2016 ANNUAL REPORT COLLEGE OF AGRICULTURAL AND MARINE SCIENCES



Sultan Qaboos University

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COLLEGE OF AGRICULTURAL AND MARINE SCIENCES ANNUAL REPORT 2016



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Editorial





OUR VISION

"Our vision is to be among the top applied biosciences colleges in the Middle East region and recognized internationally for excelling in agricultural and marine science education and research while contributing substantially to national and regional development."

OUR MISSION

"Develop human resources to meet challenges in producing food while conserving the natural environment and biodiversity, in processing food to add value, and to trading food to ensure food security in Oman

Find solutions to issues of strategic importance through basic and applied research and disseminate knowledge to the Omani and International communities which will result in continuous improvements to the quality of life

Coordinate career guidance for students at CAMS, provide continuous education for professionals in CAMS and the wider community, and consult private and public sector agencies to facilitate progress of a knowledge-based society. "

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Assistant Dean for Postgraduate Studies and Research



College of Agricultural and Marine Sciences (CAMS) guided by quality management principles, is a center of excellence that utilizes innovation and scientific research to contribute to sustainable growth and positively impacting development of the agriculture and fisheries sectors in Oman. This is achieved through offering quality scientific and technological solutions in various fields of environment, agriculture, and marine sciences. CAMS maintaining excellent collaborations with both common people and private entities locally and lead institutions globally. Our collegemaintains continuous-efforts to develop its research capabilities to response and realign to the newly emerging and growing needs for the Sultanate.

Research-based learning to equip young researchers with professional skills is one of the primary goals of CAMS and for this CAMS offeringseries of Mastersand PhD programs. The Masters programs covers areas like Animal and Veterinary Sciences, Crop Production, Crop protection, Food Science and Nutrition, Marine Science and Fisheries, Natural Resources Economics, Soil and Water Management and Agricultural Engineering. The PhD studies offered so far in five disciplines: Crop Sciences, Marine Sciences and Fisheries, Food Science and Nutrition, Natural Resources Economics, and Soil and Water Management. Our college possesses excellent technical and laboratory facilities which allow to train the students in latest cutting edge technologies. By exposing them to real-life experience in research, the students of CAMS are equip with the needed skills and tools to use in their future jobs and conduct practical research in their area of specialty.

<u>Awards</u>

SQU Best Teacher & Researcher Awards 2016





Outstanding Scientist Award

r. M. Mohamed Essa, Associate Professor in Human Nutrition, Department of Food Science & Nutrition, College of Agricultural & Marine Sciences at SQU, has won the award for "Outstanding Scientist" in Nutritional Neuroscience for his contributions and achievements in the field of nutritional neuroscience instituted by Venus International Foundation, Chennai, India. The awards were presented during the Venus International Foundation Annual Awards Meet held in Chennai, India on 3 December 2016. Dr. Essa is the editor-in-chief for International Journal of Nutrition, Pharmacology, Neurological Diseases published by Wolters & Kluwer, USA and is involved in the editorial board of various well-known journals such as Frontiers in Neuroscience, Biochemie,



PLOS one, etc. He is an expert in the field of Nutritional Neuroscience and published 104 papers, 41 book chapters and several books. Dr. Essa's research work received the National Research Award 2015 under health sector by The Research Council of Oman.

The aim of the event was to acknowledge and recognize efforts of research enthusiasts based on their professional experience to motivate and promote a research culture by creating networks between researchers of varied science and education fields. Venus International Foundation, based in Chennai, India is a global network foundation seeks to enhance the academic systems for teaching and research. Established in 2015, the foundation strives to make a meaningful impact in supporting education and human services results oriented approach and a keen understanding of the relevant issues, needs and opportunities..

Dr. Zainab Al-Nahdi FSn PhD Studenrs got first place in the 3-Minute Thesis Competition

The 3-Minute Thesis Competition (3MT), which provides an opportunity to share postgraduate research in a competitive context, was organized by the Deanship of Postgraduate Studies at Sultan Qaboos University. Postgraduate students not only present their theses showing their scope and significance, they also do it in a competitive manner in three minutes.

Dr. Zainab Al-Nahdi a health awareness spe-

cialist at the Ministry of Education, who was PhD student at the department of Food Science and Nutrition from College of Agricul-



tural and Marine Sciences, had won the first place of (3MT) of the first season as the best scientific presentation in English category for the academic year 2015/2016. She won the competition by presenting her PhD thesis entitled "Physico-Chemical Characterization of Agar and Carrageenan Extracted from Red Seaweeds Melanothamnus Somalensis And Hypnea Bryoides From Arabian Sea"

The evaluation criteria applied on the top 17 participants, based on clearance and logical sequence of ideas, enthusiasm, capturing and maintaining audience's attention with sufficient stage presence, besides eye contact, vocal range, maintain a steady pace, and have a confident stance with using a single static PowerPoint slide in a language appropriate to a non-specialist audience.

It is worth mentioning that Dr. Zainab holds a bachelor's degree from the Sultan Qaboos University, majoring in chemistry and biology, who was able then to pursue her postgraduate studies and get a Master of Science degree in Food and Nutrition Department from Sultan Qaboos University, in addition to Master degree of Science majoring in pharmacology and biotechnology, from Sheffield Hallam university, UK. She recently completed PhD degree in Food Science and Nutrition from Sultan Qaboos University. FSN PhD student received Best Young Researcher Forum Award



rs. Zahra Sulaiman

Al-Kharousi; a Ph.D. candidate in the department of Food Science and Nutrition, was awarded with the Best Young Researcher Forum Award for her oral presentation in the

"International Conference on Food Microbiology" held during August 08-10, 2016 in Birmingham, UK. The title of her presentation was "Ingesting antibiotic-resistant bacteria along with fresh fruits and vegetables: What are the possible consequences?" The study highlighted the importance of defining antibiotic resistance problem in fresh fruits and vegetables that are mostly eaten raw and included examining of thirteen types locally produced or imported fresh fruits and vegetables. Various degrees of bacterial resistance against several antibiotics were demonstrated in this study suggesting that fresh produce may play an important role in disseminating antibiotic-resistant bacteria through the food chain. The possible consequences for ingestion of bacteria harboring antibiotic-resistant genes and their interaction with gut microbiota were also discussed during the presentation. This study was undertaken in conjunction with the local efforts to address and manage bacterial antibiotic resistance in various environments which will eventually contribute to a better global tackling of the problem. Mrs. Zahra Al-Kharousi is supervised by Prof. Nejib Guizani. The other committee members include Dr. Ismail Al Bulushi, Dr. Abdulla Al Saadi and Dr. Baby Shaharoona.

Best Paper SWAE Fcaulty and Graduate Student



A^{s part} of the

TRC-funded project (RC/AGR/ SWAE/15/01), Dr Abdulrahim Al-Ismaili and his MSc MSc student, Mr. Said Tabook, partici-

pated with an article in the 3rd International Conference on Agriculture, Horticulture & Plant Sciences (IJTA), New Delhi, India in the period June 25-26, 2016. This article entitled "Evaluation of Greenhouse Cropping Systems in Oman" was presented by Dr. Al-Ismaili because the MSc student was not able to present the paper in the conference. At the end of the conference, Dr. Al-Ismaili was awarded a "Best Paper Award" based on the quality of paper and presentation. A copy of the award is presented below. This study presents a preliminary trial to evaluate the performance of greenhouse cropping systems in Oman using five performance indicators; land-use efficiency (LUE), water-use efficiency (WUE), irrigated-water-use efficiency (IWUE), gross-water-use efficiency (GWUE) and energy-use efficiency (EUE). Three cucumber greenhouses were chosen as case studies. The first greenhouse was in Suwaiq city (SGH), the second greenhouse was in Thumrait city (TGH) and the third greenhouse was representing greenhouse systems in Al-Batinah governorates (BGH). Thumrait greenhouse (TGH) had the highest LUE (181405 kg/ha) compared with Al-Batinah greenhouses (BGH) and Suwaiq greenhouse (SGH) (156695 and 142450 kg/ ha, respectively). Similarly, WUE was the highest in TGH (49.2 kg/m3) and lowest in SGH (38.6 kg/m3) because the latter had the highest water consumption for irrigation. Correspondingly, TGH had the highest

IWUE (673.4 kg/m3) in comparison to BGH (381.9 kg/m3) and SGH (323 kg/m3). On the other hand, BGH had the lowest GWUE (159.9 kg/m3) because it had the maximum water consumption for cooling. SGH had the highest EUE (0.34) followed by TGH (0.21) and BGH (0.15). From above, it is misleading to use a single performance indicator to describe the overall performance greenhouse cropping systems because one greenhouse could be strong in one indicator and weak in others. However, because energy-use efficiency (EUE) includes all input and output variables that are incorporated with other indicators, it is highly recommended to use it as a holistic performance indicator of greenhouse systems.

Best Oral Presenation Award

T Zekri was awarded the best oral presentation during the International Water Conference organized at Sultan Qaboos University, 13-16 March 2016 for the paper "Intervention Scenarios to Manage Seawater Intrusion in a Coastal Agricultural Area in Oman" Paper was co-authored with Dr Kalbus and Dr Karimi.

Best Oral Presenation Award

PhD student Mrs. Laila Al-Naamani received the best oral presentation award for her presentation in marine biotechnology during the International Congress on Marine Corrosion and

Fouling (ICMCF) meeting in Toulon, France. This award was granted by the European Society for Marine Biotechnology. Mrs. Laila presented her PhD work that was done at the Sultan Qaboos University, CAMS and Newcastle University, UK. The results of her work were published in the Chemosphere journal and later on highlighted by European Coating Journal.

Best Reserch Publication Award



Dr. Gilha Yoon and his co-authors (Ha-Al-Kaabi, ier Um Kalthoum Al-Kindi, Salem Khoom, Miyoung Cho, and Myong Ae Park) received the best research publication award for the publication: "The mortality

of Haliotis mariae (Haliotidae: Mollusca) in Oman: a case study"; in the CAMS journal during the University Day celebrations. Omani abalone, Haliotis mariae is the only species of abalone found in Omani waters. Given the rarity of this species and the high price it can fetch on the market (US\$ 150 kg-1 dry weight), the wild abalone fishery in the Dhofar region has been regarded as a valuable income source for the past decade. The study investigated the mortality of abalone held at the Mirbat Research Center through bacteriological and histopathological based investigations and challenge tests. Only the adult wild abalone that had been kept for a year in the hatchery, visually, appeared to be clear of disease symptoms. The study concluded that the bacterium Staphylococcus sciuri may be the likely cause of abalone mortalities.

FSN Faculty co-authored work received National Research Award 2016 under Health Sector

A research that described the cognitive profiles in Omani dementia patients with multi-infarct dementia in Omani population authored by Prof. Samir Al- Adawi and co-authored by Dr. Mohamed Essa, from Food Science and Nutrition and others has won National Research Award given by The Research Council (TRC) in Health and Social Sciences Sector. The findings of the paper titled "Cognitive profiles in patients with multi-infarct dementia: An Omani study" was published in a well-known journal named Dementia and Geriatric Cognitive Disorders Extra - A Karger journal on 2014. This study is a collaborative project with the involvement of well- known scientists from Australia and Oman. This is an explorative and clinically designed study to describe neurocognitive functioning in patients with MID seeking consultation at a tertiary care center in Oman. Our data are necessary for planning and setting up community services and health care programs for demented patients in a society where dementia is a growing silent epidemic. This study was led by Prof. Samir Al-Adawi Professor in the Department of Behavioral Medicine of the College of Medicine and Health Sciences at Sultan Qaboos University along with Dr. Mohamed Essa. This project was supported by a research grant from the Research Council, Oman (RC/AGR/FOOD/11/01) given to Dr. Mohamed Essa, from FSN, CAMS. Dr. Mohamed Essa's work is receiving the National Research Award for the past two consecutive years (2015 and 2016) under health sector.

SF student society won the third place for the competition between colleges and ecology societies within Oman. The competition was organized by Environmental society of Oman. Each of the teams has been asked to organize a number of meeting, workshops and campaigns associated with Oman environment and conservation in order to win the program.



af" Company (owned by CAMS students) has also earned an award "Best Marketing Plan of 2016".

Keynotes



r. Amanat Ali served as Member of the Scientific Committee for "Food Safety and Traditional Foods Conference, 2016, April 12-14, 2016, Al-Bustan Palace

Hotel, Muscat, Sultanate of Oman. http:// foodsafetyweek.om/en-gb/Conference. Dr. Ali gave a keynote talk on "Nutritional quality, glycemic index and glycemic load of traditional Omani foods and their health significance in meal planning" at the conference.

There is a progressive increase in the prevalence of obesity and diabetes (diabesity) worldwide over the past 3 to 4 decades, in particular in Arab world. Unhealthy dietary habits and sedentary lifestyle are believed to be the main factors associated with these diseases. Depending upon the type of food consumed, there is a proportionate rise in transient postprandial blood glucose concentrations. The carbohydrate rich foods that spike up glycemic exposures have particularly been implicated in the development of diabetes and other chronic diseases. The regulation of blood glucose is therefore a primary goal in the management of diabetes and any dietary technique that limits hyperglycemia and insulin response following a meal is likely to be important in limiting the complications of diabetes. The concept of glycemic Index (GI) of foods is now considered as a valid and reproducible method of classifying carbohydrate rich foods based on their postprandial blood glucose responses. It has been hypothesized that chronic consumption of high glycemic index (GI) or glycemic load (GL) foods/diets can challenge the glucose homeostasis mechanisms leading to insulin resistance and may increase the risk of diabe-

tes, CVD and cancers. The data from various studies have shown that low GI and GL diets were relevant in the prevention and management of diabetes and coronary heart disease, and probably obesity. The GI and GL values of foods/meals could therefore be a rationale way to counsel not only diabetic patients but also to the normal people in selecting carbohydrate rich foods based on their blood glucose responses. The presentation will discuss the significance of the concepts of GI and GL values of foods/diets and their role in the prevention and management of diabesity as well as the physiological mechanisms involved. The paper will also discuss how low GI and GL foods can be incorporated in daily diet-plans for both the normal population as well as for the people with physiologic abnormalities in the prevention and management of diabesity.

r. Mostafa Waly gave a talk as a key note speaker on the topic 'Targeting Colorectal Cancer with Dietary Antioxidants" at 16th ISANH Conference held in Dubai, United Arab Emirates, on April 14th, 2016. This conference was mainly directed to address the impact low intake of fruits and vegetables in the etiology of colorectal cancer (CRC), the global cause of morbidity and mortality in the Western countries and gulf region. Dr. Waly's presentation was focused on the concept that CRC, is among the primary preventive cancers if adequate intake of antioxidants was provided either by diet, and nutritional supplements. There was a focus on Dr. Waly's research group at Sultan Qaboos University which has successfully identified phytonutrients- rich dietary bioactive agents (Date Pit Pomegranate Peel, Mushroom Extract, and Nabag Extract) in providing antioxidant protective effect against oxidative stress-induced CRC, using in-vivo experimental study models. It was concluded that the high intake of plant-based foods

might be adopted as a dietary-based intervention approach for the primary prevention of oxidative-stress mediated cancers, including CRC. The mechanism was thought to be by abrogating oxidative stress in carcinogenic cells.



The Oman Diabetes Association has invited Dr. Mostafa Waly to deliver a talk as a key note speaker on the topic of " Diet, Exercise and Metabolic Syndrome " at Al Naseem Health Center, Ministry of Health, on April 12th, 2016. This workshop activity aimed to address modifiable causes of metabolic syndrome among high risk groups of the Omani adult's population. The event was based on two ways communication with the audience, as Dr. Waly has identified the metabolic syndrome as a clustered syndrome characterized by five major abnormalities: cardiovascular risk factors, including elevated blood pressure, dyslipidemia, impaired glycemic control, and abdominal obesity. Dr. Waly has shown data that this syndrome is reaching an epidemic spread in parallel to obesity, and is expected to continue to rise. Adequate dietary intake and routine exercise contribute to reduce several of the symptoms of the syndrome, and the synergistic interaction of these two factors shall provide the required stimulus to combat metabolic syndrome.

r. Mohammed Al Abri delivered a talk at the International Conference on Food Security Agricultural Sustainability and Pulses on the contribution of



locally produced camels' meat in meeting future red meat demands in Oman. The talk discussed the potential for genetic improvement in growth and meat quality traits. Current national pro-

jects seek to meet the demand in red meat by importing animals and carcasses from overseas. Although that is a reasonable approach to meet the demand in the immediate future, it is not sustainable and can be jeopardized by geopolitical unrest or disease outbreaks in exporting countries. Therefore, it is of an utmost importance to start genetic improvement programs of local livestock as these have been adapting for centuries to local environments and diseases. Camels are the perfect candidate livestock as they have not previously been selected for meat production. Therefore it is expected that their response to selection for this trait will be very high. Recent research findings have showed high Heritabilities of growth traits in camels which boosts their potential for genetic improvement. In addition, camels are the perfect livestock candidate for investment for future food security of the country..



r. Othman Alqaisi from the Animal and Veterinary Sciences department has participated in the agribenchmark network conference in Spain and has

represented the Sultanate of Oman in this global forum and presented the farming and industry status-quo of the Omani sheep and goat production. Agribenchmark network is a German public organization based in

Braunschweig and working under the umbrella of Thünen-Institut. The Beef and Sheep Conference 2016 took place in Córdoba, in the Andalusia region of Spain between 09th to 16thJune 2016. A comprehensive programmed with internal workshops on sheep and beef farming systems, international comparisons, latest developments on beef and sheep markets and trade, farm analysis, field trips to sheep, cow-calf and beef finishing farms has been experienced. The public Global Forum on June 16 held by the Spanish ministry of agriculture in Madrid and hosted audiences of more than 100 decision makers of the Spanish beef and sheep supply chain as well as agribenchmark country representatives. Competitiveness in the context of sustainable beef and sheep production was the leading topic of the event. Among the conference activities, participants have visited the OVISO (Spanish sheep producers cooperative) and the wool center which is made up by 13 sub-cooperatives and now acting as the biggest meat producing company in Spain which has a sheep population of 16.5 million head. OVISO has created a structure and consolidated a network of services to the livestock sector ranging from production support to marketing and product transformation. Furthermore, participants have visited the COVAP (Spanish Communal Feedlot Cooperative) located in Córdoba. COVAP was formed by 10,000 associates and cover activities in the dairy cattle and sheep, and meat of sheep and beef animals.



r. Shekar Bose presented a paper at the '2nd IORA (Indian Ocean Rim Association) Blue Economy Dialogue: Economic Potential and Com-

mercialization Aspects of Blue Economy in

the Indian Ocean' held in New Delhi, India, 4-5 November, 2016. The Dialogue was sponsored by the RIS (Research and Information System for Developing Countries) - an organization based in New Delhi, India - that specializes in policy research on international economic issues and development cooperation. Dr. Bose travelled at the invitation from the RIS. His presentation highlighted the socio-economic and cultural significance of the Indian Ocean fisheries for the Indian Ocean Rim (IOR) countries. Under the sustainable development paradigm, Dr. Bose's presentation made special emphasis on key management and regulatory issues of strategic impotance along with their implications, and discussed possible strategic options to promote knowledge integration, industry cooperation, effective communication, and mutual trust.



r. Mohamed Essa from FSN department gave a key note talk on Food supplements/natural antioxidants and Brain Function in 16th congress of international Soci-

ety of Antioxidants in Nutrition & Health, held at Dubai, United Arab Emirates, on April 14th, 2016. In this, Dr. Essa explained about the importance of Diet rich in natural products on brain function. He explained that naturally occurring antioxidants found in fruits, vegetables, etc may potentially hinder neuro-degeneration, and improve behavior. Considering the limits of existing preventive methods, intervention strategies using antioxidants rich natural products such as fruits, vegetables and nuts are of paramount importance. Usage of neuro-protective antioxidants is being considered as a promising approach to delay the progression of disease and have the ability to reduce the

functional neuronal loss in acute and chronic neuro-degeneration of the brain. Diet rich in phytochemicals such as alkaloids, flavanoids, etc are known to possess protective activity against brain diseases. Molecular mechanisms behind the curative effects rely mainly on the action of phytonutrients on distinct signaling pathways associated with protein folding/neuro-inflammation. The diverse array of bioactive nutrients present in these natural products plays a pivotal role in prevention and cure of various neurodegenerative diseases including Alzheimer's disease, Parkinson's disease and other neuronal dysfunctions.

