



“KTHM COLLEGE, NASHIK”

A PROJECT REPORT ON

“STATISTICAL ANALYSIS OF FARMING ACTIVITIES OF SMALL-SCALE FARMERS”

SUBMITTED TO



SAVITRIBAI PHULE PUNE UNIVERSITY

IN PARTIAL FULLFILLMENT OF T.Y.bsc

BY

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UNDER THE GUIDANCE OF: -

- ❖ **MRS. PRATIMA SONAWANE**
- ❖ **MRS. NUTAN KHANGAR**

Academic Year: 2019-20

Certificate

This is to certify that, ABHISHEK KHAIRNAR, PAVAN LANDGE, SAMADHAN DHIKALE, SANKET KADAM, SHARAD DESHMUKH, AVDHESH BUVA, the students of T.Y.Bsc(STATISTICS), of KTHM college, Nashik have submitted the project report entitled “STATISTICAL ANALYSIS OF FARMING ACTIVITIES OF SMALL SCALE FARMERS”, in Academic year 2019-20 for the partial fulfilment of degree of graduation of University of Pune.

Project Guide

Head of Department

Dr.A.S.Padhey

ACKNOWLEDGEMENT

Firstly, we express our sincere gratitude to the FARMERS of our country for so restless efforts of fulfilment of each and every stomach. We thank to every farmer we met for collection our necessary information for Project. By their support we feel indeed happy in presenting our project report on “STATISTICAL ANALYSIS OF FARMING ACTIVITIES OF SMALL-SCALE FARMERS”.

We would like to thank our project guide MRS. PRATIMA SONAWANE. We are very thankful to her for encouragement and guidance for Project. It was our privilege to work under her Guidance.

We are thankful to our teachers of statistics department. Also, we express our gratitude to KTHM College for making us available the Computer lab and other equipment.

We are most thankful to Head of Department Dr A. S. Padhey mam.

Date:

Place: Nashik

Declaration by Students

We declare that the project entitled “Statistical analysis of farming activities of small-scale farmer” submitted by us for the partial fulfilment of our bachelor degree of science in statistics during 2019-20. We further declare that the analysis has been carried out based on the information given by farmers.

- Abhishek Khairnar
- Pavan Landge
- Samadhan Dhikale
- Sharad Deshmukh
- Sanket Kadam
- Avdhesh Buva

Date:

Place: KTHM College, Nashik

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INTRODUCTION

India is agricultural country. Agriculture, with its allied sectors, is the largest source of livelihoods in **India**. 70 percent of its rural households still depend primarily on agriculture for their livelihood, with 82 **percent** of **farmers** being small and marginal. **India's agriculture** is composed of many crops, with the foremost food staples being rice and wheat. **Indian farmers** also grow pulses, potatoes, sugarcane, oilseeds, and such non-food items as cotton, tea, coffee, rubber, and jute (a glossy fiber used to make burlap and twine). **India** is a fisheries giant as well.

For the sake of study of the farming activities of farmers we selected the region Nashik (Maharashtra). In the Nashik District mostly, the land is irrigated and Farmers are mainly interested to take crops like Grapes, tomatoes, onions etc. Most of the farmers in some region of the district are performing traditional farming.

The brief survey of the farming lands in Nashik District is given below-

Sr.no	Particulars	Numbers
1	Geographical area	15548 square kilometers
2	Total Taluks	15
3	Totals villages	1960
4	Total population	61,09,052
5	Number of account holders	6,42,662
6	Small Land holders	3,50,956 (54%)
7	Marginal Land holders	2,88,496 (44%)
8	Others	3,210(0.2%)
9	Kharif village	1577
10	Rabi village	383

For the detail information and to provide the proper services to the farmers data study and analysis is needed. Our small effort in the analysis of the sample collected of farmers leads to the important conclusions. Which should be made aware to farmers of the district and also the government which is able to provide proper attention but due to some reasons is not able to reach farmers.

The state government has increased the organic farming area in Nashik division from 800 hectares to 1,200 hectares to promote the form of agriculture and discourage use of chemical fertilizers.

To study the actual implementation of this on the field is our small effort.

There have been various government schemes for the welfare of farmers, but they are unaware of these schemes. This is the reason farmers are unable to take benefits of this. Considering this fact, a fortnight programme has been organized by the state agricultural department in Nashik division, said an official from agricultural department. To check the benefit of this on the actual field we discussed with farmers.

Abstract of the project

Collected data is of the attribute type and statistical analysis of the data is carried out by using following statistical techniques:

- **Pie chart and bar diagram for Attributes**
- **Chi-square test For independence of Attributes**
- **Multiple correspondence analysis**
- **Odds ratio**

OBJECTIVES

Questionnaire for data collection

1) Region

Ans--_____

2) Gender

Ans--_____

3) Age

Ans--_____

4) Education

- a) Illiterate
- b) Primary school
- c) Secondary school/10th
- d) Higher secondary/12th
- e) Graduation

5) Number of members in family:

- a) 1- 4
- b) 5- 8
- c) 9- 12
- d) More than 12

6) How many acres of land do you own?

- a) 0 – 3
- b) 3 – 6
- c) 6 – 9
- d) 9 – 12
- e) More than 12

7) Which Type of land you own?

- a) Irrigated land
- b) Non irrigated land

8) Which common problems do you face while farming?

- a) Lack of Irrigation
- b) Lack of labours
- c) Electricity shortage
- d) Not getting approval of loan on time
- e) Lack of technology
- f) Lack of advanced farming equipment

9) Which Side-Businesses helps you while performing farming occupation?

- | | | |
|------------------------|-------------------|------------------|
| a) None Cattle farming | b) Cattle farming | c) Dairy farming |
| b) d) poultry farming | e) Goat farming | g) job |
| | | f) other |

10) How the crop insurance does helps on the failure of crop?

- a) Does not takes crop insurance
- b) To return the loan
- c) Cultivation of new crop
- d) No. it does not help

11) How much investment do you do per acre on cultivation of crop? (in rupees)

- a) Less than 50,000
- b) 50,000 – 1,00,000
- c) 1,00,000 – 1,50,000
- d) 1,50,000 – 2,00,000
- e) More than 2,00,000

12) How much quantity of fertilizer do you use per acre?

- a) 0 – 200 kg
- b) 200 – 400 kg
- c) 400 – 600 kg
- d) More than 600 kg

13) How much litres per acre of pesticides do you use?

- a) 0 – 5 litres
- b) 5 – 10 litres
- c) 10 – 15 litres
- d) More than 15 litres

14) How do you buy medicines for farming?

- a) In cash
- b) Borrow

15) How much is your annual income per acre? (in rupees)

- a) Less than 50,000
- b) 50,000 – 1,50,000
- c) 1,50,000 – 3,00,000
- d) 3,00,000 – 4,50,000
- e) More than 4,50,000

16) How much loan have you taken per acre?

- a) Less than 50,000
- b) 50,000 – 1,50,000
- c) 1,50,000 – 3,00,000
- d) 3,00,000 – 4,50,000
- e) More than 4,50,000

17) Which crop have you taken loan for?

- a) Grapes, pomegranate, onions.
- b) Cereals, grain crops
- c) Sugarcane, soya Bean, corn, cotton
- d) Tomato, capsicum, leafy vegetables
- e) Other

18) Do you return your loan on time?

- a) No
- b) Yes

19) What is your priority for taking loan?

- a) Society
- b) Nationalize banks
- c) Government banks- co-operative banks
- d) Landlords

20) Why?

- a) Low interests
- b) Less time consuming for giving loan
- c) Easy Documentation

21) What do you think of farmer is not capable of refunding loan?

- a) Fluctuations in the market rate
- b) Lack of agriculture market information
- c) Change in climate/natural disasters
- d) More interest rate on loan
- e) Hopes from government

22) How does loan effects on your livelihood?

- a) Effect on education of children
- b) Effect on health(physical-mental)
- c) Financial stress

23) Do you get information on time about Government-Grant, schemes?

