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BIOSHIELD

WORKSHOP REPORT

WORKSHOP OBJECTIVES

The subsequent phase of data collection centres around 1 local-level workshop organization conducted with academicians, industry representatives, associated partners and students. Workshops include discussion and brainstorming sessions regarding biotechnology response to global climate change.

Overview

- To specify the effects of global climate change and increasing disasters threatening biological life on the Earth, especially agricultural product yield.
- To clarify in which areas industrial and agricultural biotechnology has developed solutions so far and what their efficiency on a global scale is
- To reveal the future research and industrial and agricultural solution/remediation areas that can be developed through biotechnology
- To contribute to developing innovation in Biotech higher education towards upskilling students by delivering a curriculum



PROGRAMME FLOW

Venue: Çanakkale Onsekiz Mart University – Faculty of Education – Meeting Room

Date: 17.01.2025 – 11.00 am

01 **Opening**

Welcome and presenting workshop objectives

02 **Session 1**

Overview of Climate Change and Its Global Impact - Climate Change and Disasters' Effects on Agricultural Productivity

03 **Session 2**

Current Biotechnology Applications in Climate Change and Climate Change-Oriented Disaster Mitigation

04 **Session 3**

Promising Research Areas in Biotechnology and Role of Biotechnology in Disaster Resilience

05 **Session 4**

Discussion for Regional Variations in Climate Change Effects - Case Studies - Experiences

06 **Evaluation**

Participants'' Opinions on Workshop Organization

07 **Closing**

Participants'' Opinions on Workshop Organization

DATA COLLECTION METHOD

Data Collection Process includes document preparation for workshops, questionnaire preparation, stakeholder communication, workshop facilitation, quality evaluation survey design and implementation.

Participant Profiles

The eligible departments for biotechnology professionals: biology, chemistry, genetics, energy, biochemistry, molecular biology, ecology, geography, eco- remediation

The sector representatives can be from the following sectors by technique: genetic engineering, molecular breeding, molecular diagnostics and tissue culture.

Workshop Materials

We, all partners, contribute to developing workshop organization materials, presentations, and resources.

Know-how Exchange

Participants will exchange their know-how about climate change and resulting disasters, its effects on agriculture, current applications, and emerging research areas.

Workshop questions will guide participants to share their know-how, creative ideas and solution offers.

Workshop Outcomes

Case studies, and recommendations will be generated during the workshops.

Data Analysis

Data analysis includes demographic information about participants, themes created from the answers to the questions, highlights from each session, and quality evaluation results.

Participant Profiles

Participant Profiles	Academician	Sector	Associated Partner	Student
Number / Percentage	6/20	3/20	1/20	10

Participant Age

Age Range	18-25	26-35	36-45	46+
Number / Percentage	10/20	3/20	4/20	3/20

Gender

Gender	Female	Male
Number / Percentage	8/20	12/20

Data Analysis

Session 1

Questions of Session 1	Themes	Sub-themes	Excerpts of participants
Q1 **What specific skills and knowledge gaps are there in current biotechnology education to combat climate change?**	**1. Biodiversity and Climate Change** **2. Biotechnology and Agriculture** **3. Education and Climate Change Awareness** **4. Interdisciplinary Education** **5. Ministry Efforts and Agricultural Policies** **6. Drought and Farmer Support**	1. The impact of climate change on natural populations such as plants, birds and reptiles, the need for technological tools (e.g., artificial intelligence, sound analysis), and accessibility challenges in applying such methods. 2. Exploration of soil quality and the use of hydroponics	**Çiğdem:** Ms. Didem is a bird expert, she works on birds. Of course, birds are also a species that is specifically affected by climate change. In other words, in terms of being an example of animals, some biotechnological methods, artificial intelligence, and sometimes methods such as determination by sounds are used to monitor them. But these are not well known. In fact, we can say that the first problem here is the lack of accessibility. **Didem:** The costs of the resources we use need to be at an accessible level. **Abdullah:** Right now, I want to work on plants. Under the topic of plants, I am actually trying to address soil pollution. That's why I'm trying to move forward as a biotechnological approach to hydroponic agriculture. I'm trying to go from an industrial point of view, not from an academic point of view, but from an industrial point of view. At this point, I come across that these issues are not well known in Turkey. **Çiğdem:** In other words, at the root of this, maybe education needs to start from the beginning within the scope of these questions. If it had

		(soilless farming) as a biotechnological approach, with challenges in industrial applications and limited awareness in Turkey. 3. The importance of integrating climate change topics into early education (primary and secondary levels) to better equip students with knowledge and skills. 4. Suggestions for including theoretical and practical courses in curricula, collaborating with experts from various	come from secondary education and primary education, maybe we would have a fuller equipment right now. In other words, when we enter these jobs in undergraduate education, we can say that our past is empty. **Sinem:** Now, biotechnology education, yes, is already an education, but when we talk about climate change, I think we need to think in a multifaceted way. In other words, it is an area that needs to be addressed from many angles, many parameters need to be considered. There are physical factors, chemical and biological factors in this, and all of them need to be evaluated together and evaluated specifically for that region. For this reason, I think that there should be theoretical and practical courses from different disciplines in the curriculum. For example, contacting an environmental engineer professor, maybe giving lectures with a climate expert, meteorologist, geographer or ecologists like us can make the perspective more cumulative. **Ibrahim:** First of all, it is not possible to consider climate change as a whole. It needs to be evaluated individually. Since we, as the ministry, have been aware of this in recent years, there has been a change in the climate since 2018, both in our province, in our country and around the world. We feel this with drought, which is an insidious natural disaster, and drought, a disaster that we have seen the effects of for many years. Drought needs to be assessed separately. The increases in the population of diseases and pests caused by the effect of climate change should be evaluated separately, and the scope of the economic struggle against them and the fight against the problems caused by the effects of natural disasters should also be considered separately. I think that giving the lessons separately in three or four different ways will be much

		multidiscipline such as environmental engineering, meteorology, geography, and ecology 5. Measures taken by the Ministry of Agriculture to combat climate change impacts, such as drought response plans, promoting biological pest control, and water-focused agricultural production planning. Examples include water-efficient irrigation practices and providing financial support for farmers based	more successful or effective in terms of guiding our fellow students. Biological control of diseases and pests is the work of a group, we have now abolished chemical control. We have also abolished it as a ministry. Earthly struggle needs to be shelved and biological control needs to come into play. As Çanakkale, we are far ahead. Since approximately 2019, we have achieved great success by switching to biological control in apples and tomatoes. With these, we have achieved much more gains in mitigating the effects of climate change. Secondly, we started agricultural production planning. We have developed an agricultural production planning that puts water at the forefront, water-centered, and a support model in this way. We have prioritized the support model that puts water at the center. In dry agricultural lands, we provide three lira support to our producers in areas with water constraints, and one lira in places where there is no water restriction. In this way, since 2020, we have started drip irrigation paddy cultivation in many provinces, where many ministry officials say, "Don't fantasize". Currently, thousands of acres of paddy cultivation in Çanakkale is carried out with drip irrigation and seventy percent water savings have been achieved. We make our drought action plans in great detail. In terms of precautions against disasters, there is an increase of twenty to eighteen percent in agricultural insurance for our producers to take out insurance within the scope of agriculture compared to the previous year and this year. About eight thousand people have been trained on this subject. I think that the educational dimension of the work should be evaluated separately, and the trainings aimed at combating drought and combating climate change should be evaluated

		on water availability. 6. Discussions on the importance of drought action plans, agricultural insurance uptake, and training programs for farmers to adapt to climate change effects. 7. Addressing climate change requires separating its impacts, such as drought, disease, and pest population increases, into distinct areas for focused evaluation and effective response.	separately. Institutes should be established for farmers and those who will provide this training. Drought-resistant varieties need to be developed. For example, it is very important to develop drought-resistant oil sunflower varieties. We are currently working on this issue as the provincial directorate. However, to a certain extent, we can publish the varieties you have developed. We can't develop those varieties. I think that you and the institutes can only train or guide our fellow students in this regard. **Ahmet Kılınç: The** increasing population with climate change naturally affects the limited resources of food and we have to feed this population somehow. There is a growing demand. Especially in the food processing sector, there are things I have observed both in terms of raw materials and water resources used. Take the cheese industry, for example. The water, milk and all other raw materials used here need to be evaluated. We think that the whey that comes out of the cheese is around ninety percent. If these developments can ensure that less water is wasted, a few more products can be extracted from the composition of this water, and finally it can be used in recycling, a major problem in this sector will be solved. There is a tremendous waste of these raw materials. With biotechnological developments, studies can be carried out to make cheese hold more water or to turn these raw materials into final products with less waste. The rapid depletion of water resources affects businesses a lot. Today, many food manufacturing businesses have an incredible water expense. Studies can be carried out on the reuse or

