Post-harvest assessment of wheat and barley production – 2023-2024 agricultural season

January 2025 | Northwest Syria (NWS)

Context & Rationale

As of October 2024, Northwest Syria (NWS) continued to face significant challenges stemming from prolonged conflict and economic crisis, exacerbated by the aftermath of the February 2023 earthquake. The region remained plagued by recurrent flare-ups of armed conflict[1] and destruction of civilian infrastructure, including water systems and agricultural land,[2] continuing to hamper the sustainable economic recovery of communities. In 2024, the further depreciation of the Turkish Lira (TRY) against the US Dollar (USD) continued to fuel inflation,[3] sharply increasing the cost of essential goods and pushing more households into poverty. Between October 2023 and October 2024, the Survival Minimum Expenditure Basket (SMEB) in TRY rose by 20%,[4] while according to REACH's 2024 Multi-Sectoral Needs Assessment (MSNA), 51% of households in NWS faceing food security and livelihoods (FSL) needs.

The agricultural sector, historically a key livelihood source in NWS,[5] has been facing severe disruptions due to these compounded challenges, with both productivity and long-term economic and environmental sustainability significantly compromised.[6] Farmers have reportedly been struggling with restricted access to arable land due to ongoing conflict and displacement,[7] as well as reduced water availability.[8] The rising costs of production inputs created additional barriers, making farming increasingly unaffordable. High operational costs have consistently been identified as a primary barrier to agricultural livelihoods in the region,[9] and the substantial decline in agricultrual production and livelihoods has extensively been documented over the recent years, directly exacerbating the regional food insecurity.[10] Additionally, climatic variability and adverse environmental factors, such as irregular rainfall, rising temperatures, and prolonged droughts, have greatly affected agricultural productivity in the region.[11]

This assessment focused on evaluating the 2023-2024 wheat and barley agricultural season in NWS, examining production trends, climate-related challenges, and critical input constraints. It also explored farmers' coping mechanisms and financial status, aiming to inform future planning and advocacy efforts by FSL partners to support agricultural livelihoods and food systems in the region.

Methodology Overview

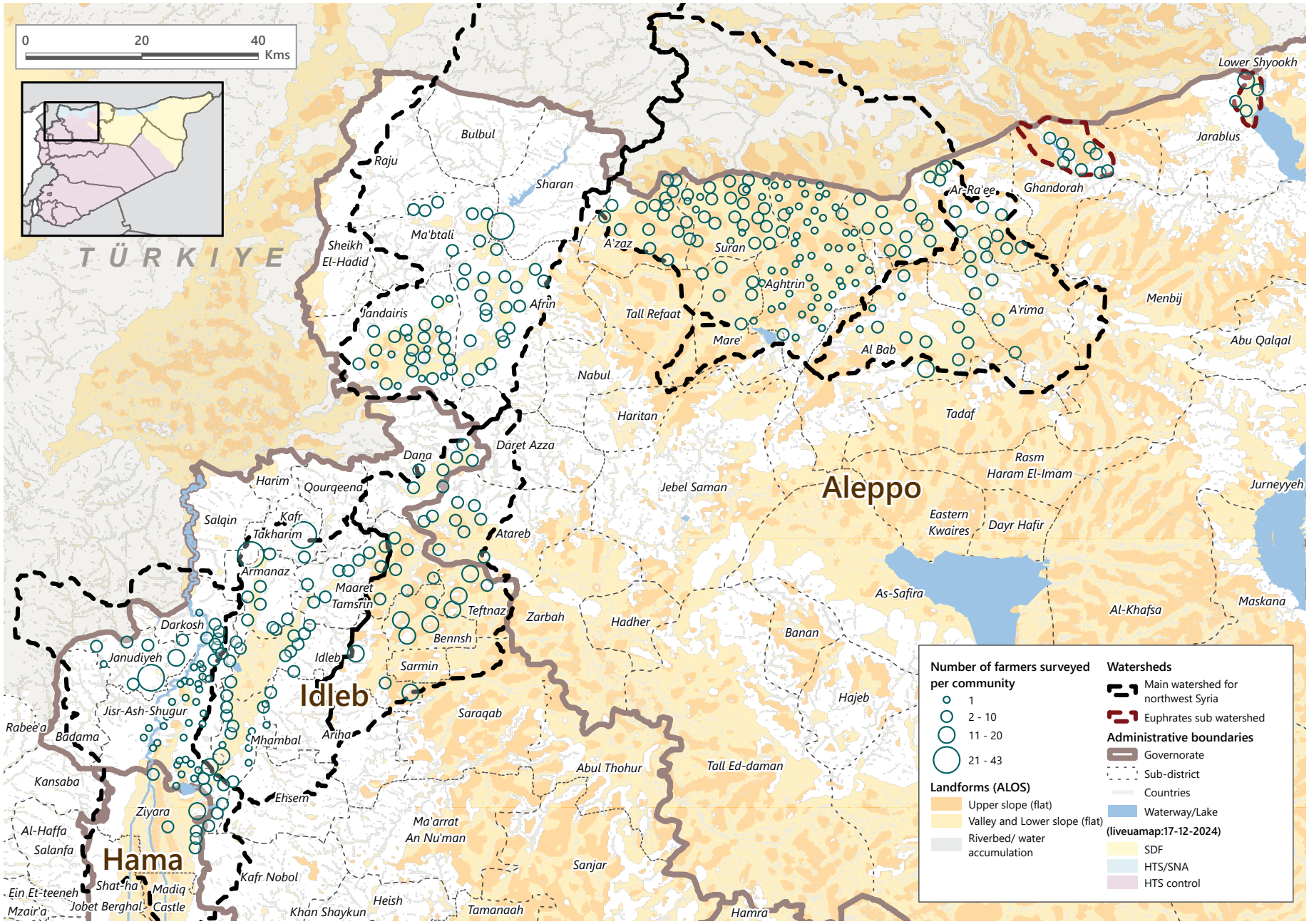
The assessment employed a mixed-methods approach. A total of 1,355 quantitative individual interviews (IIs) were conducted with wheat and barley farmers across 27 sub-districts in NWS between September 22 and 30, 2024. In addition, 35 structured key informant (KI) interviews with agricultural authorities and experts were carried out between October 30 and 31, 2024. The study also incorporated remote sensing data analysis and a desk review of secondary sources to further inform the findings.

A purposive sampling method was employed, targeting farmers across various sub-districts, with an initial quota of 60 surveys per sub-district. In areas with operational constraints, the sample size was adjusted to a minimum of 30 surveys. This approach allowed for flexibility in data collection while ensuring comprehensive coverage of agricultural challenges. The findings were then aggregated at the sub-district and governorate levels. For more detailed information on the methodology, please consult the Assessment methodology section.

Due to this purposive sampling approach, findings from this assessment should be interpreted as indicative only.

Findings should be interpreted with caution, as they reflect the situation up until October 2024. Given the rapidly changing political, economic, and security context at the time of publishing of this report's publication,[12] the validity and relevance of the results may be limited. Nonetheless, these insights remain useful for informing policy and humanitarian interventions, but their applicability must consider the evolving circumstances in NWS.

Map 1: Assessment coverage map



Key messages

- **Wheat and barley production levels in Northwest Syria (NWS) likely declined overall during the 2023-2024 agricultural cycle compared to the previous one, driven by significant yield reductions in Idleb and Hama governorates.** Although most wheat and barley farmland remained stable in size, 58% of wheat farmers and 46% of barley farmers reported lower yields than the previous season. This trend was particularly acute in Idleb and Hama, where yield reductions were prevalent across all land use categories, and a larger share of farmers reported stable or decreased cultivated land rather than increases. **A likely decrease in overall barley and wheat production may lead to reduced grain availability in the market, increased prices, and hightened food insecurity risks for communities reliant on wheat- and barley-based staples.**
- **Despite slightly lower rainfall levels compared to the average of previous years, a combination of remote sensing indicators and farmers' reports suggests that vegetation health and water availability in NWS were relatively favorable during the 2023-2024 agricultural cycle.** This may be due to mitigating factors such as cooler-than-average temperatures (negative LST), which reduce water loss through evapotranspiration, and soil moisture reserves that help sustain vegetation despite slightly below-average precipitation (negative SPI). This is corroborated by the fact that the majority of farmers in NWS, with similar shares across governorates, reported sufficient water availability for production (81%), and reported somewhat or very good plant health (91%).
- **Wheat and barley irrigated croplands consistently outperformed rainfed croplands in terms of land productivity and economic outcomes, including higher business profitability.** While yield performance and land productivity are closely tied to the predominant irrigation systems, which vary across governorates based on agro-ecological zones and watershed characteristics, macro-economic factors emerged as the primary and most influential drivers of cropland performance. Factors such as input availability, production costs, access to markets, and local economic conditions at the governorate level played a decisive role, often outweighing environmental considerations in shaping outcomes.
- **The high cost of key inputs was found to be by far, the factor most frequently reported by farmers in NWS (54%) as negatively impacting the overall production cycle, followed by low rainfall levels (36%) and high temperatures (35%).** While the reported higher incidence of pests and diseases may have contributed to the cost structures of farmlands, the exchange rate fluctuationas and the continuous increase in fuel price are likely major drivers of inputs inaccessibility, hampering farmers' capacity to respond to environmental hazards and production needs.
- **Combined data on economic performance and coping strategies suggest that a significant portion of agricultural businesses in NWS are facing increasing financial strain.** Nearly half (42%) of all farmers interviewed reported that their revenues did not cover production costs, with notable differences across governorates. Among those experiencing losses, the majority (61%) indicated they had to take on additional debt during the year to address the challenges they faced.
- **Farmers in Aleppo demonstrate greater financial resilience and stability compared to those in Hama and Idleb.** During the 2023-2024 agricultural season, the majority of farmers in Aleppo (70%) reported covering production costs and generating a profit, while most farmers in Idleb (70%) and Hama (98%) experienced economic losses. This disparity in economic performance is likely driven by factors such as better access to inputs, higher selling prices, stronger financial stability, and more diversified marketing strategies in Aleppo.

