

Agricultural knowledge from academy to farming communities: The role of higher education in enhancing food security in Syria



Shaher Abdullateef, Cara and Academic Centre for Development and Peace Studies, Turkey



shaher.abdullateef@gmail.com



Esraa Almashhour, Cara and Academic Centre for Development and Peace Studies, Turkey



Abdulmonem Alabboud, Cara and Academic Centre for Development and Peace Studies, Turkey



Basem Mohamed Saleh, Cara and Academic Centre for Development and Peace Studies, Turkey



Abdulrahman Albayoush, Cara and Academic Centre for Development and Peace Studies, Turkey



Muhammed Assaf, Kahramanmaras Sutcu Imam University, Turkey



Andrew Adam-Bradford, Independent Researcher, United Kingdom

Abstract

The dynamics of the Syrian conflict present a complex set of challenges that led to considering more than 10.5 million people food insecure and in need of urgent agricultural and livelihood assistance.

This article investigates the role of higher education (HE) in food security. It considers how universities, graduates, and appropriate curriculum and research engagement can address challenges and provide innovative solutions in Syria.

Key Words

Agriculture

Syria

Food security

Higher education

Introduction

The Food and Agriculture Organization (FAO) defines food security as a 'situation that exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life' (FAO, 2002). The Syrian War, which began as a civil uprising in 2011, quickly transformed into one of the world's most pressing humanitarian disasters, with food security emerging as a major issue. As well as causing the displacement of 13 million people (8 million of them internally displaced), the conflict has been detrimental to both the economy and the environment, and thus to agricultural production (Abdo, 2018; Kelley *et al.*, 2015; Lagi *et al.*, 2011). Kelley *et al.*'s (2015) analyses suggested that the severe 2007–2010 drought in Syria, in part caused by human practices and resulting in the migration of a significant number of rural people to cities, was a contributory factor to the war, and found that anthropogenic climate change will make such droughts more than twice as likely to occur in the future.

Moreover, due to the ongoing conflict, the country's education system has been severely damaged, with disastrous effects on the production and dissemination of knowledge. Higher education (HE) has been no exception: university buildings, infrastructure, resources, and research centres have been targeted for violent attacks, and academics, staff and students subjected to violence and intimidation (Cara, 2019; Millican *et al.*, 2019;

To cite this article: Abdullateef, S., Almashhour, E., Alabboud, A., Saleh, B. M., Albayoush, A., Assaf, M. and Adam-Bradford, A. (2020) Agricultural knowledge from academy to farming communities: The role of higher education in enhancing food security in Syria, *Education and Conflict Review*, 3, 67–76.

Milton, 2019; Watenpaugh *et al.*, 2014). Tens of thousands of university students have had no choice but to end their academic studies for a variety of pressing reasons, including security risks associated with travelling to their universities, injury, escape from military service, and internal displacement. In addition, thousands of academics, veterinary practitioners and agricultural engineers, including agricultural extension staff, have had to flee violence and threats to their lives. Consequently, a considerable detrimental impact on agriculture and food security, with the potential loss of agricultural knowledge and expertise, has been observed in the country.

Prior to the conflict, agriculture was the most important sector of the Syrian economy. In 2001, it made up as much as 27 percent of the gross domestic product (GDP) (World Bank, 2019; FAO, 2017; FAO and WFP, 2010). Despite being in a period of sustained crisis since 2011, agriculture is still considered an important part of Syria's economy (26 percent of GDP) and critical for the self-sufficiency of more than 75 percent of households who grow their own food for consumption. However, Syria is a currently a country where more than 10.5 million people are considered in need of urgent life-saving and life-sustaining food, and agricultural and livelihood assistance (FAO, 2019; OCHA, 2018; OCHA, 2017; FAO, 2017). Recently, many factors, including loss of expertise, forced internal and external displacement, damage to the agricultural infrastructure and collapsed extension services have seriously affected food security (Boden *et al.*, 2019).

