
## Max. :6.0000 Max. :0 Max. :3.00000 Max. :0   
## NA's :191 NA's :196 NA's :196 NA's :196   
## other\_crops \_\_001 text\_qi3tf85 text\_pu6bd80   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## bullocks cow buffalo goat   
## Min. :0.0000 Min. :0.0000 Length:229 Length:229   
## 1st Qu.:0.0000 1st Qu.:0.0000 Class :character Class :character   
## Median :0.0000 Median :0.0000 Mode :character Mode :character   
## Mean :0.2096 Mean :0.1878   
## 3rd Qu.:0.0000 3rd Qu.:0.0000   
## Max. :2.0000 Max. :5.0000   
##   
## sheep poultry text\_cu6dv88 sprayer   
## Length:229 Min. :0.0000 Length:229 Min. :0.0000   
## Class :character 1st Qu.:0.0000 Class :character 1st Qu.:0.0000   
## Mode :character Median :0.0000 Mode :character Median :0.0000   
## Mean :0.0262 Mean :0.1223   
## 3rd Qu.:0.0000 3rd Qu.:0.0000   
## Max. :5.0000 Max. :1.0000   
##   
## motor thresher tractor other\_001   
## Min. :0.0000 Min. :0.00000 Min. :0.00000 Length:229   
## 1st Qu.:0.0000 1st Qu.:0.00000 1st Qu.:0.00000 Class :character   
## Median :0.0000 Median :0.00000 Median :0.00000 Mode :character   
## Mean :0.2052 Mean :0.03493 Mean :0.06114   
## 3rd Qu.:0.0000 3rd Qu.:0.00000 3rd Qu.:0.00000   
## Max. :4.0000 Max. :5.00000 Max. :5.00000   
##   
## farm\_income monthly\_expense select\_one\_ld4vw19 secondary\_business  
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## business\_type business\_type/labor business\_type/dairy  
## Length:229 Min. :0.000 Min. :0.0000   
## Class :character 1st Qu.:1.000 1st Qu.:0.0000   
## Mode :character Median :1.000 Median :0.0000   
## Mean :0.869 Mean :0.0524   
## 3rd Qu.:1.000 3rd Qu.:0.0000   
## Max. :1.000 Max. :1.0000   
##   
## business\_type/poultry business\_type/job business\_type/cottage  
## Min. :0.000000 Min. :0.00000 Min. :0   
## 1st Qu.:0.000000 1st Qu.:0.00000 1st Qu.:0   
## Median :0.000000 Median :0.00000 Median :0   
## Mean :0.004367 Mean :0.01747 Mean :0   
## 3rd Qu.:0.000000 3rd Qu.:0.00000 3rd Qu.:0   
## Max. :1.000000 Max. :1.00000 Max. :0   
##   
## business\_type/goat\_farming business\_type/other text\_yx7ko73   
## Min. :0.0000 Min. :0.0000 Length:229   
## 1st Qu.:0.0000 1st Qu.:0.0000 Class :character   
## Median :0.0000 Median :0.0000 Mode :character   
## Mean :0.0131 Mean :0.0655   
## 3rd Qu.:0.0000 3rd Qu.:0.0000   
## Max. :1.0000 Max. :1.0000   
##   
## text\_cu8jm42 loan\_status loan\_amount loan\_purpose   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## loan\_purpose/agriculture\_inputs loan\_purpose/agriculture\_machinery  
## Min. :0.000 Min. :0.0000   
## 1st Qu.:1.000 1st Qu.:0.0000   
## Median :1.000 Median :0.0000   
## Mean :0.904 Mean :0.1616   
## 3rd Qu.:1.000 3rd Qu.:0.0000   
## Max. :1.000 Max. :1.0000   
## NA's :31 NA's :31   
## loan\_purpose/crop\_loss loan\_purpose/debt\_repayment  
## Min. :0.0000 Min. :0.0000   
## 1st Qu.:0.0000 1st Qu.:0.0000   
## Median :0.0000 Median :0.0000   
## Mean :0.4899 Mean :0.4798   
## 3rd Qu.:1.0000 3rd Qu.:1.0000   
## Max. :1.0000 Max. :1.0000   
## NA's :31 NA's :31   
## loan\_purpose/household\_needs loan\_purpose/supplementary\_business  
## Min. :0.0000 Min. :0.0000   
## 1st Qu.:0.0000 1st Qu.:0.0000   
## Median :1.0000 Median :0.0000   
## Mean :0.6111 Mean :0.0101   
## 3rd Qu.:1.0000 3rd Qu.:0.0000   
## Max. :1.0000 Max. :1.0000   
## NA's :31 NA's :31   
## loan\_purpose/other LoanOtherReason loan\_source loan\_source/bank  
## Min. :0.0000 Length:229 Length:229 Min. :0.0000   
## 1st Qu.:0.0000 Class :character Class :character 1st Qu.:0.0000   
## Median :0.0000 Mode :character Mode :character Median :1.0000   
## Mean :0.0303 Mean :0.5909   
## 3rd Qu.:0.0000 3rd Qu.:1.0000   
## Max. :1.0000 Max. :1.0000   
## NA's :31 NA's :31   
## loan\_source/private\_lender loan\_source/cooperative  
## Min. :0.0000 Min. :0.0000   
## 1st Qu.:0.0000 1st Qu.:0.0000   
## Median :0.0000 Median :0.0000   
## Mean :0.2071 Mean :0.2727   
## 3rd Qu.:0.0000 3rd Qu.:1.0000   
## Max. :1.0000 Max. :1.0000   
## NA's :31 NA's :31   
## loan\_source/relatives\_friends loan\_source/self\_help\_group  
## Min. :0.0000 Min. :0.000   
## 1st Qu.:0.0000 1st Qu.:0.000   
## Median :0.0000 Median :0.000   
## Mean :0.3232 Mean :0.202   
## 3rd Qu.:1.0000 3rd Qu.:0.000   
## Max. :1.0000 Max. :1.000   
## NA's :31 NA's :31   
## loan\_source/microfinance loan\_source/other bank\_name   
## Min. :0.00000 Min. :0.00000 Length:229   
## 1st Qu.:0.00000 1st Qu.:0.00000 Class :character   
## Median :0.00000 Median :0.00000 Mode :character   
## Mean :0.06566 Mean :0.01515   
## 3rd Qu.:0.00000 3rd Qu.:0.00000   
## Max. :1.00000 Max. :1.00000   
## NA's :31 NA's :31   
## bank\_name\_001 loan\_duration overdue\_loan overdue\_duration  
## Length:229 Min. : -1.00 Length:229 Min. : -1.0   
## Class :character 1st Qu.: 2.25 Class :character 1st Qu.: 1.0   
## Mode :character Median : 4.00 Mode :character Median : 3.0   
## Mean : 485.81 Mean : 218.7   
## 3rd Qu.: 7.00 3rd Qu.: 5.0   
## Max. :45000.00 Max. :2051.0   
## NA's :31 NA's :31   
## subsidized\_loan health\_conditions\_other low\_market\_price   
## Length:229 Length:229 Length:229   
## Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## climate\_change irrigation\_problem high\_fertilizer\_cost  
## Length:229 Length:229 Length:229   
## Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## lack\_of\_govt\_support labour\_cost middleman\_exploitation  
## Length:229 Length:229 Length:229   
## Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## high\_production\_cost inflation\_stress lack\_of\_processing\_units  
## Length:229 Length:229 Length:229   
## Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## electricity\_issue no\_minimum\_price no\_farm\_loan pest\_disease   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## disaster\_damage no\_compensation storage\_marketing\_issue  
## Length:229 Length:229 Length:229   
## Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## lack\_of\_family\_support tech\_resistance aadhar\_card   
