KAP Farmers Inferential Statistics

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## data

## KAP Data

### Knowledge

### Attitudes

### Practices

## Combine datasets

### KAP Mean scores

The mean of overall scores for KAP scores of each individual

| **Characteristic** | **N = 275** |
| --- | --- |
| Knowledge\_score | 6.61 (2.13) |
| Attitudes\_score | 3.01 (2.17) |
| Practices\_score | 3.03 (1.67) |

**?@tbl-meanscores** shows the overall mean scores and their standard deviations for each construct. The overall score for an individual with the highest score would be 11. Therefore an overall mean score of 6.61 indicates overall sufficient knowledge. The highest score for attitude would be 7, thus an a mean score of below 3.5 indicate unpreferable attitude towards biologicals while a mean score of 3.03 for practices indicate overall invalid practices level.

## KAP categories

Table 1: The KAP levels for the study sample

| **Characteristic** | **N = 275** |
| --- | --- |
| Knowledge\_cat |  |
| Insufficient\_Knowledge | 66 (24%) |
| Sufficient\_Knowledge | 209 (76%) |
| Attitude\_cat |  |
| Preferrable\_Attitude | 102 (37%) |
| Unpreferrable\_Attitude | 173 (63%) |
| Practices\_cat |  |
| Invalid\_Practice | 203 (74%) |
| Valid\_Practice | 72 (26%) |

[Table 1](#tbl-KAPLevels) shows that 76% of the respondents had sufficient knowledge compared to 24% with insufficient knowledge. Regarding attitude, the majority had unpreferrable attitude towards biologicals (63%) while only 37% reported preferable attitude. Regarding practices, the majority had invalid practices (74%) while only 72 individuals of the 275 sampled (26%) reported valid practices. ## KAP Correlation

| term | Knowledge\_score | Attitudes\_score | Practices\_score |
| --- | --- | --- | --- |
| Knowledge\_score | NA | 0.3560758 | 0.1878687 |
| Attitudes\_score | 0.3560758 | NA | 0.4072203 |
| Practices\_score | 0.1878687 | 0.4072203 | NA |

**?@tbl-KAPCorrelation** shows that knowledge and attitude exhibited a weak positive correlation (r = 0.36), knowledge exhibited a very weak positive correlation with attitude (r = 0.19). Attitude and practices exhibited a relatively strong positive correlation (r = 0.41). The results indicate that although knowledge is considerably sufficient, the attitudes and practices are largely preferable and invalid. The results also show that attitudes are strongly correlated with practices; Preferable attitudes towards biologicals ultimately lead to valid biologicals practices.

## Social Demographic vs KAP scores

## KAP scores Vs County

Table 2: KAP Scores across counties

| **Characteristic** | **kajiado**, N = 95 | **kiambu**, N = 108 | **machakos**, N = 72 | **p-value** |
| --- | --- | --- | --- | --- |
| Knowledge\_score | 6.47 (2.18) | 6.71 (2.10) | 6.64 (2.11) | 0.7 |
| Attitudes\_score | 3.19 (2.13) | 2.75 (2.23) | 3.18 (2.14) | 0.3 |
| Practices\_score | 3.79 (1.94) | 2.69 (1.45) | 2.53 (1.21) | <0.001 |

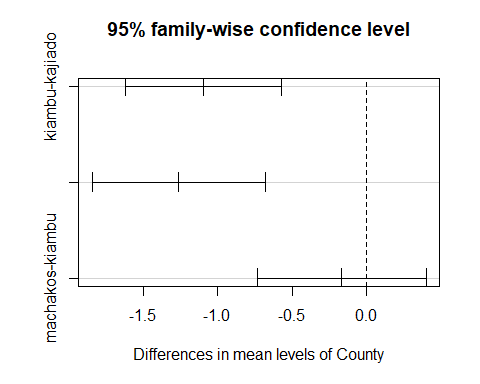
As illustrated in [Table 2](#tbl-KAPCounties), the p values for knowledge and attitudes are greater than 0.05 (critical value representing 95% confidence interval) while the p value for practices is <0.001 (thereby less than 0.05). The p values are results from ANOVA analysis done to done whether KAP mean scores are statistically significantly different in the three counties. Knowledge and attitudes are not significantly statistically different but practices are statistically significantly different. The mean score for Kajiado county is 3.79, which is higher than for Kiambu (2.69) and Machokos which had the lowest mean score for practices (2.53).

Since the results for practices across counties indicates statistical significance; and there being three levels of different counties, a post-hoc analysis is necessary to determine which counties were different from each other. The calculations are as illustrated below;

Call:  
 aov(formula = Practices\_score ~ County, data = KAP\_data)  
  
Terms:  
 County Residuals  
Sum of Squares 85.1167 682.6506  
Deg. of Freedom 2 272  
  
Residual standard error: 1.584217  
Estimated effects may be unbalanced

Df Sum Sq Mean Sq F value Pr(>F)   
County 2 85.1 42.56 16.96 1.15e-07 \*\*\*  
Residuals 272 682.7 2.51   
---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Tukey multiple comparisons of means  
 95% family-wise confidence level  
  
Fit: aov(formula = Practices\_score ~ County, data = KAP\_data)  
  
$County  
 diff lwr upr p adj  
kiambu-kajiado -1.0950292 -1.6201728 -0.5698857 0.0000046  
machakos-kajiado -1.2616959 -1.8450522 -0.6783396 0.0000019  
machakos-kiambu -0.1666667 -0.7346843 0.4013510 0.7686731



The Anova results indicate that Machakos and Kajiado, Kiambu and Kajiado had statistically significant differences in Practices score while machokos and Kimabu had no statistically significant mean differences in practice scores. ### KAP Scores Vs Age

Table 3: KAP Scores across age groups

| **Characteristic** | **18\_35**, N = 5 | **36\_50**, N = 198 | **51\_60**, N = 46 | **Above\_60**, N = 26 | **p-value** |
| --- | --- | --- | --- | --- | --- |
| Knowledge\_score | 6.80 (1.92) | 6.79 (2.13) | 6.09 (2.19) | 6.15 (1.91) | 0.14 |
| Attitudes\_score | 4.20 (2.59) | 2.98 (2.19) | 3.15 (1.91) | 2.81 (2.43) | 0.6 |
| Practices\_score | 4.40 (1.82) | 2.97 (1.64) | 3.20 (1.77) | 2.88 (1.68) | 0.2 |

[Table 3](#tbl-KAPAge) illustrates KAP scores across different age groups. ANOVA test was employed to determine whether the differences in scores across different age groups were statistically significant. The results as illustrated by the P values; being greater than 0.05 show that the differences in KAP score across age groups were not statistically significant. A post hoc analysis was thus not necessary.

### KAP Scores Vs Education Level

Table 4: KAP scores across Education Level

| **Characteristic** | **bachelor\_degree\_and\_above**, N = 12 | \*\*college\_training\_\_certificate\_\_diploma\*\*, N = 41 | **no\_schooling**, N = 7 | **primary\_education**, N = 116 | **secondary\_education**, N = 99 | **p-value** |
| --- | --- | --- | --- | --- | --- | --- |
| Knowledge\_score | 7.58 (1.24) | 6.76 (2.11) | 6.00 (2.45) | 6.23 (2.27) | 6.92 (1.96) | 0.059 |
| Attitudes\_score | 4.33 (2.10) | 3.02 (1.96) | 3.29 (2.43) | 2.53 (2.19) | 3.40 (2.12) | 0.008 |
| Practices\_score | 4.67 (2.02) | 3.49 (1.87) | 3.14 (1.95) | 2.75 (1.46) | 2.96 (1.65) | 0.001 |

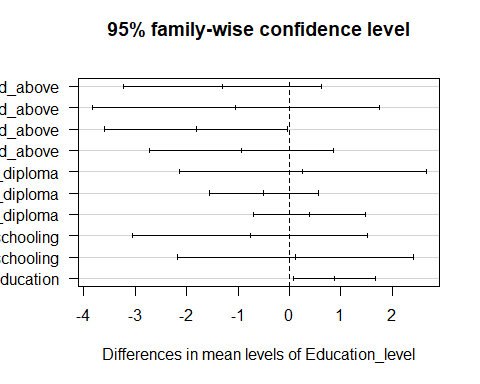
[Table 4](#tbl-KAPEdu) shows the differences in KAP mean scores across highest education level attained by the respondents. The p values were derived from an analysis of variance (ANOVA); The p values indicated that the differences in mean scores for knowledge were statistically insignificant meaning that no matter the level of education attained knowledge or information on biologicals was more or the same equal (p = 0.059, NS). The attitudes towards biologicals were statistically different across education levels (p = 0.008); This meant that the attitudes towards biologicals was influenced by the education level of the respondents; or education level had a significant influence on attitudes towards biologicals. Practices scores were significantly different across different education levels (p = 0.001). This shows that education level had a significant influence on biologicals practices. Since attitudes and practices had statistically significant mean scores across education levels the post hoc analysis were necessary.

