Monitoring and Impact Analysis of the BMZ and EU-funded FAO Resilience Programme in Syria

Final Report

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June 26, 2018

Executive summary

The objective of this report is to present insights of a statistical analysis of recent survey data from Syria to support FAO Syria in building knowledge, learning and capacity. Our analyses reveal a set of very clear results, which have important policy implications.

Our empirical analysis confirms that food security in Syria has been strongly affected by the crisis and climatic conditions. Our key findings are:

- Food security deteriorated dramatically during, and due to, the crisis.
- Our statistical analysis of the empirical data from the Agricultural Damage and Needs Assessment (ADNA) and the Crop and Food Security Assessment Mission (CFSAM) background studies documents very critical food security outcomes in 2016, across all four pillars of food security and across the whole country.
- A comparison with data from 2010 demonstrates and quantifies the dramatic degradation in food security since the start of the crisis.
- In addition, many regions have been affected by weather shocks such as droughts in recent years.

Our analysis emphasises that droughts impair food security in two ways:

- First, droughts have the expected direct, negative effects on food security.
- Second, droughts also exacerbate the adverse impacts of the crisis, pushing many household into extreme emergency.

Concerning the impact of the FAO programme, we document four main findings:

- First, the programme successfully supported local production chains, filling in the gap created by conflict-induced institutional weakness.
- Second, our statistical analysis reveals that that the provision of seeds delivered substantial and critically important impacts on yields, food security and resilience measures.
- Third, we find that vulnerable households, such as female-headed households, benefited tremendously from the programme.

- Fourth, as the trainings targeted the most vulnerable, it remains to be seen how much the provision of trainings strengthens these positive impacts for the average household. This will require more detailed information and longer-term analysis of the specific trainings offered.

The results form Work Packages 1 and 2 have several implications for programme targeting, impacts and modalities as follows:

Programme targeting. Our results document strong interrelations between insecurity and both conflict intensity and climatic adversity. Hence future food security and resilience programmes should prioritise regions and households affected by these stresses. Moreover, we find strong benefits for female-headed households, which suggests continued further targeting of these households.

Programme impacts. Our results also demonstrate that the FAO programme created strong impacts on yields, many dimensions of food security as well as on the (reduced) use of harmful livelihood coping strategies, which is related to resilience. We therefore recommend similar approaches in future food security and resilience interventions.

Programme modalities. Even in the absence of additional training, the provision of seeds achieved strong impacts on yields, food security and resilience. The existing database is insufficient to analyse the full impact of the different trainings in detail. We thus recommend building programmes around the provision of seeds and further test how trainings can best accompany this component.

Contents

1 Introduction

The Syrian conflict has adversely affected the lives of millions of people across the country. Assisting the conflict-affected populations and effectively supporting their livelihoods requires knowledge on a) how households respond to violence exposure, climatic conditions and policy interventions, and b) how institutional factors – such as regional governance and agricultural markets – shape these responses. However, the general understanding of these issues, and hence the capacity of policy-makers and practitioners to intervene effectively, is severely limited due to numerous challenges, including challenges to implementing programmes and to collecting reliable data in conflict-affected areas.

FAO has been implementing a resilience-building programme under two projects: "Support to improve food security, protect agricultural livelihoods and build resilience of crisis affected people and host communities in Syria" (funded by BMZ) and "Strengthening the resilience to food insecurity of crisis-affected households and communities" (funded by the EU). The programme focuses on the provision of improved wheat and vegetable seeds, as well as training in sustainable agronomic practices, which the farmers previously could not easily access due to the disruption in household incomes, seed systems and extension services.

The FAO programme in Syria is particularly suited to study the impacts of conflict and climatic stress on food security and how policy interventions can mitigate these impacts for four reasons. First, Syria is characterised by high levels of conflict stress and food insecurity, which both vary over time and space. Second, and at the same time, climatic stressors are present, which also vary over time and space. Third, FAO conducted extensive background surveys before the programme, which provide rare high-quality, survey-based information on food security, resilience, (self-reported) weather shocks and (self-reported) conflict stress. Fourth, FAO will conduct extensive background surveys after the implementation of the programme, providing endline information.

In this report we present and discuss the results of two specific work packages. Work Package 1 explores the micro-level mechanisms linking food insecurity and resilience with violent conflict and climate shocks in the context of Syria. We address the following specific questions:

- What are the impacts of conflict and climatic stress on food security?
- How do impacts of conflict and climatic stress differ from each other - and how may they combine or interact?

Work Package 2 assesses the causal, short-term impacts of the FAO programme in Syria. We address the following specific questions:

- What is the short-term impact of the programme?
- What is the short-term impact of the provision of seeds without additional training?
- What is the short-term impact of the provision of seeds plus additional training?

The report is structured as follows. Section 2 introduces the data and methods used. Section 3 discusses the status quo of food security, conflict and climate stress in rural Syria, before the intervention (Work Package 1). Section 4 presents our results on the linkages of food insecurity with conflict and climate stress in rural Syria (Work Package 1). Section 5 provides our analysis of the short-term impacts of the FAO programme rural Syria (Work Package 2). Section 5 considers how the FAO programme altered local institutions of Syrian agriculture 'from the bottom' (Work Package 2). Section 6 offers concluding remarks and recommendation on targeting, treatment arms and overall capacity in future interventions in Syria.

2 Data and methods

We use multiple data sources to study how food security behaviour and outcomes in rural Syria are shaped by local conflict dynamics and climatic conditions. We use FAO's CFSAM and ADNA datasets and match them spatially with available secondary data on conflict events and droughts at the subdistrict level. Below, we describe the data sources in detail and their suitability and limitations for the analysis.

2.1 Household survey data

The extensive background study of the FAO programme produced two survey datasets based on household interviews: the Crop and Food Security Assessment Mission (CFSAM) dataset and the Agricultural Damage and Needs Assessment (ADNA) dataset. The CFSAM and ADNA datasets provide detailed information on crop production and yields, food security, exposure to weather shocks, constraints due the conflict and socio-economic status. Moreover, the ADNA survey include retrospective questions on a large set of household outcome variables "before the crisis",

that is for 2010. This allows various comparisons between behaviours and outcomes in 2016 and those in 2010 for the same households, assuming responses reflect actual values for 2010.

2.2 Conflict event data

In the case of Syria, a dataset of conflict events with satisfactory completeness and sufficient spatial resolution (i.e., georeferenced events based on spatial coordinates) is not publicly available. Most available datasets are either used for monitoring purposes based on various media and non-media report or accumulated using automated text searches of online news reports. None of the publicly available datasets on conflict incidence provide consistent temporal and spatial coverage. Therefore, matching conflict events with the FAO survey data at the administrative levels below the Governorate is not plausible. We overcome this lack of spatially disaggregated conflict event data by using a pilot dataset on conflict incidence that produces detailed and georeferenced information via the novel "crowdseeding" technique.[1] Crowdseeded information is collected in collaboration with and reported by individuals residing in selected areas of Syria. The advantage of this pilot dataset is that it provides the location of the conflict events which can be aggregated at the subdistrict level. It covers January to September 2016, which covers a suitable period of time before the survey data was collected by FAO. A limitation of this dataset is that detailed information is only available for a handful of subdistrict, as the scope of the reporting coverage was small.

2.3 Weather data

For external information on drought incidence, we use the Standardised Precipitation-Evapotranspiration Index (SPEI) from May 2015, which is the most recent, publicly available month for which data is available. The SPEI has a spatial resolution of 0.5 degrees latitude/longitude, which covers an area larger than many subdistricts in Syria. For subdistricts where grid cells overlap, we calculated the simple average of the values of the grids that intersect in the subdistrict. The SPEI index takes usually a value between -2 and 2, where -2 signifies extreme drought and 2 signifies extreme precipitation. As a caveat, this indicator may not reflect trends in drought that match with the time period of the FAO assessment survey and the FAO programmes, given the limited recent time coverage of the index.

[1] See Baliki, G. (2017): "Empirical Advances in the Measurement and Analysis of Violent Conflict", Humboldt-Universität zu Berlin.

