STEP 1. Identify Challenges

Read the Future Scene carefully and generate ideas for challenges, concerns, and possible related problems. Choose the 16 most important challenges and write them in the space provided

In 2042 in Tasmania, the Beebots are used to investigate trees for disturbances. However, they have been "identifying a blemish on a trunk" even when this is only "scratches from a possum." This shows the potential of beebots to be unable to accurately analyze whether or not the cherry trees are in danger. This could be extrapolated to suggest that the false alarms (and revisions to code), or a lack of proper identification technology, or even a brief malfunction, could all contribute to the BeeBots letting pseudomonas avium into the orchard.

2 In 2042 in parts of Australia outside Tasmania, the death of many fruit trees such as the cherry trees mentioned in the passage might cause cities to become less visually appealing. Fruit trees such as cherry trees are frequently used to improve the aesthetics of large cities and the death of these trees due to antibiotic-resistant bacteria could make them less appealing to live in for their residents due to the loss of fauna.

3 In 2042, in Tasmania, cherry farmers like Matilda have "[difficulties] living with so much uncertainty" regarding the antibiotic resistant bacteria. This could result in a negative effect to the mental health of cherry farmers who are facing a lot of stress trying to manage and surveil new appearances of pseudomonas avium, since many humans feel most stressed when things out of their control are threatening them. This could make them psychologically uncertain and have chronic unhappiness, all of which is bad.

4 In 2042, in Tasmania, cherry "prices tripled last summer", and they would have to "again increase prices" the next year. This increase in the price of cherries would hurt consumers for whom it would cost more money to buy cherries. It could also result in the socioeconomic disparity between consumers widening because certain ones would be unable to actually buy food previously considered available, like cherries, which would enhance the hierarchical divide and be bad for the social relationships between consumers.

5 In the year 2042 in Tasmania, "importing any fruit and vegetables to Tasmania is prohibited, including from mainland Australia". For the people living in Tasmania, this could force people to only eat the food available to be grown in Tasmania, possibly resulting in a monotropic diet or a diet of primarily processed food, which could result in a damage to people's dietary and physical health in the form of malnutrition or osteoporosis.

6 In the year 2042 in Tasmania, the bacteria pseudomonas avium has the potential to "travel between countries" through a variety of methods. As a result, the bacteria could still get into the cherry orchards and wipe out the entire plantations of cherries. Without cherries, an important food source for native possums, the natural ecosystem could be endangered. As the possums, potentially a keystone species, don't have their food, trees won't be as fertilized with their waste droppings. Their predators won't have food either, all of which could hurt the ecosystem as a whole.

7 In 2042 in countries other than Australia, their fruit production industries might be negatively affected by the advent of pan-resistant diseases such as Pseudonomas avium. This might cause them to develop a trade imbalance due to over-importation of agricultural products from disease-free locations like Tasmania. This might cause a power imbalance in the economic respect between Australia and the rest of the world, potentially creating an Australian hegemony.

8   In 2042 in locations besides Australia, a "once $12 billion dollar industry was drastically reduced." As a result of that, "family farms and corporations [were sent] into bankruptcy." Overall, a variety of people lost their jobs and sources of income, likely leading them to be unable to provide for their families or pay rent or buy food, showing a lack of basic needs for them. This is a common element that comes from unemployment and a lack of wealth.

9   In 2042 in Tasmania, cherry orchards are vast rows of trees arranged next to each other, with no other types of different plants, as is suggested by the image in the future scene above the caption, "BeeBots monitor vast areas of crops for signs of infection." This implies that the farming techniques used in the future scene by farmers like Matilda (which is justifiable given their economic incentive) are likely to be monoculture, growing only cherry trees. However, as a result of this, the soil fertility of the crop-growing land could be significantly reduced. Without techniques like crop rotation or polyculture, the soil will not be renourished by other plants like legumes, and thus is likely to be unsustainable in the long term and to hurt the environment.