#### Post-hoc analysis for attitudes

Call:  
 aov(formula = Attitudes\_score ~ Education\_level, data = KAP\_data)  
  
Terms:  
 Education\_level Residuals  
Sum of Squares 64.1102 1229.8316  
Deg. of Freedom 4 270  
  
Residual standard error: 2.134229  
Estimated effects may be unbalanced

Df Sum Sq Mean Sq F value Pr(>F)   
Education\_level 4 64.1 16.028 3.519 0.00806 \*\*  
Residuals 270 1229.8 4.555   
---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Tukey multiple comparisons of means  
 95% family-wise confidence level  
  
Fit: aov(formula = Attitudes\_score ~ Education\_level, data = KAP\_data)  
  
$Education\_level  
 diff  
college\_training\_\_certificate\_\_diploma-bachelor\_degree\_and\_above -1.3089431  
no\_schooling-bachelor\_degree\_and\_above -1.0476190  
primary\_education-bachelor\_degree\_and\_above -1.8074713  
secondary\_education-bachelor\_degree\_and\_above -0.9292929  
no\_schooling-college\_training\_\_certificate\_\_diploma 0.2613240  
primary\_education-college\_training\_\_certificate\_\_diploma -0.4985282  
secondary\_education-college\_training\_\_certificate\_\_diploma 0.3796502  
primary\_education-no\_schooling -0.7598522  
secondary\_education-no\_schooling 0.1183261  
secondary\_education-primary\_education 0.8781783  
 lwr  
college\_training\_\_certificate\_\_diploma-bachelor\_degree\_and\_above -3.23267499  
no\_schooling-bachelor\_degree\_and\_above -3.83519251  
primary\_education-bachelor\_degree\_and\_above -3.58482770  
secondary\_education-bachelor\_degree\_and\_above -2.72089862  
no\_schooling-college\_training\_\_certificate\_\_diploma -2.13568037  
primary\_education-college\_training\_\_certificate\_\_diploma -1.56345083  
secondary\_education-college\_training\_\_certificate\_\_diploma -0.70888799  
primary\_education-no\_schooling -3.04105401  
secondary\_education-no\_schooling -2.17399513  
secondary\_education-primary\_education 0.07620154  
 upr  
college\_training\_\_certificate\_\_diploma-bachelor\_degree\_and\_above 0.61478881  
no\_schooling-bachelor\_degree\_and\_above 1.73995441  
primary\_education-bachelor\_degree\_and\_above -0.03011483  
secondary\_education-bachelor\_degree\_and\_above 0.86231276  
no\_schooling-college\_training\_\_certificate\_\_diploma 2.65832846  
primary\_education-college\_training\_\_certificate\_\_diploma 0.56639448  
secondary\_education-college\_training\_\_certificate\_\_diploma 1.46818831  
primary\_education-no\_schooling 1.52134958  
secondary\_education-no\_schooling 2.41064736  
secondary\_education-primary\_education 1.68015513  
 p adj  
college\_training\_\_certificate\_\_diploma-bachelor\_degree\_and\_above 0.3368410  
no\_schooling-bachelor\_degree\_and\_above 0.8403076  
primary\_education-bachelor\_degree\_and\_above 0.0440745  
secondary\_education-bachelor\_degree\_and\_above 0.6124039  
no\_schooling-college\_training\_\_certificate\_\_diploma 0.9982419  
primary\_education-college\_training\_\_certificate\_\_diploma 0.7002990  
secondary\_education-college\_training\_\_certificate\_\_diploma 0.8736436  
primary\_education-no\_schooling 0.8910690  
secondary\_education-no\_schooling 0.9999087  
secondary\_education-primary\_education 0.0239128



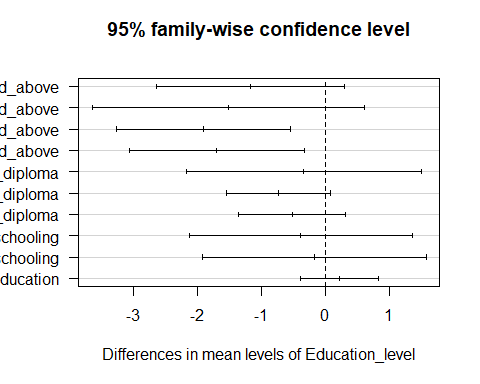
The post hoc results significant differences in attitudes mean scores between primary school and those with bachelors degree and primary and secondary school.

#### Post-hoc analysis for practices

Call:  
 aov(formula = Practices\_score ~ Education\_level, data = KAP\_data)  
  
Terms:  
 Education\_level Residuals  
Sum of Squares 50.4112 717.3561  
Deg. of Freedom 4 270  
  
Residual standard error: 1.629992  
Estimated effects may be unbalanced

Df Sum Sq Mean Sq F value Pr(>F)   
Education\_level 4 50.4 12.603 4.743 0.00103 \*\*  
Residuals 270 717.4 2.657   
---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Tukey multiple comparisons of means  
 95% family-wise confidence level  
  
Fit: aov(formula = Practices\_score ~ Education\_level, data = KAP\_data)  
  
$Education\_level  
 diff  
college\_training\_\_certificate\_\_diploma-bachelor\_degree\_and\_above -1.1788618  
no\_schooling-bachelor\_degree\_and\_above -1.5238095  
primary\_education-bachelor\_degree\_and\_above -1.9166667  
secondary\_education-bachelor\_degree\_and\_above -1.7070707  
no\_schooling-college\_training\_\_certificate\_\_diploma -0.3449477  
primary\_education-college\_training\_\_certificate\_\_diploma -0.7378049  
secondary\_education-college\_training\_\_certificate\_\_diploma -0.5282089  
primary\_education-no\_schooling -0.3928571  
secondary\_education-no\_schooling -0.1832612  
secondary\_education-primary\_education 0.2095960  
 lwr  
college\_training\_\_certificate\_\_diploma-bachelor\_degree\_and\_above -2.6480895  
no\_schooling-bachelor\_degree\_and\_above -3.6527861  
primary\_education-bachelor\_degree\_and\_above -3.2741018  
secondary\_education-bachelor\_degree\_and\_above -3.0753886  
no\_schooling-college\_training\_\_certificate\_\_diploma -2.1756318  
primary\_education-college\_training\_\_certificate\_\_diploma -1.5511271  
secondary\_education-college\_training\_\_certificate\_\_diploma -1.3595672  
primary\_education-no\_schooling -2.1350983  
secondary\_education-no\_schooling -1.9339947  
secondary\_education-primary\_education -0.4029044  
 upr  
college\_training\_\_certificate\_\_diploma-bachelor\_degree\_and\_above 0.29036593  
no\_schooling-bachelor\_degree\_and\_above 0.60516707  
primary\_education-bachelor\_degree\_and\_above -0.55923150  
secondary\_education-bachelor\_degree\_and\_above -0.33875284  
no\_schooling-college\_training\_\_certificate\_\_diploma 1.48573632  
primary\_education-college\_training\_\_certificate\_\_diploma 0.07551733  
secondary\_education-college\_training\_\_certificate\_\_diploma 0.30314935  
primary\_education-no\_schooling 1.34938402  
secondary\_education-no\_schooling 1.56747232  
secondary\_education-primary\_education 0.82209635  
 p adj  
college\_training\_\_certificate\_\_diploma-bachelor\_degree\_and\_above 0.1815019  
no\_schooling-bachelor\_degree\_and\_above 0.2857190  
primary\_education-bachelor\_degree\_and\_above 0.0012423  
secondary\_education-bachelor\_degree\_and\_above 0.0063118  
no\_schooling-college\_training\_\_certificate\_\_diploma 0.9855641  
primary\_education-college\_training\_\_certificate\_\_diploma 0.0956138  
secondary\_education-college\_training\_\_certificate\_\_diploma 0.4083022  
primary\_education-no\_schooling 0.9719328  
secondary\_education-no\_schooling 0.9985009  
secondary\_education-primary\_education 0.8811233



Regarding practices, Bachelors degree and above brought the significant difference since it showed differences between those secondary and primary education

### KAP Scores Vs Marital status

Table 5: KAP Scores Vs Marital Status

| **Characteristic** | **divorced**, N = 3 | **married**, N = 216 | **separated**, N = 2 | **single**, N = 42 | **windowed**, N = 11 | **p-value** |
| --- | --- | --- | --- | --- | --- | --- |
| Knowledge\_score | 7.33 (2.52) | 6.54 (2.15) | 7.50 (0.71) | 7.10 (1.90) | 6.00 (2.45) | 0.4 |
| Attitudes\_score | 3.33 (0.58) | 2.86 (2.17) | 6.50 (0.71) | 3.69 (2.03) | 2.91 (2.39) | 0.033 |
| Practices\_score | 3.33 (3.21) | 2.93 (1.62) | 4.00 (2.83) | 3.33 (1.76) | 3.73 (1.74) | 0.3 |

