



# Assessing Investment Needs in Ukraine's Agricultural Reconstruction and Recovery

## Executive summary

- While the war in Ukraine is ongoing and its outcome yet unclear, the damage to its agriculture and agrifood sector is already of an unprecedented scale, both in terms of the impact on the national economy and on global food security.
- Reconstruction and rehabilitation plans for Ukrainian agriculture are **urgently needed** in order to mitigate the impact of the war domestically and internationally but their successful implementation will depend on the **achievement of stable and long-lasting peace**.
- Damage caused by war to a country with an agricultural output and exports as significant as that of Ukraine is **unparalleled since the Second World War**. Current damage to infrastructure is estimated in the range of **USD 68-199 billion** and the economy is expected to shrink by 40 percent in 2022.
- Reconstruction and rehabilitation costs of Ukrainian agriculture due to loss and damage resulting from the Russian aggression on the country **will most likely exceed the similar estimated costs following the armed conflict in Syria**, considering the complexity of its food system (including export infrastructure) and billions of USD in lost revenues from exports.
- **Damages** are defined as totally or partially destroyed physical assets and stocks, while **losses** are calculated in terms of forgone output and incomes as a result of the war.
- The total value of capital stock in Ukrainian agriculture (including down- and upstream sectors) is estimated at **USD 29 billion**. The potential direct damage to agriculture assets can initially be estimated at **USD 6.4 billion** (this includes destroyed irrigation infrastructure, storage, machinery and other agricultural equipment, in-port infrastructure, greenhouses, field crops, livestock and processing units).
- The additional expected economic losses from the war in 2022 are estimated at about **USD 22 billion**.
- FAO's International Financial Institutions partners (World Bank, EBRD) have already pledged **USD 3 and 2 billion** respectively for recovery in Ukraine. However, it is clear that actual recovery and investment needs **will be far higher in agriculture and the agrifood industry alone**.
- Any agricultural investment/recovery plan will need to be a part of the national recovery strategy, and will need to be based **on pre-disaster baseline, damage and loss assessments** followed by an **assessment of recovery investment needs**. Tentative priority areas to be covered by a recovery and investment plan for Ukrainian agriculture will likely include support to rural households and food security, liquidity and access to finance, de-mining, critical inputs supply, seed production and livestock breeding, compensation for lost assets and other areas of immediate and long-term development needs.

## Setting the scene

While the military outcome of Russia's Federation invasion of Ukraine which started on 24 February 2022 is yet unclear, it is becoming evident that the political and economic implications, not only for Ukraine but for the whole world, are already enormous and will be long-lasting. Globally, the food security of hundreds of millions of people in a large number of low-income grain-importing countries is threatened. Ukraine has been an increasingly important global supplier of grains and vegetable oils, which is now at high risk and facing uncertainties in keeping up with this role due to the unfolding war. Locally, agriculture has been a backbone of Ukraine's economy, generating 20-22% of the country's GDP (if up- and downstream sectors are accounted for) and more than 40% of total export revenues. Therefore, the unfolding war is expected to have a far-reaching crack-down effect on Ukraine's economic growth and global food security. The damage to the country's infrastructure has already exceeded an unprecedented scale of more than **USD 68<sup>1</sup>-119 bn** and the economy is expected to **shrink by as much as 40%<sup>2</sup> in 2022**.

Reconstruction and investment plans for agriculture would be critically important to mitigate the scale of war effects at local and global levels. However, any plan will depend on long-lasting peace. It is clear that investment will not flow under uncertainties on the control of sovereign territory, access to ports and markets, market infrastructure, domestic consumption based on the return of refugees and internally displaced people, the resumption of usual business activities and many other conditions.

Investment needs in agriculture rehabilitation and recovery will also need to be integrated in the national economy reconstruction plans and strategies that, amongst others, include physical infrastructure, transportation, housing, industry and other areas outside of FAO's direct mandate.