			recycling of these waters. I think that students should improve themselves in these areas. **Seydi Ali Doyuk:** I am the director of the fisheries and aquaculture branch. When we talk about climate change, water is at the top of everything. The aquaculture sector is a sector that needs clean and abundant water. When the amount of water decreases, production also decreases. We cannot carry out the aquaculture activities that we would do in dams and ponds. When we look at it in the context of climate change, aquaculture is the organism that shows the greatest sensitivity to water temperatures. Rising water temperatures in trout or mussel farms harm living things and lead to deaths. For this reason, it is very important to use water sparingly and cleanly. Events such as mucilage occur due to the pollution of the seas. With the increase in water temperatures with climate change, the migration of fish is also affected. It is necessary to explain these to students in a multidimensional way. I think that the use of water, keeping it clean and saving should be included in the training programs. **Nurşen Çördük:** We have a problem: Students cannot put their theoretical knowledge into practice. We tell them everything, but when we tell them about any problem, they don't know how to reach this solution, how to use the information and create problems. It may be due to the education system, but students do not have much knowledge of current things. They don't know about climate change and sustainability. Practical training should be emphasized. He needs to

			learn how to solve the problem, what data and information to use. This deficiency is present in all classes. **İlke Karakaş:** I would like to give an answer to this question about my field. Now, climate change is negatively affecting the entire ecosystem in general. Of course, while it affects negatively, it actually accelerates the evolutionary processes of living things such as microorganisms. This can also be considered a plus. For example, the uncontrolled transition of the climate towards drought or the transformation into extremely salty, extreme environments reduces the diversity of plants, affects agriculture, affects water and can negatively affect all areas in general. However, we are able to fight against these living things, that is, microorganisms, against these stress factors. For example, we can provide a variety of interactions with microorganisms so that a plant under drought stress can cope with this stress. In addition, support with microorganisms can be provided to extend the shelf life in the food field or to prevent pathogenicity in fish. In my opinion, this field, that is, substances obtained from extreme environments and their relationship with sustainability, needs to be covered in both theoretical and practical courses. I think such an approach can make a significant difference in the fight against climate change. Ayşegül Balı: In particular, I myself have worked on mucilage vitality before. You just mentioned mucilage, but when we were doing that study, for example, we followed the climate process for a year, taking samples from the sea. We tried to look at how mucilage affects marine

			organisms, and there was a huge reduction in the population. This was seen very clearly in the studies carried out compared to the previous year. Ayşe: When I was studying at university, more utopian subjects were being discussed. For example, scenarios such as how to solve a problem were being used. We were thinking about what could be done with genetic studies. I don't know what the situation is in universities right now, if current problems are covered in the courses. 5-6 years ago, when I was an undergraduate student, current issues were not brought up much in classes. Are students aware of this now? Are current issues covered in the lessons? For example, when they learn a technique, do they think, "We can use this technique to solve this current problem"? I remember in the past, my teacher Tuğba gave us an assignment at the time: "There is such a problem, go and research and find a solution". I don't know if such questions are being given right now. When a new technique is learned, is it discussed how this technique can be adapted to a problem that needs to be solved in Turkey or in the world? For example, we took a course on stem cells in our semester and our teacher said, "Research what is being done in the world about stem cells." Everyone was choosing different topics. At that time, I learned that a stem cell study on mice in Japan was applicable to humans, and I will never forget it. Such methods made the lesson more permanent and effective. Kemal Hoca: Now, of course, climate change is inevitably a very interdisciplinary field and includes many disciplines. Of course, biotechnology is a specific branch. Our main problem in this area is: Are we able to adequately incorporate this interdisciplinary structure? Or how much have we been able to include so far? If we can concentrate

			our efforts on this point, I think we can improve the quality of education in this direction. Begum: I'm currently doing my Ph.D. and I'm studying the body temperature of a species of lizard. In my literature searches, I see very clearly how much animal populations are declining with climate change. But I don't know how much knowledge undergraduates have about it. How much do they observe nature? How well do they know the animals? Maybe more educational programs can be made on this subject and awareness can be raised. Ceren: I will do a study on wetlands. I just submitted my thesis proposal this semester. At the same time, I will determine environmental variables; Among them are parameters such as air temperature. If we link them to climate change, wetlands are already suffering a lot. Climate change has a significant impact on the drying or depletion of these areas. As my friend said, is the basic meaning of climate change clearly explained to students? Or is this information conveyed to them well enough?
-What knowledge and skills do students need to acquire?			**Çiğdem:** Since we are talking about biotechnology here, biology should be known as a priority and basic discipline as an infrastructure. If a student is going to work in this field, he must first know biology well. Next, the area of specialization in which he will work — such as plants or animals — should be determined and he should be made to specialize in that field. But it is always important to start from the very basics in the field to be studied.

			I think that technology courses should actually be included in all departments. Of course, these courses are available in biology and molecular biology departments, but they should be included in other departments as well. In this way, students can have the opportunity to comment more, improve themselves and be more active in a field while taking technology courses. It will always be more advantageous to start one step ahead instead of starting from scratch. I emphasize that in biotechnology education, it is necessary to take biology and technology from the basics. If an environment is to be created to learn biotechnology at advanced stages, I think that this process should be supported by basic biotechnology education starting from the secondary education level. In terms of education, it is important for teachers to be open to innovations in transportation to students. Some teachers may be resistant, but this is usually due to habit. As everything has a foundation, when this foundation is not learned correctly, wrong results can occur. Students are using AI, but they must be guided by an advisor. For example, it is important for them to receive support on issues such as confirming the accuracy of information or developing methods that will reduce waste of time. Artificial intelligence is a tool that makes things easier in all of our fields, but the use of these tools needs to be approached with expertise. We can consider artificial intelligence as a technology that accelerates and facilitates our business processes. Celal Can Varol: Technology and artificial intelligence now have an indispensable place in every aspect of our lives. Regardless of people's job or interest, they need to use these tools. However, this is true not only for science students or scientists, but also for people from all walks

			of life. Therefore, from middle school, at the high school level and even earlier, it is of great importance to teach how to use such tools. Individuals who learn at a young age how to use these tools regularly, appropriately and effectively can be much more successful in accessing and producing information in the future. For example, there are dozens of different AI tools available right now. However, knowing which of these tools is suitable for which job plays a critical role in achieving an individual's goals. If students are provided with an education system that will answer basic questions such as "Which artificial intelligence can I use for which job?" or "What purpose can these tools serve?", the contribution of these tools will be much greater in their future studies. Based on my own experience, I can say this: When I need to use artificial intelligence for a job, I first spend time learning how that artificial intelligence works. After trying to understand the operation of the tools, I can move on to my main job. However, if I had been taught this process beforehand, I would have been able to focus directly on my own work and use my time more efficiently. **Fatma Beyza:** We know the problem and yes, it is constantly said that there is a problem. However, there is less talk about how we can contribute to this problem. So, it is necessary to focus on what can be done. Everyone has something to do; This can range from the smallest step to large-scale projects. I think at this point, we need to focus on what can be done on a global scale, starting at the minimal level. Every individual, community, or institution can do something on their own scale, and when these efforts

			come together, they can make a big difference. Such an approach can help us take more concrete steps towards solving problems. **Elif:** Actually, I agree with everyone, because things are a little more theoretical, especially from a student perspective. Until you graduate and get a job, the focus is usually on theoretical knowledge in the education process. Of course, we do internships, but our knowledge of how things work in industry or agriculture may be incomplete, especially for students who want to work in agriculture and biotechnology. At this point, projects that will act as a bridge are very valuable to us. For example, *Biote(A)ch* is a good example of this. We, especially as the Department of Molecular Biology and Genetics of ÇOMU, receive a serious education in the field of plant-based biotechnology. However, when we go to the Faculty of Agriculture for a project, we encounter a different perspective, or when we go to an engineering faculty, we encounter a different approach. For this reason, it is very important to increase the number of such projects and to bring students together with professionals and experts from the sector. In particular, it will be beneficial to include the provincial directorates of agriculture in this process. Because the real question is: Can we directly apply the knowledge we have learned in theory to industry or agriculture? Or how can we use this information to create more environmental, more peaceful solutions?

			As a result, I think that education in these areas is open to improvement and a much more effective learning process can be achieved with more cooperation. **Ahmet Kılınç:** It is necessary to approach this issue in the following way: The student should first ask himself the question "What subject do I want to work on?" After making this decision, with our support, the student can gain experience in businesses or in the sector they are interested in. For example, by spending the last period of his last year directly in the sector, he can personally observe the deficiencies and problems in that sector. Then, they should bring these problems to the university and start producing solutions with the support of their professors. In the current situation, students often do not know the industry, so they cannot see the problems of the sector. This limits the support and hands-on learning process that the student can receive from the university. At this point, it is conceivable to extend the training period by one year. By spending the entire last year in the private sector, the student can consolidate their knowledge in the sector and do a report or project work in this process. This study can be considered as a graduation project. Everyone can give an example from their industry. I, for example, work mostly with food engineers. According to my observations, graduates who are new to the industry experience a lack of self-confidence. Since they do not know the industry, they are influenced by workers or masters, which leads to them not being able to prove themselves to their employers. This situation results in masters having more say in the workplace and even being paid more.

