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The use of geospatial data for monitoring areas with illicit crop cultivation

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UNWGIC, Deqing, November 2018

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Illicit crop monitoring programme

- Annual surveys in main coca and opium growing countries, some cannabis
- Since early 2000s
- Monitoring variables:
  - Area (hectares)
  - Yield (kg/ha)
  - Production (tons/year)
  - Prices
  - Socio-economic data of farmers

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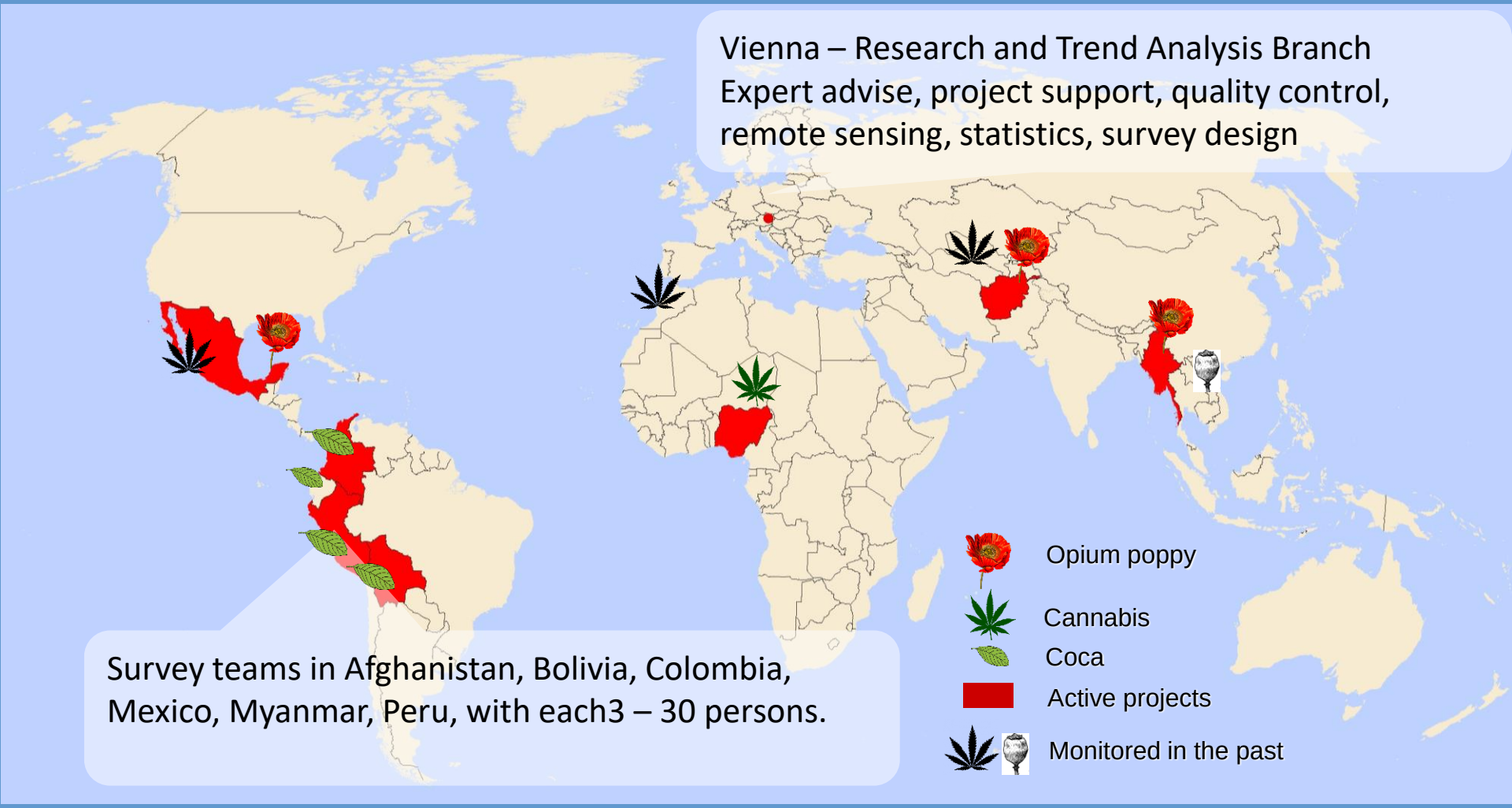
Where does UNODC monitor crops?



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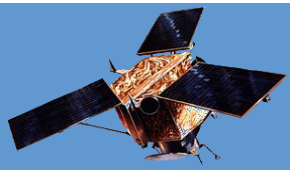
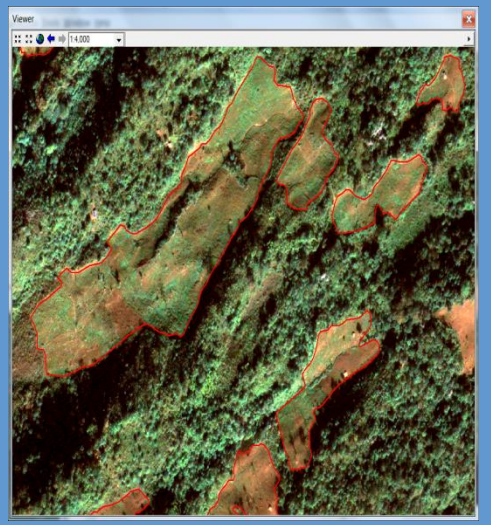
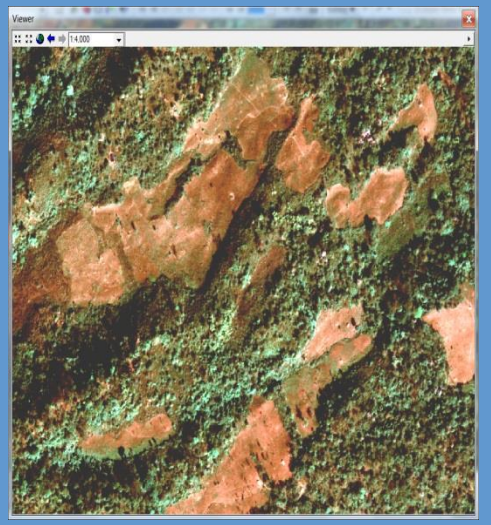
Challenges for illicit crop monitoring using remote sensing







