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SADGURU GADAGE MAHARAJ COLLEGE, KARAD



CLASS: B.Sc.III (STATISTICS)

PROJECT TITLE

***“Statistical analysis of Sugarcane crop in Gamewadi
& Supane region”***

Under the Guidance of

Miss: Kadam S.L.

YEAR – 2019-2020

CERTIFICATE

DEPARTMENT OF STATISTICS

This is to certify that has successfully completed the project on, the “**Statistical analysis of sugarcane crop in Gamewadi & Supane region**” for the partial fulfilment of Bachelor of Science degree in Statistics, under my supervision as per rules and regulations of Shivaji University, Kolhapur during the academic year 2019-2020 and submitted the same. This work represents bonafide work of these students.

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We specially thanks to **farmers** for providing us necessary information relevant to our project study. Without their co-operation it was really difficult to be successful in our project.

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INTRODUCTION

Sugarcane is oldest crop known to man. A major crop of tropical and sub-tropical region's worldwide. Across the world 70% sugar is manufactured by sugarcane. India is second largest country in sugarcane production in the world. Sugarcane is major source of raw material for sugar industries and other allied group of by-product industries.

Sugarcane plays a major role in the economic of sugarcane growing areas. Hence improving sugarcane production will greatly help in economic prosperity of the farmer's and stakeholder's associated with sugarcane cultivation. In India sugarcane cultivated over an area of 4.36 million hector, with an annual production of 281.8 million tons and productivity 64.6 ton per hectare. Maharashtra cover's only 80% of total cultivation area, it contributes 35% in the country's total sugarcane production because of higher recovery than any other state.

Sugarcane is long duration crop and faces various abiotic traces like shortage of water, high temperature during summer, low temperature during winter, flooding during rainy season, nutritional stress, salinity, alkalinity and biotic stresses like fungal diseases as red dots, smut, wint, rust etc.

OBJECTIVES OF STUDY

- To analyse and interpret the data graphically.
- To analyse the effectiveness of factor affecting on sugarcane yield.
- To find association between average yield of two village.
- To calculate expenditure & net profit.

DATA COLLECTION

Given data is primary type and we collect this data from 155 farmers of following areas in Karad city using questionnaire,