			In recent years, universities' relations with the private sector and other institutions have begun to increase. In the past, such contacts were almost non-existent, but now more projects and collaborations are taking place. For example, we take the students who come to us for internship to different sectors and enable them to gain experience in the field. However, the important thing here is to transfer field experiences to the university and to support students with this information. **Fatih Sezer:** The seven plus one application started in the biology department, as it is in many departments. This system works exactly as you say: The student receives his education at the university for seven semesters and spends the last semester working in a company in the private sector. Whichever field he wants to work in, he can evaluate his last period by gaining experience in that sector. Since this practice has just begun, students who are included in this system will only reach the graduation process after four years. Of course, students are currently doing internships as well; They go back and forth for as little as a month. However, I think that this application, in which they will spend an entire period in the sector, will be much more beneficial. In this way, students will get to know the sector better and have the chance to learn the dynamics of business life. **Nurşen Çördük:** In the past, students were more conscious and assertive. Today's students, on the other hand, are more insecure and fragile, perhaps due to their upbringing. We observe this as well. I kept saying, "What am I going to do? I can't." This situation also manifests itself in the education process. Even high-achieving students can be timid.

			Unfortunately, this lack of self-confidence and shyness makes it difficult for students to adapt to a completely different process when they start their business life. For them, business life becomes a very different and time-consuming process. **Ayşe:** Sir, my biggest problem right now is related to physiology. In fact, it could have been a more comprehensive physiology course for us. I'm trying to sort this out with my own business manager. Last year, thankfully, he devoted a day entirely to training and gave me an intensive physiology class. This was very helpful. Apart from that, we took an ecology course, but this course was removed from the lesson plan at some point. We, as students, opposed it. Because in the next semester we had a course on molecular evolution, and the knowledge of ecology was fundamental to understanding evolution. A good understanding of ecology is critical not only for evolution lessons, but also for understanding climate change and finding solutions. Without knowledge of the environment and ecology, it would be very difficult to develop solutions to such problems. **Ayşe:** Sir, I am sorry to say that I do not know much about biotechnology, as a biologist. If I had seen a lesson on these techniques, I would have come here more knowledgeable by now. For example, if I knew about cloning, I could use it to maintain extinct organisms. The lack of such classes pushes me to study in a more limited way at the moment.

			Ceren: Yes, although I studied biology in my undergraduate life, I did not take a course on biotechnology. It could have been a course on biotechnology; Or, as you say, courses like biostatistics could be taken. I could have used this information more easily now. For example, I could have integrated it into my doctoral dissertation, but I didn't take such courses. It would have been much more beneficial to have such courses in undergrad.
What are the effects of climate change?			**Kemal Hoca** This is a multidimensional problem and has an impact on the social and positive sciences. If our field is positive sciences, we can summarize all the problems as follows: Soil, water, animals and plants are affected by the bad effects of climate change. Especially recently, the frequency and severity of fires and the extent of burned areas have become a major problem in this region. Biodiversity is also adversely affected. It is also observed how the growth times of plants after fires, regeneration processes, combined with periods of intense drought and heat, are affected. The development of animals is also changing, and its effects on the water cycle are huge. The prolongation of rainfall and drought periods, their spread over large areas or heavy rainfall at short intervals cause changes in the ecological balance. We observe all these effects in our lives and we also encounter them in scientific studies. **Aisha**

			In my field of work, especially animal husbandry, one issue worries me. I am currently working on an animal farm and herd breeding is carried out with artificial insemination. But we're constantly developing herds using the same bulls with similar sperm, and we're evolutionarily reducing biodiversity. In Turkey, everyone is starting to use the sperm of the same bull. This situation is similar to the potato crisis that led to major famines in Ireland at the time. They take a bull, do genetic testing, breed it, and send the sperm around the world. This severely reduces genetic diversity. This situation is ignored not only in animal husbandry, but also in plant agriculture. **Bob** I also work in zoology and do research on amphibians and reptiles. These animals experience climate change directly because they are cold-blooded. The fact that they still do not engage in hibernation during periods of hibernation is due to the fact that the temperatures are not compatible with the winter season. For example, we found a species of frog on campus that was supposed to be hibernated in February. In Bozcaada, too, a lizard species that should have entered into hibernation is still not sleeping. The fact that the temperatures are not suitable for winter also affects the breeding times of the animals. **Begum** We work with the same team as Ceren, and in a study conducted in Bozcaada, we observed that a reptile species that was previously distributed in certain areas shifted to higher, colder areas in 2022. This suggests that as a result of climate change, the distribution areas of animals are changing.

			Kemal Hoca If we summarize what our friends say, phenological changes are observed. Environmental influences change the rhythm and stimuli of living things. In plants, as well as animals, there is a forward shift in processes such as flowering and bud formation. These changes are observed not only in certain regions, but also throughout the world, in northern latitudes and temperate zones.

Data Analysis

Session 1 – HIGHLIGHTS

1- Biotechnology holds great potential in improving environmental sustainability.

2- However, it is clearly stated that more work, training and support mechanisms are needed to make these solutions feasible and economical.

3-

Data Analysis

Session 2

Questions of Session 2	Themes	Sub-themes	Excerpts of participants
Q1- **What are the main deficiencies in biotechnology research to mitigate climate change?**	1. Analysis and Use of Climate Data 2. Agricultural Technologies and Sustainability 3. Integration of Climate and Agriculture in Education 4. Data Management and Sharing Problems 5. Interdisciplinary Collaboration 6. Sustainable Agriculture and Environment 7. Dissemination and Facilitation of Technology	. 1. Collecting, analyzing, and monitoring long-term climate data with modern techniques (satellite and remote sensing) and monitoring their agricultural impacts 2. Student projects on climate change and plant development 3. Modeling and forecasting for the future 4. Optimizati	**Çiğdem:** Currently, we can monitor climate change with biotechnological tools, such as the use of drones in agriculture or satellite imaging methods. However, the biggest shortcoming in this regard is that such monitoring has not been carried out in the past. In other words, we cannot access historical data. For example, what was the situation like 20 years ago? How much are our losses now? We're watching right now, yes; Maybe we can follow the arid areas. But we don't have much access to historical data. That's why biotechnology is an important tool, and measuring climate change is something that needs to be done in the long term, not in the year. The monitoring we are currently doing with biotechnological methods will create a data source in the future. For example, determining how much a water supply is decreasing. As more up-to-date biotechnological methods are developed in the future, these processes will become easier. Currently, data such as habitat use and measurement of water capacity can be collected with satellite images. However, in the next process, this data can be monitored more effectively. The biggest shortcoming here is that these methods have not been used in the past and therefore we cannot give an accurate output.

	8. Animal Welfare and Health	on of fertilization and irrigation systems 5. Use of artificial intelligence and big data in agriculture 6. Recycling of agricultural waste and environmentally friendly practices 7. Teaching basic data analysis methods at primary and secondary school level 8. Children's awareness of the weather and climatic conditions of the environment they live in 9. Inclusion of agriculture and biotechnology	In addition, the tools to be used must be sustainable. That is, the concept we call optimization is important. If you're using a tool in a field, it needs to be sustainable. Because you should be able to get the same results over and over again so that you can make comparisons with the past or previous studies. For this reason, the use of biotechnology is of great importance not only for climate change, but in all areas. **Celal Can:** Today, sustainability has become a very important issue in every field and in every medium, and this is a part of every article and project. In the field of biotechnology, many different methods can be developed, especially solutions can be produced for problems such as drought, greenhouse gases, soil condition. However, what is important here is the idea that these biotechnological outputs should be sustainable. While solving a situation, negatively affecting or destroying the other party can make you question whether this technology is really useful. Therefore, the resulting outputs should be sustainable; In this way, we can be more effective tools in preventing crises. Because while solving a problem, the emergence of another problem means not actually solving the problem, but only postponing it. Therefore, sustainability should have a much more important place in the field of biotechnology, as in every field, and must be prioritized. **Ahmet Kılınç:** Today, in the field of agriculture and animal husbandry, cooling problems have started to come to the fore instead of heating. Especially in cattle breeding, the productivity of animals decreases as the temperature increases. While the temperature range in which animals are most productive is around 17-20 degrees, temperatures reaching 40 degrees in summer negatively affect yields. For this reason, in areas where animals are kept, cooling systems, such as fans and cold air spraying methods, are used to

		topics in lesson plans 10. Providing comprehensive knowledge to students through interdisciplinary collaboration 11. Facilitating data access for academic studies 12. Academics and industry experts carry out projects together. 13. Development of multidisciplinary knowledge and skills (genetics, statistics, programming) 14. Expanding the use of biological control and natural fertilizers	control the temperature. Likewise, cooling processes in greenhouses require high energy consumption, which is now a huge cost. While heating is no longer a problem, factors such as drought and increased soil salinity are creating greater challenges in agriculture. Irrigable agricultural land is decreasing, and the salinity of the soils is increasing as a result of years of improper fertilization. The solution to this poses the need to breed plant species that are resistant to drought and salinity. Another suggestion is on the use of sea water. Two-thirds of the Earth's surface is covered by seas, but drinking water resources are limited. The salinity of seawater is around 4%, and it can be very efficient to use this salt water with biotechnological methods, especially as irrigation for salt-resistant plants. For example, making brine more concentrated and using it as a brine can be functional in the food industry (pickles, cheese, etc.). In this way, waste sea water can be used without depleting drinking water resources. In addition, by developing temperature-tolerant animals and plants, more efficient livestock and agriculture can be carried out in high temperature conditions. For example, improving the genetic traits of warm-climate-tolerant breeds in Africa and transferring this endurance to local breeds through embryo transfer could have great benefits in the future. These biotechnological approaches can offer important solutions for both adaptation to environmental factors and sustainable agriculture and animal husbandry. **Seydi Ali DOYUK: Factors** such as climate change, decrease in water resources, and increase in temperatures lead to major changes not only with their effects on the environment but also on ecosystems. The warming of the