- Often small fields distributed over large mountainous areas
- Difficult access and limited ground truth information
- Visual interpretation using mixture of information from spectral characteristics, two-date imagery, context information, overflights, former surveys, eradication data
- Difficult to automate

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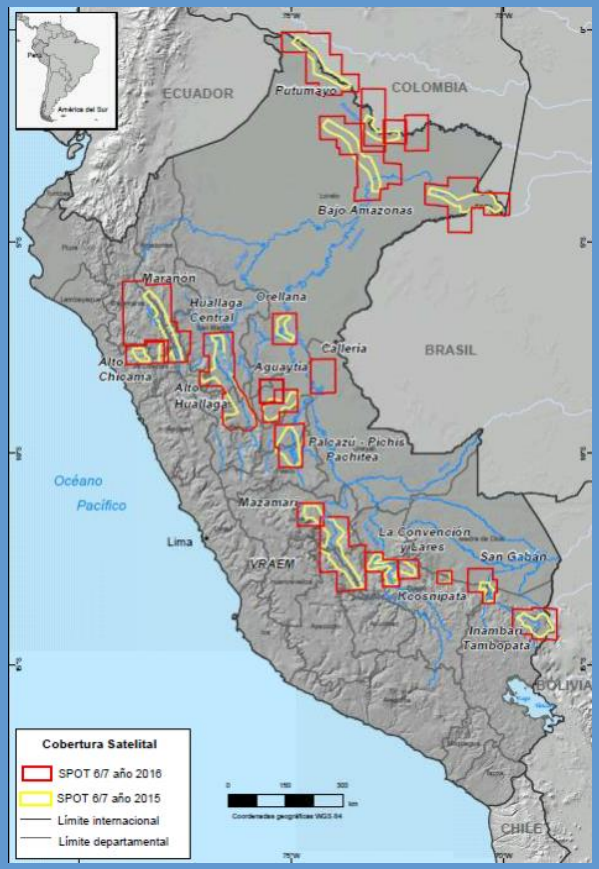
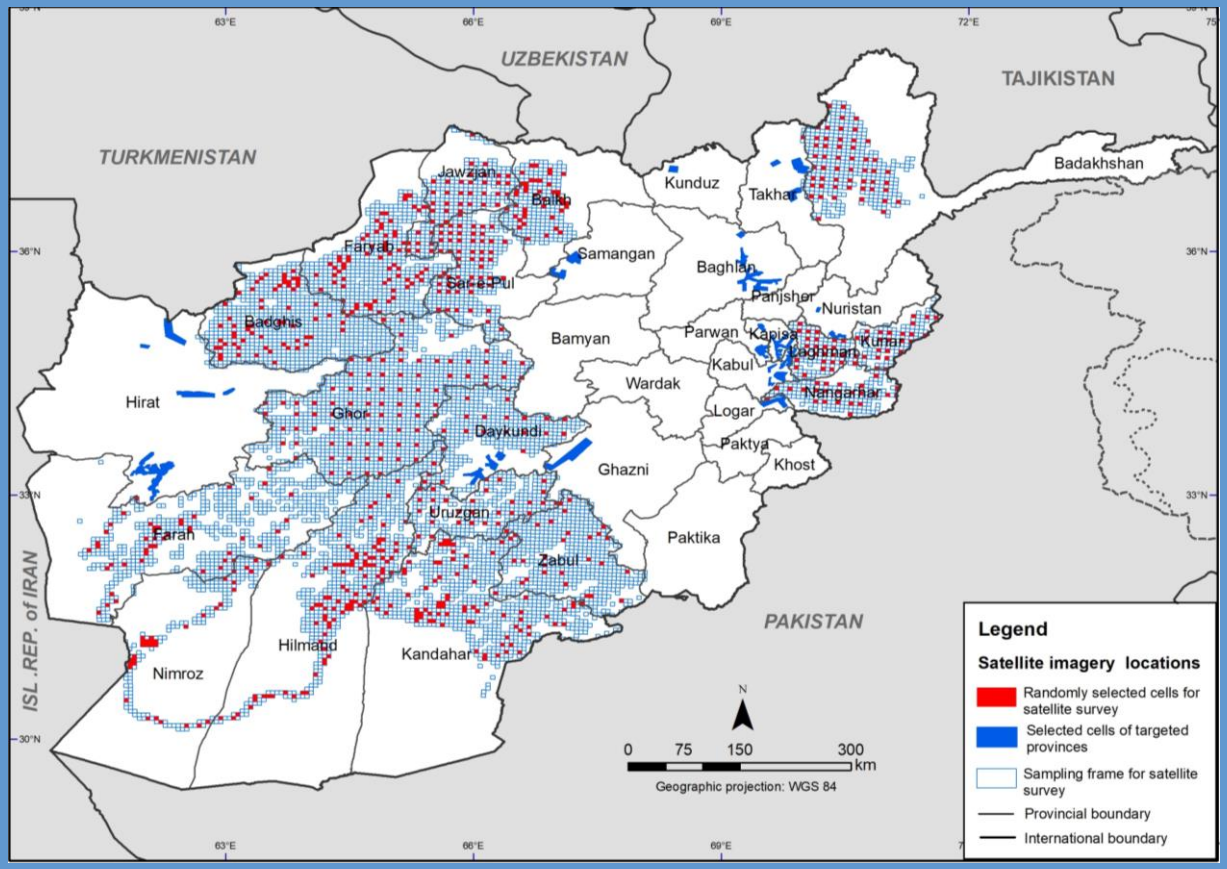
Full coverage mapping and sampling approaches