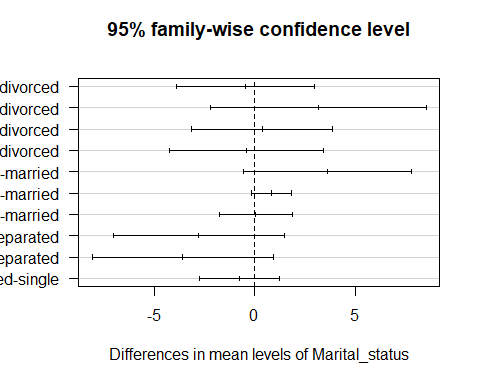
As illustrated in [Table 5](#tbl-KAPMar), knowledge and practices scores were statistically insignificant in different groups on marital status (with p values, (p = 0.4 ns) for knowledge and (p = 0.3 ns)for practices), however attitudes significantly different depending on marital status (p = 0.03). Therefore marital status had a significant influence on attitudes towards biologicals. A Post hoc analysis is hereby necessary;

#### Post hoc analysis for attitudes against marital status

Call:  
 aov(formula = Attitudes\_score ~ Marital\_status, data = KAP\_data)  
  
Terms:  
 Marital\_status Residuals  
Sum of Squares 48.9833 1240.8853  
Deg. of Freedom 4 269  
  
Residual standard error: 2.147779  
Estimated effects may be unbalanced  
1 observation deleted due to missingness

Df Sum Sq Mean Sq F value Pr(>F)   
Marital\_status 4 49 12.246 2.655 0.0335 \*  
Residuals 269 1241 4.613   
---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
1 observation deleted due to missingness

Tukey multiple comparisons of means  
 95% family-wise confidence level  
  
Fit: aov(formula = Attitudes\_score ~ Marital\_status, data = KAP\_data)  
  
$Marital\_status  
 diff lwr upr p adj  
married-divorced -0.4722222 -3.9013478 2.9569033 0.9956345  
separated-divorced 3.1666667 -2.2179924 8.5513257 0.4890118  
single-divorced 0.3571429 -3.1679439 3.8822297 0.9986810  
windowed-divorced -0.4242424 -4.2662293 3.4177445 0.9981515  
separated-married 3.6388889 -0.5513155 7.8290932 0.1225594  
single-married 0.8293651 -0.1653694 1.8240995 0.1513512  
windowed-married 0.0479798 -1.7752380 1.8711976 0.9999938  
single-separated -2.8095238 -7.0786159 1.4595683 0.3714053  
windowed-separated -3.5909091 -8.1251978 0.9433796 0.1923906  
windowed-single -0.7813853 -2.7792486 1.2164781 0.8197068



The post hoc analysis did not indicate any significant differences.

### KAP Scores vs Gender of the household head

A student t-test was employed in determining the statistical significance of differences in mean scores against gender of the household head.

Table 6: The KAP scores against the Gender of the household head

| **Characteristic** | **female**, N = 38 | **male**, N = 237 | **p-value** |
| --- | --- | --- | --- |
| Knowledge\_score | 5.97 (2.26) | 6.71 (2.09) | 0.065 |
| Attitudes\_score | 3.03 (2.35) | 3.01 (2.15) | >0.9 |
| Practices\_score | 3.24 (1.82) | 3.00 (1.65) | 0.4 |

The p value as indicated by [Table 6](#tbl-KAPGen), gender of the household head did not register any significant influence on KAP scores (p = >0.05).

## KAP Scores Vs Household Monthly Income

An analysis of variance (ANOVA) was employed in determining the statistical significance of the differences in mean KAP scores across household monthly incomes

Table 7: The KAP scores Significance across levels of monthly income

| **Characteristic** | **10000\_20000**, N = 61 | **5000\_10000**, N = 111 | **Above\_20000**, N = 42 | **Below\_5000**, N = 58 | **p-value** |
| --- | --- | --- | --- | --- | --- |
| Knowledge\_score | 7.20 (1.81) | 6.84 (2.03) | 6.88 (1.93) | 5.31 (2.28) | <0.001 |
| Attitudes\_score | 3.49 (2.06) | 3.33 (2.18) | 2.90 (2.02) | 1.90 (2.05) | <0.001 |
| Practices\_score | 3.38 (1.84) | 2.89 (1.57) | 3.31 (1.75) | 2.64 (1.51) | 0.049 |

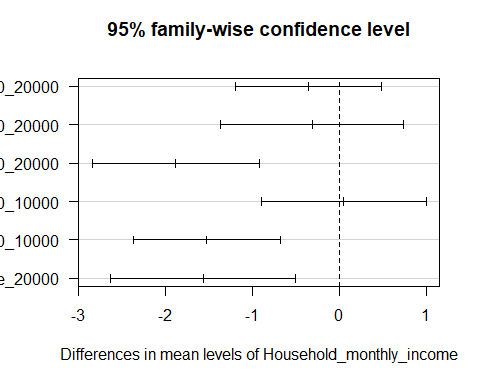
[Table 7](#tbl-KAPIn) illustrates that KAP Scores were significantly different across different categories or levels of monthly income. Knowledge was statistically significantly different across levels of income (p < 0.001) as well as attitudes (p<0.001) and practices (p = 0.049). Therefore, the level of income had a significant influence on knowledge, attitude and practices on biologicals. Post hoc analysis were necessary due to statistical significance of the results.

### Post hoc for knowledge against monthly income

Call:  
 aov(formula = Knowledge\_score ~ Household\_monthly\_income, data = KAP\_data)  
  
Terms:  
 Household\_monthly\_income Residuals  
Sum of Squares 127.7809 1101.5390  
Deg. of Freedom 3 268  
  
Residual standard error: 2.027368  
Estimated effects may be unbalanced  
3 observations deleted due to missingness

Df Sum Sq Mean Sq F value Pr(>F)   
Household\_monthly\_income 3 127.8 42.59 10.36 1.79e-06 \*\*\*  
Residuals 268 1101.5 4.11   
---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
3 observations deleted due to missingness

Tukey multiple comparisons of means  
 95% family-wise confidence level  
  
Fit: aov(formula = Knowledge\_score ~ Household\_monthly\_income, data = KAP\_data)  
  
$Household\_monthly\_income  
 diff lwr upr p adj  
5000\_10000-10000\_20000 -0.35888347 -1.1942330 0.4764661 0.6832841  
Above\_20000-10000\_20000 -0.31576893 -1.3666643 0.7351265 0.8649157  
Below\_5000-10000\_20000 -1.88637648 -2.8476014 -0.9251516 0.0000043  
Above\_20000-5000\_10000 0.04311454 -0.9063746 0.9926037 0.9994204  
Below\_5000-5000\_10000 -1.52749301 -2.3766702 -0.6783159 0.0000308  
Below\_5000-Above\_20000 -1.57060755 -2.6325275 -0.5086876 0.0009363



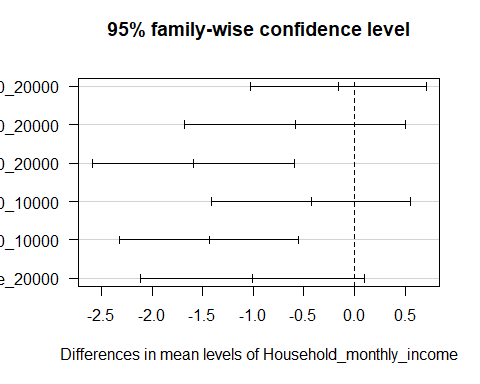
The significant differences in mean scores were established between, Below\_5000 and 10000\_20000 (p < 0.001), Below\_5000 and 5000\_10000 (p < 0.001) and Below\_5000 and Above\_20000 (p < 0.001). The knowledge scores were lowest low income earners (< 5000) in comparison higher income earners (above 10000).