		15. Efficient use of water resources and drought prevention 16. Industrial livestock farming and the reduction of carbon emissions.	Mediterranean Sea is causing species that were not previously native to the Mediterranean to enter the region. The invasion of these species disrupts the ecosystem balance by suppressing local creatures. Invasive species such as pufferfish, for example, pose a threat to marine ecosystems. However, instead of seeing these species only as harmful, it is necessary to develop biotechnological solutions to bring them into the economy. Marine pollution, such as mucilage, causes great damage to marine ecosystems. Nitrogen and phosphorus emissions cause water to be polluted and temperatures to rise. In order to solve these problems, biotechnological treatment methods should be developed and sustainable solutions should be produced for the protection of water resources. We also need to explore how we can use them effectively when combating invasive species. For example, making puffer fish suitable for consumption or using it in other industries. Warming seas will lead to the shift of Mediterranean fish species to the Marmara and Black Seas, and this can have major effects on the ecosystem, especially in the Black Sea. The decline of fish species in the Black Sea and the extinction of local species such as mussels will require the production of new species and the protection of existing species with biotechnological solutions. The cultivation of new species can be carried out through biotechnological research. Studies can be carried out on the genetic adaptations of these species in order to cope with situations such as the northward shift of Mediterranean species. In addition, biotechnological methods should be developed to render invasive species harmless and to be used in beneficial sectors.

			As a result, biotechnological solutions for climate change and biodiversity conservation will not only solve environmental problems, but also benefit economically. **Nurşen Çördük:** Being able to produce permanent solutions for sustainability is a critical point in terms of achieving effective results for the future. However, right now we are often trying to save the day with workarounds. This often means ignoring the long-term effects. In fields such as plant biotechnology, advanced methods such as gene transfer techniques and modifications are often limited to academic studies and cannot be applied in the field. Many biotechnological solutions are unable to land in the field due to high costs. This actually leads us to not be able to benefit from the potential of technologies. These methods, which we often tout as "beautiful theoretical solutions", may be far from being applicable in practice. This is a significant obstacle for biotechnology to offer a truly sustainable solution. Therefore, these technologies need to be made more accessible and economical. At this point, increasing field-oriented research, especially in order for biotechnological innovations to be applicable on a larger scale, will be an important step in reducing costs and producing sustainable solutions. In addition, collaborations and public policies need to be supportive to increase the applicability of technologies in the field.

			Ahmet Kılınç: Efficient use of water in agriculture is becoming more and more important and the projects carried out in this regard are really promising. In particular, projects such as "Drop by drop becomes paddy" are an important step in terms of increasing the sustainability of paddy production by using water resources more efficiently. Such projects show that it is possible to achieve the same yield with less water than with traditional irrigation methods. In addition, increasing field days and fieldwork allows farmers to see which species are more productive in practice. Such applications reveal how scientific research works in the field and its real-world impacts. The contributions of universities and the dissemination of species supported by the Ministry of Agriculture can also accelerate this process. Although progress has been made in the production of indigenous seeds, long-term studies are required to develop more productive and resilient species suitable for future climatic conditions. Such innovative seeds are critical to meeting the agricultural needs not only of today, but also of the decade from now. Not only increasing productivity, but also working with sustainability and environmental impacts in mind, offers a great opportunity for the future of agriculture. **İlke Karakaş:** Yes, you are making a correct point. In order to combat climate change and ensure sustainability, it is very important not only to provide technological solutions, but also to raise awareness of manufacturers. Waste generated in sectors such as olive oil production can harm the environment if not managed correctly. However, the recycling potential of these wastes is

			quite high. Wastes such as black water and pirin can be evaluated by biotechnological methods and converted into many useful raw materials. Many businesses need training on waste management. Therefore, organizing educational programs on biotechnology can help manufacturers understand how to make this waste beneficial. However, the correct delivery of these trainings will help producers realize the value of waste. Recycling products such as olive waste not only ensures environmental sustainability but can also create an additional source of income for producers. A sense of trust needs to be created in order for manufacturers to cooperate more on biotechnological solutions. Therefore, in addition to such trainings, it would also be useful to develop incentive strategies for manufacturers to adopt such solutions. This process can create a lucrative situation, not only environmentally but also economically. **Fatih Sezer:** On the one hand, producers generally do not see it as profitable to make use of their waste. Most of the time, they think that it is costly to set up facilities to evaluate waste. The process of setting up these facilities and developing a potential product may entail high costs at the beginning, which pushes them to avoid such investments. **Ahmet Kılınç:** There is a study carried out by the Provincial Directorate of Environment for the last three years. Now, companies do not distinguish between black water and pomace; They separate both together. This method provides economic benefits, especially by extracting pomace oil. However, the blackwater pools are still left open and the water in these pools is expected to dry out. In case of rain, the drying process of the water is prevented. This makes it difficult to dispose of waste.

			Olive black water can be used in plant production. Especially when olives are used as fertilizer for irrigation, it would be useful for institutions such as the Faculty of Agriculture and the Faculty of Biology to investigate the results of this practice. If embedded in the legislation of the Ministry of the Environment, the potential benefits of this water could be considered more broadly. Another problem is whey. Whey can provide a significant benefit in animal nutrition. For example, when high-protein water is used to soak dry feed, the fact that this water is whey makes the feed more nutritious. In addition, a tastier and nutritious feed for animals is obtained. This method makes a significant contribution in terms of nutritional value, while reducing costs, especially for farmers who keep dogs. Such applications can be a solution to one of Turkey's important problems. **İlke Karakaş:** We have two BAP projects related to Karasu. In these projects, we investigate recyclable industrial raw materials within the black water. We are not only studying the potential of olive irrigation, but also the use of these substances in various fields such as cosmetics, health and medicine. These products can be an alternative to the items we buy abroad in dollars and euros. Therefore, the establishment of special facilities for the research and recycling of these products can be beneficial for both the ministry and the university research group. We also have a study on whey. In this study, we produced carotenoid pigment from whey. This pigment can be used as textiles, cosmetics, food and dyestuff. However, as basic scientists, we do not have the opportunity to work in partnership with various government and public institutions, so we can only do the research part of the product. We are not able to implement the

			implementation part, which is an obstacle in transferring the results of the projects to the sector. **Ayşegül Balı:** The biggest deficiency in developing biotechnological solutions related to climate change is that we do not have enough information about its long-term effects. Generally, studies focus on short-term effects and feasible solutions are sought in a short time. However, studies on long-term effects are very limited. Therefore, field studies or laboratory research examining long-term effects can be increased and more sustainable solutions can be developed in this area. **Melih (I started because I had to give ideas to the participants)** One of the biggest shortcomings in this area is that individuals who directly experience problems are not listened to enough. For example, as scientists, in order to develop an accurate understanding, we need to talk to people who face these problems directly. Collaborating with industry representatives, farmers, and experts working with nature is critical. This will contribute to making climate change efforts more effective and inclusive. **Aisha** I would like to add. I think the biggest deficiency in this regard is the lack of incentives. For example, whoever the ministry or administration is, they

			should actually raise this issue. In order to solve some of the big problems, government agencies need to step in, guide and impose rules. For example, it should be said that gas measurements should be made and carbon emissions should not exceed a certain level. If it is at a high level, there should be incentive programs where they can come together with universities that conduct biotechnological research on this subject. Because I think that the more incentive programs there are for the private sector, the easier it will be for universities to communicate. In addition, universities are prone to research, but there are budget problems. I think the private sector will only deal with the issue if a penalty system is introduced. **Sinem:** Yes, you made a very important point. Especially in regions with unique ecosystems, such as the Dardanelles, it may not always be enough to apply standard methods. Each region has its own ecological, economic and socio-cultural characteristics. Therefore, it will be much more effective to develop special solutions according to regional dynamics. For example, factors such as marine dynamics, water temperatures, water flow rates can directly affect the success of techniques applied to regions with different seas. In this context, developing the most suitable biotechnological solutions for the needs of that region by conducting region-specific research will be an important step to both protect the environment and ensure sustainability. Such customized approaches can lead to more efficient results, and it may be easier for locals to adopt these solutions. **Ibrahim:** Effective and efficient use of natural resources is a critical step to ensure sustainability. Since each region and basin in our country has its own

			problems, it is necessary to develop local solutions by focusing on these problems. In this context, academic studies play a very important role, especially in biotechnology and sustainable agriculture. For example, traditional chemical methods of weed control in paddy production can lead to environmental problems while trying to increase productivity. Chemical pesticides contribute to climate change by polluting soil and water resources. However, in recent years, biological control methods have been an important step in solving this problem. The use of biological fertilizers and biological control methods not only saves energy, but also helps to increase productivity without polluting natural resources. Such practices offer an effective solution in reducing the negative effects of climate change. At this point, the contributions of academic staff are important to ensure the integration of these biotechnological solutions into field applications. Academic studies can lay the groundwork for the development of biological solutions suitable for local conditions and the transfer of these solutions to farmers, producers and businesses. Increasing productivity with biotechnological methods in production facilities such as paddy, olives, olive oil and tomato paste can make it possible to produce sustainably without polluting natural resources. As a result, trainings and field studies should be organized for farmers, producers and enterprises in order to disseminate such biotechnological solutions. Thus, while minimizing environmental impacts, an economically sustainable production model can be created. **Aslıhan: Actually,** it comes to what you just said. The gap seems to be a lack of communication.