3 The status quo of current conflict and climatic stressors and household welfare and coping strategies in rural Syria (Work Package 1)

In this section, we provide examples of the variability of food insecurity across regions and time in Syria.

3.1 Food insecurity

Figure 1 plots the average CFSAM Food Consumption Score (FCS) at the subdistrict level, classified into three categories: poor, borderline and acceptable food consumption levels. The FCS is calculated based on the past 7-day food consumption recall for each household and classified into three categories: poor consumption (FCS from 1 to 28); borderline (FCS from 29 to 42); and acceptable consumption (FCS above 42). The score for each food group is calculated by multiplying the number of days for each commodity with its relative weight. Hence, a higher index score implies less food insecurity. As Figure 1 indicates that many subdistricts in 2016 were classified as poor or borderline, and that these are scattered across various parts of the country.

Figure 2 plots the average CFSAM Reduced Coping Strategy Index (RCSI) at the subdistrict level, classified into three categories: low, medium and high. The RCSI is used as a proxy indicator of household food security, which is based on a short list of 5 food-related coping strategies applied during the past 7 days. Each category is multiplied by a weight depending on its severity. Hence, a higher index indicates a higher degree of negative food-related adaptation and thus indicates food insecurity. The map in Figure 2 confirms that many subdistricts in 2016 are highly food insecure (classified as "high" RCSI values) and that these are located across Syria.

To illustrate the variability over time, we rely on the ADNA survey data, which also provides retrospective information on selected food security measures in 2010 (in addition to levels in 2016). Figure 3 indicates the share of households in a subdistrict that report that they spent more than 75% of their household income on food purchases in 2010. It is apparent that in the vast majority of subdistricts less than 25% of interviewed households spent more than 75% of their household income on food purchases. Figure 4 shows that the pattern has drastically transformed in 2016, where in the vast majority of subdistricts more than 75% of interviewed households report

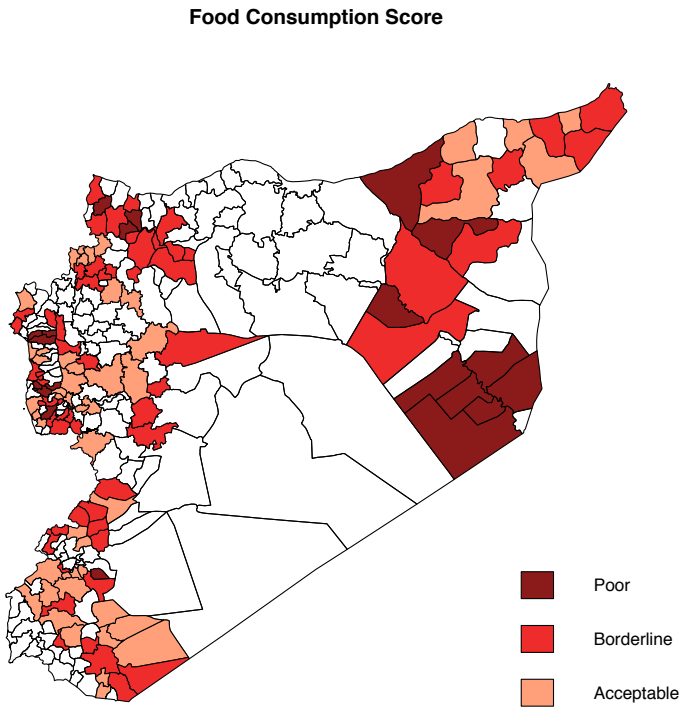


Figure 1: Food consumption score in Syria

that they spend more than 75% of their household income on food items.

3.2 Drought

Figure 5 displays objective drought levels from SPEI at the subdistrict level. The map demonstrates many subdistricts across the country were affected by serious drought in May 2015 (the most recent month available).

3.3 Conflict

Figure 6 plots the number of recent conflict events at the subdistrict level, based on the crowdseeded dataset. While the spatial coverage of this dataset is limited as discussed above, the map shows that many subdistricts were severely affected by conflict between January and

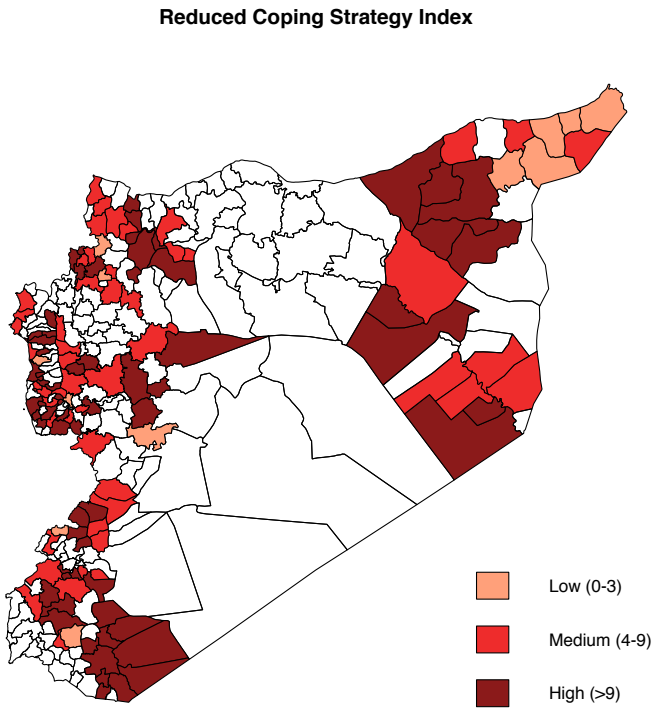


Figure 2: Average number of food-related adaptations across sub-districts in 2016. White = no data.

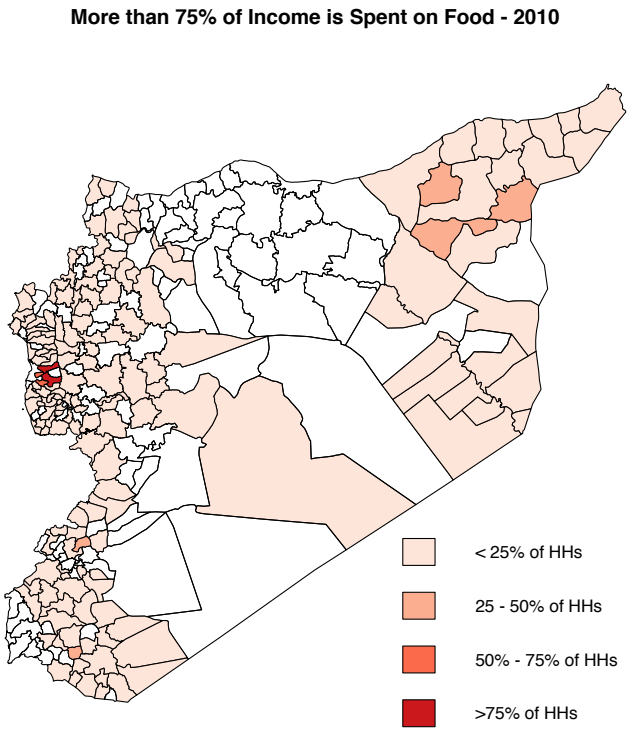
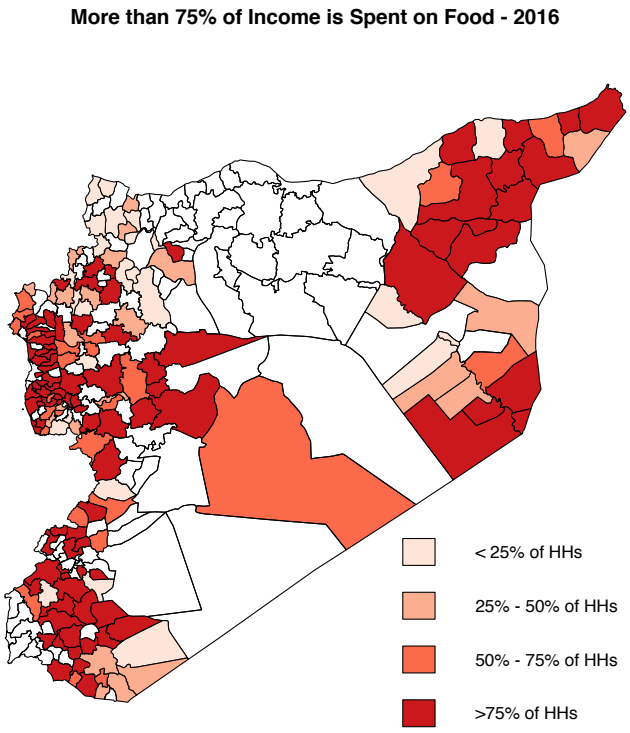


Figure 3: Share of households in a sub-district spending most income on food purchases in 2010. White = no data.