➤ Gamewadi



➤ West Supne



STATISTICAL TOOLS USED

- **Graphical Representation**
- **Testing of Hypothesis**

STATISTICAL SOFTWARE USED

- **MS-Excel**
- **R-Software**

GRAPHICAL REPRESENTATION

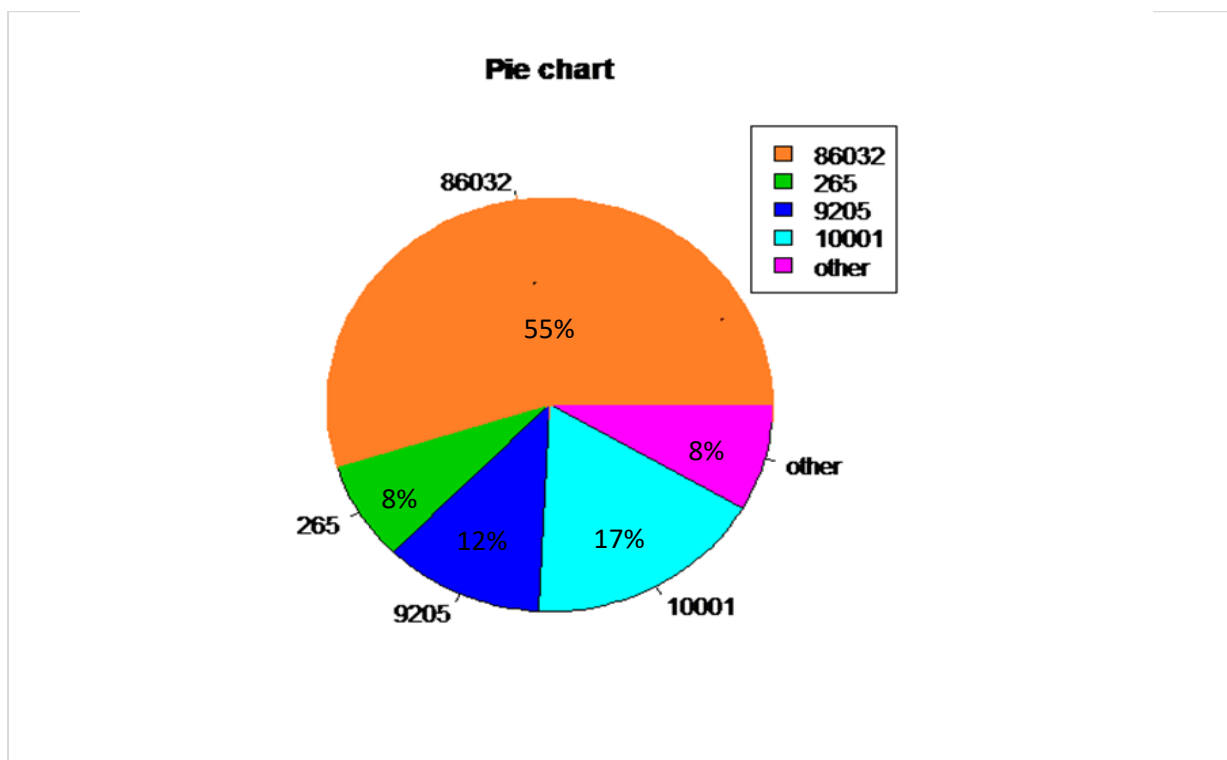
1. Pie chart

Distribution of Type of Sugarcane:

Types of sugarcane	86032	265	9205	10001	Other	Total
Frequency	85	12	18	27	13	155

R Code:

```
pie(e,main="pie chart",col=6:11,lables=m )
```



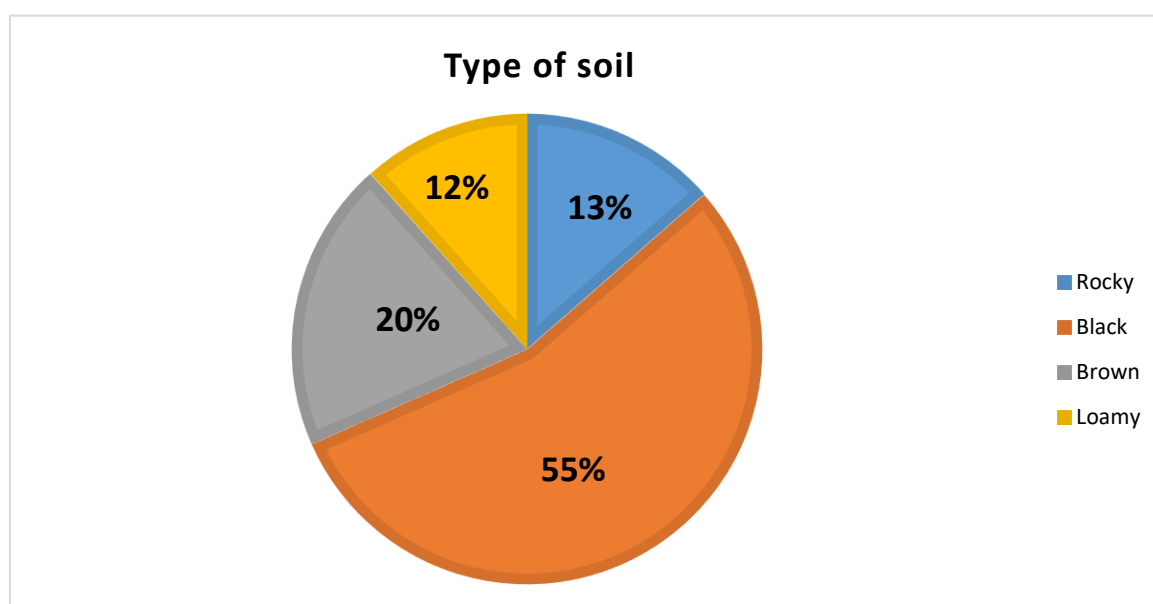
Conclusion:

Out of 155 famers 55% farmer used 86032 type of sugarcane and 8% farmers used 265 type of sugarcane in both villages.