			Sinem: Yes, the most basic thing is to work together. We will provide data. I'm saying this on behalf of the biology department as basic scientists. Of course, different disciplines such as molecular biology and genetics are closer to the industry, but we are the main data provider. So we provide that data and we say, what do we do with it? At the point of implementing this, we need you, industrial organizations or to work with engineering. In this sense, your education, experience and getting to know the region are very different. You are always in the field, we are mostly in the kitchen laboratory part of the business. We have identified such and such a problem, we have thought of something to solve it, we need to come together at the point of whether it can be done or whether we can implement it. **Ibrahim:** Let me give you an example. Black water with olives is a problem, yes, it is a waste. If you take this into account, maybe you will recycle it as a useful fertilizer and reduce the problems that climate change may experience. Also, you will return it as something useful. But you don't know that's a problem. **Abraham: Or** whey is a problem. I don't know, china sap is a problem for us. But in the last two years, electricity has started to be produced from paddy straw. What happened after that? The manure obtained from there was returned as fertilizer to my paddy field or other areas. Something that was a problem as waste was returned in a beneficial way by working together. That's what I call "working together." **Sinem:** There are things that we experience differently from your experience. These are being put together.

			Ibrahim: For the last three years, pruning residues and pruning branches have not been a problem in Çanakkale. It started to come back to us as electricity, as a hivre. Why? Because only that facility, biology, needs to step in, you need to step in and that work needs to be evaluated. The focus was on identifying and solving them. **Aslıhan:** Vegetable wastes are now also used as biochar. This, in turn, sequesters the carbon in the greenhouse gas. In fact, carbon sequestration is very important in this respect. **İbrahim:** For example, the biggest problem of Çanakkale soils is the problem of organic matter. At the moment, we have started to close this gap with what we see as waste. So while we used to cover it with more farm manure, it's now starting to be covered with those. **Sinem:** The less external input there is, the more natural a transformation takes place.
- What technologies are currently most useful in biotechnology and agriculture for analyzing climate data, and how can they be			**Çiğdem: We** collect climate data in our field of expertise and their impact on agriculture is analyzed. With various statistical programs, this is actually done more and more. With mapping methods such as archeogis, analyzes are mostly made using these methods. Currently, the use of biotechnology in agriculture has an important place in terms of monitoring the effects of drought, especially by processing satellite images and images taken by drones with certain programs. It can be integrated into training programs. After all, with very simple analyses, that is, with very simple devices, students can be incentivized. Data such as

integrated into educational programs?			the weather and wind speed of the area can be measured and done even with primary school students. In this way, a general knowledge of the environment at that moment can be given to children. This can actually be done on the basis of exchange; The child can become aware of the weather situation they are in and make inferences about how it affects them. This is the simplest, but other studies can be added to it in the future. When growing a plant at home, perhaps it can be given some climate-related factors, for example, temperature. Such studies are actually being done right now. Secondary school students are working on these issues, especially with their projects. Studies are also being carried out to monitor the effects of climate change, especially on agriculture. The students in training are engaged in research related to agriculture, but they can and have begun to do such work in butars or at home, without planting tobacco themselves. In the past, this did not exist. However, in recent years, I see that secondary school students, especially those related to climate change and plants, have participated in panels and focused a lot on this issue. I observe that they are very conscious. This will be updated further in the future. **Celal Can:** First of all, I would like to talk about the following. Recently, I don't remember the exact date, but I read that the academics of the Faculty of Agriculture and the academics of computer engineering came together and produced a study. This study was as follows: They designed a system that could irrigate according to the needs of the plant with a device that could determine the water rate in the paddy fields. This device measured the amount of water at different points of the field and irrigated accordingly. Thus,

			unnecessary and excessive irrigation was prevented. This kind of integration seems like a very logical and nice solution. Likewise, soil analyzes can be carried out with devices that can be placed in different areas in the fields, not only for irrigation. These devices can instantly determine what the soil needs, its water needs, as well as how much water, nitrogen and phosphorus the plant in that soil needs in line with the information entered. In this way, the farmer can increase his yield many times over with fertilization and irrigation. In addition, excessive irrigation, excessive fertilization and over-spraying are prevented. This, in turn, offers an important solution to the problems we are currently experiencing, such as the water crisis and drought. Regular use of water resources helps to prevent drought. At the same time, with the increase in the amount of pesticides used, soil pollution is prevented. I think that this technology will play a huge role against the climate crisis, drought and environmental pollution and will have very positive effects. **Çiğdem:** These devices can be difficult to access because they are costly, but if they are very low cost and simple mechanisms that farmers can use, for example, they can be used immediately at that time and on site with a technology, it can be really useful. It used to be that to carry out soil analysis, for example, it was to send it to the laboratory, where it was necessary to carry out a series of operations and analyzes; This process could be very time-consuming and costly. Currently, a system that instantly measures the needs of the soil can really provide great convenience to everyone. We use a similar technology for water; We can instantly measure values such as water parameters, dissolved oxygen, pH. However, it is important that this

			technology can be easily used by people who are not experts. The fact that that instant data can be easily tracked in a way that works for everyone can make a big difference. **Nurşen Çördük:** We are already using statistical programs. It is also important that children are taught such data analysis methods and how they should be interpreted. Sometimes the results are questioned, for example, whether there is a difference between zero point one and zero point two. Is this difference significant? Such analysis needs to be taught. In some data, the difference obtained is insignificant, while in others there are significant differences. I think statistics should be given. It is very important which data should be analyzed with which statistical methods, because not every program can be used everywhere. At this point, interpretation skills are also required. Because there is a lot of data that can come out, and how will this data be collected and interpreted? In this regard, they need to learn the programs. **Seydi Ali DOYUK:** I can say this now: If we go through temperature-related or meteorological data, when you model these data, you can get the opportunity to see the coming years. From the point of view of fisheries management, we observe that the sudden increase or decrease in temperature data completely affects fish migration. For this reason, fishing is concentrated in some regions, while in other regions we do not see fishing activities. When we start to analyze these data properly and model them according to the years, we can easily reach many results. Meteorology already regularly shares annual and monthly temperature data, variable data from previous years. It is necessary to teach how to analyze this data very well. Because while temperature is a factor that affects fish migration, it also affects drought. Which regions have had rainfall and which

			areas have not? How effective have these situations been? In fact, all of these data, such as temperature, precipitation and storms, are factors that affect each other. The healthier we can analyze this data, the better results can be achieved. Because there aren't many people who can analyze this data. **Ahmet Kılınç:** All public institutions collect data, but they should be able to obtain a lot of data when sharing this data and in academic studies or when any student enters a library. However, legal issues, internal policies within the authorities, and drawbacks related to the sharing of data complicate this process. For this reason, for example, if a student asks us for information, we cannot give it because he has to make an official application. It has to be through the university, and I have to ask the ministry about it. In other words, the fact that this data is captive but can be used for academic studies requires a bit of a bureaucratic process. **Seydi Ali DOYUK:** There are many, many data sources everywhere. But everyone collects data and uses only the part that works for them, and closes it to someone else. Multidimensional thinking should be taught; In other words, even earthquakes in the world should be evaluated from a general point of view, not from a national perspective. It is necessary to look at how much change in temperatures there has been in the world, and it is necessary to look at all of them and pay attention to how they relate to each other. But what do we do? For example, the faculty of education only looks at the educational dimension, not other areas. The sailor looks at the specimens he has taken from the sea; It uses only its own data. No one else has access to this data. In other words, everyone is working individually. It is now necessary to establish a culture of collaboration. The most important achievements will come from a collaborative culture in terms of data.