- a) No
- b) Yes

24) Which things have you taken Government grant for?

- a) Have not taken Government-Grant
- b) Pond (shet tale), Drip-irrigation
- c) Poly-house
- d) For side-business
- e) Buying agriculture equipment

25) Do you think that government should work on Debt Waiver or should give proper attention on market rate of crops?

- a) Debt waiver
- b) market rate
- c) No opinion

THEORY

- **Graphical Representations:**

Graphical Representation is a visual display of data and statistical results. It is often more effective than presenting the data in tabular form. There are many different types of graphical representations which is used depending upon the nature of data and type of the statistical results. It is very effective way to serve the purpose of comparison at a glance and revealing the patterns in the data. Graphs and diagrams are easy to understand and create an effect. Graphs and charts are often used to easy understanding of large quantities of data and relationships between parts of the data. Graphs can usually read more quickly than the raw data that they are produced from. They are used in wide variety of fields and can be created by hands often on graphs papers or by computer using a chart application. Therefore, Graphs and Charts believed to be powerful tools to convey information.

- **Bar Diagram:**

Bar graph is used frequently in practice for the comparative study of two or more items or values of single variable or a single classification or category of data. Bar diagrams are one of the easiest and the most commonly used devices of presenting most of the business and economic data. These are especially satisfactory for categorical data or series.

- **Pie Chart:**

It is a special type of diagram used to represent the whole quantity by a circle and the Subdivision of the whole quantity is shown by the sectors of that circle. This diagram is a two dimensional diagram.

CHI-SQUARE (χ^2) TEST FOR INDEPENDENCE OF ATTRIBUTE:

Suppose that the given data are classified into r levels of attribute A denoted A_1, \dots, A_r and s Levels of attribute B represented by B_1, \dots, B_s .

Then different class frequencies can be represented in the following tabular form:

A \ B	B1	B2	....	Bj	....	Bs	Total
A1	O11	O12	....	O1j	....	O1s	(A1)
A2	O21	O22	....	O2j	....	O2s	(A2)
....
Ai	Oi1	Oi2	....	Oij	....	Ois	(Ai)
....
Ar	Or1	Or2	....	Orj	....	Ors	(Ar)
Total	(B1)	(B2)	...	(Bj)	....	(Bs)	N

This table is as (r x s) contingency table.

$N = \sum \sum O_{ij}$ = Total observed frequency

$(A_i) = \sum O_{ij}$ = Total of observed frequencies in i^{th} row; $i=1,2,\dots,r$

$(B_j) = \sum O_{ij}$ = Total of observed frequencies in j^{th} column; $j=1,2,\dots,s$

Here, Hypothesis under consideration is,

H_0 : Two attributes A and B are independent.

v/s

H_1 : Two attributes A and B are not independent.

$e_{ij} = \frac{(A_i)(B_j)}{N}$; $i=1,2,\dots,r$; $j=1,2,\dots,s$.

The test statistic under H_0 is,

$$\chi^2 = \sum \sum \frac{(O_{ij} - e_{ij})^2}{e_{ij}} = \sum \sum \frac{O_{ij}^2}{e_{ij}} - N$$

Criteria: We reject H_0 at $\alpha\%$ l.o.s. if χ^2

$r-s-1 \geq \chi^2$

$(r-s-1); \alpha$, Otherwise accept it.

Note: for this project we are using R software to conduct chi-square test of independence of attributes hence decision rule is as follows,

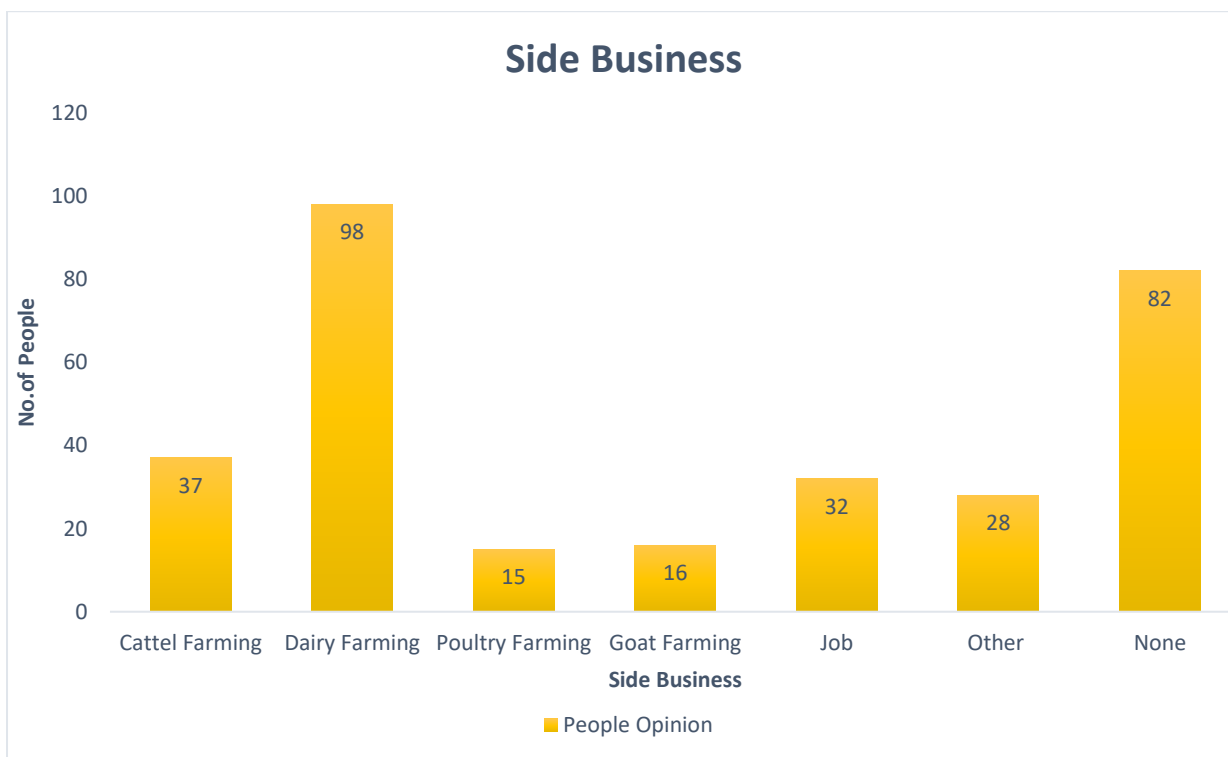
If p-value of test is less than given level of significance we reject null hypothesis at a given level of significance.

GRAPHICAL REPRESENTATION OF DATA

BAR-PLOT

SIDE BUSINESS

Side Business	People Opinion
Cattle Farming	37
Dairy Farming	98
Poultry Farming	15
Goat Farming	16
Job	32
Other	28
None	82

