

## Omani School Students' Attitudes toward Agriculture: Investigating the Role of Gender and Geographical Regions

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**Abstract:** A 24-item questionnaire was designed to collect specific data in order to determine Omani students' attitudes toward agriculture and, specifically, whether or not these attitudes differ according to gender and the geographical regions where students reside. A survey research method based on the use of a questionnaire was employed. The questionnaire items were divided into four domains: participants' general knowledge about agriculture, their personal interest about agriculture, the role of government in supporting agriculture, and the role of agriculture in food security. The questionnaire was administered to 394 randomly selected Grade 10 students. Participants consisted of 189 male students and 205 female students in total. Questionnaires were distributed to 130 students from North Al Batinah Governorate, 142 from Al-Dakhiliyah Governorate, and 122 from Muscat Governorate. Questionnaire reliability was calculated using Cronbach's alpha, an internal consistency method, which resulted in a value of 0.83 for the instrument. The study was conducted in the 2016/2017 academic year. The findings indicated that students' attitudes toward agriculture, overall, were positive and both gender and geographical region had an effect upon their attitudes. The results of this study demonstrate a need to recommend improving students' attitudes towards agriculture, especially for students who reside in the Muscat Governorate; for example, schools should be encouraged to include agricultural collaborative learning activities, both inside and outside the classroom. Overall, the study results suggest a benefit in conducting additional research in the area of agriculture education in Oman.

**Keywords:** Attitudes; agriculture; 10th grade students; gender; geographical region.

### تقصي اتجاهات طلبة المدارس العمانية نحو الزراعة في ضوء متغيري النوع والمنطقة الجغرافية

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**مستخلص:** هدفت هذه الدراسة إلى تحديد اتجاهات الطلبة العمانيين نحو الزراعة، وعلى وجه التحديد، ما إذا كانت هذه الاتجاهات تختلف باختلاف نوع الطالب والمنطقة الجغرافية التي يقيم فيها. تم استخدام طريقة المسح باستخدام استبيان مكون من 24 بنداً لجمع بيانات. وقد تم تقسيم بنود الاستبيان إلى أربعة مجالات هي: المعرفة العامة بالزراعة، واهتمامهم الشخصي بالزراعة، ودور الحكومة في دعم الزراعة، ودور الزراعة في الأمن الغذائي. وقد تم تطبيق الدراسة في العام الدراسي 2016/2017 على 394 طالباً تم اختيارهم عشوائياً من طلبة الصف العاشر، مقسمين إلى 189 طالباً و 205 طالبة. وكان عدد المشاركين من محافظة شمال الباطنة 130 طالباً وطالبة، ومن محافظة الداخلية 142 طالباً وطالبة ومن محافظة مسقط 122 طالباً وطالبة. وقد تم التحقق من صدق الاستبيان من خلال صدق المحكمين ومن الثبات باستخدام ثبات الاتساق الداخلي باستخدام معامل ألفا كرونباخ، والتي كانت قيمة الثبات تساوي 0.83 للأداة ككل. أشارت نتائج الدراسة إلى وجود اتجاهات إيجابية لدى الطلبة نحو الزراعة وأن كلا من النوع والمنطقة الجغرافية كان لهما تأثير على اتجاهات الطلبة. وأوصت الدراسة بضرورة تحسين اتجاهات الطلبة الذكور بشكل عام وخاصة أولئك المقيمين في محافظة مسقط. كما ينبغي تشجيع المدارس على تضمين أنشطة زراعية تتفد بشكل تعاوني داخل الفصل وخارجه. كمت تقترح الدراسة إلى أهمية إجراء بحوث إضافية في مجال التعليم الزراعي في عمان.

**الكلمات المفتاحية:** الاتجاهات، الزراعة، طلبة صف العاشر، النوع، المنطقة الجغرافية.

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There is a strong link between agriculture and education. Education plays an important role in scientific agriculture because it helps farmers choose inputs of important information efficiently while, across time, improving the ability of their farming practices. Agricultural Education includes a wide range of media, such as the teaching of agriculture, natural resources, agricultural science, small animal care, health and nutrition, livestock management, biology and land management (Phipps et al., 2008). The integration of agriculture education within school curricula brings learning to life and helps students learn through experiential learning (Mabie & Baker, 1996). Research findings indicate that students taught by integrating agricultural and scientific principles showed better achievement than did students taught by traditional methods (Enderlin & Osborne, 1992; Enderlin, Petrea, & Osborne, 1993; Roegge & Russell, 1990). In addition, the involvement of undergraduates in agriculture activities resulted in enhanced academic and personal development (Astin, 1993). Involving students in agricultural activities at school may help developing their attitudes towards agriculture. This could include, for example, establishing school gardening at school as a learning activity of agricultural education. A school garden can lead to list of outcomes detailed by the Royal Horticultural Society in the United Kingdom which includes: improvement of scientific knowledge and understanding, and improved literacy and numeracy, including the use of a varied vocabulary and enhanced awareness of food production. Additional benefits include improved confidence, resilience and self-esteem, development of physical skills such as fine motor skills, development of a sense of responsibility, a positive attitude to healthy food selections and enhancements in emotional well-being (Passy et al., 2011).