			Kemal Hoca **When we talk about climate, of course, there is a difference between weather and climate. Since the climate covers a longer period of time, we need to work with data on a larger scale. Is there adult manpower that can work with these long data sets? Can they get trained to do those analyzes? I know in biotechnology, you analyze large data sets because you do sequencing. But those working in the field of agriculture may not have the skills to work with those data sets. Artificial intelligence should definitely be used and it is necessary to know how to program. So you need to know not only excel but also programming. For example, there may be programs such as MEDLAB that can easily analyze large data sets and produce graphs immediately. Because we can sometimes have problems in excel. For example, I worked with 5-year-old data sets with systems that can collect data quickly every half hour. We couldn't do that in excel. There should be both a program to analyze such data and analysis methods that will allow us to access information that we cannot see from this data. In order to teach these things to our students, we need to develop a system for educators to be found and persuaded, not only from the university, but also from industry or the public. There is also another issue. For example, when I talk to agriculturists, some of them say, I wish I knew a little more genetics. Students studying in some departments, such as geography, I hear such things as if I wish my analysis methods were a little more advanced.** **Fatma Beyza:** This approach is really important. Developing solutions that are suitable for both industrial production processes and small-scale producers

			can support sustainability and local development. Interdisciplinary collaboration can also bring together different perspectives, increasing the impact of such projects. Conversion studies with substances that are common in agriculture and are often wasted, such as olive waste, can offer environmentally friendly and economically beneficial solutions. **Fatma Beyza:** Yes, it is very critical to inform producers about biological and environmentally friendly practices. Traditional methods are often preferred because they look familiar and reliable. However, providing education and guidance on topics such as biological controls, natural fertilizers or more efficient use of water can make producers more sympathetic to these methods. It should also be emphasized that such methods will be more sustainable and economical in the long run. Training and exemplary success stories can encourage them to adopt these innovative practices.
- What are the most appropriate indicators for assessing the impact of biotechnological solutions to reduce			**Çiğdem:** Yes, analyses and studies to determine the nutritional and health needs of animals are really important, but animal welfare and health should also be taken into account. Today, research with some microorganisms and bacteria offers potential solutions for carbon emissions and waste management, especially in industrial animal husbandry. However, the wider spread of such applications requires more research and industrial adaptation. The use of agricultural products can play an important role in solving such problems, as plants can be an effective tool when it comes to sequestering carbon and mitigating environmental impacts. More efficient integration of

greenhouse gas emissions in agriculture?			microorganisms and biotechnological solutions can accelerate developments in these areas. The adaptability of the developed methods to the environment, their applicability and effectiveness on an industrial scale will be key factors in creating a more sustainable system in the long term. **Celal Can:** Yes, the role of algae in the management of greenhouse gases is very important. Algae can help reduce greenhouse gases in the atmosphere by working effectively in carbon dioxide recycling. This can provide significant environmental benefits by increasing the carbon sequestration capacity of algae, especially in marine ecosystems. In terms of preventing greenhouse gases and combating climate change, the use of algae has great potential as one of the ways to reduce carbon emissions. However, pollution of the seas can negatively affect algae populations. Marine pollution, especially plastic waste and chemicals, threatens the health of algae, which can undermine their capacity to sequester carbon. Therefore, protecting marine ecosystems and preventing pollution will be critical for algae to be able to fulfill this important role more efficiently. This two-pronged approach can offer a sustainable solution in terms of both reducing greenhouse gases and protecting marine ecosystems. **Nurşen Çördük: Actually,** it is more that the things that are being studied now are not accessible. A data can be generated for this. In other words, there should be a platform like our NCBI, where everyone uploads their work and clearly states the data. We have it because there are a lot of things like that... As you say, it is being studied, it remains on the sidelines. The same goes for our own articles. They don't even look back. Unknown. If a person is going to research and do research on that subject, he can reach it. There must be clear data. There must be a database. There needs to be a system where everything

			is uploaded there, where the data is clearly given and can be interpreted. It needs to be accessible. Yes. In other words, as we mentioned before, other people use the same data, use it multidisciplinarily, interpret it differently. But they work unaware of each other. But when something like this happens, when there is a database, anyone can enter it. I think that everyone can enter all the data on that subject and the person who reads it can get information in a versatile way. There needs to be a database. **Aisha** We had a former principal. His words became our motto; You don't know what you don't measure. It is necessary to measure it in order to be able to comment and evaluate. You have to measure everything. But companies generally measure, follow and evaluate if they will get results in a short time. Again, to give an example from animal husbandry, cattle have lanyards and thanks to these chips, everything is tracked instantly. Second-to-second data comes into the system. This is done in about 5,000 animals. At the end of the day, all these data are evaluated in terms of milk yield. Because minimum expense and maximum efficiency are desired. I learned this year that if the raw materials used in feeding are changed, the greenhouse gases from animals can be reduced. However, this approach obliges you with that expensive raw material. That's why no one approaches it. In the face of this situation, producers or farm owners suggest that some of the costs of such raw materials should be supported by the state to reduce global warming. If such support comes, then they can feed it with this raw material. Because such global problems are both too risky to be put on the back burner and too complex to be solved alone.

			Begum For example, what is our level of consciousness in this regard? In other words, will there be an awareness-raising study on this issue in the villages? I think that not only biotechnological solutions, but also awareness-raising studies are important. **Ibrahim:** When you go into that field, that producer doesn't accept it. But people like us, who have spent years in this business, never give up... Now, we started with five decares, first with drip irrigation. At the moment, nine thousand five hundred decares. No manufacturer admits this, saying, "Is this real?" In other words, the manufacturer you find never accepts. But you see, after five or six years, there is no one who does not use your innovation. This is how the work done in the field of agriculture and chemical fertilizers began. The app was previously used by no one. At the moment, he does not use chemical fertilizers, for the last five years, everyone has started biological fertilizers. They do not use chemical fertilizers. It is necessary to be patient, it is necessary to transfer the expertise of the work. Of course, as I say, you have to connect the links of the middle chain one by one. When you take one out, it's ... And you shouldn't back down. At the moment, we have started the project of collecting and disposing of pesticide wastes. In 2017-2018, all provinces began to laugh from under the mustache. We started with ninety containers, we started with one ton. Currently, we have collected and disposed of 31 thousand kilograms of pesticide waste. Currently, in 350 settlements, producers do not leave the pesticide packaging waste they use indiscriminately to nature. They throw it here, but we have done educational work, we have involved institutions, we have included universities. Gradually, but now there is political pressure: "Put containers in our village, and we will collect our medicines." This is where we are now. So, first of all, all innovations are in this way, especially in the field of

			agriculture, which is much more difficult. It's difficult, but it's persistent. In other words, as long as people understand, it is permanent, you continue without giving up. **Fatma Beyza:** In summary, I would like to say this: It is very important to raise more awareness of producers and to educate them on this issue. In other cities, as you say, they were "laughing under the mustache," but then those people accept and start the process. I think those people need to be made aware and such studies should be done in more cities. Because every city has its own wastes and crises. For this reason, it is important for each province to create its own strategy. **Elif:** In the problem you mentioned, I think that maybe farmers and biotechnologists should be combined. Because, for example, we have teachers working in the field of biofertilizers and we also have teachers who are experimenting in agricultural fields. At first, the farmers around them did not know about these technologies, but when they saw how effective a bacterium was on the soil, they realized that there was no need for chemical fertilizers. And then the farmers around him say, as you say, "Let's start experimenting with this." In this sense, perhaps the trials can be increased and farmers and students and graduates can work together. **Ibrahim:** As I said at the beginning, I think you need to take lessons that can explain issues like climate change to producers. This is where we are lacking: we need to get this education at school. We also learn by working, but it is too late, we lose 10-15 years. It is very important to receive this education at school. **Elif: Recently,** some of our courses have been on this subject and I think it is really comprehensive. For example, we can dissolve chemical waste left in the soil with bacteria, or we can produce something from waste. Plants are

			already solving them thanks to their own systems, and we can apply chemical farming. I did an internship in Italy last year and worked with wheat. I noticed that the Italians and many research groups are using natural methods such as Elisidors to fight pathogens. We can meet on common ground by telling our farmers about our work in this field. **Sinem:** We also need to be trained to be able to communicate here. So, it's important that we get a sociological education. **Ibrahim:** In our country, such trainings are usually offered as elective courses and no one chooses these courses. I think that such courses should be compulsory.

Data Analysis

Session 2 – HIGHLIGHTS

1- Biotechnology has great potential to improve environmental sustainability.

2- Making these solutions feasible and economical requires more work, training, and support mechanisms.

