

# KAP Farmers Inferential Statistics

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**data**

**KAP Data**

**Knowledge**

**Attitudes**

**Practices**

**Combine datasets**

**KAP Mean scores**

Table 1: 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 2: 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 2 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

Table 3: Correlation between KAP Constructs

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

Table 3 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 4: KAP Scores across counties

Characteristic	kajiado, N = 95	kiambu, N = 108	<b>machakos, N =</b> 72	<b>p-value</b>
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 4, 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 determine whether KAP mean scores are statistically significantly different in the three counties. Knowledge and attitudes are not statistically significantly 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 Machakos 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		

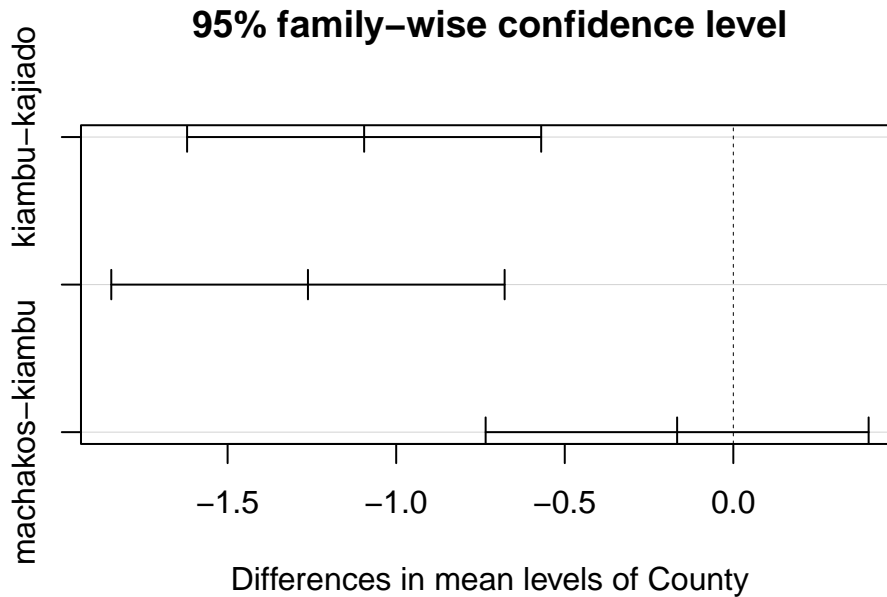
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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

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 Kimabuu had no statistically significant mean differences in practice scores. ### KAP Scores Vs Age

Table 5: 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 5 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 6: KAP scores across Education Level

Characteristic	bachelor_degree N = 12	college_above N = 41	university N = 7	schooling_higher 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 6 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		

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Tukey multiple comparisons of means  
95% family-wise confidence level

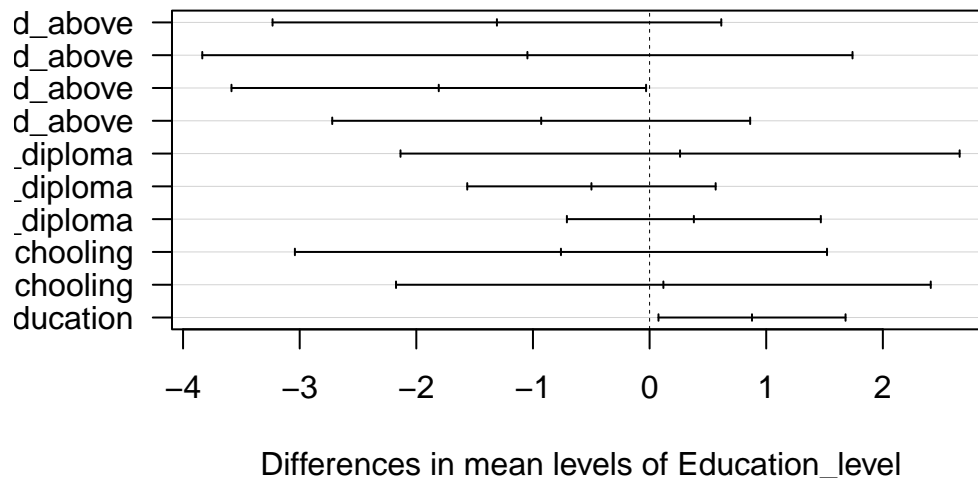
Fit: aov(formula = Attitudes\_score ~ Education\_level, data = KAP\_data)