2. Pie Chart

Distribution for type of soil:

Soil	Rocky	Black	Brown	Loamy	Total
Frequency	21	85	31	18	155



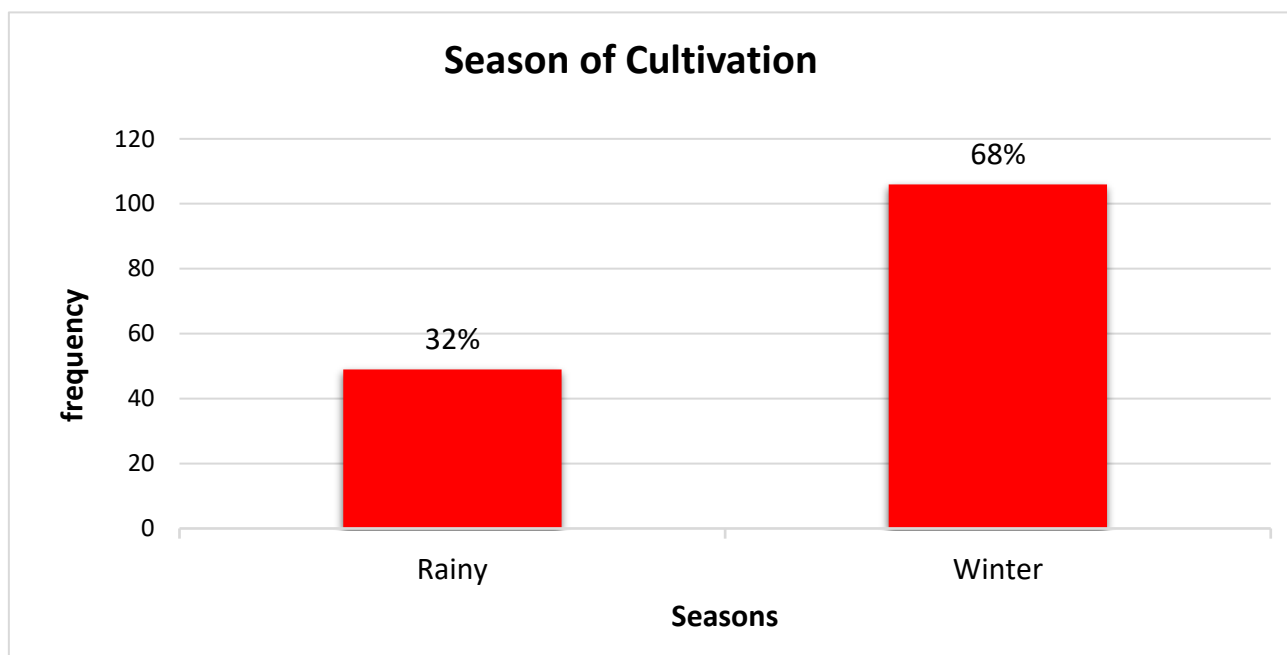
Conclusion:

55% area is covered by black soil in both villages which is high quality and more fertile than other soil which is good for sugarcane crop. On other side loamy soil covered 12% area which is also good for sugarcane crop.