Several published studies have demonstrated the positive effects of school

gardens on health, attitudes, and educational outcomes. For example, Passy et al. (2011) found that students who have participated in school gardening activities gained a positive attitude to healthy/nutritious food, adopted good habits in order to incorporate vegetables in their diet, and had increased emotional wellbeing. In addition, these students increased their scientific knowledge, while their literacy and numeracy skills also increased (Passy et al., 2011). Self-confidence and self-esteem were other positive effects of school garden participation, particularly for underachieving students (Sheffield, 1992; Hoffman et al., 2004). Beyond school gardens, out-of-class settings can also motivate students to learn about science, encouraging lifelong learning while also exposing them to potential future careers (Bamberger & Tal, 2007; Tal, 2012). Other studies have reported how exposure to agriculture activities may positively influence youth behaviors and attitudes related to consumption of vegetables and fruits (Williams & Dixon, 2013; Ohly et al., 2016; Heim et al., 2009).

Zaitoon (1996, 109) defined attitude as a "collection of cognitive, affective and behavioral components which relate to individual response towards any issue, matter or an episode, either for (favorable) or against (unfavorable)". Attitudes are a complex combination of things, which we tend to call personality, beliefs, values, behaviors, and motivations (Ambusaidi & Al-Fari, 2017). Aiken (1997) described attitude as a cognitive, affective and behavioral response which is organized on the basis of experience and knowledge, to the individual-himself/herself or any object or event around his/her environment.

Gun (2012) points out that an individual's attitudes could be reflected in his/her performance and sayings or when interacting with others and that they enable him or her to make appropriate decisions. For example, if a student has positive attitudes towards agri-

culture, he/she will reflect these attitudes through several behaviors such growing plants at home, participating in agricultural activists at school, and perhaps even by choosing to study agriculture at university level. Moreover, Ambusaidi and Al-Fari (2017) argued that attitudes determine expected reactions and help to achieve many economic and social goals. Attitudes, through the interactions between its members, could achieve society's ambitions (Ambusaidi & Al-Rashdi, 2012).

Students' attitudes about agriculture (topics, activities etc.) could be changed towards the positive if teachers: 1) use appropriate teaching methods; 2) use practical agriculture activities such school gardens; and 3) have positive attitudes towards agriculture. This is because teachers and parents have the greatest influence on students' attitudes (Metin, Acisli & Kolomuc, 2012; Ugras *et al.*, 2012). Therefore, both Ministry of Agriculture and Fishers (MoAF) and the Oman Research Council in collaboration with Ministry of Education (MoE) fund some research projects and programs targeting schools students to increase their awareness about agricultural education such as School Garden project. These research projects and programs are used to formulate strategies and recommendations with other stakeholders in the country in order to develop students' views and attitudes toward agriculture sector. It is assumed that if students participate in such projects and programs they will learn more about how to grow plants at school and at home and, hence, help reduce expensive food importation from other countries.

### Study Problem

Agriculture generally plays a critical role in food security and the economy in every country. In Oman, the government has established many initiatives to encourage companies and youth to work and invest in this sector. Indeed, His Majesty Sultan Qaboos bin Said has

paid great attention to agriculture since 1970. From the 1970s to 2000, employment within this sector has been primarily occupied by Omanis. However, after that time, according to the National Centre for Statistics and Information - (NCSI), approximately 91,349 expatriates in the agriculture, forestry, and fishing sector are employed and only 1,077 Omanis (National Centre for Statistics and Information (NCSI) (2018b). This represents a significant gap between the number of national and expatriate employees in this sector. In order to encourage more Omanis to be a part of this integral economic driver, this issue should be revisited by the Omani government. One way to do so is to develop young children attitudes towards agriculture via the school curriculum. To the best of our knowledge, the current study is the first in Oman to investigate public school students' attitudes toward agriculture. Therefore, the results of this study may help inform decision makers both in MoAF and MoE to further develop positive, collaborative, and easy-to-implement school programs in agriculture education.

### Study Questions

The current research aimed to answer the two following questions:

1. **What are Omani school students' attitudes toward agriculture?**
2. **Do these attitudes differ according to gender, geographical regions, and interaction between these two variables?**

## Methodology

### Participants

The sample consisted of 394 school students (205 females and 189 males) from Grade 10. They were selected from different schools in three Omani geographical regions, using a stratified random sampling method in order to ensure there were enough student participants to reflect trends within the two study

variables: gender and geographical regions. According to Cohen (2000), stratified random sampling is a useful blend of randomization and categorization, thereby enabling both quantitative and qualitative research to be undertaken. The randomization is done in each region to select both the schools and students within schools. From each region, two schools were selected, one for boys and another for girls, and from each school two classes were selected. The number of students differed in each class and, for this reason, there is a difference in the number of boys and girls in the sample.

