ALX Foundations: Milestone 3 Worksheet

Instructions: Provide responses to all items in the orange boxes. The worksheet consists of Sections A-E. Work on this worksheet one section at a time throughout your week, and return to Savanna after each section for the next set of content and further instructions.

SECTION A: Problem Statement

Step 1: Your GCGO

Which Grand Challenge or Great Opportunity (GCGO) do you want to play a part in addressing? (Pick one.)

As a reminder, the GCGOs are:

- Urbanization
- Education
- Infrastructure
- Healthcare
- Climate change
- Governance
- Job creation
- Agriculture
- Natural resources
- Arts, culture, and design
- Tourism
- Empowerment of women
- Regional integration
- Wildlife conservation

GCGO:
Agriculture

Step 2: Describe Your Problem

You are going to take a first pass at briefly describing your chosen problem. This can be any problem that speaks to you, as long as it is a real-life occurrence that is clearly linked to your chosen GCGO, that occurs in a certain place and for certain people (and/or animals), and that it can be clearly defined.

For example, if you chose wildlife conservation as your GCGO, you might first state your chosen problem as:
There are very few white rhinos left in Kenya and they are in danger of going extinct.

Another example, if you choose infrastructure as your GCGO:
Residents of major cities in South Africa endure prolonged periods without electricity, significantly hampering their ability to generate income.

Note that this is just your first attempt stating the problem, and you don't need to quantify the problem yet. In order to get to your official problem statement (which does need to be quantifiable) first answer the following questions. The more specific your answers, the better. You may also ask Google, Wikipedia, , ChatGPT, and/or other reliable online sources to help you. Please be sure to cite (give credit to) any sources that you use.

Describe your problem using What/Who/When/Where/Why/How….

1. **What** is the problem? What is reality like because of this problem? What will reality be like if the problem continues?

The problem revolves around unsustainable agricultural practices and the insufficient utilization of renewable resources in African countries.

2. **Who** does this problem impact, directly and indirectly? Who contributes to the problem?

Unsustainable agriculture and underutilization of renewable resources impacts smallholder farmers, agricultural enterprises, rural communities, and indirectly affects urban populations, governments, and the international community. Contributors include farmers, governments, market forces, and global supply chains.

3. **When** did this problem begin? When does it occur?

This problem has been ongoing for decades in Africa, but has become increasingly urgent due to climate change and environmental degradation. It occurs continuously as long as unsustainable farming practices persist.

4. **Where** is this problem occurring? What is the context in which it occurs?

This problem is occurring primarily in rural areas across Africa where agriculture is a significant economic activity. It occurs within the context of diverse environmental conditions, varying levels of infrastructure development, and socioeconomic challenges faced by rural communities.

5. **Why** is this a problem? What are the pain points or gaps? Why do you personally care about this problem?

This problem is critical because it leads to environmental damage, food insecurity, and economic instability. Pain points include declining productivity, soil degradation, water scarcity, and vulnerability to climate change. Gaps exist in access to modern farming techniques, infrastructure, and policy shortcomings. I care about this issue as it's essential for sustainable development, food security, and environmental preservation.

6. **How** would reality be different if this problem were solved? (This can be your opinion.)

If this problem were solved, reality would be significantly different. Small farmers utilizing sustainable energy would be shielded from water scarcity and reduced operational costs. Moreover, their productivity could increase, benefiting both economically and environmentally from adhering to ecological principles.

Step 3: Understand and Quantify Your Problem

Next, you will conduct some basic web research to better understand, define, and quantify your problem. You will do this through a combination of Google search, Wikipedia, credible web sources, ChatGPT or other AI research tool, and your own synthesis of information from these sources. Be sure to give credit to your sources, and paraphrase (use your own words) rather than quoting directly.

7. What is the historical context for this problem? What happened in the past that contributes to the problem now?

Historically, agricultural practices in Africa have been influenced by factors such as colonial legacies, rapid population growth, and shifts in land use patterns. These factors have contributed to unsustainable farming methods and resource depletion, exacerbating the problem today.

8. What are the possible economic (money-related) reasons why this problem exists and continues?

Economic factors contributing to the problem include limited access to capital for investment in sustainable technologies, the high upfront costs of renewable energy systems, and market dynamics favoring conventional farming practices over sustainable alternatives.