Farmer profiles

Figure 1: Assessed wheat and barley cultivated land sizes, in donums[13]

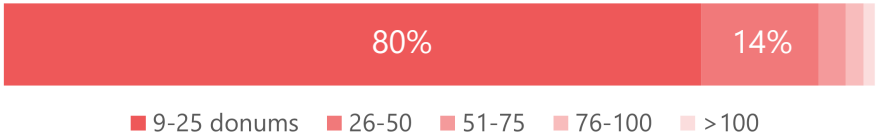


Figure 2: Proportion of assessed farmlands, by crop grown during the 2023-2024 agricultural season

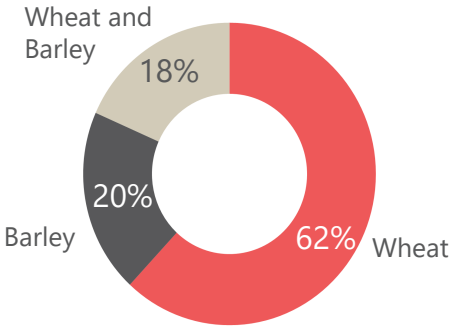


Table 1: Proportion of irrigation methods used per crop type, by percentage of respondents by governorate and overall

	Aleppo	Idleb	Hama	Overall
Wheat				
Irrigated	30%	16%	0%	21%
Mix	24%	6%	2%	14%
Rainfed	46%	79%	98%	65%
Barley				
Irrigated	5%	6%	0%	5%
Mix	11%	2%	0%	6%
Rainfed	84%	92%	100%	88%

While the vast majority of farmers interviewed in Northwest Syria (NWS) primarily relied on rainfed irrigation solutions, different patterns in irrigation systems emerged between wheat and barley (Table 1).

In fact, **barley cultivation across all assessed subdistricts in NWS was found almost entirely dependent on rainfed methods across the entire region**, likely due to the fact that barley is typically more drought-resistant than wheat and better suited to areas with low rainfall or marginal soils. Its capacity to deliver satisfactory yields under rainfed conditions makes it a favored choice in regions where irrigation resources are scarce.

On the other hand, **wheat irrigation methods varied significantly based on governorate, watershed areas and agro-ecological zones, reflecting differing climatic conditions, soil types, topography, and water availability** (Map 2). In drier regions with limited rainfall, water-efficient techniques like sprinkler or furrow irrigation may be preferred to optimize scarce resources. On the other hand, in areas with higher rainfall and readily available water sources, surface irrigation or fully rainfed systems may be more practical and cost-effective. In eastern sub-districts of Aleppo Governorate, such as Jarablus, Al Bab, and Ar-Ra'ee, irrigation systems—likely involving canals or pumped methods—are predominantly used for wheat crops. Conversely, in the southwestern sub-districts of Greater Idleb, including Darkosh, Janudiyeh, and Kafr Takharim, wheat was exclusively rainfed.

Beyond environmental factors, the choice of irrigation methods also depends on economic and security considerations. In Idleb and parts of Hama Governorates, wheat and barley cultivation remains exclusively rainfed despite the presence of extensive irrigation infrastructure visible in satellite imagery. This discrepancy can likely be attributed to multiple factors: the prolonged conflict in the region has resulted in significant damage to irrigation systems, reduced access to essential inputs, and ongoing population displacement.

The vast majority (87%) of interviewed farmers reported owning the land they cultivated, while a smaller proportion (21%) indicated renting land. Notably, land rental was more prevalent in Idleb and Hama governorates, where it accounted for 33% of respondents in each. This difference could be explained by varying socio-economic and agricultural conditions across the three governorates. Factors such as conflict, displacement, fragmented land ownership, economic challenges, and limited access to resources may contribute to the higher prevalence of land rental in these areas.

Map 2: Wheat yields and reported main irrigation method for wheat farmlands during the 2023-2024 wheat growing season

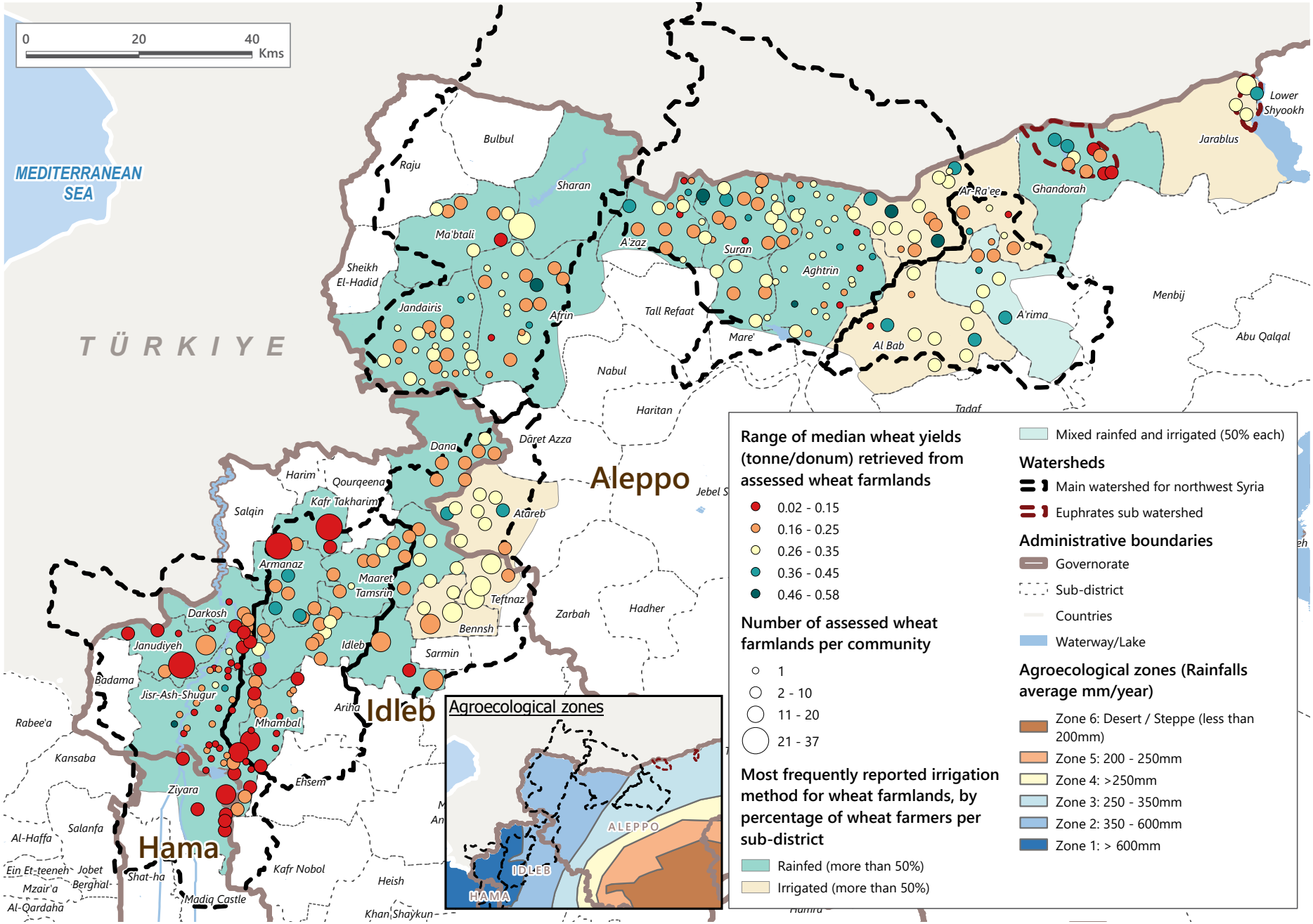


Table 2: Median wheat and barley yields[14] for the 2023-2024 agricultural season by irrigation method and governorate, alongside reported changes in productivity and cultivated area compared to the previous season, by percentage of wheat and barley respondents per governorate

		Aleppo	Idleb	Hama	Overall
WHEAT	Median yield (tonne/donum) for the 2023-2024 season				
	Irrigated	0.333	0.304	NA	0.325
	Mix	0.300	0.250	0.120	0.300
	Rainfed	0.250	0.190	0.125	0.200
	Overall	0.300	0.200	0.125	0.244
	Reported change in yield compared to previous season (2022-2023)				
	Yield was less	25%	84%	98%	58%
	Yield was the same	41%	7%	2%	22%
	Yield was more	34%	9%	0%	20%
	Reported change in cultivated land compared to previous season (2022-2023)				
	Remained the same	65%	45%	37%	54%
	Decreased	16%	42%	39%	30%
	Increased	18%	14%	24%	16%
BARLEY	Median yield (tonne/donum) for the 2023-2024 season				
	Irrigated	0.250	0.200	NA	0.238
	Mix	0.200	0.200	NA	0.200
	Rainfed	0.200	0.155	0.100	0.160
	Overall	0.220	0.150	0.100	0.200
	Reported change in yield compared to previous season (2022-2023)				
	Yield was less	11%	82%	94%	46%
	Yield was the same	45%	9%	6%	28%
	Yield was more	43%	9%	0%	26%
	Reported change in cultivated land compared to previous season (2022-2023)				
	Remained the same	70%	51%	65%	61%
	Decreased	10%	32%	24%	20%
	Increased	20%	18%	12%	18%

Wheat and barley yields

Data on land productivity and yield performance compared to the previous season indicate significant geographical disparities between Aleppo Governorate and the governorates of Idleb and Hama (Table 2). **Aleppo is showing considerably higher productivity levels across all irrigation methods.** Reflecting this, reported farmer satisfaction trends are aligning closely with land performance, with 20% of farmers in Aleppo reporting being moderately or very unsatisfied with their yields. In contrast, dissatisfaction is prevailing among farmers in Idleb and Hama, with 78% and 100%, respectively, reporting being moderately or very unsatisfied with their harvests (Map 4).