With reference to regions, 130 students were from North Al Batinah Governorate, which is characterized as an agricultural and costal area, 142 students were from Al-Dakhiliyah Governorate, which is characterized as an interior and dry area, and 122 students participated in the study from Muscat Governorate, which is characterized as an urbanized area with less cultivated land. School locations and density of student populations were taken into consideration when the questionnaire instrument was administered to participants to ensure findings could reveal a clear picture about students' attitudes about agriculture, which, in turn, may, over time, improve their attitudes and views. The study instrument was administered at the end of the 2016/2017 academic year by the researchers and it was collected on the same day that it was administered. Table 1 shows the distribution of the sample according to the two study variables.

Table 1  
 Distribution of the sample according to the study variables

Gender	Geographical Region			Total
	North Al Batinah	Al-Dakhiliyah	Muscat	
Male	55	60	74	189
Female	75	82	48	205
Total	130	142	122	394

### Research Instruments

The research used a questionnaire to measure students' attitudes towards agriculture. This type of research method was considered most suitable to achieve the purpose of the study. The researchers designed a Students' Attitudes towards Agriculture Scale (SATAS). It was designed after reviewing the previous literature related to agriculture and perceptions and attitudes, such as Ambusaidi *et al.* (2018), and Meischen and Trexler (2003). A five-point Likert scale was used, with each item in the scale featuring the following response choices: 5 = strongly agree, 4 = agree, 3 = neutral (undecided), 2 = disagree, and 1 = strongly disagree. Since the sample target was students whose first language is Arabic, the scale was prepared in Arabic. The scale was distributed with the items grouped into four domains: general knowledge about agriculture (6 items), personal interest about agriculture (9 items), the role of government in supporting agriculture (4 items), and the role of agriculture in food security (5 items).

The final draft of the scale consisted of 24 positive and negative items. For the validation process, the instrument was given to five specialists in agricultural education. They were asked to give their opinions on:

- The suitability of this instrument in achieving the aims of the study
- Whether instrument items were appropriate to the domain or subscale which they belonged to
- The accuracy of the language used
- Whether or not items needed to be added or omitted

In response to the specialists' opinions, some items and the scale layout were modified to make it easier for students to respond. Most suggested modifications were implemented, such as rewording some items, or changing the placement of some items in the SATAS.

In order to check the instrument's reliability, the internal consistency coefficient (Cronbach's Alpha) was used. This measure indicated a strong correlation between the items and the dimensions which they measure. The reliability coefficient for overall scale was found to be 0.83, and for the domains ranged between 0.67-0.80, which is considered to be suitable for the purpose of the study. After assuring the instrument's reliability and validity, 24 items measuring student attitudes toward agriculture were administered to the sample. Table 2 shows the distribution of the items on the instrument.

### Data Analysis

Students' attitudes towards agriculture were statistically analyzed across every domain/dimension and items in the SATAS, as well as according to gender and geographical region, using SPSS. Positive attributions were graded as 5 (strongly agree), 4 (agree), 3 (neutral), 2 (disagree), and 1 (strongly disagree). For negative attributions, grades were: 1 (strongly agree), 2 (agree), 3 (neutral), 4 (disagree), and 5 (strongly disagree) (Aiken, 1997). Then, to determine students' attitudes towards agriculture, the mean value of each item and domain was calculated and classified into five categories: strong positive attitudes (range of mean value between 4.21-5.00), positive attitudes (range of mean value between 4.21-4.20), undecided or neutral (range of mean value between 2.61-3.40), negative attitudes (range of mean value between 1.81-2.60), and strong negative attitudes (range of mean value between 1.00-1.80).

## Results and Discussion

### Students' Attitudes Towards Agriculture:

In order to answer the first research question, mean values and the standard deviations were used see (Table 2).

It is clear from Table 2 that students had positive, although not strong, attitudes

in all measurement dimensions. Overall, this may be a reflection of the fact that Oman was once a traditionally agricultural society. However, in the present, the agricultural sector currently contributes around 1.5% to GDP in 2017 (National Centre for Statistics and Information (NCSI) (2018a). Another domain, the "role of agriculture in food security" has the highest mean value among other domains (Table 2). This may be attributed to general understandings that: 1) food items from plants are important for human growth; and 2) in recent years, many agricultural projects established by the Omani government aim to increase food security, such as Al Arfan Farms, which produce vegetables from the first aquaponics farm in Oman (Times of Oman, 2017). This last point of understanding may also help to explain why "the role of government in supporting agriculture" domain resulted in the second highest mean value of the questionnaire. In addition to increasing food security, the Omani government has supported farmers in supplying them with fertilizers and pesticides, seedlings, tillage, modern irrigation systems, and harvesting machines for barley and wheat (Ambusaidi et al., 2015).

**Table 2**  
Mean values and standard deviations of students' attitudes towards agriculture for each domain

Dimension (Sub-scales)	Mean value	SD	Type of the attitude
General			
knowledge about agriculture	3.66	0.58	Positive
Personal interest about agriculture	3.42	0.54	Positive
The role of government in supporting agriculture	3.48	0.73	Positive
The role of agriculture in food security	3.96	0.68	Positive
Overall Scale	3.60	0.45	Positive

The "personal interest about agriculture" domain received the lowest mean value (Table 2). This may be due to the fact that most agricultural sector workers are non-Omani (National Centre for

Statistics and Information (NCSI) (2018a) - a fact which may be affecting views of Omani students towards this sector's type of jobs. Indeed, most students do not practice any real agricultural activities in their schools and within society. Another reason is that Omani students are rarely exposed to any real agricultural activities because there is no specific subject about agriculture. The topics related to agriculture usually exist in science or social science studies subjects. If the curriculum allows students to work in collaborative learning activities related to agriculture that will give them ample time to explore agricultural activities, it may positively impact their lifestyle. However, if such an approach is not feasible, an extra-curricular activities may be adopted through school gardens.