10   In 2042 in Tasmania, "various Miracle Cures like coating trees with syrup were advertised ... many farmers tried these ideas." The absurd idea of coating trees with syrup reveals how much these miracle cures could be scamming farmers out of their money and time in buying these cures and enacting them. For example, the cost to buy syrup for all of these trees, as well as the labor for actually applying them, might result in farmers being unethically cheated and attacked by these other advertising corporations, which is immoral and therefore bad.

11   In 2042 in Tasmania, it is said that, "Australia already has the strictest biological-quarantine requirements globally, and the Tasmanian government implements even more rules. Importing any fruit and vegetables to Tasmania is prohibited, including from mainland Australia." Such a quarantine mentality could have the potential to increase restrictions upon immigration as well which might have the effect of discriminating against minority groups from poor countries.

12   In 2042, in Tasmania, farmers like Matilda use "automated methods" such as "Bark-embedded sensors and Beebots". Increasing automation of farming tasks could result in traditional jobs such as a farm hand being removed for being obsolete due to this new automation. This would result in a loss of jobs in the Tasmanian economy that could increase unemployment and be an economic issue.

13   In 2042, in Tasmania, "legal disputes between farmers and insurance companies were ongoing". Since insurance corporations often have backings in government, a corrupt miscarriage of justice may result from the ongoing legal disputes, sinking farmers further into debt due to legal monetary complications that could result from the legal disputes.

14   In 2042, in Tasmania, antibiotic "research and funding have focused on humans." As a result, other animals and plants could also be susceptible to this type of antibiotic resistance, leading to a society that could have a lack of a variety of foods and meat from livestock due to the species being decimated by bacteria. Thus, the society could become malnourished and lack physical health from a lack of overall food.

15   In the year 2042, around the world, Tasmanian cherry trees may be used to "reseed global orchards." If they do this, there will be a lack of genetic diversity associated with the cherry trees across the world, leaving a potential for the cherry trees to once again die out in the event of a pandemic. In that case, all the efforts to rekindle cherry trees will be wiped out again, wasting society's efforts and time, which is bad.

16   In 2042 in Australia, it is said that farmers either cut down or burned trees that were suspected to have been infected with pseudomonas avium. Killing these trees might cause the diversity of the microbiome of the forests to decrease. This potentially might upset the symbiotic relationship between microbes and their host trees and open niches for pan-resistant bacteria to thrive in the ecosystem.

STEP 2. Identify the Underlying Problem

Using the challenges listed in Step 1, identify a problem of major importance to the Future Scene situation. Write your Underlying Problem making sure your question clearly explains the action that will be taken and the desired results/goal of that action.

Since, in 2042, in Tasmania, antibiotic resistant bacteria such as pseudomonas avium are causing farmers to worry about their cherry orchards immensely, and are causing a serious financial blow to the cherry industry, how might we reduce the occurrence of infection so that the effect of antibiotic-resistant bacteria on the cherry industry are minimized?

STEP 3. Develop Solutions

Generate solution ideas to the Underlying Problem in Step 2. Choose the 16 most effective solutions and write the elaborated ideas in the space provided.

In the year 2042 and beyond, around the world, software engineers as well as scientists in the fields of antibiotics will come together under the IIARA to work for the industry to create a bacteriophage-identifying AI. This AI will sample from a list of all known bacteriophages and match them up with the pseudomonas avium to help reveal which one is likely the most effective at combating it, using its computational ability to match everything, as well as the quick germination of bacteria and bacteriophages. Then, it could also couple with a newer antibiotic to better cause results. This was seen with M. Abscessus, where after testing over 10,000 bacteriophages, scientists found 'Muddy,' who in combination with a drug, were able to create a 70% survival rate from an earlier 20% survival rate. Through all of this, the AI can help find something to combat the avium bacteria and then allow this bacteriophage to thrive to prevent infection in already riddled areas, as well as in specifically Tasmania. It also fixes the idea of antibiotic resistance because bacteriophages are adapting just as quickly as the bacteria, allowing this solution to be long-term successful, despite potential minor fluctuations. This, with the bacteria neutralized, the occurrence of infection will decrease significantly, and thus the cherry industry over the globe will rebound and improve.