Very high / High / Medium resolution remote sensing imagery





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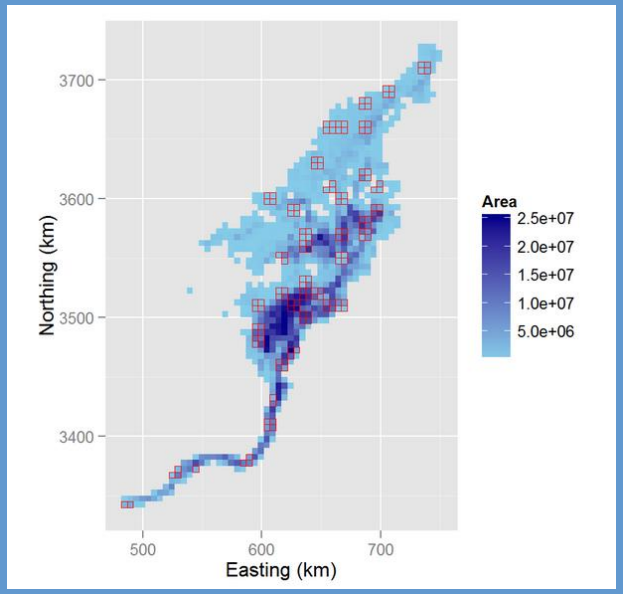
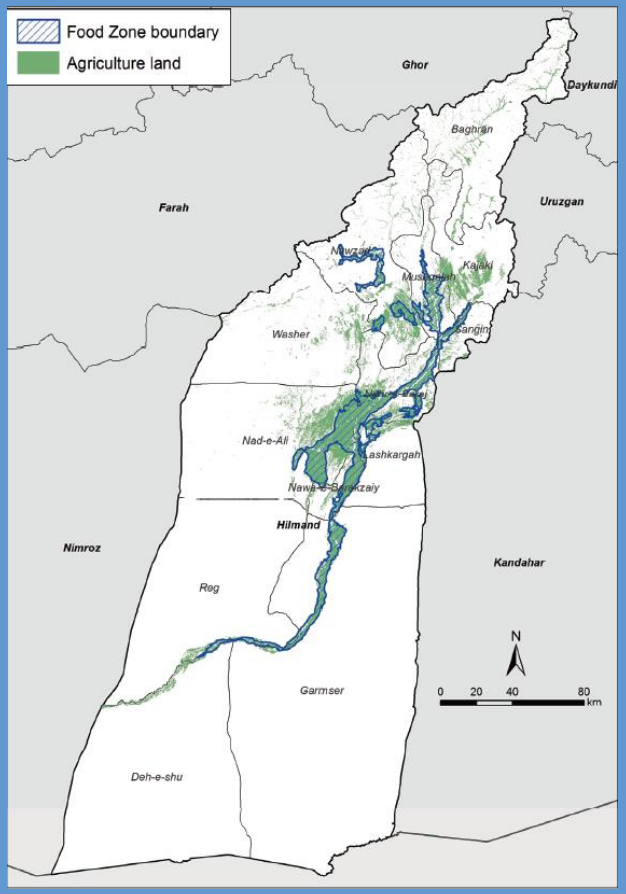
Sampling frames: mapping potential growing areas

- Agricultural areas in Afghanistan using medium resolution satellite images
- Spatial simulations of potential crop areas to test sampling methods





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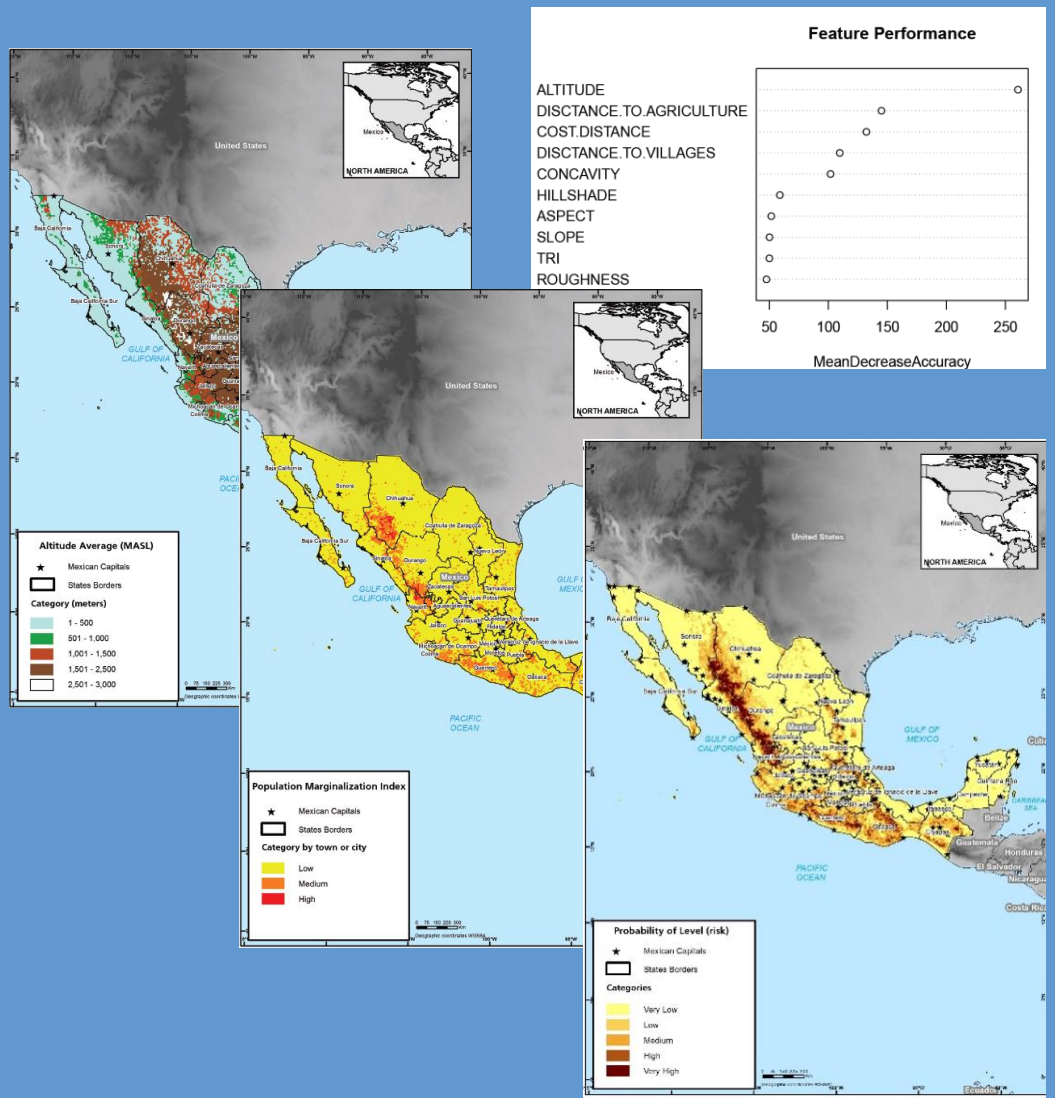
Mapping of potential opium poppy cultivation areas