\$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

### 95% family-wise confidence level



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		

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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)

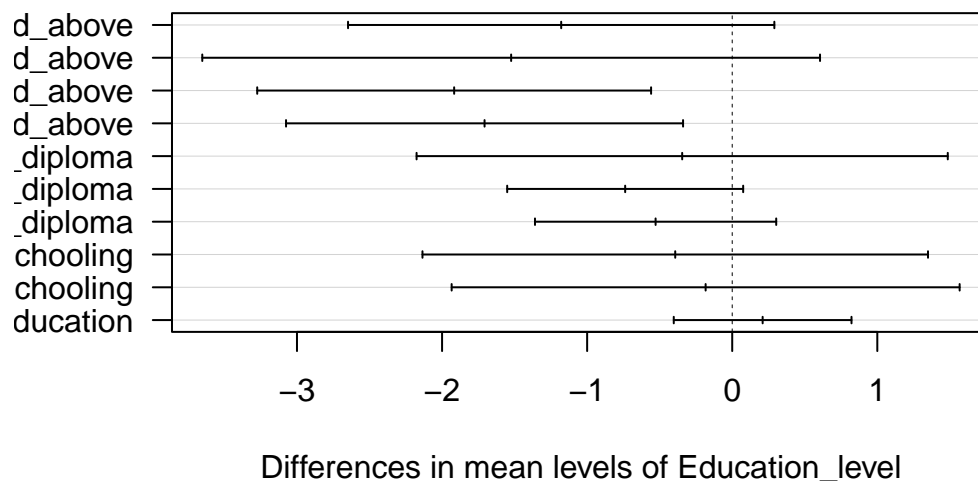
\$Education\_level

	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

### 95% family-wise confidence level



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 7: 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	5.033 (2.52)	6.54 (2.15)	7.50 (0.71)	7.10 (1.90)	6.00 (2.45)	0.4
Attitudes_score	3.633 (0.58)	2.86 (2.17)	6.50 (0.71)	3.69 (2.03)	2.91 (2.39)	0.033
Practices_score	3.633 (3.21)	2.93 (1.62)	4.00 (2.83)	3.33 (1.76)	3.73 (1.74)	0.3

As illustrated in Table 7, 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		

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

1 observation deleted due to missingness

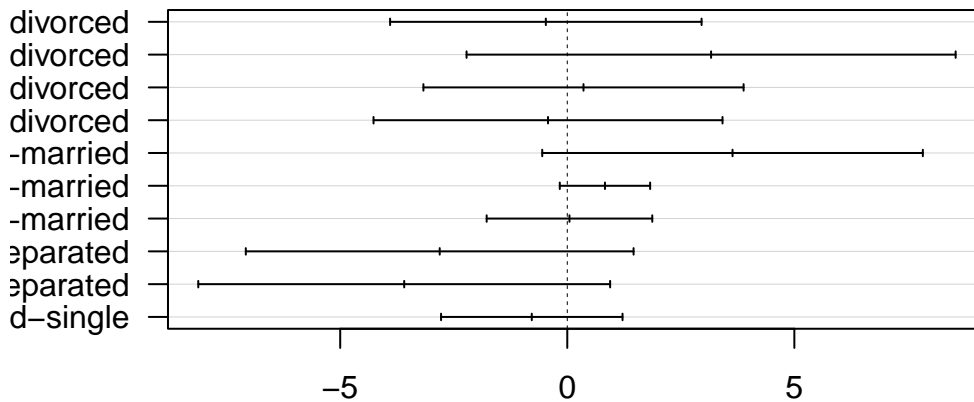
Tukey multiple comparisons of means  
95% family-wise confidence level

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

### 95% family-wise confidence level



Differences in mean levels of Marital\_status

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 8: 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 8, 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 9: 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 9 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		