9. What are the possible political reasons why this problem exists and continues?

Political factors include inadequate policy frameworks, weak enforcement of environmental regulations, and competing interests that prioritize short-term economic gains over long-term sustainability. Additionally, political instability and corruption can hinder effective governance and resource management.

10. What cultural beliefs and/or social norms possibly contribute to this problem?

Cultural beliefs and social norms may prioritize traditional farming methods over innovative, sustainable practices. Resistance to change and a lack of awareness about the benefits of sustainable agriculture can also contribute to the problem.

11. Who are the people potentially responsible (directly or indirectly) for creating and/or maintaining this problem?

Various stakeholders are responsible for creating and perpetuating this problem. This includes governments and policymakers for failing to implement effective regulations and support sustainable agricultural development. Agricultural industries and corporations may prioritize profit over sustainability, while consumers' demand for cheap food can drive unsustainable production practices.

Now that you have the preliminary information you need, you'll continue your web research to find some numbers, or quantifiable information, to help describe your problem:

What numerical data can you find that is relevant to your problem? Be sure to use your own words and also cite (give credit to) your sources.

Example 1:

According to Chat GPT, there are about 880 white rhinos currently living in Kenya. This population is very small, and they are critically endangered.

Example 2:

Johannesburg has approximately 5.8 million residents (per ChatGPT) and had approximately 4.7 million international overnight visitors in 2019 (according to the South African Tourism Annual Report for 2019/2020).

12. Approximately how many people (and/or animals) are **directly** impacted by this problem? Explain.

According to FAO statistics and World Bank data, approximately 70% of the population in sub-Saharan Africa relies on agriculture for their livelihoods. Given the widespread nature of unsustainable agricultural practices and underutilization of renewable resources in the region, it can be estimated that hundreds of millions of people are directly impacted by this problem.

13. Approximately how many people (and/or animals) are **indirectly** impacted by this problem? Explain.

FAO statistics and World Bank data suggest that the entire population of Africa, which is over 1.3 billion people, is indirectly affected by the repercussions of unsustainable agricultural practices on food availability, prices, and environmental sustainability.

14. What other numerical data can you share that is relevant to your problem? What can you find out about its size and scope? What can be measured? (For example, the amount of trash produced in Nairobi each day, the number of people without access to clean water, etc.)

Africa faces significant challenges in agriculture, marked by land degradation affecting approximately 65% of arable land [FAO]. Water use efficiency presents another concern, as agriculture accounts for about 70% of freshwater withdrawals, yet only about 4% of cultivated land is equipped for irrigation [FAO]. Furthermore, agriculture contributes approximately 14% of Africa's total greenhouse gas emissions, primarily from livestock and fertilizer use [FAO].

Step 4: Describe Your Solved State

Without having to come up with *how* to solve the problem, describe what the desired, solved state looks like. Please use numbers wherever possible, and make your solved state specific and measurable.

Example 1:
There would be a population of 10,000 healthy and protected white rhinos living in the wild in Kenya.

Example 2:
All 5.8 million residents of Johannesburg would have affordable and consistently available power from clean energy sources, 99.5% of the time.

15. If the problem were addressed/solved, what would reality be like?

If the problem were addressed and solved, reality would be characterized by sustainable agricultural practices and the widespread utilization of renewable resources. This would lead to increased agricultural productivity, improved environmental sustainability, and enhanced resilience to climate change.

16. Are there other benefits that would come from your problem being solved? Name at least one.

By adopting sustainable farming practices, smallholder farmers could generate higher incomes, create employment opportunities, and contribute to poverty reduction and overall socioeconomic well-being in rural communities.

Step 5: Clarify Your Problem Scope

You are more effective at solving a problem when you know where its limits are. That is, when you know what is “in scope” and “out of scope.” For this reason, it is important to list what is out of scope, or NOT included as part of your problem definition.

Example 1:
The scope of the problem does not cover any other animal species besides white rhinos. It does not include white rhinos outside of Kenya.

Example 2:
The scope of the problem does not include any businesses or people outside of the legally-defined Johannesburg city limits. It does not apply to tourists or visitors staying for less than 1 year in Johannesburg.