Research Themes

Multisectorial Action Plan for Prevention of Childhood Obesity: Multisectorial Action Plan for Prevention of Childhood Obesity Childhood obesity is on the rise worldwide



and Oman is not an exception. Dr. Lyutha participated in three-day working group workshop lead by Department of Nutrition, Ministry of Health, and World Health Organization. The workshop was conducted At Hormuz Grand Hotel from 18-20 October 2016. Teams worked on analyzing three prioritized childhood obesity related risk factors and proposing solutions based on the analyses from the perspective of different stakeholders. The team of Dr. Lyutha worked on the school environment analyzing factors associated with the environment and thus potential avenues for intervention of childhood obesity.

Local Expert for National Nutrition Survey



r. Lyutha Al Subhi is serving as a local nutrition expert for the National Nutrition Survey (NNS) 2015. This collaboration was initiated in 2014 during the planning process of

the NNS. The project started rolling in December 2016 with World Health Organization support. In December 2016, the team came together for the final preparation for the survey under one roof. An intense workshop, called for all support teams from all the Governorates in Oman, was conducted during the training workshop; during the process Dr. Lyutha reviewed the semifinal lengthy questionnaires of the study with instant discussion with the support teams. The support teams included, nurses and dietitians from different health settings in Oman. Also, Dr. Lyutha assisted with some logistics related to the study such as communication with specialized labs for blood and urine analyses; pulling together some supplies for the pilot testing and training for the actual survey; from SQU these supplies were provided by collaboration with the SQU hospital. Further, Dr. Lyutha conducted field training for two of the support teams of the study. In this field tanning, teams and supervisors visited different houses in Boushar and Azaiba. Within a household the team was supervised in conducting the survey, taking anthropometric measurements, and colleting blood samples. Guidance was provided to the team as the process continued. At the end of every field day, the teams met for lengthy discussions and inputs from different teams and their supervisors leading to a fine tuning of the process and procedures.

Controlling darkness of Date Fruits during storage



Date fruits is the main agricultural product in the sultanate. Date fruits because they are dry, they are normally stored at room temperature. During storage several changes take place in the fruit which adversely affect its quality and as a result reduces its commercial value especially yellow dates. Dr. Ahmed Al-Alawi and his group (Ms. Insaaf Al-Marhoubi and Ms. Mariam Al-Amrani) are trying to solve this problem through testing different treatments to control black colour formation in yellow dates. The outcome of this project is expected to improve dates quality, extend marketability period and reduce storage cost. It is worth mentioning that this research project is funded by the internal grant of CAMS college (AGR/FOOD/16/02).

Role of Minerals in Hydroponic Agriculture

n natural conditions, soil acts as a mineral nutrient reservoir. In hydroponic system the required mineral nutrients are introduced into a plant's water supply artificially in addition to exposing part of the root system to aeration. This is all what the plants require for its nutrition for its normal growth since no other sources of plant nutrients are added to the system. These minerals are the major essential resources which are applied in the right balance to satisfy crop requirements needed for the formation of organic compounds which are the building blocks of all the food in plants through the process of photosynthesis. Mr. Muthir Saleh Al-Rawahi is currently investigating the uptake of minerals in Hydroponic agriculture as part of his doctoral research under the supervision of Associate Professor Dr Salim Ali Al-Rawahy Hydroponics has been widely adopted by growers in large commercial scale all over the world in particular for high value vegetable crops grown under greenhouse. In Oman, green house growers are facing problems associated with water scarcity and quality coupled with soil salinity and soil borne pests and diseases. Therefore, the adoption of soilless growing techniques (hydroponics) is inevitable for the production of high value nutritious vegetable crops. Around ten years

ago hydroponic growing techniques were introduced to Omani growers who are now highly successful in producing high quality crops with high economic returns as a result of technical collaboration between the Ministry of Agriculture (MAF) and the International Centre for Agricultural Research in Dry Areas.

However, the high temperature during summer time is affecting the nutrient solution quality and hence affecting plant growth and development negatively. Research program is being implemented to investigate the problem with a number of research experiments to study the influence of nutrient solution temperature on the solution of oxygen level and its effect on root and plant growth and development, yield and quality of products, and enhancing system design to maximize yield and quality.



Making Wastewater Irrigation Decisions Easy



In Oman, the total volume of treated wastewater (TW) is increasing to more than 100 Mm3 per year as a result of rapid population growth, urbanization and industrial development. Although 68% of the

TW production is used for irrigating public garden and green strips, however the surplus of more than 30% is discharged to the sea. A study was conducted by Nawal Al_Wehebi under the supervision of Drs. Mushtaque Ahmed and Hemanatha Jayasuriya to make it easy for decision makers to arrive at a decision on wastewater irrigation. The aim of this project was to develop a decision support system (DSS) to assist farmers and managers for maximization of the conjunctive use of TW with GW for irrigation, through identifying best year-round crop rotation sequences of wheat, cowpea and cucumber for rotation 1, potato, cowpea and maize for rotation 2 and sweet melon, millet and lettuce for rotation 3. Then, performance of crop rotations was evaluated in term of cultivated area changes, TW and GW used under different irrigation water salinities (control, 1, 2 and 4 dS/m) using average climatic data of Muscat (1996-2010). Decision support system was used to assess the cost-benefit analysis of using TW conjunctive with GW for irrigation under different levels of irrigation water salinities. Sensitivity analyses on subsidy, GW cost and future production of TW were performed for the crop rotations by using the developed DSS in order to simulate future changes that may assist the farmers to draw a plan of action to avoid economic losses for any changes happen. By using Oman statistical data, the results showed that (assuming no leaching fraction considered and TW availability of 90,865 m3/day) the cultivated area increased by 155% for rotation 1, 97% for rotation 2 and 252% for rotation 3. By irrigating crops with different irrigation water (TW+GW) salinities (control, 1, 2 and 4 dS/m) cultivated area reduced. Crops in rotation 1 were the least affected crops by increasing irrigation water salinity where the reduction of cultivated area was 34% at zero GW (ZGW) use scenario and 31% at zero treated wastewater (ZTW) excess scenario as the salinity increased from no leaching fraction considered

(control) to 4 dS/m. Crops in rotation 3 were the most sensitive crops to increasing irrigation water salinity and the reduction in cultivated area was 97% at ZGW use scenario and 96% at ZTW excess scenario as the salinity level increased to 4 dS/m. Various scenarios were looked at especially how cost of inputs will affect the farmer's income. The developed DSS was used to simulate the predicted increase of TW production by fourfold in 2025 for Muscat and the results showed an increase in the total profits of all crops in the three rotations with different irrigation water salinities by around 300%.

Utilization of a Waste Product

Tt is well-recognized that management of wastewater and sludge is a critical environmental issue in many countries. A regular and environmentally-safe wastewater treatment and associated sludge management requires the development of realistic and enforceable regulations as well as treatment systems appropriate to local circumstances. A study was conducted on using sewage sludge by Suad Abdulkhaliq under the supervision of Dr Mushtaque Ahmed. The objectives of this research were to compare the current Omani legislation with international legislation and to recommend whether it is necessary to implement some amendments and modifications to the national regulations. Moreover, the effect of composted sewage sludge (commercially known as Kala compost) was investigated on the phytoremediation and bioremediation methods on diesel-contaminated soil by means of two plant species (Bermuda grass and Ryegrass) for the former method and by using it with isolated microorganisms from diesel-contaminated soil for the latter one. Lastly, the effective application of Kala compost and inorganic (NPK) fertilizers on soil quality and two crops (radish and beans) was studied. The study revealed that the national regulations are considered to be too general and a number of recommendations

are suggested to modify the guidelines under the consideration of decision makers in Oman. The remediation of diesel- contaminated soil showed that 77% removal of total petroleum hydrocarbons (TPH) in the phytoremediation method was achieved when 10% Kala compost was applied in contaminated soil when cultivated with Bermuda grass, showing the effect of this plant in the remediation of TPH in the diesel-contaminated soil compared to Ryegrass . The isolated strains in the bioremediation method were Biscillus genera which belong to degradable diesel strain categories which had shown their capabilities to degrade diesel fuel up-to 66% after incubation for one week and 90% after incubation for two week especially when 1% Kala compost was added to the treatments. In addition, their concentration dropped from 87 to 29 mg of alkanes/g soil in the same treatment. These strains are considered as halotolerant and mesophilic, which can grow in coastal sediments where the salinity could reach up to 10% of NaCl concentration, and can survive in the Omani hot summer months where the temperature reaches up to 55oC. Finally, Kala compost showed its efficiency in producing higher crop yields of radish and beans compared to NPK fertilizers in the agricultural experiment. Moreover, chemical analysis of soil and the two crops did not show any risk of heavy metal accumulation.



Mitigating Environmental Risks of Wastewater Reuse for Agriculture

field-based project was completed under the leadership of Dr Ahmed Al Busaidi of SWAE on conjunctively used irrigation of groundwater and treated wastewater for vegetables. Treated wastewater has shown high potential for reuse in agricultural production, which can thereby contribute to the conservation of surface water and groundwater resources especially in dry countries. Use of treated wastewater for agricultural irrigation is an age-old practice in Tunisia and Jordan while Oman is still on a learning curve. However, issues exist on relying completely on treated wastewater for irrigation. As an alternative, the conjunctive us of treated wastewater and conventional water resources could be employed, helping to safeguard a fair farmer income and sustain food production. Despite this promising option, more research and education efforts are needed to ensure proper use for agricultural production. Therefore, the objective of this project was to identify means/tools to optimize treated wastewater reuse in conjunction with other available water resources by taking into consideration their quantity and quality, in addition to the agronomic, environmental, and economic components.

The project was successfully done in three countries (Oman, Tunis & Jordan). Quality of treated wastewater, soil and irrigated crops were evaluated and found to be free from any microbial or chemical contaminations except in some cases where bad management was applied or treated wastewater was not completely treated.

More than three decision support system models were developed. The models can guide farmers and decision makers to the best usage of treated wastewater with maximum benefits for the farmer and less risks for all surrounding environment. Moreover, the models can work with treated wastewater, groundwater and surface water or mixture of two waters which depend on water availability, water cost and environmental risks such as soil and grown crops and finally the outcome that farmers can get. This approach can maximize the usage of treated wastewater and minimize groundwater abstraction so water productivity will increase and more water will be kept for future application. The findings of the project were disseminated through different media. Whereas, knowledge exchange and capacity buildings were approached to local and international scientists including farmers.



Field survey in Qatar



he field survey was carried out on daily basis in the Al-Karrara site located 60 km South-West of Doha, one hour drive from the QEERI-QF facilities. We used different

Very High Frequency (VHF) GPR systems from 40 to 500 MHz (SubEcho and Mala) to probe the subsurface detectability of shallow and deep aquifer systems (See figures below). We were able to map the water table profile and locate some sub-surface features like fractures, which we belief it is responsible for discharging significant amount of groundwater through evaporation. The site results extremely interesting and conveyed to the team several research questions that definitely need to be explored in the future. This project and its results will certainly be beneficial for the groundwater resources management in one of the most arid area in earth. The work continues for the coming 4 years. The site in Qatar is quite different than the ones in Oman and Morocco and as a hydro-geologist of arid environments I could benefit and learning a lot from this fieldwork. MEDRC & SQU collaborate to provide Omani Farmers Environmentally Friendly Desalination Techniques



In Oman, due to the increased level of soil and water salinization along Al-Batinah region coast, an increasing number of farmers are using small-scale desalination units for producing irrigation water. Desalination technology remains still an expensive option for agriculture and has environmental challenges that include energy requirements, water quality, and disposal means of rejected brine which end up in many cases by contaminating their groundwater and increasing its salinity. However, it can still be an attractive option for sustainable agriculture if used within specific constraints. Brine disposal costs are high today, between 5 and 33% of total desalination cost, complicating implementation. This cost depends on the quality of the concentrate, treatment level before disposal, disposal method and the volume or quantity of concentrate. In spite of the scale of this economic and environmental problem, the options for brine management for inland plants have been rather limited. One of the options is to use evaporation ponds.

To help farmers in Oman deal with the challenge of brine management, MEDRC (Middle East Desalination Research Center) and Department of Soils, Water & Agricultural Engineering of CAMS, joined efforts to carry out a research project on evaporation enhancement that includes: 1) A comprehensive literature review on the topic of evaporation enhancement and identification of most promising ones for field situations; 2) Perform laboratory experiments under controlled conditions and field experiments with the most promising evaporation methods; and 3) Perform cost-benefit analysis of the selected methods and prepare design criteria and guidelines for practical applications. This project aims to assist and train Oman Farmers in adopting such methods. The goal is to enable operators of small-scale desalination



plants for agriculture: 1) Reduce the impact of brine discharge on the environment, 2) Protect their crops, and 3) Reduce operation costs.



Professor Eugene H. Johnson is a co-principal investigator on Project entitled 'Sexual stage specific protein genes of Theileria lestoquardi: putative tar-

get for transmission blocking intervention and markers for transmission dynamics'. The principal investigator of this project is Professor Prof Hamza Babiker from the department of Biochemistry, College of Medicine, and Sultan Qaboos University. The project received an OMR 50000 grant from GCC. Another Co-PI in this project is Prof. Arnab Pain, University and College/Centre: King Abdullah University for Science and Technology (KAUST)



Professor Osman Gaafar is currently involved in research investigating the use of vegetable waste for feeding Omani livestock after processing and mix-

ing with other feeds. Waste of leaf vegetables (cabbages, lettuce and cauliflower) has been collected from Al Mawaleh vegetable market and dried in a solar dryer in collaboration with the Dept. of SWAT. Mixed rations will be prepared and fed to Omani sheep.

r. Waleed Al-Marzooqi research focuses on understanding the role of chicken microbiota in nutrition and health as this is vital for improving the efficiency of poultry production and achieving future sustainability. Recently, there have



been concerns over the use of antibiotics in animals and humans which led to emergence of antibiotic resistance in human or zoonotic pathogens. There is an increasing

pressure to eliminate such practice. Replacements of hazardous chemical and antibiotic based approaches are particularly needed. In order to identify bacterial species that promote or interfere with good gastrointestinal health of the host, it is important to first define the gastrointestinal microflora of chickens reared on simple diet devoid of other dietary supplements that may influence the microflora's composition. An internal research grant on "the effect of housing and strain of chickens on the biodiversity of gut microflora in the gastrointestinal tract using 16sr DNA-based analysis" is in its third year.



r. Mohammed Al Abri received an internal grant to study the Genetic characterization of the Arabian horses in Oman. The aim of this project is to decipher the genet-

ic background in the Omani Arabian horses by comparing them to Arabian horses from a diverse genetic background. Genome wide SNP data obtained using genotyping by sequencing will be used to achieve this objective. The results of this project should unravel the genetic make-up and genetic diversity of the Arabian horses in Oman. These measures are crucial for decision makers as well as owners in shaping future policies and practices in breeding and management.

r. Yasmin ElTahir is working on the ongoing strategic research project. The focus of the project is to shed



light on brucellosis in different animal species in the Sultanate of Oman. The team has revealed for the first time that brucellosis is prevalent in goats in Al Jabal Al Akhdar, Sul-

tanate of Oman with an overall prevalence of 11.4%. Utilization of Bp26 as an alternative antigen to study the seroprevalence of brucellosis and to differentiate infected animals (including carriers) from vaccinated animals is ongoing.

Anti-cancer compounds in Omani marine organisms

research team headed by Dr. Sergey Dobretsov of the Centre of Excel-Llence in Marine Biotechnology, Department of Marine Science and Fisheries at the College of Agricultural and Marine Sciences, Sultan Qaboos University, has done a pioneer research project aimed at screening of anti-cancer compounds in Omani marine organisms. The study suggested that chemical compounds produced by Omani marine organisms have cytotoxic properties and can be used for anti-cancer treatment. The results of this study have been recently published in the Sultan Qaboos University Medical Journal. The publication of Dr. Sergey Dobretsov, Dr. Yahia Tamimi, Mr. Mohamed Al-Kindi and Dr. Ikram Burney is entitled "Screening for Anti-Cancer Compounds in Marine Organisms in Oman". During this collaborative project SQU scientists from two colleges (Agricultural and Marine Sciences, Medicine and Health Sciences), University Hospital and the Centre of Excellence in Marine Biotechnology collected marine fungi, bacteria, sponges, sea weeds, soft corals, tunicates, bryozoa, and sea cucumbers from Oman waters. These organisms were selected because of their high biotechnological potential validated in the preliminary study. Dr.

Dobretsov's research team has extracted and purified bioactive compounds using different chromatography methods and instruments in cooperation with the scientists from Germany and the United States of America. The experiments demonstrated high anticancer potential of extracts and pure compounds of



Omani marine organisms which needs to be investigated in details in the future.

Aquaponics

quaponics is a combination of aquaculture (growing aquatic organisms) and hydroponics (growing plants without soil). It is a culture system in which the uneaten feeds and wastes produced by the cultured fish supplies nutrients for plants grown hydroponically, which in turn purify the water by taking up the nitrates converted from nitrites and ammonia by the nitrifying bacteria. It is an environment-friendly way of growing fish and plants as the wastewater is not discharged to the environment but rather used for the growth of plants. The 'wastewater' is actually not a waste because it contains nutrients that can be utilized by plants. Analysis of elements including heavy metals have shown that the fish and plants are safe for human consumption.Since Fall 2014 semester, several groups of undergraduate students

under the supervision of Dr. Wenresti Gallardo (Department of Marine Science and Fisheries) have conducted several experiments to develop this simple and effective aquaponic system. Fish can be stocked at densities 3-5 times more than in non-aquaponic system, without changing the water. Mint, lettuce, strawberry and other plants can be grown in an aquaponic system, depending on the season. Analysis of heavy metals have shown that the fish and plants (vegetables) are safe for human consumption

Development of land-based integrated multi-trophic aquaculture (IMTA) system suitable for Oman

• nvironment-friendly aquaculture techniques and systems are necessary to ensure sustainable aquaculture development. One of the aquaculture systems that has great potential for environmental protection is the integrated multi-trophic aquaculture or IMTA. It involves the culture of a number of species belonging to different trophic levels, some of them are fed and others are extractive, in which the particulate and dissolved wastes (uneaten feeds, feces, excretion) of other species can be utilized by other species. IMTA research at CAMS was initiated by Dr. Wenresti Gallardo in 2015 with internal grant funding for three years. In 2016, an undergraduate student (Balqees Al-Rashdi) completed her special problem research on the effect of fish densities on water quality and growth and survival of abalone, seabass, mussel and seaweeds.