## Major reconstruction plans: a historical reference

Since the Second World War, there is no comparable precedent of a country at war, whose agricultural sector is of a global significance similar to that of Ukraine. This is due to the facts that Ukrainian agriculture plays a key role in (i) the country's economy (20-22% of GDP, including upstream and downstream, and 40% of exports revenues) and (ii) as a major exporter of staple crops such as wheat, maize and oilseeds, which have a vital function in ensuring the food security of millions across the globe. The effects of the ongoing war in Ukraine are thus of an unprecedented scale not only with respect to the country's own economy, but also to global food security. The latter is further compounded by the reduction of export of the same commodities from Russia, as well as by the increase in oil and fertilizer prices.

This suggests that reconstruction and recovery efforts in Ukraine – especially with respect to the agrifood sector – will also be of an unprecedented scale. Estimates of damages and losses and related reconstruction efforts due to armed conflicts in the last decades provide some possible comparisons.

For the first three years (1996-1999) after the war in Bosnia and Herzegovina, international donors collected USD 5.1 billion (equivalent to about 9.2 billion current USD) for the country's reconstruction. However, agriculture played a relatively limited role in the local economy at the time. Direct damages due to the bombing of Yugoslavia

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<sup>1</sup> <https://www.wsj.com/livecoverage/russia-ukraine-latest-news-2022-03-25/card/ukraine-suffers-63-billion-worth-of-infrastructure-damage-m2M06JsDdaao2gSMYz1S>

<sup>2</sup> <https://www.dw.com/uk/richne-padinnia-ekonomiky-ukrainy-mozhe-siahnuty-40-vidsotkiv-minekonomiky/a-61340071>

in 1999, in turn, were estimated at USD 3.8 billion while total damages and losses in 2006 were estimated at USD 29.6 billion (including indirect economic damage, loss of human capital, and loss of GDP). Although agriculture was significant to the country's economy, contributing 18% to GDP in 1999, the value which it generated in absolute terms (USD 2.4 billion) was much lower than in today's Ukraine.

Damages and losses in agriculture due to the conflict in Syria might provide a more relevant comparison. In 2011, the agricultural GDP of the country was close to USD 49 billion, accounting for 20% of total GDP (USD 252 billion). In 2017, FAO estimated the overall financial cost of damage and loss in the agricultural sector over the 2011–2016 period at about USD 16 billion, which is equivalent to more than one third of Syria's GDP in 2016. This being said, it is very likely that the loss and damage that Ukrainian agriculture and the country's agrifood sector are currently undergoing will be of a much larger scale, considering the country's significance as an exporter, the complexity of its food system and export infrastructure which is being affected and the resulting loss of revenues from exports (according to FAOSTAT, Syria's total agricultural products exports in 2010 amounted to USD 2.55 billion, compared to USD 22 billion in the case of Ukraine in 2020).

## Scale of agricultural damages and losses

This note largely follows the FAO methodology on defining and calculating agricultural damages and losses<sup>3</sup>, including the following definition of damages and losses:

- **Damages** refer to the replacement/repair cost of totally or partially destroyed physical assets and stocks in the areas affected by war. At this preliminary stage we rely on a publicly available formation on capital stocks by sectors as a proxy to be used in damages calculations;
- **Losses** are calculated in terms of the changes in economic flows arising from the war, including forgone output and income.

Damages and losses are considered along the entire food supply chain, i.e. agriculture and down- and upstream sectors (agricultural inputs supplies, processing and trade).

**Key assumptions.** At this early stage, the calculations in this note are rather preliminary and are based on the publicly available information of capital stocks and maps with respect to the territories that directly suffer losses and destruction (e.g. primarily temporarily occupied territories of Ukraine and fighting areas see the Annex for more details). Clearly, multiple shellings of territories that are not occupied also damaged agricultural infrastructure and supply chains. Nevertheless, it is difficult to evaluate the scale of damages without additional information and assessments. It is estimated that up to 20% of the territory (farmland) of Ukraine may be currently affected, or about 4-5 mln ha of farmland. In particular the regions and corresponding affected areas of active military activities are the following: Kyiv region ~ 25%, Zhytomyr region ~ 10%, Chernihiv region ~ 50%, Sumy region ~ 70%, Kharkiv region ~ 20%, Kherson region ~ 100%, Zaporizhzhia region ~ 50%, in addition to the Donetsk and Luhansk regions which have been affected by war since 2014.