Moreover, the conflict has seen numerous instances where food has been weaponised during sieges to break the population's resolve. In 2016, for example, attention was focused on the besieged town of Madaya and how hunger had been deliberately provoked there. Yet, Madaya was one of several Syrian cities that had been under siege for months where their populations were also dying of hunger (Zareceansky, 2016). Al Shimale (2016) reported on how food became instrumentalised as a weapon of war during the siege of Aleppo where more than 300,000 people were encircled by the forces of the Assad regime. The besieged residents were often unable to obtain food and were barely eating one meal a day. One of the respondents in Al Shimale report said, 'We were not able to get food every day and were barely eating one meal a day. We had six pieces of bread for the whole family every two days'.

Human Appeal (2018), one of the leading UK charities providing humanitarian aid in Syria, has reported how the sieges of places like Aleppo, Homs and Eastern Ghouta in Syria have caused food insecurity and malnutrition to spiral out of control. Their report details how forced starvation on a population can have devastating effects in the short, medium and long term and how it disproportionately harms vulnerable people such as children, the elderly and pregnant and lactating women, and those with disabilities. Syria's case is particularly heart breaking as the uprising, which began as mass protests against an authoritarian regime, has subsequently developed into a complex internationalised civil war that threatens to destroy its local food systems irreversibly. Consequently, more than 6.5 million people are currently food insecure and a further 4 million people are at risk of becoming acutely food insecure (FAO, 2017; Zurayk, 2013).

The dynamics of Syrian conflict present a complex set of challenges for educational development. Existing models of education are inappropriate, inadequate and/or inaccessible to some communities in conflict-affected contexts (Cara, 2018; Abdullateef *et al.*, 2018). A nation's knowledge is one of its strategic domains that needs to be constantly developed and renewed. Agricultural systems could be enhanced when universities produce and share agricultural knowledge; the extension role of universities is realised; and there is a good mechanism to promote farmers' learning (Chikaire *et al.*, 2015). As noted above, since 2011 tens of thousands of university staff and students have had to stop or suspend their studies for a variety of reasons. In addition, those who do graduate have limited opportunities to apply theoretical knowledge through professional practice. The cumulative effect is that Syria's working population is rapidly deskilling.

At present, agricultural students and graduates in Syria face significant barriers to skills development, leaving them unable to support farmers with technical solutions and extension. The consequences of this damage to the education sector have been particularly profound for the agricultural sector. This article investigates the role of HE in food security in Syria. It looks at food availability; food access; changes in farming practices; knowledge exchange and the place of agricultural extension in knowledge transfer.

It considers how universities, graduates and appropriate curriculum and research engagement can address challenges and provide innovative solutions to food insecurity and as such has relevance for similar contexts in other parts of the world.



Figure 1. Example of agricultural practices dissemination to farmers via extension staff pre-2011. A: Knowledge transfer through delivering seminars and workshops; B: Practice application by farmers; and C: Follow up and evaluation.

Methodology

This research was carried out as part of the Cara Syria Programme in 2019. The programme aimed to enhance research skills of Syrian academics in exile on topics related to their areas of interest. The training courses on research skills were helpful in designing and carrying out this research. Both qualitative and quantitative data were collected from three regions (Al-Atareb, Azaz-Jarablus and Kafarnubul) in North West Syria (Table 1). The selected locations have received the highest levels of internally displaced persons (IDPs), including farmers from other regions of Syria affected by violence.

In Syria, as in other countries, universities and research centres are considered the main sites of knowledge resources and knowledge production. Agricultural and veterinary scientists in HE carry out experiments, obtain results and offer solutions for the changes and challenges facing farmers. Agricultural engineers, as extension staff, transfer this knowledge to farmers in a number of different ways, including through workshops, lectures and fieldwork. Using a qualitative methodological approach, our research investigates the knowledge pathway from HE, including universities and research centres, to farmers and agriculturalists via extension services and staff (Figure 2) to understand the challenges and the impact of the following main factors of the food security in Syria, in particular:

- Farmers' behaviour and experiences and subsequent changes in the farming systems;
- Agricultural extension services including extension infrastructure and practitioners;
- HE's role, including curriculum and research.

