Tasks: **LAND USE**

* ~~Ag practices~~
* Companies (industrial land use?)
* ~~Water use by industry?~~
* Pollution needs to be considered?
* Water quality considerations
* ~~Land ownership 🡪 building where and how~~

# **General Land Use**

* UFC Davis
  + “The state owns all water resources including irrigated land in Burkina Faso. There are currently no direct or explicit water rights outside of customary rights. The state can expropriate land from farmers to establish new water infrastructure like irrigation networks.”
  + “Although public spending on irrigation has increased in the last few years, irrigated farmland accounted for less than one percent of the total agricultural area in use in 2013 (OECD, 2013)” 🡪 nice image for irrigated ag land
  + “About 15% of terrestrial Burkina Faso is under some form of protection (IUCN & WDPA 2015). This includes three national parks (Category II), and nine habitat/species management areas (Category IV), as defined by the IUCN”
    - See maps for conservation priority areas

# **Agriculture Practices**

* Health Impact (PDF): Nearly 90% of the population is employed by the agriculture sector.
* The World Bank (<https://www.worldbank.org/en/results/2017/06/29/burkina-faso-agriculture-as-a-powerful-instrument-for-poverty-reduction>)
  + “Cotton exports are still dominant and represent about 60 percent of total agricultural exports, and there is a need to diversify agricultural production and exports from cotton”
  + “has a potential comparative advantage in several non-traditional cash crops, such as fruit (especially mangoes) and vegetables (such as onions, tomatoes, potatoes and beans), both for West Africa’s coastal countries and for European countries, where demand is high, particularly demand for organic products”
* UFC Davis (<https://gfc.ucdavis.edu/profiles/rst/bfa.html#:~:text=The%20main%20food%20crops%20in,maize%20in%20more%20humid%20south>.)
  + Soils: “Alfisols with near neutral pH but low organic matter content”
    - Page has nice graphics for ogo matter
  + “Exploitable surface water resources are estimated to be 4750 km3 per year, or 280 m3 per year per capita in 2013.”
  + **Crop Production: “**The main food crops in Burkina Faso are Sorghum, Millet, Cowpea and Maize. Millet dominates in the dry north and maize in more humid south. The area planted with millet has been stable, at about 1.25 million ha over the past decades. The Sorghum area has increased, but not by as much as the cowpea and maize area, which has doubled over the past 15 years.” (IMAGES)
  + **Also livestock production** 🡪 see site for images of distribution 🡪 could impact location of water sources?
  + “The reservoirs attached to the dams in Burkina Faso support a fledgling aquaculture industry, but it is not very well-developed.”
* Yield Gap Atlas (<https://www.yieldgap.org/Burkina-faso#:~:text=Agricultural%20productivity%20is%20low%20in,small%20amount%20of%20nutrient%20inputs>.)
  + “Sorghum (Sorghum bicolor), millet (Pennisetum glaucum) and maize (Zea mays) are the major staple food crops and are grown on about 80% of the arable land area.”
  + “Cropping systems in Burkina Faso change greatly from one region to another in relation to agro-ecological and socio-economic conditions. The Burkinabé agriculture predominantly consists of rain-fed subsistence systems that are characterized by small family farms (from 1.5 to 12 ha per household). Only rice, sugar cane, vegetable and fruit crops are irrigated. Increases in crop production have largely come more from extensification (i.e. increase of area) than from intensification (i.e. increased use of inputs and improved varieties). To cope with rainfall unpredictability, poor soil quality, insufficient labor availability, or lack of appropriate plowing equipment, most farmers practice direct planting.”
* Health Impact (PDF)
  + **Diagram

    Description automatically generated**“The water requirements for irrigation are highest in the two basins of Comoé (2000 m3/ km2/year) and Mouhoun (**black volta basin**) (1,000–1,900 m3/km2/year) because of the large irrigation schemes that require two-thirds of these amounts.”
  + “In the northern Nakambé (**white volta basin)** and the Niger Basin, where most of the country’s livestock are concentrated, animals are the main consumers of water (Figure 3). They need more than 200 m3/km2/year.”

# **Water Use by Industry**

* Chart

  Description automatically generated<https://www.worldometers.info/water/burkina-faso-water/>
* Water Action Hub, UN (<https://wateractionhub.org/geos/country/35/d/burkina-faso/>)
  + “Total water withdrawals in 2000 amounted to 690 million m3 for irrigation and livestock (86 per cent of the total), 104 million m3 for domestic use (13 per cent) and 6 million m3 for industry (1 per cent).”

# **Water Quality Considerations**

* Small Reservoirs project (https://smallreservoirs.org/)
  + “Phytoplankton dynamics and specifically, occurrence of Algal Blooms will be used as indicators to document at a large spatial scale the effective risks (ecological as sanitary) associated with Harmful Algal Blooms (HAB) episodes in relation with the intensity of the pressure exerted on watersheds. We will: 1) document at large spatial scale the effective risks (ecological and sanitary associated with HAB episodes in relation the intensity of the pressure exerted on the watersheds, 2) determine with hydrologists the environmental conditions that promote algal accumulations at "hot" spots, 3) evaluate the impact of watershed artificialization (density of reservoirs and landscape dynamics) on such occurrences, and 4) produce both typological perspective and metabolic models of aquatic ecosystems that can be integrated into the tools.”
* UFC Davis
  + Arsenic contamination is a problem in Burkina Faso, as arsenic is naturally present in rock formations in northern Burkina Faso.
* Health Impact (PDF)
  + “Temporary and perennial water bodies such as those created by small dams offer ideal conditions for the aquatic and amphibian snails that are potential intermediate hosts of human and bovine schistosomiasis”
  + “In general, irrigation systems and small permanent water bodies are preferred breeding sites of the snail hosts as well as principal points of contact between people and the parasite”
  + Malaria 🡪 proximity to small reservoirs and irrigated areas
    - “The water reservoir itself provides very few breeding sites, and increased malaria transmission is mainly found around small dams with irrigation systems.”
  + “After schistosomiasis and malaria, the vector-borne diseases onchocerciasis (river blindness), trypanosomiasis (sleeping sickness) and lymphatic filariasis (of which elephantiasis can be a symptom) have the potential to be influenced by small reservoir development in Burkina Faso.