Biophysical and socio-economic indicators from village/farmer surveys and secondary data:

- Altitude
- Slope
- Accessibility
- Population
- Poverty indices
- Presence of armed groups
- Land cover, etc.



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Time series investigation: vegetation index or rainfall

- Vegetation indexes:
  - Optimum timing for VHR acquisition
  - As aid to differentiate from other crops
  - Multi-cropping in a year

- Rainfall data from satellites:
  - Anomalies / drought

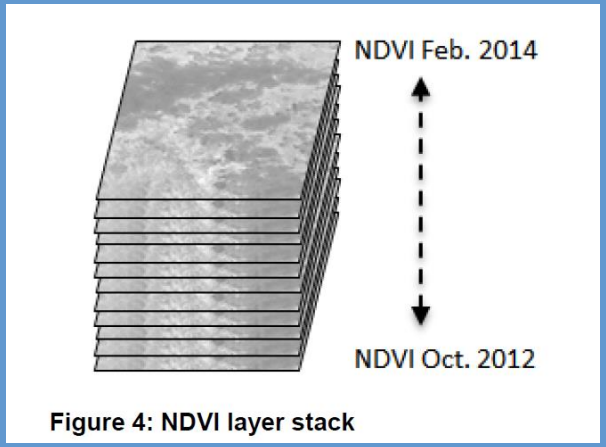
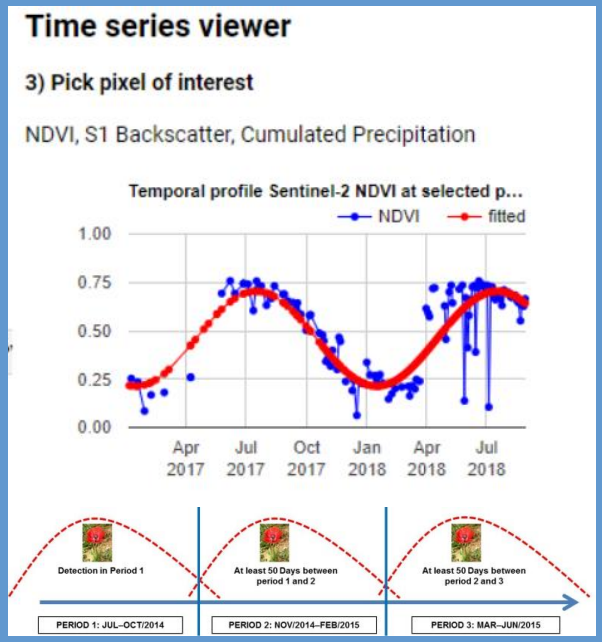


Figure 4: NDVI layer stack



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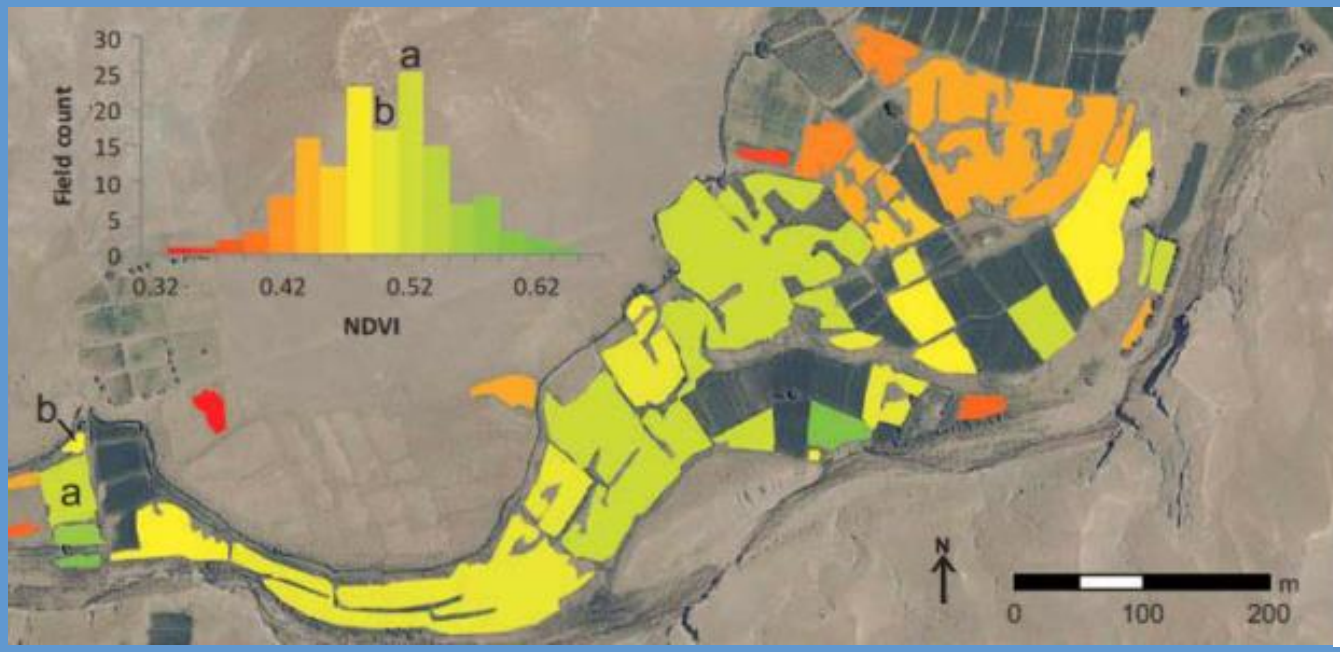
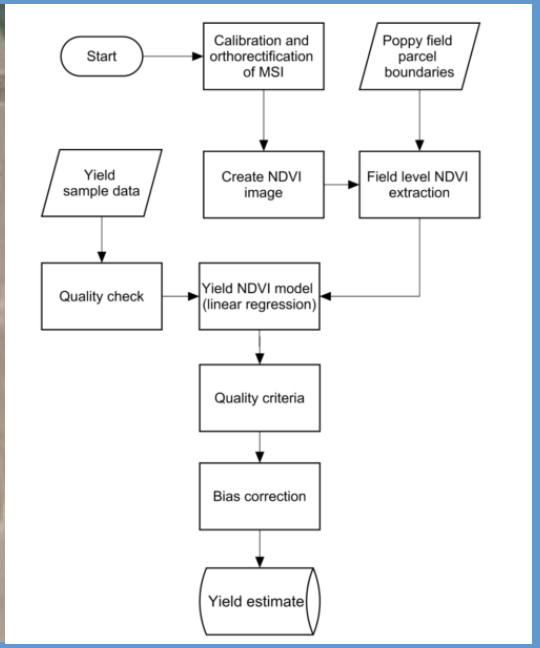
Bias correction of yield measurements