17. What is NOT in scope for your problem?

Issues not directly related to unsustainable agriculture and the underutilization of renewable resources are not within the scope of this problem. For example, broader environmental issues unrelated to agriculture, such as industrial pollution or deforestation for non-agricultural purposes, would be outside the problem scope. Additionally, social and economic challenges unrelated to agricultural sustainability, such as political instability or healthcare access, are not within the problem's scope.

Step 6: Areas for Learning

What do you not know or understand that you would like to know more about? This can be anything related directly or indirectly to your problem. Let your curiosity run wild!

Example 1:
I'd like to know where most of the demand for rhino horn is coming from. I'd like to know who are the primary buyers and who is behind the trafficking of rhino horn. I'd like to know how long the average rhino's lifespan is. I'd like to know how many babies a typical female rhino has, and how many babies typically survive into adulthood. I'd like to know more about what diseases impact rhinos. I'd like to know more about the kinds of habitats that rhinos thrive in. I'd like to understand what international organizations do the best job supporting wildlife conservation and what their practices are. I'd like to know what models of community involvement have been most successful in keeping wildlife safe and thriving. I'd like to understand how much land is available in Kenya for rhinos to roam.

Example 2:
I'd like to better understand the utility company Eskom and its history. I'd like to understand why Eksom has failed to plan properly to update its infrastructure. I'd like to understand the relationship between Eksom and the South African government. I'd like to know if there are private utility companies providing competition to Eksom. I'd like to know what the latest breakthroughs are in solar power. I'd like to know what other possible energy sources might be made available in Johannesburg. I'd like to know how much energy tourists and temporary visitors use. I'd like to better understand the process of how limited energy supply gets allocated to people and businesses. I'd like to better understand the economic impact to people and businesses of not having power.

18. What else would you like to know or understand better? (It can be anything related to your problem.) List 5-10 things.

1. Current government policies and initiatives aimed at promoting sustainable agriculture in African countries.
2. Success stories or case studies of smallholder farmers or agricultural enterprises adopting renewable energy technologies in their operations.
3. The role of international organizations or NGOs in supporting sustainable agriculture initiatives in Africa.
4. Challenges faced by smallholder farmers in accessing finance or resources to implement sustainable farming practices.

5. Innovative technologies or approaches being developed to address water scarcity in agriculture.
6. Market dynamics and consumer preferences driving demand for sustainably produced agricultural products in Africa.
7. Strategies for integrating traditional knowledge and practices with modern sustainable agriculture techniques.
8. Collaborative efforts between public and private sectors to promote sustainable agriculture and renewable energy adoption.
9. Impact assessments of sustainable agriculture interventions on rural livelihoods, food security, and environmental sustainability.
10. Opportunities for scaling up successful sustainable agriculture initiatives across different regions of Africa.

Step 7: Problem Statement

This step is the culmination of all you have done in Part A. You will synthesize the work you have done above to create a problem statement of 150 - 250 words. This should be in narrative form, 2-4 paragraphs, and should NOT use bullet points.

Your problem statement should:

- Provide a succinct description of the problem **in the first sentence**.
- Indicate specific population affected
- Explain the impact (cost, time, environmental, personal) and why the problem matters.
- Explain what reality would look like if the problem were solved. The gap that exists between present reality and the desired outcome should be clear.

Please cite (give credit to) where your information came from directly in your statement. Avoid word-for-word quoting and instead paraphrase (use your own words), as modeled in the example. Also list your sources and their urls (web addresses) at the end.

Example :
Kenya's white rhinos are in critical danger of extinction. There are currently about 880 white rhinos in the country of Kenya, per Wikipedia. According to Chat GPT, Rhinos are considered a keystone species, meaning they have a disproportionately large impact on their ecosystem compared to their population size. Rhinos help shape their environment by influencing vegetation growth and acting as seed dispersers, which creates habitat for other species (per ChatGPT).

The extinction of white rhinos would have cascading effects on other plant and animal species in their habitat. According to the Kenya Wildlife Service, rhinos' presence in reserves and parks bring millions of tourists each year, contributing to local economies and supporting conservation efforts. Once a species goes extinct, it is gone forever. The extinction of rhinos would represent the loss of millions of years of evolutionary history, and unique genetic diversity that science has yet to fully understand and benefit from (per ChatGPT).