Food Security

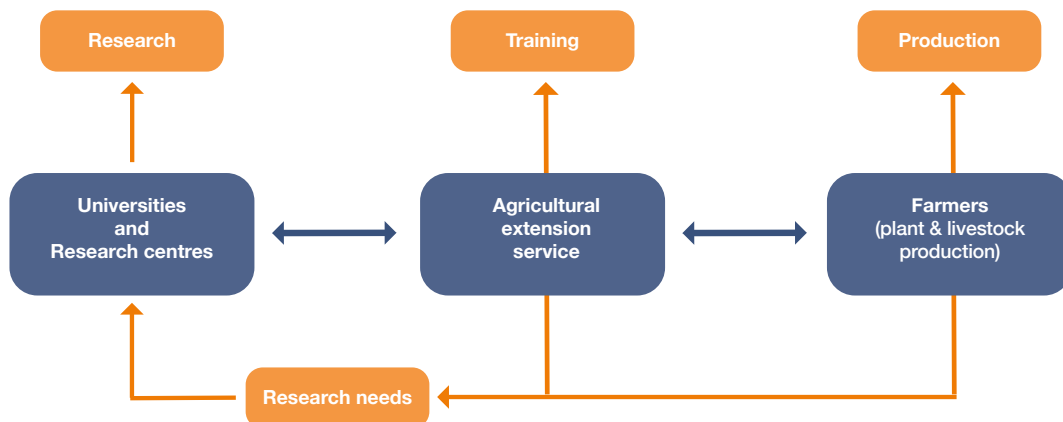


Figure 2. Agriculture knowledge pathway from universities to the farmers via agricultural extension staff to enhance food security in Syria.

In carrying out this research, a literature review was conducted using available reports and previous studies to formulate the main themes and questions for the questionnaire. Both quantitative and qualitative data were collected via diagnostic questionnaires and focus groups. Drawing on the literature review, as well as the research team's own knowledge of the food security situation, a questionnaire was developed and tested through a pilot survey with 15 respondents at each research site. This enabled the research team to collect participants' feedback for further improvement of the research instruments. The final version was then distributed to local facilitators. Three online capacity building workshops were organised (40 participants in total) to ensure that facilitators had the required skills to undertake the interviews and fully grasped the research aim and questions, the contents of the questionnaire and research ethics. In addition, the authors developed a list of focus group discussion (FGD) questions for detailed information and clear understanding of the main issues in the research.

Focus group discussions (FGDs)

A total of six FGDs were conducted, two at each location – one with extension staff and one with internally displaced and host farmers (Table 1).

In total, 40 agriculture engineers and veterinary practitioners with at least 5 years' experience of working in agricultural extension services, and 33 internally displaced and host farmers participated in the FGDs. The FGDs provided deep insights into the impact the conflict-related problems facing HE has had on agricultural practices. The discussions focused on lessons learned, farmers' success stories and extension challenges and suggestions.

Interview-based questionnaires

A questionnaire was used to capture community level feedback from host and internally displaced farmers. The questionnaire comprised informative and open questions regarding farmers' social and economic circumstances; food production and availability; agriculture extension services; graduates' experience; curriculum; and research impact on food security pre- and post-2011. In total, 301 individual interviews with 119 internally displaced farmers and 183 host farmers were carried out in 50 villages in the studied areas (Table 1). In addition, a WhatsApp group was established to facilitate the communication between the researcher and the data collection team for immediate technical support and feedback.

Research area	Focus group discussions			Questionnaire – individual interviews			
	FGDs	Farmers	Ext. staff*	Villages	Interviews	ID farmer	Host farmer
Idlib	2	13	11	15	90	44	46
Al-Atareb	2	10	14	20	97	34	63
Azaz-Jarablus	2	10	15	15	114	41	73
Total	6	33	40	50	301	119	182

* Extension staff are agronomists and veterinarians with at least 5 years of experience of working in agricultural extension services.

Table 1.

Research area and sample size used for each tool of data collection resources via focus group discussions and individual-based interviews.

The current food crisis in Syria

Syria was an exception in the Arab world with regard to food security. Whereas all other Arab countries were classified as having a food deficit, Syria was considered a food self-sufficient country (Haddad *et al.*, 2011; Shideed, 2008). However, due to the war and the resulting displacement of populations, food insecurity is now considered one of the most critical challenges facing the Syrian people. The results obtained in our research showed that 46.8 percent of respondents from both host communities and IDPs depend on agriculture and 33.5 percent depend on livestock production as their main income source. This confirms the fact that the majority of the Syrian population is located in rural communities. Thus, agriculture is not only a means of subsistence but, equally importantly, also a source of income for most Syrians (Schmidhuber and Tubiello, 2007).