- Models to correct for selection bias in the fields to measure yields
- Challenge: sufficient ground truth data for calibration





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Vicious circle of illegal drug production

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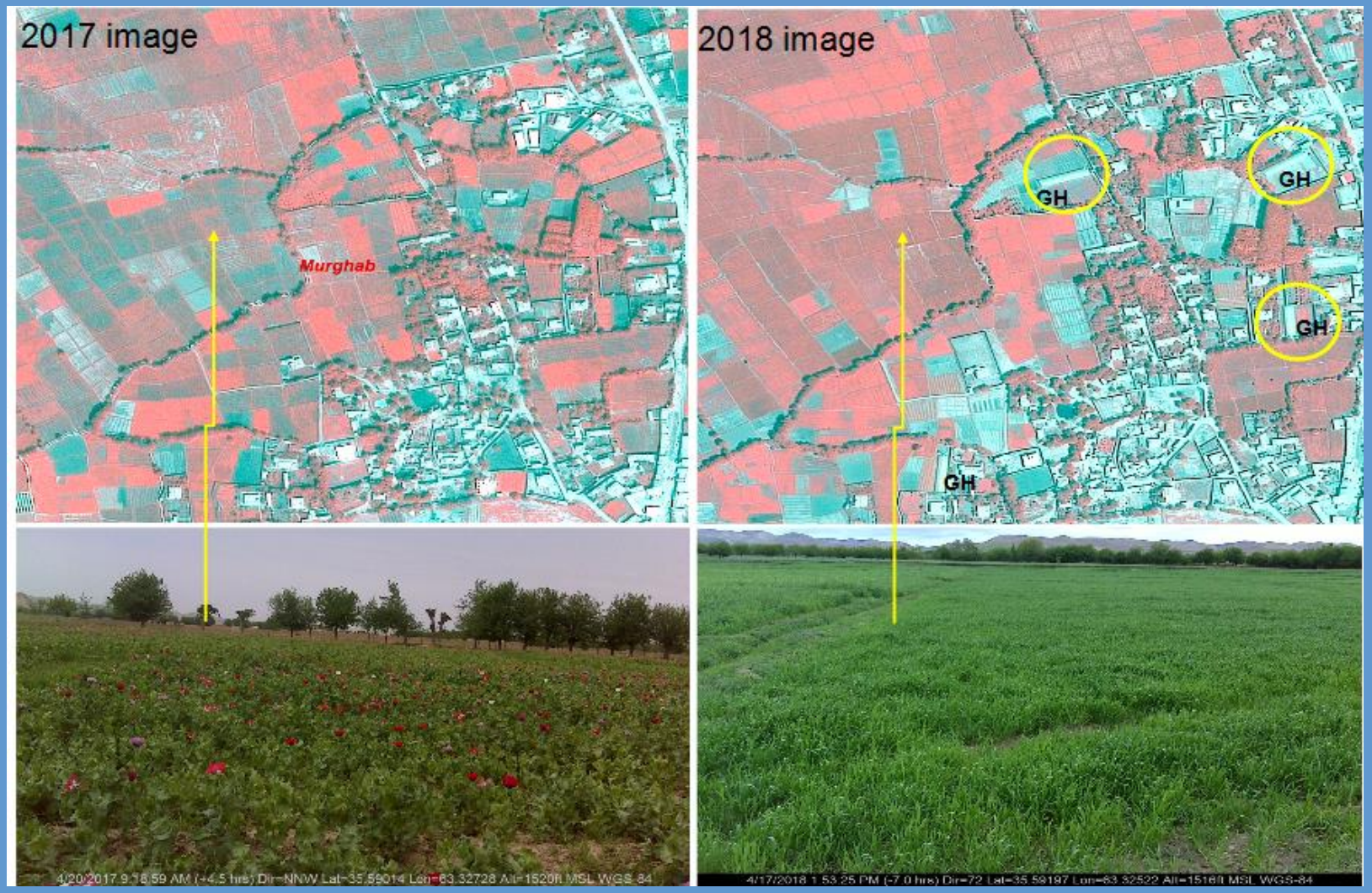
Impact assessments of development programs