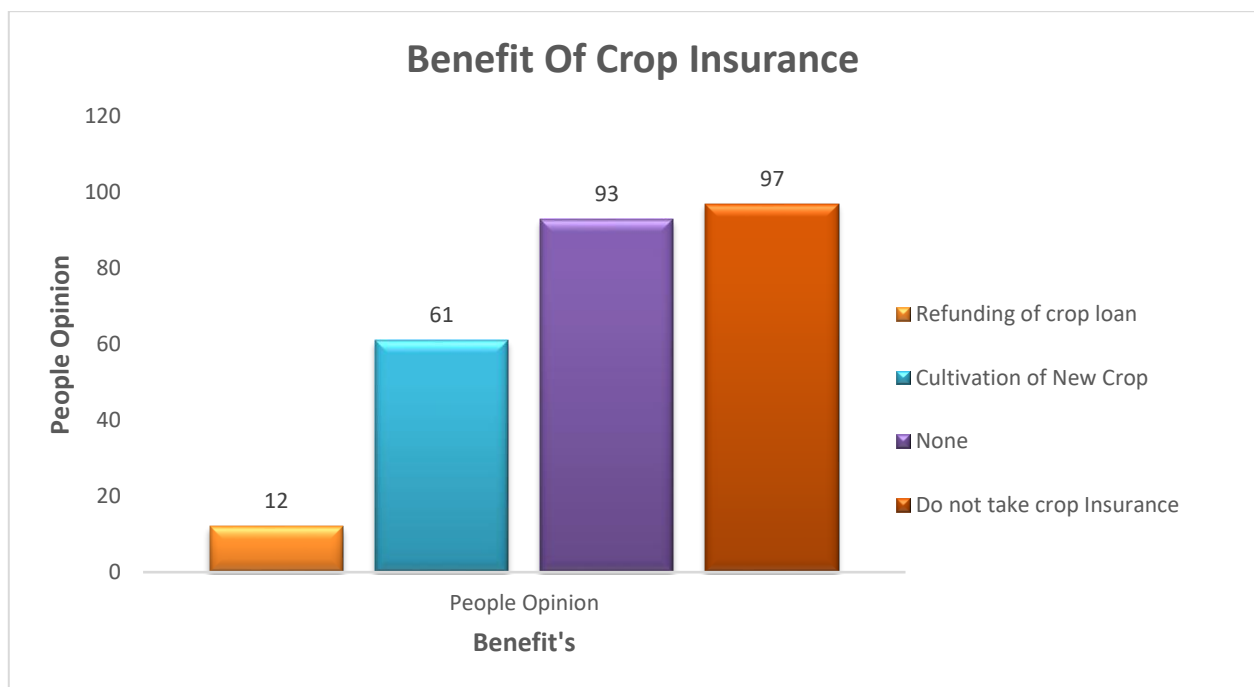


CONCLUSION:

- From the above bar-plot we may observe that from our 250 farmers sample most of the farmers are do **DAIRY FARMING** as a side business and 82 farmers does not do any of the side business

BENEFIT OF CROPS

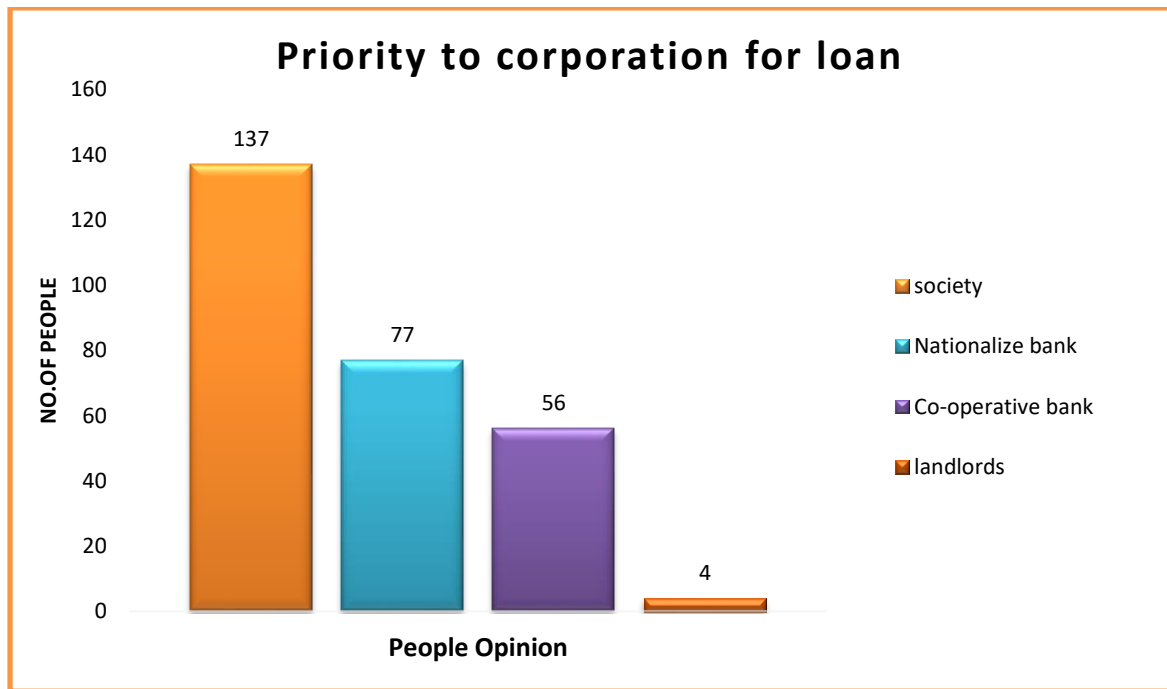
Benefit Of Crop Insurance	People Opinion
Refunding of crop loan	12
Cultivation of New Crop	61
None	93
Do not take crop Insurance	97



- **CONCLUSION:** From the above bar-plot we may observe that from our 250 farmers sample most of the farmers are do not take CROP INSURANCE and they do not have any benefit of CROP INSURANCE.
-

PRIORITY TO CORPORTATION FOR LOAN

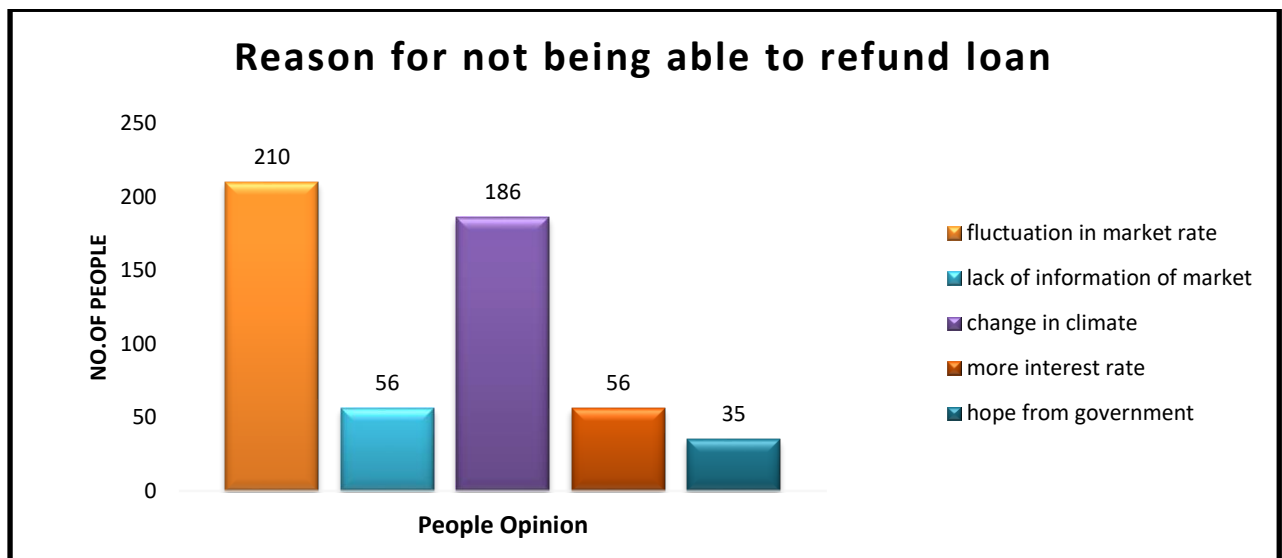
Priority to corporation for loan	People Opinion
Society	137
Nationalize bank	77
Co-operative bank	56
Landlords	4



- **CONCLUSION:** From the above bar-plot we may observe that from our 250 farmers sample most of the farmers are take CROP LOAN from SOCIETY.