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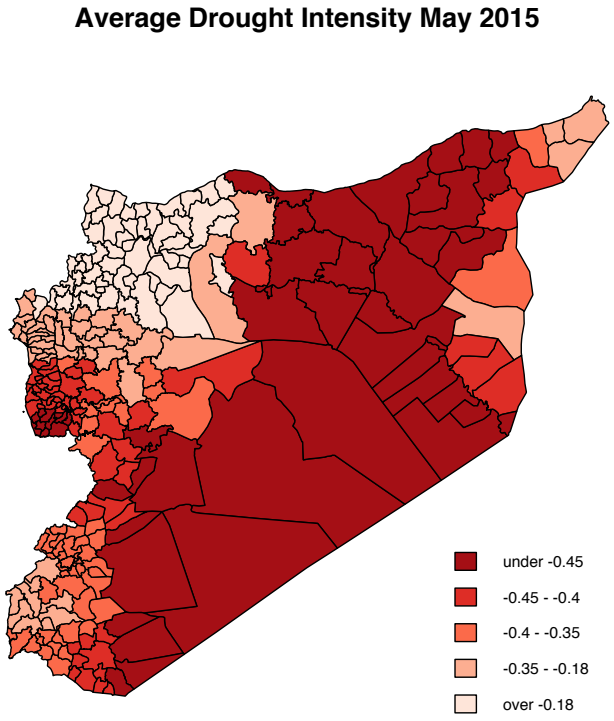

Figure 5: Average level of objective drought intensity in May 2015 across sub-districts. White = no data.

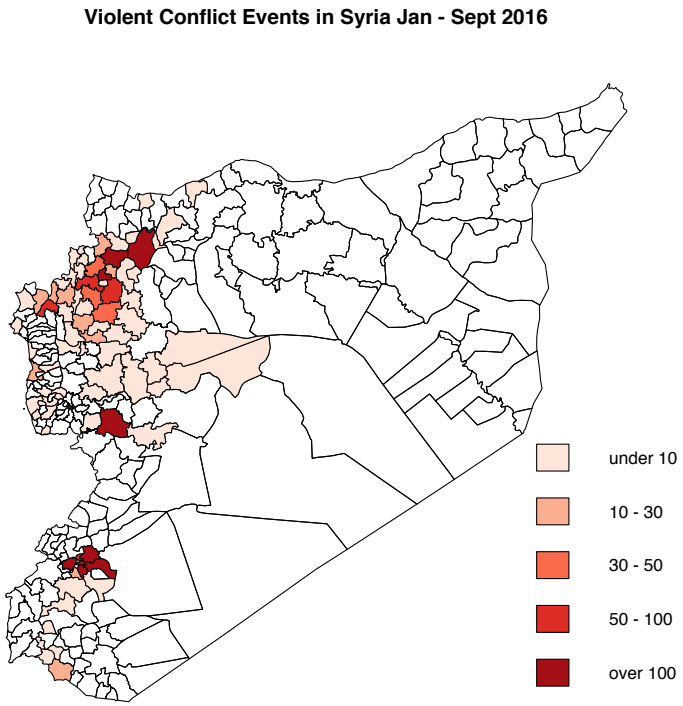

Figure 6: Number of violent events in 2016 across sub-districts (from external conflict event data). White = no data.

September 2016. As with drought exposure, there are highly affected areas spread across the regions covered by this dataset.

4 The micro-relationships of food security with conflict and climate stressors in rural Syria (Work Package 1)

In this section, we explore how the crisis and adverse climatic conditions affect behaviours and outcomes related to food security in Syria. More specifically, we analyse the effect of variation in exposure to drought and conflict intensity as covariate shocks/stressors at the local level. Within a certain location, there are, of course, differences between individual households that are exposed to "the same shock" in many important socio-economic or demographic characteristics such as in assets or household size. These differences may naturally also influence how strongly a household

is actually exposed to or affected by the shock. We focus on average effects, i.e. we study how much an average household is affected by exposure to conflict and climatic stress. This is standard practice in the social sciences and often considered the most important information for policy-making, informing how the average household may be assisted best.[2]

First, we conduct a household-level analysis and use the ADNA dataset to compare the effect of the crisis on a number of agricultural household characteristics and food security outcomes. We also analyse differences between households who did and did not experience drought. Second, we aggregate the data from all sources to conduct a subdistrict-level analysis, assessing the impacts of conflict exposure and of drought as well as their combined impacts on food security.

Overall, our analyses demonstrate strongly adverse effects of the crisis on food security. Similarly, droughts impair food security directly and exacerbate the negative impacts of the crisis.

4.1 Household-level analysis

The impacts of the crisis. Table 1 presents comparisons of mean socio-economic outcomes and behaviours between 2010 and 2016. The results in Panel A suggest that the crises induced significant changes in household composition. Most differences in demographic indicators are relatively small in magnitude, but statistically significant. For instance, more households are headed by females in 2016 and household are slightly larger. The likelihood that a household is headed by a widow more than doubled. Panel B shows that livestock holdings consistently dropped for all categories. The number of animals held dropped by about 50% for most categories, relative to 2010. Panel C reveals similar reductions in agricultural asset holdings, ranging from a 9% decrease for tools to a 28% decline in greenhouses. Looking at food-related behaviours, Panels D and E provide strong evidence for systematic shifts in behaviour. For example, only 4% of surveyed households report that they spent three-quarters (or more) of the total income on food purchases in 2010. In 2016, 65% of respondent households spend this much on food purchases (Panel D). Similarly, 14 out of every 100 households sold all their produce on the market, which increased by 77% in 2016 (Panel E). An apparent result of the crisis is therefore that "extreme" behaviours became much more common.

Table 2 compares agricultural productivity and constraints between 2010 and 2016. First,

[2] A sub-group analysis could in principle be done, but would require to specify the particular sub-groups that are of most interest and related data. While beyond the scope of this project, it could be considered for future work.