Our research found that 80 percent of respondents secured their own food requirements from their agricultural activities. In 2018, the FAO reported that more than 75 percent of Syrians were self-reliant in food production. However, this research highlighted that food availability was significantly reduced for both plant and livestock production. This was a result of the lack of extension services, low quality agricultural input, high production costs, and

reduced cultivated and irrigated fields. For example, irrigated fields have decreased from a pre-crisis total of 19.8 percent cultivated fields to less than 10 percent since 2011.

In addition, vulnerable communities have become unable to afford their essential food needs. Low food purchasing ability was recorded for main food items such as bread (44.9 percent), vegetables (23.2 percent), eggs (13.9 percent), and red meat (27.2 percent). Thus, even if food was available in local markets, communities are not able to purchase it. Moreover, livestock numbers had decreased for a majority, with 58 percent of sheep farmers and 65.5 percent of cattle farmers stating there had been a drop. Agriculture inputs availability reduced from 79.6 percent pre-crisis, to 47.2 percent since 2011. These results could reflect not only the long-standing conflict, but also the sudden desperate straits of vulnerable populations. If food prices remain high, there is likely to be persistent and increasing Syrian social disruption.

Agronomist and veterinary practitioners experience pre- and post-2011

HE is generally regarded as a place for teaching and learning about theoretical knowledge in the field. This research showed that the experience of agronomists and veterinary practitioners needs to be continuously

updated. Although their experience was described as very good to good before the crisis with only 40 percent of respondents, currently, it is reduced to good to medium with about 30 percent of the respondents. This result seems to be a negative consequence of the destruction of the HE system and the migration of skilled academics, agronomists and veterinary scientists. FGD2-extension staff discussed this issue and highlighted the weak skills of new graduates, noting that this was one of the challenges faced by farmers:

Weak experience limited to theoretical knowledge has led farmers to be less confident with the new graduates.

In addition, FGD1-extension staff reported that:

There are engineers, but the link between academic study and reality on the ground [practical knowledge] is very weak and theoretical knowledge gained during the study at a university only allows students to graduate without [any practical] knowledge in field production.

There is, therefore, an urgent need to identify the knowledge and skills gaps and to provide innovative solutions for capacity building. As expertise is lost in Syria through the migration of academics and practitioners, solutions are required to improve knowledge mobilisation and strengthen collaborations with experts in the wider global community. However, this requires rebuilding trust and expertise in the Syrian agriculture and food sectors, and identifying existing knowledge.

The role of universities and research centres pre- and post-2011

One of critical effects of the ongoing war has been the reduction of educational quality, which has led to the deskilling of new university graduates. Our research showed that the quality of HE pre-crisis was described as good by 72 percent of farmers and as weak by 50 percent of farmers currently. The role of the curriculum in enhancing food security in Syria was described as good before the crisis and dropped considerably after eight years of ongoing conflict. HE is considered a main source of knowledge and development for agricultural extension staff. FGD1-extension staff clarified the role of HE in these terms:

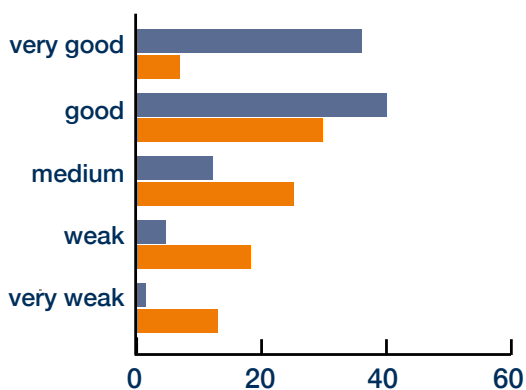
HE can play an effective role by carrying out research relevant to improving agricultural activities in our area.

The FGD3-farmers highlighted some limitations and challenges:

The role of HE in improving food production is very weak because of the lack of laboratories and the opportunities for conducting physical and chemical analyses of soil and crops.