### Post hoc for attitude against monthly income

Call:  
 aov(formula = Attitudes\_score ~ Household\_monthly\_income, data = KAP\_data)  
  
Terms:  
 Household\_monthly\_income Residuals  
Sum of Squares 98.0854 1186.9109  
Deg. of Freedom 3 268  
  
Residual standard error: 2.104465  
Estimated effects may be unbalanced  
3 observations deleted due to missingness

Df Sum Sq Mean Sq F value Pr(>F)   
Household\_monthly\_income 3 98.1 32.70 7.382 9.04e-05 \*\*\*  
Residuals 268 1186.9 4.43   
---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
3 observations deleted due to missingness

Tukey multiple comparisons of means  
 95% family-wise confidence level  
  
Fit: aov(formula = Attitudes\_score ~ Household\_monthly\_income, data = KAP\_data)  
  
$Household\_monthly\_income  
 diff lwr upr p adj  
5000\_10000-10000\_20000 -0.1584699 -1.025586 0.70864641 0.9650693  
Above\_20000-10000\_20000 -0.5870414 -1.677900 0.50381761 0.5059384  
Below\_5000-10000\_20000 -1.5952516 -2.593030 -0.59747308 0.0002783  
Above\_20000-5000\_10000 -0.4285714 -1.414168 0.55702505 0.6749541  
Below\_5000-5000\_10000 -1.4367816 -2.318251 -0.55531183 0.0002003  
Below\_5000-Above\_20000 -1.0082102 -2.110513 0.09409265 0.0865268



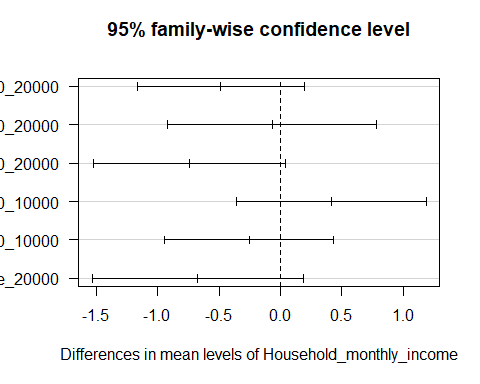
The significant difference in attitude was observed between Below\_5000 earners and 5000 to 10000 earners (p < 0.01)

### Post hoc for practices against monthly income

Call:  
 aov(formula = Practices\_score ~ Household\_monthly\_income, data = KAP\_data)  
  
Terms:  
 Household\_monthly\_income Residuals  
Sum of Squares 21.5636 727.4033  
Deg. of Freedom 3 268  
  
Residual standard error: 1.64748  
Estimated effects may be unbalanced  
3 observations deleted due to missingness

Df Sum Sq Mean Sq F value Pr(>F)   
Household\_monthly\_income 3 21.6 7.188 2.648 0.0494 \*  
Residuals 268 727.4 2.714   
---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
3 observations deleted due to missingness

Tukey multiple comparisons of means  
 95% family-wise confidence level  
  
Fit: aov(formula = Practices\_score ~ Household\_monthly\_income, data = KAP\_data)  
  
$Household\_monthly\_income  
 diff lwr upr p adj  
5000\_10000-10000\_20000 -0.48515729 -1.1639794 0.19366478 0.2534538  
Above\_20000-10000\_20000 -0.06752537 -0.9215044 0.78645362 0.9969717  
Below\_5000-10000\_20000 -0.73911815 -1.5202291 0.04199276 0.0710578  
Above\_20000-5000\_10000 0.41763192 -0.3539423 1.18920615 0.5008703  
Below\_5000-5000\_10000 -0.25396086 -0.9440195 0.43609779 0.7770158  
Below\_5000-Above\_20000 -0.67159278 -1.5345306 0.19134503 0.1861042



The post hoc analysis between monthly income and practices did not register significant differences at any level.

### KAP Scores Vs Years of Farming

Table 8: KAP Score Vs Farming Years

| **Characteristic** | **1-5 Years**, N = 92 | **11-20 Years**, N = 65 | **6-10 Years**, N = 76 | **Above 20 Years**, N = 42 | **p-value** |
| --- | --- | --- | --- | --- | --- |
| Knowledge\_score | 6.52 (2.29) | 6.78 (1.95) | 6.67 (2.15) | 6.43 (2.00) | 0.8 |
| Attitudes\_score | 3.04 (2.22) | 2.89 (2.28) | 3.25 (2.11) | 2.71 (2.03) | 0.6 |
| Practices\_score | 2.79 (1.56) | 3.00 (1.59) | 3.20 (1.77) | 3.29 (1.85) | 0.3 |

[Table 8](#tbl-KAPFY) shows that number of years in farming did not have significant influence on knowledge, practices and attitudes towards biologicals

### KAP vs agricultural role

Table 9: KAP scores vs Agricultural Role

| **Characteristic** | **exportation**, N = 2 | **exportation farming**, N = 5 | **exportation farming market\_gardening**, N = 1 | **exportation market\_gardening**, N = 6 | **exportation market\_gardening farming**, N = 1 | **farming**, N = 32 | **farming exportation**, N = 1 | **farming market\_gardening**, N = 59 | **farming market\_gardening exportation**, N = 1 | **input\_supply farming**, N = 1 | **market\_gardening**, N = 153 | **market\_gardening farming**, N = 9 | **market\_gardening input\_supply**, N = 3 | **market\_gardening processing**, N = 1 | **p-value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Knowledge\_score | 4.50 (2.12) | 6.80 (1.64) | 8.00 (NA) | 6.50 (1.05) | 7.00 (NA) | 5.19 (2.40) | 7.00 (NA) | 7.41 (1.82) | 9.00 (NA) | 7.00 (NA) | 6.50 (2.06) | 7.44 (2.13) | 7.33 (3.06) | 11.00 (NA) | 0.001 |
| Attitudes\_score | 2.50 (3.54) | 3.40 (1.67) | 2.00 (NA) | 1.50 (2.35) | 4.00 (NA) | 3.09 (2.31) | 3.00 (NA) | 2.37 (1.88) | 4.00 (NA) | 3.00 (NA) | 3.24 (2.25) | 3.56 (1.74) | 3.33 (3.06) | 6.00 (NA) | 0.4 |
| Practices\_score | 3.00 (1.41) | 2.80 (1.30) | 2.00 (NA) | 2.00 (0.00) | 2.00 (NA) | 3.00 (1.95) | 2.00 (NA) | 2.64 (1.31) | 3.00 (NA) | 2.00 (NA) | 3.20 (1.74) | 3.11 (1.69) | 4.67 (2.31) | 7.00 (NA) | 0.2 |

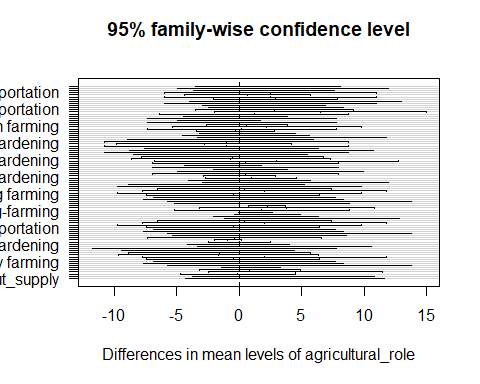
Agricultural of the respondent had a statistically significant influence on knowledge on biologicals (p = 0.01), while attitudes (p = 0.4) and practices (p = 0.2) did not have scores that were statistically significant across different agricultural roles. Therefore a post analysis was necessary for knowledge versus agricultural role.

#### Post hoc analysis for knoledge vs agricultural role

Call:  
 aov(formula = Knowledge\_score ~ agricultural\_role, data = KAP\_data)  
  
Terms:  
 agricultural\_role Residuals  
Sum of Squares 148.3177 1089.0495  
Deg. of Freedom 13 261  
  
Residual standard error: 2.042695  
Estimated effects may be unbalanced

Df Sum Sq Mean Sq F value Pr(>F)   
agricultural\_role 13 148.3 11.409 2.734 0.0012 \*\*  
Residuals 261 1089.0 4.173   
---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Tukey multiple comparisons of means  
 95% family-wise confidence level  
  
Fit: aov(formula = Knowledge\_score ~ agricultural\_role, data = KAP\_data)  
  