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

3 observations deleted due to missingness

Tukey multiple comparisons of means

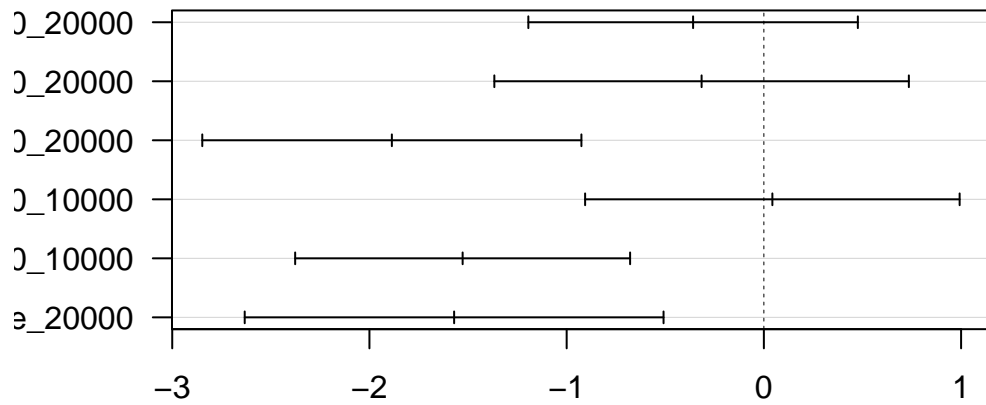
95% family-wise confidence level

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

### 95% family-wise confidence level



Differences in mean levels of Household\_monthly\_income

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		

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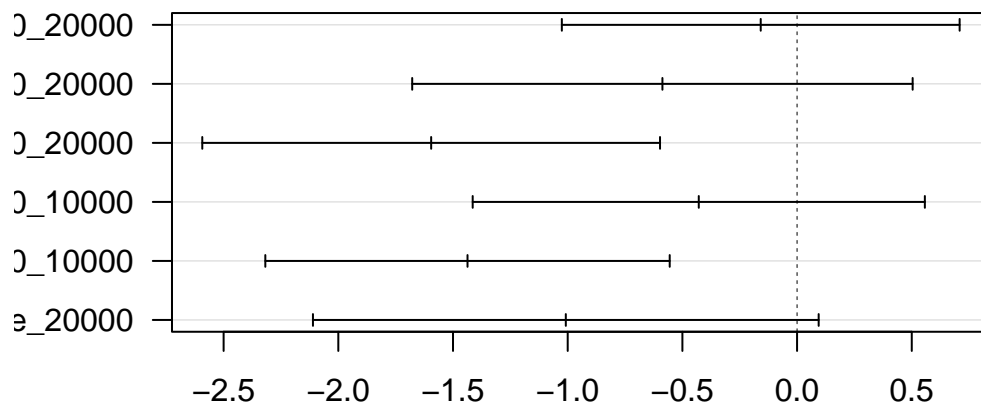
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
3 observations deleted due to missingness

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	0.7086464	0.9650693
Above_20000-10000_20000	-0.5870414	-1.677900	0.5038176	0.5059384
Below_5000-10000_20000	-1.5952516	-2.593030	-0.5974730	0.0002783
Above_20000-5000_10000	-0.4285714	-1.414168	0.5570250	0.6749541
Below_5000-5000_10000	-1.4367816	-2.318251	-0.5553183	0.0002003
Below_5000-Above_20000	-1.0082102	-2.110513	0.0940926	0.0865268

### 95% family-wise confidence level



Differences in mean levels of Household\_monthly\_income

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		

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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

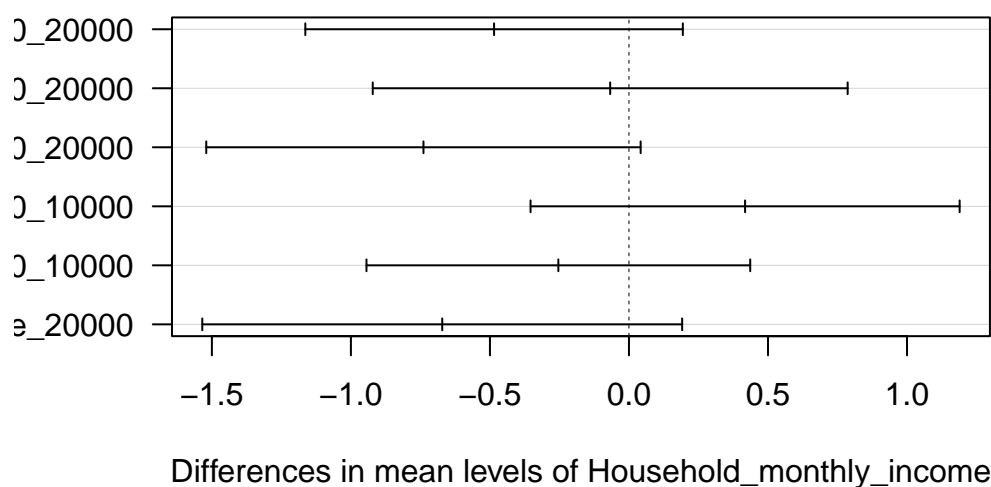
Fit: aov(formula = Practices\_score ~ Household\_monthly\_income, data = KAP\_data)