## Length:229 Length:229 Length:229   
## Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## voter\_id ayushman\_bharat\_card pm\_kisan\_card JobCard   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## PMLIfeInsurance caste\_validity caste\_validity\_001  
## Length:229 Length:229 Length:229   
## Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## caste\_validity\_001\_001 caste\_certificate age\_nationality\_certificate  
## Length:229 Length:229 Length:229   
## Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## pan\_card bank\_account ration\_card\_001 driving\_license   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## pm\_kisan pm\_kisan\_mandhan pm\_kisan\_mandhan\_001  
## Length:229 Length:229 Length:229   
## Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## pm\_kisan\_mandhan\_001\_001 pm\_kisan\_mandhan\_001\_001\_001 pmksy   
## Length:229 Length:229 Length:229   
## Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## pmfby kisan\_credit loan\_waiver organic\_farming   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## organic\_farming\_001 aif\_funding agri\_tech farm\_pond   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## community\_pond tractor\_scheme accident\_insurance farmer\_training   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## tree\_plantation solar\_pump water\_conservation market\_facility   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## agri\_dev rupee\_insurance atma Difficulties   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## Difficulties/1 Difficulties/2 Difficulties/3 Difficulties/4   
## Min. :0.0000 Min. :0.0000 Min. :0.0000 Min. :0.0000   
## 1st Qu.:0.0000 1st Qu.:1.0000 1st Qu.:0.0000 1st Qu.:0.0000   
## Median :1.0000 Median :1.0000 Median :1.0000 Median :0.0000   
## Mean :0.5556 Mean :0.7544 Mean :0.5965 Mean :0.1053   
## 3rd Qu.:1.0000 3rd Qu.:1.0000 3rd Qu.:1.0000 3rd Qu.:0.0000   
## Max. :1.0000 Max. :1.0000 Max. :1.0000 Max. :1.0000   
## NA's :58 NA's :58 NA's :58 NA's :58   
## Difficulties/5 other\_difficulties scheme\_info\_sources  
## Min. :0.0000 Length:229 Length:229   
## 1st Qu.:0.0000 Class :character Class :character   
## Median :0.0000 Mode :character Mode :character   
## Mean :0.1286   
## 3rd Qu.:0.0000   
## Max. :1.0000   
## NA's :58   
## scheme\_info\_sources/local\_agriculture\_office scheme\_info\_sources/cooperative  
## Min. :0.0000 Min. :0.0000   
## 1st Qu.:0.0000 1st Qu.:0.0000   
## Median :0.0000 Median :0.0000   
## Mean :0.2489 Mean :0.0917   
## 3rd Qu.:0.0000 3rd Qu.:0.0000   
## Max. :1.0000 Max. :1.0000   
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## scheme\_info\_sources/tv\_radio scheme\_info\_sources/internet\_apps  
## Min. :0.0000 Min. :0.0000   
## 1st Qu.:0.0000 1st Qu.:0.0000   
## Median :0.0000 Median :1.0000   
## Mean :0.4498 Mean :0.7074   
## 3rd Qu.:1.0000 3rd Qu.:1.0000   
## Max. :1.0000 Max. :1.0000   
##   
## scheme\_info\_sources/ngo scheme\_info\_sources/\_ other\_info\_sources  
## Min. :0.0000 Min. :0.00000 Length:229   
## 1st Qu.:0.0000 1st Qu.:0.00000 Class :character   
## Median :1.0000 Median :0.00000 Mode :character   
## Mean :0.5983 Mean :0.04425   
## 3rd Qu.:1.0000 3rd Qu.:0.00000   
## Max. :1.0000 Max. :1.00000   
## NA's :3   
## scheme\_improvements scheme\_improvements/more\_info\_training  
## Length:229 Min. :0.0000   
## Class :character 1st Qu.:0.0000   
## Mode :character Median :1.0000   
## Mean :0.7293   
## 3rd Qu.:1.0000   
## Max. :1.0000   
##   
## scheme\_improvements/simplified\_process scheme\_improvements/local\_help\_centers  
## Min. :0.0000 Min. :0.0000   
## 1st Qu.:1.0000 1st Qu.:0.0000   
## Median :1.0000 Median :1.0000   
## Mean :0.8646 Mean :0.7249   
## 3rd Qu.:1.0000 3rd Qu.:1.0000   
## Max. :1.0000 Max. :1.0000   
##   
## scheme\_improvements/other other\_improvements family\_problems   
## Min. :0 Length:229 Length:229   
## 1st Qu.:0 Class :character Class :character   
## Median :0 Mode :character Mode :character   
## Mean :0   
## 3rd Qu.:0   
## Max. :0   
## NA's :3   
## suicide\_causes suicide\_prevention govt\_initiatives farming\_training   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## alternate\_income informant\_name informant\_mobile surveyor\_name   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## depression\_1 depression\_2 depression\_3 depression\_4   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## depression\_5 anxiety\_1 anxiety\_2 anxiety\_3   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## anxiety\_4 social\_support\_1 social\_support\_2 social\_support\_3   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## social\_support\_4 suicidal\_ideation\_1 suicidal\_ideation\_2 suicidal\_ideation\_3  
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## financial\_stress\_1 financial\_stress\_2 financial\_stress\_3 financial\_stress\_4  
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## coping\_1 coping\_2 coping\_3 coping\_4   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## life\_satisfaction\_1 life\_satisfaction\_2 life\_satisfaction\_3  
## Length:229 Length:229 Length:229   
## Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## life\_satisfaction\_4 member\_depressed mental\_support medical\_need   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## govt\_schemes\_awareness positive\_mental\_state social\_participation  
## Length:229 Length:229 Length:229   
## Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## govt\_support\_needed education\_continuity housing\_type housing\_condition   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## additional\_observations Point\_and\_shoot\_Use\_mera\_to\_take\_a\_photo  