As a next step we used information on registration of a total of 56.3 thousand enterprises in agriculture, food processing, warehouses and wholesale enterprises in the agri-industrial sector to spatially identify and classify the

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<sup>3</sup> FAO (2022). Unpublished report on Current FAO emergency assessment work in Ukraine and explanation of Damage and Loss methodology

enterprises as potentially affected by the war. **Overall, 10.5 thousand or 18.6% of all enterprises were identified as located in the regions immediately affected by fighting in Ukraine** (see Table 1 in the Annex). As about 40% of agricultural output in Ukraine is produced by unregistered small farms<sup>4</sup> that are missing from the official registers, we further adjusted total agricultural output by a corresponding adjustment factor. It is difficult to undertake a similar adjustment for a capital stock of unregistered smallholder farms.

### **A. Damages**

Potential estimated agricultural supply chain damages are currently estimated **to be about USD 6.3 bn**. This could be considered as a conservative estimate of possible estimated damages, as it does not include capital stock of informal smallholders located in war-affected regions<sup>5</sup>.

### **B. Losses**

Forgone output and incomes due to the war could be estimated using different approaches and tested for consistency. Building upon the approach above, which takes into account spatial heterogeneity of the areas affected across the regions, the expected output loss (in 2020 prices) amounts to **USD 12 bn**, including agriculture alone at about **USD 6.5 bn or 20% of total agricultural output in 2020**. This could be adjusted for agri-food output and price growth in 2021 (21.85%<sup>6</sup> and 14.4%<sup>7</sup> respectively), the estimated losses amount to **USD 16.7 bn**. In 2022 prices that are believed to be more than 30% higher than in 2021 and assuming no increase after a record 2021 harvest, estimated output losses could reach **USD 22 bn** in 2022.

Ukraine's GDP was USD 200.2 bln in 2021 and the aggregated contribution of agriculture was estimated at 22% or USD 44 bln. Projected real growth in 2022 was expected to be at 3.4% and inflation at 5%<sup>8</sup>, i.e. 2022 GDP should have been about USD 217.14 bln and agri-food GDP about USD 47.8 bln. The IMF projects Ukraine's economy to shrink by 10%, but the recession can be at 25-35%<sup>9</sup> if the war continues longer throughout the year<sup>10</sup>. EBRD expects Ukraine's GDP to drop by 20% in 2022<sup>11</sup>. This means **USD 4.4 to 15 bn** of income losses for agriculture and

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<sup>4</sup> Nivievskiy, O., Iavorskiy, P., and Donchenko, O. (2021). Assessing the role of small farmers and households in agriculture and the rural economy and measures to support their sustainable development. A study commissioned by the EU SAFPI Project <https://kse.ua/wp-content/uploads/2021/02/KSE-Smallholders.pdf>

<sup>5</sup> While about five million rural households (those that reside in rural areas and own land) accounted for 37% of agricultural output in 2020, the estimates of their agricultural assets/capital are not readily available. The latest available estimates from the State Statistics Service of Ukraine (2017) suggested that 19% of rural households owned agricultural machinery, 10% had machinery sheds and 59% had farm buildings with a substantial variation between the regions. The estimates of damage and losses in this important farm category would need to be made separately at a later stage.