My problem would be considered solved when the population of wild, white rhinos in Kenya reaches 10,000, and when all imminent threats to their population including poaching and habitat destruction are not present. If this were the reality, it would create ecosystem balance, create large revenues from ecotourism, preserve important cultural symbols, and allow for genetic diversity that could benefit humanity in ways we may not yet fully understand.

Sources:
Kenya Wildlife Services Annual Report 2017, https://www.kws.go.ke/content/annual-reports
ChatGPT, https://chat.openai.com/
"White Rhinoceros", Wikipedia, https://en.wikipedia.org/wiki/White_rhinoceros

19. My problem is statement is:

This research aims to investigate the transition of smallholder farmers in Morocco towards adopting renewable resources for their agricultural operations. Agriculture in Morocco holds significant economic importance, contributing approximately 15% to the country's GDP. Moreover, it serves as a major determinant of economic growth, given the sector's substantial contribution to employment, with around 45% of the total workforce engaged in agriculture, fishing, and forestry activities. However, the sector faces challenges due to the variability of agricultural output from year to year. Specifically, the study will focus on the implementation of technologies such as solar panels for irrigation and the adoption of efficient methods like drip and pivot systems among smallholder farmers. Additionally, the integration of renewable energy sources such as solar panels and biogas for heating purposes will be explored.

The target population comprises smallholder farmers in Morocco who currently encounter challenges related to productivity, costs, and environmental sustainability in agriculture. The research seeks to understand the potential impact of transitioning to renewable resources on these challenges and to identify the benefits that smallholder farmers could derive, including reduced operational costs, increased productivity, and minimized environmental impact. The study will highlight the gap between the present reality of unsustainable agricultural practices and the desired outcome of a sustainable, efficient, and environmentally friendly farming system, providing valuable insights for policymakers, stakeholders, and practitioners in the agricultural sector.

Sources:
1- Food and Agriculture Organisations: https://www.fao.org/faostat/
2- World Bank : https://data.worldbank.org
3- Haut Commissariat au Plan : https://www.hcp.ma
4-chat.openai.com

20. Please list all sources that you used to form your problem statement:

1- Food and Agriculture Organisations
2- World Bank
3- Haut Commissariat au Plan

Please go back to Savanna and continue with your learning content. You will be filling out Step 8 after you've completed the Peer Activity.

Step 8: Peer Activity Report

This step is related to your peer activity and should help you to improve your problem statement. Answer the following questions as part of the activity and then update your Problem Statement in Step 7 above, based on your feedback.

21. Who reviewed your problem statement? (Give the first and last names of your 2 peers).

Aicha Bahammou
Redwane Ait Ammar

22. In brief, what feedback did they give to you?
They provided positive feedback on the clarity of my research objectives, the thoroughness of my findings, and the relevance of my recommendations.

23. Was their feedback useful to you? Did it feel kind? Why or why not?

Their feedback was useful as it affirmed the effectiveness of my research approach and provided validation for my findings. It felt kind because they acknowledged the strengths of my work while also offering constructive suggestions for improvement.

24. Who did you give feedback to? (Give the first and last names of 2 peers- they may be the same or different peers from above.)

I gave feedback to Aicha Bahammou & Redwane Ait Ammar

25. Do you feel that you gave useful and kind feedback to your peers? Why or why not?

Yes, I believe I provided useful and kind feedback to my peers. I ensured my feedback was constructive, focusing on highlighting strengths while also suggesting areas for improvement in a supportive manner.

Please go back to Savanna and continue with your learning content. You will be prompted on when to return to complete Section B.

SECTION B: Research Questions & Hypothesis

IMPORTANT: Complete this section AFTER completing the Savanna Modules *Asking Effective Questions* and *Web Research*.

Step 9: Research Questions

Based on what you have learned so far and on 'Step 6: Areas for Learning' from this worksheet, come up with 3 research questions. **Research questions should be complex enough that they can't be answered by a single Google search.** If appropriate, form a hypothesis that your research may confirm or reject. (As a reminder, a hypothesis is a prediction of how you think your research will answer your research question. It is your best guess. If you truly have absolutely no idea, state "not applicable.")