REASON FOR NOT BEING ABLE TO REFUND LOAN

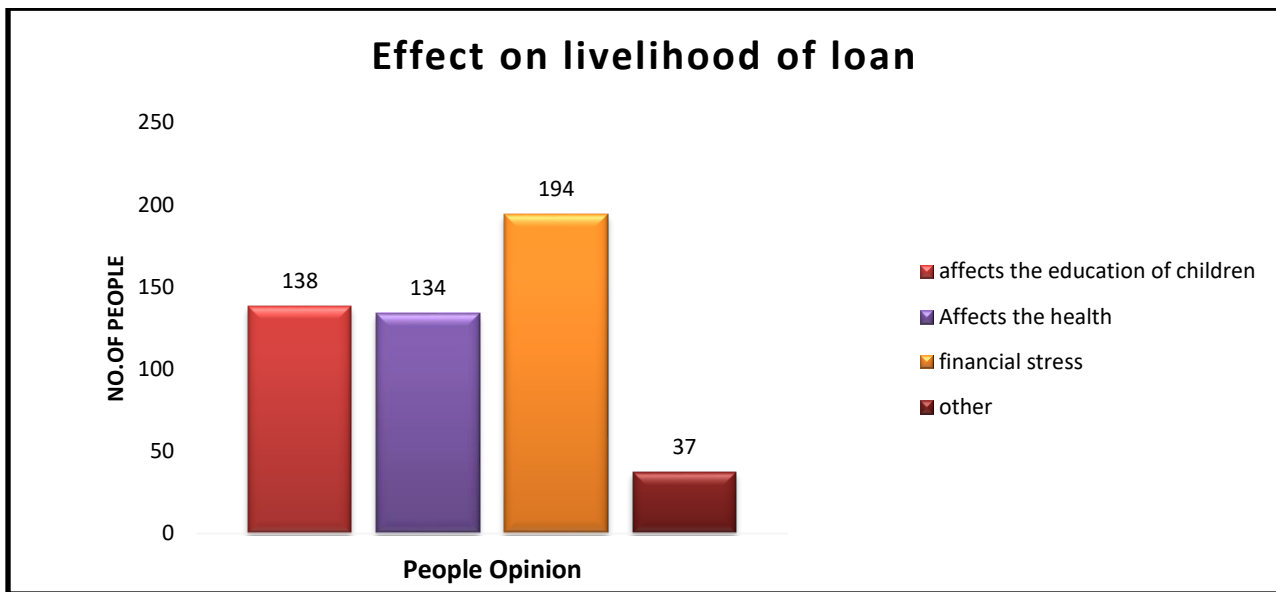
Reason for not being able to refund loan	People Opinion
fluctuation in market rate	210
lack of information of market	56
change in climate	186
more interest rate	56
hope from government	35



- **CONCLUSION:** From the above bar-plot we may observe that from our 250 farmers sample most of the farmers say that the they do not **REFUND LOAN** because fluctuation in market rate and change in climate, and very few of the farmers are hope from government for refunding a loan.

EFFECT ON LIVILIHOD OF LOAN

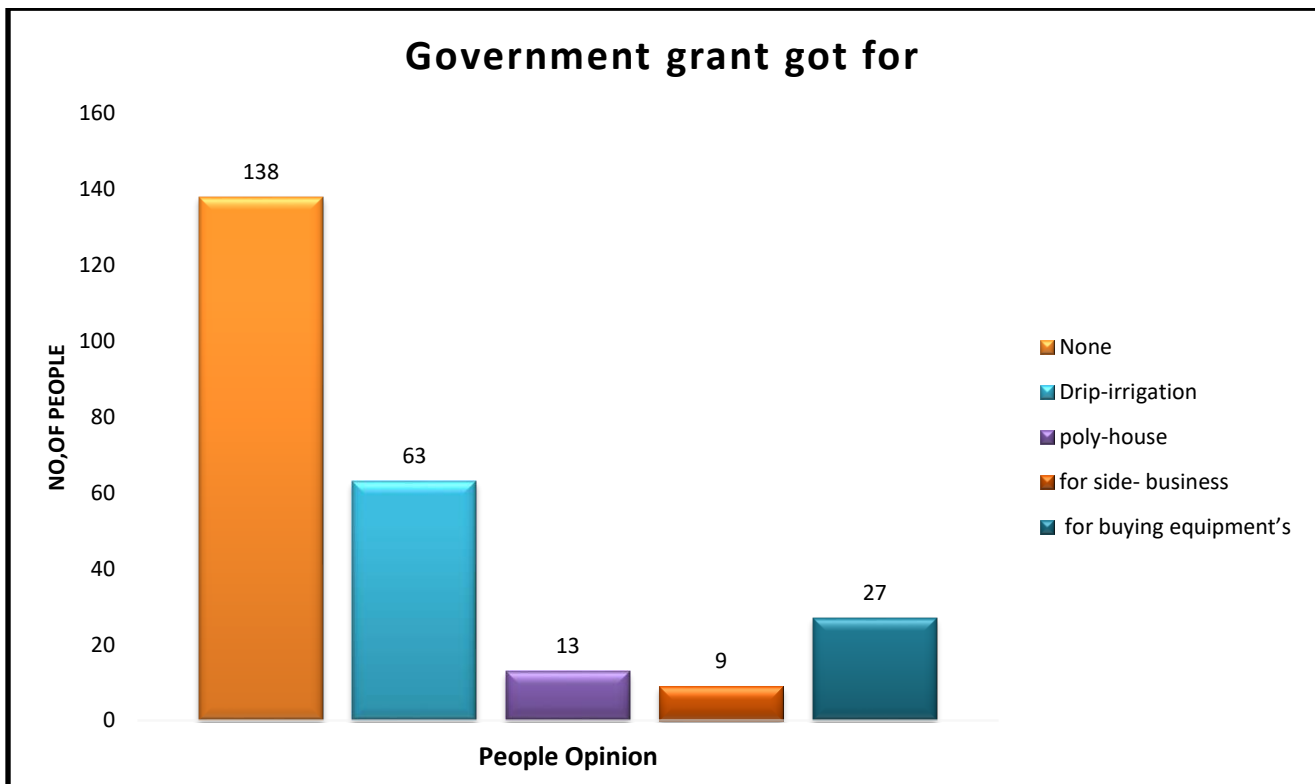
Effect on livelihood of loan	People Opinion
affects the education of children	138
Affects the health	134
financial stress	194
Other	37



-
- **CONCLUSION:** From the above bar-plot we may observe that from our 250 farmer's sample most of the farmers say that the Effect of Loan on Livelihood is they have a financial tress, and it affects the education of their children's.
-

GOVERNMENT GRANT GOT FOR

Government grant got for	People Opinion
None	138
Drip-irrigation	63
poly-house	13
for side- business	9
for buying equipment's	27



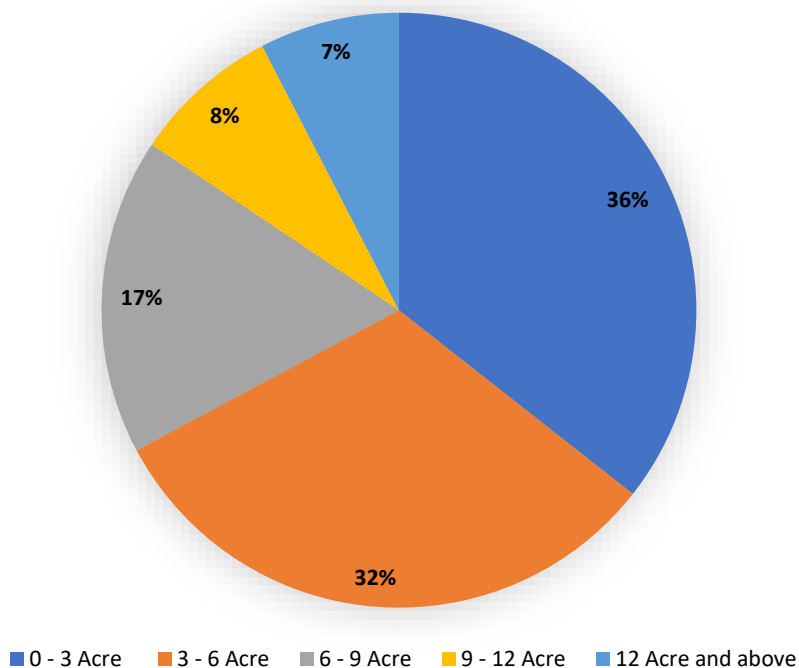
-
- **CONCLUSION:** From the above bar-plot we may observe that from our 250 farmer's sample most of the farmers say that they do not Got Govement grant.
-