$agricultural\_role  
 diff  
exportation farming-exportation 2.300000e+00  
exportation farming market\_gardening-exportation 3.500000e+00  
exportation market\_gardening-exportation 2.000000e+00  
exportation market\_gardening farming-exportation 2.500000e+00  
farming-exportation 6.875000e-01  
farming exportation-exportation 2.500000e+00  
farming market\_gardening-exportation 2.906780e+00  
farming market\_gardening exportation-exportation 4.500000e+00  
input\_supply farming-exportation 2.500000e+00  
market\_gardening-exportation 2.003268e+00  
market\_gardening farming-exportation 2.944444e+00  
market\_gardening input\_supply-exportation 2.833333e+00  
market\_gardening processing-exportation 6.500000e+00  
exportation farming market\_gardening-exportation farming 1.200000e+00  
exportation market\_gardening-exportation farming -3.000000e-01  
exportation market\_gardening farming-exportation farming 2.000000e-01  
farming-exportation farming -1.612500e+00  
farming exportation-exportation farming 2.000000e-01  
farming market\_gardening-exportation farming 6.067797e-01  
farming market\_gardening exportation-exportation farming 2.200000e+00  
input\_supply farming-exportation farming 2.000000e-01  
market\_gardening-exportation farming -2.967320e-01  
market\_gardening farming-exportation farming 6.444444e-01  
market\_gardening input\_supply-exportation farming 5.333333e-01  
market\_gardening processing-exportation farming 4.200000e+00  
exportation market\_gardening-exportation farming market\_gardening -1.500000e+00  
exportation market\_gardening farming-exportation farming market\_gardening -1.000000e+00  
farming-exportation farming market\_gardening -2.812500e+00  
farming exportation-exportation farming market\_gardening -1.000000e+00  
farming market\_gardening-exportation farming market\_gardening -5.932203e-01  
farming market\_gardening exportation-exportation farming market\_gardening 1.000000e+00  
input\_supply farming-exportation farming market\_gardening -1.000000e+00  
market\_gardening-exportation farming market\_gardening -1.496732e+00  
market\_gardening farming-exportation farming market\_gardening -5.555556e-01  
market\_gardening input\_supply-exportation farming market\_gardening -6.666667e-01  
market\_gardening processing-exportation farming market\_gardening 3.000000e+00  
exportation market\_gardening farming-exportation market\_gardening 5.000000e-01  
farming-exportation market\_gardening -1.312500e+00  
farming exportation-exportation market\_gardening 5.000000e-01  
farming market\_gardening-exportation market\_gardening 9.067797e-01  
farming market\_gardening exportation-exportation market\_gardening 2.500000e+00  
input\_supply farming-exportation market\_gardening 5.000000e-01  
market\_gardening-exportation market\_gardening 3.267974e-03  
market\_gardening farming-exportation market\_gardening 9.444444e-01  
market\_gardening input\_supply-exportation market\_gardening 8.333333e-01  
market\_gardening processing-exportation market\_gardening 4.500000e+00  
farming-exportation market\_gardening farming -1.812500e+00  
farming exportation-exportation market\_gardening farming 2.575717e-14  
farming market\_gardening-exportation market\_gardening farming 4.067797e-01  
farming market\_gardening exportation-exportation market\_gardening farming 2.000000e+00  
input\_supply farming-exportation market\_gardening farming 8.881784e-16  
market\_gardening-exportation market\_gardening farming -4.967320e-01  
market\_gardening farming-exportation market\_gardening farming 4.444444e-01  
market\_gardening input\_supply-exportation market\_gardening farming 3.333333e-01  
market\_gardening processing-exportation market\_gardening farming 4.000000e+00  
farming exportation-farming 1.812500e+00  
farming market\_gardening-farming 2.219280e+00  
farming market\_gardening exportation-farming 3.812500e+00  
input\_supply farming-farming 1.812500e+00  
market\_gardening-farming 1.315768e+00  
market\_gardening farming-farming 2.256944e+00  
market\_gardening input\_supply-farming 2.145833e+00  
market\_gardening processing-farming 5.812500e+00  
farming market\_gardening-farming exportation 4.067797e-01  
farming market\_gardening exportation-farming exportation 2.000000e+00  
input\_supply farming-farming exportation -2.486900e-14  
market\_gardening-farming exportation -4.967320e-01  
market\_gardening farming-farming exportation 4.444444e-01  
market\_gardening input\_supply-farming exportation 3.333333e-01  
market\_gardening processing-farming exportation 4.000000e+00  
farming market\_gardening exportation-farming market\_gardening 1.593220e+00  
input\_supply farming-farming market\_gardening -4.067797e-01  
market\_gardening-farming market\_gardening -9.035117e-01  
market\_gardening farming-farming market\_gardening 3.766478e-02  
market\_gardening input\_supply-farming market\_gardening -7.344633e-02  
market\_gardening processing-farming market\_gardening 3.593220e+00  
input\_supply farming-farming market\_gardening exportation -2.000000e+00  
market\_gardening-farming market\_gardening exportation -2.496732e+00  
market\_gardening farming-farming market\_gardening exportation -1.555556e+00  
market\_gardening input\_supply-farming market\_gardening exportation -1.666667e+00  
market\_gardening processing-farming market\_gardening exportation 2.000000e+00  
market\_gardening-input\_supply farming -4.967320e-01  
market\_gardening farming-input\_supply farming 4.444444e-01  
market\_gardening input\_supply-input\_supply farming 3.333333e-01  
market\_gardening processing-input\_supply farming 4.000000e+00  
market\_gardening farming-market\_gardening 9.411765e-01  
market\_gardening input\_supply-market\_gardening 8.300654e-01  
market\_gardening processing-market\_gardening 4.496732e+00  
market\_gardening input\_supply-market\_gardening farming -1.111111e-01  
market\_gardening processing-market\_gardening farming 3.555556e+00  
market\_gardening processing-market\_gardening input\_supply 3.666667e+00  
 lwr  
exportation farming-exportation -3.4863336  
exportation farming market\_gardening-exportation -4.9703251  
exportation market\_gardening-exportation -3.6468834  
exportation market\_gardening farming-exportation -5.9703251  
farming-exportation -4.3533517  
farming exportation-exportation -5.9703251  
farming market\_gardening-exportation -2.0657613  
farming market\_gardening exportation-exportation -3.9703251  
input\_supply farming-exportation -5.9703251  
market\_gardening-exportation -2.9189358  
market\_gardening farming-exportation -2.4620348  
market\_gardening input\_supply-exportation -3.4800743  
market\_gardening processing-exportation -1.9703251  
exportation farming market\_gardening-exportation farming -6.3760891  
exportation market\_gardening-exportation farming -4.4878408  
exportation market\_gardening farming-exportation farming -7.3760891  
farming-exportation farming -4.9382938  
farming exportation-exportation farming -7.3760891  
farming market\_gardening-exportation farming -2.6145371  
farming market\_gardening exportation-exportation farming -5.3760891  
input\_supply farming-exportation farming -7.3760891  
market\_gardening-exportation farming -3.4397892  
market\_gardening farming-exportation farming -3.2131113  
market\_gardening input\_supply-exportation farming -4.5173927  
market\_gardening processing-exportation farming -3.3760891  
exportation market\_gardening-exportation farming market\_gardening -8.9701246  
exportation market\_gardening farming-exportation farming market\_gardening -10.7806890  
farming-exportation farming market\_gardening -9.8357226  
farming exportation-exportation farming market\_gardening -10.7806890  
farming market\_gardening-exportation farming market\_gardening -7.5675757  
farming market\_gardening exportation-exportation farming market\_gardening -8.7806890  
input\_supply farming-exportation farming market\_gardening -10.7806890  
market\_gardening-exportation farming market\_gardening -8.4352880  
market\_gardening farming-exportation farming market\_gardening -7.8456507  
market\_gardening input\_supply-exportation farming market\_gardening -8.6525658  
market\_gardening processing-exportation farming market\_gardening -6.7806890  
exportation market\_gardening farming-exportation market\_gardening -6.9701246  
farming-exportation market\_gardening -4.3892743  
farming exportation-exportation market\_gardening -6.9701246  
farming market\_gardening-exportation market\_gardening -2.0567515  
farming market\_gardening exportation-exportation market\_gardening -4.9701246  
input\_supply farming-exportation market\_gardening -6.9701246  
market\_gardening-exportation market\_gardening -2.8750030  
market\_gardening farming-exportation market\_gardening -2.7006031  
market\_gardening input\_supply-exportation market\_gardening -4.0570112  
market\_gardening processing-exportation market\_gardening -2.9701246  
farming-exportation market\_gardening farming -8.8357226  
farming exportation-exportation market\_gardening farming -9.7806890  
farming market\_gardening-exportation market\_gardening farming -6.5675757  
farming market\_gardening exportation-exportation market\_gardening farming -7.7806890  
input\_supply farming-exportation market\_gardening farming -9.7806890  
market\_gardening-exportation market\_gardening farming -7.4352880  
market\_gardening farming-exportation market\_gardening farming -6.8456507  
market\_gardening input\_supply-exportation market\_gardening farming -7.6525658  
market\_gardening processing-exportation market\_gardening farming -5.7806890  
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farming market\_gardening-farming 0.7009218  
farming market\_gardening exportation-farming -3.2107226  
input\_supply farming-farming -5.2107226  
market\_gardening-farming -0.0286045  
market\_gardening farming-farming -0.3525125  
market\_gardening input\_supply-farming -2.0300933  
market\_gardening processing-farming -1.2107226  
farming market\_gardening-farming exportation -6.5675757  
farming market\_gardening exportation-farming exportation -7.7806890  
input\_supply farming-farming exportation -9.7806890  
market\_gardening-farming exportation -7.4352880  
market\_gardening farming-farming exportation -6.8456507  
market\_gardening input\_supply-farming exportation -7.6525658  
market\_gardening processing-farming exportation -5.7806890  
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input\_supply farming-farming market\_gardening -7.3811350  
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market\_gardening farming-farming market\_gardening -2.4372580  
market\_gardening input\_supply-farming market\_gardening -4.1666529  
market\_gardening processing-farming market\_gardening -3.3811350  
input\_supply farming-farming market\_gardening exportation -11.7806890  
market\_gardening-farming market\_gardening exportation -9.4352880  
market\_gardening farming-farming market\_gardening exportation -8.8456507  
market\_gardening input\_supply-farming market\_gardening exportation -9.6525658  
market\_gardening processing-farming market\_gardening exportation -7.7806890  
market\_gardening-input\_supply farming -7.4352880  
market\_gardening farming-input\_supply farming -6.8456507  
market\_gardening input\_supply-input\_supply farming -7.6525658  