For example, schools can establish a school garden with simple materials. In this learning environment, schools can conduct several activities under the supervision of science or social science, or even with any experienced teacher in agriculture, to use with students. This will help students to gain good experience in how to successfully grow plants and take care of them in order to produce foods. As a result, students may appreciate the food chain and links between "growing and eating" (Bowker & Tearle, 2007). Additionally, students may appreciate the aesthetic beauty of plants grown under their direct care and supervision.

Bowker and Tearle (2007) highlighted that the school gardens, by giving students the experience of growing crops, promote teaching children about current global issues concerning food, including our dependence on each other and the importance of using natural resources in a sustainable way. Moreover, Desmond et al. (2004) highlighted the value of experiential learning in the "living laboratory of the garden". They suggest that school gardens can be a powerful tool to improve the quality of nutrition and education of children and their families, if

they are integrated with national agricultural, nutrition, and education programs. This claim is supported by Utter et al., (2016) who state school gardens in New Zealand have a positive impact on students' health. A positive impact on students' physical activity was also reported elsewhere (Wells, Myers, & Henderson, 2014).

If schools have no proper school garden, then they can use community gardens to develop students' attitudes towards agriculture. Outside of the traditional school setting, these gardens also present students with exposure to beneficial agricultural activities. Butler and Maronek (2002) noted that community gardens which involved children were associated with increased food security and food quality. Moreover, informal learning through what is called "place based learning" can be used to allow students to visit places where agriculture occurs, such as governmental or personal farms. For example, if students are investigating specific insects that harm plants, their research can be conducted both in the classroom and in the field, such as an active agriculture farm. In order to find out the type of attitude response to each questionnaire item, both mean values and standard deviations were calculated. Table 3 presents the mean values and standard deviations calculated for each item in the questionnaire.

Across the four domains, students' attitudes in most items are strongly positive or positive (Table 3). Overall, Omani students had positive attitudes towards agriculture. In the first domain (general knowledge about agriculture), the four items that have high mean values (strongly positive and positive attitudes) are: I have an awareness of plants importance in our lives; I spread the knowledge about plants to those younger than me; I would like to know about the plants in Omani environment; and I like to know the types of plants when I visit a garden or a farm. It could be inferred from these responses that Omani



Grade 10 students have the intention and willingness to know more about plants and to use and share knowledge gained with others. This intention may help, over time, to change any negative attitudes amongst some students about agriculture. Sloane and Zimmer (1993) have asserted that peer education promotes positive beliefs and behavior. The Ministry of Education (MoE) could take advantage of this study by creating an environment of collaborative peer education at schools in order to increase students' positive attitudes towards not only agriculture, but also towards other important issues such as leading a healthy lifestyle and maintaining a healthy diet.

For the second domain (personal interest about agriculture), the six items with

high mean values (positive attitudes) are: I like to use medicinal plants as medication; in general, I am interested in teaching science; I am interested in plants in the school garden, home and surrounded environment; I follow the rules of safety and security when planting plants in the school garden or home; I use different farming tools professionally; and I use plants to make useful and innovative things. Overall, Grade 10 students conveyed personal interest about agriculture through their questionnaire responses; however, this interest can be further encouraged by involvement in real, hands-on agriculture activities at school. Indeed, the item, "I like to participate in plant-related activities" received the lowest mean value

**Table 3**  
**Mean values and standard deviations of attitudes scale items towards agriculture**

Item	Mean value	SD	Type of the attitude
General Knowledge about Agriculture			
I spread the knowledge about plants to those younger than me	3.44	1.09	Strongly Positive
I talk to others about the importance of plants in our lives	3.35	1.12	Undecided (Neutral)
I develop my knowledge about insects that affecting on plants and control them without using of insecticide	3.05	1.27	Undecided (Neutral)
I have an awareness of plants importance in our lives	4.28	.952	Strongly Positive
I like to know the types of plants when I visit a garden or a farm	3.85	1.13	Positive
I would like to know about the plants in Omani environment	3.99	1.06	Positive
Personal Interest about Agriculture			
I use different farming tools professionally	3.66	1.09	Positive
I use plants to make useful and innovative things	3.53	1.18	Positive
I am interested in plants in the school garden, home and surrounded environment	3.89	1.13	Positive
I like to participate in plant-related activities	2.57	1.25	Undecided (Neutral)
I like to ask questions about plant cultivation techniques	3.16	1.14	Undecided (Neutral)
I follow the rules of safety and security when planting plants in the school garden or home	3.83	1.09	Positive
I prefer to use cosmetics made from plants	3.57	1.33	Positive
I like to use medicinal plants as medication	3.96	1.15	Positive
The Role of Government in Supporting Agriculture			
I support the government to focus on jobs that are related to agriculture in the future	2.69	1.25	Undecided (Neutral)
I support the use of pesticides by the government to increase the production of crops	2.78	1.38	Undecided (Neutral)
I support the government's efforts to increase the production of crops in the country	4.26	1.13	Strongly Positive
Agricultural sector helps to recruit a large group of the unemployed	3.70	1.14	Positive
Working in the agricultural sector is easy	3.24	1.15	Undecided (Neutral)
The Role of Agriculture in Food Security			
I differentiate between fresh vegetables from the garden or farm and those are canned in markets	4.05	1.07	Positive
I like to eat fruits and vegetables from Omani farms	4.34	1.03	Strongly Positive
I make sure to put the vegetables in my recipe.	3.35	1.45	Positive
I eat fruits daily	3.94	1.15	Positive
I make sure to grow plants in my house	4.11	1.10	Positive