The lack of practical aspects in Syrian HE, even before the crisis, has been discussed in several previous studies. CARA (2019) and Abdullateef and Parkinson (2017) found that prior to the crisis, Syrian HE was characterised as theoretically oriented, with a concomitant lack of practical expertise relating to the needs of communities and industry.

Agronomist experience



Veterinary experience

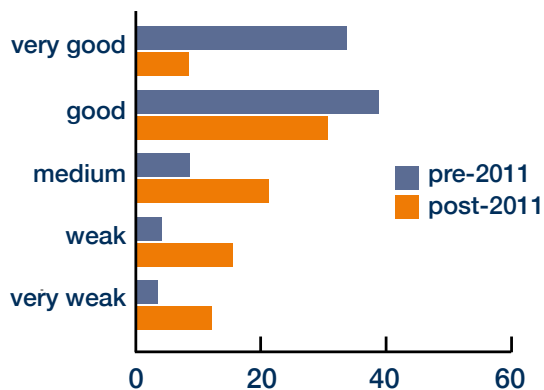
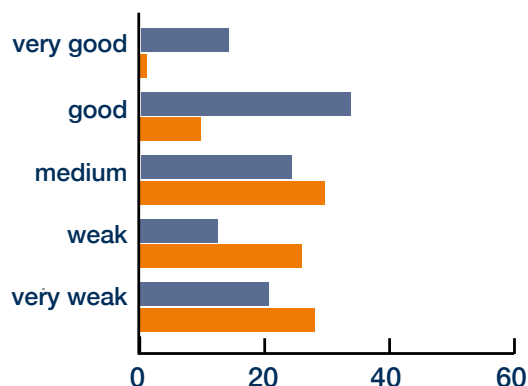


Figure 3. Agronomist and veterinary experience pre- and post-2011 from point of view of farmers and livestock breeders.

Curriculum



Research

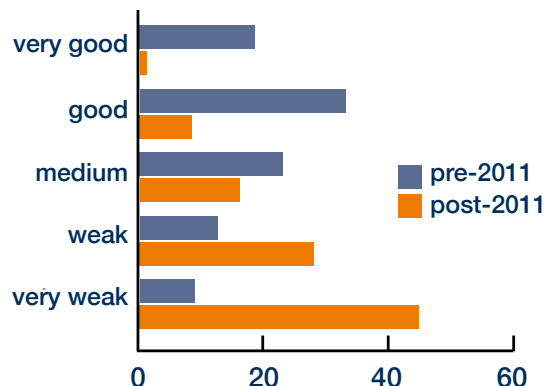


Figure 4. Curriculum and research role evaluation pre- and post-2011 from the point of view the farmers and livestock breeders.

To improve the role of universities, FGD-1 extension staff suggested that:

HE can play an active role by conducting research specific to a region and its agricultural problems through providing seminars to introduce cultivation methods and to alert farmers...to be aware of diseases and treatment methods.

The respondents in the research identified the following as the most reliable current agricultural sources: expert farmers who have previous experience in plant and livestock production; agricultural engineers and veterinary practitioners who have experience gained throughout their work; practical field days held by local organisations; and viewing agricultural extension programmes delivered by social media. These were also mentioned by FGD1-farmers, FGD2-extension staff and FGD3-extension staff.

Agricultural extension services pre- and post-2011

In Syria, the agricultural extension system forms the main chain of knowledge transfer between universities, research centres and the farming system. Our research showed a weak extension service both pre- and post-2011. Only 54 percent and 48 percent of respondents received any kind of extension services pre- and post-crisis, respectively. Crop rotation was used as an indicator of the impact of an effective agricultural extension. The results showed that crop rotation in the farming system decreased to 45.8 percent of total farms. Only a few framers were able to attend to some extension activities as the FGD2-farmers reported that:

[We] have gained experience and knowledge of livestock and plant diseases and learned ways to treat them through the seminars, agricultural exhibitions and symposiums held in the region.