Larval culture of the tropical spiny lobster, Panulirus homarus: a new candidate species for aquaculture in Oman

Spiny lobsters (Palinuridae) are one of the world's most valuable seafoods and form the basis of important fisheries world-wide. However, commercial fishing has left many species fully or over-exploited. Some 3,000 fishermen land spiny lobsters in Oman, where reported landings have decreased from over 2,000 t/y in the 1980's to less than 500 t in 2010. In Oman, the scalloped spiny lobster, Panulirus homarus (sub species megasculptus), is the main commercial species, which occurs south of Ras al-Hadd, with the main fisheries in Masirah and Dhofar.

Hatchery production of lobster larvae (phyllosoma) is technically challenging because of the protracted duration of larval develop-



ment, the large number of moults (shedding of the exo-skeleton) involved and the delicate nature of the larvae. Culture of larval spiny lobsters involves complex management of water quality and the maintenance of a stable microbial environment.

A research project initiated in 2014 by Dr. Stephen Goddard, with funding from The Research Council (TRC) was turned over to Dr. Wenresti Gallardo in 2016 when Dr. Goddard resigned from the university. The project focuses on defining essential production criteria such as water treatment technology, optimum water quality conditions, optimum incubator vessel dimensions and design, conditions required for post-larval settlement, growth and survival and larval nutrition.

In 2016, the research team successfully reared the phyllosoma larvae up to stage 5 in 91 days which was not achieved in previous larval rearing attempts. This was accomplished using a diet of grown Artemia and individual rearing method. In another experiment, the combination of Artemia and commercially-available microencapsulated diet resulted in higher larval survival (up to 93 days) than Artemia only (69 days) or microensulated diet only (17 days). Further work need to be done to test other potential feeds for the larvae

Fisheries Science

nesh Govender is a fisheries scientist who specializes in the stock of Lassessment of exploited fish stocks. Using mathematical and computer models he is able to determine whether a fish stock is overexploited or optimally exploited. Within SQU he teaches Ichthyology, Marine Biochemistry and Molecular Biology and he offers two courses in Fisheries Management. All these courses were developed by him. In collaboration with Drs Sergey Dobretsov and Raeid M.M. Abed he supervised a PhD student Thirumahal Muthukrishnan. She successfully defended her degree. His contribution was to conceive a project for her on how to evaluate the counting of bacteria on a microscope slide and its accuracy. This work has been published in a peer reviewed journal. In collaboration with MoAF and working with HE Dr Hamed Al Oufi they determined the



gear selectivity of the Indian Oil Mackerel. They showed that Indian Oil Mackerel is vulnerable to gill nets that have small mesh sizes, which may lead to overexploitation. This study has been submitted for publication and is in press. The brown mussel which occurs in small abundances in Oman was studied by Dr Anesh Govender and Dr Said Al Bawani and the latter's colleagues from Malaysia and they were able to describe the growth rate of this species using only the length of this invertebrate. This study is pending publication. At SQU Dr Anesh Govender has helped many postgraduate and undergraduate students, from all departments at CAMS, with statistical analysis of their research data.

Fishing Gear Research



r. Hussein M a s r o o r i worked with three grants: 1) catching and economic performance of the demersal longline fishery to identify the best hook size to be used in de-

mersal fishing; 2) biological deterioration as an approach to terminate the effective fishing life span of lost traps through using different type of natural fibers; and 3) estimating the capital stock and investment in artisanal fishery using Al-Seeb as a case study.

Oceanography Research - A cutting Edge technology in studies of seasonal algal blooms

Seasonal algal blooms developing in the Omani shelf waters during the South-West and North-East monsoons result in periodic fish kill incidents, shortages in desalination plant functioning, and recreational problems for tourists and divers.

Our team, sponsored by the ONRG grant linking scientists and technicians from the Department of Marine Science and Fisheries and University of East Anglia, has launched several sea gliders, in order to study seasonal algal blooms. Sea gliders are autonomous robotic systems equipped with numerous sensors allowing recording of physical, chemical, and biological parameters of the water column. These records could be carried out every 6 hours, on the way to the surface (from the depth of several hundred meters) and back. In reaching the surface, the glider transmits recorded data via satellites and gets a new command- on what to do and where to sail.

Data on vertical distribution of temperature, salinity, water density, dissolved oxygen concentration, and phytoplankton biomass (based on fluorescence measurements), was complemented by sampling on board SQU research vessel "Al-Jamiah" coming from time to time to visit the glider. This sampling allowed us to understand what species have played the most important role in the formation of algal blooms.

Overall, sea glider observations combined with plankton sampling and remote sensing provided insight into the termination of the winter monsoon algal blooms observed at sea surface and subsequent descending of these blooms to the depth of 25-55 m during the Spring Inter-monsoon season. In comparison to the surface bloom, species diversity of the subsurface bloom is decreased by half. The dinoflagellate Noctiluca scintillans dominated by biomass in all samples collect-



ed from the depth of subsurface fluorescence maximum. The subsurface algal blooms persist throughout inter-monsoon seasons, linking blooms initiated during the South-West and North-East monsoons.

New Tomato lines adapted to Oman

The overall goal is to develop improved tomato germplasm that make production systems more stable and productive under climate change in Oman and the region. Forty-two tomato lines were introduced from University of Florida, USA. The genotypes carry different disease resistance genes to Bacterial wilt, Begomovirus, Fusarium crown rot, and Spotted wilt as well as heat tolerance genes. Seed increases for each of the lines were done between March and August 2016 in the greenhouse, AES, SQU.

DNA molecular characterization of the tomato lines using Single Nucleotide Polymorphisms (SNPs) was developed at Cornell University, USA. The total number of SNPs identified were 11,604 for the tomato genome (12 chromosomes). This is the foundation for a genetic fingerprint for future studies of diversity and resistant genes-phenotype associations.Phenotypic evaluation and adaptation under the Omani climate are being conducted now with 22 lines that carry virus resistance and heat tolerance genes. The lines were planted in the field at AES in early October, 2016. The tomatoes will be evaluated in the field for their phenotype, virus resistance and heat tolerance. The genetic diversity of the tomato lines will be studied using the SNPs. Association between SNPs molecular markers and the phenotypic traits will be analyzed. This is the starting point for better understanding of the genetic basis of virus resistance and heat tolerance from new sources of genetic material for incorporation into adapted cultivars in Oman and GCC countries.

Leafminer (Tuta absoluta) Research

I n 2016, we continued the monitoring of Tuta absoluta populations in three different sites spanning Al Batinah, Muscat, and Ad Dakhiliyeh. In addition, we conduct-



ed a new more comprehensive survey of this pest in which we looked at the populations of this pest in 49 different sites throughout northern Oman. These sites were not dedicated vegetable crop fields commonly seen in Al Batinah. They were in fact date palm orchards with minimal tomato production areas. We wanted to know whether Tuta absoluta would be present at high population levels at these presumably tomato-less agricultural areas.

Pheromone traps were hung for a period of 4 months. Traps were brought to the laboratory and we were surprised to find out that 48 of 49 traps captured male Tuta absoluta in the range of 2 to 352 individuals per trap. We are suspecting that sites with large numbers of trapped Tuta absoluta had tomato or other solanceous crops grown in their vicinities. Most of the larger catches were in Al Batinah North and Al Batinah South. These results need to be checked against confirmed infestations by Tuta absoluta on crop plants in these same surveyed sites. Effect of Deficit Irrigation Regimes on Greenhouse Cucumber (Cucumis sativus) Growth and Yield



ater is a limited natural resource for which there is competition as agricultural, industrial and domestic use. Studies were conducted to investigate the impact of a series of deficit irrigation regimes on overall cucumber crop performance under greenhouse conditions at the Agricultural Experimental Station (AES), SQU. Cucumber seedlings were raised and transplanted into the greenhouse.

Plants were irrigated with 100%, 80%, 60% and 40% of recommended irrigation rates. Results showed that using reduced amount of irrigation water at levels of 60% or 80% had no significant effect on final harvestable crop yield as compared to 100% or full irrigation. However, the crop yield was decreased significantly when plants were irrigated with 40% irrigation. Irrigation regimes did not show any pronounced effect on fruit soluble solids (sugar content) or leaf chlorophyll. Results showed that significant amounts of water (20-30%) can be saved without any negative impact on crop quality and productivity for greenhouse cucumbers. Subsequent experiments are underway to confirm our earlier findings.

Dubas Bug Research

r. Ali Al Wahaibi, has been working as Co-PI on two dubas-bug related projects, both funded by TRC. He has been helped by Mr. Ali Al Raeesi (Entomology Lab) and a group of dedicated re-



search assistants. The first project deals with the impact of predatory arthropods that feed on the dubas bug and help reduce its population. Predators were sampled from 80 date palm orchards throughout Oman. Arthropod (insects and their close relatives) samples were sent to the University of Kentucky (USA) which is collaborating on this research in terms of producing primers for a dubas bug DNA fingerprint. This molecular fingerprint is then used to detect the dubas bug DNA in the gut of predators. We managed to screen the gut content of 433 arthro-The molecular analysis confirmed pods. that six different species of arthropods feed on the dubas bug in the field. These were four species of spiders (Aranae), one species of small mantids (Mantodea), and one species of dustywings (Neuroptera). The distribution of these six species across Oman can be mapped using data from the project. Additionally, observations of feeding in the laboratory have revealed further groups of insects that feed on the dubas bug: a species of green lacewing (Neuroptera), a species of ants (Hymenoptera), a species of rove beetles (Coleoptera), and a species of ladybird



beetles (Coleoptera).

Since March 2016, we have been doing intensive sampling (weekly and biweekly) of arthropods in two date palm orchards in Ad Dakhiliyeh. Arthropod species have been sorted, counted, preserved and stored according to optimum molecular analysis standards. This kind data will help us understand the changes of the population of the dubas bug and those that prey on this pest, through molecular means and/or laboratory observations. This data will point to the relative importance of each predatory species as natural control for this important pest of date palm.

The other project has been focusing on relating dubas bug density and distribution to important geographical, biological and human-factors that could impact populations of this pest in date palm orchards. The biological factors include the assemblages of predatory and parasitic species that would feed on the dubas bug, while the human factors include cultural and pest management practices implemented by farmers and Ministry of Agriculture and Fisheries (MAF). Most important of these human factors are tree spacing, plant diversity, pruning regime, general upkeep of date palms and farm in general, and most importantly pesticide applications. Fifty-six date palm orchard sites

have been sampled so far and include direct sampling of insects from date palms and understory vegetation, estimation of egg densities and honeydew on leaves, and also from soil to determine its arthropod fauna and levels of pesticide residue. A questionnaire was used to collect site-specific agricultural data. We have also been gathering historical data relating to pesticide applications by MAF and farmers for all sampled sites.

Since April 2016, MSc student, Sara Al-Ansari (supervised by Dr. Ali Al-Wahaibi) has been processing the soil and plant samples, sorting and counting arthropods and recording abundance and species richness data. Sara is also looking at the relationship between pesticide residues in the soil and density of dubas bug and natural enemy groups. Preliminary analysis of her soil data shows an increase in overall arthropod species richness with an increase in dubas bug densities, with the highest average abundance recorded at moderate dubas bug densities

Photocatalytic degradation of toxic organic compounds in water using zinc oxide nanorods

r y study in PhD is focusing on the application of zinc oxide nanoma-Leterial for degrading toxic organic compounds that present in water. Many industries are responsible for water pollution such as crude oil exploration and refinery activities, pharmaceutical and pesticide manufacturing, mining, food and textile industries. As a result, those industries can yield wastes, if not properly treated, and lead to threat human health and biodiversity. Many conventional treatment technologies are currently used for water treatment from toxic compounds such activated carbon, biological treatment, flocculation and coagulation, membrane filtration and sedimentation. Conventional wastewater treatment technologies are widely used in the field and could offer good solutions for water treatment from pollutants. Although they got high aspects of development but still are not sufficient to remove all pollutants from water and seems to produce secondary wastes. Advanced oxidation processes (AOPs) is a promising technology and have received much attention for solving problems related to water contamination by degrading the toxic pollutants that present in water into harmless products such as water, carbon dioxide and mineral acids.

Nanotechnology is a technology based on size as by minimizing the size of the material therefore will increase the surface area. Attributed to nanotechnology importance in many aspects related to humans and the intervention in many industries related to oil extraction and medical fields of environmental and agricultural uses and the science and engineering of food in addition to the electronics industry. The use of catalysts nano photocatalysts supported light of the leading technologies in recent years through their efficiency in converting persistent organic toxic, such as phenol, pesticides, oil, vehicles and others to less harmful to humans and the environment. Zinc oxide (ZnO) nanostructure has got much attraction as it is a wide band gap semiconductors and is effectively to produce reactive oxygen species (ROS) that will degrade the organic compounds in water. It is active under ultra-violet (UV) light. UV irradiation has some disadvantages as it is costly and needs large area and therefore alternative solution should be selected. Visible region of the solar spectra can be used for



activating the ZnO photocatalyst if ZnO is modified to make them active in visible light. Creation of defects on ZnO nanorods by annealing it at high temperature (optimum 350 0C) could enhanced visible light absorption and accelerated the photocatalytic degradation.



FTIR Microscope FSN department has recently installed

F TIR microscope - a cutting edgeresearch instrument - to strengthenresearch capability in the department. Themachine combines IR technology with microscopeto examine micro size samples. Themachine will be involved heavily in the ongoing research projects which deal with cancerdiseases, neurogenic diseases and characterization of chemical compounds in food samples. The machine is operated under the supervision of Dr. Ahmed Al-Alawi.

and Biosciences International). [http://www.cabi.org/bookshop/book/9781780647.



Involvement of CAMS faculty in Journal & Books

new book; "Lime, Botany, Production and Uses," was completed in 2016, and is due to be released in April, 2017. Editors include Dr. M Mumtaz Khan and Dr. Rashid Al-Yahyai, SQU, and Dr. Fahad Al-Said, of The Research Council, Oman. The goal of the book is to provide an up-to-date resource on production and use of limes, including new threats, such as the witches broom disease and citrus greening disease. Chapters in the book cover classification, distribution, botany, as well as advances in breeding and genetics. Propagation methods, nursery certification, growth, development and reproductive physiology are included as well as irrigation, cultural practices, plant protection, harvesting, and post-harvest management. Traditional methods and also newer methods such as precision agriculture are covered. Additional SQU authors on specific topics include Dr. Rhonda Janke, on organic lime production methods, and xxx (any others?). The book is published by CABI (Centre for Agriculture

FSN Faculty's edited Book on the benefit of natural products and Neurodegenerative Diseases

r. Mohamed Essa, Associate Professor in the Department of Food Science & Nutrition recently co-edited a book that explored the link between natural products and neurodegenerative diseases. The book titled "The Benefits of Natural Products for Neurodegenerative Diseases" which contains chapters about the benefits of multiple natural products by leading researches, examines the molecular mechanisms behind the effects of natural products.

The co-editors of the book are Dr. Mohammed Akbar from National Institute of Health from the US, and Prof. Gilles Guillemin from Macquarie University, Australia. The volume, brought out by Springer, USA under Advances of Neurobiology category, focuses on the effects of natural products and their active components on brain function and neurodegenerative disease prevention. Phytochemicals such as alkaloids, terpenes, flavanoids, isoflavones, saponins etc are known to possess protective activity against many neurological diseases. The molecular mechanisms
behind the curative effects rely mainly on the action of phytonutrients on distinct signaling pathways associated with protein folding and neuro-inflammation. The diverse array of bioactive nutrients present in these natural products plays a pivotal role in prevention and cure of various neurodegenerative diseases, disorders, or insults, such as Alzheimer's disease, Parkinson's disease, Huntington's disease, traumatic brain injury, and other neuronal dysfunctions. However, the use of these antioxidants in the management of neurodegenerative conditions has so far been not well understood. "The Benefits of Natural Products for Neurodegenerative Diseases" is a comprehensive collection addressing the effects on the brain of natural products and edible items such as reservatrol, curcumin, gingerol, fruits, vegetables, nuts, and marine products.

This book is sixth book of Dr. Mohamed Essa after joining SQU. The advantage of this book is indexed in Pubmed for more reading access. This book further strengthens the strong collaboration between Dr. Essa, SQU and his collaborators from NIH, USA and Macquarie University, Australia. The book has total 23 chapters which were contributed by the leading researchers from USA, Australia, India and Oman. The book was published on 21st September 2016 and it is available to read through the following link http:// www.springer.com/gp/book/9783319283814

Book on the benefit of Food on Parkinson's disease

new edited book was published on 6th of October 2016 titled "Food and Parkinson's disease" by Nova Science Publishers, INC, USA under Bio-medical category (https://www. novapublishers.com/catalog/product_info. php?products_id=59289&osCsid=0cbd30c95858aff2f396fb8dfa60c72a). It was co-edited by Dr. Mohamed Essa, Associate Professor in Human Nutrition from the Department of Food Science & Nutrition at the College of Agricultural & Marine Sciences, Sultan Qaboos University and Dr. T. Manivasagam, Dr. A. Justin Thenmozhi (both from Annamalai University, India), and Dr. Mohammed A.S. Khan (from Massachusetts General Hospital and Harvard Medical School, USA). This book mainly focuses on the alternative therapeutic approach for managing Parkinson's disease. This manuscript analyzes the curative properties of natural ingredients and bioactive compounds - known as "nutraceuticals" - from natural foods, herbs, spices and plant extracts. Scientific revelations supported by conducted research concerning these remedies are presented. For example, consuming foods from natural sources that are rich in amino acids, antioxidants, vitamins and alkaloids may reduce the chances of onset of Parkinson's disease, and suggests that nutrition and diet have an impact on disease management. In addition, epigenetic modifications in conjunction with Parkinson's disease are also discussed in this book.

This book was partly supported by an internal research grant from CAMS, SQU to Dr. Essa (IG/AGR/FOOD/14/01). This book on Parkinson's disease describes the benefits and medicinal values, and mechanisms of action of natural food products. The motive is not only to describe their scientific importance of nutraceuticals but also to create awareness in general audiences about the dietary consciousness to reduce the incidence of Parkinson's disease. This book has total 11 chapters authored by well-known experts in this field from USA, India, Egypt and Oman. The first chapter discusses about the benefit of dietary amino acids for the benefit of Parkinson's disease and the second one about effect of dietary antioxidants on this disease. Other chapters are discussing about the benefits of spices, turmeric, citrus fruits, black tea components, Ayurveda and sea weed bioactive components against Parkinson's disease. The book was already nominated for the Gourmand Cook Book awards 2016 under Nutrition and Institutions category (D-09). This is the seventh book of Dr. Mohamed Essa after joining SQU, Oman. Dr. Essa thanked the individual authors for their contributions and the editors believe this book would increase the knowledge of the readers and help understand them the pathological process of Parkinson's' disease and importance of natural food products in disease management.