Pie-chart

FARMLAND IN ACRE

Farmland in acre	frequency
0 - 3 Acre	89
3 - 6 Acre	79
6 - 9 Acre	43
9 - 12 Acre	20
12 Acre and above	19

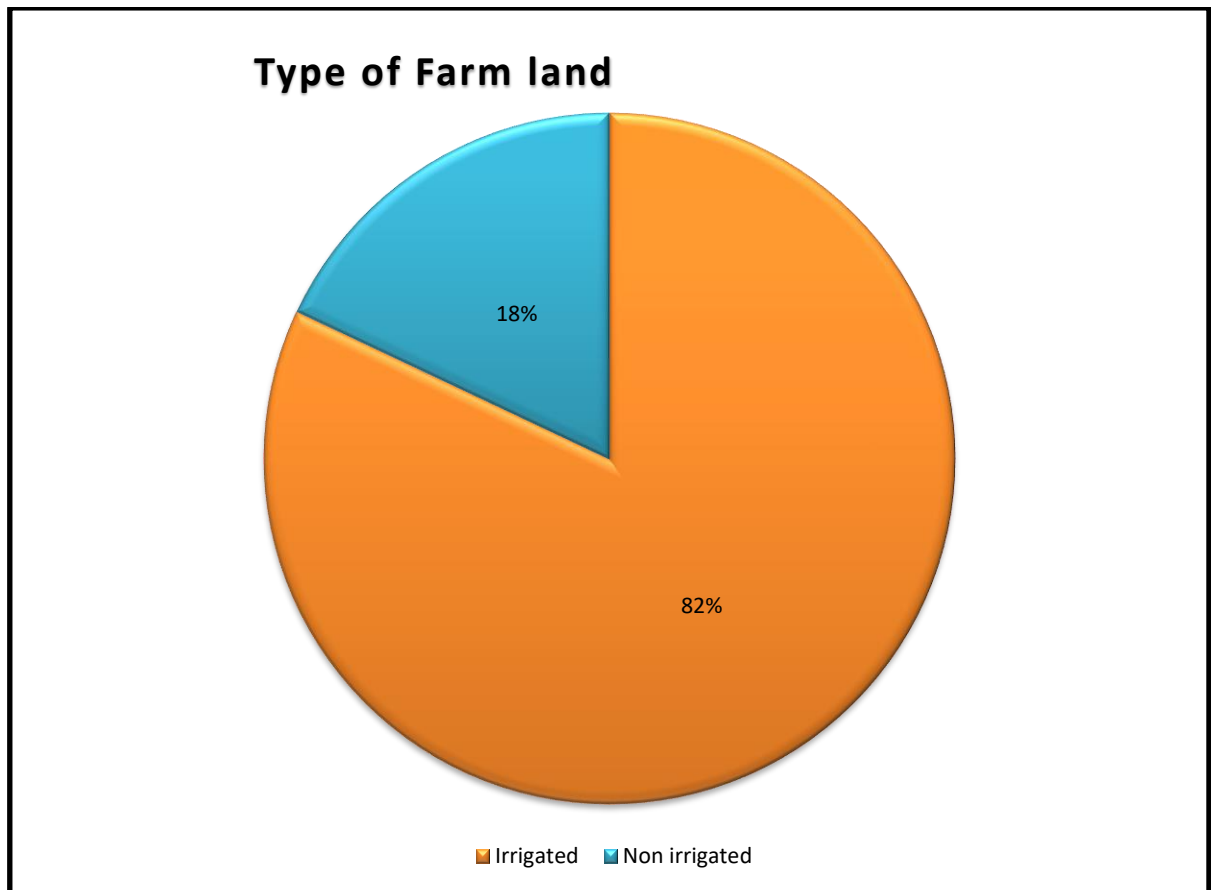
Farmland in acre



CONCLUSION: From the above pie chart we observe that 36% of the farmers having farmland between 0 – 3 Acre, 32% of the farmers having farmland 3 – 6 Acre, 17% of the farmers having farmland between 6 – 9 Acre, 8% of the farmers having farmland between 9 – 12 Acre, and remaining 7% of the farmers having farmland more than 12 Acre.

TYPE OF FARM LAND

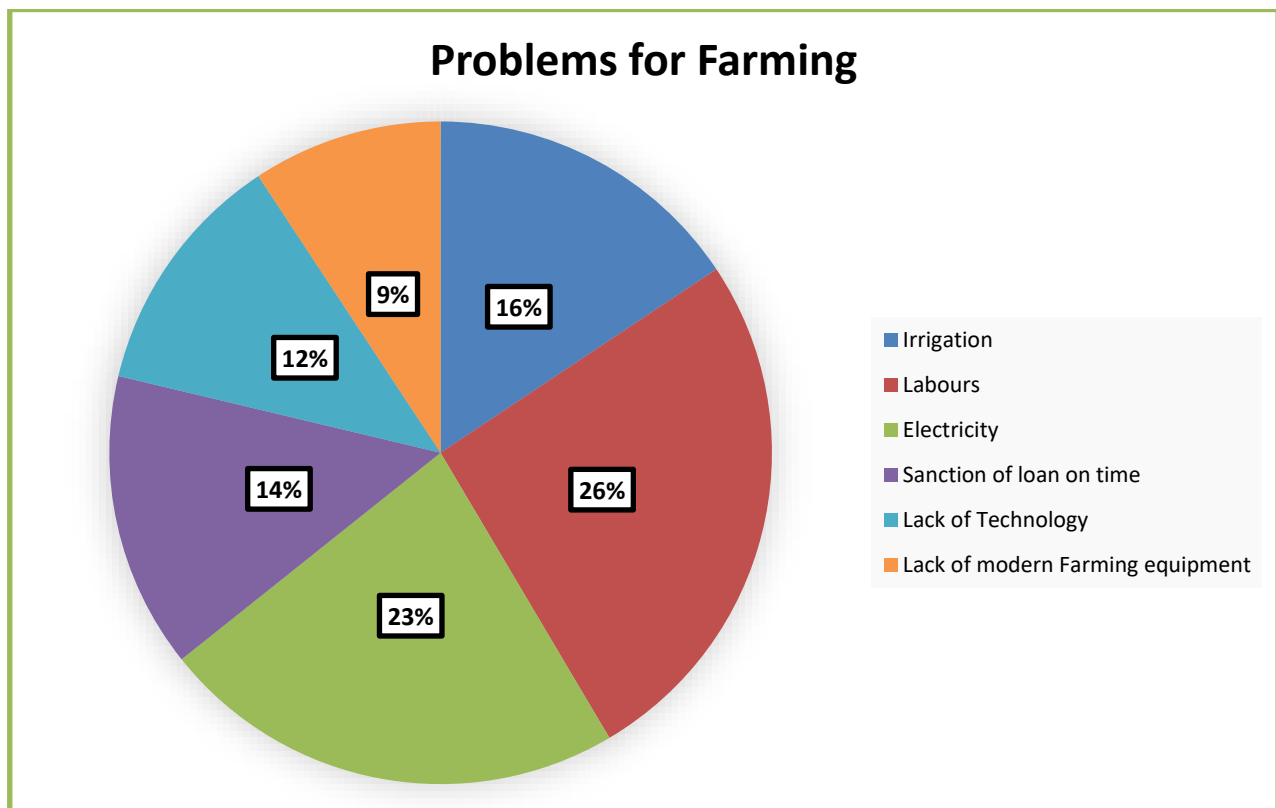
Type of Farm land	People Opinion
Irrigated	205
Non irrigated	45



-
- **CONCLUSION:** From the above pie chart we observe that 82% of the farmers having **IRRIGATED** farmland and 18% of the farmers having **NON IRRIGATED** farmland.
-