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Socio-economic data about farmers and farming

- Extensive data collection in Afghanistan and Myanmar
- Hundreds of villages visited each year
- Information about the crops, costs, income, reasons for growing illicit crops, security situation, etc.
- Price data from informants

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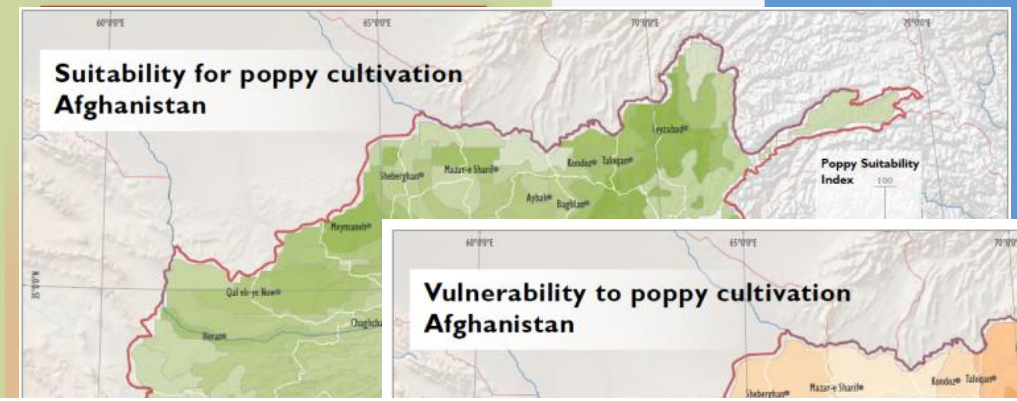
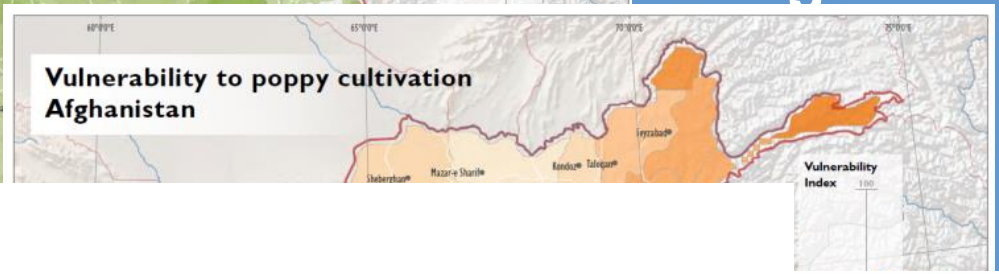
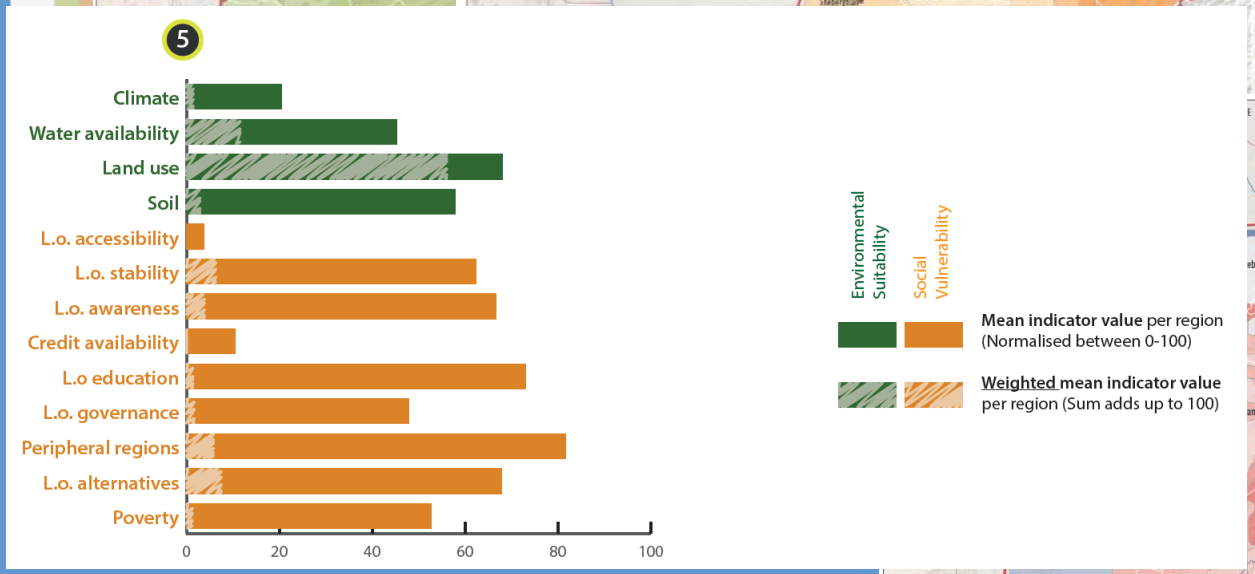
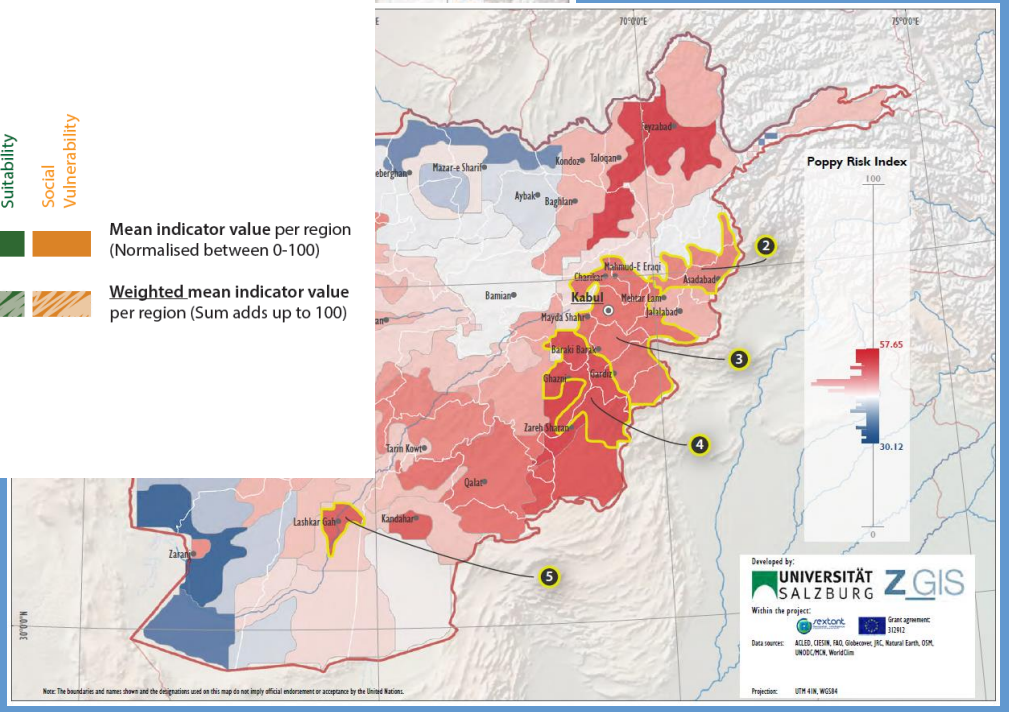
Spatial risk analysis to facilitate policy decisions in Afghanistan