Example Research Question #1:
What are some ways can we increase rhino populations?
Hypothesis*:*
Rhino populations will be increased by creating more open spaces for them to roam, increasing their protection, increasing international interest in them, and other reasons I have yet to uncover.

Example Research Question #2:
Which organizations have been effective at wildlife conservation and what practices do they use?
Hypothesis*:*
Not applicable; I don't know.

Example Research Question #3:
How many babies can a typical female white rhino have in her lifetime, and what are the reasons a female may not have high fertility?
Hypothesis*:*
A typical female white rhino can have 5 babies in her lifetime, and fertility may be affected by diet, amount of grazing territory, poaching, stress, mate availability, and other reasons I have yet ot uncover.

26. Research question #1:
How does the adoption of renewable resources, such as solar panels for irrigation and efficient farming methods, impact the productivity and profitability of smallholder farmers in Morocco?
Hypothesis :
The adoption of renewable resources by smallholder farmers in Morocco will lead to increased productivity and profitability due to reduced operational costs and improved resource efficiency.

27. Research question #2:
What are the environmental implications of transitioning to renewable resources in agriculture, particularly in terms of water conservation and carbon emissions reduction, among smallholder farmers in Morocco?
Hypothesis :
Transitioning to renewable resources in agriculture will result in significant environmental benefits, including water conservation and reduced carbon emissions, as smallholder farmers

in Morocco adopt technologies such as solar-powered irrigation and renewable energy for heating.

28. Research question #3:

How do socio-economic factors, such as access to financing, technological infrastructure, and institutional support, influence the adoption of renewable resources among smallholder farmers in Morocco?

Hypothesis :

Socio-economic factors play a crucial role in determining the adoption of renewable resources among smallholder farmers in Morocco. Increased access to financing, technological infrastructure, and institutional support will positively impact the adoption rates of renewable resources, leading to enhanced sustainability and resilience in agriculture.

Please go back to Savanna and continue with your learning content. You will be prompted on when to return to complete Section C.

SECTION C: Web Research

Part 1: Research Plan

You can plan out your research, for each of your research questions, using the template below.

29. Step # 1: Define your objectives, 3 research questions & associated hypotheses.

Key Questions: What are you trying to accomplish with this research? What do you wish to find out that will accelerate your work in the right direction?

Your Response:

I aim to understand the impact of renewable resource adoption on smallholder farmers in Morocco to inform sustainable agricultural policies and practices effectively.

30. Step # 2: Determine your end outputs.

Key Questions: What type of data/information is ideal for you to find, based on what you are trying to accomplish? Do you need to present it in any particular format?

Your Response:

Time series data from sources like FAO, World Bank, and HCP (Haut Commissariat au Plan Marocaine) would be ideal. Presenting it in a structured format for econometric analysis would be beneficial.

31. Step # 3: Scope your main sources of information.

Key Questions: Do you already know where you might want to go to find the information you're seeking? Are there particular entities or organizations that you know are seen as "experts" on the topic?

Your Response:

As a research analyst familiar with international topics, I'll leverage my existing networks and utilize reputable sources like FAO, World Bank, and possibly local Moroccan institutions like HCP known for their expertise in socio-economic data collection and analysis.

After you updated earlier parts of the worksheet based on your research plan, please go back to Savanna and continue with your learning content. Return to Part 2 and Part 3 prior to submitting your milestone.

Part 2: Conducting Research

You can answer the following questions as you complete conducting your research into your research questions.

32. Step 1: Begin gathering your required information.

Key Questions: What search terms should you use? How many reports/articles do you want to read before deciding you have seen enough?

Your Response:

Relevant search terms include "renewable resources agriculture Morocco," "solar panels irrigation smallholder farmers, “CSA: Climate Smart Agriculture”," and "sustainable farming methods." I aim to review at least 15 reports/articles before determining if I've gathered enough information. (+ the articles of the methodology that I can use as CBA, Linear Regression …)

33. Step 2: Evaluate the Validity/Credibility of Your Sources and Information

Key Questions: Are the sources credible and reliable? Consider the authority, accuracy, objectivity, and currency of the information to ensure its validity for your research.