PROBLEM FOR FARMING

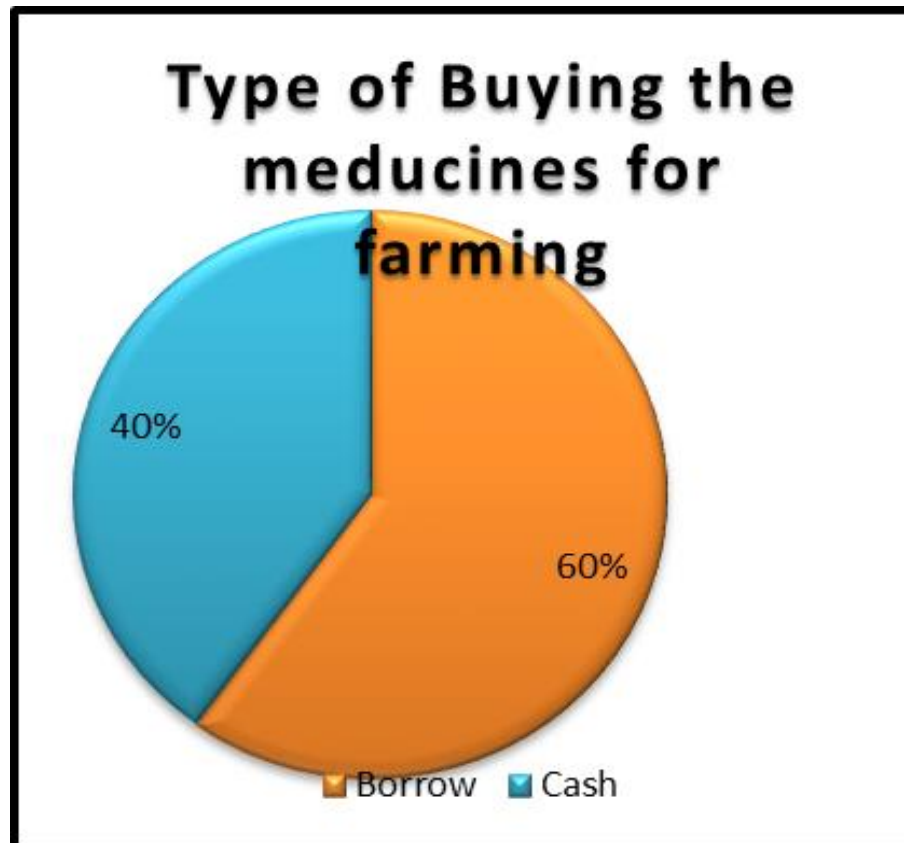
Problems for Farming	People Opinion
Irrigation	103
Labors	170
Electricity	150
Sanction of loan on time	95
Lack of Technology	79
Lack of modern Farming equipment	61



- **CONCLUSION:** From the above pie chart we observe that 26% of the farmers having LABOUR problem, 23% of the farmers having ELECTRICITY problem, 16% of the farmers having IRRIGATION problem, 14% of the farmers having SANCTION OF LOAN ON TIME, and remaining 12% & 9% of the farmers having LACK OF TECHNOLOGY and LACK OF MODERN EQUIPMENT problems.

TYPES OF BUYING THE MEDICINE'S FOR FARMING

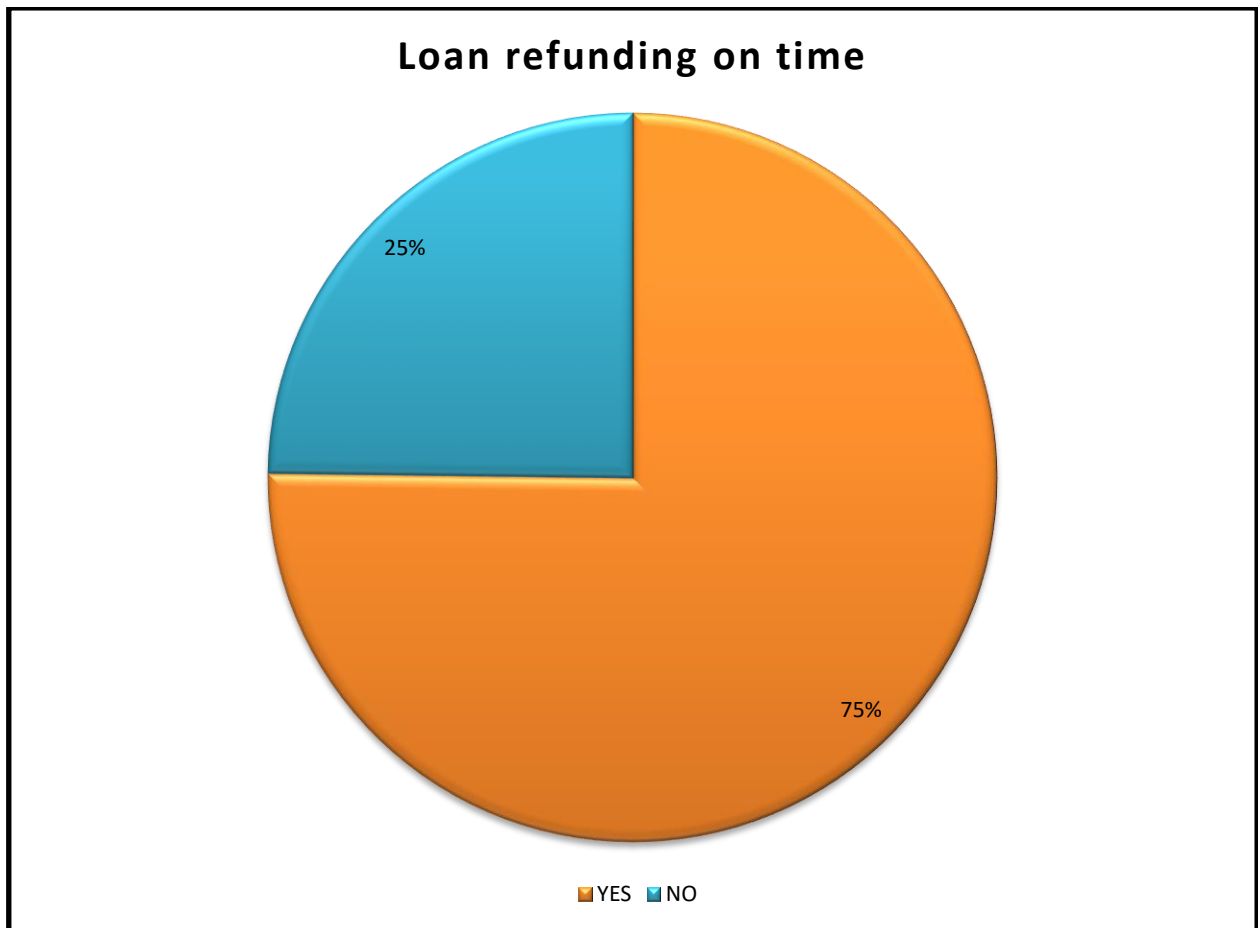
Type of Buying the medicine's for farming	People Opinion
Borrow	150
Cash	100



-
- **CONCLUSION:** From the above pie chart we observe that 60% of the farmers buy medicines for farming in BORROW and 40% of the farmers buy in CASH.
-