The reported **changes in cultivated land (measured in donums) from the last agricultural cycle indicate that the majority of barley and wheat farmland remained stable at the regional level.** Specifically, 61% of barley farmers and 54% of wheat farmers reported no change in the size of their cultivated land between the 2023-2024 and 2022-2023 agricultural seasons. **However, changes in productivity suggest a widespread decline in yields.** A total of 46% of barley farmers and 58% of wheat farmers who planted the corresponding crop also in the previous season (2022-2023) reported lower yields compared to the previous season.

While the exact magnitude of changes in cultivated land and yield is unknown, assuming equal scales for reported positive and negative changes, **the predominance of yield reductions within all categories of land change—combined with a larger proportion of farmers reporting stable or decreased cultivated land rather than increases—strongly suggests that overall wheat and barley production likely declined at regional level and within Idleb and Hama governorates.** This trend is particularly evident in rainfed agricultural croplands, and are consistent with observations from specific agro-ecological zones, underscoring the higher vulnerability of rainfed systems. For Aleppo on the other hand, under the same assumptions, it is likely that positive changes in yield and land would have outweighed the negative ones, resulting in stable or slightly increased wheat and barley production (Map 4).

A likely decrease in aggregate barley and wheat production could reduce local market availability, drive up prices, and exacerbate food insecurity risks for communities reliant on wheat- and barley-based staples.

Nearly half of the KIs interviewed in NWS (43%) indicated that, even with wheat imports, food aid, and existing reserves, aggregate wheat availability will likely remain insufficient to meet expected demand in their sub-district for the 2024-2025 marketing period (July 2024–June 2025).

Normalised Vegetation Index (NDVI) and wheat yields

The analysis of the relationship between farmer-reported changes in wheat productivity levels and observed changes in vegetation health, both compared to the previous season (2022-2023), identified a positive correlation between vegetation health and farmers' perceptions of yield variations across communities.

A statistical examination of Normalized Difference Vegetation Index (NDVI) changes and reported wheat yield variations confirmed a significant correlation between the two variables. Specifically, **areas with lower or negative NDVI values, reflecting weaker vegetation health or stagnant growth, were linked to reports of decreased wheat productivity from farmers. Conversely, areas with higher and positive NDVI values were more commonly associated with farmers reporting stable or increased yields.**

Map 3: Normalized Difference Vegetation Index (NDVI) percentage change compared to previous season (2022-2023) per sub-watershed and reported change in wheat yields during the 2023-2024 growing season compared to the previous season (2022-2023) per community assessed

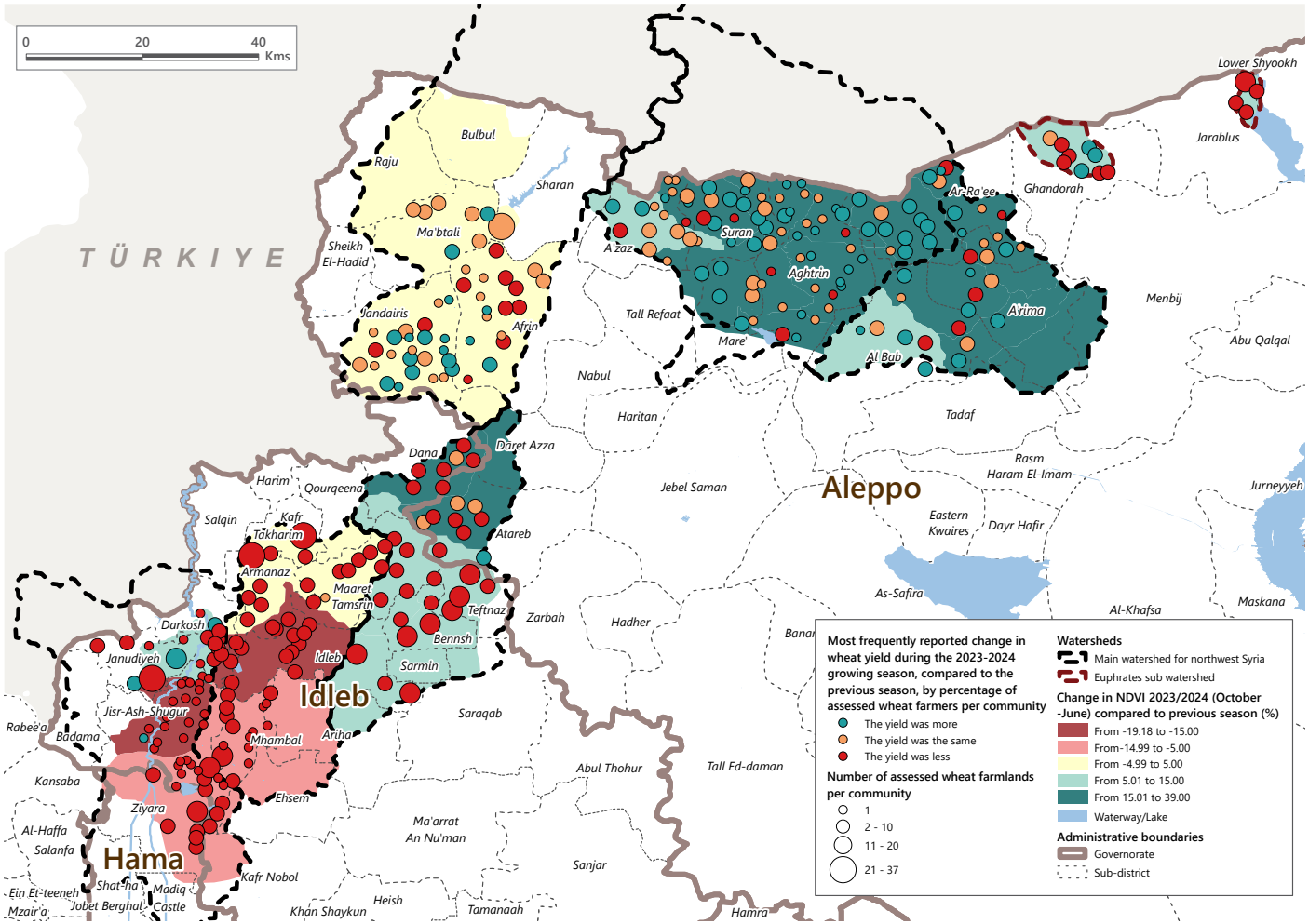
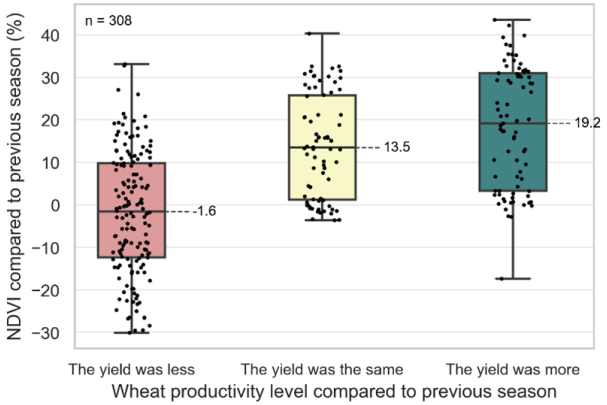
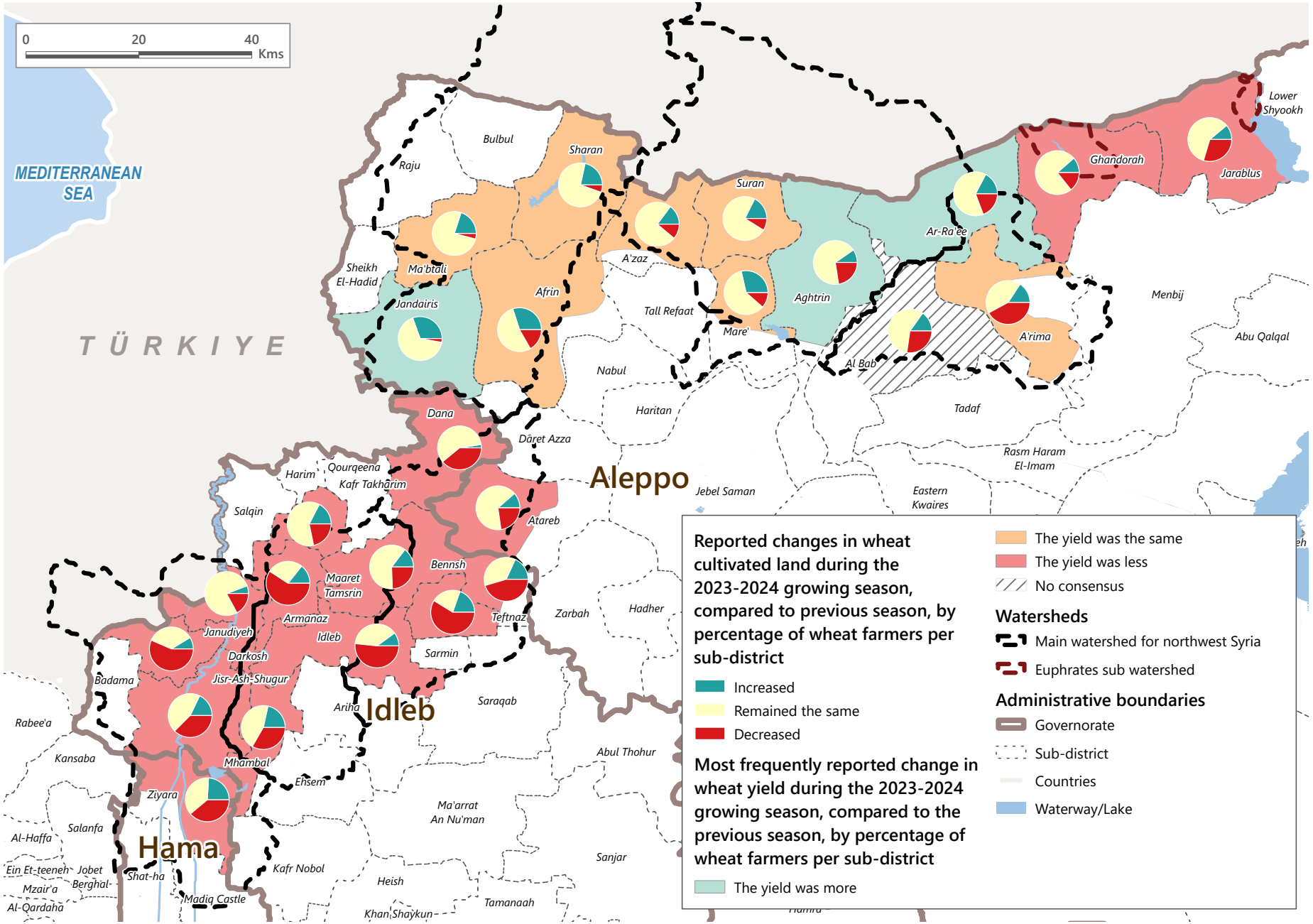