Your Response:

Yes, the sources are credible and reliable, as they include reputable organizations such as FAO, World Bank, and HCP (Haut Commissariat au Plan Marocaine). I assessed the authority, accuracy, objectivity, and currency of the information to ensure its validity for my research.

34. Step 3: Synthesize and Communicate Your Key Findings.

Key Questions: Summarize the key information and findings that you have gathered during your research. Organize these findings in a clear and coherent manner, ensuring that they directly address your research objectives and questions.

Your Response:

The research findings indicate that the adoption of renewable resources, such as solar panels for irrigation and efficient farming methods, can lead to increased productivity and profitability among smallholder farmers in Morocco. Additionally, transitioning to renewable resources offers significant environmental benefits, including water conservation and reduced carbon emissions. Socio-economic factors, such as access to financing and technological infrastructure, play a crucial role in determining the adoption rates of renewable resources among smallholder farmers. These findings directly address the research objectives of understanding the impact of renewable resource adoption on Moroccan agriculture and provide actionable insights for addressing the identified problem effectively.

35. Return to Your Original Objectives and Key Questions.

Key Questions: Revisit your initial objectives and key questions to ensure that your research findings adequately address them. Reflect on whether your findings have effectively contributed to solving the identified problem.

Your Response:

In reflecting on my research, I find that my findings have effectively contributed to addressing the identified problem of unsustainable agriculture and underutilization of renewable resources among smallholder farmers in Morocco.

I am confident that my research findings will serve as a meaningful contribution to solving the identified problem. They have advanced knowledge, informed policy, and provided actionable insights for practitioners in the agricultural sector. This will ultimately contribute to building a more sustainable and resilient agricultural system in Morocco.

Part 3: Research Summary

In 200-300 words, provide an executive summary of your research in the text box below. You should be synthesizing information from multiple sources. Provide answers and explanations for the 3 questions you investigated and your key research findings. This should be in a narrative format (no bullet points), and be at least 3 paragraphs long.

Please use at least 3 different online sources such as ChatGPT, organizational websites, Wikipedia, etc. Please cite (give credit to) where your information came from directly in your statement. Avoid word-for-word quoting, paraphrase instead (use your own words), as modeled in the example. Also, list your sources and their URLs (web addresses) at the end.

36. Research Summary

In this research, I explored the transition of smallholder farmers in Morocco towards adopting renewable resources for their agricultural practices. Recognizing the significance of agriculture to Morocco's economy, contributing around 15% to the GDP and employing approximately 45% of the workforce, the study aimed to understand the potential benefits of renewable resource adoption in enhancing productivity, reducing costs, and promoting environmental sustainability within the agricultural sector. Through an examination of available data from sources such as the FAO, World Bank, and HCP (Haut Commissariat au Plan Marocaine), the research addressed three key questions.

Firstly, the study investigated the impact of renewable resource adoption on smallholder farmers' productivity and profitability. Findings suggested that transitioning to renewable resources, such as solar panels for irrigation and efficient farming methods, could lead to increased productivity and profitability by reducing operational costs and improving resource efficiency. Secondly, the research explored the environmental implications of this transition, focusing on water conservation and carbon emissions reduction. It was found that transitioning to renewable resources in agriculture could yield significant environmental

benefits, including water conservation and reduced carbon emissions. Finally, the study examined the socio-economic factors influencing the adoption of renewable resources among smallholder farmers. It was revealed that access to financing, technological infrastructure, and institutional support played crucial roles in determining adoption rates.

Overall, the research findings suggest that transitioning to renewable resources holds promise for smallholder farmers in Morocco, offering opportunities for improved productivity, cost savings, and environmental sustainability. However, challenges related to access to resources and institutional support need to be addressed to facilitate widespread adoption and maximize the benefits of renewable resource utilization in Moroccan agriculture. These insights can inform policy decisions and support initiatives aimed at promoting sustainable agricultural practices in the country, contributing to the development of a more resilient and environmentally friendly agricultural sector.

Once you have completed this worksheet, export/convert to .pdf, rename it per the instructions, and upload to Savanna as your Milestone # 3 Submission. Celebrate a job well done!