Table 1: Mean differences in socio-economic status and behaviour, 2016 vs. 2010

	Mean (s.e.)		Difference in means (2016 vs. 2010)			
	2010	2016	Δ	s.e.	%Δ	Sign.
A. Demographics						
Head is male (1= yes, 0 = no)	0.96 (0.20)	0.92 (0.28)	-0.04	0.34	-4%	***
Head married (1= yes, 0 = no)	0.94 (0.24)	0.91 (0.29)	-0.03	0.37	-3%	***
Head a widow (1= yes, 0 = no)	0.03 (0.18)	0.07 (0.26)	0.04	0.31	108%	***
Size (#)	6.63 (3.16)	6.88 (3.38)	0.25	4.63	4%	***
Members with income (#)	1.32 (0.74)	1.38 (0.82)	0.06	1.11	4%	***
B. Livestock (#)						
Cows	1.60 (4.69)	0.73 (2.54)	-0.87	5.33	-54%	***
Horses	0.16 (0.76)	0.10 (0.48)	-0.06	0.90	-37%	***
Sheep	17.48 (44.48)	8.26 (26.61)	-9.23	51.83	-53%	***
Goats	2.79 (9.16)	1.33 (4.86)	-1.46	10.37	-52%	***
Poultry	56.19 (536.36)	26.42 (360.70)	-29.76	646.37	-53%	**
Camels	0.03 (0.65)	0.01 (0.34)	-0.02	0.73	-64%	
Beehives	1.16 (7.29)	0.54 (5.10)	-0.62	8.90	-54%	***
Other Animals	0.28 (2.93)	0.15 (1.81)	-0.13	3.44	-47%	**
C. Agricultural assets (1 = yes, 0 = no)						
Tools	0.94 (0.24)	0.85 (0.35)	-0.08	0.43	-9%	***
Tractors	0.88 (0.33)	0.78 (0.41)	-0.1	0.53	-11%	***
Storage facilities	0.39 (0.49)	0.31 (0.46)	-0.09	0.67	-22%	***
Water pumps	0.52 (0.50)	0.40 (0.49)	-0.12	0.70	-23%	***
Water tanks	0.51 (0.50)	0.43 (0.50)	-0.08	0.70	-17%	***
Greenhouses	0.04 (0.19)	0.03 (0.16)	-0.01	0.25	-28%	**
Animal shelters	0.51 (0.50)	0.43 (0.50)	-0.07	0.70	-15%	***
Other machineries	0.60 (0.49)	0.49 (0.50)	-0.11	0.70	-19%	***
D. Share of total income spent on food purchases (five categories)						
0%	0.02 (0.13)	0.01 (0.09)	-0.01	0.16	-55%	***
1-25%	0.20 (0.40)	0.02 (0.12)	-0.18	0.42	-46%	***
26-50%	0.48 (0.50)	0.06 (0.24)	-0.42	0.55	-84%	***
51-75%	0.26 (0.44)	0.27 (0.44)	0	0.63	1%	
76-100%	0.04 (0.20)	0.65 (0.48)	0.61	0.52	1473%	***
E. Share of own output consumed by household (five categories)						
0%	0.14 (0.35)	0.25 (0.43)	0.11	0.55	77%	***
1-25%	0.40 (0.49)	0.38 (0.49)	-0.02	0.69	-5%	
26-50%	0.30 (0.46)	0.16 (0.36)	-0.14	0.58	-47%	***
51-75%	0.12 (0.32)	0.09 (0.29)	-0.02	0.43	-19%	***
75-100%	0.05 (0.22)	0.12 (0.33)	0.07	0.39	1458%	***

Note: Levels of statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

we find that access to all types of loans became much less common, including from relatives or from banking institutions (Panel A). Second, access to land decreased in a comparable way. For instance, the size of irrigated land households can access declined by 54% from 2010 till 2016 (Panel B). Third, we analyze yields (how much output can be generated from a given land size), which are partly a function of technology. With the exception of peas, yields for all crops and vegetables dropped significantly from 2010 levels, with the changes ranging in magnitude from -14% (maize) to -34% (chickpeas) in that period. Fourth, as suggested by the previous results, actual production (measured in kg) is significantly lower in 2016 for all crops. The gap is largest for irrigated wheat at -71%. Fifth, we compute the total dietary energy households produced from all crops and vegetables combined. The mean dietary energy produced fell by 2016 by 60% from the 2010 level. Divided by a household's total dietary energy needs, the data reveal that in 2010 the mean household produced about 7 times the (minimum) amount needed, while by 2016 the mean ratio dropped below 3.

Table 3 highlights that about 32% of respondent households had produced agricultural output in 2010, but none in 2016. Among these households, 26% report land damages as a main reason, 7% land confiscations and 59% general insecurity.

Taken together, these results suggest that during the crisis food security was very negatively affected across multiple dimensions. Some of these effects are clearly the result of conflict stress, such as severe losses in capital and assets and highly reduced access to loans and infrastructure.

The impacts of adverse climatic conditions. Table 4 explores the role of weather shocks by dividing the surveyed sample based on a household's self-reported experience of at least one drought in 2016.

Panel A shows, perhaps surprisingly, that households who report a drought hold significantly more land on average. Interestingly, this masks an asymmetry between irrigated and rain-fed land. The "drought group" holds significantly less irrigated land than the "no drought group" (-15%). However, for the outcome concerning total land holdings, this effect is offset by rain-fed land, where the drought group holds significantly more (+25%).

Panel B reveals another interesting result: households who report a drought produce on average more or less similar amounts of crops and vegetables compared to non-drought reporting households. Yet they actually produce more barley (10%) and chickpeas (20%), relative to others.

Table 2: Mean differences in agricultural productivity and constraints, 2016 vs. 2010

	Mean (s.e.)		Difference in means (2016 vs. 2010)			
	2010	2016	Δ	s.e.	%Δ	Sign.
A. Access to credit and loans (1= yes, 0 = no)						
Relatives	0.15 (0.36)	0.08 (0.27)	-0.08	0.45	-49%	***
Friends	0.11 (0.32)	0.06 (0.23)	-0.06	0.39	-50%	***
Informal Lenders	0.01 (0.12)	0.01 (0.10)	0	0.16	-31%	
Banks	0.04 (0.20)	0.00 (0.07)	-0.04	0.21	-89%	***
Government	0.42 (0.49)	0.12 (0.32)	-0.3	0.59	-72%	***
Shopkeeper	0.06 (0.23)	0.03 (0.17)	-0.03	0.29	-49%	***
B. Access to land (ha)						
Total	5.67 (9.96)	3.86 (7.09)	-1.8	12.23	-32%	***
Irrigated	2.08 (5.17)	0.97 (3.01)	-1.11	5.98	-54%	***
Rainfed	3.60 (7.77)	2.92 (6.31)	-0.69	10.01	-12%	***
C. Yield (kg/ha)						
Irrigated wheat	3486.22 (1292.70)	2676.99 (1164.05)	-809.23	1739.57	-23%	***
Rainfed wheat	1643.73 (1088.09)	1132.70 (895.03)	-511.03	1408.91	-31%	***
Barley	1296.84 (637.35)	926.57 (570.11)	-370.26	855.13	-29%	***
Maize	3336.82 (1444.89)	2872.95 (1560.92)	-463.87	2127.01	-14%	*
Chickpeas	1041.95 (600.24)	690.18 (528.45)	-351.77	799.71	-34%	***
Peas/beans	4978.57 (5110.68)	5444.51 (5385.50)	465.94	7424.46	9%	
Potatoes	20637.80 (9364.78)	17243.89 (8769.44)	-3393.91	12829.74	-16%	***
D. Amount Produced (kg)						
Irrigated wheat	4415.20 (16932.48)	1272.55 (7512.24)	-3142.65	18524.1	-71%	***
Rainfed wheat	1526.89 (5368.92)	840.00 (4262.38)	-686.89	6855.16	-45%	***
Barley	2019.11 (9972.89)	1068.90 (6783.56)	-950.21	12061.31	-47%	***
Maize	93.61 (1055.69)	46.07 (577.11)	-47.54	1203.14	-51%	**
Chickpeas	205.22 (1010.23)	83.98 (596.51)	-121.25	1173.2	-59%	***
Peas/beans	225.34 (2910.41)	92.90 (1512.02)	-132.43	3279.74	-59%	**
Potatoes	1538.78 (11372.08)	830.11 (6529.82)	-708.67	13113.46	-46%	***
E. Dietary energy (DE)						
Own DE supply (10^6 kcal)	31.18 (80.95)	12.42 (43.77)	-18.76	92.02	-60%	***
DE supply/ DE demand	7.15 (24.27)	2.82 (11.50)	-4.33	26.77	-60%	***

Note: Levels of statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Crisis impacts on production

Non-zero production pre-crises and zero production 2016:	31.8%	(N = 988)
Reasons why production ceased (multiple answers)		
Land damaged a main reason:	26.2%	(N = 259)
Land confiscated a main reason:	7.2%	(N = 71)
Insecurity a main reason:	58.7%	(N = 580)

Table 4: Mean differences in agricultural productivity, by self-reported drought exposure in 2016