3. Bar diagram

Season of Cultivation :

Season of Cultivation	Rainy	Winter	Total
Frequency	49	106	155



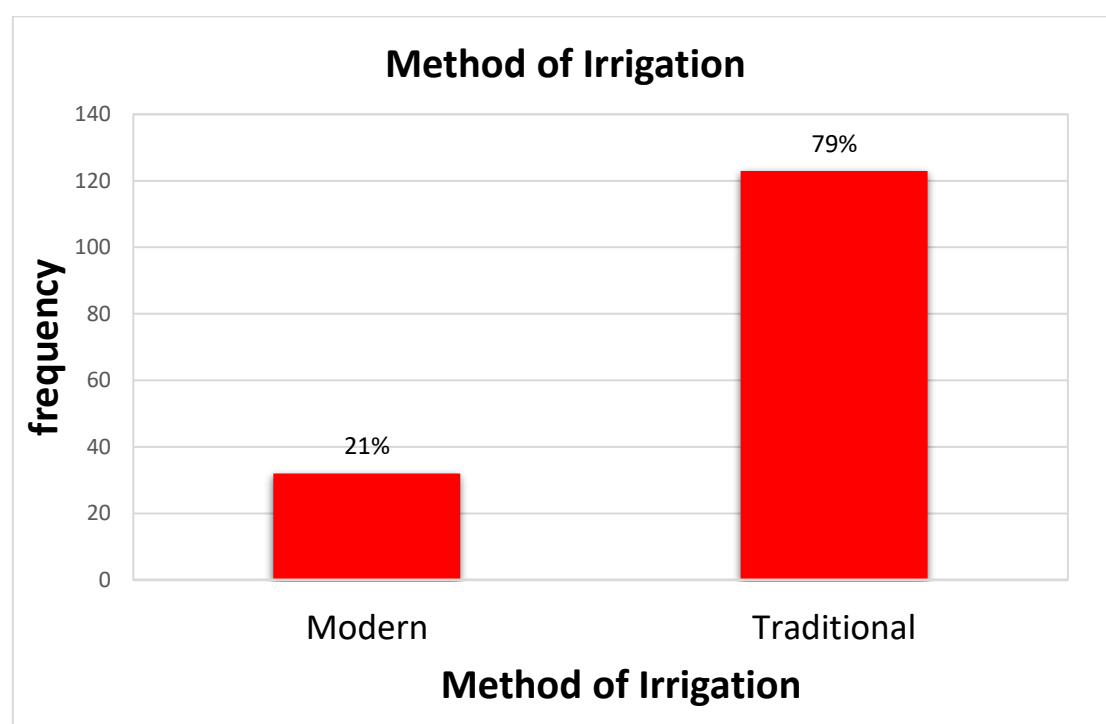
Conclusion:

There are mainly two seasons of cultivation in both village which is Rainy(68%) and Winter(32%).Rainy season give more yield And take extra time for full growth of sugarcane as compare to winter season.

4. Bar diagram

Method of Irrigation :

Method of irrigation	Modern	Traditional	Total
Frequency	32	123	155



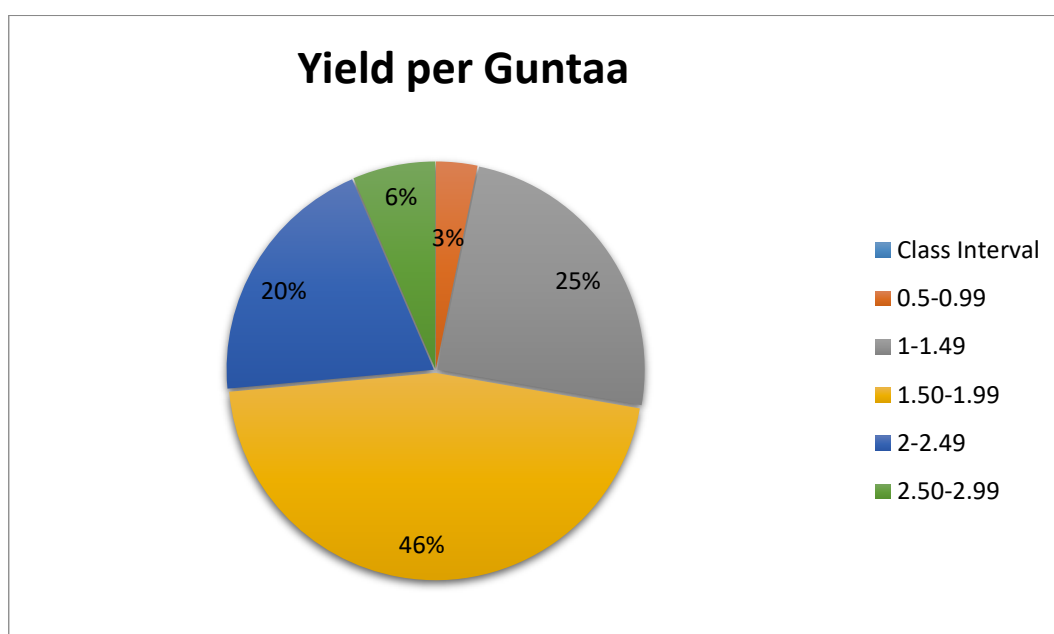
Conclusion:

There are mainly two irrigation system used in both villages, in which traditional system is used by 79% of farmer & modern system is used by 21% of farmer which is useful for increasing yield but it is expensive and it has high maintenance.

5. Pie Chart

Distribution for yield per guntaa:

Class Interval (In ton)	0.5-0.99	1-1.49	1.50-1.99	2-2.49	2.50-2.99	Total
Frequency	5	38	71	31	10	155



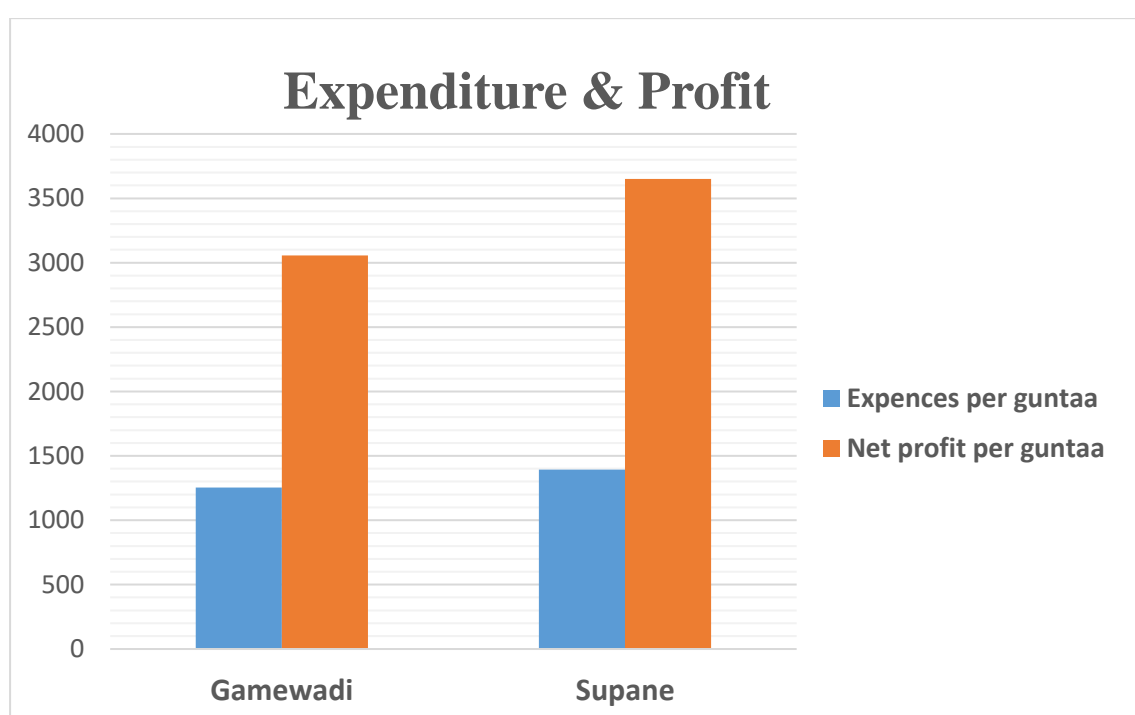
Conclusion:

The average yield in both village are in between 1.50-1.99 ton per guntaa which is good yield hence sugarcane cultivation in that area give profit to farmer also it denote that the atmosphere of both village is also suitable for sugarcane crop.