Exhibitions and symposiums

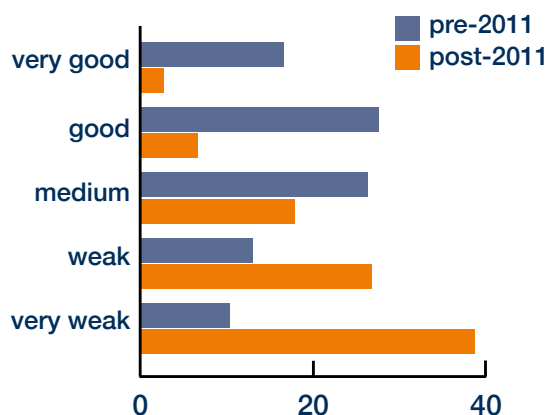


Figure 5. Agricultural exhibitions and symposiums role evaluation pre- and post-2011 from the point of view of farmers and livestock breeders.

There is a lack of agricultural extension and a lack of institutional work. Some local organisations provide workshops and training courses, but these are available only to their members. There is also a lack of specialized extension centres. (FGD1-farmers)

On the other hand, weak local governance structures and extension services, especially in opposition-controlled areas, were considered as the main challenges impacting food production. UKaid (2018) highlighted that at national level, statistics and updated data are often lacking. FGD3-extension staff reported that:

Currently, there is no accurate resource for agricultural data for both plant and livestock production.

Stories of successful agricultural knowledge exchange

Agricultural knowledge exchange between host communities and IDPs in some cases introduced new production practices. In spite of the negative effect of farmer displacement, there were encouraging stories of knowledge exchange for successful food production. FGD2-extension staff highlighted some of these practices such as ‘introducing new crops to host areas, introducing new agricultural methods like plastic tunnels and using seedlings production in trays for early production’ and ‘introducing Najdi sheep by displaced farmers into the host community in Azaz-Jرابلس (FGD1-farmers). It was also reported that IDPs introduced medicinal and aromatic plants for cultivation in the host areas (e.g. thyme and safflower plants)’. There were also benefits to displaced farmers from the host community. As FGD2-extension staff noted:

Internally displaced farmers from Dair-Azzour have learned the production of pistachio seedlings from host farmers in Jarablus.

Internally displaced farmers learned from host farmers new methods/practices to cultivate cumin plants e.g. use 40 kg instead 20 kg cumin seeds per hectare, and tillage the soil two times instead of one time to improve seed germination and growing and of course, the yield at harvest time.

Although vegetable cultivation is common agricultural knowledge among Syrian farmers in all regions, the internally displaced farmers brought with them additional cultivation practices to improve the production per unit area.

We learned from the displaced framers how to cultivate some vegetables such as cauliflower and cabbage that were not well known to us, and how to use soluble fertilisers (FGD3-farmers).

However, despite positive examples coming out of the movement of people to different parts of the country, the FGD3-extension-staff also pointed out some negative effects of displacement on agriculture, for example:

Introducing... fruit tree species which are not suitable for host areas such as, almonds, cherry and apricot to host farmers in Maret-alnumaan. [Also] introducing some dwarf species of olive trees imported from Spain, which led to the spread of new pests in the host regions.

FGD3-farmers highlighted that:

Displaced farmers contributed to excluding cultivation of some crops that were previously cultivated in host areas, and replacing them with new crops, especially medicine and ornamental plants.



Figure 6. Agricultural knowledge exchange between host and internally displaced farmers

Conclusion

The protracted war in Syria is a humanitarian disaster for all Syrians, not least in its impact on agriculture and food security. This study concluded that alternative systems of knowledge transfer should be developed that make best use of the resources HE has to offer using new curriculum approaches that reflect the rapid development of agricultural research. This will help build the capacity of farmers in conflict areas and could be done through distance learning, social media, student field days, orientation seminars and graduation projects.

Research is needed into the rehabilitation of the agricultural sector focusing on the long-term transition from humanitarian interventions to development initiatives. Capacity building programmes to develop the efficiency of agricultural engineers and veterinary practitioners should aim at enhancing existing skills and providing additional up-to-date scientific expertise. The agricultural knowledge infrastructure of HE also needs to be improved through the introduction of new teaching methods and modern theoretical and practical approaches to improve the quality of curriculum and scientific research. Building a network that connects Syrian academics and researchers with international universities and research institutions will bring together local knowledge with international expertise to support research that meets the needs of the current Syrian context.