market\_gardening processing-input\_supply farming -5.7806890  
market\_gardening farming-market\_gardening -1.4309890  
market\_gardening input\_supply-market\_gardening -3.2018407  
market\_gardening processing-market\_gardening -2.4418240  
market\_gardening input\_supply-market\_gardening farming -4.7217721  
market\_gardening processing-market\_gardening farming -3.7345396  
market\_gardening processing-market\_gardening input\_supply -4.3192325  
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exportation farming-exportation 8.0863336  
exportation farming market\_gardening-exportation 11.9703251  
exportation market\_gardening-exportation 7.6468834  
exportation market\_gardening farming-exportation 10.9703251  
farming-exportation 5.7283517  
farming exportation-exportation 10.9703251  
farming market\_gardening-exportation 7.8793206  
farming market\_gardening exportation-exportation 12.9703251  
input\_supply farming-exportation 10.9703251  
market\_gardening-exportation 6.9254717  
market\_gardening farming-exportation 8.3509237  
market\_gardening input\_supply-exportation 9.1467409  
market\_gardening processing-exportation 14.9703251  
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exportation market\_gardening-exportation farming 3.8878408  
exportation market\_gardening farming-exportation farming 7.7760891  
farming-exportation farming 1.7132938  
farming exportation-exportation farming 7.7760891  
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farming market\_gardening exportation-exportation farming 9.7760891  
input\_supply farming-exportation farming 7.7760891  
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market\_gardening farming-exportation farming 4.5020002  
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market\_gardening processing-exportation farming 11.7760891  
exportation market\_gardening-exportation farming market\_gardening 5.9701246  
exportation market\_gardening farming-exportation farming market\_gardening 8.7806890  
farming-exportation farming market\_gardening 4.2107226  
farming exportation-exportation farming market\_gardening 8.7806890  
farming market\_gardening-exportation farming market\_gardening 6.3811350  
farming market\_gardening exportation-exportation farming market\_gardening 10.7806890  
input\_supply farming-exportation farming market\_gardening 8.7806890  
market\_gardening-exportation farming market\_gardening 5.4418240  
market\_gardening farming-exportation farming market\_gardening 6.7345396  
market\_gardening input\_supply-exportation farming market\_gardening 7.3192325  
market\_gardening processing-exportation farming market\_gardening 12.7806890  
exportation market\_gardening farming-exportation market\_gardening 7.9701246  
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farming market\_gardening-exportation market\_gardening 3.8703108  
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input\_supply farming-exportation market\_gardening 7.9701246  
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farming exportation-exportation market\_gardening farming 9.7806890  
farming market\_gardening-exportation market\_gardening farming 7.3811350  
farming market\_gardening exportation-exportation market\_gardening farming 11.7806890  
input\_supply farming-exportation market\_gardening farming 9.7806890  
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market\_gardening input\_supply-exportation market\_gardening farming 8.3192325  
market\_gardening processing-exportation market\_gardening farming 13.7806890  
farming exportation-farming 8.8357226  
farming market\_gardening-farming 3.7376376  
farming market\_gardening exportation-farming 10.8357226  
input\_supply farming-farming 8.8357226  
market\_gardening-farming 2.6601404  
market\_gardening farming-farming 4.8664014  
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farming market\_gardening exportation-farming exportation 11.7806890  
input\_supply farming-farming exportation 9.7806890  
market\_gardening-farming exportation 6.4418240  
market\_gardening farming-farming exportation 7.7345396  
market\_gardening input\_supply-farming exportation 8.3192325  
market\_gardening processing-farming exportation 13.7806890  
farming market\_gardening exportation-farming market\_gardening 8.5675757  
input\_supply farming-farming market\_gardening 6.5675757  
market\_gardening-farming market\_gardening 0.1563536  
market\_gardening farming-farming market\_gardening 2.5125875  
market\_gardening input\_supply-farming market\_gardening 4.0197603  
market\_gardening processing-farming market\_gardening 10.5675757  
input\_supply farming-farming market\_gardening exportation 7.7806890  
market\_gardening-farming market\_gardening exportation 4.4418240  
market\_gardening farming-farming market\_gardening exportation 5.7345396  
market\_gardening input\_supply-farming market\_gardening exportation 6.3192325  
market\_gardening processing-farming market\_gardening exportation 11.7806890  
market\_gardening-input\_supply farming 6.4418240  
market\_gardening farming-input\_supply farming 7.7345396  
market\_gardening input\_supply-input\_supply farming 8.3192325  
market\_gardening processing-input\_supply farming 13.7806890  
market\_gardening farming-market\_gardening 3.3133420  
market\_gardening input\_supply-market\_gardening 4.8619715  
market\_gardening processing-market\_gardening 11.4352880  
market\_gardening input\_supply-market\_gardening farming 4.4995499  
market\_gardening processing-market\_gardening farming 10.8456507  
market\_gardening processing-market\_gardening input\_supply 11.6525658  
 p adj  
exportation farming-exportation 0.9867484  
exportation farming market\_gardening-exportation 0.9813857  
exportation market\_gardening-exportation 0.9954610  
exportation market\_gardening farming-exportation 0.9992863  
farming-exportation 0.9999999  
farming exportation-exportation 0.9992863  
farming market\_gardening-exportation 0.7792608  
farming market\_gardening exportation-exportation 0.8750017  
input\_supply farming-exportation 0.9992863  
market\_gardening-exportation 0.9836813  
market\_gardening farming-exportation 0.8538183  
market\_gardening input\_supply-exportation 0.9630551  
market\_gardening processing-exportation 0.3467965  
exportation farming market\_gardening-exportation farming 0.9999995  
exportation market\_gardening-exportation farming 1.0000000  
exportation market\_gardening farming-exportation farming 1.0000000  
farming-exportation farming 0.9333165  
farming exportation-exportation farming 1.0000000  
farming market\_gardening-exportation farming 0.9999957  
farming market\_gardening exportation-exportation farming 0.9993996  
input\_supply farming-exportation farming 1.0000000  
market\_gardening-exportation farming 1.0000000  
market\_gardening farming-exportation farming 0.9999990  
market\_gardening input\_supply-exportation farming 1.0000000  
market\_gardening processing-exportation farming 0.8371017  
exportation market\_gardening-exportation farming market\_gardening 0.9999908  
exportation market\_gardening farming-exportation farming market\_gardening 1.0000000  
farming-exportation farming market\_gardening 0.9858437  
farming exportation-exportation farming market\_gardening 1.0000000  
farming market\_gardening-exportation farming market\_gardening 1.0000000  
farming market\_gardening exportation-exportation farming market\_gardening 1.0000000  
input\_supply farming-exportation farming market\_gardening 1.0000000  
market\_gardening-exportation farming market\_gardening 0.9999786  
market\_gardening farming-exportation farming market\_gardening 1.0000000  
market\_gardening input\_supply-exportation farming market\_gardening 1.0000000  
market\_gardening processing-exportation farming market\_gardening 0.9989306  
exportation market\_gardening farming-exportation market\_gardening 1.0000000  
farming-exportation market\_gardening 0.9755971  
farming exportation-exportation market\_gardening 1.0000000  
farming market\_gardening-exportation market\_gardening 0.9989574  
farming market\_gardening exportation-exportation market\_gardening 0.9973974  
input\_supply farming-exportation market\_gardening 1.0000000  
market\_gardening-exportation market\_gardening 1.0000000  
market\_gardening farming-exportation market\_gardening 0.9998266  
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market\_gardening processing-exportation market\_gardening 0.7412006  
farming-exportation market\_gardening farming 0.9998342  
farming exportation-exportation market\_gardening farming 1.0000000  
farming market\_gardening-exportation market\_gardening farming 1.0000000  
farming market\_gardening exportation-exportation market\_gardening farming 0.9999886  
input\_supply farming-exportation market\_gardening farming 1.0000000  
market\_gardening-exportation market\_gardening farming 1.0000000  
market\_gardening farming-exportation market\_gardening farming 1.0000000  
market\_gardening input\_supply-exportation market\_gardening farming 1.0000000  
market\_gardening processing-exportation market\_gardening farming 0.9829752  
farming exportation-farming 0.9998342  
farming market\_gardening-farming 0.0001157  
farming market\_gardening exportation-farming 0.8567430  
input\_supply farming-farming 0.9998342  
market\_gardening-farming 0.0619527  
market\_gardening farming-farming 0.1725621  
market\_gardening input\_supply-farming 0.8996610  
market\_gardening processing-farming 0.2300793  
farming market\_gardening-farming exportation 1.0000000  
farming market\_gardening exportation-farming exportation 0.9999886  
input\_supply farming-farming exportation 1.0000000  
market\_gardening-farming exportation 1.0000000  
market\_gardening farming-farming exportation 1.0000000  
market\_gardening input\_supply-farming exportation 1.0000000  
market\_gardening processing-farming exportation 0.9829752  
farming market\_gardening exportation-farming market\_gardening 0.9999583  
input\_supply farming-farming market\_gardening 1.0000000  
market\_gardening-farming market\_gardening 0.1904532  
market\_gardening farming-farming market\_gardening 1.0000000  
market\_gardening input\_supply-farming market\_gardening 1.0000000  
market\_gardening processing-farming market\_gardening 0.8978741  
input\_supply farming-farming market\_gardening exportation 0.9999886  
market\_gardening-farming market\_gardening exportation 0.9947150  
market\_gardening farming-farming market\_gardening exportation 0.9999811  
market\_gardening input\_supply-farming market\_gardening exportation 0.9999854  
market\_gardening processing-farming market\_gardening exportation 0.9999886  
market\_gardening-input\_supply farming 1.0000000  
market\_gardening farming-input\_supply farming 1.0000000  
market\_gardening input\_supply-input\_supply farming 1.0000000  
market\_gardening processing-input\_supply farming 0.9829752  
market\_gardening farming-market\_gardening 0.9869636  
market\_gardening input\_supply-market\_gardening 0.9999876  
market\_gardening processing-market\_gardening 0.6340895  
market\_gardening input\_supply-market\_gardening farming 1.0000000  
market\_gardening processing-market\_gardening farming 0.9303841  
market\_gardening processing-market\_gardening input\_supply 0.9557800