	Mean (s.e.)		Difference in means (2016 vs. 2010)			
	No drought	Drought	Δ	s.e.	%Δ	Sign.
A. Access to land (ha)						
Total	3.57 (6.90)	4.51 (7.44)	9.66	10.1	14%	***
Irrigated	1.13 (3.36)	0.64 (2.12)	-0.50	3.97	-15%	***
Rainfed	2.44 (5.82)	3.87 (7.09)	1.43	9.18	25%	***
B. Amount produced (kg)						
Irrigated wheat	1318.39 (5958.59)	1180.64 (9922.45)	-137.75	11574.11	-2%	
Rainfed wheat	782.56 (4534.18)	955.06 (3657.12)	172.5	5825.23	4%	
Barley	889.29 (5255.46)	1429.34 (9099.60)	540.05	10508.21	10%	**
Maize	50.84 (661.35)	36.49 (352.11)	-14.35	749.25	-2%	
Chickpeas	54.39 (443.54)	143.35 (818.72)	88.96	931.15	20%	***
Peas/beans	107.14 (1752.80)	64.36 (842.86)	-42.78	1944.92	-2%	
Potatoes	988.45 (6706.54)	512.83 (6151.37)	-475.61	9100.39	-7%	*
C. Yield (kg/ha)						
Irrigated wheat	2730.49 (1165.17)	2551.67 (1155.00)	-178.82	1640.63	-15%	*
Rainfed wheat	1234.31 (980.15)	1021.50 (777.92)	-212.82	1251.34	-22%	***
Barley	1022.15 (595.35)	813.62 (517.41)	-208.53	788.76	-35%	***
Maize	2854.04 (1607.19)	2911.70 (1501.27)	57.66	2199.28	4%	
Chickpeas	743.18 (530.09)	648.12 (525.53)	-95.05	746.44	-18%	
Peas/beans	5646.52 (5057.21)	5075.60 (6040.75)	-570.92	7878.2	-11%	
Potatoes	17438.91 (8591.67)	16591.77 (9453.38)	-847.14	12774.31	-10%	
D. Dietary energy (DE)						
Own DE supply (10^6 kcal)	11.99 (38.15)	13.30 (53.29)	1.32	65.53	11%	
DE supply/ DE demand	2.69 (1035.90)	3.08 (1349.63)	0.39	17.01	14%	

Note: Levels of statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Panel C reports yields for the different crops and vegetables, which tend to be lower for those who report drought but not significantly different from others for most items (in a statistical sense). We do find, however, that households who report a drought have significantly lower yields for barley (-35%) and rain-fed wheat (-22%). As the production levels are more or less the same for both groups, and for barley higher in the drought group, the lower yields are driven by the larger holdings of rain-fed land for the drought group.

Finally, we find no statistically consistent findings in the differences in dietary energy supply and self-sufficiency between households who report a drought versus those who do not.

4.2 Subdistrict-level analysis

The analyses at the subdistrict level confirms the trends observed at the household level. Aggregating data from CFSAM, ADNA, and the external sources on drought and conflict allows better matching of information. At the same time, however, the number of observations drops significantly. Given the limited coverage of the available conflict event data, a large number of observations (subdistricts) have to be dropped from the analysis, where we do not observe conflict intensity. The data contains 272 observations, which is equal to the number of subdistricts in Syria. However, there are about 190 observations missing in the conflict event data. Moreover, if we match the number of subdistricts between the conflict event dataset and that of ADNA and CFSAM, the number of missing observations rises to 224 and 234, respectively. Therefore, given the current limitation of the data, the findings of the subdistrict analysis using external conflict event data might not be sufficient to provide a complete picture on the interrelations between food insecurity on hand, and conflict and drought on the other hand, for the case of Syria.

In order to overcome this issue of observations, we proxy the subdistrict intensity of conflict by the number of households that reported that at least one household member has been injured due to the crisis. Based on the distribution of the data, if a subdistrict falls into the 3rd quartile, it is coded as "High" conflict intensity. Figure 7 shows the distribution of the conflict exposure at the subdistrict level. The subdistricts that are denoted to be "High" in conflict have at least 15% of respondents reporting direct exposure to violent conflict.

To capture drought, we also project the number of households who reported drought as one of their selected challenges in production last year to the subdistrict level. Figure 8 shows the distribution of the subdistrict divided by "Low", "Medium", and "High". Here, "High" means that

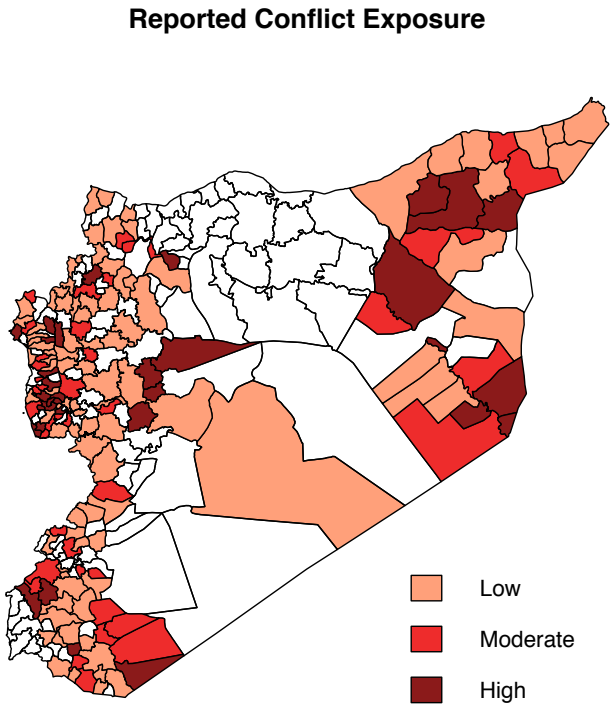

Figure 7: Average level of reported conflict intensity in 2016 across sub-districts (from self-reported survey data on injuries of household members due to conflict violence). White = no data.

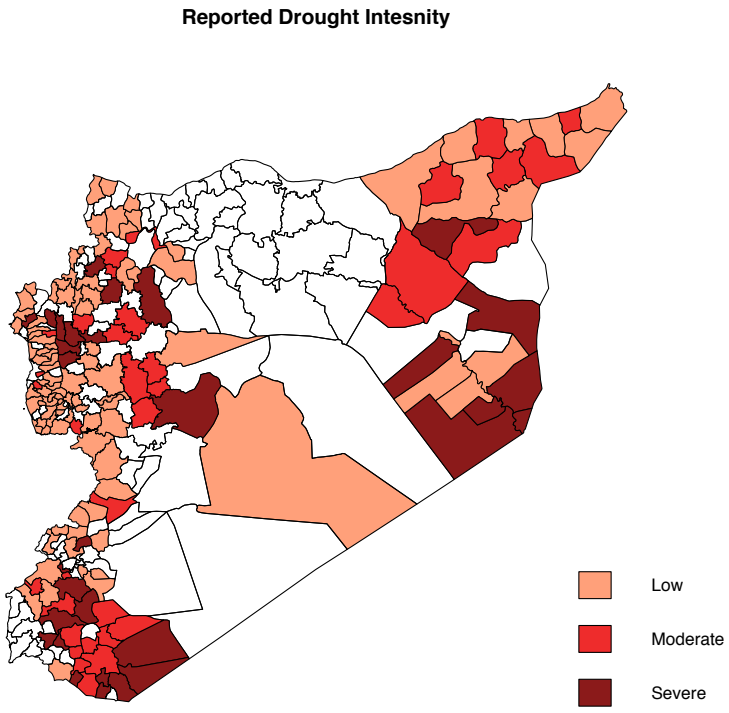

Figure 8: Average level of reported drought intensity in 2016 across sub-districts. White = no data.

at least 67% of households reported drought within a subdistrict. The provided map shows that many subdistricts in 2016 were highly affected by droughts (according to self-reported information), and that these are scattered across the country. Comparing the two maps of drought and conflict exposure, the subdistricts that are most affected are mainly located in the eastern part of Syria (Deir Ez-Zour) and some parts of Idleb.