\$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



### 95% family-wise confidence level



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

### KAP Scores Vs Years of Farming

Table 10: 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	5.52 (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 10 shows that number of years in farming did not have significant influence on knowledge, practices and attitudes towards biologicals

### KAP vs agricultural role

Table 11: KAP scores vs Agricultural Role

Characteristic	farming														p-value		
	exportation				farming				market_gardening				input_supply				
	exportation		farming		exportation		farming		input_supply		market_gardening		input_supply				
	farm-ing	exportation	farm-ing	exportation	farm-ing	exportation	farm-ing	exportation	farm-ing	exportation	farm-ing	exportation	farm-ing	exportation			
	N	N	N	N	N	N	N	N	N	N	N	N	N	N			
=	=	N	=	N	=	=	=	N	=	=	=	N	N	=	N		
2	1	=	6	1	32	1	59	1	1	153	=	9	3	=	1		
Knowledge_score	15	16	8	8	00	6.50	7.00	5.19	7.00	7.41	9.00	7.00	6.50	7.44	7.33	11.00	0.001
	(2.12)	(1.64)	(NA)	(1.05)	(NA)	(2.40)	(NA)	(1.82)	(NA)	(NA)	(2.06)	(2.13)	(3.06)	(NA)			
Attitudes_score	15	16	8	8	00	1.50	4.00	3.09	3.00	2.37	4.00	3.00	3.24	3.56	3.33	6.00	0.4
	(3.54)	(1.67)	(NA)	(2.35)	(NA)	(2.31)	(NA)	(1.88)	(NA)	(NA)	(2.25)	(1.74)	(3.06)	(NA)			
Practices_score	16	16	8	8	00	2.00	2.00	3.00	2.00	2.64	3.00	2.00	3.20	3.11	4.67	7.00	0.2
	(1.41)	(1.30)	(NA)	(0.00)	(NA)	(1.95)	(NA)	(1.31)	(NA)	(NA)	(1.74)	(1.69)	(2.31)	(NA)			

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
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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
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market_gardening farming-exportation market_gardening	-2.7006031
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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
farming exportation-farming	-5.2107226
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
farming market_gardening exportation-farming market_gardening	-5.3811350
input_supply farming-farming market_gardening	-7.3811350
market_gardening-farming market_gardening	-1.9633770

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
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exportation market_gardening farming-exportation	10.9703251
farming-exportation	5.7283517
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farming market_gardening-exportation	7.8793206
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market_gardening input_supply-exportation	9.1467409
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exportation farming market_gardening-exportation farming	8.7760891
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
farming market_gardening-exportation farming	3.8280964
farming market_gardening exportation-exportation farming	9.7760891
input_supply farming-exportation farming	7.7760891
market_gardening-exportation farming	2.8463251
market_gardening farming-exportation farming	4.5020002
market_gardening input_supply-exportation farming	5.5840594

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
farming-exportation market_gardening	1.7642743
farming exportation-exportation market_gardening	7.9701246
farming market_gardening-exportation market_gardening	3.8703108
farming market_gardening exportation-exportation market_gardening	9.9701246
input_supply farming-exportation market_gardening	7.9701246
market_gardening-exportation market_gardening	2.8815389
market_gardening farming-exportation market_gardening	4.5894920
market_gardening input_supply-exportation market_gardening	5.7236778
market_gardening processing-exportation market_gardening	11.9701246
farming-exportation market_gardening farming	5.2107226
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
market_gardening-exportation market_gardening farming	6.4418240
market_gardening farming-exportation market_gardening farming	7.7345396
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
market_gardening input_supply-farming	6.3217599
market_gardening processing-farming	12.8357226
farming market_gardening-farming exportation	7.3811350
farming market_gardening exportation-farming exportation	11.7806890
input_supply farming-farming exportation	9.7806890
market_gardening-farming exportation	6.4418240