with an 'undecided' attitude. Omani schools could take advantage of this learning opportunity in preparing a suitable agricultural learning environment, such as a school garden. Ambusaidi et al. (2018) conveyed that employing school gardens as an educational resource may improve learning outcomes in the development of science skills. In addition, according to Ambusaidi et al. (2018), school gardens had a positive impact on the affective domain of students, in some cases encouraging them to pursue healthier eating habits. In the third domain (the role of government in supporting agriculture), two items that received a high mean (strongly positive and positive attitudes) are: I support the government's efforts to increase the production of crops in the country, and agricultural sector helps to recruit a large group of the unemployed. One interpretation of this data could be that Grade 10 students highly appreciate the efforts carried out by the government to make agriculture an attractive economic and employment sector for youth. In fact, the MoAF has initiated a new initiative for unemployed and motivated youth in which participants are given free land with support from the ministry in order to cultivate and grow crops. Finally, for the fourth domain (the role of agriculture in food security), the item with the highest mean value (strongly positive attitudes) is: I like to eat fruits and vegetables from Omani farms. All remaining questionnaire items received positive attitudinal responses from students. Student responses for the fourth domain (the role of agriculture in food security) demonstrate their strong belief that both fruits and vegetables are important for food security while also being essential health food items. Badawi et al. (2011) stated that if students do not eat many fruits and vegetables and rely mainly on fast food with high protein and fat and a lack of vitamins and minerals, it will result in malnutrition at an adolescent stage.

The outcomes of the first research question is that 10th grade Omani students' have overall positive attitudes towards agriculture. There is slight variations in the students' attitudes between the four domains. For "The role of agriculture in food security", it is obvious that most items rated strongly positive or positive, whereas in "The role of government in supporting agriculture" domain, more items were rated as "undecided".

#### **The Effect Of Students' Gender, Geographical Region, And The Interaction Between The Two Variables In Their Attitudes**

The mean values and standard deviations of student questionnaire responses were used to find out if their attitudes towards agriculture differed according to gender and geographical region (Table 4).

In Table 4, female student responses had higher average mean values for two domains (general knowledge about agriculture and the role of agriculture in food security) than male students. For the remaining two domains (personal interest about agriculture and the role of government in supporting agriculture), male student responses had higher average mean values than female students. Regarding the geographical region, student responses in both North Al Batinah and Al-Dakhiliyah Governorates had higher mean values in all four dimensions compared to students from Muscat Governorate. In order to determine whether these differences, in average mean values, were statistically significant, a multivariate analysis was used (Table 5).

There were statistically significant differences in the students' attitudes towards agriculture (Table 5) related to students' gender and geographical regions and the interaction between them. However, in order to determine the direction of students' attitudes, the second step of multivariate questionnaire analysis was calculated in Table 6.



**Table 4**  
Mean values and standard deviations of students' attitudes according to gender and years residing in a geographical region

Dimension	Gender				Geographical Region					
	Male		Female		North Al Batinah		Al-Dakhiliyah		Muscat	
	M	SD	M	SD	M	SD	M	SD	M	SD
General knowledge about agriculture	3.61	.560	3.70	.592	3.86	.643	3.63	.554	3.53	.605
Personal interest about agriculture	3.48	.485	3.37	.576	3.51	.517	3.48	.510	3.26	.556
The role of government in supporting agriculture	3.54	.683	3.43	.769	3.53	.708	3.58	.707	3.32	.758
The role of agriculture in food security	3.86	.643	4.06	.691	4.02	.656	4.05	.648	3.96	.677

**Table 5**  
Results of multivariate tests

Source of variance	Wilks' Lambda	F	Hypothesis df	Error df	Sig.
Gender	0.936	5.289	5.000	384.000	.001
Geographical Region	0.083	3.186	10.000	766.000	.001
Gender × Geographical Region	0.949	2.056	10.000	768.000	.026