Author Bios

Shaher Abdullateef has a PhD from Humboldt University and is a researcher at the Academic Centre for Development and Peace studies (ACDP), with experience in food security, biotechnology and hydroponics.

Esraa Almashhour has a PhD from St Petersburg University of Agricultural Sciences and has experience in soil chemistry and analysis, and food security.

Abdulmonem Alabboud has a PhD from Ain Shams University and specialises in wheat plant breeding, agricultural development, and food security.

Majdi Alhusni has a PhD in Agricultural Economics and Management from China Agricultural University and specialises in agricultural projects appraisal.

Basem Mohamed Saleh has a PhD from University of Aleppo and specialises in potato cultivation, food security and agriculture and livelihoods.

Abdulrahman Albayoush has an MSc in food science from University of Aleppo and specialises in food security and livelihood issues.

Muhammed Assaf is a PhD candidate at Kahramanmaraş Sütçü İmam University with experience in medicinal plants physiology, food security and bioengineering.

Andrew Adam-Bradford has a PhD from the University of Coventry and specialises in urban agriculture and food security in Northern Iraq and the Middle East.

References

- Abdullateef, S. and Parkinson, T. (2017) *Securing Syria's academic knowledge and industrial future through participatory action research: A case study of agricultural engineering education*, Society for Research in Higher Education Annual Conference, December 2017, Newport, Wales, UK.
- Abdo, H. G. (2018) Impacts of war in Syria on vegetation dynamics and erosion risks in Safita area, Tartous, Syria, *Regional Environmental Change*, 18 (6), 1707–1719. doi:10.1007/s10113-018-1280-3. ISSN 1436-3798.
- Al Shimale, Z. (2016) *How food became a weapon in the siege of Aleppo*. Accessed on [2020] at: <https://www.middleeasteye.net/features/how-food-became-weapon-siege-aleppo>
- Boden, L., Abdullateef, S., Aldakhil, M., Alkaddour, A., Alkhalil, A., Alsbahi, S.A., Atik, O., Calia, C., Lannizzotto, M., Keulertz, M., Kizildeniz, T., Kleinermann, C., Parkinson, T., Reid, C., Robertson, K., Simm, G., Suiimi, M., Taha, A., Melis, A.V., Yao, A. (2019) *Syrian academics and their role in the future of food security for Syria, Global Health and Food Security in Fragile and Conflict Affected States (FCAS)*. Global Academy of Agriculture and Food Security, University of Edinburgh, CARA. Accessed on 20 July 2020 at: https://www.ed.ac.uk/files/atoms/files/ghafs_fullreport_eng_jan20.pdf
- Cara (2019) *Syrian higher education post 2011: Immediate and future challenges*. Accessed on 20 July 2020 at: <https://www.cara.ngo/wp-content/uploads/2019/06/190606-REPORT-2-POST-2011-FINAL-ENGLISH.pdf>
- FAO (2002) *The state of food insecurity in the world 2001*, Rome: Food and Agriculture Organization.
- FAO and WFP (2010) *Crop and food security assessment mission to Ethiopia. Special report*, Rome: FAO and WFP. Accessed on 12 July 2020 at: <http://www.fao.org/docrep/012/ak346e/ak346e00.pdf>
- FAO (2016) *Migration and protracted crises: Addressing the root causes and building resilient agricultural livelihoods*, Rome: FAO. Accessed on 10 July 2020 at: <http://www.fao.org/fsnforum/resources/fsn-resources/migration-and-protracted-crises-addressing-root-causes-and-building>
- FAO (2017) *Counting the cost: Agriculture in Syria after six years of crisis*, Rome: FAO. Accessed on 10 June 2020 at: <http://www.fao.org/emergencies/resources/documents/resources-detail/en/c/878213/>
- FAO (2018) The Syrian Arab Republic: Humanitarian response plan 2018, Accessed 12 June 2020 at: <http://www.fao.org/emergencies/llamamientos/llamamiento-detalle/es/c/1099774/>