FSN Faculty edited a special issue in high impact journal

r. Mohamed Essa from FSN department edited a special issue on "DietarySupplements/Antioxidants: Impact on Redox Status in Brain Diseases" in Oxidative Medicine and Cellular Longivity (Impact factor – 4.492) by Hindawi Publishers. Dr. Essa edited this special issue along with his international collaborators Professor. Byoung-Joon Song from National Institute of Health, USA, Gilles J. Guillemin from Macquarie University, NSW, Australia and Thamilarasan Manivasagam from Annamalai University, India. The issue was developed due the importance of Healthy diets rich in natural products could decrease the risk and outcome of brain diseases, because oxidative stress plays a major role in neurodegenerative diseases and many other chronic diseases. Total 17 articles were submitted by experts from different part of the world and 7 were accepted after several rounds of review by the experts. This issue was published in 2016,

December along with an editorial by Dr. Essa and his associate editors.



Assistant Dean for Undergraduate Studies



The college of Agricultural and Marine Sciences offer 10 majors. These are Agricultural Engineering, Animal Science, Crop Sciences, Food Science, Human Nutrition, Marine Science and Fisheries, Natural Resource Economics, Soil Sciences, Veterinary Technology and Water Technology. The office of the Assistant Dean for undergraduate Studies continued, jointly with departments in promoting excellency in academia life for more than 1143 students. The office continue working on improving the academic curricula through different college committees. In addition, the college started the program accreditation (e.g. Agricultural Engineering). The office had developed an innovative criteria and guidelines for best CAMS student selection that will be implemented in 2017.

New committee was issued to look after the probation students. All CAMS probation students were transferred to a selective academic supervisors in order to help them to overcome this situation and guide them towards completing their degree. These supervisors were given two sessions on how to deal with probation students. The office conducted 2 hours workshop for the foundation students on the academic regulations and registration issues. The office continued providing data and statistics for all departments that is needed for academic program revision and accreditation.

Teaching

Experts from the WTO Agriculture and Commodities Division delivered class lectures for NRE students enrolled in the 'International Trade NREC 4410' and 'Food Policy NREC 3102' courses during the 9th and 10th of November 2016 . Ms. Marie-Bel Marinez lectured on the "WTO and the Agreement on Agriculture" and Mrs. Ulla Kask lectured on" Food Policies and the role of WTO". They also helped reviewing the course on international trade offered for graduate students in the Department.

Real-world learning: Field Trips by SWAE Students



Undergraduate and graduate students in the Soil Science program are on a Winter Tour field trip. The students dig mini-pedons, collect soil samples and carry out land surveying in a wadi (Bid-Bid). Students explore intricate hydrology of the hyporheic zone and adjacent floodplain, currents in open channels, farm water management with the help of four hydraulically commingled falaj channels and conjunctive groundwater supply.



r Zekri developed an info-graphics video with the support of the Department of Teaching & Learning, Center for Educational Technology at SQU on "Economics of Re-

cycling" intended to students and broadcasted in YouTube with the link: https://www. youtube.com/watch?v=Efg7AZ7HIhE&feature=youtu.be

Soil & Water Winter Tour – SWAE4110: A snap shot of inquiry-research based undergraduate course



he Soil & Water Tour (SWAE4110) is a compulsory, 2-credit, research oriented, inquiry based fieldwork-laboratory integrated course. It includes 5 days of

fieldwork during the winter break followed by laboratory experiments and analysis, which last for 3 months. The course aims to train the undergraduates to handle robust scientific models, to solve wicked and illposed problems, to sustain intellectual curiosity, and to commit to lifelong learning. It facilitates students to acquire both generic-specific skills and fundamental laws and principles of soil sciences.

The fieldwork consisting of wide arrays of assigned research topics relevant to soil-water-vegetation relationships in natural and anthropogenic environments, soil quality, and terrestrial ecosystem functions. Specific examples of such fieldworks include: Studying soils across soil catena, classification and management of salt affected soils, studying

terraced soils and irrigation system in wadies across Al-Hajar Mountains, evaluation of soil fertility of agricultural lands of the Al-Batinah region; Impact of recharge/ storage dams on the soils' hydropedological properties; management of Aflaj systems, in particular, water use efficiency and quality assessment, among others. Students go through the multifaceted learning activities of the inquiry based paradigm, which involves making observations, posing questions, examining literature; planning investigations; using tools and instruments to gather, analyse, and interpret data; proposing answers, explanations, and predictions; and communicating the results.

The ultimate goal is to adequately prepare the soil sciences students for the challenges of professional life or future graduate studies. This is in line with the considerable international interest in strengthening the roles of inquiry and research, with closer integration of learning, research, and teaching in the undergraduate experience.

<u>New courses</u>

Aquatic Animal Health Management

Since increasing trades of aquatic organisms between regions and countries, awareness of biosecurity problems is not only useful but also necessary. This course covers aquatic animal health and diseases from the viewpoints of the host, the pathogen and the environmental factors that they share. The characteristics, epidemiology, prevention, control and management of the important aquatic diseases are investigated. The course includes theoretical and practical aspects of aquatic animal health management from wild populations to aquaculture systems and their relationship with environmental factors. The course examines causative pathogens, nutrition and genetics of wild and cultured aquatic animals.

Aquaculture Development and Management of its Environmental Impacts

n line with the promotion of sustainable aquaculture development in the Sultanate of Oman, Dr. Wenresti Gallardo developed and offered a new course titled "Aquaculture Development and Management of its Environmental Impacts".

The course presents the developments and advances in aquaculture, socio-economic benefits and environmental impacts of aquaculture, sustainability issues in aquaculture, environmental impact assessment, prevention and mitigation of adverse effects, and guidelines for sustainable aquaculture. The course is intended to equip the students with the necessary knowledge and tools to achieve sustainable development in aquaculture in Oman. Learning strategies include lectures, literature review, written report and oral presentations on environmental impacts of aquaculture, field trips and discussions. The course was first offered as an elective at the Department of Marine Science and Fisheries in Spring 2016 semester. Fifteen students took the course which was evaluated favorably by the students at the end of the semester.

Animal Biotechnology

This course will examine the application of biotechnology to animals. The use of biotechnology for animal related issues such as food safety, disease control and biosecurity will be addressed. A range of genetic, immunological and reproductive technologies will be introduced with some practical exposure.

The integration of these technologies to improve animal production, health and welfare will be explored.

Organic Agriculture

rganic Agriculture, is designed to cover the history of organic farming, the principles that have been in place from the beginning that have now become codified into law, and also the practical aspects of organic farming. Industry trends and policies that affect organic producers are also discussed. Students going into farming, food science, farm advising/outreach, research, or policy will find the information to be practical and helpful for their careers.

Specific learning objectives of the course are: 1) to learn the principles and practices commonly used on organic farms, such as crop rotation, soil quality improvement, and biological pest control strategies,

2) students will develop the analytical ability to use an agro-ecosystems approach to understanding the broader umbrella of sustainable agriculture, and see how organic agriculture systems function using agro-ecosystems theory and terminology,

3) students will also become familiar with the history of the organic movement worldwide, including the development and implementation of international standards, and further refinement of those standards in subsequent years. Finally,

4) students will thoroughly understand requirements for organic certification of farms, processing facilities, and handling of retail items for both large and small operations, and will be able to certify a farm or other entity. Alternative certification and other labeling programs will be contrasted.

In addition to lectures and labs, students take several field trips to working organic farms and a commercial-scale compost facility. They conduct research organic soil amendments, and prepare the documents to certify a hypothetical farm, and then "inspect" each other's farms. This class was first offered in the spring of 2016, and had 34 students.

Sustainable Agriculture

Sustainable Agriculture , was offered in the fall of 2016 with 11 graduate students participating. The objectives of this course were: 1) Become familiar with sustainable agriculture in Oman and globally, 2) Understand the principles and practices used in sustainable agriculture; why are they used, who uses them, and barriers to adoption, 3) address questions related to sustainability within various bio-regional and socio-political contexts, and 4) develop new and creative ways to address current barriers to creating and maintaining sustainable agriculture/horticultural systems in the future. Water and energy limitations were consid-





ered in-depth, as well as climate, and other emerging issues.

Readings, reflection, and in-class discussion were the primary teaching methods for this course. In addition, field trips, and attending a conference was included. Students applied what they learned in the course by analyzing a sustainability issue related to their graduate research and presented options, or pathways towards sustainability in the future. Traditional agriculture was studied as a starting point for designing sustainable agriculture systems into the future, and several sustainability frameworks and tools were used to analyze real-life situations. New Course Section

ANVS3110 Animal Biotechnology

This course will examine the application of biotechnology to animals. The use of biotechnology for animal related issues such as food safety, disease control and biosecurity will be addressed. A range of genetic, immunological and reproductive technologies will be introduced with some practical exposure. The integration of these technologies to improve animal production, health and welfare will be explored.

Special Problems conducted at Animal and Veterinary Sciences:

1. Under the supervision of Dr. Waleed Al Marzooqi, Shadha Khamis Mohammed Al-Aufi's project entitled "Normal cellular morphology of the blood of Omani chicken." Cytology of blood cells is considered to be an essential part of hematological examination and can have important effects on clinical pathology. Blood samples will be collected from the wing vein of clinically healthy Omani chicken. The blood smears will be stained using Giemsa, Wright and new methylene blue methods. Characteristics features of blood cells of Omani chicken will be studied by light microscopy. Cellular measurements in the blood in relation to age will be evaluated."

2. Under the supervision of Prof Osman Gaafar, Dawood Al-Siyabi has completed a Special Problem course on evaluation of rations compose from date palm waste mixed with other agricultural by-products and fed to sheep. The rations will be used to evaluate the reproductive and produced performance of sheep fed non-conventional diets.

Students Projects



Northead Almarzooqi's supervision Ms. Idah Al-Moqbali, an MSc graduate from the Department of Animal and Veterinary Scienc-

es has successfully defended her Master work in July 2016. Her thesis is entitled "Effect of feeding thermally processed Prosopis juliflora pods on the performance, meat quality, haematological and serological parameters of broiler chickens". Ms. Idah's work was supervised by Dr. Waleed Al Marzooqi - the head of Department of Animal and Veterinary Sciences. Ms. Idah's work was to investigate the use of raw or processed Prosopis juliflora pods as energy source to substitute corn in Oman. Her study showed that Inclusion of processed Prosopis juliflora pods in poultry diets can be used successfully up to 10% level without any negative effects on growth, meat quality, or health status of birds which consequently will contribute to reduced feed cost for small and medium scale farmers.

nder Dr. Yasmin ElTahir' supervision Ms Al-Galya Al-Toobi has successfully defended her thesis entitled 'Serological, cultural, and molecular evidence of Brucella infection in goats in Al Jebal Akhdar, Sultanate of Oman' in December 2016. Her study is the first to reveal that brucellosis is prevalent in goats in Al Jabal Al Akhdar, Sultanate of Oman with an overall prevalence of 11.4%. The present study also compared the performance of three different serological tests RBT, I-ELISA and CFT. Statistical analysis using Kappa statistics showed the degree of agreement was best seen between RBT and CFT (96%) followed by RBT and I-ELISA 91.4 %, and CFT and I- ELISA 89.2%.

Species-specific Multiples PCR showed typical profile for B. melitensis. Structured questionnaire and Chi-square (x2) statistical analysis identified that presence of abortion is the major risk factor for prevalence of Brucellosis whereas age, sex played no significant role in the animals tested. Besides, poor knowledge about brucellosis, consumption of unpasteurized milk or milk products, free trade and the introduction of new animals to herds are all contributing risk factors to the prevalence of brucellosis. The prevalence of human brucellosis obtained verbally from pastoralists give an insight that brucellosis could pose a public health hazard, especially in those high risk groups, mainly the pastoralists in the study area. Because of their constant and increased interaction with their animals, pastoralists could be at a high risk of occupational infection.



Prof. Osman Gaafar is supervising a joint PhD project between University of Kassel, Germany (Prof. Eva Schlecht and Prof Andreas Bürket) and

AVS, SQU. The PhD student involved in the project is Mrs. Mwanaima Ramadhan.Mrs. Ramadhan continued the work initiated by Ms. Steffi Apenburg during 2014 and 2015 which investigates the nitrogen balance of goats under different treatments of water stress, with a focus on (i) the partitioning of nitrogen excretion towards urine or faeces and (ii) microbial nitrogen synthesis in the rumen and hindgut. For this purpose, the study uses indirect markers such as stained fiber particles for determination of rumen passage of feed, purines (markers for rumen microbial synthesis) and aminosugars (markers for microbial flora in the hindgut). Data will be collected under controlled conditions (N-balance trials at the agricultural station on SQU premises) in a series of experiments of 4 months duration. The experiments would be very beneficial for both sides BSc and MSc students. All costs of the experiments is covered by a project funded by the German Research Foundation (DFG) handled through the University of Kassel.

Chitosan and Chitozan-ZnO nanocomposites for active food packaging and biofouling prevention.

The third Ph.D. student of the Department, Mrs. Laila Al-Naamani defended her Ph.D. work in January 2016. Her thesis is entitled "Chitosan and Chitozan-ZnO nanocomposites for active food packaging and biofouling prevention". Ms. Laila's work was supervised by Dr. Sergey Dobretsov - the head of the Department of Marine Science and Fisheries. Her thesis was examined by the external examiners Prof. Mario De Stefano (Second University of Naples, Italy) and Dr. Ahmed Al-Alawi (Food Science and Nutrition, CAMS, SQU). Chitosan is a natural polysaccharide and it can be obtained from chitin found in insect's cuticles and the exoskeleton of crustaceans, such as lobsters, shrimps and crabs. Chitosan has potent antimicrobial properties and it can be used in agriculture, food industry, biomedical field and wastewater treatment. The study of Mrs. Laila Al-Naamani focuses on chitosan extraction from the crab Portunus segnis collected from Omani markets, production of chitosan-ZnO nanocomposite and its use in active food packaging and antifouling coatings. Mrs. Laila's experiments demonstrated that extracted chitosan showed good antioxidant activity as well as high antibacterial activity against bacterial pathogens. Chitosan films inhibited settlement of biofouling larvae. Incorporation of ZnO nanoparticles into the chitosan matrix improved its water affinity and antimicrobial activity. Chitosan-ZnO nanocomposite active food

packaging reduced the growth of bacteria and fungi on packed okra samples after 12 days of storage and proved its effectiveness in maintaining food quality and shelf life. Nanocomposite coatings also showed anti-diatom and antimicrobial activity in laboratory and mesocosm experiments. The findings of this study showed the possibility of extracting chitosan from shells of local crab and potential use of chitosan and its nanocomposite in active food packaging and antifouling applications.

Chicken Feather Meal and Macroalgal Meal as Potential Replacement for Fish Meal in Formulated Feed for Indian White Shrimp Penaeus indicus

r. Ahmed Said Saif Al-Souti conducted part of his PhD research with the aim of utilizing chicken feather meal and macrolgal meal as replacement for fish meal in formulated feed for the Indian white shrimp Penaeus indicus. With the supervision of Dr. Wenresti Gallardo, Mr. Ahmed has tested several methods to improve the digestibility of chicken feathers without losing the protein content. He has analyzed the protein content and pepsin digestibility of raw and treated chicken feathers and some macroalgal (seaweed) species which are abundant during kareef in Salalah. The chicken feather meal and macroalgal meal are used as ingredients in a formulated feed and will be tested in the Indian white shrimp Penaeus indicus. He has analyzed the proximate analysis such as protein content, lipid, ash and fiber, and pepsin digestibility of raw and treated chicken feathers and some macroalgae (seaweeds).

Bioaccumulation of heavy metals particularly cadmium (Cd), mercury (Hg) and lead (Pb) in a carnivore and herbivore fish species

r. Humaid Al-Khadhuri, an MSc student supervised by Dr. Wenresti Gallardo conducted his thesis research on the bioaccumulation of heavy metals particularly cadmium (Cd), mercury (Hg) and lead (Pb) in a carnivore and her-



bivore fish species. The study was conducted to determine and compare the concentration of heavy metals in carnivore (grouper species) and herbivore (parrotfish species) and in muscle and liver of each type of fish, to establish any relationship between heavy metal concentration and weight, sex, food habit, and living environment. Also, the study aimed to determine if the concentrations of heavy metals in groupers and parrotfish are within the limits established by Ministry of Agriculture and Fisheries Wealth of Oman and FAO/WHO standards. The research showed that parrotfish has higher concentration of Cd (0.81 \pm 0.24 ppb wet weight) and Pb (3.76 ±0.38 ppb wet weight) than grouper while Hg concentration is approximately the same in both fish types. Highest concentration of Cd (parrotfish: 614.14 ±214.11, grouper: 681.45 ±96.64 ppb wet weight) and Pb (parrotfish: 7.73 ±1.29, grouper: 4.31 ±0.31 ppb wet weight) is in the liver; while muscle has the lowest heavy metal concentration. There was high concentration of cadmium in Fahal

2 and Dimaniat. Except for mercury, there was no significant difference in heavy metal concentration between parrotfish species. There were variations in mercury concentration in muscle and cadmium in liver between grouper species. There was no clear relation between heavy metal concentration and fish weight or sex. By this work Mr. Al-Khadhuri obtained his MSc degree after successfully defending his thesis in2016.

Vitamin B12 limitation in winter phytoplankton communities

The growth of phytoplankton can be limited either by grazing (top-down control) or from the environmental conditions that affect the primary production such as light or nutrient (bottom-up control). In his master thesis, Hussain Al-Aghbari investigated the nutrients that may affect phytoplankton growth in the winter and in the spring with the long-term goal to better understand toxic algal bloom. He designed an experimental protocol in which 32 combinations of 8 nutrients were added in small concentrations to natural phytoplankton communities and resulted in various growth of the community at different time of the winter and spring. The nutrients investigated were: Nitrogen, Phosphorus, Silicium, Iron, minor minerals (Zn, Co, Mn) and 3 vitamins (B12, B1 and H). For the trials carried in winter (January -February), the phytoplankton community responded to the nutrient spikes that contained vitamins B12 (Cobalamine) but did not respond significantly to the addition of the main nutrients (N, P, Si). These observations suggest that at that time of the year, the main nutrients were sufficiently abundant to support phytoplankton growth but that there was a shortage of Vitamin B12. Two months later, however, in April-May, the situation was very different. The community responded well to the addition of nitrogen and to a lesser extend to phosphorus, but

the addition of minerals or vitamins did not change growth significantly. This second set of observation suggests that later in the season, the phytoplankton community is limited by the main nutrients. Because nearly all toxic algae are vitamin B12 dependent, this suggest that toxic algal bloom may be triggered not so much by the presence of any nutrients in the water column but by the presence of



the right nutrients: in this case vitamin B12. The source of these vitamins in natural sea water needs to be investigated but is seems that the decomposition of organic matter by vitamin B12 producing bacteria may be responsible. A bloom of phytoplankton species able to synthetize this vitamin may thus be necessary to trigger later toxic blooms.

Characterization of Alternaria species associated with foliar diseases of wheat and date palms in Oman.