LOAN REFUNDING ON TIME

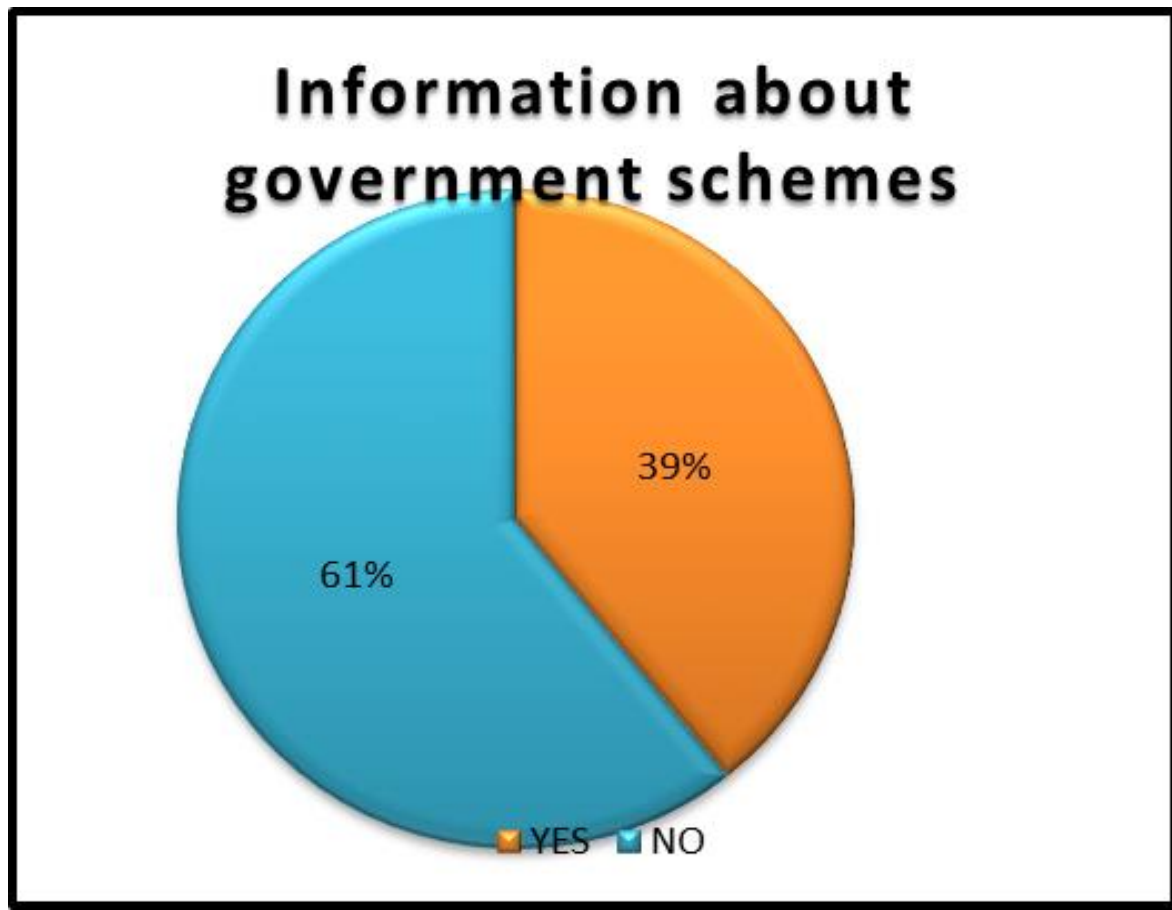
Loan refunding on time	People Opinion
YES	188
NO	62



-
- **CONCLUSION:** From the above pie chart we observe that 75% of the farmers are refund the on time and 25% of the farmers do not refund the loan on time.
-

INFORMATION ABOUT GOVERNMENT SCHEMES

Information about government schemes	People Opinion
YES	98
NO	152

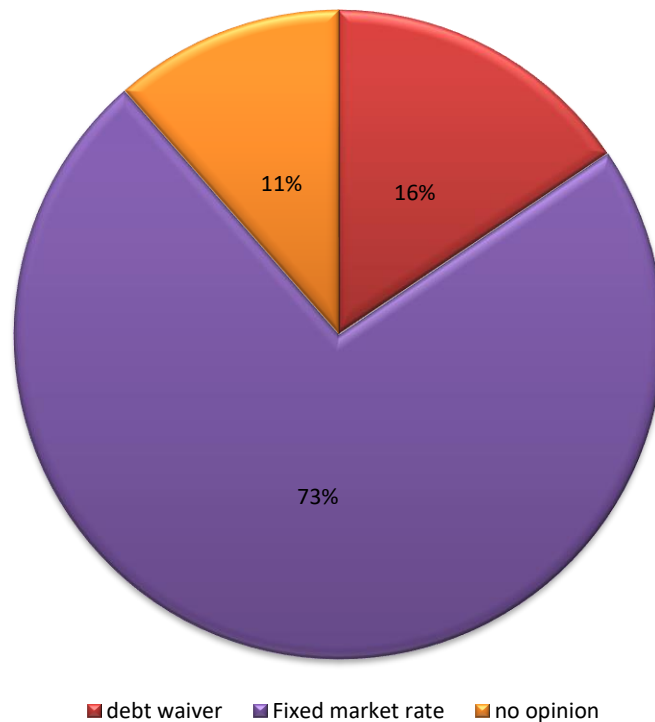


- **CONCLUSION:** From the above pie chart we observe that 61% of the farmers are does not Got Information about Government Schemes on the time, and 39% of the farmers Got Information about Government Scheme on the Time.

OPINION ABOUT DEBT WAIVER

Opinion about Debt waiver	People Opinion
debt waiver	38
Fixed market rate	178
no opinion	28

Opinion about Debt waiver



-
- **CONCLUSION:** From the above pie chart we observe that 73% of the farmers Opinion is the Government must give the Fix Market Rate to the all Crops, and 16% of the farmers Opinion is the Government give the Debt Waiver, 11% of the Farmers does not give their Opinion.
-

Chi-square tests for testing of independence of attributes

1) Region and Type of farm land in Nashik district

H_0 : The factors Region and Type of farm land in Nashik district are independent.

V/S

H_1 : The factors Region and Type of farm land in Nashik district are dependent.

Observed Frequency:

	A	B	All
East	40	11	51
North	19	2	21
South	72	18	90
West	74	14	88
All	205	45	250

R- commands:

```
> d=edit(as.data.frame(NULL))
```

```
> m=as.matrix(d)
```

```
> chisq.test(m,correct=T)
```

Pearson's Chi-squared test

data: m

X-squared = 1.9668, df = 3, p-value = 0.5793

Decision rule: If P-value < 0.05 then reject H_0 .

Here P-value=0.5793>0.05

Therefore we may accept H_0 at 5% level of significance.

Conclusion:

- We may conclude that the Regions and Type of farm land in Nashik district are independent

2) Region and income of the farmers IN Nashik District

H_0 : The factors Region and income of the farmers are independent.

V/S

H_1 : The factors Region and income of the farmers are dependent.

Observed Frequency:

	A	B	C	D	E	All
East	14	30	4	1	2	51
North	5	11	4	0	1	21
South	20	32	23	11	4	90
West	17	30	23	12	6	88
All	56	103	54	24	13	250

R- commands:

```
> d=edit(as.data.frame(NULL))
```

```
> m=as.matrix(d)
```

```
> chisq.test(m,correct=T)
```

Pearson's Chi-squared test

data: m

X-squared = 21.218, df = 12, p-value = 0.04728

Decision rule: If P-value < 0.05 then reject H_0 .

Here P-value=0.04728<0.05

Therefore we may reject H_0 at 5% level of significance.

Conclusion:

- We may conclude that the Region and income of the farmers in Nashik District are dependent.

3) Type of farm land and income of farmers in Nashik District

H_0 : The factors type of farm land and income of farmers are independent.

V/S

H_1 : The factors type of farm land and income of farmers are dependent.

Observed Frequency:

	A	B	C	D	E	All
A	38	88	46	21	12	205
B	18	15	8	3	1	45
All	56	103	54	24	13	250

R- commands:

```
> d=edit(as.data.frame(NULL))
```

```
> m=as.matrix(d)
```

```
> chisq.test(m,correct=T)
```

Pearson's Chi-squared test

data: m

X-squared = 10.212, df = 4, p-value = 0.037

Decision rule: If P-value < 0.05 then reject H_0

Here P-value=0.037<0.05

Therefore we may reject H_0 at 5% level of significance.

Conclusion:

- We may conclude that the type of farm land and income of farmers in Nashik district are dependent.

4) Type of farm land and total Cost for farming in Nashik District

H_0 : The factors type of farm land and total Cost for farming are independent.