**Table 6**  
Test of Between-Subjects effect

Source of variance	Dimension of attitudes	Type III Sum of squares	df	Mean square	F	Sig.	Partial Eta Squared
Gender	General knowledge about agriculture	.614	1	.614	1.94	.164	.005
	Personal interest about agriculture	1.14	1	1.14	4.24	.040	.011
	The role of government in supporting agriculture	.939	1	.939	1.817	.178	.005
	The role of agriculture in food security	3.93	1	3.93	9.25	.003	.023
Geographical Region	General knowledge about agriculture	4.38	2	2.192	6.933	.001	.035
	Personal interest about agriculture	4.15	2	2.07	7.69	.001	.038
	The role of government in supporting agriculture	4.39	2	2.19	4.25	.015	.021
Gender × Geographical Region	The role of agriculture in food security	5.10	2	2.554	6.01	.003	.030
	General knowledge about agriculture	3.20	2	1.60	5.06	.007	.025
	Personal interest about agriculture	3.04	2	1.52	5.65	.004	.028
Error	The role of government in supporting agriculture	3.43	2	1.71	3.32	.037	.017
	The role of agriculture in food security	4.98	2	2.49	5.86	.003	.029
	General knowledge about agriculture	122.65	388	.316			
	Personal interest about agriculture	104.48	388	.269			
	The role of government in supporting agriculture	200.49	388	.517			
	The role of agriculture in food security	164.87	388	.425			

Table 6 demonstrates that male student responses revealed statistically significant interest in the domain of personal interest about agriculture. Alternatively, female students' questionnaire responses revealed statistically significant interest regarding the role of agriculture within the food security domain. Male student responses reflect more interest in particular issues related to agriculture, such as preferring to use cosmetics made from plants and the use of specific farming tools. Culturally and traditionally, this greater interest may link to the

fact that, regionally, agriculture has typically been a more male-oriented and influenced activity, often requiring intense physical effort. In addition, when working on a farm or house garden, both culturally and traditionally, Omani male students typically hold a closer relationship to their fathers compared to female students. However, the questionnaire scale results reveal that female students do care more about the role of agriculture in food security than male students (Table 6). In most Omani homes, women hold the responsibility

for preparing food and feeding meals to their family. Further, women typically demonstrate care in feeding their kids healthy, natural food such as vegetables and fruits. They use these same learned skills to feed themselves healthy food (Wardle et al., 2004). Moreover, women tend to pay attention to and control their weight more than men (Bellisle et al., 1995; Serdula et al., 1993). It is well-established that an increased intake of fruits and vegetables, combined with a reduced intake of food low in fat and sugar, are important aspects for weight control through diet (Kristal et al., 1990; Wardle et al., 2000).

Regarding the geographical region where students live, significant statistical difference were revealed in their questionnaire responses for all domains (Table 6). To identify this difference, multiple comparisons using the Least Significant Difference (LSD) test were made and the results are presented in Table 7.

Table 7 exhibits differences between student questionnaire responses from

both North Al Batinah and Al-Dakhiliyah regions and the Muscat region, illustrating that participants from both governorates had more positive attitudes towards agriculture compared to students from Muscat Governorate. Indeed, North Al Batinah and Al-Dakhiliyah Governorates have more farms and agricultural lands compared to the more urbanized Muscat Governorates, positively influencing the responses of the participants. North Al Batinah region is the largest agricultural region in this study, recognized as the food basket of Oman. Al-Dakhiliyah region is another significant agricultural region, with many farms and people working within the economic sector.

For student responses reflecting interaction between gender and geographical region, Table 6 demonstrates significant differences in all four domains. Differences related to each combination group (i.e. gender and geographical region) are in the following figures (Figures 1-4).

Table 7  
Multiple Comparisons using LSD test

Domain	Geographical Region	North Al Batinah	Al-Dakhiliyah	Muscat
General knowledge about agriculture	North Al Batinah	-	*	*
	Al-Dakhiliyah	-	-	*
Personal interest about agriculture	North Al Batinah	-	-	*
	Al-Dakhiliyah	-	-	*
The role of government in supporting agriculture	North Al Batinah	-	-	*
	Al-Dakhiliyah	-	-	*
The role of agriculture in food security	North Al Batinah	-	-	*
	Al-Dakhiliyah	-	-	*