This study was conducted to investigate Alternaria species associated with leaf spot in date palm and wheat in Oman. Out of 98 date palm samples and 146 wheat samples, Alternaria was isolated from 30% and 38% of the symptomatic leaf samples, respectively. Other fungal species were recovered from date palm (e.g. Cladosporium; 10%) and wheat (e.g. Bipolaris; 14%), but their frequency of isolation was low. Identification of 28 Alternaria isolates from date palm and 35 Alternaria isolates from wheat using sequences of four genes, ITS, GPDH, TEF and RPB2, showed that the isolates belong to nine different Alternaria species. Four of these species were found on date palm, and seven on symptomatic wheat leaves. Pathogenicity tests of some of the common isolates showed that five were pathogenic on date palm, and four were pathogenic on wheat. No evidence was found for host specialization of Alternaria species on date palm and wheat. This is the first report of date palm and wheat as new hosts for A. burnsii and the first reports A. burnsii, A. slovaca, A. californica, A. tomato, and A. ventricosa in Oman. The study shows that several species of Alternaria are associated with leaf spot in date palm and wheat in Oman, and some of the isolates have the ability to cause infection in both hosts. This was done by Hamed Hamoud Abdullah Al-Nadabi (Supervisor Dr. Abdullah Al Saadi, Crop Sciences Department)

Characterization of fungal pathogens associated with root diseases of beans and cowpea in Oman.

The aim of this study was to characterize fungal species associated with root diseases of green bean (Phaseolus vulgaris), cowpea (Vigna unguiculata), long beans (Vigna radiate) and fava bean (Vicia faba) in four geographical regions in Oman. Root samples were collected from plants suffering from weakened growth and yellowing symptoms. Isolations on agar resulted in 204 fungal isolates, with most of the isolates belonging to the genus Alternaria or Fusarium. Identification using DNA sequencing revealed that the isolates belong to 20 fungal species, the most dominant of which was Alternaria alternata. Pathogenicity tests were conducted.

The inoculations on P. vulgaris (green bean) revealed that Pythium aphanidermatum induced rotting and damping-off symptoms while Fusarium equiseti induced yellowing symptoms on the leaves. Rhizoctonia solani produced lesions and root rot on Vigna unguiculata (cowpea) while Curvularia lunata and Curvularia aeria produced root lesions. Alternaria alternata produced brown symptoms on the tap root of Vicia faba (fava beans). P. aphanidermatum resulted in a significant reduction in the fresh weight, dry weight and shoot length of Phaseolus vulgaris. Interestingly, all other fugal species did not have any significant effect on the fresh weight, dry weight, shoot length or root length of any of the bean species or cowpea which were tested in this study. The study shows that several fungal species can be found associated with the roots of beans and cowpea in Oman. Some of these fungal species can result in major effects, especially during the seedling stage. Other fungal species can have minor effects or are saprophytes on bean and cowpea roots. This was done by: Asma Al Jaradi (Supervisor Dr. Abdullah Al Saadi, Crop Sciences Department)

Genetic analysis reveals low genetic diversity and a high level of gene flow among Stemphylium lycopersici populations associated with two tomato cultivars.

T temphylium lycopersici is an important pathogen causing leaf spot and other diseases of tomatoes worldwide. Although much information is available about the pathogen, little is known about dynamics of S. lycopersici in tomato fields. Seventy-nine symptomatic leaf samples were collected from two tomato cultivars grown in a farm. Fungal species associated with the disease were isolated on potato dextrose agar. All isolates were identified as S. lycopersici based on DNA sequence analysis. The 79 isolates obtained from the two cultivars were subjected to amplified fragment length polymorphism (AFLP) analysis using three primer combinations. The Stemphylium population from the two cultivars was found to have a very low level of genetic diversity. Cluster analysis showed intermixing of isolates from the two cultivars. In addition, analysis of molecular variance showed the presence of a very low level of genetic differentiation between populations obtained from the two cultivars. These findings indicate the presence of a high rate of gene flow between the two populations and may suggest that the two populations originated from the same inoculum source. The implications of these findings on the management of Stemphyllium-induced leaf spot of tomatoes are discussed. This was done by:Karima Al Mamari. (Supervisor Dr. Abdullah Al Saadi, Crop Sciences Department)

Characterization and evaluation of fungicide resistance among Lasiodiplodia theobromae isolates associated with mango dieback in Oman.

ieback is one of the most common diseases of mango in different parts of the world, including Oman. Despite efforts to control the disease using fungicides, disease incidence is still high. This study characterized the causal agents of the disease in two farms in Oman and the degree of sensitivity of fungal isolates to four common fungicides. The survey found dieback symptoms with most mango cultivars on farms, with some cultivars having higher disease incidence. Isolations from 40 mango trees developing dieback symptoms revealed association of Lasiodiplodia spp. with 95% of the trees. Alternaria and Fusarium spp. were isolated from only 10% and 8% of the trees, respectively. Further identification of 67 Lasiodiplodia isolates using DNA sequence revealed that all isolates are Lasiodiplodia theobromae. Pathogenicity tests using two randomly selected isolates of L. theobromae on 'Amerbally' and 'Omani' mango cultivars showed that the four-month old seedlings started showing dieback symptoms within

two weeks of inoculation. Testing sensitivity of 28 randomly selected L. theobromae isolates to four common fungicides showed that the EC50 levels of the isolates were on average 0.54 mg l-1 for iprodione, 111.6 mg l-1 for copper oxychloride, 229.3 mg l-1 for copper hydroxide and over 1000 mg l-1 for thiophanate-methyl. This study shows the association of L. theobromae with dieback symptoms and the development of resistance to some fungicides, especially thiophanate-methyl. Development of resistance to fungicides could be one of the main reasons behind the reduction in the efficacy of managing dieback farms in the study. This was done by: Mohammed Khadeim Ali Al Jabri (Supervisor Dr. Abdullah Al Saadi, Crop Sciences Department)

Characterization and evaluation of resistance to hymexazol among Pythium species in cucumber greenhouses in Oman

study was conducted to characterize the common Pythium species in greenhouses in Oman and their level of resistance to hymexazol, a widely used fungicide on cucumbers in Oman. Pythium isolates were obtained from soil samples, cocopeat bags and cucumber roots collected from Muscat, Al Batinah North, Al Batinah South, Al Dakiliya, Al Sharqiya North, Buraimi and Dhofar. Identification of 80 Pythium isolates to the species level using DNA sequencing showed that they belong to four species, namely P. aphanidermatum (77 isolates), P. spinosum (1 isolate), P. myriotylum (1 isolate) and P. catenulatum (1 isolate). Pathogenicity test of three species showed that P. aphanidermatum, P. myriotylum and P. spinosum are pathogenic on cucumber. Phylogenetic analysis of P. aphanidermatum isolates showed that most of the isolates obtained from cocopeat clustered separately from isolates obtained from soil and roots. This may indicate a difference in the origin of the cocopeat isolates, which could have been introduced into Oman from another country. Evaluating the resistance of 27 P. aphanidermatum isolates to hymexazol showed that 23% are moderately resistant to resistant. This study is the first to report P. myriotylum and P. catenulatum in Oman. It also appears to be the first to report the development of resistance among P. aphanidermatum populations from greenhouses to hymexazol. Growers should use integrated disease management strategies to avoid development of resistance to hymexazol and other important fungicides. This was done by: Zainab Al Balushi. (Supervisor Dr. Abdullah Al Saadi, Crop Sciences Department).

Comparison and Efficacy Testing of Novel Soil Amendments used in Organic Farming Systems in Oman.

The aim of this study was to compare several common and novel soil amendments for their impact on plant growth and soil properties. Two types of soil (cropped and virgin), two types of indicator crop plants (okra & broccoli), and two types of compost (animal waste and plant residue), and the biochar were used in combination as experimental treatments. The soil was brought in from a private organic farm from Sohar, and the compost was purchased from a local nursery vendor. Biochar is being researched as having possible beneficial properties such as adding to the soil carbon pool, reducing the effect of salt, and promoting beneficial microorganisms through enhanced soil structure.

Because biochar is not available in the market we decided to design our own low cost biochar apparatus to make our own. The apparatus was designed with the help an engineer and online available biochar prototype information. The apparatus is consists of a large metallic drum and 5 gallon bucket, which is filled with dried wood pieces as feed-



stock for the biochar. The bucket is inverted into the 55-gallon drum. A small amount of dried wood, or other source of fuel, was added around the inner drum into the donut-shaped space. Small openings were cut around the base of the outer drum to allow airflow into that space. It was then covered with a lid and small cylindrical chimney to create draft. The method requires that the biochar feedstock is submitted to high temperature without the presence of oxygen; otherwise it will turn to ash. It was matter of great satisfaction that we were able to achieve our goal in making high quality biocahr at AES. This biochar apparatus/Machine is very cost effective and will be useful for future experimentation.

During cropping season (spring 2016), seedling of okra and broccoli were raised and transplanted into the experimental site (pots in the greenhouse), where the plants were irrigated automatically. The plant growth and development data of the indicator crops was recorded for 10 weeks. Soil analysis is under-way now (texture, pH, EC, organic matter, total nitrogen, water holding capacity and total organic carbon) and the experiment will be repeated to confirm the results. We anticipate that the results of this experiment will help us to make scientifically based recommendations to organic farmers and others using these soil amendments, including a cost-benefit analysis of purchasing and/or making these inputs. This was done by: Masters student Waleed Al Busaidi (Supervisor Dr. Mumtaz Khan, co-supervisor Dr. Rhonda Janke, Crop Sciences Department.

New authored book by PhD student and two faculties from FSN

new book authored by a PhD scholar and two academicians from the Department of Food Sciences and Nutrition, provides clinical dieticians, up to date information, tools and techniques used for nutritional assessment. This pocket guide entitled "Handbook for Nutritional Assessment through Life Cycle" covers the nutrition assessment of people throughout their life cycle, from pregnancy stage to old age. Nutritional assessment includes dietary history, physical assessment, biochemical assessment, anthropometric assessment and nutrient estimations. Charts, tables and graphs that can be used by practitioners as quick reference tools for nutritional assessment, hydration status, nutrient deficiencies and excess, and body composition are included in this pocket guide.

Ghazi Daradkeh, the co-author of the book is a research scholar in Food Science and Nutrition at SQU, who has 25 years' experience in the field of clinical nutrition and dietetics. Dr. M. Mohamed Essa, another co-author is an Associate Professor in the same department, who is well-established in the field of nutrition and neuroscience. He is the Editor in Chief of the International Journal of Nutrition, Pharmacology and Neurological Diseases published by Wolters & Kluwer, USA. Prof. Nejib Guizani is a professor in the Department of Food Science & Nutrition is another co-author of this book. The book was published by Nova Science Publishers, USA.

Traumatic Brain Injury Patients could Face Cognitive Dysfunction and Nutritional Imbalance study that assessed the nutritional status and nutritional adequacy of traumatic brain injury (TBI) in some Omani and Qatari patients, found that the participated TBI population from both countries tends to exhibit nutritional imbalance, including deficiency in energy, carbohydrate, protein, micronutrients, and fibre.

The study also proves that these TBI patients exhibit altered cognitive functioning such as memory impairment and a behavioural problem such as lack of initiative. The study indicates that TBI population in Oman, Qatar and elsewhere are at risk of developing malnutrition, neurobehavioral complication and deranged biochemical profile. This study was conducted by Ghazi Ahmed Daradkeh, as part of his PhD program in the Department of Food Science & Nutrition of the College of Agricultural & Marine Sciences at Sultan Qaboos University, under the supervision of Dr. Mohamed Essa, Associate Professor in the Department and co-supervised by Prof. Samir Al-Adawi, Dr. Mostafa Waly from SQU and Dr. Amanda Brown from Qatar University Traumatic Brain Injury (TBI), also known as acquired brain injury or concussion is one of the most serious and challenging health problems worldwide. Emerging economies such as Oman and Qatar have high rates of traumatic brain injury due to road traffic accidents. The incidence of TBI is alarming in Oman. In Oman, this study was conducted in Khoula Hospital in Muscat from February 2014 to February 2015 among consecutive patient with TBI. In Qatar, this study was conducted among attendees admitted to the National Trauma Center, Rumailah Hospital, Hamad Medical Corporation, Doha, from August 2014 to June 2015. The results of this study also indicate that elevated oxidative stress and less antioxidant status in TBI population enrolled in the study from both countries. This study indicates that TBI in Oman and Qatar are at risk of developing malnutrition, neuto impede their road to regaining premorbid self. Patients with TBI enrolled in this study exhibited a wide range of increased metabolic rate, catabolism, and upper gastrointestinal intolerance during the early post-injury course. These hyper metabolic abnormalities lead to malnutrition state in this TBI study population of both countries. There is a lack of interest with nutritional assessment and nutrition

ro-behavioural complication and deranged

biochemical profile. These factors are likely

tion of both countries. There is a lack of interest with nutritional assessment and nutrition support of TBI patient, including accurate required nutrients calculations, proper time of feeding administration, type and quantity of feeding which has an impact on nutritional, behavioral and neurological outcome after TBI. Malnutrition universal screening tool (MUST) is an efficient predictive tool for malnutrition assessment. Altered behavior status such as lack of will, cognition, memory, depression, executive functioning, etc also present in their study TBI population of Oman and Qatar. In view of the present findings, it can be concluded that Cognitive, emotional, and behavioural impairments are common in both Omani and Qatari with moderate to severe TBI patients enrolled in this study. Further, elevated oxidative stress by means of elevated free radical generation, increased oxidation of macromolecules, reduced enzymatic and non-enzymatic antioxidants in the enrolled TBI population also found. Altered nutritional, biochemical and behavioural status were found in both Omani and Qatari TBI populations used in this study. The results could also confirm that there is link between these nutritional, behavioural and biochemical status in TBI conditions. These data could give a novel lead to find the better therapeutic strategies for post TBI complications. Ghazi Ahmed Daradkeh, is the first doctoral student to complete PhD in Nutrition from the Nutrition program of the Department of Food science and Nutrition, CAMS at SQU.

These studies are nationally relevant and of contemporary importance.

The first study entitled "Impact of Food and Fuel Prices on Poverty in Oil Exporting Economies: The Case of Sultanate of Oman" was conducted by Naeem Al Hamdeni. The drastic drop in international fuel prices and the resulting fiscal constraints compelled the government of Oman to reduce the subsidy by raising fuel prices in 2016. The phasing down of fuel subsidies would influence poverty and household food security in Oman. In this context the study quantitatively analyzed the impact and sensitivity of food and fuel price changes on incidence of poverty in Oman, using a simulation model developed by the World Bank. It is estimated that the recent increase of fuel prices by 33% increases poverty incidence by 1%. The government could use the existing mechanism and institutions of social security provisions to target and provide financial transfers to poor household that would be adversely affected by phasing down of fuel subsidies.

The second study entitled "Impact of the Domestic Labor Market on Sustainability of Agriculture in Oman" was conducted by Hamam Al Farsi. The study examined the nexus between labor market policies, agricultural employment and sustaining of local production, for food security in the Sultanate of Oman. Operations research methods were used to quantify the impact of labor market policies on agricultural employment, farm gross income and land use intensity. The study concluded that the scarcity of Omani labor in the agricultural sector of Oman was related to government determined high wages offered in the nonagricultural sector. Ideally in the long run labor markets need to operate freely, to enhance food security and assure employment of Omani labor in agriculture.

Research Project' course at the Department of NRE under the guidance of Dr. H. Kotagama. These studies are nationally relevant and of contemporary importance.

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Under Graduates Projects

quaponics: Growing of fish and plants in an integrated system quaponics is a combination of aquaculture (growing aquatic organisms) and hydroponics (growing plants without soil). It is a culture system in which the uneaten feeds and wastes produced by the cultured fish supplies nutrients for plants grown hydroponically, which in turn purify the water by taking up the nitrates converted from nitrites and ammonia by the nitrifying bacteria.

s a follow-up to the aquaponics research initiated in Fall 2014, several undergraduate students (Aiman Al-Maimani, Ahmed Al-Azwani, Zaher Al-Brashdi, Salim Al-Mamari and Mohammed Al-Qarni) have conducted experiments to determine suitable plants for growing in an aquaponics system, accumulation of macro- and micronutrients and their uptake by different plants, and the levels of ammonia, nitrite and nitrate in full versus partial recirculating aquaponic systems. Among the plants tested, mint grew well even during the summer when temperature went up to 50°C. The students are analyzing their data from the experiments for journal publication.

Balqees Al-Rashdi completed her undergraduate research on integrated multi-trophic aquaculture (IMTA) under the supervision of Dr. Wenresti Gallardo, Associate Professor at the Department of Marine Science and Fisheries. The research was conducted to develop a landbased recirculating integrated multi-trophic aquaculture (IMTA) system using a combination of abalone (Haliotis mariae), seabass or barramundi (Lates calcarifer) as fed species, and mussel (Perna sp.) and seaweed (Ulva fasciata) as extractive species. Specifically, the study was carried out to determine of the effect of sea bass densities of 20, 40 and 60 individuals per 500-liter tank on water quality, growth and survival of all species in the system. Sampling of all species was done every two weeks to check their growth. Water samples were taken every two weeks for measurement of water quality (ammonia, nitrite, nitrate, phosphate, silicate). In addition, daily measurement was done for temperature, dissolved oxygen and salinity in all tanks. Growth of abalone and mussels was found to be higher in tank densities of 20 fish and 40 fish, respectively, while seabass growth showed no significant difference between densities. Seaweeds did not grow well as there was very low nitrate concentration in the system most likely due to the lack of efficient biofilter in the mussel tanks.

Yield and Marketability of Black Tomatoes in Oman

halid Abdullah Al Kharousi grew two varieties of black tomatoes; 'Indigo Rose' and 'Cherokee Purple,'



and compared them to two standards slicing tomatoes; 'Big Beef' and 'Campbell's.' The objectives of his project were 1) to see how the tomatoes performed under greenhouse conditions in Oman, and 2) to determine the marketability of black tomatoes with customers in Oman. To address the first objective, Khalid ordered seed from the U.S., and





started all transplants from seed and moved them to an in-ground production system at the AES. Plants were irrigated and fertilized according to standard winter tomato production practices. The 50+ tomatoes quickly filled the space, and by winter break, Khalid was harvesting tomatoes and addressing his second objective with a series of taste tests (sensory analysis) with his peers.

The reason Khalid chose black tomatoes for his study were based on novelty, and also for health reasons. Black tomatoes, and other dark-colored fruits and vegetables are high in anti-oxidants. These compounds are known to protect from cancers and other chronic ailments. In addition to the taste test comparisons, Khalid collected data on yield and other growth parameters. If the black tomatoes yield well, they might also bring a premium price in the market, or at least attract health-conscious consumers. Khalid's supervisor was Dr. Rhonda Janke, in the Crop Sciences Department.