Figure 3: Box plot illustrating changes in NDVI of crops compared to the previous season (2022-2023) across farmer-reported changes in wheat yield compared to the previous season (2022-2023) for each response group



The NDVI is used to quantify vegetation greenness and useful to understand vegetation health and vegetation density. High NDVI values correspond to healthy, dense vegetation while low NDVI corresponds to unhealthy, sparse vegetation. Agricultural land was identified using cropland extent layers and landform data, focusing on areas like upper and lower slopes, riverbeds, and valleys—landforms generally linked to farming. As such, NDVI changes were calculated based on the total agricultural extent and do not differentiate between crop types. For more detailed information on the methodology, please consult the Assessment methodology section.

Map 4: Reported changes in cultivated wheat land and wheat yields during the 2023-2024 wheat growing season compared to the previous season (2022-2023)



Production cycle

The great majority (94%) of total respondents reported that one or more factors negatively impacted the 2023-2024 wheat agricultural cycle. These factors varied across different governorates (Table 3), agro-ecological zones, and watersheds. Among those who did not experience negative effects, nearly all were from Aleppo Governorate, making up 11% of respondents there.

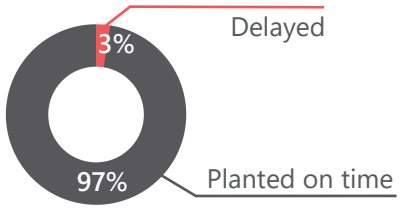
Farms in agro-ecological zone 1 (Map 2), which receive higher rainfall and rely mainly on rainfed agriculture, most frequently cited diseases, fungi, and insect infestations as significant impacts. Heavy rains and high moisture levels can create conditions conducive to fungal growth and disease spread, explaining the higher prevalence of these issues in such areas. Remote sensing data further supports this, showing cooler-than-average temperatures and lower-than-average rainfall levels in NWS (Table 12). On the other hand, farms in agro-ecological zones 2 and 3, which are less rainy and primarily irrigated, indicated that the high costs of inputs, especially fuel for irrigation, were a key challenge impacting productivity.

Table 3: Top 5 factors most frequently reported as most negatively impacting wheat and/or barley yields during the 2023-2024 agricultural season, by percentage of respondents per governorate and overall

	Aleppo	Hama	Idleb	Overall
High cost of key inputs (seeds, water, fuel, fertilisers/pesticides)	56%	20%	54%	54%
Low rainfall	21%	25%	51%	36%
High temperatures	36%	47%	34%	35%
Impact of disease or fungi	16%	42%	46%	32%
Impact of insects or rodents	7%	73%	31%	21%

Planting & Germination

Figure 4: Timeliness of wheat and barley planting, by percentage of total respondents



- **Planting timeline:** most wheat (59%) and barley (75%) farmers planted in November; smaller percentages planted in December (35% wheat, 21% barley).
- **Causes of planting delay:** delayed planting was attributed to low rainfall (16/34 respondents), high input costs (10/34), and insecurity (6/34).
- **Germination rate:** almost all wheat and barley farmers reported that all (73%) or more than half (25%) of planted seeds germinated, with similar rates observed across the three governorates.

Crop Health

Table 4: Reported wheat and/or barley crop health across the agricultural cycle, by percentage of respondents per governorate

	Aleppo	Idleb	Hama
Very healthy	48%	2%	34%
Somewhat healthy	50%	63%	54%
Poor health	2%	35%	12%

- **Changes in crop health compared to previous season:** Responses on crop health changes varied significantly between governorates. In Aleppo, the majority (64%) reported no change in crop health compared to the previous season. Conversely, in Idleb and Hama, the majority (55% and 61% respectively) reported a decline in crop health. These trends align closely with reported changes in crop yield (Table 2).
- **Causes of poor crop health:** the top three causes reported specifically for poor crop health were the same across all three governorates, consisting in the impact of diseases and fungi (75% of all respondents), the impact of insects or rodents (60%) and high temperatures (47%).

Harvest

Table 5: Top 5 challenges most frequently reported by wheat and/or barley farmers during the harvest stage, by percentage of respondents per governorate

	Aleppo	Idleb	Hama
High cost of labour force / machinery	35%	40%	68%
High prices of transportation	37%	36%	30%
High cost of warehouse, bags	37%	23%	22%
Unexpected rainfall	19%	33%	63%
Infestation/diseases affecting crop at the time of the harvest	8%	21%	80%

- **Harvest timeline:** 94% of all respondents reported harvesting on time. Most wheat (75%) and barley (66%) farmers harvested in June; smaller percentages harvested in July (16% wheat, 10% barley) and May (8% wheat, 23% barley).
- **Harvest rate:** almost all wheat and barley farmers reported harvesting all (75%) or more than half (18%) of the planted land, with similar rates observed across the three governorates.

Financial barriers to accessing essential agricultural inputs

Table 6: Most commonly reported inputs for which wheat and barley farmers faced financial barriers during the 2023-2024 agricultural cycle, by percentage of respondents per governorate and overall

	Aleppo	Idleb	Hama	Overall
Fertilisers	72%	91%	95%	82%
Pesticides / Herbicides	44%	83%	97%	65%
Seeds	32%	52%	62%	43%
Fuel	43%	21%	48%	33%
External services (machine maintenance, specialised agri-services)	14%	18%	17%	16%
Tools, equipment and machinery	11%	17%	32%	15%
None	16%	2%	0%	8%

Table 7: Top 4 financial barriers faced for the top 4 inputs for which farmers most commonly reported facing financial barriers, barriers by percentage of overall farmers

	High prices	Lack of access to liquidity	Lack access to credit	Poor quality
Fertilisers	71%	49%	37%	29%
Pesticides / Herbicides	64%	45%	30%	46%
Seeds	65%	50%	35%	34%
Fuel	72%	42%	37%	7%

Table 8: Degree of negative impact reported for the top 4 inputs for which wheat and/or barley farmers most commonly faced financial barriers, by percentage of overall respondents

	Low	Moderate	High
Fertilisers	36%	42%	22%
Pesticides / Herbicides	42%	28%	30%
Seeds	32%	45%	23%
Fuel	36%	44%	20%

The vast majority (92%) of overall farmers interviewed in NWS reported facing market or financial barriers in accessing essential inputs during the latest agricultural cycle (Table 6). Fertilizers emerged amongst the most frequently reported inputs for which farmers faced financial barriers across all three governorates and for all types of croplands, regardless of irrigation methods.
These figures reinforce previous findings on access to agricultural inputs and financial barriers, highlighting the ongoing challenges and deepening economic unsustainability of agricultural operations in NWS.[15]

There appears to be a geographical variation in the second most frequently reported input for which farmers encountered financial barriers, likely influenced by the predominant irrigation practices in each governorate. In areas where rainfed croplands dominate (Hama and Idleb Governorates), herbicides and pesticides were the most commonly reported financially challenging input together with fertilizers. This may be explained by the fact that the variability in soil moisture in rainfed areas, combined with a higher incidence of diseases, fungi, and insects, may add financial strain on farm budgets due to the variable costs of pesticides and herbicides. This is further confirmed by the top 3 main challanges that negatively affected the agricultural season in Greater Idleb and Hama (Table 3), being the high cost of inputs and the impact of diseases and insects.

In Aleppo Governorate, where irrigated wheat croplands are more common, fuel costs were the second greatest financial barrier. This is likely due to the higher fuel dependency for activities like water pumping and other irrigated agricultural processes.

Almost all farmers in NWS who reported no financial barriers to farming are located in Aleppo Governorate. This pattern is consistent across different irrigation methods, despite the fact that Aleppo is the governorate where most crop cultivation depends on irrigation—requiring external inputs and higher water management costs. **This suggests that the stark contrast between Aleppo and Idleb and Hama is unlikely to stem only from differences in irrigation practices. Instead, it may reflect broader macroeconomic or systemic factors, such as the relative economic stability of farming operations in Aleppo or improved access to markets for essential agricultural inputs, which help alleviate financial constraints for these farmers.**

Seeds

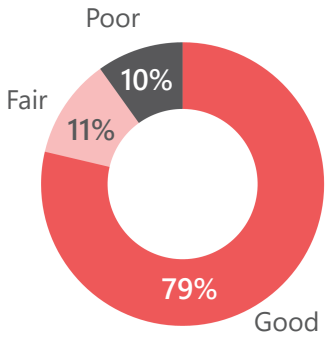
Data on seed access in NWS suggests strong accessibility, with 97% of farmers reporting access to an adequate quantity of seeds and 100% stating that the seeds they obtained were suitable for their soil composition, land size, local climatic conditions, and productive goals. Additionally, almost all (99%) farmers reported being aware of the origin of their seeds. Most farmers (88%) used only local seeds, while the majority of farmers who reported using imported seeds (11%), indicated Turkey as the main supplier (85%).