Data Analysis

Session 3

Questions of Session 3	Themes	Sub-themes	Excerpts of participants
Q1-What are the main demands of the industry for professionals in the field of biotechnology?	1. Multidisciplinary Studies and Communication 2. Time, Cost and Efficiency 3. Technological Innovation and Innovation 4. Waste Management and Environmentally Friendly Solutions 5. Identification of Stakeholders and Communication 6. The Need for Training and Trained Personnel	1. Lack of collaboration between different disciplines and lack of academic support for multidisciplinary projects. 2. Developing product efficiency and cost-effective solutions. 3. The importance of artificial intelligence and	**Çiğdem:** Regarding the work done by the sector, more rational solutions need to be developed. In their own business, in whatever sector they operate, it is important to have applications that will facilitate that area. Of course, each industry has its own unique requirements. I don't have a company either, but I can make such an inference by thinking on a sector-by-sector basis. In fact, they can get help from biotechnologists primarily to shorten time, contribute to product output, and reduce cost. **Celal Can:** The sector, regardless of the sector, demands the person who will work in that sector to do a job with minimum wage and as soon as possible. Because time is always of the essence, and it is also necessary that the cost of the resulting product is low, so that the product can reach a wide range. As my professor said, I think that time and wages should be kept low. I think people in the industry need to identify this demand. **Didem:**

	7. Participation of Private Sector and Government Institutions 8. Academic Structure and Internal Transformation	innovative thinking. 4. Biotechnology is a constantly evolving field that is open to innovations and the necessity of integrating new technologies into the sector. 5. Recycling of wastes by biotechnological means, Reducing the costs related to waste management 6. Lack of communication between academia and industry and other sectors.	I agree with my hon. I also think that the product obtained should be an output in order to solve the problem effectively. In a short time, it can be expected that the result obtained will be more effective and at less cost. People in the industry can expect such results. **Aisha** Another issue is the recycling of waste. Waste disposal can be very costly for companies. Therefore, there is a need for cheap and easy-to-apply methods. While small companies can ignore waste, large companies have ideas such as establishing biogas production facilities. However, they put such plans on hold or cannot be established because they are costly. In general, they want to achieve minimum expense and efficiency. There are also demands for yield increases. There is a need for biotechnologists, but biotechnologists also need to go to the field and understand the problems and know the needs of the field. The two sides don't understand each other right now. Foreign dependency should be prevented. Obstacles to Agricultural Biotechnology in animal feed should be removed. We are dependent on foreign sources for raw materials. When the war broke out in Russia, we could not buy raw materials. When fed with poorer quality feeds, greenhouse gas emissions increased. There is a great need for biotechnologists in animal diseases. Veterinarians are not inclined to work in multidisciplinaries. They are especially needed in terms of vaccine development. There is a need for trained personnel here. **Begum**

		7. The lack of recognition of the sectors and the lack of cooperation. 8. Shortages of trained personnel, especially in the field of biotechnology and veterinary medicine. 9. To provide students with interdisciplinary thinking skills. 10. The involvement of the state in the transformation process with new guidelines in sectors such as agriculture. 11. Making academic	Biodegradable packaging materials are needed because waste disposal is very costly. **Ahmet Kılınç:** When I ask about you, you will say, "Oh, there was that." So, first of all, we will take a step. First of all, we will go and talk. Everyone knows each other. It is much easier to do this, especially in small cities like ours. Everyone knows each other. There's a part of everyone's mind that we don't know. I think it's important to take the first step. After that first step, it comes. **Seydi Ali Doyuk:** In other words, when we look at it from the perspective of different professional groups or academic studies, the academic community should actually take the lead in them. In other words, in the academic community, one department and the academics in the other department—two departments that are next to each other—do not work side by side. **Seydi Ali Doyuk:** Individual studies are encouraged. Unfortunately, multidisciplinary studies are not supported. That's the problem. In other words, we see this in academic promotions; There's something very different, actually. So it's not like that abroad. So you're right, it is. **Seydi Ali Doyuk:** First of all, when we create a culture of working together with a common mind and a common culture, and produce joint projects together, as a result, when everyone reaches the people in their own field of work, that partnership will begin to form. It is necessary not to think about merging from the top down, from the bottom up. You have to start at the top.

		departments more multidisciplinary . Academic institutions encourage interdisciplinary studies.	**Nurşen Çördük:** Individual studies are encouraged. Unfortunately, multidisciplinary studies are not supported. That's the problem. In other words, we see this in academic promotions; There's something very different, actually. So it's not like that abroad. So you're right, it is. **Nurşen Çördük:** In other words, even in the department, we cannot work together in whatever we work. Or, you know, we're just working with chemistry, agriculture, different departments. Unfortunately, apart from that, I think the most important thing is to know the stakeholders. We know the problem, we know what we're working on. But it is necessary to first identify the stakeholders involved in this problem. **Nurşen Çördük:** Who is included in this? Once you've identified them, actually, yes, communication... I mean, how many years have we been here? We're in college. We did not communicate with industry, agriculture, the university in any way. In fact, this is our problem. No communication was established at all. In fact, there are different groups that are trying to solve the same problem, but they do not know each other, they do not come together. **Nurşen Çördük:** In fact, when they come together, even in such workshops, even though we are a small group, many ideas emerge. This should be given the opportunity. Indeed, there may be congresses, workshops, visits. There were actually a lot of visits during this accreditation process. In order to introduce ourselves, for both

			sides, "You know, you can see our working environment, our laboratories." In the same way, we can see your workspace. **Nurşen Çördük:** In this way, I think it is possible to come together by communicating and trying to find solutions to the problem, and by making different interpretations. But I think the first step is to really identify stakeholders. **İlke Karakaş:** In my opinion, in these bilateral relations and multidisciplinary studies, the research dean's office of the university should have a data web page. There should be a separate portfolio for companies and a separate portfolio for academics who want to apply for projects at work or to do various EU projects or TÜBİTAK projects. **İlke Karakaş: And** for example, if I am doing microbial biotechnology studies but I cannot carry the product I produce to the engineering dimension, for example, the research dean's office appoints a professor in engineering as a mentor to my project, taking into account the protection of natural interests, for example, or we finalized this product with the professor in engineering. **İlke Karakaş: By** assigning a company to the research dean's office, as a mentor, it can support the sustainable dimension of that product to the commercial and business market. Because now there is something like bilateral relations, for example, it is one thing to go to a company as a teacher, or it is another to go as a person, it is another to go through an institution.

			İlke Karakaş: I think the perception is changing. In other words, I think that going by making bilateral agreements between institutions rather than coming as an individual will increase the contribution. **Ahmet Kılınç:** I think this request would be very useful if students were invited to the sector, public institutions or by inviting them, where students were gathered together, grouped and an environment was created with them in the form of "Look, ask your questions, get your ideas, this is how help can be provided in this regard." **Ahmet Kılınç:** In other words, it is necessary to ensure that children make this contact now. Because tomorrow they may work with us or they will be in the private sector. They will meet again. If necessary, he can devote an afternoon or an hour of a week to this. People from different branches can be invited. I think it would be more beneficial if they did this more. **Ayşegül Balı:** In this regard, as a graduate student who has just graduated from undergraduate school, I think that we are a little inadequate in terms of interdisciplinary approaches. With elective courses, especially students in the biotechnology department can be given elective courses in these fields and supported by professors from different faculties. Thus, students' interdisciplinary perspectives can be broadened. In areas such as economics, students can be informed and more dominant.

-How can interdisciplinary approaches such as systems thinking and ecological economics for climate adaptation and mitigation be integrated into biotechnology education?			**Abdullah** : First of all, I think we need to teach students how to think innovatively and effectively. In addition, we need to teach the importance of artificial intelligence and how it can be used. Later, by leaving these two to the student, we can ensure that different ideas emerge in this field. It is necessary to leave the ability of interpretation to the student. **Çiğdem:** What is actually up-to-date at the moment, that is, the ability to interpret, we already have access to a lot of information. Memorization training is no longer the right thing to do. We produce a lot of information. Now it's important to give you the ability to interpret and actually how to use it in biotechnology and develop a perspective that can plan for the future. After all, these areas are not stable. The fields that are constantly developing every day are also open to innovations because we call biotechnology and will try to integrate those innovations continuously. Of course, if we talk about multidisciplinary studies, ecology always has a great importance in the work to be done on climate change. In other words, within the cycle we have been talking about from the beginning, it is necessary to approach the event a little bit ecologically. In other words, if we want to monitor or eliminate the effect of climate change on a living organism, we need to be an expert in that organism and look at its effects by considering its environmental conditions in an ecological sense.