<sup>6</sup> 2021 food prices index from the World Bank Commodity market outlook <https://www.worldbank.org/en/research/commodity-markets>

<sup>7</sup> Ukrstat

<sup>8</sup> <https://bank.gov.ua/ua/news/all/u-2022-rotsi-zrostannya-ekonomiki-prishvidshitsya-do-34-inflyatsiya-spovilnitsya-do-77-ta-povernetsya-do-tsili-5-u-2023-rotsi--inflyatsiy-niy-zvit>

<sup>9</sup> <https://www.reuters.com/world/europe/ukraine-economy-could-shrink-by-third-due-russia-invasion-imf-report-says-2022-03-14/>

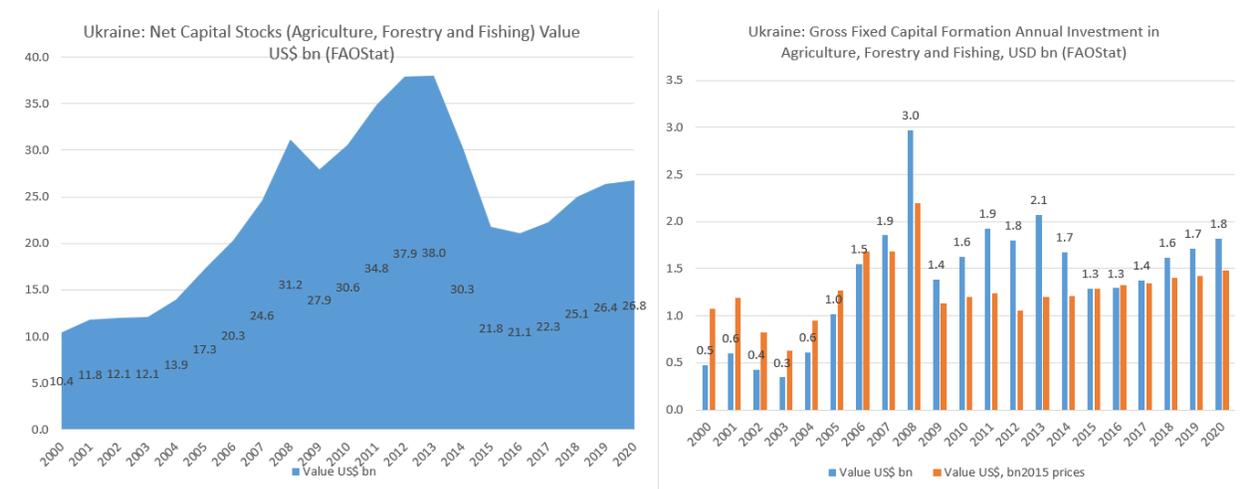
<sup>10</sup> the Ministry of Economy expects a 40% reduction of GDP

<sup>11</sup> <https://www.ebrd.com/news/2022/ebrd-sees-war-on-ukraine-causing-major-growth-slowdown.html>

related sectors (assuming 10 and 30% GDP losses, correspondingly) which is consistent with the expected revenue losses indicated above<sup>12</sup>.

## Agricultural investment: status prior to invasion

Following the annexation of Crimea by the Russian Federation and the war in Donetsk and Luhansk regions in 2014 and a sharp depreciation of the national currency that have reduced the net value of Ukraine's agricultural capital stocks<sup>13</sup> by an estimated USD 16.9 billion from USD 38 billion in 2013 to USD 21.1 billion in 2016 (or 44%) based on FAO estimates of agricultural, forestry and fisheries capital stocks (graph on the left). However, as the country continued to realise its comparative advantage, exporting cereals, vegetable oil and other products, farmers continued to invest. The value of gross fixed capital formed in agriculture, forestry and fisheries (an indicator often used to describe physical investment flows) increased, and as of 2020, the net value of agricultural capital in Ukraine was estimated at nearly USD 27 billion (left graph below) with investment steadily increasing from USD 1.3 billion in 2015 to USD 1.8 billion in 2020 (right graph below).