- FAO (2019) *Survey of Syrian farmers reveals agriculture should be kick-started now despite huge destruction*. Accessed on 10 June 2020 at: <http://www.fao.org/news/story/en/item/878210/icode/>
- Haddad, N., Duwayri, M., Oweis, T., Bishaw, Z., Rischkowsky, B., Aden Aw Hassan, A. A. and Grando, S. (2011) The potential of small-scale rainfed agriculture to strengthen food security in Arab countries, *Food Security*, 3(1), 163-173. <https://doi.org/10.1007/s12571-010-0099-7>
- Human Appeal (2018) *Hunger as a weapon of war: How food insecurity has been exacerbated in Syria and Yemen*, Cheadle: Human Appeal, Accessed on 20 July 2020 at: <https://reliefweb.int/sites/reliefweb.int/files/resources/advocacy-report-v013-final.pdf>
- Kelley, C.P., Mohtadi, S., Cane, M. A., Seager, R. and Kushnir, Y. (2015) Climate change in the Fertile Crescent and implications of the recent Syrian drought, *PNAS*, 112(11), 3241–3246, Accessed on 20 July 2020 at: <http://www.pnas.org/content/112/11/3241.full.pdf>
- Lagi, M., Bertrand, K.Z., and Bar-Yam, Y. (2011) The food crises and political instability in North Africa and the Middle East, pp.1–15. <http://dx.doi.org/10.2139/ssrn.1910031>
- Millican, J., Abdulhafiz, A.H., Abdullateef, S., Abedtalas, M., Al Abdullah, S., Al Ibrahim, Z., Al Ibrahim, A.A., Al Oklah, W., Barmu, T., Kadan, B., Mamo, A.R. and Shaban, F. (2019) *Syrian Higher Education post 2011: Immediate and future challenges, policy brief*, pp 1–5, London: Cara. Accessed on 10 June 2020 at: <https://www.educ.cam.ac.uk/networks/eripublications/syria/190606-POLICY-BRIEF-ENGLISH.pdf>
- Milton, S. (2019) Syrian higher education during conflict: Survival, protection, and regime security, *International Journal of Educational Development*, 64, 38–47. <https://doi.org/10.1016/j.ijedudev.2018.11.003>
- OCHA (2017) Humanitarian response Plan 2017: Syrian Arab Republic, Strategic Steering Group: OCHA Syria, Accessed on 20 July 2020 at: <https://www.humanitarianresponse.info/operations/whole-of-syria>
- OCHA (2018) Humanitarian response Plan 2018: Syrian Arab Republic, Strategic Steering Group: OCHA Syria. Accessed on 20 July 2020 at: <https://www.humanitarianresponse.info/operations/whole-of-syria>
- Schmidhuber, J. and Tubiello, F.N. (2007) Global food security under climate change, *PANS*, 104(50), 9703–9708.
- Shideed, K. (2008) The food crisis and its socioeconomic impact: towards reducing the food gap in the Arab countries, *Arab Agriculture Investment Journal*, 6, 31–35.
- The World Bank (2019) Agriculture, forestry, and fishing, value added (% of GDP). Accessed on 20 July 2020 at: <https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?locations=SY>
- UKAid (2018) *Understanding market drivers in Syria*, London: The Syria Independent Monitoring (SIM) team. Accessed on 20 July 2020 at: https://assets.publishing.service.gov.uk/media/5a65ef1fe5274a0a37ef2f15/Research_Report_-_Understanding_Market_Drivers_in_Syria_January_2018.pdf
- Watenpaugh, K. D., Fricke, A. L., & King, J. R. (2014). We will stop here and go no further: Syrian University students and scholars in Turkey. University of California, Davis, New York: Institute of International Education. Accessed on 20 July 2020 at: <https://www.iie.org/Research-and-Insights/Publications/We-Will-Stop-Here-And-Go-No-Further-Syrian-University-Students-And-Scholars-In-Turkey>
- Zareceansky, P. (2016) *Hunger as weapon of war* (El hambre como arma de guerra). Accessed on 20 July 2020 at: <http://www.projectefam.cc/blog/15/hunger-as-weapon-of-war>
- Zurayk, R. (2013) Civil war and the devastation of Syria's food system, *Journal of Agriculture, Food Systems, and Community Development*, 3(2), 7–9. <http://dx.doi.org/10.5304/jafscd.2013.032.009>