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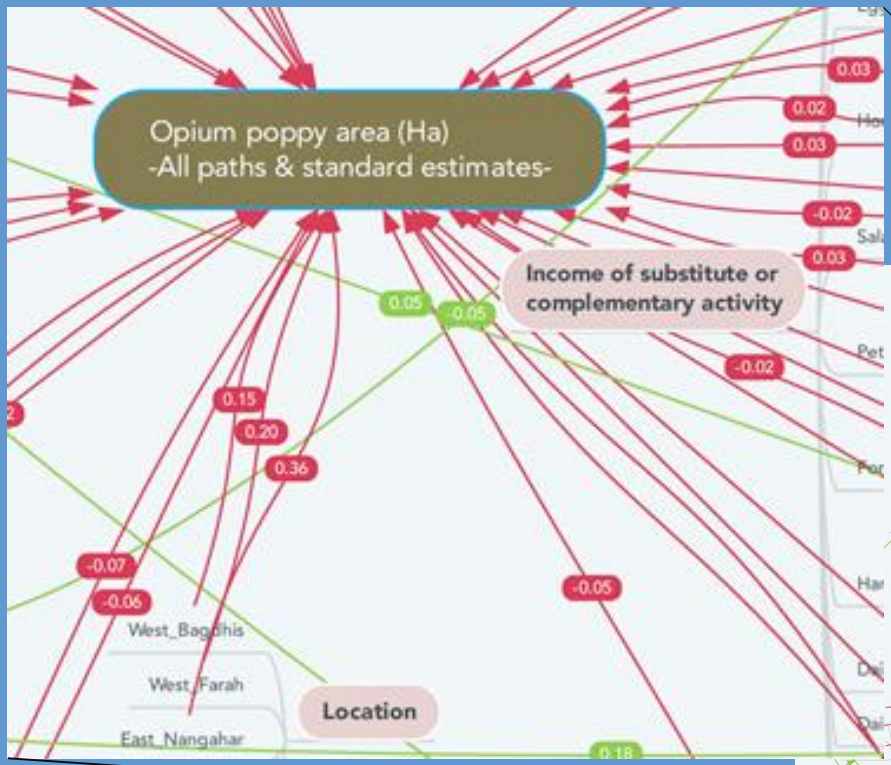
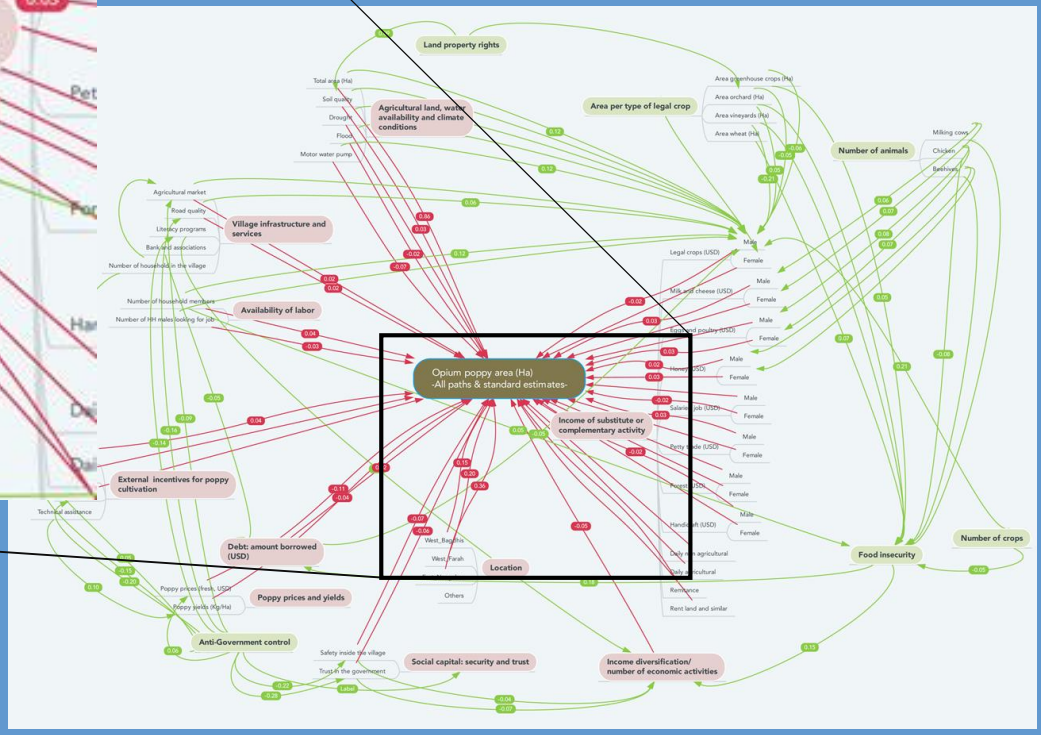
Multiple factor analysis – theory of change