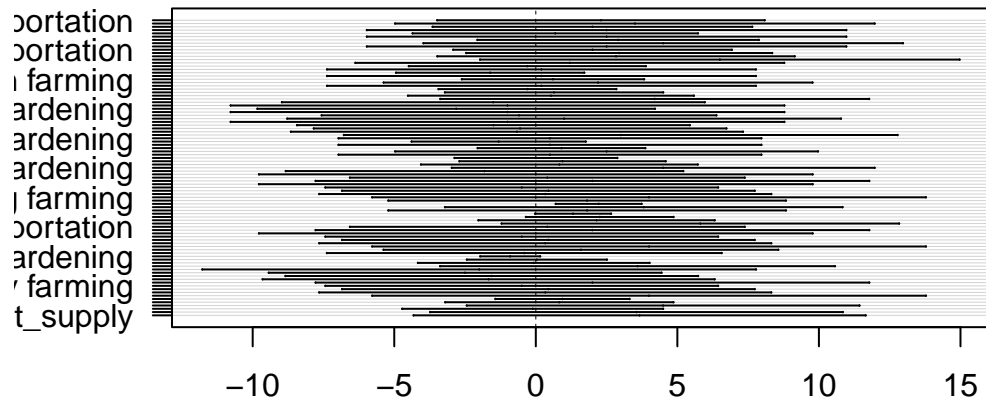


market_gardening farming-farming exportation	7.7345396
market_gardening input_supply-farming exportation	8.3192325
market_gardening processing-farming exportation	13.7806890
farming market_gardening exportation-farming market_gardening	8.5675757
input_supply farming-farming market_gardening	6.5675757
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
market_gardening input_supply-exportation market_gardening	0.9999987
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

**95% family-wise confidence level**



Differences in mean levels of agricultural\_role

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

Table 12: KAP Scores Versus land ownership

Characteristic	N = 71	hire	hire	hire	owned	owned	owned	p-value	
		family_land,	fam-ily_land,	owned,	fam-ily_land,	hire,	fam-ily_land,		
Knowledge_score	6.54 (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	3.10 (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 12 shows that land ownership has no influence on knowledge, practices and attitudes towards biologicals.

## KAP Vs Labour Source

Table 13: KAP Score Against the source of Labour

Characteristic								
	family_labour				paid_labour			
	family_labour	paid_labour	family_labour	paid_labour	family_labour	paid_labour	family_labour	paid_labour
	N = 102	N = 102	rela- tive_labour, N = 1	rela- tive_labour, N = 3	rela- tive_labour, N = 3	paid_labour, N = 34	paid_labour, N = 22	paid_labour, N = 2
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)
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)
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)
								value

Table 13 showed that the source of labour has no influence on knowledge, practices and attitudes towards biologicals.

### KAP Vs the market of produce

Table 14: KAP Score Against the market where the produce is sold

Characteristic	export_market		local_market		p-value
	export_market, N = 4	local_market, N = 2	local_market, N = 232	export_market, N = 17	
Knowledge_score	6.06 (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 14 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

Table 15: KAP Scores Versus whether one is an organic farmer or not

Characteristic	Dont Know, N =		yes, N = 85	p-value
	18	no, N = 171		
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

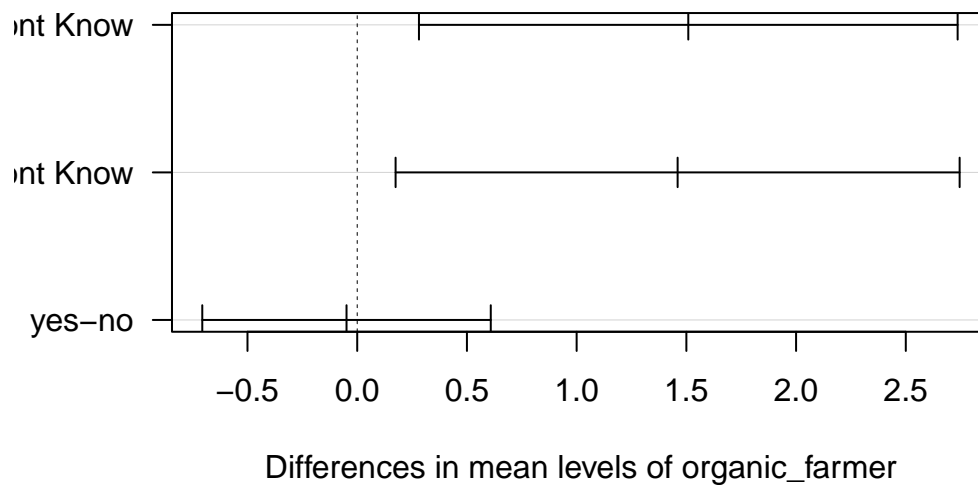
Tukey multiple comparisons of means

95% family-wise confidence level

Fit: aov(formula = Knowledge\_score ~ organic\_farmer, data = KAP\_data)