## Length:229 Length:229   
## Class :character Class :character   
## Mode :character Mode :character   
##   
##   
##   
##   
## Point\_and\_shoot\_Use\_mera\_to\_take\_a\_photo\_URL \_\_003   
## Length:229 Length:229   
## Class :character Class :character   
## Mode :character Mode :character   
##   
##   
##   
##   
## text\_ye0iz81 \_\_005 life\_insurance \_\_006   
## Length:229 Mode:logical Length:229 Length:229   
## Class :character NA's:229 Class :character Class :character   
## Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## agri\_insurance \_\_007 cropping\_pattern \_   
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## crops\_kharif crops\_kharif/jowar crops\_kharif/bajra crops\_kharif/maize  
## Length:229 Min. :0.0000 Min. :0 Min. :0.0000   
## Class :character 1st Qu.:0.0000 1st Qu.:0 1st Qu.:0.0000   
## Mode :character Median :0.0000 Median :0 Median :0.0000   
## Mean :0.3333 Mean :0 Mean :0.3333   
## 3rd Qu.:0.5000 3rd Qu.:0 3rd Qu.:0.5000   
## Max. :1.0000 Max. :0 Max. :1.0000   
## NA's :226 NA's :226 NA's :226   
## crops\_kharif/urad\_moong crops\_kharif/soybean crops\_kharif/\_\_\_\_ \_\_008   
## Min. :0.0000 Min. :0 Min. :0.0000 Min. :2   
## 1st Qu.:0.0000 1st Qu.:0 1st Qu.:0.5000 1st Qu.:2   
## Median :0.0000 Median :0 Median :1.0000 Median :2   
## Mean :0.3333 Mean :0 Mean :0.6667 Mean :2   
## 3rd Qu.:0.5000 3rd Qu.:0 3rd Qu.:1.0000 3rd Qu.:2   
## Max. :1.0000 Max. :0 Max. :1.0000 Max. :2   
## NA's :226 NA's :226 NA's :226 NA's :228   
## crops\_rabi crops\_rabi/wheat crops\_rabi/gram crops\_rabi/jowar\_late  
## Length:229 Min. :0 Min. :0.0000 Min. :0   
## Class :character 1st Qu.:0 1st Qu.:0.0000 1st Qu.:0   
## Mode :character Median :0 Median :0.0000 Median :0   
## Mean :0 Mean :0.3333 Mean :0   
## 3rd Qu.:0 3rd Qu.:0.5000 3rd Qu.:0   
## Max. :0 Max. :1.0000 Max. :0   
## NA's :226 NA's :226 NA's :226   
## crops\_rabi/\_\_\_\_ crops\_summer crops\_summer/maize crops\_summer/sugarcane  
## Min. :1 Length:229 Min. :0.0000 Min. :0   
## 1st Qu.:1 Class :character 1st Qu.:0.0000 1st Qu.:0   
## Median :1 Mode :character Median :0.0000 Median :0   
## Mean :1 Mean :0.3333 Mean :0   
## 3rd Qu.:1 3rd Qu.:0.5000 3rd Qu.:0   
## Max. :1 Max. :1.0000 Max. :0   
## NA's :226 NA's :226 NA's :226   
## crops\_summer/groundnut crops\_summer/cucumber\_melon crops\_summer/\_\_\_\_  
## Min. :0 Min. :0 Min. :0.0000   
## 1st Qu.:0 1st Qu.:0 1st Qu.:0.5000   
## Median :0 Median :0 Median :1.0000   
## Mean :0 Mean :0 Mean :0.6667   
## 3rd Qu.:0 3rd Qu.:0 3rd Qu.:1.0000   
## Max. :0 Max. :0 Max. :1.0000   
## NA's :226 NA's :226 NA's :226   
## crops\_horticulture crops\_horticulture/banana crops\_horticulture/pomegranate  
## Length:229 Min. :0 Min. :0   
## Class :character 1st Qu.:0 1st Qu.:0   
## Mode :character Median :0 Median :0   
## Mean :0 Mean :0   
## 3rd Qu.:0 3rd Qu.:0   
## Max. :0 Max. :0   
## NA's :226 NA's :226   
## crops\_horticulture/citrus crops\_horticulture/\_\_\_\_ other   
## Min. :0 Min. :1 Min. :0   
## 1st Qu.:0 1st Qu.:1 1st Qu.:0   
## Median :0 Median :1 Median :0   
## Mean :0 Mean :1 Mean :0   
## 3rd Qu.:0 3rd Qu.:1 3rd Qu.:0   
## Max. :0 Max. :1 Max. :0   
## NA's :226 NA's :226 NA's :226   
## \_\_009 \_\_010 text\_lo1xd85 \_\_011   
## Length:229 Length:229 Mode:logical Length:229   
## Class :character Class :character NA's:229 Class :character   
## Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## health\_conditions health\_conditions/heart\_disease health\_conditions/diabetes  
## Mode:logical Mode:logical Mode:logical   
## NA's:229 NA's:229 NA's:229   
##   
##   
##   
##   
##   
## health\_conditions/respiratory\_disease health\_conditions/mental\_stress  
## Mode:logical Mode:logical   
## NA's:229 NA's:229   
##   
##   
##   
##   
##   
## health\_conditions/other \_\_012 \_\_013   
## Mode:logical Length:229 Length:229   
## NA's:229 Class :character Class :character   
## Mode :character Mode :character   
##   
##   
##   
##   
## \_\_014 \_\_015 other\_farming\_issues job\_card   
## Length:229 Mode:logical Length:229 Length:229   
## Class :character NA's:229 Class :character Class :character   
## Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## \_\_017 balasaheb\_project \_\_018 ahilyadevi\_nursery  
## Length:229 Length:229 Length:229 Length:229   
## Class :character Class :character Class :character Class :character   
## Mode :character Mode :character Mode :character Mode :character   
##   
##   
##   
##   
## other\_schemes \_\_002 \_\_002/1 \_\_002/2   
## Length:229 Length:229 Min. :0.000 Min. :0.0000   
## Class :character Class :character 1st Qu.:0.000 1st Qu.:1.0000   
## Mode :character Mode :character Median :1.000 Median :1.0000   
## Mean :0.566 Mean :0.7547   
## 3rd Qu.:1.000 3rd Qu.:1.0000   
## Max. :1.000 Max. :1.0000   
## NA's :176 NA's :176   
## \_\_002/3 \_\_002/4 \_\_002/5 \_id   
## Min. :0.0000 Min. :0.0000 Min. :0.0000 Min. :446352748   
## 1st Qu.:0.0000 1st Qu.:0.0000 1st Qu.:0.0000 1st Qu.:447638195   
## Median :1.0000 Median :0.0000 Median :0.0000 Median :448205674   
## Mean :0.6415 Mean :0.1132 Mean :0.0566 Mean :448658399   
## 3rd Qu.:1.0000 3rd Qu.:0.0000 3rd Qu.:0.0000 3rd Qu.:449605979   
## Max. :1.0000 Max. :1.0000 Max. :1.0000 Max. :451346930   
## NA's :176 NA's :176 NA's :176   
## \_uuid \_submission\_time \_validation\_status  
## Length:229 Min. :2025-02-27 16:29:31.00 Length:229   
## Class :character 1st Qu.:2025-03-03 15:57:06.00 Class :character   
## Mode :character Median :2025-03-05 06:19:57.00 Mode :character   
## Mean :2025-03-06 06:47:55.54   
## 3rd Qu.:2025-03-08 17:19:30.00   
## Max. :2025-03-13 04:47:29.00   
##   
## \_notes \_status \_submitted\_by \_\_version\_\_   
## Mode:logical Length:229 Mode:logical Length:229   
## NA's:229 Class :character NA's:229 Class :character   
## Mode :character Mode :character   
##   
##   
##   
##   
## \_tags \_index   
## Mode:logical Min. : 1   
## NA's:229 1st Qu.: 58   
## Median :115   
## Mean :115   
## 3rd Qu.:172   
## Max. :229   
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# Count Missing Values

