



Agriculture as a funding source of ISIS: A GIS and remote sensing analysis



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ABSTRACT

Agriculture is an important source of income for the Islamic State in Syria and Iraq (ISIS), which currently rules over large parts of the breadbaskets of the two countries. It has received limited attention compared to other sources of ISIS revenues such as oil, looting, ransom, foreign donations and various forms of taxation. We estimate winter crops production of wheat and barley in ISIS-controlled areas in both Syria and Iraq for the years 2014–2015 and irrigated summer crops production (cotton) in Northeast Syria. We show that remote sensing can give a credible estimation of agricultural production in the absence of statistics. With evidence from MODIS Aqua and Terra Satellites as well as Landsat imagery, we find that agricultural production in ISIS-controlled Syrian and Iraqi zones has been sustained in 2014 and 2015, despite the detrimental impact of conflict. After a drought in 2014 production was able to capitalize on improved rainfalls in 2015. First indications show that the winter grain harvest of 2016 in Iraqi territories of ISIS was significantly above pre-conflict mean and below pre-conflict mean in its Syrian territories. We also show how water flows along the Euphrates have impacted production. We estimate the revenue that ISIS can derive from wheat and barley production and the likely magnitude of an exportable surplus. Agricultural production gives the group a degree of resilience, although its economy is not sustainable in the longer run and could be affected by military collapse. Taxation of recurrent income streams such as agriculture will become more important for ISIS as its extractive sources of revenues show signs of dwindling. Beside non-grain food imports, agricultural production is crucial for its political legitimacy by ensuring food provision to the broader population. Food security considerations would require a high priority in any post-ISIS reconstruction effort and would need to include the rehabilitation of supply chains for agricultural inputs such as quality seeds and fertilizers.

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1. Introduction

In 2013 and 2014 the Islamic State in Iraq and Syria (ISIS) established itself in the main grain producing regions of the two countries. On the one hand ISIS's onslaught impacted agriculture; farmers were displaced, supplies of subsidized input factors were disrupted and procurement of grain at subsidized prices by the government in Baghdad broke down. On the other hand ISIS has considered food related infrastructure such as silos as strategic assets. Like oil refineries it has sought to take them over intact. Agriculture is a means to facilitate food security in its territories and a source of tax income that becomes increasingly important

as other sources of revenues from extractive sources such as oil, ransom and confiscations are dwindling.

We first provide a theoretical and empirical background by analyzing the ISIS economy and what role agriculture plays in it. We then give an overview of the used materials and methods. We show that GIS and remote sensing analysis of agricultural production is a useful tool in the absence of statistics. We do so by correlating production in non-conflict years with growing seasons' remotely-sensed derived vegetation indices, namely the Enhanced Vegetation Index (EVI) (Huete et al., 2002; Huete and Justice, 1999).

We find that agricultural production in ISIS territory has proven to be resilient, despite the impact of conflict. By analyzing changes in water volumes in the Assad Lake and consequently flows along the Euphrates we give a concrete example of how conflict related events have affected agricultural production. Based on crop and

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population estimates we gauge the exportable surplus and the likely magnitude of revenues that ISIS can derive from wheat and barley production. We conclude that the production of an agricultural surplus, namely grains, becomes more important for ISIS as non-recurrent income streams have declined. Although the ISIS economy is not sustainable in the longer run and may well face military collapse, agriculture currently gives it a degree of resilience.

2. Theoretical and empirical background

2.1. The ISIS economy

ISIS aspires to be a state; as such it is not a mere terrorist organization. It spends two thirds to three quarters of its revenues on its military and security apparatus (Al-Tamimi, 2015a; Jones and Solomon, 2015), but food provision, health care and power generation feature prominently as well in self-portrayals of its propaganda media. Provision of services requires resources, which raises the question how sustainable the ISIS economy is (Hansen-Lewis and Shapiro, 2015; Woertz, 2014).

ISIS does not publish economic statistics; estimates rely on leaked documents, hearsay, accounts by refugees and occasional news from people within ISIS territory. The main sources of income for ISIS have been oil and gas production; other resource extraction such as phosphate mines and cement factories; transit fees and tariffs; bank looting, extortion and human trafficking; taxation of agriculture; looting of cultural artifacts; kidnapping for ransom; donations from abroad; and taxation of the salary of civil servants in ISIS territory that the government in Baghdad continued to pay until summer 2015 (Al-Tamimi, 2015a; Financial Action Task Force (FATF), 2015; Jones and Solomon, 2015; Solomon et al., 2015; Solomon and Jones, 2015).

Many of these income sources are non-sustainable one-off events, not recurrent revenue. As the geographic expansion of ISIS territory has stalled and gone partly into reverse since late 2014 they have suffered.

