

Team Research Plan

What steps has your team taken to understand the framework of the circular economy? (250 words maximum length)

The circular economy is an approach to maximize value and eliminate waste by improving how goods and services are designed, manufactured and used. It aims at tackling global challenges like climate change, biodiversity loss, waste and pollution. In understanding the framework of circular economy, our team has done an extensive research on the topic. We have consulted series of scholarly articles including the ones from Ellen MacArthur Foundation. We have reviewed series of circular economy projects to understand the concept of circular economy. While at it, the intriguing part was differentiating it from recycling. We found from Ellen MacArthur Foundation that "Recycling begins at the end - the 'get rid' stage of a product's lifecycle. The circular economy, however, goes right back to the beginning to prevent waste and pollution from being created in the first place."

In addition, have done a thorough review of the resources on circular economy provided on the wege prize website to help us grasp the framework of circular economy. This made us more poised than ever to challenge the status quo with a circular project.

What is the wicked problem your team is interested in addressing? (250 words maximum length)

Long before the agriculture revolution, it still served as the main backbone of the survival of mankind. Today, agriculture land area covers about 38% of the global land surface.

According to our findings, there is excessive use of fertilizers and pesticides in commercial farming. Excess use of fertilizers may lead to heavy metal accumulation, eutrophication and accumulation of phosphate and nitrate

In agriculture, where irrigation farming is used, there are about 70% of freshwater withdrawals globally, resulting in water waste. Excess harmful fertilizers that runoff into watersheds due to fertilizer application harms the ecosystem. Pumping water for irrigation and other commercial agricultural technologies uses a lot of energy in fertilizer manufacture. Malnutrition issues in poor and underdeveloped places owing to the inadequate output of vegetables, fruits, and seafood.

Aquaculture has also long remained with man. It supplies about 7.5 percent of total protein supply (21.9 percent of the total animal protein supply). This sector too is not devoid of wicked problems. The negative effects include organic pollution and eutrophication, a buildup of excess nutrients (primarily organic nitrogen and phosphorus) and wastes in an ecosystem.

These vexing issues must be addressed, which is why our team proposes Aquaponics system which combines crop farming and hydroponics. To a large extent as we would be explaining, this method would go a long way to address these wicked problems

Description Area

What context is critical to help others understand the wicked problem your team is interested in addressing? Provide 3 web links that provide this context.

Link 1

<https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview>

Link 2

<https://www.theaquaponicsource.com/what-is-aquaponics/>

Link 3

https://www.cngfarming.org/6_facts_about_aquaponics

What human, technological, and ecological factors impact the wicked problem your team is interested in addressing? (250 words maximum length)

Human activities such as excessive use of fertilizers and pesticides for farming have devastating effects on our soil . Most detrimental of these effects is biodiversity loss in the soil .This means that the soil has a lower quality and it's less fertile . It also removes a greater percentage of organic matter in the soil .

Human has also been in the habit of improper dumping of refuse.Soil is usually the mostly polluted part of the ecosystem around dump sites because the seepage of water through the waste dump leaches out undesirable components that pollute it as the main medium of transporting and distributing chemicals elements

Technological advancement has led to the discovery of many equipments that aid in farming yet destroy our natural resources, using heavy machines to plough lands for agriculture purposes and to fish mars our ecosystem by destroying homes of aquatic and terrestrial life.

During harmattan season, especially in the northern part of Ghana ,the lands go dry and the water bodies dry up resulting in famine. With the institution of aquaponics system, water can be conserved and used to grow crops and save some fish species even in daring situations which will go a long way to reduce famine strikes and preserve aquatic life in Ghana and Africa at large .

How could addressing this wicked problem support the development of a circular economy? (250 words maximum length)

The circular economy is a systems solutions framework for economic development, which addresses the root causes of global challenges. Driven by design and underpinned by renewable energy and the usage of renewable materials, the circular economy revolutionizes how we design, produce and consume everything around us, based on three principles, namely the elimination of waste and pollution, keeping products and materials in use, and regenerating natural systems. We identified Aquaponics as a farming approach that can address our wicked problems, through nutrient and waste recycling. It can aid in addressing both planetary boundaries and sustainable development goals. By implementing this solution, we believe that it will disseminate among the communities as it is one of the most effective and advantageous solution in the field that is in line with the circular economy principles, thus enabling the development of a circular economy as we will have more farmers and fish farmers using the solution that is circular and viable compared to current solutions. More people using a circular solution means developing the circular economy. More people using a circular economy solution means that Aquaponics systems and models can be improved to better serve producers and consumers and, more importantly, to better serve the environment.

How could addressing this wicked problem support the United Nations' Sustainable Development Goals? Choose 1-3 specific goals to focus on. (250 words maximum length)

Food production relies on the availability of resources, such as land, freshwater, fossil energy and nutrients, and current consumption or degradation of these resources exceeds their global regeneration rate. Thus, a major global challenge is to shift the growth-based economic model towards a balanced eco-economic paradigm that replaces infinite growth with sustainable development. In order to maintain a balanced paradigm, innovative and more ecologically sound cropping systems are required, such that trade-offs between immediate human needs can be balanced whilst maintaining the capacity of the biosphere to provide the required goods and services. In this context, aquaponics has been identified as a farming approach that, through nutrient and waste recycling, can aid in addressing both planetary boundaries and sustainable development goals, particularly the goal 2 eradicate hunger, ensure food security, improve nutrition and promote sustainable agriculture, producing food for all and generating a decent income as well as support the environmental protection; goal 6 ensure access to water and sanitation for all and ensure sustainable management of water resources, saving water by reusing it and treating it so that it is clean for fish and plants and goal 12 establish sustainable consumption and production patterns, allowing for sustainable consumption patterns with fish and vegetables. Aquaponics is also proposed as a solution for using marginal lands in urban areas for food production closer to markets as well as for arid regions or areas with nonarable soils.

How do you plan to involve mentors and/or subject matter experts in your design process as you develop your solution? (250 words maximum length)

Aquaponics is a very nascent field in our target location. Ghana is noted for agriculture with about 44.1% to 51.5% of household owning or operating a crop farm. With just about 0.22% of the population in aquaculture, a combination of the two (aquaculture and crop farming) is even more rare. Nonetheless, there are individuals with appreciable skills in field that makes them suitable to serve as experts and consultants on our solution implementation.

As such, working on our solution will include mentors in our design thinking process from empathizing through to testing. We have an expert who has agreed to serve as a constant team mentor to provide consultation services and supervise our activities throughout the journey.

After brainstorming and bringing out our ideas, we report to our mentor who in turn scrutinizes our submission so we could have a more robust final idea to hit ground.

We are in talks with experts to work with at the prototyping and testing stage. Building an aquaponics system requires some extent of technical skills and as such, we will include industry experts that will help us build and test our prototype.

What are your next steps? (250 words maximum length)

With a strong conviction of causing change, our next step will be to register as an enterprise within the laws of our target location, that is, Ghana. This will ensure that we have the full force to work on a solution to the wicked problem with all our structures in place.

With a registered enterprise, we will then have the mandate to officially constitute the structure of our company with defined roles to each of our team members in other to optimize our productivity. This will also give us the mandate to form a business advisory board which will primarily include industry experts and mentors.

With the structures and business board in place, our team will then go all out to conduct a needs assessment to find an optimum location for the solution prototyping. We will then build a prototype aquaponics system in consultation with our mentors and field experts. Monitoring our prototype for a particular time frame, we will build knowledge on the impact and challenges we should be anticipating as we go all out in building the aquaponics solution to our identified wicked problem.