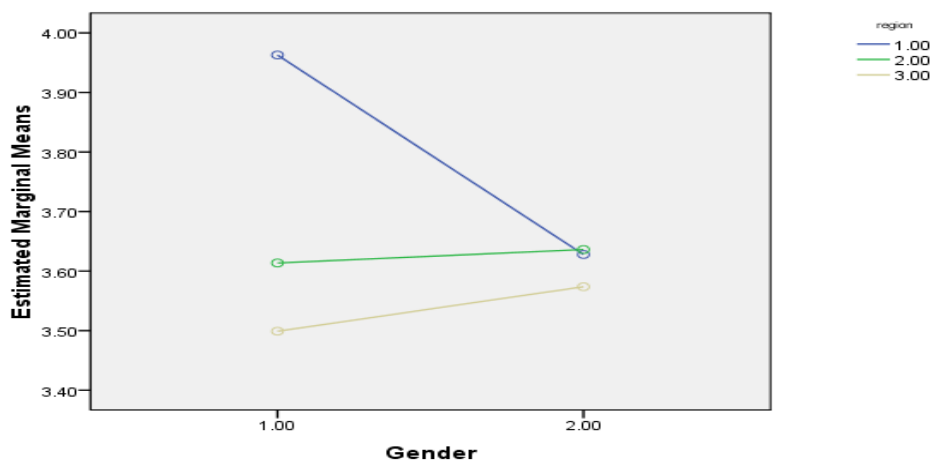
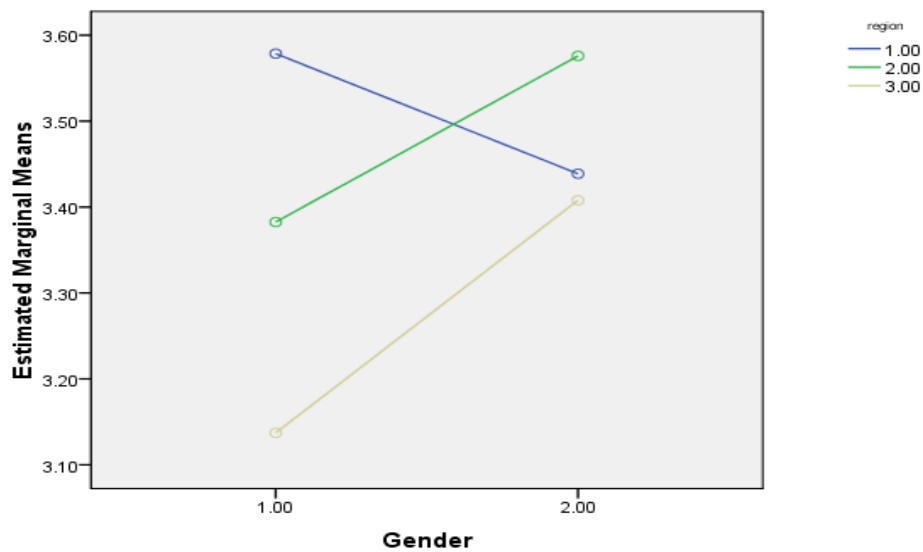


Figure 1  
The Interaction between Gender and Geographical Region in General Knowledge Domain

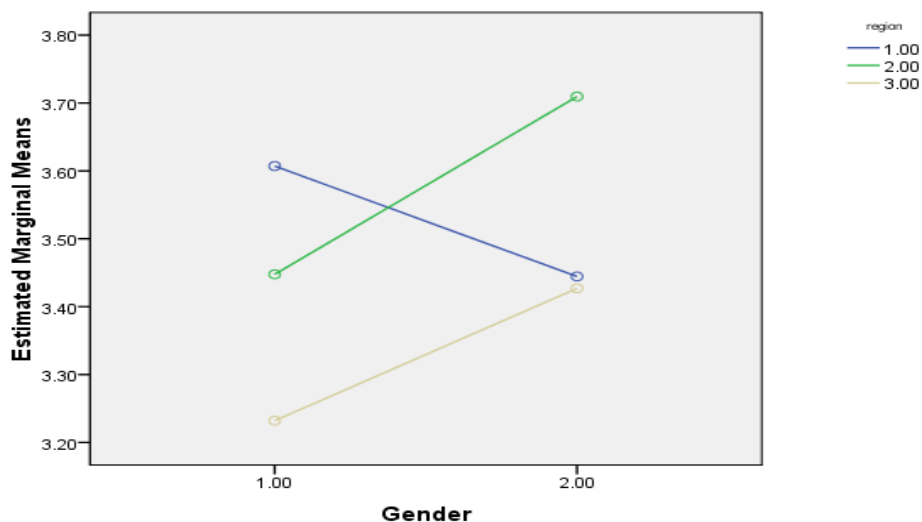
(Note: For Gender, 1 = female, and 2 = male. For Region, 1= North Al Batinah, 2= Al-Dakhiliyah, 3= Muscat).



**Figure 2**  
The interaction between gender and geographical region in Personal Interest Domain

As demonstrated in Figure 1, female student responses from North Al Batinah region display more positive attitudes in general knowledge about the agriculture domain compared to students from other regions, even from male student responses from the same region. For the personal interest about agriculture domain, Figure 2 displays the interaction between gender and geographical region results.

The results in Figure 2 demonstrate that female students from North Al Batinah region and male students from Al-Dakhiliyah region responses revealed more positive attitudes in the personal interest about agriculture domain compared to student responses from other groups. For the role of government in supporting agriculture domain, Figure 4 illustrates the interaction between gender and geographical region.