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## farmer\_id   
## 56   
## farmers\_name   
## 0   
## village   
## 0   
## taluka   
## 0   
## age   
## 0   
## gender   
## 0   
## marital\_status   
## 0   
## education   
## 0   
## religion   
## 0   
## caste   
## 0   
## subcaste   
## 0   
## mother\_tongue   
## 0   
## family\_type   
## 0   
## head\_of\_family   
## 0   
## relation\_with\_farmer   
## 0   
## total\_family\_members   
## 0   
## income\_sources   
## 0   
## income\_sources/agriculture   
## 0   
## income\_sources/labour   
## 0   
## income\_sources/job   
## 145   
## income\_sources/business   
## 0   
## income\_sources/Privatejob   
## 3   
## income\_sources/GovernmentJob   
## 3   
## income\_sources/Pension   
## 3   
## income\_sources/Other   
## 3   
## otherincome   
## 228   
## traditional\_business   
## 0   
## annual\_income   
## 0   
## bpl\_status   
## 0   
## ration\_card   
## 0   
## FarmersGroup   
## 62   
## SHGroup   
## 62   
## land\_type   
## 0   
## irrigated\_land   
## 0   
## dry\_land   
## 0   
## total\_land   
## 0   
## SoilTesting   
## 67   
## SoilTestedYear   
## 226   
## water\_sources   
## 0   
## water\_sources/none   
## 0   
## water\_sources/river   
## 0   
## water\_sources/well   
## 0   
## water\_sources/canal   
## 0   
## water\_sources/borewell   
## 0   
## water\_sources/farm\_pond   
## 0   
## water\_sources/reservoir   
## 0   
## water\_sources/dam   
## 0   
## water\_sources/neighbor\_water   
## 0   
## cotton   
## 43   
## maize   
## 144   
## jowar   
## 179   
## bajra   
## 188   
## pulses   
## 187   
## soybean   
## 188   
## wheat   
## 174   
## gram   
## 170   
## sorghum   
## 188   
## maize2   
## 171   
## groundnut   
## 194   
## melon   
## 194   
## sesame   
## 196   
## banana   
## 191   
## pomegranate   
## 196   
## citrus   
## 196   
## vegetables   
## 196   
## other\_crops   
## 0   
## \_\_001   
## 30   
## text\_qi3tf85   
## 213   
## text\_pu6bd80   
## 102   
## bullocks   
## 0   
## cow   
## 0   
## buffalo   
## 0   
## goat   
## 0   
## sheep   
## 0   
## poultry   
## 0   
## text\_cu6dv88   
## 190   
## sprayer   
## 0   
## motor   
## 0   
## thresher   
## 0   
## tractor   
## 0   
## other\_001   
## 165   
## farm\_income   
## 0   
## monthly\_expense   
## 0   
## select\_one\_ld4vw19   
## 65   
## secondary\_business   
## 0   
## business\_type   
## 0   
## business\_type/labor   
## 0   
## business\_type/dairy   
## 0   
## business\_type/poultry   
## 0   
## business\_type/job   
## 0   
## business\_type/cottage   
## 0   
## business\_type/goat\_farming   
## 0   
## business\_type/other   
## 0   
## text\_yx7ko73   
## 181   
## text\_cu8jm42   
## 112   
## loan\_status   
## 0   
## loan\_amount   
## 31   
## loan\_purpose   
## 31   
## loan\_purpose/agriculture\_inputs   
## 31   
## loan\_purpose/agriculture\_machinery   
## 31   
## loan\_purpose/crop\_loss   
## 31   
## loan\_purpose/debt\_repayment   
## 31   
## loan\_purpose/household\_needs   
## 31   
## loan\_purpose/supplementary\_business   
## 31   
## loan\_purpose/other   
## 31   
## LoanOtherReason   
## 223   
## loan\_source   
## 31   
## loan\_source/bank   
## 31   
## loan\_source/private\_lender   
## 31   
## loan\_source/cooperative   
## 31   
## loan\_source/relatives\_friends   
## 31   
## loan\_source/self\_help\_group   
## 31   
## loan\_source/microfinance   
## 31   
## loan\_source/other   
## 31   
## bank\_name   
## 112   
## bank\_name\_001   
## 226   
## loan\_duration   
## 31   
## overdue\_loan   
## 31   
## overdue\_duration   
## 31   
## subsidized\_loan   
## 31   
## health\_conditions\_other   
## 178   
## low\_market\_price   
## 0   
## climate\_change   
## 0   
## irrigation\_problem   
## 0   
## high\_fertilizer\_cost   
## 0   
## lack\_of\_govt\_support   
## 0   
## labour\_cost   
## 0   
## middleman\_exploitation   
## 0   
## high\_production\_cost   
## 0   
## inflation\_stress   
## 0   
## lack\_of\_processing\_units   
## 0   
## electricity\_issue   
## 0   
## no\_minimum\_price   
## 0   
## no\_farm\_loan   
## 0   
## pest\_disease   
## 0   
## disaster\_damage   
## 0   
## no\_compensation   
## 0   
## storage\_marketing\_issue   
## 0   
## lack\_of\_family\_support   
## 0   
## tech\_resistance   
## 0   
## aadhar\_card   
## 0   
## voter\_id   
## 0   
## ayushman\_bharat\_card   
## 0   
## pm\_kisan\_card   
## 0   
## JobCard   
## 57   
## PMLIfeInsurance   
## 58   
## caste\_validity   
## 0   
## caste\_validity\_001   
## 3   
## caste\_validity\_001\_001   
## 3   
## caste\_certificate   
## 0   
## age\_nationality\_certificate   
## 0   
## pan\_card   
## 0   
## bank\_account   
## 0   
## ration\_card\_001   
## 0   
## driving\_license   
## 0   
## pm\_kisan   
## 0   
## pm\_kisan\_mandhan   
## 0   
## pm\_kisan\_mandhan\_001   
## 3   
## pm\_kisan\_mandhan\_001\_001   
## 3   
## pm\_kisan\_mandhan\_001\_001\_001   
## 3   
## pmksy   
## 0   
## pmfby   
## 0   
## kisan\_credit   
## 0   
## loan\_waiver   
## 0   
## organic\_farming   
## 0   
## organic\_farming\_001   
## 3   
## aif\_funding   
## 0   
## agri\_tech   
## 0   
## farm\_pond   
## 0   
## community\_pond   
## 0   
## tractor\_scheme   
## 0   
## accident\_insurance   
## 0   
## farmer\_training   
## 0   
## tree\_plantation   
## 0   
## solar\_pump   
## 0   
## water\_conservation   
## 0   
## market\_facility   
## 0   
## agri\_dev   
## 0   
## rupee\_insurance   
## 0   
## atma   
## 0   
## Difficulties   
## 58   
## Difficulties/1   
## 58   
## Difficulties/2   
## 58   
## Difficulties/3   
## 58   
## Difficulties/4   
## 58   
## Difficulties/5   
## 58   
## other\_difficulties   
## 201   
## scheme\_info\_sources   
## 0   
## scheme\_info\_sources/local\_agriculture\_office   
## 0   
## scheme\_info\_sources/cooperative   
## 0   
## scheme\_info\_sources/tv\_radio   
## 0   
## scheme\_info\_sources/internet\_apps   
## 0   
## scheme\_info\_sources/ngo   
## 0   
## scheme\_info\_sources/\_   
## 3   
## other\_info\_sources   
## 216   
## scheme\_improvements   
## 0   
## scheme\_improvements/more\_info\_training   
## 0   
## scheme\_improvements/simplified\_process   
## 0   
## scheme\_improvements/local\_help\_centers   
## 0   
## scheme\_improvements/other   
## 3   
## other\_improvements   
## 226   
## family\_problems   
## 0   
## suicide\_causes   
## 0   
## suicide\_prevention   
## 0   
## govt\_initiatives   
## 0   
## farming\_training   
## 0   
## alternate\_income   
## 0   
## informant\_name   
## 0   
## informant\_mobile   
## 0   
## surveyor\_name   
## 0   
## depression\_1   
## 0   
## depression\_2   
## 0   
## depression\_3   
## 0   
## depression\_4   
## 0   
## depression\_5   
## 0   
## anxiety\_1   
## 0   
## anxiety\_2   
## 0   
## anxiety\_3   
## 0   
## anxiety\_4   
## 0   
## social\_support\_1   
## 0   
## social\_support\_2   
## 0   
## social\_support\_3   
## 0   
## social\_support\_4   
## 0   
## suicidal\_ideation\_1   
## 0   
## suicidal\_ideation\_2   
## 0   
## suicidal\_ideation\_3   
## 0   
## financial\_stress\_1   
## 0   
## financial\_stress\_2   
## 0   
## financial\_stress\_3   
## 0   
## financial\_stress\_4   
## 0   
## coping\_1   
## 0   
## coping\_2   
## 0   
## coping\_3   
## 0   
## coping\_4   
## 0   
## life\_satisfaction\_1   
## 0   
## life\_satisfaction\_2   
## 0   
## life\_satisfaction\_3   
## 0   
## life\_satisfaction\_4   
## 0   
## member\_depressed   
## 0   
## mental\_support   
## 0   
## medical\_need   
## 0   
## govt\_schemes\_awareness   
## 0   
## positive\_mental\_state   
## 0   
## social\_participation   
## 0   
## govt\_support\_needed   
## 0   
## education\_continuity   
## 0   
## housing\_type   
## 0   
## housing\_condition   
## 0   
## additional\_observations   
## 0   
## Point\_and\_shoot\_Use\_mera\_to\_take\_a\_photo   
## 4   
## Point\_and\_shoot\_Use\_mera\_to\_take\_a\_photo\_URL   
## 4   
## \_\_003   
## 176   
## text\_ye0iz81   
## 226   
## \_\_005   
## 229   
## life\_insurance   
## 226   
## \_\_006   
## 178   
## agri\_insurance   
## 226   
## \_\_007   
## 176   
## cropping\_pattern   
## 226   
## \_   
## 179   
## crops\_kharif   
## 226   
## crops\_kharif/jowar   
## 226   
## crops\_kharif/bajra   
## 226   
## crops\_kharif/maize   
## 226   
## crops\_kharif/urad\_moong   
## 226   
## crops\_kharif/soybean   
## 226   
## crops\_kharif/\_\_\_\_   
## 226   
## \_\_008   
## 228   
## crops\_rabi   
## 226   
## crops\_rabi/wheat   
## 226   
## crops\_rabi/gram   
## 226   
## crops\_rabi/jowar\_late   
## 226   
## crops\_rabi/\_\_\_\_   
## 226   
## crops\_summer   
## 226   
## crops\_summer/maize   
## 226   
## crops\_summer/sugarcane   
## 226   
## crops\_summer/groundnut   
## 226   
## crops\_summer/cucumber\_melon   
## 226   
## crops\_summer/\_\_\_\_   
## 226   
## crops\_horticulture   
## 226   
## crops\_horticulture/banana   
## 226   
## crops\_horticulture/pomegranate   
## 226   
## crops\_horticulture/citrus   
## 226   
## crops\_horticulture/\_\_\_\_   
## 226   
## other   
## 226   
## \_\_009   
## 225   
## \_\_010   
## 186   
## text\_lo1xd85   
## 229   
## \_\_011   
## 200   
## health\_conditions   
## 229   
## health\_conditions/heart\_disease   
## 229   
## health\_conditions/diabetes   
## 229   
## health\_conditions/respiratory\_disease   
## 229   
## health\_conditions/mental\_stress   
## 229   
## health\_conditions/other   
## 229   
## \_\_012   
## 177   
## \_\_013   
## 204   
## \_\_014   
## 184   
## \_\_015   
## 229   
## other\_farming\_issues   
## 226   
## job\_card   
## 226   
## \_\_017   
## 176   
## balasaheb\_project   
## 226   
## \_\_018   
## 177   
## ahilyadevi\_nursery   
## 226   
## other\_schemes   
## 226   
## \_\_002   
## 176   
## \_\_002/1   
## 176   
## \_\_002/2   
## 176   
## \_\_002/3   
## 176   
## \_\_002/4   
## 176   
## \_\_002/5   
## 176   
## \_id   
## 0   
## \_uuid   
## 0   
## \_submission\_time   
## 0   
## \_validation\_status   
## 216   
## \_notes   
## 229   
## \_status   
## 0   
## \_submitted\_by   
## 229   
## \_\_version\_\_   
## 0   
## \_tags   
## 229   
## \_index   
## 0