Source: FAO Stat

Commercial/corporate farms have been mostly investing in modern agricultural machinery, precision farming technologies, better livestock and poultry technologies while smaller farmers have invested in vegetable production, including modern greenhouses, fruit, in-field irrigation, livestock and other activities. It is very likely that the estimates above underestimate investment made by rural households and small family farmers as they are largely part of the informal economy.

<sup>12</sup> i.e. value added is lower than revenues

<sup>13</sup> Net capital stocks correspond to the value of gross capital stock minus depreciation

<https://www.fao.org/3/cb1080en/CB1080EN.pdf>

## Cases and examples of damage

Information on specific cases of damage to agricultural, food production, storage and market infrastructure is not yet complete and requires verification. This section provides a summary of publicly available information with limited verification conducted through agro-industry associations in Ukraine. The damage reported so far has been wide-ranging from the entire food supply chain: inputs and machinery supply, production, storage, distributions and food retail:

- damage and theft of agricultural machinery, equipment (tractors, sprayers, combine harvesters, trucks, etc.) and greenhouses, including damage from mines to agricultural machinery and operators;
- loss of dairy and swine animals due to indiscriminate shelling and/or deliberate killing;
- damage to agricultural research facilities in Southern Ukraine;
- damage to six grain silos;
- theft of grain loaded for exports from the port of Berdyansk,
- damage to vessels waiting to be loaded with grain
- destroyed food warehouses with poultry meat, meat and vegetables;
- damaged, suspended or limited production at about 16 meat processing facilities ( Kyiv, Kharkiv, Donetsk, Chernihiv); 6 oilseed crushing plants (Kharkiv, Donetsk, Zaporizhia, Kherson); 12 bakeries (Chernihiv, Sumy, Kharkiv, Zaporizhia, Luhansk, Donetsk); 6 flour millers (Chernihiv, Kharkiv, Kherson, Kyiv), 3 milk processors (Sumy, Chernihiv, Kyiv) and 6 confectionery producers (Kyiv, Sumy, Kharkiv)
- numerous destroyed and looted food retail stores in all war-affected area that belong to all major retail chains and independent store operators.

A thorough damage assessment review will need to be conducted using FAO methodology for an accurate damage estimate.

## Agricultural investment/recovery plans: approach and main components

FAO will work closely with its investment and financial partners, such as the World Bank and the European Bank for Reconstruction and Development that have already pledged USD 3 and 2 billion for the recovery of Ukraine. However it is clear that actual recovery and investment needs will be much higher than this initial commitments in agriculture and the agrifood industry alone.

Any agricultural investment/recovery plan will need to be a part of the national recovery strategy, and will need to be based on a well-defined pre-war baseline, damage and loss assessments followed by an assessment of recovery needs and required respective investment. It will also include short and medium terms goals and priority areas.

While it is early to consider developing investment plans, considering the extent of the war and its impact on a complex food system such as the one in Ukraine, a post-war recovery plan for Ukrainian agriculture will likely include the following main components:

**Support to rural household, incomes and food security.** Support efforts will need to be aimed at supporting food supply and demand. On the supply and farmers' income side, currently, about 12,000 hectares of summer greenhouses in Southern Ukraine are under the occupied territories in Kherson, Zaporizhzhia and Donetsk regions and therefore putting at risk an estimated USD 100 million from the sale of early spring vegetables due to broken logistics chains and the inability of small farmers and households to sell products. These farmers will likely experience issues with irrigation for all crops and face issues with the production of and sale of onions (about half of Ukraine's production of onions worth 80-100 million dollars in wholesale prices) as well as of high-value crops like grapes, peaches and apricots. Smallholder farmers will most likely require investment/ matching grants support and/or agricultural input packages (seeds, fertilizers, breeding animals/poultry).

On the demand side, according to official Ukrainian statistics, an average household **spent a considerably high 49%** of income on food with meat, bread and dairy products constituting the bulk of expenses in 2020. Considering sharp drop in consumer incomes, reduced consumption based due to the outflow of refugees, it will be critically important to support consumers through targeted social programmes, food assistance programmes, local procurement and school meal programmes.