**Figure 3**  
The interaction between gender and geographical region in Role of Government Domain

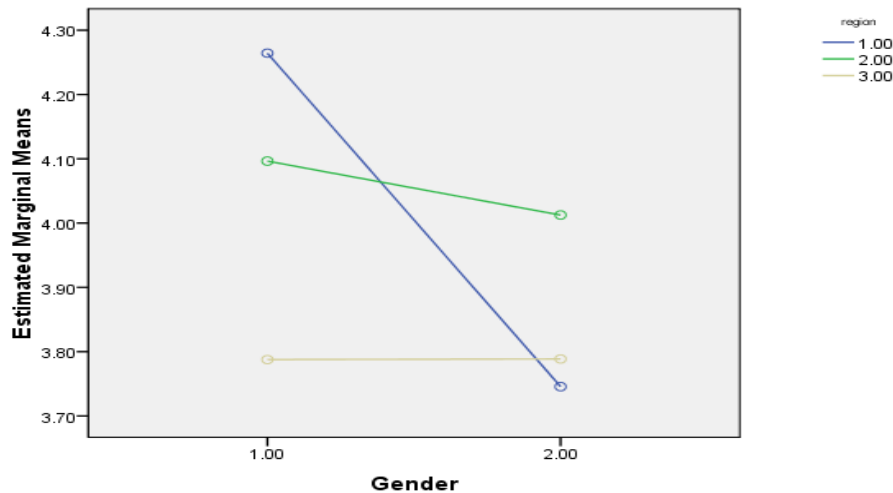


Figure 4  
The interaction between gender and geographical region in Food security Domain

The results in Figure 3 illustrate that male students responses from Al-Dakhiliyah region had more positive attitudes in the role of government domain compared to student responses from females and other geographical regions. For the role of agriculture in food security domain, Figure 4 displays the interaction between gender and geographical region results.

The results in Figure 4 shows that female student responses from North Al Batinah region had more positive attitudes in the in food security domain compared to student responses from females and other geographical regions.

It can be concluded from the primary data analysis results that both gender and geographical regions had an effect on students' attitudes towards agriculture. In some domains, female students have more positive attitudes towards agriculture and, in other domains, male students display more positive attitudes. This variation is a reflection of gender interest and how males and females perceive agriculture in their lives. Moreover, this difference may be related to the way agricultural topics are taught inside the classroom and the learning experience that science teachers offer to students. For the geographical regions, students living in agricultural-oriented regions, such as North Al Batinah and Al-

Dakhiliyah Governorates regions, have more positive attitudes towards agriculture compared to students who live in the more urban capital (Muscat Governorate).

### Conclusion and Recommendations

The current study found that 10<sup>th</sup> grade students in Oman have overall positive attitudes towards agriculture. In addition, the study showed that both male and female students had positive attitudes towards agriculture. Male students revealed more positive attitudes in the "personal interest about agriculture" domain than female students. This response is a good indicator that male students, particularly with further support and encouragement, may choose to study agricultural sciences in higher education or opt to work in agriculturally-related fields. Supporting this assertion, Greenwald (1989) reports that people with positive attitudes toward a situation or subject tend to support them positively. In the current study, female students revealed more positive attitudes in the "role of agriculture in food security" domain than male students. An essential component for body health, food security is related to having healthy food, and having enough food to eat (Schroeder, 2011). For geographical regions, study results revealed students in both North Al Batinah and Al-Dakhiliyah Gover-

norates had more positive attitudes towards agriculture than students from Muscat Governorate. This is likely due to their limited exposure to agricultural activities as they are in more urbanite areas.

Based on this study's results, there is a need to develop a strategic plan to enhance agricultural activities in schools across the sultanate. This could be co-designed and administered by the MoE and the MoAF. In fact, in the study, both genders displayed positive attitudes towards agriculture and plants; however, as has been outlined here, additional support in schools will have positive knock-on effects in health for the wider society. If such a strategy is adopted so that agricultural education will be part of the school system, it will receive a great deal of attention from both school curriculum designers and teachers and, hence, can be included in the school curriculum either as a separate school subject or as extracurricular activities. If such a strategic plan is not formed, then the MoE should focus on offering less immersive student activities which celebrate national and international events related to agriculture and plants. "Tree Day", for example, is celebrated every year on 31 October. On this day, school-based events could feature tree planting or plant scientists or expert talks to students (Times of Oman, 2016). Furthermore, the MoE can initiate a "Green School Initiative" across all schools in the country, with all students participating. Such an initiative is strongly linked to sustainable development in the community (Ambusaidi, 2018). Many activities can be conducted in schools related to such an initiative, including planting within the school area. This type of initiative goes beyond improving students' attitudes towards agriculture by encouraging students to be more eco-friendly both at home and at school. Li and Lang (2014) maintain that green schools give better opportunities for students to attain environmental

knowledge and develop environmental-friendly worldviews and behaviors

There is a need for further research studies in local agriculture. Studying teaching methods or training programs on students' knowledge and behavior about agriculture, for example, could reveal agriculture's cultural and societal effects. Osborne et al. (2003) noticed that it was behavior, rather than attitude, which had become a focus of interest in studying attitudes of students. In its methodology, the current study used a quantitative-based questionnaire in form of a Likert scale to collect data. However, using a qualitative approach in future studies, such as participant observation and focus groups, would provide in-depth data about students' attitudes toward agriculture. In addition, further studies are needed to explore higher educational class students' attitudes towards agriculture. This can be associated to respondents socio-economic and demographic variables. Another study can compare the attitudes of farmer community children with non-farming community students.

Finally, this study aimed to share knowledge with other researchers about Omani students' attitudes towards agriculture. Researchers interested in agricultural education may adapt this study's instrument to explore additional dimensions of student attitudes towards agriculture, or other types of participant groups. Globally, the results of this study can be used in order to compare Omani students' attitudes towards agriculture with students of similar age in other countries to examine similarities and differences, as well as social and cultural influences.

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