6. Multiple Bar diagram

Multiple Bar Diagram for Expenses And net Profit per guntaa:

Village name	Gamewadi	Supane
Average expenses per guntaa (Rs)	1253.5	1392.8
Average net profit per guntaa (Rs)	3056.3	3651.156



Conclusion:

In Gamewadi the farmer expenses 1253 Rs. averagely per guntaa and earns 3056 Rs. per guntaa averagely on the other hand in Supane the farmer expenses 1392 Rs. averagely and earns 3651 Rs. per guntaa averagely. It clearly notify that Yield are dependent on expenditure.

DATA ANALYSIS

1. Chi-Square test for Independence Two Attributes

A: Average Yield per guntaa

B: Type of Sugarcane

Hypothesis:

H_0 : Type of sugarcane and yield are independent.

H_1 : Type of sugarcane and yield are not independent.

Observation Table:

Table for observed value

A \ B	86032	265	9205	10001	Other	Total
0.5-0.99	3	0	0	1	1	5
1-1.49	19	3	6	4	6	38
1.50-1.99	44	4	13	6	4	71
2-2.49	14	4	0	11	1	30
2.50-2.99	5	0	1	5	0	11
Total	85	11	20	27	12	155

R Code:

```
> x=c(3,19,44,14,5,0,3,4,4,0,0,6,13,0,1,1,4,6,11,5,1,6,4,1,0)
```

```
> n=5;m=5
```

```
> y=matrix(x,nrow=n,ncol=m);y
```

```
      [,1] [,2] [,3] [,4] [,5]
```

```
[1,]  3  0  0  1  1
```

```
[2,] 19  3  6  4  6
```

```
[3,] 44  4 13  6  4
```

```
[4,] 14  4  0 11  1
```

```
[5,]  5  0  1  5  0
```

```
> chisq.test(y)
```

Pearson's Chi-squared test

data: y

X-squared = 32.748, d.f. = 16, p-value = 0.007979

Result:

Here, P value is less than $\alpha = (0.05)$ then we reject H_0 at 5% level of significance

Conclusion:

The two attributes type of sugarcane and yield are dependent.

2.Chi-Square test for Two Attributes

A: Average Yield

B: Method of Cultivation

Hypothesis:

H_0 : Method of cultivation and yield are independent.

H_1 : Method of cultivation and yield are not independent.

Observation Table:

Table for observed value

B \ A	Nursery	Seeds	Total
0.5-0.99	1	4	5
1-1.49	3	34	37
1.50-1.99	14	58	72
2-2.49	6	25	31
2.50-2.99	3	7	10
Total	27	128	155

R Code:

```
> x=c(1,3,14,6,3,4,34,58,25,7);x
```

```
> n=5;m=2
```

```
> y=matrix(x,nrow=n,ncol=m);y
```

```
  [,1] [,2]
```

```
[1,]  1  4
```

```
[2,]  3 34
```

```
[3,] 14 58
```

```
[4,]  6 25
```

```
[5,]  3  7
```

```
> chisq.test(y)
```

Pearson's Chi-squared test

data: y

X-squared = 3.6394, d.f. = 4, p-value = 0.457

Result:

Here, P value is greater than $\alpha = (0.05)$ then we accept H_0 at 5% level of significance.

Conclusion:

The two attributes method of cultivation and yield are independent.

3.Chi-Square test for Two Attributes

A: Type of soil.

B: Average yield (in ton)

Hypothesis:

H_0 : Type of soil and yield are independent.

H_1 : Type of soil and yield are not independent.