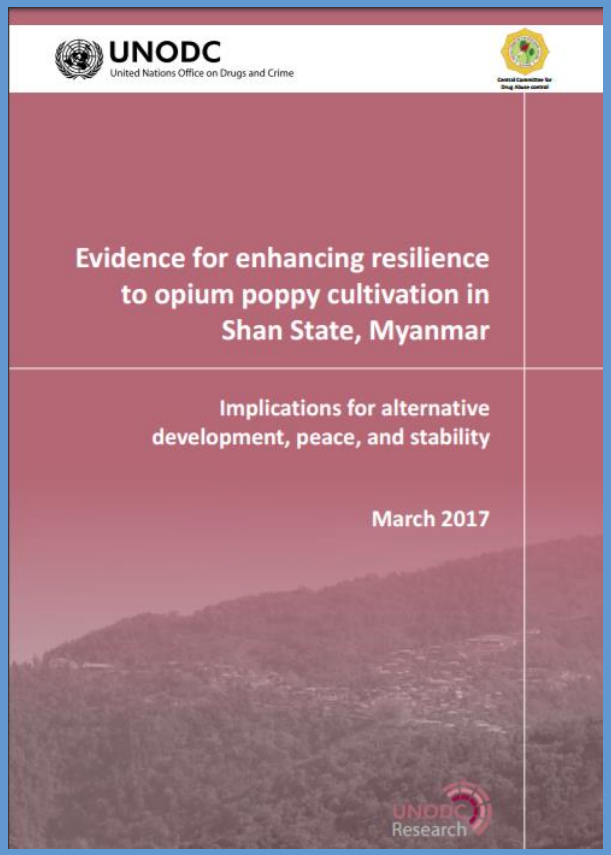


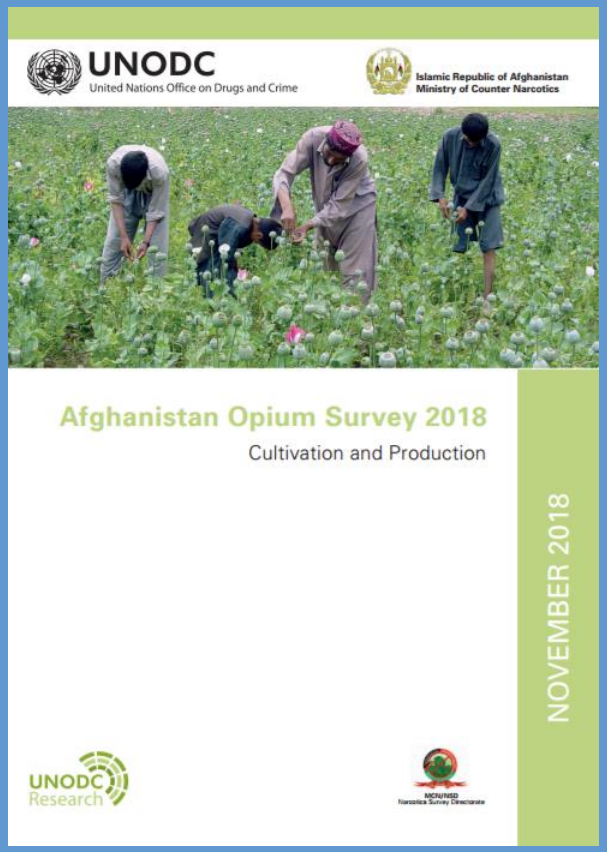


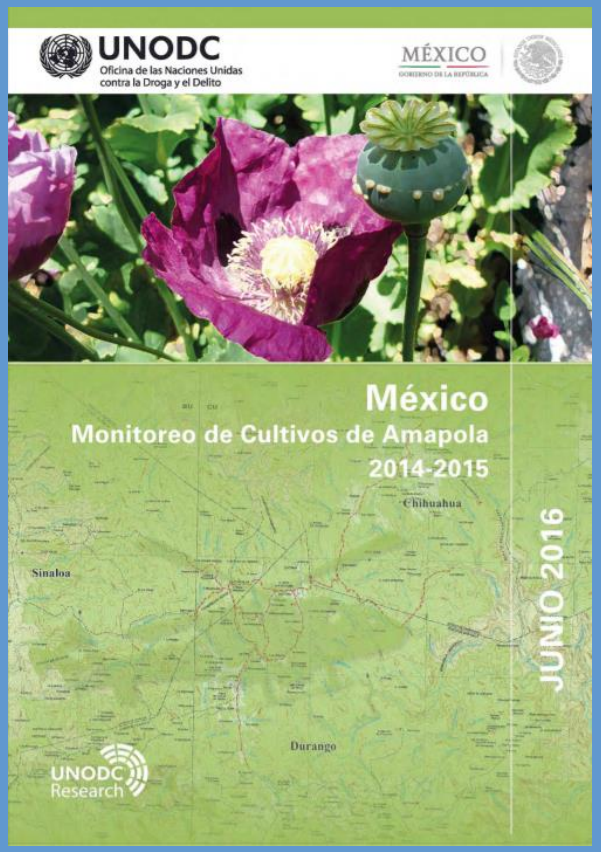
Conclusions

- Illicit crop monitoring is strongly dependent on remote sensing: satellite images and geographic data collected from the air
- Challenges to get independent ground truth data to validate and calibrate
- Secondary geospatial information is used to build sampling frames
- Detailed information generated for the evaluation of impact of policies and projects, also in a geospatial manner

Thank you!







https://www.unodc.org/unodc/en/crop-monitoring/