2   In 2042 around the world, Goldman Sachs will create a trust that pools investment from many different investors. This trust will be used to indiscriminatorily fund startups who are proposing to create new solutions to the problem of pan-resistant bacteria or are manufacturing tools to combat this disease. There will be two levels of funding. The first will include general funding which screens good product ideas. The second will receive much larger funding grants for companies that are better able to solve the problem. In this way, by giving funding to cash strapped startups, solutions to the global agricultural disease problem can be deployed with more speed and efficiency. Hence, they will also experience less selection from investors who care more about profit rather than solving world problems. Thus, the business community will be monetarily incentivised to solve the problem of the pan-resistant crop diseases.

3   In 2042, around the world, a team at Microsoft, who will be willing to do this because it matches their mission of environmental sustainability, will build an artificial intelligence system which provides surveillance for the incidents of virus bacteria via satellite imagery. The AI will then accurately predict where the strains of bacteria will end up, based on landscape mapping of rivers, streams, in addition to information about the forecasts of wind, and weather. This can help farmers to build safeguards to infection in advance, thus reducing the rates of occurrence and reducing the impact of antibiotic bacteria strains on the cherry industry.

4. In 2042, around the world, Nike will partner with the IIARA to create a line of boots with specific tiny detectors in them. These tiny detectors will be able to screen for trace amounts of the pseudomonas avium bacteria if it is resting atop one's shoes. Then, when people seek to enter Tasmania, the sensors will begin to send alerts to their phone letting them know that they are a potential spreader of the disease and making them quarantine their shoes. This could allow these people to wear fashionable new shoes with metallic looks (from the sensors on all parts of the shoes), improving their aesthetic and having the consumer like the look, as well as preventing the disease from spreading into Tasmania and thus reducing the possibility of infection, resulting in the cherries in Tasmania being able to thrive and potentially repopulate the globe with cherry trees, after which these shoes could be used regardless of the location to prevent the bacteria from spreading further.

5. In 2042 in Tasmania, the Tasmanian government will create parks featuring fruiting tree species that are susceptible to the disease pseudomonas avium. While playing in these parks, celebrities and ordinary people will see the trees and be inspired to use hygenic practices that decrease the spread of such pan-resistant agricultural diseases. This will effectively inform the public about the pressing problem of antibiotic resistance.

6. In 2042, towards Tasmania, and later around the world, Amazon and FedEx will collaborate with the Tasmanian government as well as scientists to create a system in regards to the transportation of people, who could be carrying the antibiotic resistant bacteria on them. To address this issue, they will create a plane and ferry system in which passengers must be "Incubated," a term for the process they will create, which includes a quarantine system that is longer than the life of the bacteria on surfaces like plastic or humans (since they are not trees). As a result, the incidence of infection will decrease because the disease will not spread as rapidly as it did from Europe to Chile and more, and thus places that were unexposed like Tasmania are more able to rebuild their cherry industry.

7. In 2042, in Tasmania, GeoDomes, a new startup company based in Tasmania, will be provided funds from the government to construct geodesic glass domes to shelter each cherry orchard from infection. Each geodesic dome will be cheap to construct but sturdy, as a geodesic dome, which is a dome made of triangle pieces, is one of the strongest structures a human can make with inexpensive materials, while also letting sunlight through. This will reduce the occurrence of antibacterial - resistant bacterial infection since the geodomes will block it and thus lessen the impact of the antibacterial microbes on the cherry industry. Also farmers will see that the government is willing to financially help them prevent infections, and will be more willing to listen to their educational programs against misinformation.