### **Supporting liquidity of farmers and access to finance**

The Ukrainian commercial farmers are often heavily indebted to input suppliers or banks. Consequently, most credit is extended as seasonal loans and is commonly reserved for the purchase of inputs. Due to the disruption of agri-food exports (blockade of ports, licensing or export bans on certain products) and domestic supply chains, farmers cannot sell their stocks in order to finance the 2022 planting and repay their loans.

Three main export-oriented crops: wheat, maize and sunflower seed accounted for 57% of Ukraine's crop output by value. Before the war, about 9.5 mln tons of maize, 6 mln tonnes of sunflower and 4.5 mln tonnes of wheat were held as stocks in Ukraine with an estimated value of USD 8.3 billion, out of which 60% (**nearly USD 5 billion**) were held by commercial farms. This is equivalent to operating capital needs (complete spring crop planting, harvesting and rent) of roughly 8 million hectares in 2022. Without being able to sell stocks, farmers will face liquidity issues.

Financial institutions may also not be willing to extend loans to farmers as financing agriculture is often perceived as risky: commercial interest rates on UAH or USD denominated loans were often about 2% higher than average rates for other sectors before the war based on the National Bank of Ukraine's data. Thus, partial credit guarantees (for commercial farms) or matching grants (for small farms and households) may be an important tool for de-risking credit extended to agriculture.

**De-mining.** According to the United Nations Office for the Coordination of Humanitarian Affairs 'Ukraine is one of the most mined countries in the world' following the conflict in Eastern Ukraine in 2014. The most recent estimates of the Ukrainian Deminers Association suggest that close to 83,000 square km might currently be contaminated by different types of landmines. While it is not clear how much of this area is agricultural land, and what is the exact size of the area actually contaminated (as opposed to being suspected or under risk), the sheer size of the contaminated area suggests that the time and costs of demining will be of an extremely large scale. The cost of mine clearance in Kuwait in the 1990s was USD 961,538 per square kilometre (USD 700 million for a total of 728Km<sup>2</sup>). More recent experience from Croatia puts the cost of demining 1 sq km of land at around EUR 1.25 (USD 1.37). In turn, the cost of destroying one stockpiled anti-personnel mine was estimated at EUR 0.56 (USD 0.61). In 1996, according to the United Nations Mine Action Centre (now UN Mine Action Service), around

13,000 sq km of land were considered “suspected hazardous area” . Croatia has spent approximately EUR 450 million (USD 493 million) on demining since 1998, when the process was taken over by private contractors coordinated by the Croatian Mine Action Centre. The cost to complete the demining is estimated at EUR 500 million (USD 550 million) or more. **Considering these costs, the demining effort in Ukraine could cost several billion USD and possibly over USD 10 billion.**

### **Support to critical inputs supply, national seed production and livestock breeding**

Due to supply chain disruptions or physical damage to seed and breeding facilities, farmers may experience issues in procuring critical inputs (as some suppliers may leave the market), seeds or breeding livestock and poultry. Verified reports already suggest substantial damage, looting and consequent closure of the Institute of Irrigated Agriculture of the National Academy of Agricultural Sciences near Kherson, an important producer of field, forage crop seeds, potato, tomato and other seeds in Southern Ukraine.

### **Compensation for lost assets**

As farmers and agribusiness owners in Ukraine often lack insurance on their assets or the latter does not cover war-related risks, compensation for damages to production facilities or lost incomes may be an important tool to support their operation.

### **Support to export market access**

Ukraine's agriculture is export-oriented and any intermediate loss of traditional markets in Asia, Middle East and Africa would need to be promptly compensated, most likely with respect to a deeper market integration and more free trade with the EU and other Western countries, Turkey and new free trade agreements.

Targeted support to

(i) rural roads and railway transportation of food and

(ii) skills building/training of farmers and food industry employees would most likely be needed in long-term considering that 151 300 farmers/food system employees have directly been affected by the war/moved and may not return to their pre-war places of work.