# Impute Missing Values (Numerical Columns)

data <- data %>%  
 mutate(across(where(is.numeric), ~ ifelse(is.na(.), median(., na.rm = TRUE), .)))

## Distribution Analysis

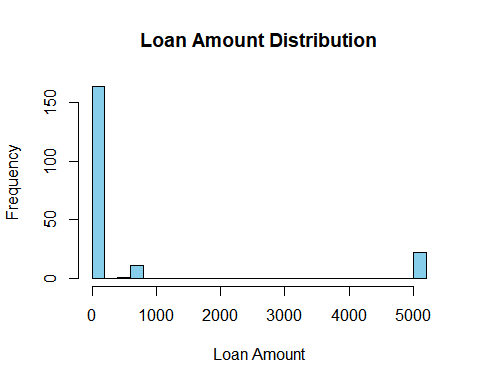
# Histogram for Numerical Variables  
str(data$loan\_amount)

## chr [1:229] "75k\_1lakh" "50k\_75k" "below\_50k" "below\_50k" "1lakh\_5lakh" ...

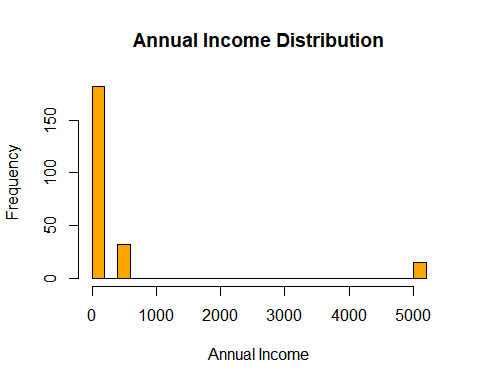
str(data$annual\_income)

## chr [1:229] "below\_50k" "below\_50k" "below\_50k" "below\_50k" "below\_50k" ...

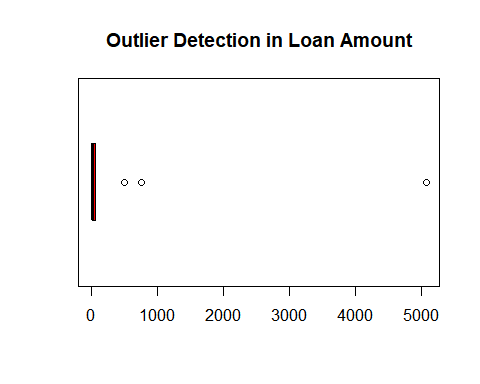
# Clean and Convert to Numeric  
data$loan\_amount <- as.numeric(gsub("[^0-9.]", "", data$loan\_amount))  
# Clean and Convert to Numeric  
data$annual\_income <- as.numeric(gsub("[^0-9.]", "", data$annual\_income))  
  
# Now Check Again  
hist(data$loan\_amount,   
 main = "Loan Amount Distribution",   
 col = "skyblue",   
 xlab = "Loan Amount",   
 breaks = 30)



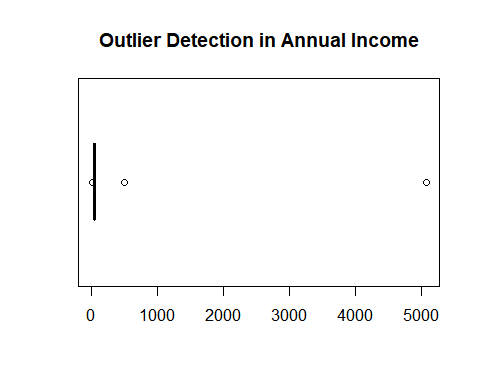
hist(data$annual\_income,   
 main = "Annual Income Distribution",   
 col = "orange",   
 xlab = "Annual Income",   
 breaks = 30)

 ##Boxplot for Outlier Detection

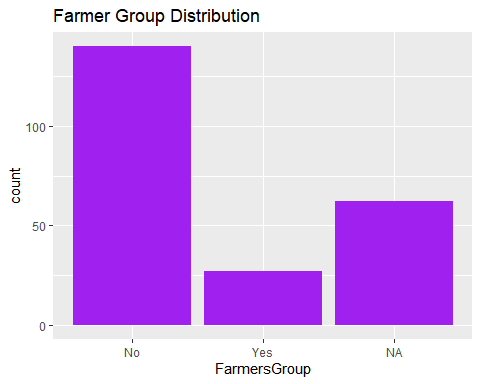
# Boxplot for Outlier Detection  
boxplot(data$loan\_amount, main = "Outlier Detection in Loan Amount",   
 col = "red", horizontal = TRUE)



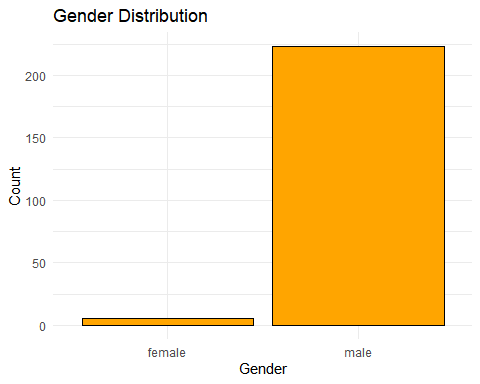
boxplot(data$annual\_income, main = "Outlier Detection in Annual Income",   
 col = "green", horizontal = TRUE)

 # Bar Plot for Categorical Variables

# Bar Plot for Farmer Groups  
ggplot(data, aes(x = FarmersGroup)) +  
 geom\_bar(fill = "purple") +  
 labs(title = "Farmer Group Distribution")

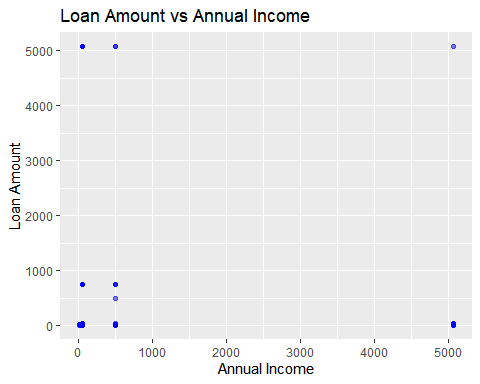


ggplot(data, aes(x = gender)) +   
 geom\_bar(fill = "orange", color = "black") +  
 theme\_minimal() +   
 labs(title = "Gender Distribution", x = "Gender", y = "Count")



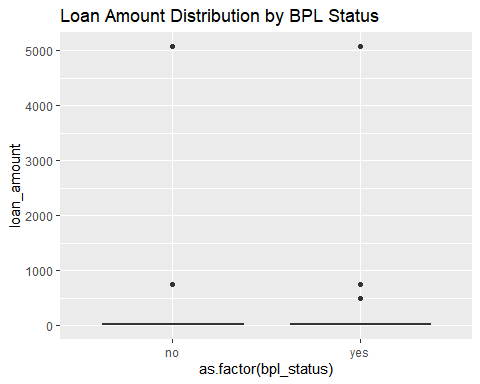
ggplot(data, aes(x = annual\_income, y = loan\_amount)) +  
 geom\_point(color = "blue", alpha = 0.5) +  
 labs(title = "Loan Amount vs Annual Income",  
 x = "Annual Income", y = "Loan Amount")

## Warning: Removed 31 rows containing missing values or values outside the scale range  
## (`geom\_point()`).



ggplot(data, aes(x = as.factor(bpl\_status), y = loan\_amount)) +  
 geom\_boxplot(fill = "coral") +  
 labs(title = "Loan Amount Distribution by BPL Status")