V/S

H_1 : The factors type of farm land and Total Cost for farming are dependent.

Observed Frequency:

	A	B	C	D	E	All
A	38	74	45	28	20	205
B	12	19	6	3	5	45
All	50	93	51	31	25	250

R-commands:

```
> d=edit(as.data.frame(NULL))
```

```
> m=as.matrix(d)
```

```
> chisq.test(m)
```

Pearson's Chi-squared test

data: m

X-squared = 4.4575, df = 4, p-value = 0.3476

Decision rule: If P-value < 0.05 then reject H_0

Here P-value=0.0348<0.05

Therefore we may reject H_0 at 5% level of significance.

Conclusion:

- We may conclude that the type of farm land and total expenditure for farming in Nashik District are dependent.

5) Way of buying fertilizers and total cost for farming in Nashik District

H_0 : The factors way of buying fertilizers and total cost for farming are independent.

V/S

H_1 : The factors way of buying fertilizers and total cost for farming are dependent.

Observed Frequency:

	A	B	C	D	E	All
A	24	39	23	8	6	100
B	26	54	28	23	19	150
All	50	93	51	31	25	250

R- commands:

```
> d=edit(as.data.frame(NULL))
```

```
> m=as.matrix(d)
```

```
> chisq.test(m,correct=T)
```

Pearson's Chi-squared test

data: m

X-squared = 7.2996, df = 4, p-value = 0.1209

Decision rule: If P-value < 0.05 then reject H_0 .

Here P-value=0.1209<0.05

Therefore we may reject H_0 at 5% level of significance.

Conclusion:

- We may conclude that the way of buying medicine and total cost for farming in Nashik District are dependent.

6) Income of the farmers and the behavior of refunding of the loan in Nashik District

H_0 : The factors income of the farmers and the behavior of refunding of the loan are independent.

V/S

H_1 : The factors income of the farmers and the behavior of refunding of the loan are dependent.

Observed Frequency:

	A	B	C	D	E	All
A	14	18	21	9	0	62
B	42	85	33	15	13	188
All	56	103	54	24	13	250

R- commands:

```
> d=edit(as.data.frame(NULL))
```

```
> m=as.matrix(d)
```

```
> chisq.test(m,correct=T)
```

Pearson's Chi-squared test

data: m

X-squared = 15.074, df = 4, p-value = 0.00455

Decision rule: If P-value < 0.05 then reject H_0 .

Here P-value=0.00455<0.05

Therefore we reject H_0 at 5% level of significance.

Conclusion:

- We may conclude that the income of the farmers and the behavior of refunding of the loan in Nashik District are dependent.

7) Region and the information about government schemes In Nashik District

H_0 : The factors Region and the information about government schemes are independent.

V/S

H_1 : The factors Region and the information about government schemes are dependent.

Observed Frequency:

	A	B	All
East	26	25	51
North	5	16	21
South	60	30	90
West	61	27	88
All	152	98	250

R- commands:

```
> d=edit(as.data.frame(NULL))
```

```
> m=as.matrix(d)
```

```
> chisq.test(m,correct=T)
```

Pearson's Chi-squared test

data: m

X-squared = 18.098, df = 3, p-value = 0.0004198

Decision rule: If P-value < 0.05 then reject H_0

Here P-value=0.0004198<0.05

Therefore we may reject H_0 at 5% level of significance.

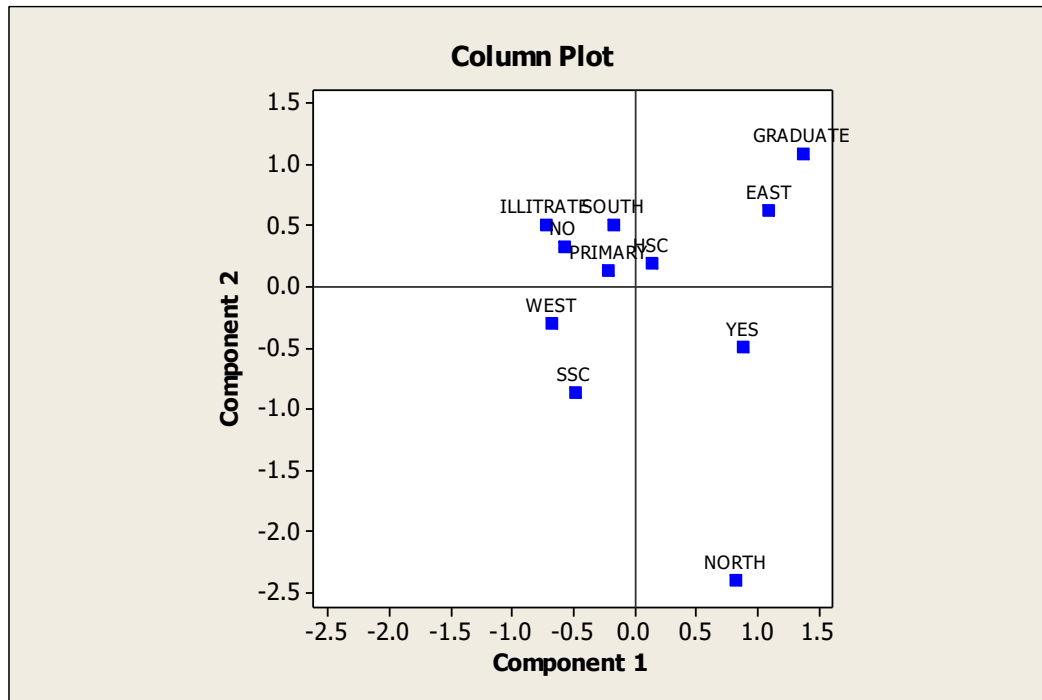
Conclusion:

- We may conclude that the Region and the information about government schemes in Nashik District are dependent.

Biplot

Biplots are a type of exploratory graph used in **statistics**, a generalization of the simple two-variable **scatterplot**. A biplot allows information on both **samples** and variables of a **data matrix** to be displayed graphically. Samples are displayed as points while variables are displayed either as vectors, linear **axes** or nonlinear trajectories. In the case of categorical variables, *category level points* may be used to represent the levels of a categorical variable. A *generalized biplot* displays information on both continuous and categorical variables.

- ☐ We use Minitab Software to draw a Biplot Graph
- **Multivariate Analysis of Region, Framers Education and Awareness about the Government Scheme's.**



➤ **Conclusion:**

From the graph we observed that,

- 1) There is association between illiterate farmer, south region and having awareness about the government schemes
- 2) There is association between farmers with primary education, south region and having awareness about the government schemes
- 3) The farmers with graduation and east region are associated.
- 4) The farmers in the north region and having awareness about the government schemes are associated.

➤ Simple data Analysis

		REGION			
Education		EAST	WEST	NORTH	SOUTH
	ILLITRATE	5.88%	5.68%	9.52%	8.89%
	PRIMARY	13.72%	10.22%	19.04%	13.33%
	SSC	15.68%	37.5%	42.85%	24.44%
	HSC	43.13%	39.77	28.57%	40%
	GRADUATE	21.57%	6.81%	0%	13.33%
AWARENESS		49.01%	30.68%	76.19%	33.33%

- **From the data we can say that,**

- 1) 76.19% Farmers in north region are aware about government schemes.
- 2) Almost 44.45% and 33.33% of the farmers in the south region are illiterate and aware about government schemes respectively.
- 3) Approximately 38% farmers in east region are Graduate and 49 % are aware about government schemes.
- 4) There are approximately 46% Farmers in the west region are educated up to SSC and about 30.68% of the farmers are having awareness about the government schemes.

➤ **Discussion:**

There may be need for government to spread awareness about the schemes in the south and west region farmers through some advertisement or some agricultural related camps or exhibition's, or through the government servants of gram panchayat.

In east region almost half of the farmers are aware about the government schemes and if proper attention given to the east region farmer then there will be a proper awareness about government schemes in this region.