Based on these two aggregated variables of conflict exposure and drought, we analyse the individual impacts, as well as their combined impact, on the set of food security indicators, namely FCS, RCSI, high share of income spent on food, and percentage of calories covered from own produce. Table 5 reveals a declining trend in all four outcome variables with stressors. The mean Food Consumption Score in subdistricts that were exposed to both high levels of drought and high levels of exposure to conflict is about 33, whereas it is about 42 in subdistricts not (or weakly) affected by drought and conflict. Although both values fall within the borderline category of the FCS, they lie on the extreme ends. In other words, subdistricts who were not exposed to high conflict and drought are 0.5 points away from the "acceptable" category, while subdistricts who

Table 5: Sub-district level analysis 1: combinations of climatic and conflict stress

Drought	no	yes	no	yes	
Conflict	no	no	yes	yes	
N	109	24	26	7	Sign.
Food consumption score (mean (sd))	41.48 (13.14)	42.99 (13.73)	39.94 (10.92)	32.98 (7.92)	
Reduced coping strategy index (mean (sd))	11.68 (7.71)	13.60 (7.82)	11.58 (5.23)	14.93 (8.72)	
Share of income on food (mean (s.e.))	0.62 (0.33)	0.73 (0.28)	0.80 (0.25)	0.92 (0.21)	***
DE supply/DE demand (mean (s.e.))	2.38 (4.95)	1.26 (1.38)	1.51 (2.96)	1.04 (0.66)	

Note: Levels of statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

were exposed to both high conflict and drought are only 2.5 points above the threshold for "poor" categorisation.

These trends also hold true for the Reduced Coping Strategy Index, but the impact is not as strong. The mean score in subdistricts with both severe conflict and drought exposure is about 15, while those not affected by these stressors have a mean score of 11. Also based on the categorisation of the index and as shown previously in the map, most of the subdistricts in Syria are classified as having high RCSI values.

The most striking and strongly significant result is that of food insecurity measured by the percentage of income spent on food. In subdistricts not affected by conflict or drought, households spend 62% of their income on food, on average. This share increase with conflict and climatic stress and is as high as 92% in subdistricts affected by both conflict and drought. A similar picture emerges for self-sufficiency from own crop production, which drops from 238% in the absence of severe stressors down to about 104% when both forms of stress are present.

As a robustness check, we repeat the analysis using the external data on drought and event. As mentioned earlier, the conflict event data are not sufficient to produce consistent results given the low number of subdistricts covered. For the FCS and RCSI measures (which are extracted from CFSAM) meaningful analysis of the data cannot be done, unfortunately. However, matching with the ADNA is slightly more powerful and includes the percentage of income spent on food and calories covered from own produce. The results presented in Table 6 confirm the trends we found based on the self-reported conflict and drought information. As above, with increasing stress the mean spending on food items also rises (from 57% to 93%) and self-sufficiency decrease (from 105% to 49%).

Table 6: Sub-district level analysis 2: combinations of climatic and conflict stress (external data)

Drought	no	yes	no	yes	
Conflict	no	no	yes	yes	
N	109	24	26	7	Sign.
Share of income on food (mean (s.e.))	0.57 (0.35)	0.73 (0.29)	0.68 (0.30)	0.93 (0.10)	
DE supply/DE demand (mean (s.e.))	1.05 (1.75)	2.90 (2.14)	2.14 (2.98)	0.49 (0.43)	*

Note: Levels of statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5 The causal, short-term impacts of the FAO programme in rural Syria (Work Package 2)

5.1 Main results

This section presents the results on the impacts of the EU- and BMZ-funded FAO programme, focusing mainly on three outcomes: yields, food security, and resilience capacity. As the EU- and BMZ-funded projects were similar in many dimensions, we present results mostly for for the overall impact of programme, merging the data from the two projects. In our impact assessment we focus on the provision of staple crop and vegetables seeds as well as on the provision of trainings.[3] First, we conduct the analysis for all beneficiaries households jointly, regardless if the provision of seeds was accompanied by an additional training or not ("overall programme impacts"). Second, we separately evaluate the impacts of the programme when households a) received seeds without additional training and b) received seeds and additional training.

Overall programme impacts. Table 7 displays our results on the overall programme impacts. We find that the programme had positive and statistically significant effects on staple crop and vegetable yields. The size of these effects were largest for vegetables, barley and pulses, and also positive but more modest for wheat. The results displayed in the bottom half of Table 7 suggest that these impacts were accompanied by strong and positive benefits in food security and resilience. Nine out of eleven indicators of resilience capacity improved significantly, as proxied by the use of harmful livelihood strategies such as selling household assets, forcing children to marry and selling food aid. Similarly, three out of four measures of food security were strengthened: FCS, HDDS and RCSI.

[3]The EU project contained additional components. Unfortunately, we cannot analyse the impact of these components in this report, as this would require additional data.

Table 7: Mean differences between treatment and control households

	Control	Treatment	Δ (T - C)	%Δ	Significance
A. Socio-economic characteristics					
Female-headed	0.14	0.29	0.15		***
Age	48.84	49.77	0.93		
HH size	5.29	5.09	-0.2		
Land size	2.53	2.86	0.33		*
B. **Yield (kg/ha)**					
Wheat	1,870	1,950	80	4.3	
Vegetables	24,772	28,344	3,573	14.4	**
Barley	1,068	1,191	123	11.5	**
Pulses	2,664	4,721	2,057	77.2	***
Potatoes	19,408	19,982	575	3	
C. **Food security**					
FCS	64.58	71.59	7.01	10.9	***
HDDS	8.48	8.77	0.29	3.5	***
RCSI	43.61	33.35	-10.25	-23.5	***
Kcal Covered	3.16	3.49	0.33	10.5	
D. **Resilience (use of livelihood coping strategies)**					
Sale HH assets	0.10	0.07	-0.03	-27.4	*
Sale productive assets	0.14	0.11	-0.03	-23.1	*
Food on credit	0.57	0.45	-0.12	-20.3	***
Reduce food expenditures	0.63	0.46	-0.17	-27.5	***
Reduce asset expenditures	0.77	0.72	-0.05	-6.1	*
Extra jobs	0.27	0.22	-0.04	-16	*
Children to work	0.13	0.13	0	-3.1	
Children to marry	0.04	0.01	-0.03	-70.3	***
Risky work	0.05	0.06	0.01	10	
Sale of food aid	0.11	0.03	-0.08	-76	***
Sale of NFI	0.11	0.04	-0.07	-67.7	***

Note: Levels of statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

These results emphasise the vital role of providing support for crises-affected households living in Syria. Our results also suggest that the programme not only helped households to deal with direct and immediate needs related to food consumption and production, but that it also helped to build capacity to deal with adverse crisis impacts in the future. More specifically, the programme strengthened the economic and social position of beneficiary households compared to non-beneficiaries. For instance, beneficiaries are less likely to reduce expenditure on food and non-food items, to take out a loan, to sell assets to maintain the level of their food consumption, to engage in extra jobs to support their families, or to marry their children as an adaptive livelihood strategy.

Impacts of the provision of seeds without additional training. In order to assess the effectiveness of different programme modalities, we now distinguish the impacts of providing of seeds both with and without additional trainings. The results presented in Table 8 suggest that provision of seeds alone achieved strong impacts on yields across vegetables and (all) crops. In particular, the provision of seeds increased wheat yields by 20%, and, as a result, the average yield exceeds the FAO targeted threshold of 2 tonnes/ha. These improvements are again associated with strong and significant improvements in many dimensions of food security and resilience capacity.

These strong results of seed provision in the absence of additional training raises the question whether beneficiary households that received additional training were systematically different from those that did not. We will address this issue further below.

Impacts of the provision of seeds accompanied by additional training. Table 9 displays our results on the programme impacts when the provision of seeds was accompanied by additional training(s).

As before, we observe strong and significant improvements in many dimensions of food security and resilience. In contrast to the programme impacts in the absence of training, these positive impacts are not associated with or due to changes in yields. In fact, yields across crops and vegetables are fairly similar to those of non-beneficiaries. These results do not depend on the type of training provided, including CSA, NSI, or GAP.[4]

Limitations. Two factors limit the reliability of the detected impacts above. First, we do not have systematic data on yields, food security and resilience from beneficiaries and

[4]For brevity, we do not show the detailed results here, but these are available upon request.