8. In 2042 across the world, the company DuckDuckGo will create a web3 site known as Bushshel Overflow, a dedicated site where farmers can discuss the problems they face in agriculture. It will be an international and dedicated site which will have an easy sign up process where farmers can easily share solutions to problems that other farmers have. This will help to democratize agricultural knowledge which will benefit small, local farmers in their agricultural operations. This will help to diffuse solutions to the problem of pan-resistant crop diseases farther and more quickly put these solutions in place. This allows for the agricultural community to adapt quicker to bacterial threats which would have the effect of decreasing the spread of pan-resistant agricultural diseases.

9   In 2042, across the world with emphasis in Tasmania, scientists will work with farmers such as Matilda to introduce a sensor into the irrigation system. Because irrigation often uses groundwater from aquifers, the irrigation systems would be likely to also be exposed to the pseudomonas avium bacteria. Their sensors, thus, will also be able to reveal where the bacteria are and where they are spreading, letting farmers know about this. The irrigation system is an already set up piece of infrastructure, which causes the transition to be speedy here, however this could be generalized to a simple pipe structure spreading through the farm for antibacterial stewardship. Then, this can identify the trees that are infected and allow for that area of soil to be sectioned off and sterilized, using antibacterial stewardship to monitor infection and prevent it from spreading, reducing its occurrence and helping the farmers continue producing some cherries, rather than having a spreading infection and no cherries.

10   In 2042, in Tasmania, many farmers are baited by 'Miracle-Cures.' A team of video game designers will work with the government in their campaign against misinformation to create a recreational game that details how to help protect one's trees (and what not to spend money on, such as covering trees in syrup). The game will provide different levels in which one's character is a happy farmer who bounces around to whack enlarged images of antibiotic-resistant bacteria. At the end of each level, a fun fact about what a farmer can do will be displayed, and ads will all be for pamphlets on how to use antibiotics carefully and avoid allowing antibiotic resistance through common sources (such as injections into things like trees for their crops). As a result, the farmers will be more informed and focus their efforts onto reducing the infection possibility, thus contributing to the cause and likely being more effective than if they were doing other things like applying syrup. As a result, the cherry industry could be fixed, as farmers will be taking reasonable and helpful steps to fix their orchards and work with solutions that work.

11   In 2042, in Tasmania, many farmers use Beebots to monitor and surveil possible incidences of antimicrobial-resistant infection. However, a problem arises from Beebots since they can't possibly cover such a large area of orchard and check every single tree effectively. Thus, in Tasmania, in 2042, John Deere will make a tracking device that instead checks the sap of the cherry tree every other minute to check for infection. This tracking device will be solar powered, thus will always have battery and will be attached directly to each and every single cherry tree (via drone). This tracking device will be a systematic improvement to the old system of Beebots, thus will be better at surveillance, and thus will reduce the incidents of infection by allowing farmers to contain their infections easier, and thus will reduce the impact of the bacteria on the cherry industry.

12   In 2042, across the world, governments will collaborate to create "Antibacteria Court Cases." These are used to create accountability for people who could end up tracking bacteria across the world into new places. Essentially, they will be tried for their own negligence in bringing a new type of bacteria across the world to impact the cherry trees negatively. With this, people will be incredibly motivated to not spread this disease, or else they might end up in prison or with a hefty fine, and thus the disease won't likely be spread as often (reducing its occurrence), thus reducing impacts on the cherry industry as a whole.

13   In 2042, in Tasmania, biologists from the University of New South Wales (also known as my physics teacher's favorite Australian college) will create a microtag for a select population of possums and insert them into the native Tasmanian population. These possums will have microtags that can track the cherries that the possums eat and see if the trees have been infected by the bacteria. Once the infected cherry trees have been identified it will automatically alert all the farmers in the vicinity. This provides invaluable warnings to farmers who don't have the resource to afford the hightech solutions such as the Beebots, allowing them to contain the infection easier. Thus, the incidents of infection will reduce, and so will the impact of the antibiotic-resistant bacteria on the cherry industry.