## Annex

### Methodological approach

1. *Assessing damage to agriculture, forestry and fisheries.*

Agriculture, forestry and fisheries sector accounts for 11% of Ukraine's gross value added by the type of economy (2020). Based on the recently available information, we can assume damage to **fixed/capital assets in the following regions of Ukraine that have suffered from Russian aggression** in proportion to estimated size of the territory affected: in Zhytomyr, Kyiv, Chernihiv, Sumy, Kharkiv, Luhansk, Donetsk, Zaporizhzhya, Kherson, and Mykolayiv – see map on the right.

2. Assessing damage to food and processing industry. Food processing industry accounts for about 4% of Ukraine's GDP value added.
3. Assessing damage to wholesale and retail trade.
4. Assessing economic losses to agriculture country-wide because of lack of exports. Value addition in Ukraine's agriculture has been recently export oriented and driven; therefore, loss of exports is a major loss for the Ukrainian farmers which reduces their liquidity, ability to repay loans and re-invest.

5. Assessing economic damage due to lack of consumer base – refugees and IDPs - to be done at a later stage.

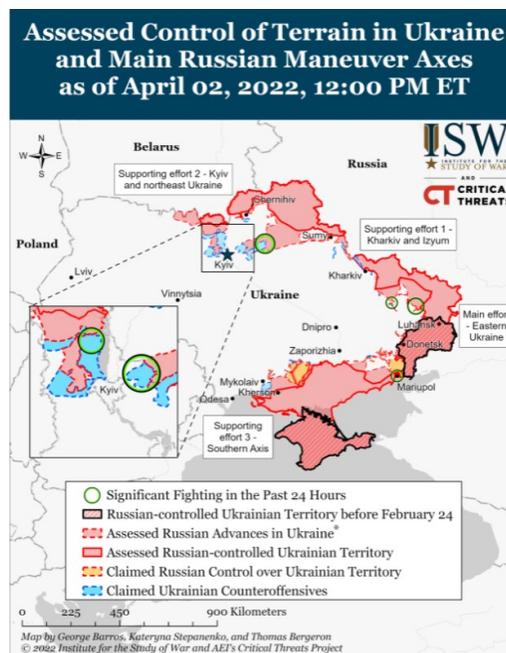


Table 1. Share of enterprises in war-affected regions (as of 4 April 2022), % of Ukraine total

	Capital stock	Output in 2020	# of enterprises	Employed
Beverages	14.1%	15.2%	14.5%	13.8%
Food processing	9.0%	9.1%	14.7%	11.5%
primary agriculture	18.5%	18.0%	20.1%	19.6%
warehouses	22.9%	23.3%	19.5%	19.9%
agri-food wholesale	18.0%	9.9%	14.2%	12.9%
<b>Total</b>	<b>16.5%</b>	<b>12.3%</b>	<b>18.6%</b>	<b>16.0%</b>

Source: own estimates based on the enterprise data/registers

Table 2. Regional shares of enterprises in war-affected regions and total

regions	Capital stock	Output in 2020	# of enterprises	employed
Dnipropetrovsk	0.8%	0.5%	0.9%	0.8%
Donetsk	6.6%	5.8%	7.9%	9.3%
Zhytomyr	0.6%	0.9%	1.1%	1.2%
Zaporizhzhia	15.1%	10.8%	20.7%	15.3%
Kyiv	24.5%	26.3%	13.9%	21.4%
Luhanks	8.0%	5.9%	10.3%	9.3%
Mykolayiv	13.4%	25.7%	14.0%	13.6%
Sumy	14.2%	10.4%	8.3%	11.0%
Kherson	16.8%	13.7%	23.0%	18.0%
<b>Total</b>	<b>USD 6 318.3 mln</b>	<b>USD 12 087.8 mln</b>	<b>10 499 number of enterprises</b>	<b>151 300 employees</b>

Source: own estimates based on the enterprise data/registers