## Warning: Removed 31 rows containing non-finite outside the scale range  
## (`stat\_boxplot()`).



##Perform Factor Analysis

str(data[, 122:140]) # Check the data types of selected columns

## tibble [229 × 19] (S3: tbl\_df/tbl/data.frame)  
## $ low\_market\_price : chr [1:229] "strongly\_agree" "strongly\_agree" "strongly\_agree" "strongly\_agree" ...  
## $ climate\_change : chr [1:229] "strongly\_agree" "strongly\_agree" "strongly\_agree" "strongly\_agree" ...  
## $ irrigation\_problem : chr [1:229] "strongly\_agree" "strongly\_agree" "strongly\_agree" "strongly\_agree" ...  
## $ high\_fertilizer\_cost : chr [1:229] "strongly\_agree" "strongly\_agree" "strongly\_agree" "strongly\_agree" ...  
## $ lack\_of\_govt\_support : chr [1:229] "strongly\_agree" "agree" "strongly\_agree" "strongly\_agree" ...  
## $ labour\_cost : chr [1:229] "strongly\_agree" "strongly\_agree" "strongly\_agree" "strongly\_agree" ...  
## $ middleman\_exploitation : chr [1:229] "strongly\_agree" "strongly\_agree" "strongly\_agree" "strongly\_agree" ...  
## $ high\_production\_cost : chr [1:229] "strongly\_agree" "strongly\_agree" "strongly\_agree" "strongly\_agree" ...  
## $ inflation\_stress : chr [1:229] "strongly\_agree" "strongly\_agree" "strongly\_agree" "strongly\_agree" ...  
## $ lack\_of\_processing\_units: chr [1:229] "strongly\_agree" "agree" "strongly\_agree" "strongly\_agree" ...  
## $ electricity\_issue : chr [1:229] "agree" "agree" "agree" "agree" ...  
## $ no\_minimum\_price : chr [1:229] "strongly\_agree" "strongly\_agree" "strongly\_agree" "strongly\_agree" ...  
## $ no\_farm\_loan : chr [1:229] "strongly\_agree" "agree" "agree" "strongly\_agree" ...  
## $ pest\_disease : chr [1:229] "strongly\_agree" "strongly\_agree" "strongly\_agree" "strongly\_agree" ...  
## $ disaster\_damage : chr [1:229] "strongly\_agree" "strongly\_agree" "strongly\_agree" "strongly\_agree" ...  
## $ no\_compensation : chr [1:229] "strongly\_agree" "neutral" "strongly\_agree" "strongly\_agree" ...  
## $ storage\_marketing\_issue : chr [1:229] "strongly\_agree" "strongly\_agree" "agree" "strongly\_agree" ...  
## $ lack\_of\_family\_support : chr [1:229] "neutral" "strongly\_disagree" "neutral" "neutral" ...  
## $ tech\_resistance : chr [1:229] "agree" "neutral" "agree" "neutral" ...

# Convert only factor or character columns to numeric  
fa\_data <- data[, 122:140] # Select columns  
  
# Check if columns are numeric or categorical  
fa\_data <- as.data.frame(lapply(fa\_data, function(x) {  
 if (is.factor(x) | is.character(x)) {  
 as.numeric(as.factor(x)) # Convert factors/characters to numeric levels  
 } else {  
 x # Keep numeric columns unchanged  
 }  
}))  
  
# Check for missing values  
summary(fa\_data)

## low\_market\_price climate\_change irrigation\_problem high\_fertilizer\_cost  
## Min. :1.000 Min. :1.000 Min. :1.000 Min. :1.000   
## 1st Qu.:3.000 1st Qu.:1.000 1st Qu.:1.000 1st Qu.:1.000   
## Median :4.000 Median :3.000 Median :4.000 Median :3.000   
## Mean :3.306 Mean :2.114 Mean :2.878 Mean :2.297   
## 3rd Qu.:4.000 3rd Qu.:3.000 3rd Qu.:4.000 3rd Qu.:3.000   
## Max. :5.000 Max. :4.000 Max. :5.000 Max. :4.000   
## lack\_of\_govt\_support labour\_cost middleman\_exploitation  
## Min. :1.000 Min. :1.000 Min. :1.000   
## 1st Qu.:1.000 1st Qu.:1.000 1st Qu.:1.000   
## Median :3.000 Median :4.000 Median :3.000   
## Mean :2.672 Mean :2.773 Mean :2.712   
## 3rd Qu.:4.000 3rd Qu.:4.000 3rd Qu.:4.000   
## Max. :5.000 Max. :5.000 Max. :5.000   
## high\_production\_cost inflation\_stress lack\_of\_processing\_units  
## Min. :1.000 Min. :1.000 Min. :1.000   
## 1st Qu.:1.000 1st Qu.:1.000 1st Qu.:1.000   
## Median :4.000 Median :4.000 Median :3.000   
## Mean :2.686 Mean :2.873 Mean :2.607   
## 3rd Qu.:4.000 3rd Qu.:4.000 3rd Qu.:4.000   
## Max. :4.000 Max. :4.000 Max. :4.000   
## electricity\_issue no\_minimum\_price no\_farm\_loan pest\_disease   
## Min. :1.000 Min. :1.000 Min. :1.000 Min. :1.000   
## 1st Qu.:1.000 1st Qu.:3.000 1st Qu.:1.000 1st Qu.:1.000   
## Median :3.000 Median :4.000 Median :3.000 Median :3.000   
## Mean :2.773 Mean :3.249 Mean :2.498 Mean :2.231   
## 3rd Qu.:4.000 3rd Qu.:4.000 3rd Qu.:4.000 3rd Qu.:3.000   
## Max. :5.000 Max. :5.000 Max. :5.000 Max. :4.000   
## disaster\_damage no\_compensation storage\_marketing\_issue lack\_of\_family\_support  
## Min. :1.000 Min. :1.000 Min. :1.000 Min. :1.000   
## 1st Qu.:1.000 1st Qu.:1.000 1st Qu.:1.000 1st Qu.:2.000   
## Median :4.000 Median :3.000 Median :3.000 Median :3.000   
## Mean :2.852 Mean :2.712 Mean :2.581 Mean :3.179   
## 3rd Qu.:4.000 3rd Qu.:4.000 3rd Qu.:4.000 3rd Qu.:5.000   
## Max. :5.000 Max. :5.000 Max. :5.000 Max. :5.000   
## tech\_resistance  
## Min. :1.000   
## 1st Qu.:1.000   
## Median :3.000   
## Mean :2.541   
## 3rd Qu.:4.000   
## Max. :5.000

# Count how many missing values remain  
colSums(is.na(fa\_data))

## low\_market\_price climate\_change irrigation\_problem   
## 0 0 0   
## high\_fertilizer\_cost lack\_of\_govt\_support labour\_cost   
## 0 0 0   
## middleman\_exploitation high\_production\_cost inflation\_stress   
## 0 0 0   
## lack\_of\_processing\_units electricity\_issue no\_minimum\_price   
## 0 0 0   
## no\_farm\_loan pest\_disease disaster\_damage   
## 0 0 0   
## no\_compensation storage\_marketing\_issue lack\_of\_family\_support   
## 0 0 0   
## tech\_resistance   
## 0

# Remove rows only if a few NAs exist; otherwise, impute missing values  
fa\_data <- na.omit(fa\_data) # OR use imputation methods if too many NAs  
  
# Verify data structure again  
str(fa\_data)

## 'data.frame': 229 obs. of 19 variables:  
## $ low\_market\_price : num 4 4 4 4 4 5 4 4 1 1 ...  
## $ climate\_change : num 3 3 3 3 3 3 3 3 1 1 ...  
## $ irrigation\_problem : num 4 4 4 4 4 4 1 4 1 4 ...  
## $ high\_fertilizer\_cost : num 3 3 3 3 3 3 1 1 1 3 ...  
## $ lack\_of\_govt\_support : num 4 1 4 4 4 4 1 1 1 4 ...  
## $ labour\_cost : num 4 4 4 4 4 1 1 1 1 1 ...  
## $ middleman\_exploitation : num 4 4 4 4 4 1 1 1 1 1 ...  
## $ high\_production\_cost : num 4 4 4 4 4 1 1 3 1 4 ...  
## $ inflation\_stress : num 4 4 4 4 4 1 4 1 1 1 ...  
## $ lack\_of\_processing\_units: num 4 1 4 4 4 1 1 1 1 4 ...  
## $ electricity\_issue : num 1 1 1 1 4 3 1 3 1 1 ...  
## $ no\_minimum\_price : num 4 4 4 4 4 4 1 4 1 1 ...  
## $ no\_farm\_loan : num 4 1 1 4 4 4 1 2 1 4 ...  
## $ pest\_disease : num 3 3 3 3 3 3 3 1 1 3 ...  
## $ disaster\_damage : num 4 4 4 4 4 4 4 1 1 4 ...  
## $ no\_compensation : num 4 3 4 4 2 3 3 1 1 4 ...  
## $ storage\_marketing\_issue : num 4 4 1 4 1 1 1 1 1 4 ...  
## $ lack\_of\_family\_support : num 3 5 3 3 2 2 5 2 1 4 ...  
## $ tech\_resistance : num 1 3 1 3 2 2 5 2 1 4 ...