A Preliminary Catalog of Psyllids and Planthoppers, Important Crop Pest Groups in Oman

wo important groups of crops pests which feed on the phloem sap of plants are Psyllids and Planthoppers, causing both direct and indirect damage to crops through the vectoring of plant pathogens. Her project was to identify the planthopper and psyllid species sampled from air-suction traps placed in the field in four sites in Oman (three in northern Oman and one in Dhofar) over three years. She also did a quick survey of dryinid wasps, a specialized group of parasitoids of planthopppers and leafhoppers. The species determination was done through morphological characteristics. Twelve morpho-species of planthoppers were found; 11 of these were identified to species or genus level, while 9 morpho-species of psyllids were found; 6 of these were identified to species or genus level. One of the psyllid species was collected from wild olive trees in Jabal Al Akhdhar. Six species of planthoppers and leafhoppers were found to be parasitized by dryinids.

Important Agricultural Pests in Oman- Toward an Understanding of Their Fauna and Population Dynamics.

This project involved an extensive survey in Oman of small elongated insects with fringed wings called thrips. Thrips are important crop pests worldwide, affecting plant health directly through their feeding or by acting as vectors of plant viruses. Jahina identified thrips species collected by different collection methods including air-suction traps placed in the field by the SQU-Entomology Lab between 2009 and



2011 at two sites in Oman (Jabal Al Akhdhar and SQU-AES). The determination of the species was done through morphological characteristics and an insect key. A total of 25 morpho-species of thrips were identified to the genus or species level. She also found, through tabulation and analysis of air-suction trap catches that the high altitude Jabal Al Akhdhar site had higher thrips numbers than the low altitude SQU-AES site. A major part of her work after collecting the thrips was preserving the thrips permanently on microscope slides to produce a reference collection and to document the collection with an excellent set of photographs.

The Effect of Actara, Evisect, & Chitosan on the Infestation of Potted Tomato Plants by the Tomato Leafminer (Tuta absoluta)

This experiment studied the effect of UV light and the compound chitosan as plant resistance-inducers, as compared to two commonly used synthetic insecticides (Evisect and Actara) on the tomato leafminer, Tuta absoluta, an important worldwide pest of tomatoes and other solanaceous crops. All three chemicals were applied to tomato plants as spray or soil drench. Treating the tomato plants with UV light for 25- 300 minutes led to severe and rapid senescence. Tomato plants irrigated or sprayed by chitosan had a significant increase in all vegetative parameters (e.g. plant height , number of leaves/plant and root length). Some of the measured damage variables (e.g. average number of blotch mines per leaf and proportion of infested leaves per plant) were significantly different among the treatments. Chitosan-spray produced the lowest proportion of infested leaves and number of blotch mines per leaf among all treatments.

Removal of Insecticide Residue from Tomato Fruits by Ultraviolet Radiation , Soap Wash, Iron Filings, Silicon Oil and Tap Water



Arjes and Laila worked together on their research project to test four different techniques for removing insecticide residue from tomato fruits. They tested UV/IR Radiation, Soap Wash, Iron Filings, and Silicon Oil and compared these to the common practice of washing fruit with tap water. They did their tests on tomato fruits laced or fortified with two insecticides (Actara and Lambda-cyhalothrin) commonly applied on tomato and other fruit crops. They found that the soap wash and iron filings resulted in the greatest insecticide residue removal compared to the other treat-



ments. Water wash and silicon oil produced moderate levels of residue removal, while UV/IR radiation resulted in least degree of residue removal. white sugar. In addition, date powder production may help to diversify Oman economy. Seerangurayar Thirupathi

Master's Projects

Physicochemical properties of date powder produced by foam-mat freeze drying method

Date palm is the major crop in the Sultanate of Oman and covers 35% of the total cultivated area and 78% of all fruit crops grown in Oman (MAF, 2015). Oman is one of the major date producers in the world. However, it exports only around 3% of the produced dates. Also, almost half of the produced dates have been not utilized and considered as surplus. Thus, utilization of surplus dates and value addition to low price dates are very important for sustainable cultivation of dates in Oman. On the other hand, sugar is added in many foods for delicious sweet taste. Studies have been proved that high consumption of sugar causes many health problems like obesity, diabetes, etc. Hence, studies were conducted to identify substitute for white sugar based on the health benefit from different natural food resources and found that date sugar has high antioxidant capacity compared with corn syrup, honey, brown sugar. Therefore, date powder was produced in three ripening stages (khalal, rutab, tamr) of dates with aid of carrier agents (maltodextrin, gum arabic) by foam-mat freeze drying method. The good physicochemical characteristics of produced date powder suggested the potential of using in many industrial applications (bread, cakes, and meat products). Also, foam-mat freeze drying technique has good feasibility to produce free flow date powder from surplus dates. It would be help to improve shelf life, ease of handling, and blendabilty with various foods. By retaining bioactive compounds of the fresh dates, date powder would be a wonderful substitute for

New Recruitment



r. Alyssa Marshell joined as an Assistant Professor the Department of Marine Science and Fisheries. She is specializing in marine ecology and fisheries biology. She

was previously working as a Post-Doctoral Research Fellow at the University of Queensland, Brisbane Australia. Originally from Australia, Alyssa completed a Bachelor of Science, majoring in Marine Biology at James Cook University, Queensland, Australia in 2002, before heading off to explore the world working in the dive and tourism industries. Alyssa returned to her studies at the University of Guam Marine Lab where she completed her Masters of Science in 2010, investigating heavily-targeted fisheries species movement patterns and population dynamics. During her studies, she also worked as a Graduate Research Assistant with the Government of Guam Coral Reef Monitoring Group. Alyssa completed her PhD in 2014 on the ecological role of herbivorous surgeonfish on coral reefs, under the supervision of Professor Peter Mumby in the Marine Spatial Ecology Lab at the University of Queensland. After completing her PhD, Alyssa continued to work with Professor Mumby, but was based at the Palau International Coral Reef Center in Palau, Micronesia. During her post-doc, Alyssa completed numerous field projects investigating the ecological role of herbivorous

fish on coral reefs, and the exploitation of herbivorous fish species in the local fisheries.



r. Riaz S h a h joined department of crop sciences as an assistant professor (Entomology) in the Fall of 2016. Before joining SQU he had teaching and research responsi-

bilities at the University of Windsor, Niagara College and Durham College in Ontario, Canada. He completed his PhD in 1998 from Lincoln University, New Zealand with a specialization in insect toxicology. Most of his research focuses on pesticide resistance detection/monitoring in pests of agricultural importance. Other areas of research include IPM program development and validation, invasive and emerging pests, multi-trophic food-web interactions and forensic entomology. Other experience includes work at CAB International, UNDP, Swiss Development Cooperation, other NGOs, Agri-industry and farmers.

Recently completed a research includes a project on testing the toxicity of commonly used low-risk pesticides against twospotted spider mites and their natural predators. The twospotted spider mite (Tetranychus urticae) (TSSM) is one of the most important pest in organic agriculture which damages all major vegetable, fruit crops and many ornamental plants. Predators including predatory mites (Phytoseiulus persimilis and Amblyseius fallacis) and predatory beetle (Stethorus punctillum) are either present in natural ecosystem or intentionally released to control spider mites. Low-risk pesticides used included ready-to-use insecticidal soap, commercial insecticidal soap formulation, garlic/ chili extract, diatomaceous earth along with

a positive control (commercial acaricide) and a negative control. Potter Tower Leafdisc bioassay technique was used to spray the required concentrations of each pesticide. Insecticidal soaps and garlic/chili extract killed the spider mites when applied directly, killing more than 95% mites. Insecticidal soaps have no residual activity killing less than 20% mites when released after spray. The garlic/chili extract also acts like a repellent. Diatomaceous earth did not provide satisfactory control. One species of predatory mites (P. persimilis) and the predatory beetle (S. punctillum) were very sensitive and suffered 60-70% mortality. The other species of predatory mites (A. fallacis) suffered less than 20% mortality. It is recommended to thoroughly spray the plants aiming directly at spider mites with any of the tested pesticide except diatomaceous earth. Sprays should be avoided in the presence of high densities of predators.



r. Othman Al Qaisi, joined the department as a new faculty Dairy Production and Nutrition, April 2016. Dr Othman graduated in 2012 from the CAU University of

Kiel with PhD in Agricultural Sciences and specialization in dairy science and nutrition; furthermore, he obtained his MSc from the University of Hohenheim in 2007. He worked at the International Farm Comparison Network IFCN in Germany from 2008-2012. After that he served the feed industry in Germany as a technical manager and as a livestock and feed analyst in the feed industry in Switzerland.

Services

Agricultural Experiment Station

The Agricultural Experiment Station is currently composed of 15 fields and over 33 units organized under three major sections: Plant, Animal, and Services. In the past year the AES staff has provided help in more than 20 courses from various deggpartments at SQU and assisted in more than 20 research projects. AES has also supported 2 international projects from China and Japan. As for outreach activities, the AES contributed by holding 3 training workshops for SQU staff in bee keeping, ornamental plants, and floral arrangement. It supplied technical assistance and machinery to the Farmers Society in Al-Suwaiq. It has also received more than 500 kindergarten and elementary school children to enrich their experience about the different farm activities.

In 2016, a new milking parlor was constructed with high-tech equipment to milk 16 cows simultaneously. Also, a project to build horse stables and training arena was approved to be constructed.

The AES generates financial income from selling plant and animal products. The total amount of income has risen this year compared to previous ones as the AES was able to generate more than 90,000 Omani Rials from selling animals, poultry, dairy milk, meat, beehives, ornamental plants and other produce.



Dairy Plant

The Dairy Plant had received a total volume of 101,648.0 litres of raw milk from the Dairy Farm of the Agricultural Experiment Station (AES) for the year 2016. This volume of milk was processed into various dairy products such as pasteurized milk, chocolate milk, flavoured milk, ice cream, cheese, and raw cream. A total sales revenue of R.O. 31,730.380 was derived from the sale of these products to the Students Consumer Establishment.

Some important activities were conducted in the Dairy Plant during the year. On June 2016, the Dairy Plant had entered into a consultancy project with Mazoon Company, a milk processing company that will open soon in the country. The actual implementation of this project was on December 2016. The Dairy Plant had been visited by several staff coming from the Ministry of Defense and the Ministry of Higher Education. Likewise, many students from various schools, both in the primary and secondary levels had visited us for educational tours. Apart from providing laboratory practical training to the students of the Department of Food Sceince and Nutrition, the Dairy Plant had also actively engaged in providing similar practical teaching assistance to the students from other Colleges, particularly those coming from the College of Science and the College of Engineering. Furthermore, a practical training on milk processing and milk analysis has been provided as well to a staff from the Royal Court of Affairs.





Departments

Animal and Veterinary Sciences



The prime focus of the Department of Animal and Veterinary Sciences is to promote and excel in teaching and research with an emphasis to nurture advances in learning and discovery that foster a significant role in increasing human knowledge and resources pertaining to animal production and health.

The Department of Animal and Veterinary Sciences presented the proposal for the establishment of an undergraduate degree program in Veterinary Medicine at SQU to the liaison Committee between the Ministry of Agriculture and Fisheries and the University. The Department received positive responses from different stakeholders for future consideration.

The successful hiring rates and accolades from both the public and private sectors regarding our graduates reflect a miraculous and stellar performance of both the technical staff and faculty.

The Department of Animal and Veterinary Sciences is proud to announce that the animal Biotechnology laboratory was certified by European OIE reference laboratory at French Agency for Food, Environmental, and Occupational Health and Safety, Maisons-Alfort, France after participation in the 2016 brucellosis bovine serum ring trial organized at French and European level.

The Department continued to publish in reputable scientific journals and maintain reputable international research collaboration with regional and overseas universities. The Department continues to offer professional veterinary services in terms of consultation towards disease investigation both to private and government agencies.

Crop Sciences



The Department of Crop Sciences (CS) is concerned with the application of crop science to agriculture and the natural environment. The aims are to address the priority issues that create limits to the expansion of crop yields both qualitatively and quantitatively to ensure food security for the current and future generations.

The Department is among the leading departments in research productivity in the college. In 2016, the department published 36 refereed papers in Scopus/ISI-indexed journals, at a rate of 4.5 refereed journal papers per faculty member. The department also received a grant from the Oman Animal and Plant Genetics Resources Center (The Research Council) for 126,300 Omani Riyals, one grant from His Majesty Trust Fund (70,000 Omani Riyals) and three internal grant projects. Seven MSc students completed their degrees in the department in 2016.

The department offered 46 course sections (undergraduate and postgraduate) in 2016, with the total number of registered students in these sections being more than 1330. The department offered a new elective course in the department on organic farming and a new university elective course on plant diseases in Oman.

The department continued community service by offering a number of workshops and seminars and through field visits to the farming community. The department also continued international collaboration with several universities and research institutions across the US, Europe, Asia, Africa and Australia. The department received two awards in 2016, the best researcher award by Dr Abdullah Al-Sadi and the best technical staff by Mr. Ali Al-Raessi.

Food Science and Nutrition



The FSN department showed a growth in all areas of academic activities. Around 1300 students were enrolled in 49 courses offered by FSN faculty. The number of postgraduate students in the department remained high with 22 students in both Master (19) and Doctorate studies (3). Our faculty remained to be active in research aiming to solve current and pressing issues in food quality and safety as well as the study of nutrient functions in maintaining good health and managing chronic diseases, such as Alzheimer, Diabetes and Cancers. In this regard, issues that are relevant to the sultanate were given priorities and addressed in our research projects. Recently, the researchers at the FSN department were successful in registering a new patent in the US Patent Office for the invention of a new food product using date syrup.

The outcome of the research projects are well disseminated to the public in many forms such as participation in international and national conferences (37), publication in peer reviewed journals (49), writing up books (3), writing in newspapers (5) and organizing workshops (1) and conferences (1). Furthermore, most of our faculty and technical members interacted extensively with different public and private sectors in Oman through many activities with the goal to serve the community. In this regard, the department organized one conference on "Food Safety and Traditional Foods" and one workshop on "Food and Brain Health" and signed one consultancy contract with one of the main food companies in the country.

In terms of capacity building, the department acquired a new FTIR microscope machine. In terms of staff development, three of the staffs are doing their higher studies (PhD and MSc) from University of Michigan (USA), University College Dublin (Ireland) and Sultan Qaboos University (Oman) and five were registered in short training courses

Marine Science and Fisheries



The Marine Science and Fisheries department continued to excel in teaching, research and community service. The department had offered 19 courses in Fall 2015 and 21 courses in Spring 2016. In total 21 and 19 sections were taught and the average section size varied from 15 to 26 students. Four undergraduate courses were re-designed.

Three new courses in aquaculture (1 graduate and 2 undergraduate) were developed. Currently, a total of 87 undergraduate, 16 MSc and 6 PhD students are studying at the department. One PhD and 3 MSc students graduated from the department in 2016. In spite of financial issues, the department remains a leader in in the marine science research in the Sultanate of Oman and among GCC countries. Faculty members from the department published 16 refereed papers in 2015 and 8 in 2016, with an average of 2.2 refereed papers per faculty member for 2015-16. The department has a total of 17 active research projects. In 2016, the members of the department attended 37 workshops and conferences.

In addition to excellence in teaching and research, the department also focuses on extension and community service through consultations, media publications, workshops and conferences. The department organized 4 conferences and workshops, 2 training courses in 2016. The department provided one week training in oceanography, fishing, marine biology and ecology to Oman Royal Navy Cadets. The members of the department serve in 28 regional and international committees. Ten popular articles about the department, its research and students were published in mass media. Finally, Dr. Sergey Dobretsov was appointed as the Director of the Centre of Excellence in Marine Biotechnology, SQU.

Natural Resource Economics



During the academic year 2015-16 the Department of Natural Resource Economics (NRE) relied on 8 faculty and two consultants to deliver 30 courses/sections. One of our faculty members, Dr. Sarath Kodithuwakku resigned from the Department in August 2016 and we are in the process to replace him.

Currently two international postgraduate students are pursuing their studies at the Department. Two new undergraduate courses are registered in the Degree Plan for 2015 cohort. At present, three NRE staff members are conducting their postgraduate studies abroad. In addition to its regular curriculum, the Department organized a training workshop by inviting Prof. Jose H.Gill, From the Technical University of Catalunya, to deliver a one week intensive course in Experimental Economics to strengthen the quantitative skills of the postgraduate students.

The NRE. faculty continued to provide services to the SQU and the larger community. This is evidenced by the participation in local training workshops/seminars, participation to international conferences, ongoing collaboration with the WTO and other international universities.

Soils, Water and Agricultural Engineering



In 2016, SWAE continued good performance in all areas; teaching, scholarly and service activities. In teaching, SWAE faculty had to undertake heavy teaching loads, while regularly teaching postgraduate courses. Fifty six courses (166 credits) were taught and the average section size was 25. Faculty course load for Spring 2016 and Fall 2016 were 2.1 and 2.6 respectively, with average 13.3 credits/faculty. The average students teaching evaluation of SWAE faculty was high closer to 3.5 and three faculty undertook teaching peer reviews. In order to eliminate class overloading and to clear backlog, more than 10 courses were taught in both semesters. There were 14 MSc and 6 PhD students enrolled with the postgraduate programs.

As related to teaching quality assurance, department started working on accreditation and Ac As per the APR and Accreditation guidelines, student outcome based assessment methods were discussed in several mini-workshops and planned to implement (AE program has already done). Course portfolio preparation was done by the AE program and in progress with SS and WT programs, in overall by the end of 2017; SWAE will be ready for the accreditation process. There were challenges faced in terms of need for equipment update and upgrades in the laboratories, training for staff with new technologies etc.

The department showed excellent performances in scholarly activities; published 38 journal, 17 conference, 12 other publications, and faculty involved in 11 externally funded 5 internally funded and 2 non-funded projects (worth over RO 1.5 million). Faculty supervised 6 PhD and 14 MSc students, and actively involved in community services (12 workshops and 1 training programs organized, and 12 articles in public media, 19 national, regional and international committee participations), extended professional activities (60 conferences, training courses and workshop attended and 2 mentoring cases), participated in 21 professional and other activities such as holding positions in professional organizations, journal editorial boards, and journal paper reviews etc. Yet, in above-quoted all areas, departmental faculty and staff are working hard to offer better as there is always a space for further improvements and HoD wishes to convey his appreciations to all whom rendered their support to accomplish the set goals.

Outreach

Assistant Dean for Training and Community Services



The Assistant Dean for Training and Community Services Office is responsible for all activities not related directly to research and teaching at the College. Our office tries its best to assist and facilitate these activities. As well, we take care of our students' extra curricula activities and support them in their events. The Office is in charge of Students Societies and Groups. The office collaborate with all units at the College level as well at SQU level. We represents the International Cooperation Office and bridge between our Organization and the International Community. Meeting with international delegates held at College and organized by ADCTS Office such as the meeting with Japanese delegation and representatives from Directorate General of Million Date Palm Plantation Project in October 2016.

Many activities are the direct responsibility of the Office such as the Annual Open Day of the College organized in Nizwa and sponsored by Oman Chamber of Commerce in November 2016, Annual Sports, Wednesday, 4 April 2016, 8th Agriculture Festival 2016 organized by CAMS Students Society in February 2016. The Office is also responsible for students internship program as well to staff training. 250 students were trained locally were 9 trained offshore in 2016. Similarly, 4 CAMS staff were trained offshore in their area of specialty. Additionally, ADTCS Office facilitate receiving trainees from out of SQU. In 2016, 5 staff members from Oman Botanic Garden and National Center for Field Research in Environmental Conservation were trained in Crop Science Department. Also, ADTCS Office arranged to train 4 students from Technical Colleges at the College. ADTCS Office makes great effort to integrate with various segments of the Community to disseminate knowledge and make CAMS a major player in society. ADTCS Office facilitates the annual Training on Marine Sciences for Ministry of Defense that was held in January 2016 and organized by the Dept. of Marine Sciences. ADTCS Office role to integrate with society include facilitating school visits to the College were 6 schools visited the College in 2016.