Table 8: Mean differences between seed treatment and control households

	Control	Treatment	Δ (T - C)	%Δ	Significance
A. Socio-economic characteristics					
Female-headed	0.14	0.24	0.10		***
Age	48.84	50.06	1.22		*
HH size	5.29	5.51	0.23		
Land size	2.53	3.15	0.62		**
B. **Yield (kg/ha)**					
Wheat	1,870	2,204	335	17.9	***
Vegetables	24,773	32,184	7413	29.9	***
Barley	1,068	1,310	242	22.6	***
Pulses	2,664	5,920	3,256	122.2	***
Potatoes	19,408	21,683	2,275	11.7	
C. **Food Security**					
FCS	64.58	71.28	6.7	10.4	***
HDDS	8.48	8.73	0.26	3	**
RRCSI	43.61	35.39	-8.22	-18.8	***
Kcal Covered	3.16	3.81	6.42	20.3	*
D. **Resilience** (use of livelihood coping strategies)					
Sale HH assets	0.10	0.04	-0.06	-57.5	***
Sale productive assets	0.14	0.12	-0.02	-11.6	
Food on credit	0.57	0.41	-0.16	-28.8	***
Reduce food expenditures	0.63	0.48	-0.15	-24.4	***
Reduce asset expenditures	0.77	0.78	0.01	1	
Extra jobs	0.27	0.26	-0.01	-3.7	
Children to work	0.13	0.16	0.03	19.8	
Children to marry	0.04	0.01	-0.03	-67.5	**
Risky work	0.05	0.07	0.02	36.5	
Sale of food aid	0.11	0.03	-0.08	0.35	***
Sale of NFI	0.11	0.04	-0.07	-67.6	***

Note: Levels of statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 9: Mean differences between "seeds plus training" treatment and control households

	Control	Treatment	Δ (T - C)	%Δ	Significance
A. Socio-economic characteristics					
Female-headed	0.14	0.34	0.20		***
Age	48.84	49.47	0.62		
HH size	5.29	4.65	-0.64		***
Land size	2.53	2.56	0.02		
B. **Yield (kg/ha)**					
Wheat	1,870	1,677	-193	-10.3	*
Vegetables	24,772	24,504	-268	-1.1	
Barley	1,068	1,074	6	0.6	
Pulses	2,664	2,901	237	8.9	
Potatoes	19,408	17,007	-2401	-12.4	
C. **Food Security**					
FCS	64.58	71.94	7.36	11.4	***
HDDS	8.48	8.81	0.33	3.9	***
RRCSI	43.61	31.38	-12.23	-28	***
Kcal Covered	3.16	3.16	-0.71	-0.2	
D. **Resilience** (use of livelihood coping strategies)					
Sale HH assets	0.10	0.10	0		
Sale productive assets	0.14	0.09	-0.05	-33.6	**
Food on Credit	0.57	0.50	-0.06	-11.4	**
Reduce food expenditures	0.63	0.44	-0.19	-30.8	***
Reduce asset expenditures	0.77	0.67	-0.1	-13.5	***
Extra jobs	0.27	0.19	-0.08	-28.9	***
Children to work	0.13	0.10	-0.03	-25.4	
Children to marry	0.04	0.01	-0.03	-72.7	***
Risky work	0.05	0.04	-0.01	-18.1	
Sale of food aid	0.11	0.02	-0.08	-77.6	***
Sale of NFI	0.11	0.03	-0.07	-67.9	***

Note: Levels of statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

non-beneficiaries at baseline, i.e. before the programme was implemented. If there were systematic differences between beneficiaries and non-beneficiaries along these dimensions or factors related to them, the impacts detected at endline, i.e. after the programme, might in part reflect such ”pre-existing” differences.

Second and related, the observed households were not randomly sorted into the three categories we consider: households that received seeds, households that received seeds plus additional training and non-beneficiary households. The top panels of Table 7, Table 8 and Table 9 suggest that comparisons between the three groups indeed need to be interpreted with caution as basic socio-economic data reveal a few systematic differences across the three groups (”imbalance”). Most importantly, 29% of beneficiaries households are female-headed, compared to only 14% of non-beneficiary households (Table 7). Beneficiary households also hold slightly more land than non-beneficiaries, but the difference is small, even though marginally statistically significant. The average age of the head and the average size of the household do not differ noticeably between beneficiaries and non-beneficiaries.

The share of female-headed households also varies significantly between beneficiaries that only received seeds and those that received seeds in addition to training: 24% of ”seed-only” households are headed by a female (Table 8), while 34% of households receiving both seeds and training are female-headed (Table 9). In addition, households that received both seeds and training are significantly smaller than ”seed-only” households and non-beneficiary households.

These systematic differences may be reflected in the estimated programme impacts, as female-headed households may be among the most vulnerable households and smaller households are often less productive. We will address these issues in the next section. At the same time, we note that understanding these patterns and their consequences in detail require more information and longer-term analyses of these specific households (long-term impacts of trainings).

5.2 Results after “statistical corrections”

Using ADNA data collected before programme implementation. Pre-programme data on yields, food security and resilience from beneficiaries and non-beneficiaries is not available. We therefore use the ADNA dataset on yields and food security to assess structural differences that existed before the programme at the sub-district level, i.e. between beneficiary and non-beneficiary sub-districts. This allows us to “correct” the differences detected after the programme at the sub-district level and to assess the robustness of our main results.

Table 10: Mean differences between treatment and control – corrected based on ADNA data

	Control	Treatment	Δ (T - C)	%Δ	Significance
A. Socio-economic characteristics					
Female-headed	0.16	0.27	0.11		***
Age	48.77	49.53	0.76		
HH size	5.14	5.11	-0.03		
Land size	2.01	2.65	0.64		***
B. **Yield (kg/ha)**					
Wheat	1,763	2,119	356	20.2	***
Vegetables	24,013	32,444	8,431	35.1	***
Barley	967	1,243	277	28.6	***
Pulses	1,940	5,566	3,626	187	***
Potatoes	19,883	17,312	-2,571	-12.9	
C. **Food Security**					
FCS	63.07	73.14	10.08	16	***
HDDS	8.57	8.85	0.28	3.2	***
RCSI	46.90	34.16	-12.73	-27.2	***
Kcal Covered	3.01	3.58	0.57	18.8	*
D. **Resilience** (use of livelihood coping strategies)					
Sale of HH assets	0.11	0.04	-0.07	-66.7	***
Sale of productive assets	0.12	0.12	0	2.3	
Food on credit	0.61	0.40	-0.21	-34.8	***
Reduce food expenditures	0.65	0.41	-0.24	-36.3	***
Reduce asset expenditures	0.73	0.75	0.01	1.9	
Extra jobs	0.25	0.23	-0.02	-6.5	
Children to work	0.10	0.14	0.04	35.5	*
Children to marry	0.05	0.01	-0.04	-80.2	***
Risky work	0.05	0.06	0.01	26.9	
Sale of food aid	0.16	0.03	-0.13	-80.6	***
Sale of NFI	0.15	0.04	-0.11	-73	***

Note: Levels of statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The sub-district level analysis suggests that our main results are robust to correcting for pre-programme differences in food security and yields (Table 10). As before, we find that the programme strongly and significantly improved food security and resilience in multiple dimensions.

Matching based on socio-economic variables. To take the systematic socio-economic differences between beneficiaries and non-beneficiaries into account, we conduct two additional analyses.
First, we repeat our main analysis for female-headed households only. Table 11 demonstrates that the positive impacts on food security and resilience are present for this sub-group, too. In particular, we find that the impacts on resilience were particularly pronounced for female-headed households. For instance, the gains in terms of having to rely less on extra jobs, risky jobs and sending children to work are higher than the average gains for the full sample.

Second, we use a statistical technique called "propensity score matching" that creates two "corrected" treatment and control groups that are on average similar in gender of the household head, age of the household head and household size (Table 11). The results displayed in Table 12 show that our main results – the strong and positive impacts on food security and resilience – are robust to this correction as well.

Overall, while we are somewhat limited in our analysis by what type of data was available (and when it was collected), our various estimations and techniques paint a clear and robust picture concerning the likely causal, short-term impacts of the FAO programme in rural Syria on food security and resilience, which is what had been intended and which, in turn, is very encouraging.