cor\_matrix <- cor(fa\_data, use = "pairwise.complete.obs") # Allows partial data  
print(cor\_matrix)

## low\_market\_price climate\_change irrigation\_problem  
## low\_market\_price 1.000000000 0.3542079 0.2239043  
## climate\_change 0.354207890 1.0000000 0.4221334  
## irrigation\_problem 0.223904291 0.4221334 1.0000000  
## high\_fertilizer\_cost 0.235328504 0.4680388 0.4205330  
## lack\_of\_govt\_support 0.133776437 0.2519831 0.2187351  
## labour\_cost 0.185252430 0.4245553 0.3787476  
## middleman\_exploitation 0.166372560 0.3524158 0.2596312  
## high\_production\_cost 0.281469066 0.5118756 0.3560304  
## inflation\_stress 0.343336080 0.3979179 0.3265400  
## lack\_of\_processing\_units 0.001314896 0.1813958 0.2387004  
## electricity\_issue 0.160264051 0.2680396 0.2669968  
## no\_minimum\_price 0.283723221 0.3174034 0.2612752  
## no\_farm\_loan 0.025100712 0.1377256 0.2090534  
## pest\_disease 0.276809347 0.5360141 0.3949860  
## disaster\_damage 0.198353300 0.4694096 0.3591699  
## no\_compensation 0.189772133 0.2527798 0.1615452  
## storage\_marketing\_issue 0.275381602 0.3469322 0.3679787  
## lack\_of\_family\_support 0.131996364 0.1316963 0.1281728  
## tech\_resistance 0.056843046 0.1247275 0.1592068  
## high\_fertilizer\_cost lack\_of\_govt\_support labour\_cost  
## low\_market\_price 0.2353285 0.1337764 0.1852524  
## climate\_change 0.4680388 0.2519831 0.4245553  
## irrigation\_problem 0.4205330 0.2187351 0.3787476  
## high\_fertilizer\_cost 1.0000000 0.2879107 0.2984361  
## lack\_of\_govt\_support 0.2879107 1.0000000 0.3638025  
## labour\_cost 0.2984361 0.3638025 1.0000000  
## middleman\_exploitation 0.3478227 0.1457032 0.3587169  
## high\_production\_cost 0.4432430 0.3031458 0.4419222  
## inflation\_stress 0.4633301 0.2838945 0.3947128  
## lack\_of\_processing\_units 0.2073375 0.2566337 0.2824710  
## electricity\_issue 0.2394786 0.2671927 0.2619398  
## no\_minimum\_price 0.2638082 0.1487084 0.3116923  
## no\_farm\_loan 0.2188731 0.2559975 0.2113932  
## pest\_disease 0.4125133 0.1873326 0.4685139  
## disaster\_damage 0.4535745 0.3915848 0.3602640  
## no\_compensation 0.1990779 0.2562057 0.2379399  
## storage\_marketing\_issue 0.3002117 0.1057712 0.3304090  
## lack\_of\_family\_support 0.1639250 0.2801076 0.2444381  
## tech\_resistance 0.0604159 0.1423418 0.1031816  
## middleman\_exploitation high\_production\_cost  
## low\_market\_price 0.1663726 0.28146907  
## climate\_change 0.3524158 0.51187557  
## irrigation\_problem 0.2596312 0.35603037  
## high\_fertilizer\_cost 0.3478227 0.44324296  
## lack\_of\_govt\_support 0.1457032 0.30314576  
## labour\_cost 0.3587169 0.44192224  
## middleman\_exploitation 1.0000000 0.40645743  
## high\_production\_cost 0.4064574 1.00000000  
## inflation\_stress 0.3722643 0.51705950  
## lack\_of\_processing\_units 0.1967961 0.16292434  
## electricity\_issue 0.2027702 0.32673566  
## no\_minimum\_price 0.3108613 0.35139694  
## no\_farm\_loan 0.2496976 0.18310393  
## pest\_disease 0.2940281 0.46630096  
## disaster\_damage 0.3258524 0.40596078  
## no\_compensation 0.1619370 0.25063061  
## storage\_marketing\_issue 0.2056380 0.35610045  
## lack\_of\_family\_support 0.1553359 0.23688559  
## tech\_resistance 0.1491302 0.08334036  
## inflation\_stress lack\_of\_processing\_units  
## low\_market\_price 0.3433361 0.001314896  
## climate\_change 0.3979179 0.181395820  
## irrigation\_problem 0.3265400 0.238700382  
## high\_fertilizer\_cost 0.4633301 0.207337475  
## lack\_of\_govt\_support 0.2838945 0.256633737  
## labour\_cost 0.3947128 0.282470979  
## middleman\_exploitation 0.3722643 0.196796085  
## high\_production\_cost 0.5170595 0.162924340  
## inflation\_stress 1.0000000 0.247196303  
## lack\_of\_processing\_units 0.2471963 1.000000000  
## electricity\_issue 0.2290263 0.312857224  
## no\_minimum\_price 0.3528385 0.238100170  
## no\_farm\_loan 0.1426453 0.365738756  
## pest\_disease 0.3929062 0.236333726  
## disaster\_damage 0.4229370 0.251665390  
## no\_compensation 0.2494298 0.193230742  
## storage\_marketing\_issue 0.3478942 0.230933838  
## lack\_of\_family\_support 0.1651716 0.271394919  
## tech\_resistance 0.0781577 0.225459765  
## electricity\_issue no\_minimum\_price no\_farm\_loan  
## low\_market\_price 0.1602641 0.28372322 0.02510071  
## climate\_change 0.2680396 0.31740336 0.13772556  
## irrigation\_problem 0.2669968 0.26127522 0.20905343  
## high\_fertilizer\_cost 0.2394786 0.26380816 0.21887313  
## lack\_of\_govt\_support 0.2671927 0.14870841 0.25599750  
## labour\_cost 0.2619398 0.31169233 0.21139318  
## middleman\_exploitation 0.2027702 0.31086134 0.24969762  
## high\_production\_cost 0.3267357 0.35139694 0.18310393  
## inflation\_stress 0.2290263 0.35283853 0.14264533  
## lack\_of\_processing\_units 0.3128572 0.23810017 0.36573876  
## electricity\_issue 1.0000000 0.22864534 0.29437898  
## no\_minimum\_price 0.2286453 1.00000000 0.21707662  
## no\_farm\_loan 0.2943790 0.21707662 1.00000000  
## pest\_disease 0.2527820 0.35940451 0.22942429  
## disaster\_damage 0.2967166 0.35000635 0.28087480  
## no\_compensation 0.1824948 0.12883798 0.24229127  
## storage\_marketing\_issue 0.1975579 0.28235103 0.18476250  
## lack\_of\_family\_support 0.2858102 0.17342614 0.16913982  
## tech\_resistance 0.1910615 -0.09110104 0.22868515  
## pest\_disease disaster\_damage no\_compensation  
## low\_market\_price 0.2768093 0.1983533 0.1897721  
## climate\_change 0.5360141 0.4694096 0.2527798  
## irrigation\_problem 0.3949860 0.3591699 0.1615452  
## high\_fertilizer\_cost 0.4125133 0.4535745 0.1990779  
## lack\_of\_govt\_support 0.1873326 0.3915848 0.2562057  
## labour\_cost 0.4685139 0.3602640 0.2379399  
## middleman\_exploitation 0.2940281 0.3258524 0.1619370  
## high\_production\_cost 0.4663010 0.4059608 0.2506306  
## inflation\_stress 0.3929062 0.4229370 0.2494298  
## lack\_of\_processing\_units 0.2363337 0.2516654 0.1932307  
## electricity\_issue 0.2527820 0.2967166 0.1824948  
## no\_minimum\_price 0.3594045 0.3500064 0.1288380  
## no\_farm\_loan 0.2294243 0.2808748 0.2422913  
## pest\_disease 1.0000000 0.5646761 0.2427082  
## disaster\_damage 0.5646761 1.0000000 0.2167546  
## no\_compensation 0.2427082 0.2167546 1.0000000  
## storage\_marketing\_issue 0.3712428 0.3032411 0.2787398  
## lack\_of\_family\_support 0.1928435 0.2358106 0.1650677  
## tech\_resistance 0.1817812 0.1000971 0.1263118  
## storage\_marketing\_issue lack\_of\_family\_support  
## low\_market\_price 0.2753816 0.1319964  
## climate\_change 0.3469322 0.1316963  
## irrigation\_problem 0.3679787 0.1281728  
## high\_fertilizer\_cost 0.3002117 0.1639250  
## lack\_of\_govt\_support 0.1057712 0.2801076  
## labour\_cost 0.3304090 0.2444381  
## middleman\_exploitation 0.2056380 0.1553359  
## high\_production\_cost 0.3561005 0.2368856  
## inflation\_stress 0.3478942 0.1651716  
## lack\_of\_processing\_units 0.2309338 0.2713949  
## electricity\_issue 0.1975579 0.2858102  
## no\_minimum\_price 0.2823510 0.1734261  
## no\_farm\_loan 0.1847625 0.1691398  
## pest\_disease 0.3712428 0.1928435  
## disaster\_damage 0.3032411 0.2358106  
## no\_compensation 0.2787398 0.1650677  
## storage\_marketing\_issue 1.0000000 0.2459347  
## lack\_of\_family\_support 0.2459347 1.0000000  
## tech\_resistance 0.2206492 0.2078735  
## tech\_resistance  
## low\_market\_price 0.05684305  
## climate\_change 0.12472752  
## irrigation\_problem 0.15920678  
## high\_fertilizer\_cost 0.06041590  
## lack\_of\_govt\_support 0.14234179  
## labour\_cost 0.10318165  
## middleman\_exploitation 0.14913015  
## high\_production\_cost 0.08334036  
## inflation\_stress 0.07815770  
## lack\_of\_processing\_units 0.22545977  
## electricity\_issue 0.19106150  
## no\_minimum\_price -0.09110104  
## no\_farm\_loan 0.22868515  
## pest\_disease 0.18178118  
## disaster\_damage 0.10009705  
## no\_compensation 0.12631179  
## storage\_marketing\_issue 0.22064917  
## lack\_of\_family\_support 0.20787351  
## tech\_resistance 1.00000000