# **Land Ownership**

* UFC Davis
  + “Such a law implies that land tenure rules vary across villages. The new law also allows for individual possession and collective land rights, inheritance transfers, and verbal and written lease agreements. The codification of customary law does not imply that land is titled and registered, however. At current standing, the land becomes titled and owned only when a private operator purchases and registers it from the state. After it is titled, it can be freely bought and sold.”
  + “The Ministry of Agriculture, Water Resources and Fisheries, the Ministry of Environment, the Ministry of Animal Resources, the Ministry of Economy and Finances, and the Ministry of Territorial Administration and Decentralization are some of the agencies involved in land tenure and administration.”

# **Focus on Water Quality and Water Usage**

**Source list**

**UFC:**<https://gfc.ucdavis.edu/profiles/rst/bfa.html#:~:text=The%20main%20food%20crops%20in,maie%20in%20more%20humid%20south>

**Yield Gap Atlas:** <https://www.yieldgap.org/Burkina-faso#:~:text=Agricultural%20productivity%20is%20low%20in,small%20amount%20of%20nutrient%20inputs>

**PDF Health (2009):** <https://www.researchgate.net/publication/241760971_Health_impacts_of_small_reservoirs_in_Burkina_Faso>

**World Meters:** <https://www.worldometers.info/water/burkina-faso-water/>

**Water Action Hub (2000):** <https://wateractionhub.org/geos/country/35/d/burkina-faso/>

**PDF Urban: stored, Urban Rural Water Interface**

**Drinking Water Supply:** <https://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/Burkina_Faso-Drinking_Water_Supply_and_Sanitation_Programme-Appraisal_Report.pdf>

**Chart, line chart

Description automatically generated**

**Image: projection population until 2030 (PDF: urban rural water)**

# **Water Usage**

Look for more concrete data (quantitative) and more recent data (>2005).

Focusing on usage needed for agriculture, municipality (drinking?), industry (not so much).

* Chart

  Description automatically generated“Exploitable surface water resources are estimated to be 4750 km3 per year, or 280 m3 per year per capita in 2013.” [Source: UFC]
  + **Table

    Description automatically generated**Image: [world meters]
  + Image: “Volume of potable water sold by ONEA to urban centres in Burkina, 2013” [Urban Rural Water Interface]
* “Total water withdrawals in 2000 amounted to 690 million m3 for irrigation and livestock (86 per cent of the total), 104 million m3 for domestic use (13 per cent) and 6 million m3 for industry (1 per cent).” [water action hub]
* “As regards the volume water used each year (4.94 billion m3 ), consumer demand stands at about 505 million m3 per year (19%) and hydroelectricity demand at 2.091 billion m3 (81%). The consumer demand of 505 million m3 is broken down as follows: 21% for domestic use, 64% for irrigation, and 14 % for livestock” [Drinking Water Supply, 2003]
* Water use: image 🡪 2005
* **Agriculture**:
  + The Burkinabé agriculture predominantly consists of rain-fed subsistence systems that are characterized by small family farms [Yield Gap Atlas]
  + The water requirements for irrigation (2009) are highest in the two basins of Comoé (2000 m3/ km2/year) and Mouhoun (**black volta basin**) (1,000 – 1,900 m3/km2/year) because of the large irrigation schemes that require two-thirds of these amounts. [PDF Health, 2009]
  + “In the northern Nakambé (**white volta basin)** and the Niger Basin, where most of the country’s livestock are concentrated, animals are the main consumers of water. They need more than 200 m3/km2/year.” [PDF Health, 2009]
  + The practice of irrigation is recent in Burkina. About 20 800 ha, or 13% of the potential, have been developed. The total irrigated area is estimated at 14,600 ha, and the volume of wsater used is estimated at 323 million m3 per year. The demand for pastoral water supply is estimated at 72 million m3 per year. The water requirements of the other sectors (health, education, fisheries, wildlife, industries, mining, tourism and recreational activities) have not yet been processed in a comprehensive and concerted manner. The demand for water by these other sectors is low, and is only about 6.35 million m3. [Drinking Water Supply, 2003]

# **Water Quality**

Current water quality situation, impacts on people of using small reservoir systems, and environmental/wildlife impact? (algae etc)

* **Current Situation:**
  + “Arsenic contamination is a problem in Burkina Faso, as arsenic is naturally present in rock formations in northern Burkina Faso.” [UFC]
* **Small Reservoirs**
  + “Temporary and perennial water bodies such as those created by small dams offer ideal conditions for the aquatic and amphibian snails that are potential intermediate hosts of human and bovine ***schistosomiasis***” [PDF health]
    - “In general, irrigation systems and small permanent water bodies are preferred breeding sites of the snail hosts as well as principal points of contact between people and the parasite” [PDF Health]
  + ***Malaria*** 🡪 proximity to small reservoirs and irrigated areas [PDF Health]
  + “After schistosomiasis and malaria, the vector-borne diseases ***onchocerciasis*** (river blindness), ***trypanosomiasis*** (sleeping sickness) and ***lymphatic filariasis*** (of which elephantiasis can be a symptom) have the potential to be influenced by small reservoir development in Burkina Faso.” [PDF Health]
* **Environmental/Wildlife**