Table 9: Top 3 most frequently reported seed sources among wheat and/or barley farmers during the 2023-2024 agricultural season, by percentage of respondents per governorate

	Aleppo	Idleb	Hama
Traders	49%	68%	60%
Stored from previous seasons	45%	22%	20%
Farmers association/cooperative	3%	5%	53%

Most farmers (94%) also reported knowing the number of seed varieties they were using, with 85% of these relying on a single variety and 15% using two. **These figures indicate a very low level of seed variety adoption and diversification among farms in NWS.** This raises significant concerns for the sustainability of crop production and seed conservation. **Limited genetic diversity increases vulnerability to pests, diseases, and decreases adaptability to environmental stresses, increasingly frequent with climate change.** This reliance on a narrow genetic base jeopardizes long-term agricultural resilience, posing critical challenges to the sustainability of wheat and barley food security.

Figure 5: Reported wheat and/or barley seed quality during the 2023-2024 agricultural season, as percentage of overall farmers interviewed in NWS



This risk is compounded by the fact that approximately half of the seeds employed in NWS were reportedly unregistered (55% of farmers) and uncertified (49%). The use of such seeds poses risks to seed biodiversity and local systems by reducing genetic diversity, spreading pests and diseases, and delivering inconsistent quality.

The top challenges reported by KIs for the seed system in their sub-district were the high cost of seeds (63%), low seed quality or adulteration (49%), and limited access to improved or certified seed varieties (37%).

Fertilisers, Herbicides, Pesticides

Table 10: Share of inputs use and of disease incidence during the 2023-2024 agricultural season, by percentage of respondents per governorate

	Aleppo	Idleb	Hama
Inputs use			
Fertilizers	99%	98%	100%
Pesticides	81%	89%	100%
Herbicides	85%	93%	100%
Pests and diseases incidence			
Diseases	43%	85%	100%
Pests	35%	81%	100%
Reported change in pesticide/herbicide use compared to previous season			
Increased	25%	43%	53%
Same	71%	47%	26%
Decreased	5%	10%	21%

While the majority of farmers across NWS reported using fertilizers, pesticides, and herbicides, notable geographical variations were observed in the reported incidence of crop diseases across governorates (Table 10).

The higher prevalence of pests and diseases in Hama and Idleb is likely linked to the reliance on rainfed agriculture, which presents challenges in managing soil moisture and makes crops more vulnerable to pests and diseases.

The vast majority (91%) of KIs across the three governorates reported price increases for herbicides and pesticides in their sub-districts during the 2023-2024 agricultural season. This trend aligns with the rise in global and regional fuel prices during the same period, as well as the 23% increase in the USD/TRY exchange rate between October 2023 and October 2024.[16] These factors have a significant impact on the cost of key agricultural inputs, including fertilizers, herbicides, and pesticides, thereby escalating the financial burden on farmers.

In both Hama and Idleb, despite high financial barriers to pesticide and herbicide use (Table 6), widespread usage and notable increases in pesticide and herbicide use compared to the previous season suggest that farmers are likely willing to absorb higher costs and prices, indicating inelastic demand. This is driven by the essential need to combat pests and diseases.

In Aleppo, fewer farmers face financial barriers, and despite lower pest incidence, most continue to use pesticides. **This indicates fewer economic constraints on farmers in Aleppo, and potentially greater ability to adopt preventive crop health strategies, suggesting in turn a more favorable economic situation compared to Hama and Idleb.**

Water

The majority of interviewed farmers across NWS (81%) indicated that water availability, regardless of the irrigation method, was sufficient to meet their production objectives for the season (Table 12). Most farmers noted that water availability either remained the same (46%) or increased (37%) compared to the previous agricultural season.

Among farmers who reported irrigating wheat and/or barley, private boreholes emerged as the predominant water source, utilized by 82% of respondents, followed by surface water at 11%. Notably, none of the surveyed farmlands indicated reliance on sewage water, despite existing evidence documenting its use in agriculture within NWS.[17]

Table 11: Reported degree of overall water availability during the 2023-2024 agricultural season, by percentage of respondents per governorate

	Aleppo	Idleb	Hama
Water availability			
Completely sufficient	44%	53%	43%
Mostly sufficient	38%	32%	3%
Mostly insufficient	13%	12%	52%
Completely insufficient	5%	3%	2%
Top 3 reasons for water shortages			
Low rainfall	55%	80%	31%
Paid water was too expensive	20%	41%	66%
Boreholes not providing adequate quantities of water	57%	0%	0%

This perception of adequate water availability during the 2023-2024 agricultural season stands in contrast with secondary sources[18] and remote sensing data for the same period, which highlight below-average precipitation levels over the past eight years and cooler-than-average land surface temperatures (Map 5). These conditions typically have a negative impact on water resources. Slightly reduced precipitation levels suggest potential stress on water resources and agricultural systems in both Aleppo and Idleb governorates during the 2023-2024 agricultural season.

Figure 6: Reported water quality during the 2023-2024 agricultural season, as percentage of overall respondents practicing irrigation in NWS

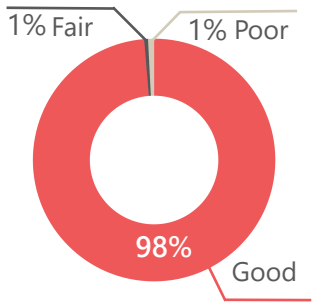


Table 12: Selected remote sensing indicators by governorate and regional level for the 2023-2024 agricultural season

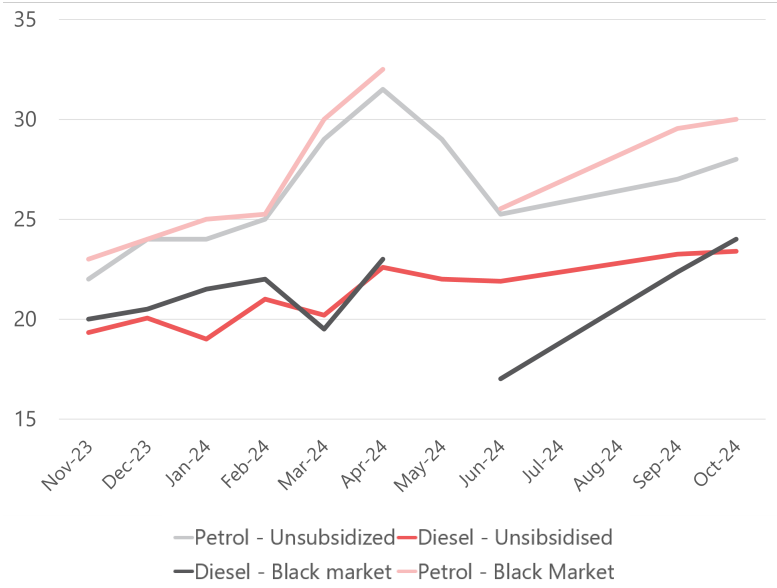
	Aleppo	Idleb	NWS
Average Land Surface Temperature (LST) anomalies[19]	-0.51	-0.77	-0.62
Average of NDVI anomalies[20]	0.03	0.03	0.03
Average of Standard Precipitations Index (SPI)[21]	-0.12	-0.07	-0.10
Sum of rainfalls anomalies (in millimeters)[22]	-734.2	-777.2	-1511.4

Fuel

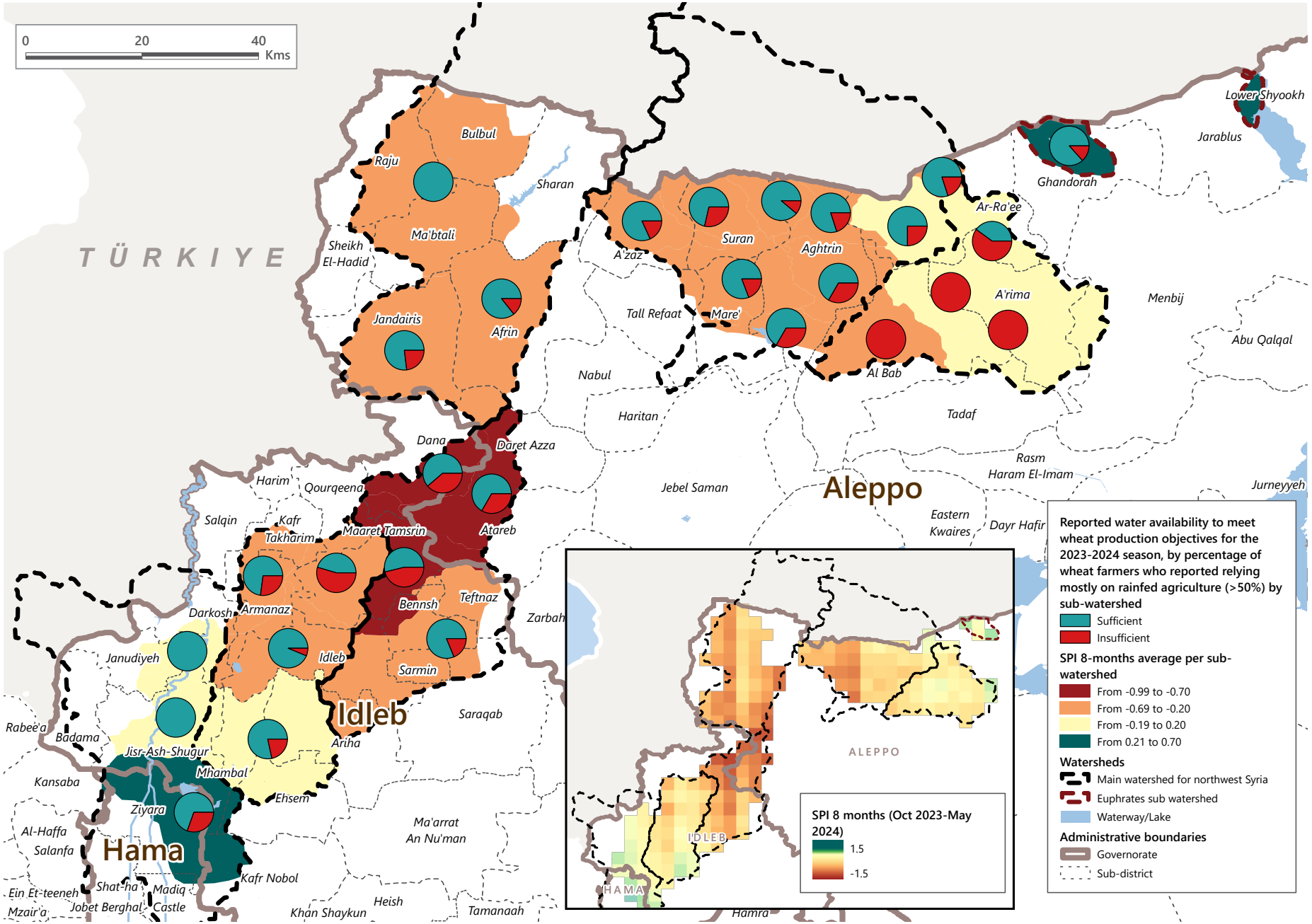
During the 2023-2024 agricultural season, fuel prices steadily increased, but its overall availability remained stable. Data from REACH's Joint Market Monitoring Initiative (JMMI) indicated a consistent rise in the cost of monitored fuel components across both fuel stations and the black market (Figure 7).[23] Despite this, the vast majority of KIs (94%) confirmed that fuel availability was sufficient to meet production objectives in their sub-districts. Additionally, most KIs (86%) noted that fuel availability in their sub-district was comparable to the previous season, with a minority (11%) even reporting an increase.