14	In 2042, in Tasmania, the drug company Moderna will create a new company called BigMonies. This company will be composed of talented roboticists and microbiologists. This group will create insect like robots named MantisBots which will be given the sole task of distributing rich cultures of probiotics into trees. The MantisBots will go to centralized dissemination facilities where they will pick up small grains of probiotic. In the probiotic, there will be dormant bacterial spores for bacteria essential for the microbiome of fruit trees such as cherry trees. They will also contain other proteins engineered with CRISPER which will target the DsbA protein in virulent bacteria to decrease their tendency to adapt to new antibiotics. The MantisBots will then fly the probiotic to the fruit trees where it will encourage the growth of good bacteria and decrease the niches that virulent bacteria like Pseudomonas avium have to grow in. This will decrease the incidence of virulent infections by giving researchers more time to create new antibiotics to fight the pan-resistant agricultural diseases.
15	In 2042, in Australia, the company School Speciality will create a funding group called BigDollars that intends to provide money to individuals in order to gain education in Microbiology. This funding group will allow more students to study agribusiness professions at institutions such as the University of Sydney. This will increase the number of professionals in the field which will help decentralized farmers like Matilda to get the professional help needed in fighting pan-resistant agricultural and bacterial diseases in crops.
16	EachersPray, a collection of scientifically-minded preachers, will preach the values of antimicrobial stewardship to Tasmanian Farmers specifically targeting the farmers who are not providing daily reports to the IIARA as they should be, since many farmers simply just "cut down the infected tree hoping for the best". Farmers who are religious will be persuaded by the preachers to follow these antibacterial stewardship practices, thus reducing the occurrence of infection and minimizing the impact of infection onto the Tasmanian cherry industry.

STEP 4. Generate Criteria

Generate criteria to determine which solution idea does the best job of solving the Underlying Problem and/or addressing the Future Scene situation. Select the 5 most important criteria for measuring solution ideas and write them in the spaces provided.

	Since, in 2042, in Tasmania, the antibiotic-resistant strain of bacteria has conquered the entire world except for Tasmania in the span of three years starting from 2039, the bacteria is shown to be extremely infectious and travel extremely quickly, thus which solution is the quickest to implement so that the extremely virulent anti-bacterial resistant bacteria doesn't infect all the trees in Tasmania before the solution is achieved?
2	Since, in 2042, in Tasmania, the cherry industry is a very important industry in Tasmania once being valued at 12 billion dollars, which solution will best minimize the effect of antibiotic-resistant bacteria on the cherry industry so that the impact of the bacteria on the Tasmanian economy as a whole is reduced?
3	Since, in 2042, in Tasmania, many farmers are being actively harmed psychologically and in terms of basic needs by the antibacterial-resistant bacteria, which solution will best reduce the occurrence of infection, so that the harm on farmers caused by the bacteria is lessened?
4	Since, in 2042, in Tasmania, the "Tasmanian cherry trees are a test case for reviving the species" and will "be saved and used to reseed the global cherry orchard", thus making it imperative to maintain the protection and safety of the Tasmanian cherry population, which solution is the most effective at protecting the cherry trees, so that they can eventually be reseeded worldwide?

| | 5 | Since, in 2042, in Tasmania, farmers are already questioning the actions of the groups that want to achieve solutions, such as the government, as shown from them "quietly cutting down the infected tree" instead of reporting it to the IIARA, which solution is the most ethical, so that the farmers will agree to the solution thus limiting moral resistance against the solution. |

STEP 5. Apply Criteria to Solutions

From the solution ideas written in Step 3, select the 8 ideas with the most potential to solve the Underlying Problem and list them on the grid. Use each criterion to rank the solutions on a scale from 1 (poorest) to 8 (best). The numerical ranking for one important criterion may be doubled.

Rank solutions.