Observation Table:

Table for observed value

$\begin{matrix} A \\ \backslash \\ B \end{matrix}$	Rocky	Black	Brown	Loamy	Total
0.5-0.99	3	2	1	0	6
1-1.49	9	17	8	3	37
1.50-1.99	6	41	16	9	72
2-2.49	3	19	5	3	30
2.50-2.99	0	6	1	3	10
Total	21	85	31	18	155

Table for Expected value

$\begin{matrix} A \\ \backslash \\ B \end{matrix}$	Rocky	Black	Brown	Loamy	Total
0.5-0.99	0.813	3.29	1.2	0.697	6
1-1.49	5.013	20.29	7.4	4.297	37
1.50-1.99	9.755	39.48	14.4	8.361	72
2-2.49	4.065	16.45	6	3.484	30
2.50-2.99	1.355	5.484	2	1.161	10
Total	21	85	31	18	155

Calculation:

$$\chi^2_{\text{cal.}} = \sum \frac{O_i^2}{E_i} - N$$
$$= 173.7175 - 155$$

$$\chi^2_{\text{cal.}} = 18.7174$$

$$\chi^2_{\text{tab.}} = 21.0260$$

Result:

Here, $\chi^2_{\text{cal.}} < \chi^2_{\text{tab}}$ then we accept H_0 at 5% level of significance.

Conclusion:

The two attributes type of soil and yield are independent.

4. Chi square test for Two Attributes

A: Season of cultivation

B: Average yield (in ton)

Hypothesis:

H_0 : Season of cultivation and average yield of sugarcane are independent

H_1 : Season of cultivation and average yield of sugarcane are dependant

Observation Table:

Table for observed value

$\begin{matrix} \text{B} \backslash \text{A} \end{matrix}$	Rainy	Winter	Total
0.5-0.99	0	5	5
1-1.49	12	27	39
1.50-1.99	16	54	70
2-2.49	14	17	31
2.50-2.99	7	3	10
Total	49	106	155

Table for Expected value

$\begin{matrix} \text{B} \backslash \text{A} \end{matrix}$	Rainy	Winter	Total
0.5-0.99	1.581	3.419	5
1-1.49	12.33	26.67	39
1.50-1.99	22.13	47.87	70
2-2.49	9.8	21.2	31
2.50-2.99	3.161	6.839	10
Total	49	106	155

Calculation:

$$\begin{aligned}\chi^2_{\text{cal.}} &= \sum \frac{O_i^2}{E_i} - N \\ &= 169.2545 - 155\end{aligned}$$

$$\chi^2_{\text{cal.}} = 14.25453$$

$$\chi^2_{\text{tab}} = 9.487729$$

Result:

Here, $\chi^2_{\text{cal}} > \chi^2_{\text{tab}}$ we then reject H_0 at 5% level of significance.

Conclusion:

The two attributes season of cultivation and average yield are dependent.

5. Chi square test for Two Attribute

A: Type of water supply

B: Average yield(in ton)

Hypothesis:

H_0 : Method of Irrigation and average yield of sugarcane are independent

H_1 : Method of Irrigation and average yield of sugarcane are dependant

Observation Table:

Table for observed value

$\begin{matrix} A \\ B \end{matrix}$	Modern	Traditional	Total
0.5-0.99	0	5	5
1-1.49	6	32	38
1.50-1.99	15	56	71
2-2.49	9	22	31
2.50-2.99	2	8	10
Total	32	123	155

Table for Expected value

$\begin{matrix} A \\ B \end{matrix}$	Modern	Traditional	Total
0.5-0.99	1.032258	3.967742	5
1-1.49	7.845161	30.15484	38
1.50-1.99	14.65806	56.34194	71
2-2.49	6.4	24.6	31
2.50-2.99	2.064516	7.935484	10
Total	32	123	155

Calculation:

$$\chi^2_{\text{cal.}} = \sum \frac{oi^2}{Ei} - N$$
$$= 158.1913 - 155$$

$$\chi^2_{\text{cal.}} = 3.191334$$

$$\chi^2_{\text{tab.}} = 9.487729$$

Result:

Here, $\chi^2_{\text{cal}} < \chi^2_{\text{tab}}$ then we accept H_0 at 5% level of significance.