While the stability in fuel availability likely mitigated disruptions to agricultural activities, the rising fuel costs could strain farmers' profit margins, potentially impacting their business sustainability and decision-making for future planting seasons.

Figure 7: Changes in median petrol and diesel unsubsidised and black market prices in NWS during the 2023-2024 agricultural season, measured in TRY, as tracked by REACH JMMI



Map 5: Average Standard Precipitation Index (SPI) (2017–2024) by sub-watershed (please refer to the Assessment methodology section for more details on the SPI calculation) and reported water availability to meet wheat production objectives for the 2023-2024 season, by percentage of wheat farmers who reported relying mostly on rainfed agriculture (>50%) per sub-watershed



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Post-harvest losses

One-third (33%) of farmers reported experiencing post-harvest losses (Figure 8), with the highest incidence in Idleb (45% of respondents there), compared to Aleppo (24%) and Hama (2%). Among those affected, most (61%) reported losing less than 40% of their harvest, while a significant 34% lost half or more—predominantly in Idleb.

The high costs of harvest-related expenditures create financial pressure that can force farmers to compromise on essential post-harvest activities. Farmers may delay harvesting because they cannot afford machinery or labor at the optimal time, leaving crops vulnerable to over-ripening or adverse weather. Transportation costs can delay the movement of harvested crops to storage or markets, increasing the likelihood of spoilage. Additionally, many farmers may be unable to invest in proper storage facilities, leaving their produce susceptible to pests, moisture, or contamination. Financial constraints also limit post-harvest handling activities, such as drying, sorting, or packaging, further reducing the quality and marketability of the harvest. These compounding effects not only heighten the risk of losses but also undermine the profitability and sustainability of agricultural operations.

Figure 8: Share of interviewed wheat and/or barley farmers in NWS who reported incurring into post-harvest losses during the 2023-2024 agricultural season

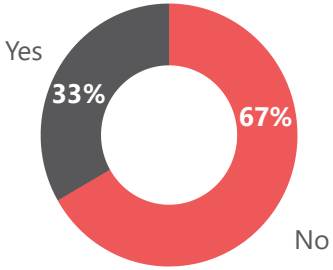


Table 13: Top 3 reasons for post-harvest losses, by percentage of respondents who reported incurring into post-harvest losses

	Total
High costs of harvest related expenditures	87%
Limited access to markets	28%
Transportation challenges	13%

Marketing strategies

Data on production management and farmers' marketing strategies reveal notable geographical differences, with **farmers in Aleppo employing more diverse output management strategies, while the vast majority in Idleb and Hama report selling their entire harvest immediately** (Table 14).

This contrast in marketing behavior reflects differing economic approaches and potentially varying levels of financial security across the governorates. In Idleb and Hama, the tendency to sell all of the harvest immediately is likely driven by the need for quick cash flow, suggesting heightened financial pressures or limited access to storage facilities or credit systems that could enable farmers to wait for more favorable market conditions. Conversely, the more varied strategies in Aleppo—where nearly half of the farmers sell part of their harvest while storing the rest—indicate greater economic resilience or a more strategic approach to marketing. Moreover, the practice of reserving part of the harvest for next season's seeds in Aleppo suggests a focus on sustainability and self-reliance in farming practices.

On the other hand, while marketing strategies show regional differences, **the marketing channels farmers relied on to sell their wheat harvest reveal the overwhelming dominance of private traders as the primary intermediary** (Table 15).

Table 14: Top 5 most frequently reported wheat and barley marketing strategies, by percentage of respondents per governorate

	Aleppo	Idleb	Hama
Sold immediately all of the harvest	43%	92%	70%
Sold immediately only part of the harvest	38%	8%	21%
Stored part of the harvest for next season's seeds	44%	2%	14%
Used part of the harvest for home consumption	18%	0%	15%
Stored part of the harvest to sell it later when prices will be more favourable	18%	5%	6%

Table 15: Most frequently reported wheat and barley marketing channels, by percentage of respondents per governorate

	Aleppo	Idleb	Hama
Traders	91%	85%	77%
Syrian Public Establishment for Grain (SPEG)	2%	7%	58%
General Organisation for Seed Multiplication (GOSM)	3%	6%	0%
Local households	2%	6%	2%

Costs and Profits

The selling price of wheat and barley displayed notable geographical variations, likely influenced by the diversity of marketing channels and buyers farmers engaged with across governorates. In Aleppo and Idleb, most farmers reported selling their outputs at private market prices, while in Hama, the majority sold at government-fixed prices. This difference in market dynamics highlights distinct economic conditions and opportunities for farmers in these regions.

KIs highlighted disparities in pricing trends, with Aleppo reportedly experiencing upward selling prices that could be more favorable for farmers, while sub-districts in Idleb and Hama appeared to face declining trends. A significant portion of KIs in Idleb and Hama indicated decreases in both government-fixed prices (10/18 of all KIs interviewed across the two governorates) and private market prices (11/18) in their sub-districts compared to the previous season. In contrast, KIs in Aleppo more frequently reported price increases, with the majority observing higher government-fixed prices (8/17 of all KIs interviewed in Aleppo governorate) and higher private market prices (8/17).

The hypothesis that farmers in Aleppo benefit from more stable and favorable macroeconomic conditions, as well as better financial security, is reinforced by reported economic performance, with **the majority of farmers in Aleppo covering production costs and generating profit, while most in Idleb and Hama reported economic losses during the 2023-2024 agricultural season** (Map 6). Factors such as better access to inputs, greater financial stability, and the ability to diversify their marketing strategies likely enable them to maximize revenue.

The reported wheat production plans for the upcoming season reveal a considerable georgraphical divergence of intentions, and reflects stark differences in the economic viability of wheat farming across the governorates (Map 7). Farmers in Aleppo most commonly reported plans to increase their wheat production for the next agricultural season (38%), followed by those intending to maintain the same production level (31%). In contrast, farmers in Idleb and Hama primarily reported plans to decrease wheat production in favor of planting other crops (37% and 28%, respectively). This trend underscores the economic unsustainability of wheat farming in Idleb and Hama compared to Aleppo, where conditions appear to be more favorable for sustaining and even expanding wheat production.

Table 16: Most frequently reported wheat and barley selling price regimes, along with reported changes in overall cost structure and economic performance (profit or loss) during the 2023-2024 agricultural season, by percentage of respondents per governorate.