									Criteria
#	Solution	1	2	3	4	5			Total
	In the year 2042 and beyond, around the world, software engineers as well as scientists in the fields of antibiotics will come together under the IIARA to work for the industry to create a bacteriophage-identifying AI. This AI will sample from a list of all known bacteriophages and match them up with the pseudomonas avium to help reveal which one is likely the most effective at combating it, using its computational ability to match everything, as well as the quick germination of bacteria and bacteriophages. Then, it could also couple with a newer antibiotic to better cause results. This was seen with M. Abscessus, where after testing over 10,000 bacteriophages, scientists found 'Muddy,' who in combination with a drug, were able to create a 70% survival rate from an earlier 20% survival rate. Through all of this, the AI can help find something to combat the avium bacteria and then allow this bacteriophage to thrive to prevent infection in already riddled areas, as well as in specifically Tasmania. It also fixes the idea of antibiotic resistance because bacteriophages are adapting just as quickly as the bacteria, allowing this solution to be long-term successful, despite potential minor fluctuations. This, with the bacteria neutralized, the occurrence of infection will decrease significantly, and thus the cherry industry over the globe will rebound and improve.	4	8	8	7	6			33

2	In 2042, around the world, Nike will partner with the IIARA to create a line of boots with specific tiny detectors in them. These tiny detectors will be able to screen for trace amounts of the pseudomonas avium bacteria if it is resting atop one's shoes. Then, when people seek to enter Tasmania, the sensors will begin to send alerts to their phone letting them know that they are a potential spreader of the disease and making them quarantine their shoes. This could allow these people to wear fashionable new shoes with metallic looks (from the sensors on all parts of the shoes), improving their aesthetic and having the consumer like the look, as well as preventing the disease from spreading into Tasmania and thus reducing the possibility of infection, resulting in the cherries in Tasmania being able to thrive and potentially repopulate the globe with cherry trees, after which these shoes could be used regardless of the location to prevent the bacteria from spreading further.	1 6 7 8 5	27
3	In 2042, around the world, a team at Microsoft, who will be willing to do this because it matches their mission of environmental sustainability, will build an artificial intelligence system which provides surveillance for the incidents of virus bacteria via satellite imagery. The AI will then accurately predict where the strains of bacteria will end up, based on landscape mapping of rivers, streams, in addition to information about the forecasts of wind, and weather. This can help farmers to build safeguards to infection in advance, thus reducing the rates of occurrence and reducing the impact of antibiotic bacteria strains on the cherry industry.	3 4 6 4 8	25
4	In 2042 around the world, Goldman Sachs will create a trust that pools investment from many different investors. This trust will be used to indiscriminatorily fund startups who are proposing to create new solutions to the problem of pan-resistant bacteria or are manufacturing tools to combat this disease. There will be two levels of funding. The first will include general funding which screens good product ideas. The second will receive much larger funding grants for companies that are better able to solve the problem. In this way, by giving funding to cash strapped startups, solutions to the global agricultural disease problem can be deployed with more speed and efficiency. Hence, they will also experience less selection from investors who care more about profit rather than solving world problems. Thus, the business community will be monetarily incentivised to solve the problem of the pan-resistant crop diseases.	5 2 3 2 7	19