Conclusion:

The two attributes method of irrigation and average yield are independent.

6. Mean test for Two Samples

Association between average yield of two villages.

Hypothesis:

H_0 : There is no significant difference between average yield of two villages i.e.

$$\mu_1 = \mu_2.$$

H_1 : There is significant difference between average yield of two villages i.e.

$$\mu_1 \neq \mu_2.$$

Here,

n_1 =sample size of Gamewadi=55

n_2 =sample size of Supane=100

μ_1 =average yield of Gamewadi =1.5354

μ_2 =average yield of Supane =1.8014

v_1 =variance of yield in Gamewadi =0.2094

v_2 =variance of yield in Supane =0.1448

R-Code :

```
> n1=55
> n2=100
> xb1=1.5212
> xb2=1.8014
> v1=2.44516
> v2=0.1448
> z1=(xb1-xb2)/sqrt(v1/n1+v2/n2)
> z1
[1] -1.307784
> pv=2*pnorm(abs(z1),0,1,lower.tail=f)
> pv
[1] 1.809053
```

Result:

Here, P-value is greater than $\alpha = 0.05$ then we accept H_0 at 5% level of significance.

Conclusion:

There is no significant difference between average yield of two villages.

CONCLUSION

We study the factors that mainly affect on sugarcane yield also we find the association between average yield of two villages & study that sugarcane crop is economically good or not.

- The factors on which sugarcane yield is dependent are
 - I) Type of sugarcane
 - II) Season of Cultivation
- The factors on which sugarcane yield is not dependent
 - I) Method of Cultivation
 - II) Type of soil
 - III) Method of Irrigation
- There is no significant difference between average yield of two villages
 - I) Average expenditure and profit is 1343 Rs. & 3442 Rs. respectively per guntaa.
 - II) We found that sugarcane crop is economically good crop for farmer's.

DATA CODING

Given data coded by binary number's :

- “1” For selected option.
- “0” For not selected remaining option's.

QUESTIONNAIRE

1) Which kind of Cane sugar it is ?

- a) 86032 b) 265 c) 9205 d) 10001 e) Other

2) How it was cultivated ?

- a) Nursery Plant b) Cane sugar seed's

3) How many month required for full growth of sugarcane ?

- a) 10 -12 b) 13-15 c) 16-18 d) 18 & above

4) In which type of soil it can grow ?

- a) Rocky b) Black cotton c) Brown(reddish) soil d) Loamy soil

5) In which season it is cultivated ?

- a) Rainy (18 months) b) Winter (12 months)

6) Which fertilizer's are mostly used ?

- a) Organic b) Inorganic c) Both

7) Which nutrients are supplied manually to sugarcane ?

- a) Macro(NPK) b) Micro (Ca,S,etc.) c) Other

8) Distance between two rows ?

- a) 3.5 feet b) 4 feet c) 4.5 feet d) Other

9) Difference in two irrigation ?

- a) 1-5 days b) 6-10 days c) 11-15 days d) More than 15

- 10) Which type of irrigation system is used ?
a) Modern by drip b) Traditional by canal
- 11) Was there any disease on the sugarcane ? (if 'Yes' then which)
- 12) Did you do something new To increase your yield? (If 'Yes' then what)
- 13) How much expenditure you spend on your plot ?
- 14) What is your field size ?
- 15) How much yield you get in total plot ? (per Guntaa)
a) 0 - 1 ton b) 1-2 ton c) 2-3 ton d) more then 3 ton
- 16) How much rate you got per ton ?

REFERENCES

- 1) 100 statistical tests (Gopal K. Kanji)
- 2) Fundamental and Mathematical statistics (S.C.Gupta & V.K.Kapoor).

THANK YOU