		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

### 95% family-wise confidence level



### 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
```

---

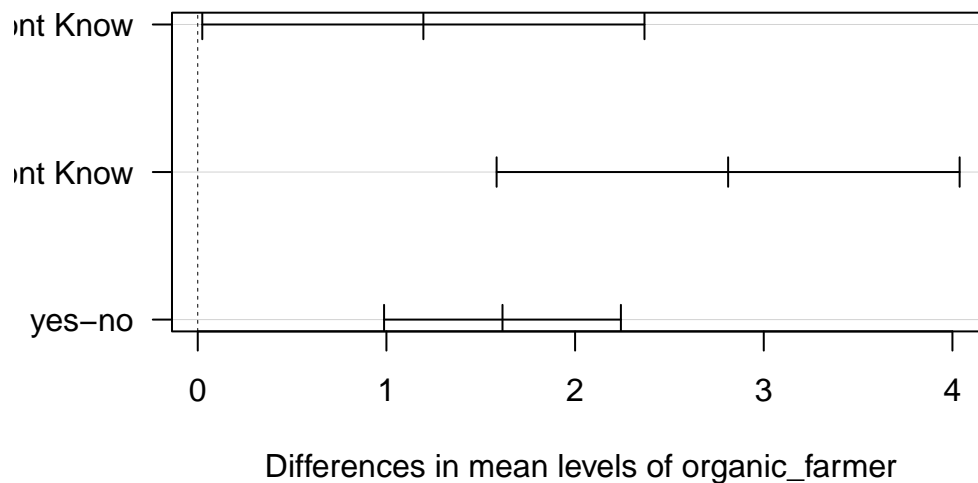
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
1 observation deleted due to missingness

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
```

### 95% family-wise confidence level



### 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

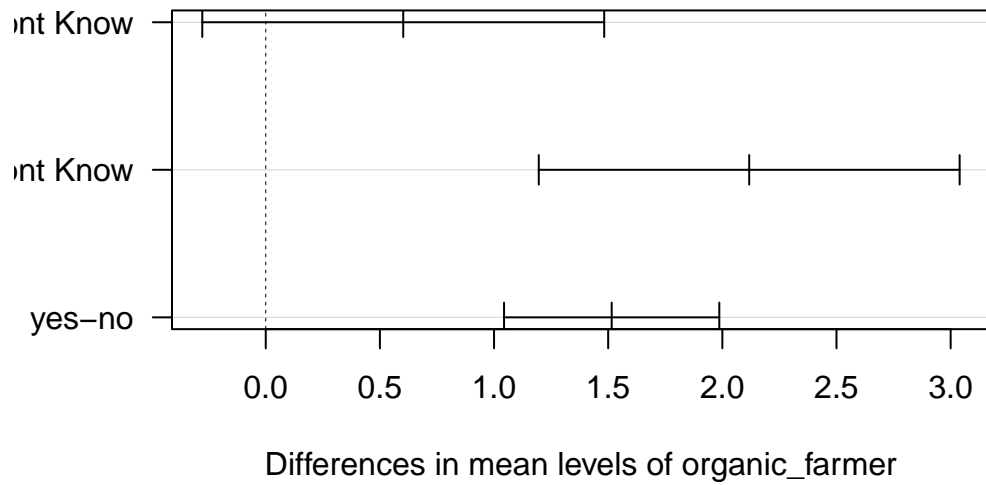
95% family-wise confidence level

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

### 95% family-wise confidence level



## 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 x 5

term <chr>	estimate <dbl>	std.error <dbl>	statistic <dbl>	p.value <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 x 12

	r.squ~1 <dbl>	adj.r~2 <dbl>	sigma <dbl>	stati~3 <dbl>	p.value <dbl>	df <dbl>	logLik <dbl>	AIC <dbl>	BIC <dbl>	devia~4 <dbl>	df.re~5 <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 x 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 x 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 x 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 x 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 ( $p = 0.4$ )