5	In 2042, across the world with emphasis in Tasmania, scientists will work with farmers such as Matilda to introduce a sensor into the irrigation system. Because irrigation often uses groundwater from aquifers, the irrigation systems would be likely to also be exposed to the pseudomonas avium bacteria. Their sensors, thus, will also be able to reveal where the bacteria are and where they are spreading, letting farmers know about this. The irrigation system is an already set up piece of infrastructure, which causes the transition to be speedy here, however this could be generalized to a simple pipe structure spreading through the farm for antibacterial stewardship. Then, this can identify the trees that are infected and allow for that area of soil to be sectioned off and sterilized, using antibacterial stewardship to monitor infection and prevent it from spreading, reducing its occurrence and helping the farmers continue producing some cherries, rather than having a spreading infection and no cherries.	2 1 5 3 4	15
6	In 2042, towards Tasmania, and later around the world, Amazon and FedEx will collaborate with the Tasmanian government as well as scientists to create a system in regards to the transportation of people, who could be carrying the antibiotic resistant bacteria on them. To address this issue, they will create a plane and ferry system in which passengers must be "Incubated," a term for the process they will create, which includes a quarantine system that is longer than the life of the bacteria on surfaces like plastic or humans (since they are not trees). As a result, the incidence of infection will decrease because the disease will not spread as rapidly as it did from Europe to Chile and more, and thus places that were unexposed like Tasmania are more able to rebuild their cherry industry.	7 5 2 1 1	16
7	In 2042, in Tasmania, the drug company Moderna will create a new company called BigMonies. This company will be composed of talented roboticists and microbiologists. This group will create insect like robots named MantisBots which will be given the sole task of distributing rich cultures of probiotics into trees. The MantisBots will go to centralized dissemination facilities where they will pick up small grains of probiotic. In the probiotic, there will be dormant bacterial spores for bacteria essential for the microbiome of fruit trees such as cherry trees. They will also contain other proteins engineered with CRISPER which will target the DsbA protein in virulent bacteria to decrease their tendency to adapt to new antibiotics. The MantisBots will then fly the probiotic to the fruit trees where it will encourage the growth of good bacteria and decrease the niches that virulent bacteria like Pseudomonas avium have to grow in. This will decrease the incidence of virulent infections by giving researchers more time to create new antibiotics to fight the pan-resistant agricultural diseases.	8 3 4 5 2	22

| 8 | EachersPray, a collection of scientifically-minded preachers, will preach the values of antimicrobial stewardship to Tasmanian Farmers specifically targeting the farmers who are not providing daily reports to the IIARA as they should be, since many farmers simply just "cut down the infected tree hoping for the best". Farmers who are religious will be persuaded by the preachers to follow these antibacterial stewardship practices, thus reducing the occurrence of infection and minimizing the impact of infection onto the Tasmanian cherry industry. | 6 7 1 6 3 | 23 |
| | | | |

STEP 6. Develop Action Plan

Develop your top-scoring solution idea into an Action Plan. Thoroughly explain how the Underlying Problem is solved, how the plan will be implemented, and how the Future Scene will be affected.

In the year 2042 and beyond, from Tasmania to Chile (where the disease was first spread), the IIARA, software engineers, antibiotic researchers, and the farmers most directly impacted by this will collaborate to solve the issue of the antibiotic resistant bacteria. To do so, they will create a bacteriophage-identifying AI, which will be named Antibiotic Identification Artificial Intelligence (AIAI). This AI will take a list of bacteriophages that are known across the world, as compiled by the IIARA based on a culmination of reports and surveys of scientists, and use those as well as a set of antibiotics and DNA encoding of pseudomonas avium to see which is likely to be the most effective in combating this disease. This was seen with the research combatting M. Abscessus, which was a disease. Scientists tested over 10,000 bacteriophages, and finally found one named 'Muddy' - which, when used in conjunction with rifabutin, caused a 70% survival rate in a disease that historically only had a 20% survival rate. Using this, a bacteriophage for the ABR bacterial infection can be found (and similarly, in potential future pandemics, this could be used as well, to address the issue, showing how it's long-term). This is also a better solution because it tailors to the evolution of the bacteria; the bacteriophage will evolve in tandem with it. After this AI is used to identify a potential solution, it will be reintroduced to the trees using the possums. It's revealed that the possums are already eating the cherries. Thus, by applying trace amounts of the bacteriophage into the trees, when the possums eat the cherries, their droppings will fertilize the trees further and allow the bacteriophage to be effectively distributed into the soil, where it can further end the spread of this antibiotic.