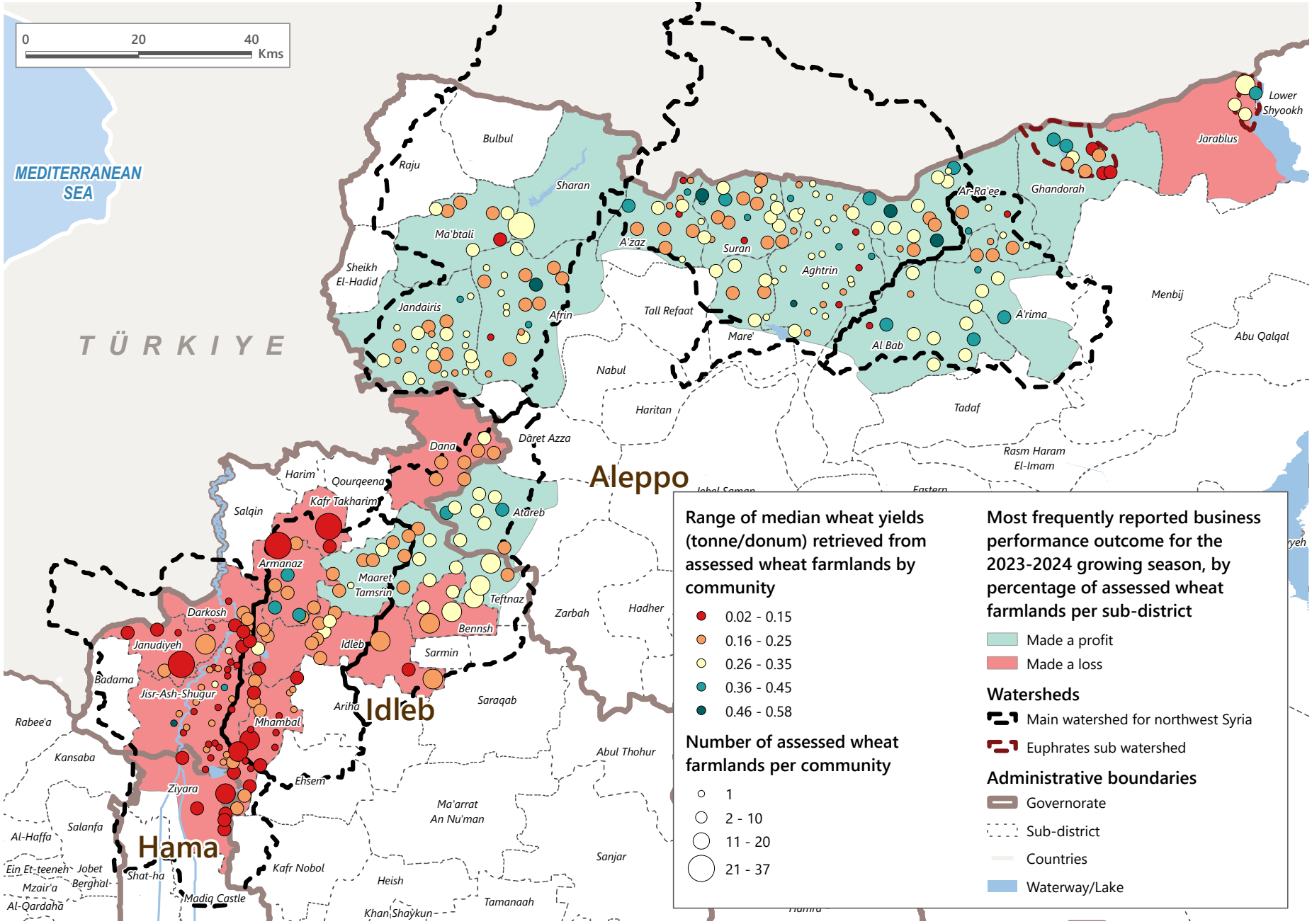
	Aleppo	Idleb	Hama
Reported pricing regime for wheat and barley sales during the 2023-2024 season			
Market price	93%	87%	25%
Mix of market price and price fixed by authorities	6%	2%	23%
Price fixed by authorities	1%	11%	52%
Reported change in overall production costs compared to previous season (2022-2023)			
Increased	66%	72%	98%
Remained the same	29%	24%	0%
decreased	5%	4%	2%
Reported economic performance for the season (2022-2023)			
Made a loss	14%	65%	98%
Breakeven	15%	13%	0%
Made a profit	70%	22%	2%

42% **of farmers interviewed across NWS reported that their revenues did not cover production costs,** with the top five sub-districts reporting the highest shares of losses located in Hama and Idleb Governorates: Ziyara (98%), Jisr-ash-Shugur (97%), Darkosh (79%), Mhambal (78%), and Bennsh (73%).

Table 17: Median governorate production costs[25] per donum of wheat and/or barley farmland for the 2023-2024 agricultural season, by cost category and overall, in US Dollars (USD/Donum)

Governorate	Fertilisers	Herbicides	Seeds	Fuel	Labour	Electricity	Transportation	Machinery	Rent	Taxes	Total
Aleppo	10	3	9	10	6	5	5	3	11	2	**88**
Idleb	13	5	10	7	14	10	4	5	47[24]	3	**120**
Hama	11	6	12	9	11	10	2	0	35	2	**99**

Map 6: Wheat yields and reported business performance of wheat farmlands during the 2023-2024 wheat growing season



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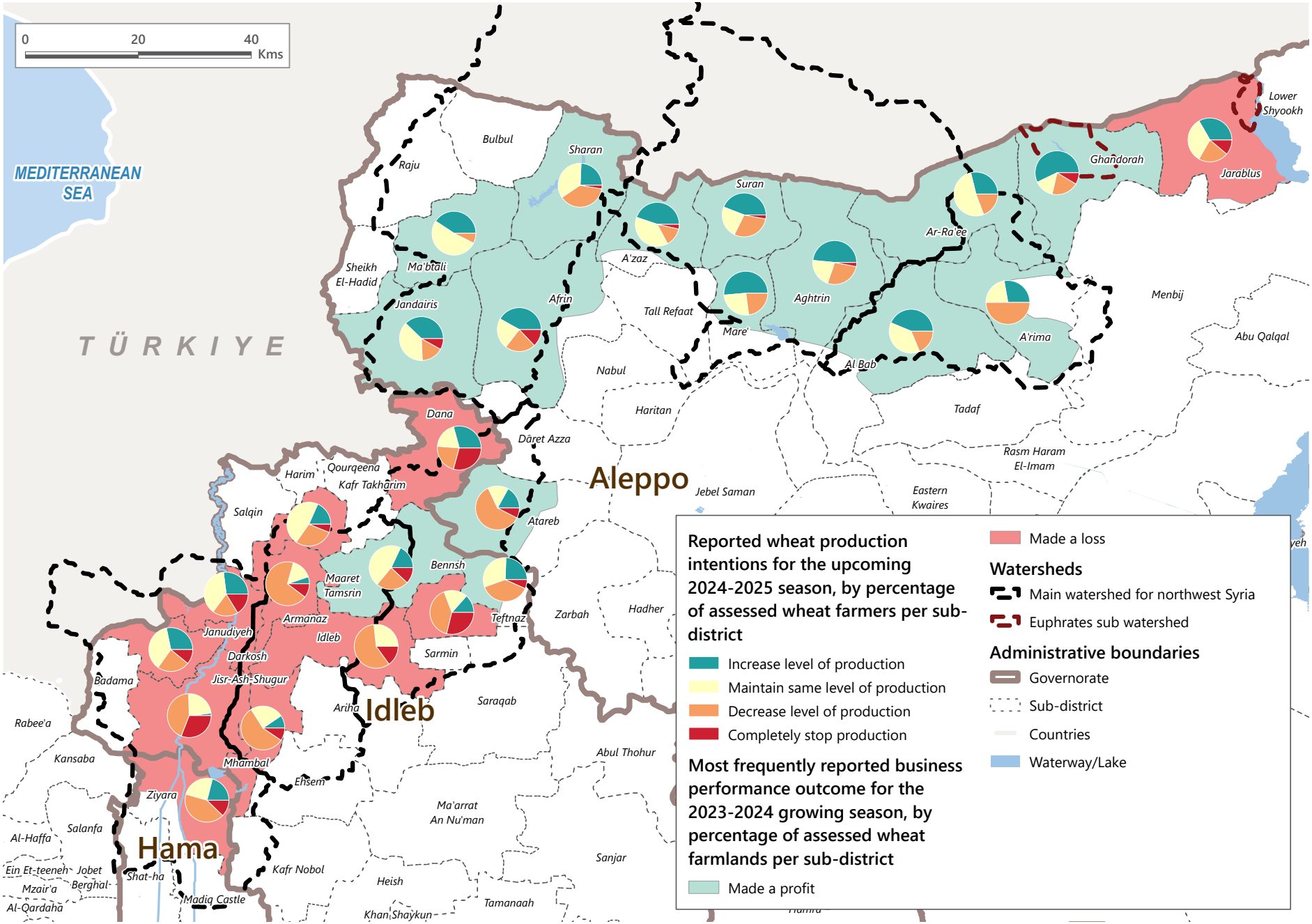
Map 7: Business performance of wheat farmlands and reported wheat production intentions for the next season (2024-2025)



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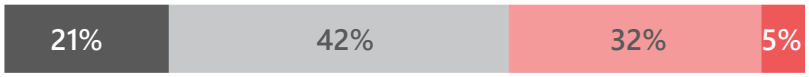
Coping mechanisms

Table 18: Top 4 coping mechanisms most commonly reported by wheat and/or barley farmers in response to challenges faced during the 2023-2024 agricultural season, by percentage of respondents per governorate and overall

	Aleppo	Idleb	Hama	Overall
Took on additional debt	25%	55%	77%	42%
Household members help in agricultural activities	24%	25%	42%	25%
Planted alternative crops	16%	17%	15%	16%
Reduced expenses on agricultural production	6%	17%	18%	12%

61% **of farmers in NWS who reported facing a loss during the 2023-2024 agricultural season also indicated that they took on additional debt during the year to cope with the challenges they encountered.**

Figure 9: Extent of reliance on additional debt as a coping mechanism, by percentage of respondents who reported taking on debt



The great majority (90%) of farmers in NWS reported engaging into some coping strategies during the 2023-2024 agricultural season. Notably, the majority (61%) of farmers in NWS who experienced a loss reported taking on additional debt to manage the challenges they faced. This suggests that **a significant portion of agricultural businesses are becoming increasingly impoverished. This trend is particularly pronounced in Hama and Idleb governorates, where the incidence of economic loss and debt accumulation is notably higher.** This points to the potential emergence of a vicious cycle of poverty, where the need to incur more debt to cover losses may further hinder farmers' ability to recover and invest in their businesses.

On the other hand, the smaller proportion of respondents reporting reductions in agricultural expenses, compared to those who took on additional debt, may indicate a certain level of inelasticity in essential inputs, suggesting that farmers are reluctant to compromise on the quality and quantity of inputs required for production.