Outreach

r Nasser Al Habsi has been selected to attend program (Patent Search and Analysis Cell) organized by Academic innovation Assistant Program (AIAP) for patent search from January to December 2016. Upon a completion of this program the cell will serve the SQU's faculty, Staff and students for supporting innovations at SQU.

Dr Nasser Al Habsi has been selected as one of the members in the patent search and analysis cell of SQU. Six members in the cell will attend a series of training sessions over one year time line to build their expertise on search and utilization of patents in the innovations. These activates and training are being organized by Academic Innovation Assistant Program (AIAP). Upon a completion of this program, the group will serve the SQU's



faculty and staff members, and students for supporting innovations at SQU.

The well-structured training to the patent cell used innovative experiential learning model. It has resulted in acquiring a unique skill set in terms of development of competency to guide/ counsel and handhold researchers/ inventors throughout the entire innovation process from ideation to technology proliferation in market by effectively using patent search, analysis to strategize innovations. The numerous case studies including live examples and scenarios are worked through has enabled implementation skills. This will be further used to 1. Counseling researchers/ inventors 2. Conducting innovation competitions 3. Establish Innovation Laboratories to assist inventors 4. Write good proposals relating to innovative technology development for industry.



r. Houcine Boughanmi, the WTO Chair, attended the Annual Conference of WTO Chairs held in Geneva on 14-16 November 2016. The Conference witnessed the launching of the WCP book 'Trade Costs and inclusive Growth: Case Studies presented by WTO Chair-holders'. The publication brings together contributions from ten WTO Chairs.



r. Houcine Boughanmi and Dr. Hemesiri Kotagama presented a paper in the WTO Chairs Session on 'the Impact of Food and Fuel Prices on Poverty in Food Import Dependent and Oil Exporting Economies: the Case of Sultanate of Oman' at the GTAP Conference held at the World Bank, Washington DC on 15-17 June 2016.

FAO Scientific Advisory Group on GIAHS

r. Slim Zekri was nominated by FAO Director General Jose Graziano da Silva as an expert in the Scientific Advisory Group (SAG) for the Globally Important Agricultural Heritage Systems FAO program for the period January 1st 2016 to December 31st 2017. The SAG, formed by seven experts from seven countries has been established following discussions among the Member Nations during the Conference concerning GIAHS governance. The SAG is constituted with the mandate of providing independent technical guidance and scientific advice on GIAHS-related activities.



2016 WTO Regional Trade Policy Course

For the third consecutive time and in collaboration with WTO, SQU held the Regional Trade Policy Course (RTPC) for the Middle East and North African Countries (MENA) starting on the 23 October 2016 and run for 8 weeks. Twenty three government officials from eight Arab countries participated in the course. Dr. Houcine Boughanmi and Dr. Shekar Bose participated in delivering the Modules on Agriculture and SPS/TBT.



he uropean Society or Marine lotechnology r. Sergey Dobretsov the head of the Department of Marine Science and Fisheries was elected as a member of the board for the European Society of Marine Biotechnology. The ESMB was established in France on 26th April 1995 to promote marine biotechnology

in Europe and to promote closer research collaboration between marine biotechnologists.

Asian ambassadors of editor

r. Mohamed Essa from FSN department was selected as one of the ambassadors for Asian Council of Scientific editors. Asian Council of Science Editors is the first and the foremost organization in Asia that was developed with the aim to provide a unified and active platform for Asian editors and scholars.where they can understand about their editorial problems, learn about the solutions and devotedly take up the future challenges to enhance the quality of Asian Scientific and Scholarly publications. Their mission is to connect professionals, develop intelligent resources, disseminate intelligent information and collaborate with regional and international organizations to represent the scholarly and professional publishing community of Asia around the world. From Oman, along with Dr. Mohamed Essa, two other members from College of Medicine, SQU are acting as ambassadors for Asian Council of Scientific editors.
Conference & Workshop

Food Safety Workshops



Since its launching in 2014, the Department of Food Science and Nutrition is actively and efficiently participating in the activities of Food Safety Weeks. Each year the Department is organizing conferences and workshops in collaboration with the Ministry of Regional Municipalities and Water Resources.

In April 2016, the Department and the Ministry of Regional Municipalities and Water Resources organized two workshops in food safety in which Dr. Ismail Al Bulushi from the Department chaired the Scientific Committees of the Workshops. The first Workshop entitled Good Hygiene Practices (GHP) in Food Small and Medium Enterprises (FSME) was lectured by one overseas speaker and 4 local speakers. This workshop was attended by 120 participants of Food Producers, Food Inspectors and university students. The second workshop which entitled Advanced Methods in Microbiological Analyses, was lectured by 3 overseas speakers and one local speaker and attended by 120 participants mainly Laboratory Technicians.

Prof. Osman Gaafar was Vice-chair Scientific Committee and Organizing CommitteeFor the Regional Conference for Animal Genetic Resources Conservation:Towards Sustainable Utilization. 23 – 24 February 2016, Sultan Qaboos University, Muscat, Sultanate of Oman.

Workshop on diagnosis and control of brucellosis in Sultanate of Oman

The Department of Animal & Veterinary Science organized the first regional training Workshop on diagnosis and control of brucellosis in the Sultanate of Oman 25-28 January 2016 The goal of this workshop was to work with appropriate personnel to develop improved diagnostic surveillance techniques and control strategies for livestock in the Sultanate of OmanThe workshop was sponsored by the Food & Agriculture Organization of the United Nations (Sub regional Office for the Gulf Cooperation Council States and Yemen), His Majesty's strategic research fund & Sultan Qaboos University/ College of Agricultural & Marine Sciences

There were 70 participants including invited speakers and different sectors in Oman (Ministry of Agriculture & Fisheries, Ministry of Health, Diwan & Sultan Qaboos University hospital). 16 of the participants received hands-on training on different diagnostic technique on Brucellosis. The laboratory sessions were conducted by Dr. Jay Maryne, Mr. Yannick Corde from National & OIE/FAO Animal Brucellosis Reference Laboratory (ANSES) & Dr. Yasmin ElTahir from the department of Animal & Veterinary Science.

five-day (October 30 - November 3, 2016) training workshop for postgraduate students on the 'Valuation Methods in Agrifood Economics' was organized by the Department of Natural Resource Economics and delivered by an international expert in the field Dr. José M. Gil from Technical University of Barcelona CRE-DA-UPC-IRTA, Spain. 4^{TH} International workshop on Food and Brain health

he Department of Food Science & Nutrition of the College of Agricul-- tural & Marine Sciences, Sultan Qaboos University, organized the 4th International Workshop on Food and Brain Health at the College on 28 and 29 November. The opening ceremony was held under the patronage of H.H. Sayyidah Dr. Mona bint Fahad Al Said, SQU Assistant Vice Chancellor for International Cooperation. The two-day workshop was organized in association with the Ageing & Dementia Research Group (ADRG) at SQU. The workshop sought to create awareness on the impact of nutrition on the brain, through youth, adulthood and old age. The workshop presentations cover a range of topics from the definition, causes and treatment for neurodegenerative diseases and cognitive impairment to research findings on dietary practices and their unique role on health. Around ten international speakers from USA, Australia, Japan and India participated in the event to share their experiences along with speakers from Oman and international students who present their work. In his welcoming remarks, Dr. Rashid Al Yahyai, Dean of the College of Agricultural & Marine Sciences, stressed on the efforts of the college in general and the Department

of Food Science and Nutrition in particular, to bring international experts to share their research experiences. Dr. Mohamed Essa, Associate Professor in the Department of Food Science & Nutrition at SQU and coordinator of the event, honored H.H. Dr. Mona Al Said for patronizing the event.

Prof. Walid Qoronfleh, Director, Biotechnology Development, Qatar Biomedical Research Institute (QBRI), and Hamad bin Khalifa University (HKBU), Qatar, gave a talk on "Where does memory reside and what influence it". He pointed out that latest research findings have established links between gut microbiota and brain including disease association concerning gut microbiome and psychiatric disorders, neurodegeneration and neurodevelopment impairment. Prof. Gilles Guillemin, Macquarie University, Australia, spoke about SQU-Macquarie research on neuroprotection by pomegranates in Oman. The study findings indicate that long term supplementation with pomegranate juice is able to protect against neurodegeneration in animal models of Parkinson's disease, Alzheimer's disease but in human patients with traumatic brain injury. Prof. Reyaz Kango from HiTech Analytical and Diagnostic Solutions, Gaithersburg, USA, gave a talk on adulteration of food and beverage products. "In the industry, food and beverage products are adulterated in many ways which includes



unacceptable enhancement, dilution and substitution with less expensive ingredients, failure to declare contamination and inaccurate or misleading labelling of a product or ingredient", he said. Dr. Sandeep Mittal from Wayne State University, Detroit, USA, spoke about his research on Tryptophan metabolism in human brain tumors. Prof. Samir Al Adawi from the Department of Behavioral Medicine at SQU explained the outcome of his group's research that investigated impact of fish oil supplement and fish in schoolchildren in Oman on indices of cognitive and behavioral functioning. Dr. T. Manivasagam from Annamalai University, India, elaborated on the effects of Aescin (a novel triterpene) from edible items on Parkinson's disease.

On the second day, Prof. Lawrence Rajendran from the University of Zurich, Switzerland spoke about insulin and nutrient signaling promoting amyloid formation in Alzheimer's disease. His study highlights the mechanistic link to how nutrition could influence Alzheimer's disease. Prof. Yukihiro Shoyama from Nagasaki International University spoke about the multifunctional neuroprotective effects of saffron and its constituent crocin. Dr. Qazi Hamid from RX Biosciences Limited USA explained antibodies engineering in therapeutics and diagnostics. Jagan Kalivarathan from Annamalai University, India presented their group's study that investigated the influence of high calorie diet on neural insulin activity. Dr. Kabali Subrahmanian from Arab Open University, Oman explored disruptive innovations in healthcare and its relevance for the food and brain health researchers. Dr. Justin Thenmozhi from Annamalai University presented about polyphenols from edible items and their action on Alzheimer's' disease. Robyn Tolhurst from Red Fern Communication Sydney elaborated on techniques for preparing well-structured scientific papers and presentations in English. Jagan Kalivarathan, PhD student from Annamalai University received travel award from Food and Brain Research Foundation sponsored by Dr. Amani Al-Rawahi. Ms. Buthainah Al-Bulushi from FSN department and one Bachelor's student received best audience awards sponsored by Science Matters – a new journal launched by Prof. Lawrence Rajendran from University of Zurich. The event was also supported by CAMS, Food and Brain research foundation, Muscat Water and Rx biosciences, USA.

Sustainable Agriculture and Marine Environment (SAME) Seminar Series

nustainable Agriculture and Marine Environment (SAME) Seminar is under $oldsymbol{
u}$ the Department of Marine Science and Fisheries (MSF), Collage of Agricultural and Marine Sciences (CAMS) and is coordinated by Ms. Miaad AL Maamari (lecturer at the department) since 2014 till today. These seminars are aimed to highlight research within Sultan Qaboos University (SQU), abroad universities, governmental and private sectors to address major academic and social challenges. Also, students take part in presenting their academic and outreach achievement related to the theme of sustainable agriculture and marine environment. This weekly SAME seminar attracted more than 50 participants from six different countries working in different fields of sustainable agriculture and marine environment during the last two years. There were 53 oral presentation and two mini-workshop that were announced about through the Collage of Agricultural and Marine Sciences (CAMS) and Sultan Qaboos University Public relation . SAME program serve as plate forum for academics, researcher and students to interact outside the standard class room, increase the knowledge dimension and provide a great opportunities for scientific collaborations and faculty or/and student exchange. than 50 participants from six different countries working in different fields of sustainable agriculture and marine environment during the last two years. There were 53 oral presentation and two mini-workshop that were announced about through the Collage of Agricultural and Marine Sciences (CAMS) and Sultan Qaboos University Public relation . SAME program serve as plate forum for academics, researcher and students to interact outside the standard class room, increase the knowledge dimension and provide a great opportunities for scientific collaborations and faculty or/and student exchange.

Food Safety and traditional Food Conference

The department of Food Science and Nutrition; in collaboration with the Ministry of Regional Municipalities and Water Resources organized a 3-day joint-conference; "Food Safety and traditional Food Conference 2016" from 12th to 14th April 2016. The opening ceremony was under HH Sayyid Kamil bin Fahd Al Said, Assistant Secretary General for the Cabinet of the Deputy Prime Minister for Council of Ministers. The conference discussed two themes: Food Safety; and traditional foods, with a total number of 36 papers and 15 posters. The conference provided a platform for professionals from different fields related to food and health to share knowledge, innovative ideas, and research achievements in the area of food safety and traditional foods. Dr Mohammed Al-Khusaibi, FSN, chaired the scientific committee which formed from the following members from FSN: Professor Shafiur Rahman, Professor Nejib Guizani,



Dr Ismail Al Bulushi, Dr Lyutha Al-Subhi, Dr Amanat Ali and Dr Ahmed Al-Alawi. The conference had a good participation from FSN postgraduate students who presented their work related to the theme conference in the poster session.



Professor Shafiur Rahman organized 2nd International Conference on Food Properties



rof. Shafiur Rahman as a founding chair organized 2nd International Conference on Food properties (ICFP 2016), 31 May - 2 June 2016, Bangkok, Thailand. Prof. Nejib Guizani was served in the advisory committee and Drs. Lyutha Al-Subhi, Mohd Al-Khusaibi, Mostafa Waly, Nasser Al-Habsi were served in the organizing committee. Prof. Rahman also organized a workshop on "Food Properties in Relation to Food Security, Food Quality and Safety". He presented opening welcome speech and a key note lecture "Strategies to Achieve Food Security: It's dimensions and Role of Food Properties". He has initiated this conference series and the 3rd ICFP 2016 will be held on 22-24 January 2018, Dubai, United Arab Emirates. The ICFP is a platform for professionals in the field of food properties for sharing knowledge, innovative ideas, and research achievements

R workshop

he Department of Marine Science and Fisheries of the College of Agricultural & Marine Sciences (CAMS) at SQU organized an introductory workshop on the usage of the R statistical system on 17th -18th of May. As many as 28 CAMS participants including faculty, researchers and PhD students and 16 participants from the Ministry of Agriculture attended the workshop. The workshop was aimed at introducing participants to R, a free open source language and environment for statistical computing and graphics program. Topics discussed included an overview of the program, data types and structures, exploratory statistics, plotting, linear regression and correlation, high quality graphics and analysis of variance. The participants appreciated the power and flexibility of using R (which is command based) as opposed to point-and-click GUI-based systems. They learned to import and explore data in R. In addition, participants gained an understanding of how to program logic, loops, and functions in R. Finally, the participants were introduced to resources for prac-



ticing and building R programming skills. The workshop held at the CAMS computer lab, was led by Drs. Alyssa Marshell (MSF), Mohammed Al Abri (AES), and Michel Claereboudt (MSF).

Barramundi workshop

n 20th October 2016, the Department of Marine Science and Fisheries held a Barramundi workshop. More than 100 participants including aquaculture farmers, governmental officers, and people who interested in fish culture from all around Oman attended. At present, only shrimp is farmed at relatively large quantities. Over the last few years the Omani government has made the development of the world-class fish farming sector a top priority, benefiting local communities, supporting food security and economy diversification. The barramundi or Asian sea bass (Lates calcarifer) is widely distributed in the Indo-West Pacific region inhabiting rivers, estuaries but can live in sea water. While barramundi is a new aquaculture species for Oman, it has been cultivated widely in ponds and cages in many other countries. Over the last few years our department has started culture of barramundi and gained significant knowledge. The aim of this workshop is to share our expertise in growing barramundi fish for Oman waters." For the workshop, 7 speakers were invited from SQU, the Ministry of Agriculture and Fisheries, and Al Hosn investment company who presented on interesting topics related to barramundi culture and management. At the end of the workshop, students of the department prepared lunch with barramundi dishes. The fish were cultured by students with average 800g for 10 months at Al Hail aquaculture station. Mr. Adul Al Sulaimani, one of researchers of the project said, "Barramundi grow very fast; ideally they reach a harvestable size (350g-3kg) in six months to two years even in hot water temperatures and they can grow very well in any water salinity, therefore there are many optimal places for barramundi cultivation. Saltwater-influenced agriculture farms will be the best place for this species in Oman." Dr. Nassar Al Maamali, owner of an aquaculture farm and one of the workshop participants said,

"This workshop is very useful to exchange information between research organizations and fields - I really enjoyed today's meeting. I hope we will hold this kind of workshop more; I really appreciate SQU for organizing this workshop for us."

Seaweed workshop

he mini-workshop "Seaweeds and their use in Oman" was conducted by the Department of Marine Sciences, SQU, the Dutch Embassy, and Wageningen University (Holland) on 25th of October, 2016 at College of Agricultural and Marine



Sciences (CAMS), SQU. The aim of this workshop was to build up collaboration and to share knowledge about Omani seaweeds and their industrial use. Dr. Rashid Al- Yahyai, the Dean of CAMS, SQU welcomed the participants. Dr. Sergey Dobretsov, the Director of Center of Excellence in Marine Biotechnology and the Head of the Marine Science and Fisheries Department, introduced seaweeds and highlighted their use. Dr. Ir. Hans van der Beek, Agricultural Counselor to the GCC countries, the Netherlands, thanked SQU for organization of this workshop. Dr. Raymond Jongschaap, WU, the Netherlands, spoke about seaweeds as alternative protein source and provided some examples from the experiments conducted in the Netherlands and Norway. Dr. Barry Jupp, GEO-Resources Consultancy, provided information about seaweeds in Oman and their potential use. Characteristics of carrageenan and agar

polysaccharides from some Omani seaweed were presented by Dr. Ahmed Al-Alawi, Head of Food Science and Nutrition Department, SQU. The round table discussion followed the presentations. During the round table discussion the participants analyzed possibilities of seaweeds cultivation and use in Oman. Overall, the workshop highlighted high biotechnological potential of Omani seaweeds, which can generate value added products, provide jobs for framers and fishermen and create new economic opportunities and contribute to food security to Oman.

Tomato Viral Diseases Workshop

The Department of Crop Sciences, College of Agricultural and Marine Sciences Sultan Qaboos University organized a workshop on "Tomato viral diseases infecting tomato crops in the Sultanate



Oman" on the 13th of November 2016. The overall goal of the workshop was to create awareness of the impact of tomato viral diseases and subsequent economic losses that occur due to this disease. A second goal was to bring together individuals working on plant protection in various organizations such as the MAF, RCA and SQU. A third goal was to raise awareness regarding possible management strategies associated with the yellow leaf curl virus disease and how to enhance crop productivity and limit environmental impacts related to control of the disease The workshop covered diverse topics including the origin of tomato infecting viruses, and their past, present and future possibilities for causing infection in Oman. The keynote speaker of the workshop, Dr. Rob William Briddon, British Professor and plant molecular virologist, gave a talk on the impact, diversity and movement of single stranded DNA viruses. Dr. Muhammad Shafiq Shahid, Assistant Professor, Department of Crop Sciences, SQU shed light on the resistance mechanisms of tomato yellow leaf curl disease viruses infecting tomato crops in Oman. Dr. Adel Al-Shihi from the MAF spoke about different virus resistance sources for tomatoes in Oman.