The post hoc analysis indicated that individuals exporting their produce had significantly higher knowledge compared to other actors ### KAP Vs Land ownership

Table 10: KAP Scores Versus land ownership

| **Characteristic** | **family\_land**, N = 99 | **hire**, N = 71 | **hire family\_land**, N = 2 | **hire owned**, N = 2 | **owned**, N = 96 | **owned family\_land**, N = 3 | **owned hire**, N = 1 | **owned hire family\_land**, N = 1 | **p-value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Knowledge\_score | 6.74 (2.21) | 6.55 (2.18) | 10.00 (0.00) | 6.00 (1.41) | 6.44 (2.00) | 6.67 (2.08) | 9.00 (NA) | 7.00 (NA) | 0.4 |
| Attitudes\_score | 3.11 (2.15) | 2.90 (2.16) | 4.00 (1.41) | 4.00 (1.41) | 2.90 (2.22) | 4.33 (3.06) | 2.00 (NA) | 6.00 (NA) | 0.7 |
| Practices\_score | 2.93 (1.62) | 2.86 (1.64) | 3.50 (2.12) | 4.50 (3.54) | 3.18 (1.70) | 2.33 (0.58) | 6.00 (NA) | 6.00 (NA) | 0.2 |

[Table 10](#tbl-KAPLO) shows that land ownership has no influence on knowledge, practices and attitudes towards biologicals.

### KAP Vs Labour Source

Table 11: KAP Score Against the source of Labour

| **Characteristic** | **family\_labour**, N = 87 | **family\_labour paid\_labour**, N = 102 | **family\_labour paid\_labour friends\_labour relative\_labour**, N = 1 | **family\_labour paid\_labour relative\_labour**, N = 3 | **family\_labour relative\_labour**, N = 3 | **paid\_labour**, N = 34 | **paid\_labour family\_labour**, N = 22 | **paid\_labour relative\_labour**, N = 2 | **p-value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Knowledge\_score | 6.06 (2.59) | 7.04 (1.88) | 8.00 (NA) | 7.00 (0.00) | 7.00 (0.00) | 6.62 (1.63) | 6.50 (2.04) | 8.00 (0.00) | 0.12 |
| Attitudes\_score | 2.94 (2.32) | 3.05 (2.03) | 6.00 (NA) | 4.33 (0.58) | 3.67 (1.53) | 2.76 (2.24) | 3.14 (2.44) | 1.00 (0.00) | 0.6 |
| Practices\_score | 2.90 (1.69) | 2.84 (1.55) | 7.00 (NA) | 2.00 (0.00) | 2.00 (0.00) | 3.29 (1.73) | 3.23 (1.97) | 2.00 (0.00) | 0.13 |

[Table 11](#tbl-KAPLS) showed that the source of labour has no influence on knowledge, practices and attitudes towards biologicals.

## KAP Vs the market of produce

Table 12: KAP Score Against the market where the produce is sold

| **Characteristic** | **export\_market**, N = 4 | **export\_market local\_market**, N = 2 | **local\_market**, N = 232 | **local\_market export\_market**, N = 17 | **p-value** |
| --- | --- | --- | --- | --- | --- |
| Knowledge\_score | 6.00 (2.16) | 7.50 (0.71) | 6.65 (2.09) | 7.53 (1.81) | 0.3 |
| Attitudes\_score | 3.00 (2.45) | 4.00 (1.41) | 2.99 (2.20) | 2.76 (1.92) | 0.9 |
| Practices\_score | 2.50 (1.00) | 3.50 (2.12) | 3.06 (1.70) | 2.71 (1.31) | 0.7 |

[Table 12](#tbl-KAPMP) showed that the market where the produce is sold has no influence on knowledge, practices and attitudes towards biologicals.

### KAP Vs organic and non-organic farmers

KAP Scores Versus whether one is an organic farmer or not

| **Characteristic** | **Dont Know**, N = 18 | **no**, N = 171 | **yes**, N = 85 | **p-value** |
| --- | --- | --- | --- | --- |
| Knowledge\_score | 5.22 (3.15) | 6.73 (2.02) | 6.68 (2.00) | 0.015 |
| Attitudes\_score | 1.39 (1.72) | 2.58 (2.17) | 4.20 (1.69) | <0.001 |
| Practices\_score | 2.00 (0.69) | 2.60 (1.29) | 4.12 (1.97) | <0.001 |

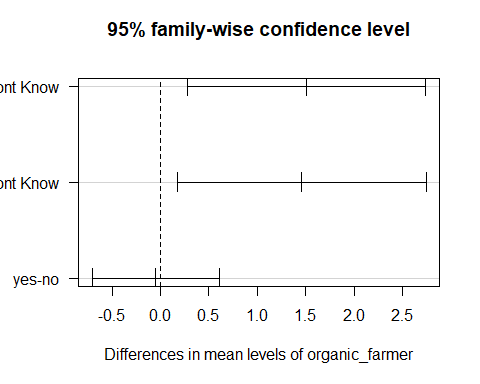
Whether an individual practices organic farming or not was statistically significant in the light of KAP Scores. Knowledge was statistically significant ( p = 0.015) as well as attitude scores (p < 0.001) and practices scores (p < 0.001). Organic farmers scored significantly higher in knowledge, attitude and practices in comparison to non organic farmers and those who did not know whether they were organic farmers or not. The differences are illustrated in the post-hoc analysis illustrated below;

### Post hoc for knowledge against organic farming

Call:  
 aov(formula = Knowledge\_score ~ organic\_farmer, data = KAP\_data)  
  
Terms:  
 organic\_farmer Residuals  
Sum of Squares 37.6024 1197.1604  
Deg. of Freedom 2 271  
  
Residual standard error: 2.101801  
Estimated effects may be unbalanced  
1 observation deleted due to missingness

Df Sum Sq Mean Sq F value Pr(>F)   
organic\_farmer 2 37.6 18.801 4.256 0.0151 \*  
Residuals 271 1197.2 4.418   
---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
1 observation deleted due to missingness

Tukey multiple comparisons of means  
 95% family-wise confidence level  
  
Fit: aov(formula = Knowledge\_score ~ organic\_farmer, data = KAP\_data)  
  
$organic\_farmer  
 diff lwr upr p adj  
no-Dont Know 1.50877193 0.2813726 2.7361712 0.0113286  
yes-Dont Know 1.46013072 0.1749560 2.7453054 0.0214059  
yes-no -0.04864121 -0.7059989 0.6087165 0.9833765

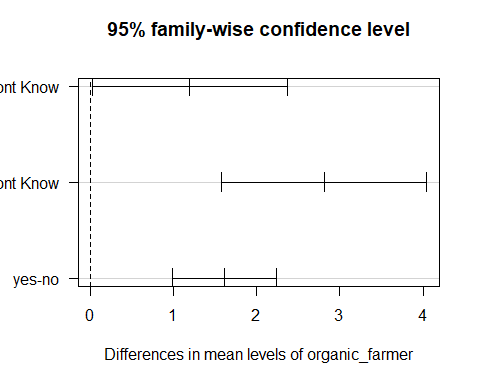


### Post hoc for attitude against mrganic farming

Call:  
 aov(formula = Attitudes\_score ~ organic\_farmer, data = KAP\_data)  
  