6 Interpretation of results regarding how the FAO programme alters local institutions of Syrian agriculture 'from the bottom' (Work Package 2)

The crisis in Syria has drastically altered the local political economy of agriculture. The dominant sector of wheat production has been affected particularly strongly. The CFSAM data on the performance of the agricultural sector estimated that, in aggregate, wheat production in 2015 at 2.4 million tonnes – about 40% less than in the pre-conflict period. The government's capacity to purchase quality seed through the General Organization for Seed Multiplication

Table 11: Mean differences between treatment and control – female-headed households

	Control	Treatment	Δ (T - C)	%Δ	Significance
A. Socio-economic characteristics					
Age	49.68	48.63	0.76		
HH size	4.42	4.34	-0.08		
Land size	2.06	2.29	0.23		
B. **Food Security**					
FCS	66.29	70.34	4.05	6.1	**
HDDS	8.07	9.21	1.14	14.1	***
RCSI	51.40	40.34	-11.06	-22.7	***
Kcal Covered	3.63	3.88	0.25	6.9	
C. **Resilience** (use of livelihood coping strategies)					
Sale of HH assets	0.14	0.09	-0.05	-35.7	
Sale of productive assets	0.20	0.11	-0.09	45	**
Food on credit	0.73	0.53	0.20	27.4	***
Reduce food expenditures	0.68	0.45	-0.23	33.8	***
Reduce Asset expenditures	0.74	0.69	-0.05	-6.8	
Extra jobs	0.40	0.24	-0.16	-40	***
Children to work	0.20	0.15	-0.05	-25	
Children to marry	0.07	0.02	-0.05	-71.4	**
Risky work	0.07	0.03	-0.04	-57.1	*
Sale of food aid	0.17	0.04	-0.13	-76.4	***
Sale of NFI	0.21	0.04	-0.17	80.95	***

Note: Levels of statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 12: Mean differences between treatment and control – propensity score matching

	Control	Treatment	Δ (T - C)	%Δ	Significance
A. Socio-economic characteristics					
Female-headed	0.26	0.26	0		
Age	50.80	50.54	-0.26		
HH size	5.18	5.31	0.13		
B. **Food Security**					
FCS	65.68	72.25	6.57	10.0	***
HDDS	8.05	8.27	0.22	2.7	**
RCSI	42.98	34.39	-10.57	-20.0	***
Kcal Covered	3.01	3.58	0.57	18.8	*
C. **Resilience** (use of livelihood coping strategies)					
Sale of HH assets	0.10	0.07	-0.03	-41.7	
Sale of productive assets	0.18	0.10	-0.08	-44.4	**
Food on credit	0.61	0.40	-0.21	-34.8	***
Reduce food expenditures	0.63	0.46	-0.24	-36.3	***
Reduce asset expenditures	0.73	0.75	0.01	1.9	
Extra jobs	0.25	0.23	-0.02	-6.5	
Children to work	0.10	0.14	0.04	35.5	*
Children to marry	0.05	0.01	-0.04	-80.2	***
Risky work	0.05	0.06	0.01	26.9	
Sale of food aid	0.16	0.03	-0.13	-80.6	***
Sale of NFI	0.15	0.04	-0.11	-73	***

Note: Levels of statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

(GOSM) and redistribute at subsidised prices to farmers also decreased substantially, causing a rapid and fundamental disruption of the agricultural input supply chain. In 2014, GOSM purchased about 45,000 tonnes of wheat seed from out-growers, while in 2012 this figure had been 280,000 tonnes. Therefore, a much smaller share of farmers received seeds from the GOSM in recent years, while most farmers either had to rely on their seed reserves from previous harvests or had to purchase seeds from private traders at very high prices. In addition, seeds purchased in the market are often of poor quality as quality control systems for market-based purchases are absent. Thus, a vital component of the FAO programme was to strengthen seed institutions relevant for local production chains.

Our detailed, micro-level results in Work Package 1 confirmed that farmers' ability to grow crops and vegetables decreased dramatically. It is worth repeating that both yields and total amounts produced per household plunged across nearly all types of crops and vegetables surveyed during the crisis (see Panels C and D Table 2). With the exception of peas, yields for all crops and vegetables in 2016 were significantly lower than in 2010, with the changes from -14% (maize) to -34% (chickpeas) in that period. The relative changes in actual production (measured in kg) were even larger in magnitude, ranging from a 45% decrease in rainfed wheat to a 71% decrease in irrigated wheat.

In our analysis of Section 4 highlights several challenges to production beyond seed supply, such as demographic change, livestock reduction, asset losses, and reduced access to land and loans. Yet, our results from Work Package 2 presented in Section 5 demonstrate that mitigating issues of seed supply had a critically important impact on agricultural production (Table 7). Notably, even in the absence of additional training the provision of seeds achieved these positive impacts, overcoming the institutional fragility created by the conflict and supporting individuals to cope with it (Table 8).

These results indicate that the seed system has been a key choke point in the Syrian agricultural sector during crisis. Furthermore, our analysis indicates that the FAO programme successfully supported local production chains, filling a critical gap created by conflict-induced institutional weaknesses. The programme successfully and spatially comprehensively stabilised the supply of crop and vegetable seeds. By so doing, the programme triggered and stabilised the productivity of smallholder farmers across the country, setting them on positive paths in terms of both production (which includes the ability to produce seeds for the next growing season), welfare and market participation.

7 Conclusions and recommendations

The objective of this report is to describe research findings which can guide FAO Syria in building knowledge, learning and capacity. Our analyses reveal a set of very clear results, which have important policy implications.

Our empirical analysis in Work Package 1 shows that food security in Syria has been strongly affected by the crisis and by climatic conditions. Food security deteriorated dramatically during, and due to, the crisis. Statistical analysis of the empirical data from the ADNA and CFSAM background assessments documents very critical food security outcomes in 2016, across all four pillars of food security and across the whole country. A comparison with data from 2010 demonstrates and quantifies the dramatic degradation in food security since the start of the crisis. In addition, many regions have been affected by weather shocks such as droughts in recent years. Our analysis emphasises that droughts impair food security in two ways. First, droughts have the expected direct, negative effects on food security. Second, droughts also exacerbate the adverse impacts of the crisis, pushing many household into extreme emergency.

Our research in Work Package 2 provides strong evidence that the FAO programme successfully supported local production chains, filling in the gap created by conflict-induced institutional shortcomings. We find that the provision of seeds delivered substantial and critically important impacts on yields, food security and resilience measures. Specifically, we find that vulnerable households, such as female-headed households, benefited tremendously from the programme. As the trainings targeted the most vulnerable, it remains to be seen how much the provision of trainings strengthens these positive impacts for the average household. Furthermore, we only measured short-term outcomes, leaving unanswered the question if the programme succeeded in lifting household welfare in the long-term. Such analyses would require more detailed information from repeated follow up surveys and correspondingly longer-term analysis of the interventions offered.

The results form Work Packages 1 and 2 have several implications for programme targeting, impacts and modalities, which we summarise here in turn.

Programme targeting. Our results document strong interrelations between insecurity and both conflict intensity and climatic adversity. Hence future food security and resilience

programmes should prioritise regions and households most strongly affected by these stresses. Moreover, we find strong benefits for female-headed households, which suggests continued further targeting of these households. Future work may well wan to test other possible measures of vulnerability, such as current or past displacement status, very small household size, high dependency rates, or very young age of (female) spouse of the household head.

Programme impacts. Our results also demonstrate that the FAO programme "worked" – it very successfully created strong impacts on yields, many dimensions of food security as well as on the (reduced) use of harmful livelihood coping strategies, which is related to resilience. We therefore recommend similar approaches in future food security and resilience interventions. In fact, it stands to reason that the FAO programme had positive impacts beyond the narrow, intended goals in the domain of agriculture. Future analyses could inspect in more detail how such seed interventions for example reduce harmful coping practices like child marriages or how the programme may have strengthened social cohesion.

Programme modalities. Even in the absence of additional training, the provision of seeds achieved strong impacts on yields, food security and resilience. The existing database is insufficient to analyse the full impact of the different trainings in detail. We thus recommend building programmes around the provision of seeds and to test further if and how trainings can best accompany the provision of seeds. To learn more about the value of trainings, its provision and its measurement may need to be standardise more and its provision could be provided to a sub-sample of all beneficiary households. Given the current evidence base, we cannot judge if trainings are useful (which they may well be) or if resources could be deployed better elsewhere.