Assistance received and preferred modalities

Figure 10: Percentage of overall wheat and/or barley farmers reporting receipt of assistance during the 2023-2024 agricultural season, by source of support

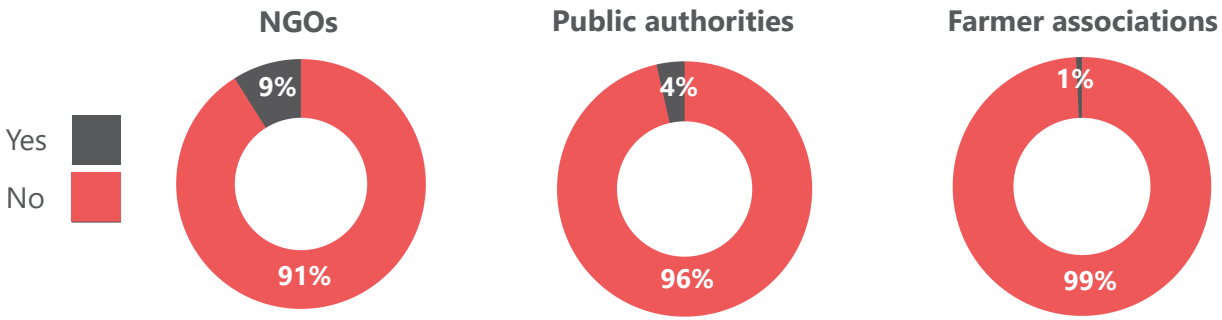


Table 19: Top 3 assistance modalities most frequently indicated as preferred by respondents if assistance were to be provided, shown by percentage of overall respondents

Cash support for agricultural inputs (seeds, fuel, fertiliser, pesticides)	83%
In-kind support for agricultural inputs (seeds, fuel, fertiliser, pesticides)	62%
Cash to pay agricultural labourers	37%

Assessment methodology

The assessment aimed to evaluate the 2023-2024 wheat and barley agricultural season in NWS. It focused on identifying production trends, challenges encountered by farmers—especially those related to climate factors and critical inputs such as seeds, fertilizers, pesticides, fuel, and water—, coping mechanisms adopted, and the overall financial status of farmers. The findings were intended to inform FSL coordination and partners' planning and advocacy efforts for the upcoming agricultural season to ensure ongoing support for agricultural livelihoods and food systems in NWS. Due to this purposive sampling approach, findings from this assessment should be interpreted as indicative only.

Methodologies

The assessment employed a mixed-methods approach, including 1,355 quantitative individual interviews (IIs) with wheat and barley farmers, conducted between September 22 and 30, 2024, and 35 structured key informant (KI) interviews with agricultural authorities and experts, conducted between October 30 and 31, 2024. Additionally, the study incorporated remote sensing data analysis and a desk review of secondary sources.

Geographical coverage

Data collection was carried out in 27 sub-districts in Northwest Syria (NWS). Surveys were conducted both in-person and remotely via telephone when necessary. Sub-district selection was undertaken in collaboration with the NWS Food Security Cluster based on several criteria:

- **Agricultural Prioritization:** Sub-districts with the largest absolute agricultural land areas and those with a high proportion of agricultural land relative to total land area were prioritized
- **Agro-Ecological Representation:** The selection ensured representation across agro-ecological zones 1-5, which are characterized by shared environmental factors like rainfall that significantly influence agricultural production.
- **Watershed Inclusion:** Croplands within the six watershed catchment areas identified by REACH GIS specialists were included to ensure comprehensive geographical coverage.

Sampling approach

Given the absence of farmer lists required for representative sampling, a purposive sampling approach was used. A target quota of 60 farmer surveys was established per sub-district, with adjustments made to a minimum of 30 surveys in contexts with operational constraints. The purposive sampling strategy aimed to capture a diverse range of farmer profiles based on the following inclusion criteria:

- Farmers who cultivated wheat and/or barley during the 2023/2024 agricultural season.
- Farmers managing at least 10 donums of land to ensure that farming constituted their primary livelihood.
- Farmer selection deliberately excluded beneficiary lists to mitigate selection bias.

For the KIs, at least one agricultural expert was interviewed per sub-district to triangulate findings from the farmer surveys. A purposive sampling strategy ensured that the most knowledgeable stakeholders in Syria's agriculture sector were included.

Remote sensing

Agricultural land was identified using a combination of cropland extent layers (UNOSAT cropland extent 10m, 2020-2023) and ALOS landform data, with a focus on upper and lower slopes, riverbeads, and valleys—landforms closely linked to agricultural activities. **NDVI** values were aggregated for each community using a 4km buffer around community boundaries. A Kruskal-Wallis H test was conducted to assess if there were significant differences between the NDVI changes associated with each group of farmer responses. A post-hoc test followed to identify specific pairwise differences. To further refine the analysis, one key improvement would be to integrate crop type maps to exclude non-wheat crops. This adjustment would ensure that NDVI changes are directly attributed to wheat productivity, avoiding the influence of other crops' growth cycles.
The **Standard Precipitation Index (SPI),** developed by McKee et al. (1993), is a drought indicator that quantifies, for specific time intervals (e.g., monthly or over multiple months), how much precipitation deviates from normal conditions based on long-term historical data with positive values indicating wetter-than-normal and negative values indicating drier-than-normal conditions. For this analysis, precipitation data was derived from the Climate Hazards Group InfraRed Precipitation with Station Data, Version 2.0 Final (CHIRPS), which spans from 1981 to the present, and is available a 0.05° (~5.5 km) spatial resolution, as shown in the inset map of Figure 7. The SPI was calculated for an 8-month accumulation period from October 2023 to May 2024 (growing season) and averaged for each watershed.

Endnotes

1) ACLED (November 2024), "Syria: The Syrian regime intensifies attacks on opposition-held areas in the north"
2) Relief web: Statement by David Carden, Deputy Regional Humanitarian Coordinator for the Syria Crisis, on the escalation of hostilities in north-west Syria, 17 October 2024
3) REACH (October 2024), "Joint Market Monitoring Initiative (JMMI) - NWS - October 2024", REACH Resource Centre
4) REACH (October 2024), "Joint Market Monitoring Initiative (JMMI) - NWS - October 2024", REACH Resource Centre
5) REACH (October 2024), "Humanitarian Situation Overview - NWS - October 2024", REACH Resource Centre
6) PeaceRep (2024), "Gender Dynamics in Northwest Syria's Agri-Food Landscape", University of Edinburgh
7) IMMAP (November 2023), "Crop Monitoring and Food Security Situation Report in Northwest Syria - Wheat and Barley", NWS FSL Cluster
8) REACH (June 2023), "Humanitarian Situation Overview - NWS - June 2023", REACH Resource Centre
9) REACH (February 2024), "Humanitarian Situation Overview - NWS - February 2024", REACH Resource Centre
10) Mercy Corps (May 2024), "Multi Sectoral Needs Assessment in Northwest Syria" - Not published
11) IMMAP (November 2023), "Crop Monitoring and Food Security Situation Report in Northwest Syria - Wheat and Barley", NWS FSL Cluster
12) OCHA (December 2024), "The Whole of Syria Flash Update No. 4 - Recent Developments in Syria (As of 10 December 2024)", ReliefWeb
13) A donum (or dunam) is a unit of area measurement traditionally used in Syria and other countries in the Middle East; 1 donum is equivalent to 1000 m^2
14) The median yields by governorate were calculated by determining the median yield of all the assessed farms within each respective governorate, rather than averaging the medians of individual sub-districts. This methodology ensures that the calculation reflects the overall distribution of yields within each governorate, avoiding potential bias from sub-district variations and providing a more reliable representation of central tendencies.
15) IMMAP (November 2023), "Crop Monitoring and Food Security Situation Report in Northwest Syria - Wheat and Barley", NWS FSL Cluster
16) REACH (October 2024), "Joint Market Monitoring Initiative (JMMI) - NWS - October 2024", REACH Resource Centre
17) Food Security and Livelihood Cluster, Agriculture Technical Working Group (ATWG) (September 2024), "Evaluation of Sewage Water Use in Agricultural Operations in Northwest Syria (NWS), Gaziantep, Türkiye
18) REACH (February 2024), "Humanitarian Situation Overview - NWS - February 2024", REACH Resource Centre
19) MODIS vegetation indices; computed in Googl Earth Engine (GEE); Monthly aggregation; Spatial resolution: 250m
20) MODIS Land Surface Temperature, anomaly of temperatures compare to the average of last 20 year; Monthly aggregation; Spatial resolution: 1km
21) CHIRPS; computed in GEE, sum of rainfalls, anomaly compare to historical average of last 20 years; Monthly aggregation; Spatial resolution: 5.5km
22) CHIRPS; computed in GEE; Monthly aggregation; Spatial resolution: 5.5km
23) REACH (October 2023), "Joint Market Monitoring Initiative (JMMI) - NWS - October 2024", REACH Resource Centre
24) Idleb and Hama governorates were found to have significantly higher median rent costs compared to Aleppo, likely due to differences in farmland ownership patterns. In Aleppo, nearly all respondents (95%) reported owning their farmland, with only a small minority (5%) indicating they rented land. Owned land typically incurred either no rent costs or minimal costs, contributing to a lower median rent value. Conversely, Hama and Idleb saw substantially higher rates of land renting (33% in both governorates). These higher levels of rented farmland were associated with elevated rent costs, thereby increasing the median rent value at the governorate level.
25) The median costs by governorate were calculated by determining the median cost of all the assessed farms within each respective governorate, for each cost category, rather than averaging the medians of individual sub-districts. This methodology ensures that the calculation reflects the overall distribution of yields within each governorate, avoiding potential bias from sub-district variations and providing a more reliable representation of central tendencies.

ABOUT REACH

REACH Initiative facilitates the development of information tools and products that enhance the capacity of aid actors to make evidence-based decisions in emergency, recovery and development contexts. The methodologies used by REACH include primary data collection and in-depth analysis, and all activities are conducted through inter-agency aid coordination mechanisms. REACH is a joint initiative of IMPACT Initiatives, ACTED and the United Nations Institute for Training and Research - Operational Satellite Applications Programme (UNITAR-UNOSAT).