This will also be implemented with a timeline. For the first three months, the AI will be in development, using DNA encoding and CRISPR to quickly gain antibiotic and bacteriophage data to upload it. Thankfully, the IIARA's detailed data collection (along with a potential BeeBot modification that would let them, too, see if they could find naturally occurring bacteriophages or bacteria), allow the data gathering stage to be sped up. Then, it's simply a matter of coding. After that, the bacteriophage will be tested to confirm that it is not detrimental to possum or human health, once again to confirm that the cherries being consumed will not hurt anyone. This will take an additional 1 month, as trials and refinement will force this to occur. After that, this will be introduced to the possums in a natural way so that the ecosystem as a whole adapts to the change, rather than this one change potentially having negative repercussions and allowing the humans to unethically Play God - instead, nature itself is allowed to reclaim this advanced bacteriophage and use it to create another relationship between the two that balances out to help fix the cherry industry. In the meantime, the Australian importation system will be upheld. Some may say that this isn't implemented in a timely manner; however, the BeeBots and the system of importation blocking has already existed for a long time: from Australia's protection of the bees in previous years to address when bee populations were dropping because of a disease and thus no bee importation was allowed. Thus, this system can still survive a little longer in comparison with the length of time it has previously been impacting others. Additionally, America's attempts to help the Chestnut Tree population and previous bacteriophage investigations with finding 'Muddy' among others, can contribute to this overall to make it a relatively quick study, because it stands upon the shoulders of other key medicinal discoveries.

This solution also clearly is able to reduce the occurrence and incidence of disease, and to help rekindle the cherry industry. Here, the very cause of the disease is being eliminated, as the bacteriophages are removing any amounts of pseudomonas avium. Therefore, it will be very effective. Further, the BeeBots, which are extensively able to monitor situations of antibiotic resistance, can provide the stewardship necessary to confirm the results of the bacteriophage and allow for targeted solutions that can have a larger impact. This is also clearly helping the cherry industry, as its initial threat was immediately fixed, and now it can continue to grow. Further, as the cherry trees are likely to be redistributed around the globe, this solution prevents further cherry industry issues as the AI could be concurrently set on other potential agricultural diseases. This also addresses the uncertainty that people like Matilda feel. Although better stewardship can help them, the true security from fixing their farm comes from only solving the root cause of the issue and removing this pressing threat, allowing farmers like her to be able to feel secure and unworried about cherry farm shortages. It can also allow corporations and other farmers to rebuild their businesses, and the cherry trees and natural ecosystem as a whole can thrive, as the bacteriophages have been introduced into the ecosystem and become naturally occurring. Thus, this is able to address the events and difficulty of farmers like Matilda, as well as to reduce the occurrence of disease and to help reduce the impacts of the cherry industry.

Some may say that this is potentially inhumane because of the lack of bacteriophage testing on animals in 2022. However, Matilda suggests that a lot of research has been done into human antibiotic testing, which implies that this research can simply be extrapolated to the larger environment and still be applicable. Additionally, this solution allows for the bacteriophages to become a part of the ecosystem: they are able to concurrently evolve with bacteria threatening the trees, but the possums as well will build up their own resistance to it (even though the bacteriophage will be selected to help avoid the possums dying out) and it can even help fix the trees until they gain genetic immunity as well (showing how in the long term, there will be a possibility for weaning away from bacteriophage use). In that sense, this is no different from something like the reintroduction of wolves to Yellowstone - introducing a new part of the ecosystem to fix something humans did wrong in the past. This is not unethical or playing god, but rather atoning for mistakes and creating a healthier environment that everyone can be a part of.

This is also helpful for the farmers like Matilda, as they can feel like they're participating in solutions. Rather than being able to code the AI, they are able to monitor the possums and their reintroduction, and be significant contributors as well as beneficiaries, once again removing the strain from their minds and making them feel like they are fixing the issue as well. Furthermore, they will have the ecosystem's needs at heart and can prevent corporations from hurting the ecosystems or the cherry trees, and since they are necessary for the introduction phase of this plan, it can better allow them to take on a role and help solve the issue of antibiotic resistance impacting their cherry trees overall.

Thus, this solution is the best and the AIAI can effectively help address the recent failure of the cherry industry.