Overall the workshop covered different aspects of plant virology from basic science to strategic applied research and development. The topics ranged from basic molecular to application in the field. Overall, the workshop had a positive impact by educating researchers in Oman on the tomato yellow leaf curl disease complex caused by single stranded DNA viruses globally, and in the Sultanate, and helped guide future research direction.



r. Ali AlWahaibi participated in the Symposium on Omani Honey on Jan. 13, 2016 in Nizwa Chamber of Commerce. He and gave oral presentation on Omani common honeybee race and participated in panel discussion about further development of beekeeping in Oman.

Dr. Ali AlWahaibi participated in the "Oman Cleaning and Facilities Management Conference" held in Muscat on 16-17 November 2016. He gave an oral presentation on bed bugs biology and management and acted as moderator for one session during the conference.

Diagnosis and control of brucellosis

The Department of Animal & Veterinary Science organized the first regional training Workshop on diagnosis and control of brucellosis in the Sultanate of Oman 25-28 January 2016The goal of this workshop was to work with appropriate personnel to develop improved diagnostic surveillance techniques and control strategies for livestock in the Sultanate of Oman

The workshop was sponsored by the Food & Agriculture Organization of the United Nations (Sub regional Office for the Gulf Cooperation Council States and Yemen), His Majesty's strategic research fund & Sultan Qaboos University/ College of Agricultural & Marine Sciences.

There were 70 participants including invited speakers and different sectors in Oman (Ministry of Agriculture & Fisheries, Ministry of Health, Diwan & Sultan Qaboos University hospital). 16 of the participants received hands-on training on different diagnostic technique on Brucellosis. The laboratory sessions were conducted by Dr. Jay Maryne, Mr. Yannick Corde from National & OIE/FAO Animal Brucellosis Reference Laboratory (ANSES) & Dr. Yasmin ElTahir from the department of Animal & Veterinary Science.



Prof. Osman Gaafar was Vicechair Scientific Committee and Organizing CommitteeFor the Regional Conference for Animal Genetic Resources Con-

servation:Towards Sustainable Utilization. 23 – 24 February 2016; Sultan Qaboos University, Muscat, Sultanate of Oman.

Visitors

Prof. Nick Adamo Head of UNESCO office, International Oceanographic Committee, Perth, Australia visited SQU in response to our invitation to set up the Second International Indian Ocean Expedition focal point in Oman. His gave a talk "Second International Indian Ocean Expedition (IIOE-2: 2015-2020): context and opportunities for the Sea of Oman and Arabian Gulf".



team of collaborators from the Ministry of Environment, Qatar visited the department of Animal & Veterinary Sciences on a consultancy with Professor Osman Mahgoub on feeding local feeds to Awassi sheep.



rofessor Dr. Rob William Briddon, British Scientist and leading virologist visited Oman as a consultant to the strategic research project; "Management of tomato yellow leaf curl disease complex in Oman." The host and Principle Investigator for the project wasDr. Muhammad Shafiq Shahid, Department of Crop Sciences, SQU. During his visit to Oman, from the 10th -14th November, 2016, his hosts arranged field visits to the Al-Batinah region to assess the intensity of viral infections in the tomato crops. In addition Prof. Briddon provided training to SQU researchers on the optimization of different molecular techniques, particularly the application of biolistic particle delivery gun (gene gun) and its use in virus host interaction research.

r. Ali Al Wahaibi arranged seminar on April 7, 2016 by a visiting scientist from the Natural History Museum in London. Dr. Andrew Polaszek, gave a very interesting presentation on "The Three P's of Economic Hymenoptera: Parasitoids, Pollinators, & Pests" In November, Dr. Ali Al Wahaibi and Mr. Ali Al Raeesi hosted a visit by three entomologists from the UK and Italy. (names?) These visitors have a deep in-



terest in studying the insect fauna of Oman. This was their second visit, focusing on the insect fauna of Dhofar.

Prof Alastair Goldman, Head, Department of Molecular Biology and Biotechnology (MBB), University of Sheffield, UK Professor Goldman visited SQU on December 14, 2016, his visit was hosted by the department of Crop Sciences to encourage academic collaboration between both institutions. He met with Dean, CAMS and other academic staff. He gave two mini-workshops in college of medicine and College of Science.

Staff and Students trainning

Internship

ne of the major aims of the educational program at Sultan Qaboos University is to prepare our undergraduates for productive working lives after graduation. The internship program in Natural Resource Economics makes an important contribution towards achieving this aim. Thirty six students from the Department of Natural Resource Economics (NRE) went for their internship training in local public and private institutions such as: Ministry of Agriculture and Fisheries, HAYA Water, OMANTEL, Bank Muscat, Daleel Petroleum Company, Tadrous Trade and Contracting, Bank Dhofar, Be'ah Company, Sohar Alminium Company, Royal Court Affairs, Diwan of Royal Court, Oman Botanical Garden Nursery, Public Authority for Consumer Protection, Oman Development Bank, Ministry of Defense, Ministry of Environment and Climate Affairs, Ministry of Regional Municipality and Water Resources, and Oman LNG Company. The Department also sent Ms. Munira Nasser Al-Zeidi (NRE student) for externship in Sri Lanka at the University of Peradeniya. University of Peradeniya is a leading university in Sri Lanka and the Faculty of Agriculture strives for excellence in education, research and outreach in the agriculture sector for sustainable development.

Under the training program she attended lectures on procurement practices, Natural Resource Management, Cost-benefit analysis, economic impacts of biodiversity, and on the role of Agricultural institutions in Sri Lanka. She participated in questionnaire survey and face-to-face interviews involving farm workers. She visited a number of agricultural farms, Research Center and Policy. She attended the workshop on Fertilizer Policy in South Asia in Sri Lanka in July 26-27, which aimed to assessing the impacts of fertilizer policy in the country.

r. Hussein Al-Masroori, Dr. Michel Claereboudt and Dr. Gerd Bruss, from the Department of Marine Science and Fisheries, were the instructors for the annual training course for the Royal Oman Navy Cadets in January 2016. The course covered elements from disciplines of oceanography, marine pollution, climate change, fisheries law and policy, and integrated coastal zone management. The Navy Cadets enjoyed the course and found it helpful for their training.

ASF lab technician, Hajir MurtadhaAl Lawati went for a training workshop from 27th – 28th of October 2016 at DHI group in Horshlom, Denmark. They used HPLC (high performance liquid chromatography) in phytoplankton pigment analysis. The DHI group has knowledge and experience from 50 years of research. Hajir learned how to filter and extract samples, the calibration procedure,



quality assurance, reporting results and distribution of different pigments in different phytoplankton groups. The people in DHI were highly qualified, friendly and they have the ability to share their valuable experience.

wo technical staffs from Food Science and Nutrition Department (CAMS), Raya Al Malki and Buthaina Al-Belushi completed IBRO neuroschool on advanced Neurodegenerative and Neurodevelopmental Disorders conducted at Doha, Qatar on November 2016. Their participation was strongly recommended by Mohammed Essa, an Associate Professor in the same department. In addition to their participation in the 3rd Middle East Molecular



Biology Congress AND Exhibition –Doha that was conducted on 16th -17th November 2016. IBRO is a global union of neuroscience organizations with the aim to promote and support neuroscience training, teaching, collaborative research and advocacy around the world.

The goal of this School was to provide students with a general understanding of neurodegenerative & neurodevelopmental disorders. 14 students from different Arab countries including Oman, Saudi Arabia, Tunisia, Morocco, Algeria, Sudan, Palestine and Egypt had actively participated in this school. Most participants were post graduate doctors in the same field and young doctors. The course provided them with three general skills in advanced neuroscience education, oral presentation and professional development. The lectures were conducted at different levels ranging from molecular, cellular and pathological to behavioral and clinical levels. Our technical staffs had a good opportunity to meet top researches, scientists and professors in neuroscience field coming from different countries like Qatar, Egypt, Lebanon, USA, Germany, UK, Netherlands and France. They had really shown effective participation in most sessions specifically during sessions relevant to biochemistry and nutrition field.

AVS Staff Training

1. Ms. Abeer N. Al Hamrashdi, was trained at the veterinary diagnostic laboratory from 1st September to 15th October 2016 in the Faculty of Veterinary Medicine, University of Helsinki in Finland. During this time she has practiced cytology on diagnostic small animal case-material as well as archived cytological slides.



- Ms. Kaadhia Khalaf Al Kharousi attended a training workshopon Biological and Diagnostic Applications of Electron Microscopy from 22nd to 24th October 2016 in College of Medicine & Health Sciences – Department of Pathology -SQU
- 3. Ms. Kaadhia Khalaf Al Kharousi & Ms Al Ghalya Al Toobi attended a workshop

entitled 'Molecular Biology Techniques' organized by the College of Medicine & Health Science from 28th August- 1st September

Mal Nasser Al-Shaqsi, Department of Crop Science, completed an internship at the Natural History Museum in Vienna, Austria this past summer (August 8-31, 2016). Amal's supervisor for this internship was Dr. Ali Al-Wahaibi in the department of Crop Sciences, SQU. Her hosts in Vienna included Dr. Dominique Zimmermann, Dr. Elisabeth Haring, and Dr. Nesrine Akkari, all in the Department of Zoology at the museum. The museum first opened in 1889, and only 20% of the collection is on display. The rest is used for research, which



was the focus of Amal's internship.

Some of Amal's unique experiences and training included classification and identification of bees and ants to families, subfamilies and genera using morphology and printed insect keys. Some of the specimens were collected while she was there, and some were over 200 years old! She also learned how to do the DNA extraction of bees, and also snails and fish which have the same process as for insects. This included using PCR methods and making the gel for electrophoresis. In another lab she used state-of-the-art equipment including a Nikon- multifocus camera and a scanning electron microscope to create images of insects and parts of insects that are otherwise hard to view (centipede-millipede taxonomy and morphology).

Overall, Amal felt like this experience helped her to improve her specific knowledge, and also her language skills, ability to working in as part of a team, and resulted in an increase self-confidence. The staff at the museum were friendly and helpful, and she recommends this experience to others. She also completed part of her internship training in Oman, at the Muscat airport plant quarantine department, and the Mawalih Souq Plant Quarantine department.

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is not pasteurized, the Brucella will reside in the chain of dairy products processed for human consumption. Humans will therefore be indiscriminately infected and debilitated if they consume these products. Some communities revere and relish the consumption of raw milk and dairy products such as homemade milk-butter and soft cheese, with the result that any Brucella infection will become a danger to them. My advice to consumers of camel milk amid the Brucellosis outbreak is simple and straightforward: "It is important that consumers buy camel milk from reliable and authorized milk vendors. In the case where they buy milk from individuals, they must make sure it has been freshly milked and boiled. For those who drink camel milk as a form of treatment for certain ailments, it is imperative that they first consult a health professional.

Articles in newspapers:

r. Yasmin El Tahir Ahmed gave an interview to Oman observer newspaper "Boiling Camel Milk is Key to keeping Safe from Brucellosis, Oman Observer, 4, Sunday 28th August 2016. The article was mainly about the consumption of unpasteurized milk and dairy products made from infected animals are also a key cause of Brucellosis infection. "Female animals infected with Brucella bacteria shed large numbers of viable organisms into the milk. If such milk

Expert: Boiling camel milk is key to keeping safe from Brucellosis

CAUTION: Oman is grappling with a rare outbreak of Brucellosis in parts of Batinah North

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Students Soci-

Agricultural & Marine Sciences Student Soceity

Agricultural Resource Economics (NRE) Group of the Society of College of Agricultural and Marine Sciences (CAMS) participated in the Majors Fair at the Cultural Center, SQU. The group also actively participated in the 8th Scientific Agricultural Festival and won third prize in the competition. The group also played a role in the CAMS 'Open Day Event' held in November 29, 2016, at the Chamber of Commerce, Nizwa.



Marine Invasion

From May 1st – 3rd 2016, the students from the Marine Sciences Group organized a "Marine Invasion Exhibition". The exhibition was organized under the patronage of Dr. Rashid bin Abdullah AL-Yahyai, a Member of State Council. Mr. Abdullah Al Kindi supervised the students. The exhibit was opened by the Dean Dr. Rashid and HoD of MSF Dr. Sergey. The exhibit has a major success. Several primary and secondary schools visited the exhibit. The main exhibition idea was an invasion of sea creatures for human beings in retaliation for human impacts on the marine environment. The exhibition was aimed the different segments of society, through the invitation for schools and university students and visitors coming from outside the university. The exhibition contains seven main corners, the first corner discussed the problem of marine pollution and long-term impact on marine organisms, while the second corner is the "ghost fishing" phenomenon which happen by lose or leave the fishermen tools and fishing nets at sea and keep them to reach the seabed which considered as the one of the most ways cause a drain on marine organisms. The over fishing Corner exposed to the dangerous of this type of fishing on fish stocks by catching all fish types and sizes without choose the needs which affecting the stock reproduction. Sea turtles corner pointed on the importance of turtles in Oman, where Oman is the second largest turtle site in the world, as well as the rarest species in the world, which should be maintained. Finally, "Cinema" corner which shows some scientific solutions to marine environment problems.



Community service by MSF students

ver 20 students and staffs from Department of Marine Science and Fisheries took part in Community Service. Throughout the service, numerous places were served, including tilapia aquaculture farms at Barka and Central Fish Market. The students had a great time encouraging one another to make a difference in the community.

Students measured and evaluated the current problems of the fish farms such as feeding, water quality and disease status. Throughout fish farm adventure event at tilapia aquaculture farm, students participated in "manager of the day" to give useful advice to the staffs there regarding daily routine management and unexpected occasions.

Students moved to Central Fish Market at Barka, focused on examination of seafood quality and safety of Omani fish products. Students checked fishes for selling from all over the Omani coast with sensory evaluation and microscopes. One of students Miss Najla Al Mandhari said "It is amazing place we can see most of fish species caught around Oman, I like to visit traditional fish market in the souk but I am very proud of this facility we have in Oman". She added "After we checked fish samples, we realized that Omani fish products are still very healthy from both wild and farm, we should monitor them and keep them healthy". Dr. Sergey Dobretsov stated "Community service by students will bring many benefits both student and community, generally this kind of action enhances the social connections between university and local community, builds the bridges for governments, enterprises and university, also community service helps build a more cohesive, safer, stronger community, increase the social network between communities. Especially for our students, their service promotes themselves to be more active in civic engagement and concerned of citizenship, therefore

I would like to encourage our students would involve this kind of activity more and more.



Our Concern is Marine environment

he year of 2016 was full of achievements for the marine science group. As the marine environment has been the most concerns for the group, they started the biggest cleaning campaign in Oman on the national beach cleaning day 17th of September under the name: "Our beaches are our priority". Mr. Bader Al Buwaiqi supervised the students. The campaign started from Khasab in Musandam through Albatinah and Muscat coast ends up in Al Ashkhara in Alhshargya region that includes about 16 beaches along the coast and more than 800 participants of different ages. This campaign was organized to decrease the human effects on the coastal areas because it was noticed that the human activities in the beach has been increasing in the couple last years. A new awareness campaign program was started on 6th of September until the end of the week. This campaign targeted different schools on Muscat to increase their awareness about the importance of the marine environment and the effects of the pollutions on the marine life. The awareness campaign program was different lectures given by marine science group students in schools.



Community Interview

nder future plans as a step to support the effectiveness of environmental effectiveness come chat question passersby to study and measure community awareness in various environmental aspects, so as to know which age groups have sufficient expertise to environmental vulnerability of human waste. Where was effective in Seeb Beach from 4:00 to 5:30 p.m. Tuesday, the questions at random to pedestrians in addition to 3 students from the Faculty of agricultural sciences and former Dean Assistant Marine Dr. Said Al Ismaili and Dr. Alyssa Marshall from the Department of marine sciences and fisheries on Wednesday. The questions centered on any more categories caused environmental pollution and why is that? And also what your part in contributing to the reduction of environmental pollution and what is your message? Passing interaction observed was lower than expected and see their portfolios on the environment is unclear and they are unaware of how bad the environmental situation unlike interviews for faculty and students, where sound interest and environmental responsibility. The extent of our role as an environmental group to change that and convert these negatives into positives, strengths, and needs not only to community outreach, but making them a wear. Students involved in college eco clubs

which was organized by ESO (environmental society of Oman). There were 7 colleges and universities compete in this program. Our students (Marine Science Group) organized many campaigns and workshops to win in this program. In 14th of December was the awards ceremony and they got the third place in this competition

International Students Supervision

r. Waly is currently serving as a thesis committee member for an international student, Rose N. Mafiana, PhD student at Walden University, Minnesota in the United States. Her doctoral research entitled "Association between Type 2 Diabetes and Colorectal Cancer in Oman". The main contribution for Dr. Waly is to supervise data collection and analysis regarding dietary intake and biochemical indices of the recruited Omani study participants.



The Plant Sciences Group (PSG) organized three educational events in the spring of 2016 in conjunction with the AES Administration, and also organized the annual "Tree Day" in the fall. The first workshop was held 14-16 March, and was on Bee-keeping. Dr. Ali Al Wahaibi from the Crop Sciences Department presented the basics of bee-keeping, including how to raise bees and collect honey. He also showed how to identify adulterated honey from the market, and a visit to the AES apiary. At the conclusion of the workshop, there were honey-combs ready for extraction, and the participators did the extraction process.

CROP Sciences Student Group

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Plant Propagation Workshop was held on 4th – 6th of April, with a focus on how to propagate indoor plants. Dr.Mumtaz Khan from the Crop Sciences Department presented the topics and demonstrated the techniques. There was also a practical exercise and participants took home plants used in the exercise.



F lower arranging was taught on the 18th-20th of April. A guest speaker presented the fundamentals of flower arranging and the materials required. Also, each participator did their own arrangement using information from the workshop.

The Tree Day Celebration was on Oct 31st – Nov 2nd. This is a main activity for plant science students, and consists of a 3-day exhibition, including guests and students with educational displays. This



year's event was held under the auspices of Dr. Rahma Al Mahroqi, SQU Deputy Vice Chancellor for Postgraduate Studies & Research.

Students had informational displays on biochar, correct plant disease diagnosis methods, floral preservation techniques, insects, the recently released Mango Encyclopedia, and up-to-date information



presented on "live" TV. Information from the Haya Water and Kala Compost facility was also there, as well as a wild-life expert from the National Field Research Centre for Environmental Conservation. The space was aesthetically decorated with thousands of leaves of local and regional trees. Videos of this event and the workshops can be seen on the Plant Science Group (PSG) channel on you-tube.

Animal and Veterinary Sciences Student Group

The students of the department have been very active through their society. They have organized different events within the college & the university throughout the year. CAMS Open Day was held in Chamber of Commerce and Industry of Oman, Nizwa branch.



Appendix - CAMS Faculty Profiles

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