# Check for factorability using Bartlett’s test

bartlett.test(fa\_data)

##   
## Bartlett test of homogeneity of variances  
##   
## data: fa\_data  
## Bartlett's K-squared = 154.62, df = 18, p-value < 2.2e-16

#conclusion Bartlett’s test of sphericity was performed to evaluate whether the correlation matrix significantly differs from an identity matrix, indicating the appropriateness of the data for factor analysis. The test produced a chi-square statistic of 154.62 with 18 degrees of freedom and a p-value < 2.2e-16.

Given the highly significant p-value (p < 0.05), we reject the null hypothesis, which assumes that the variables are uncorrelated. This result confirms that the dataset exhibits sufficient intercorrelations to proceed with factor analysis. Consequently, the data is deemed suitable for dimensionality reduction and latent factor extraction. # Check Kaiser-Meyer-Olkin (KMO) test (sampling adequacy)

kmo\_result <- KMO(fa\_data)  
print(kmo\_result)

## Kaiser-Meyer-Olkin factor adequacy  
## Call: KMO(r = fa\_data)  
## Overall MSA = 0.89  
## MSA for each item =   
## low\_market\_price climate\_change irrigation\_problem   
## 0.85 0.92 0.93   
## high\_fertilizer\_cost lack\_of\_govt\_support labour\_cost   
## 0.92 0.80 0.90   
## middleman\_exploitation high\_production\_cost inflation\_stress   
## 0.89 0.92 0.91   
## lack\_of\_processing\_units electricity\_issue no\_minimum\_price   
## 0.86 0.92 0.88   
## no\_farm\_loan pest\_disease disaster\_damage   
## 0.84 0.88 0.89   
## no\_compensation storage\_marketing\_issue lack\_of\_family\_support   
## 0.91 0.90 0.86   
## tech\_resistance   
## 0.66

##conclusion The KMO test was conducted to assess the suitability of the dataset for factor analysis. The overall MSA (Measure of Sampling Adequacy) value is 0.89, which is considered meritorious (close to the ideal value of 1). This indicates that the dataset is highly suitable for factor analysis.

MSA Interpretation for Individual Variables:

Most variables have MSA values above 0.80, indicating good to excellent adequacy. The variable tech\_resistance has an MSA value of 0.66, which is considered mediocre. Although acceptable, it may warrant closer inspection during the factor analysis process.

# Run Factor Analysis with suggested number of factors (2)  
fa\_result <- fa(fa\_data, nfactors = 2, rotate = "varimax", fm = "pa", scores = "regression")  
  
# Print factor loadings  
print(fa\_result$loadings, cutoff = 0.3)

##   
## Loadings:  
## PA1 PA2   
## low\_market\_price 0.459   
## climate\_change 0.710   
## irrigation\_problem 0.505   
## high\_fertilizer\_cost 0.597   
## lack\_of\_govt\_support 0.415  
## labour\_cost 0.524 0.331  
## middleman\_exploitation 0.452   
## high\_production\_cost 0.680   
## inflation\_stress 0.638   
## lack\_of\_processing\_units 0.597  
## electricity\_issue 0.458  
## no\_minimum\_price 0.481   
## no\_farm\_loan 0.555  
## pest\_disease 0.644   
## disaster\_damage 0.577 0.330  
## no\_compensation   
## storage\_marketing\_issue 0.454   
## lack\_of\_family\_support 0.422  
## tech\_resistance 0.389  
##   
## PA1 PA2  
## SS loadings 4.145 2.091  
## Proportion Var 0.218 0.110  
## Cumulative Var 0.218 0.328

# Check communalities (should be <1 and reasonable)  
print(fa\_result$communalities)

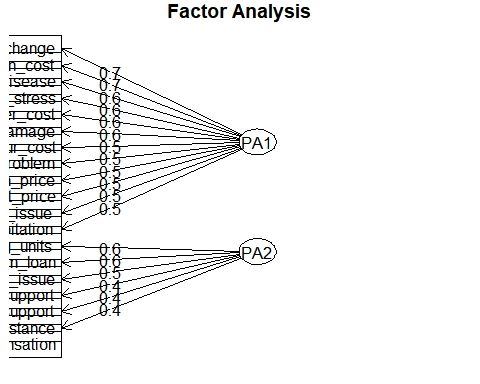
## [1] 6.236146

###conclusion Factor analysis was conducted using the Principal Axis (PA) method with Varimax rotation, identifying two key factors that explain the underlying structure of the dataset. The first factor (PA1) had strong loadings on variables such as climate\_change, high\_production\_cost, inflation\_stress, and pest\_disease, suggesting that this factor represents Production and Environmental Stress. The second factor (PA2) had strong loadings on variables like lack\_of\_processing\_units, no\_farm\_loan, lack\_of\_govt\_support, and electricity\_issue, indicating that this factor may represent Infrastructure and Financial Support.

Together, these two factors accounted for 32.8% of the total variance in the dataset, with PA1 contributing 21.8% and PA2 contributing 11.0%. While this cumulative variance is moderate, it provides meaningful insights into the primary influences within the data.

# Visualize Factor Loadings

fa.diagram(fa\_result)



# Compute Factor Scores

factor\_scores <- fa\_result$scores  
head(factor\_scores)

## PA1 PA2  
## 1 1.0722644 0.3761844  
## 2 1.3493600 -0.8213989  
## 3 1.1176344 -0.3229084  
## 4 0.9847038 0.6131313  
## 5 0.8594202 0.5288725  
## 6 0.1497597 -0.2832773

##conclusion The computed factor scores reveal how observations align with the identified factors. Higher PA1 scores indicate stronger associations with Production and Environmental Stress, while higher PA2 scores reflect greater exposure to Infrastructure and Financial Support challenges. For instance, the first observation shows notable stress in both dimensions, whereas the second observation has fewer infrastructure-related issues, as indicated by its negative PA2 score.