Terms:  
 organic\_farmer Residuals  
Sum of Squares 198.5872 1091.3982  
Deg. of Freedom 2 271  
  
Residual standard error: 2.006813  
Estimated effects may be unbalanced  
1 observation deleted due to missingness

Df Sum Sq Mean Sq F value Pr(>F)   
organic\_farmer 2 198.6 99.29 24.66 1.45e-10 \*\*\*  
Residuals 271 1091.4 4.03   
---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
1 observation deleted due to missingness

Tukey multiple comparisons of means  
 95% family-wise confidence level  
  
Fit: aov(formula = Attitudes\_score ~ organic\_farmer, data = KAP\_data)  
  
$organic\_farmer  
 diff lwr upr p adj  
no-Dont Know 1.195906 0.02397736 2.367836 0.0442938  
yes-Dont Know 2.811111 1.58401768 4.038205 0.0000004  
yes-no 1.615205 0.98755516 2.242854 0.0000000

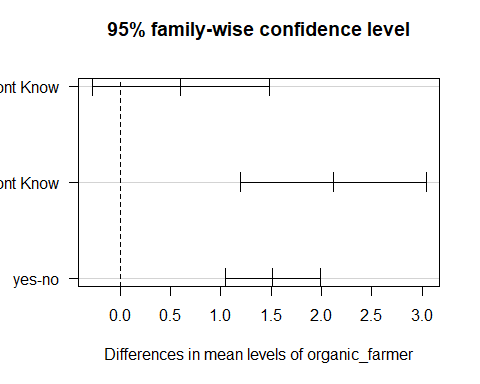


### Post hoc for practices against mrganic farming

Call:  
 aov(formula = Practices\_score ~ organic\_farmer, data = KAP\_data)  
  
Terms:  
 organic\_farmer Residuals  
Sum of Squares 150.9218 615.7826  
Deg. of Freedom 2 271  
  
Residual standard error: 1.507402  
Estimated effects may be unbalanced  
1 observation deleted due to missingness

Df Sum Sq Mean Sq F value Pr(>F)   
organic\_farmer 2 150.9 75.46 33.21 1.26e-13 \*\*\*  
Residuals 271 615.8 2.27   
---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
1 observation deleted due to missingness

Tukey multiple comparisons of means  
 95% family-wise confidence level  
  
Fit: aov(formula = Practices\_score ~ organic\_farmer, data = KAP\_data)  
  
$organic\_farmer  
 diff lwr upr p adj  
no-Dont Know 0.6023392 -0.277946 1.482624 0.2420531  
yes-Dont Know 2.1176471 1.195926 3.039369 0.0000004  
yes-no 1.5153079 1.043854 1.986762 0.0000000



## Regression Models

### Regression model for knowledge

Call:  
lm(formula = Knowledge\_score ~ Attitudes\_score + Practices\_score,   
 data = KAP\_data)  
  
Residuals:  
 Min 1Q Median 3Q Max   
-5.8183 -1.1945 0.1985 1.4526 4.4442   
  
Coefficients:  
 Estimate Std. Error t value Pr(>|t|)   
(Intercept) 5.42531 0.26286 20.640 < 2e-16 \*\*\*  
Attitudes\_score 0.32774 0.06059 5.409 1.39e-07 \*\*\*  
Practices\_score 0.06524 0.07866 0.829 0.408   
---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
  
Residual standard error: 1.991 on 272 degrees of freedom  
Multiple R-squared: 0.129, Adjusted R-squared: 0.1226   
F-statistic: 20.14 on 2 and 272 DF, p-value: 6.965e-09

# A tibble: 3 × 5  
 term estimate std.error statistic p.value  
 <chr> <dbl> <dbl> <dbl> <dbl>  
1 (Intercept) 5.43 0.263 20.6 1.34e-57  
2 Attitudes\_score 0.328 0.0606 5.41 1.39e- 7  
3 Practices\_score 0.0652 0.0787 0.829 4.08e- 1

# A tibble: 1 × 12  
 r.squ…¹ adj.r…² sigma stati…³ p.value df logLik AIC BIC devia…⁴ df.re…⁵  
 <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <int>  
1 0.129 0.123 1.99 20.1 6.97e-9 2 -578. 1164. 1178. 1078. 272  
# … with 1 more variable: nobs <int>, and abbreviated variable names  
# ¹​r.squared, ²​adj.r.squared, ³​statistic, ⁴​deviance, ⁵​df.residual

| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Attitudes\_score | 0.33 | 0.21, 0.45 | <0.001 |
| Practices\_score | 0.07 | -0.09, 0.22 | 0.4 |

Attitude contributes 33% to knowledge while practices contribute 7% to knowledge. The contribution of attitude to knowledge is statistically significant (p <0.001) while practices do not significantly contribute to knowledge (p = 0.4) ### Regression model for Attitude

Call:  
lm(formula = Attitudes\_score ~ Knowledge\_score + Practices\_score,   
 data = KAP\_data)  
  
Residuals:  
 Min 1Q Median 3Q Max   
-4.4905 -1.5492 0.1022 1.4810 4.9341   
  
Coefficients:  
 Estimate Std. Error t value Pr(>|t|)   
(Intercept) -0.33185 0.39990 -0.830 0.407   
Knowledge\_score 0.29635 0.05479 5.409 1.39e-07 \*\*\*  
Practices\_score 0.45797 0.06955 6.585 2.34e-10 \*\*\*  
---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
  
Residual standard error: 1.893 on 272 degrees of freedom  
Multiple R-squared: 0.2468, Adjusted R-squared: 0.2413   
F-statistic: 44.57 on 2 and 272 DF, p-value: < 2.2e-16

# A tibble: 3 × 5  
 term estimate std.error statistic p.value  
 <chr> <dbl> <dbl> <dbl> <dbl>  
1 (Intercept) -0.332 0.400 -0.830 4.07e- 1  
2 Knowledge\_score 0.296 0.0548 5.41 1.39e- 7  
3 Practices\_score 0.458 0.0696 6.58 2.34e-10

# A tibble: 1 × 12  
 r.squared adj.r.squa…¹ sigma stati…² p.value df logLik AIC BIC devia…³  
 <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>  
1 0.247 0.241 1.89 44.6 1.80e-17 2 -564. 1136. 1151. 975.  
# … with 2 more variables: df.residual <int>, nobs <int>, and abbreviated  
# variable names ¹​adj.r.squared, ²​statistic, ³​deviance

| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Knowledge\_score | 0.30 | 0.19, 0.40 | <0.001 |
| Practices\_score | 0.46 | 0.32, 0.59 | <0.001 |

Knowledge contributes 30% to attitudes while practices contribute 46% to attitudes. The contribution of attitude to knowledge is statistically significant (p <0.001) as wells practices significantly contribute to knowledge (p < 0.001) ### Regression model for practices

Call:  
lm(formula = Practices\_score ~ Knowledge\_score + Attitudes\_score,   
 data = KAP\_data)  
  
Residuals:  
 Min 1Q Median 3Q Max   
-2.9404 -1.0784 -0.2551 0.8802 4.0376   
  
Coefficients:  
 Estimate Std. Error t value Pr(>|t|)   
(Intercept) 1.86844 0.30375 6.151 2.74e-09 \*\*\*  
Knowledge\_score 0.03867 0.04662 0.829 0.408   
Attitudes\_score 0.30021 0.04559 6.585 2.34e-10 \*\*\*  
---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
  
Residual standard error: 1.533 on 272 degrees of freedom  
Multiple R-squared: 0.1679, Adjusted R-squared: 0.1618   
F-statistic: 27.45 on 2 and 272 DF, p-value: 1.385e-11

# A tibble: 3 × 5  
 term estimate std.error statistic p.value  
 <chr> <dbl> <dbl> <dbl> <dbl>  
1 (Intercept) 1.87 0.304 6.15 2.74e- 9  
2 Knowledge\_score 0.0387 0.0466 0.829 4.08e- 1  
3 Attitudes\_score 0.300 0.0456 6.58 2.34e-10

# A tibble: 1 × 12  
 r.squared adj.r.squa…¹ sigma stati…² p.value df logLik AIC BIC devia…³  
 <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>  
1 0.168 0.162 1.53 27.4 1.39e-11 2 -506. 1020. 1035. 639.  
# … with 2 more variables: df.residual <int>, nobs <int>, and abbreviated  
# variable names ¹​adj.r.squared, ²​statistic, ³​deviance

| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Knowledge\_score | 0.04 | -0.05, 0.13 | 0.4 |
| Attitudes\_score | 0.30 | 0.21, 0.39 | <0.001 |

Knowledge contributes 4% to practices while attitudes contribute 30% to practices. The contribution of attitude to practices is statistically significant (p <0.001) while knowledge does not significantly contribute to practices (p = 0.4)