ISIS oil production, never large by regional standards and in need of sophisticated know-how, has declined since January 2014 based on a study of satellite data that measures the flaring of associated gas of oil production (Hansen-Lewis and Shapiro, 2015). It has been further affected by intensified military action of the US and Russia against oil infrastructure and transportation fleets at the end of 2015. Most of the oil is consumed domestically or traded to other parts of Syria, rather than smuggled to neighboring countries (Solomon et al., 2015). Current oil revenues are probably much below earlier estimates by the US Treasury of monthly \$40 million; also because of oil price declines on global markets (House of Commons, 2016c; van Heuvelen, 2015). Ransom payments for Western hostages have dried up and hostages from abducted domestic population fetch much lower per capita ransoms (Belli et al., 2014).

The extent to which private and public funds from the Gulf countries have ended up in ISIS coffers is a matter of debate. The fundamentalist Wahhabi interpretation of Islam that prevails in Saudi Arabia and Qatar shows some similarities with the ideology of ISIS, but Gulf countries officially oppose the terror group. By now they see it as a threat to themselves, even though it fights against their rival Iran and its allies, the Assad regime in Damascus and the Shiite led government in Baghdad. Gulf countries have participated in international military coalitions against ISIS and Saudi Arabia has declared it a terrorist organization. Although there is no proof that Gulf governments have supported ISIS directly, Saudi Arabia and Qatar have spent lavishly on other rebel groups in Syria, some of which later on joined ISIS and took their Gulf funded weapons

and experience with them (House of Commons, 2016c; Weiss and Hassan, 2015; Zelin, 2014). There is also evidence that private donors from the Gulf have in fact funded ISIS, especially via Qatar and Kuwait where they had more leeway to operate as David Cohen, the US Treasury under-secretary for terrorism and financial intelligence, pointed out in 2014 (Mendick, 2014) and as journalist Elizabeth Dickinson has outlined in a series of articles (Dickinson, 2015).

There have been increased efforts to crack down on such funds by Gulf governments; presumably indirect public and direct private flows from the Gulf to ISIS are smaller by now than in 2013/14. Yet considerable loopholes continue to exist as the U.S. State Department has outlined (U.S. Department of State, 2016). Luay Khatteeb, Executive Director of the Iraq Energy Institute, argued in a hearing of the UK Parliament in 2016 that ISIS's oil income has been vastly overstated and instead suspected foreign inflows from the Gulf and Turkey as a major funding source (House of Commons, 2016a,c). In the same series of hearings Air Vice Marshal Edward Stringer estimated that ISIS derived 40% of its income from oil, 40% from taxation and 20% from other sources such as donations, ransom and antiquity looting. Yet he admitted that this mix might have shifted to 30% from oil sales and 50% from taxation as a result of the recent decline in oil revenues. Among non-oil revenues agriculture ranks prominently, according to the Russian UN Ambassador Vitaly Churkin ISIS made \$250 million from phosphate sales, \$200 million from barley and rye and \$100 million from cement in 2015 (Nichols and Irish, 2015).

The stop of salary payments by the government in Baghdad to civil servants in ISIS territory in the summer of 2015 was particularly painful for ISIS, as their taxation was one of its most important revenue sources, yielding hundreds of millions of dollars (Financial Action Task Force (FATF), 2015; Solomon and Jones, 2015). The bombardment of a cash storage site in Mosul in January 2016 hurt the liquidity situation of ISIS. There have also been efforts to curtail the illegal access of ISIS to the dollar auctioning system of the Iraqi Central Bank, which has offered it opportunities to earn spread fees and launder money (House of Commons, 2016a).

ISIS had to cut the salaries of its fighters by half at the end of 2015, which is indicative of considerable financial stress (Al-Tamimi, 2015b). Against this backdrop recurrent taxation becomes more important for ISIS, arbitrary taxation and outright protection rackets have increased (House of Commons, 2016a,b). Agriculture is the predominant economic activity in its territories and an obvious candidate.

2.2. ISIS, agriculture and food distribution

Agriculture is important for ISIS as a source of revenue and to safeguard domestic food supplies. In 2015 the group banned grain exports from Mosul to ensure "self-sufficiency" of the city (Jumah, 2015). It has sought to control food prices to prevent public discontent, forced landowners to continue agricultural production despite problematic commercial incentives and rented out confiscated land of refugees to maintain domestic production (FAO et al., 2015a). The jihadist manual *The Management of Savagery* (idarat al-tawahhush) that has a cult following among ISIS supporters identifies access to territories with food production as vital for control of conquered areas. It advocates consolidation of power in rural areas and taking the fight to population centers later on (McCants, 2015; Naji, 2004).

Former Baath officers within ISIS' ranks are aware of the strategic nature of agriculture. During the UN embargo (1990–2003) the Iraqi government under Saddam Hussein expanded cultivated area by a fifth to spur domestic food production (Gibson et al., 2012). It used food allocation as a tool to stabilize the regime, trade favors

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