			In other words, multidisciplinarity, ecology, biology, technology and engineering are actually very important. Of course, we are not talking about engineering, engineering and bioengineering are of great importance. Computer engineering is the same way. I think all of these things can come together and maybe do much better work. **Begum** In this way, I think that the workshops will be more correctable, and I think very valuable ideas have emerged here. Then it is necessary to carry out interdisciplinary studies, it is necessary to organize interdisciplinary workshops. **Aisha** We need to involve the private sector. For example, veterinarians are very closed to such studies. By getting to know the companies, we are here and we are doing such studies. Government organizations should also participate. For example, the Ministry of Agriculture is changing certain things, introducing new guidelines, which is about to undergo a big change. **Kemal Hoca** We also need to change the way we look at disciplines. The rigidity that Aisha is talking about is very evident in some disciplines. They

			don't accept or want to work with those who aren't among them. We have to break this somehow. In this case, it would be good to take people who are trained in interdisciplinary fields (not only in a single discipline who have a bachelor's degree, master's degree, doctorate in a field, but also a bachelor's degree in a field closely related to it, and a doctorate in a different discipline that combines them) as researchers and faculty members. Then, thanks to their perspectives, the students they train, and their approach to science, everything can be fine. In this way, an approach that will fundamentally change the structure is sufficient. The structuring of the departments should also be interdisciplinary.
-Which new areas of biotechnology (e.g., synthetic biology, CRISPR-based plant editing, microbial biofertilizations) have the most potential for climate adaptation and resilience, and how can they be integrated into the curriculum?			**Çiğdem:** So, actually, microbial fertilizers are very popular now. And in fact, the issue of making fertilizer by obtaining all three stages from waste is actually the most important. This, of course, is explained in a very simple way to education, that is, to students, here are secondary school students and undergraduate students. In order for such fertilizers, biotechnological products, etc., to be effective, they must be produced mostly from waste. Then it can achieve its main goal. And of course, we need to talk about industrial-scale production again. In other words, the more waste is disposed of, the more this will indirectly affect the climate crisis. Of course, in terms of education, I mean, how can it be? In fact, these are things that can always be learned with practice. So, theoretically, I don't think that explaining these things will have much effect on children. Because theoretical knowledge can be accessed in every way with artificial intelligence. I think that teaching these to the child

			with practice, in the simplest sense, teaching them in the laboratory with trials and experiments will perhaps raise people who are very specialized in that field among those children in the future. **Celal Can:** I think biogenes are of great importance in preventing this climate crisis. Because what lies at the heart of large fertilizers seems to be to introduce a microorganism into the soil and aim to provide the justifications of that soil by a microorganism. This leads to the fact that the farmer does not need to apply any extra fertilizers and chemicals from outside. Because the microorganisms necessary for the requirements of the soil, here are phosphate bacteria, mitogen bacteria, these meet the soil requirements. In addition, I think the use of CRISPR-Cas9 technologies is of great importance here. In plants to be developed against stresses such as drought, salinity, pH changes, there are breeding studies and grafting studies. These are traditional studies. However, it is of great importance to use this technology, which is modern and the latest technology of today, such as CRISPR, to increase specific genes, genes directly associated with drought and salinity, or to increase the activity of this gene in plants and organisms that do not have these genes, but have low expression, or to gain this gene directly. Nor is it mentioned in CRISPR and GMO status. **Abdullah:** I worked last year, but it is considered to be in the GMO class in Turkey. **Celal Can:** I don't know that in Turkey. As I said to my professor about the effect of the curriculum, explaining them in theory can have a

			volatile effect on the students. Demonstrating them in practice can be made more permanent. And I also believe that teaching these things to people at a younger age, at a younger age, can be more permanent. In this regard, I think that adding a course such as agricultural industry or agricultural biotechnology to the secondary school curriculum and filling this course may cause future generations to be more sensitive about this issue. **Kemal Hoca** **Soil microbe relationships and nitrogen fixation are a very important issue in the ecosystem field. You know, three-quarters of the atmosphere is nitrogen. But nitrogen is the primary element that limits primary production. This work is done by plants and actinomycetes belonging to the legum family with a symbiotic relationship. Other than that, there is not much who does. And then there are some free-living bacteria. Through synthetic biology, efforts are being made to transfer this to other plants, and in this way, it is important to reduce our need for synthetic fertilizers, naturally enrich ecosystems and increase primary consumption.** I am sure that biotechnology will definitely take its place among these fields. Because the consequences of biotechnology are things that will have a big impact on the profitability of the private sector. It will affect not only the private sector, but also people's lives. For example, in

			order for a peach to form, I need ten kilos of water for a pound of peaches that I throw away. If a study can be done with biotechnology that can produce this species, the same as five kilos, and the result can be obtained, I think it will affect the whole society. In the same way, if we can achieve results such as more products from less unit area, more yield from fewer animals with new breeding technologies, of course, greenhouse gases will decrease, climate change will slow down a little more, and the use of water resources will decrease a little more. In other words, biotechnology is a big field, but it is not enough on its own. But of course, biotechnology alone is very difficult to do this. As I said, it will be very important for the future studies to be able to have very good field trials in the industry, to create a suitable environment and to give really good budgets for research, and for students to go to the field a little more and identify these problems while they are still students. **Seydi Ali Doyuk:** There is a lot to be said about it. When we look at it with common sense, we need to find new species. We need to use our limited resources more efficiently. Once you do these things, people will own it. As it is embraced, it will develop more and be emphasized more. **Seydi Ali Doyuk:** He's going to move away from everything that he thinks is going to bring additional costs to people right now. This means that as a result of studies such as breeding new species and

			more cold-resistant fruits, more products and more food will emerge. As people see this, I think these studies will increase. **Nurşen Çördük:** I think genetic engineering comes to the fore here. Already gene transfer techniques, Cas9 technology is actually going to see a lot of it. In practice, I think I can say it briefly and concisely. Apart from that, I think ancestral seeds are very important. For us, I think it is very, very important that we lose them in the correctional work. **Nurşen Çördük:** Most of the genes we want are already in their gene pool. Not to lose them, because through breeding studies, we actually went the way of obtaining a single type of species, obtaining varieties, and we lost many of the characteristics we wanted. We have narrowed the gene pool. Therefore, ancestral seeds should also be given importance. **İlke Karakaş:** I think that there will be advanced developments in the field of bio-entrepreneurship in the coming times. Because that's what you're telling everybody, it's actually a partner. I think that this kind of bio-entrepreneurship branch of entrepreneurship has been formed by using biological products in all fields such as plant, food, aquaculture, animal husbandry, cosmetics, health, and synthesizing new products, and that they now contribute to the economy and trade, and this will increase even more in the future. **Ayşegül Balı:** I agree with my professors. Especially in biotechnology, such as the tissue culture method and the use of bioreactors, these allow you to obtain three plants or four plants from one plant. In

			particular, tissue culture leads to the easier production of some elements with a bioreactor with plants obtained from tissue culture. I also think that their use will increase even more in the coming years. **Ahmet Kılınç:** Data engineering is actually very important. Now, it is not possible with one person to bring together so many different studies. This is the job of data engineering to combine this with artificial intelligence, to complement each other's deficiencies and make them a single piece. Everyone is working, all articles are being published. A data engineering that can combine all these with artificial intelligence and obtain a one-piece result that can complete the shortcomings of this place is also a must. **Seydi Ali Doyuk:** In other words, let me say at the end what I was going to say at the beginning. The more unnaturalness we became, the bigger problems we faced. We have polluted our water, we have destroyed nature. We experienced all this during the time we moved away from nature, that is, away from naturalness. We played with his genetics. What? We gave a lot of medicines, we used pesticides, we used antibiotics, we used detergents. Every house uses tons of detergents, tons of nitrogen and phosphorus compounds are released into the seas. When we look at it, the more we have moved away from the natural, the more we have degraded ourselves. **Seydi Ali Doyuk:** But when we look at how to recover this, I think it will be going back to our essence. I mean, how much can we get away with it? How much can we reduce the detergents we take home? Every month, though, there is a bag of chemicals that are taken into a house. Dishwashing detergents, laundry detergents... These are

			nitrogen outputs. These are the chemical loads there, and everything has come out. What we call mucilage is nitrogenone. As long as we do not move away from them, we will be burdened with an additional burden no matter what we do. **Seydi Ali Doyuk:** The main thing is, how can we live naturally? Okay, we will use our water sparingly, we will not pollute nature too much. His return to us will be gradual. In other words, in many regions of the Europeans, residues from the herbicides they used in the vineyards at the time appear in the wines. **Seydi Ali Doyuk:** That's why we will not pollute our land, we will not pollute our water. After all, we ourselves will try to stay clean. But while we stay clean, we will try not to use it anyway. In other words, we believe that when we return to our essence, we can fix everything.
-What infrastructure needs (laboratory equipment, digital resources, field stations) should be addressed to support biotechnology education for			**Çiğdem:** I mean, of course, they can learn in laboratory applications, but when you look at it, it starts at home for that age group. In other words, it is necessary to instill in the child the fact of fighting the climate crisis completely subconsciously, with some observations, impressions or experiments that he can do at home about the work he does in the laboratory. In fact, this is such an issue that it should become a lifestyle, not just in school or in the laboratory or something. Of course, although great analyzes are not expected from the child, it is necessary to convince him that the small changes he will make are actually very important. So maybe he needs to be

climate-related challenges?			rewarded for what he does, and he needs to be ingrained in it all his life, as a personality. Then better outputs can be obtained. Of course, technologically, with artificial intelligence or similar technologies, it will analyze these things or give a score, for example. I mean, you know, there's a number of things that he's doing today that have to do with climate change, which he thinks is effective in his own way. For example, he will enter them into a program, and there he will give them stars. For example, a program to analyze whether it is true or not. It can be analyzed how effective what it does is, what effect it has on climate change, whether it is positive or negative. It occurred to me that maybe there could be that kind of software. In other words, this type of laboratory and at home and outside life should be applied. Some things need to happen. **Abdullah:** Fieldwork can also be done from an early age. Children can be taught something by simply taking them to the tree planting activity, emphasizing the importance of soil and the importance of plants, the importance of climate change. In terms of technology, these children, who provide education in a controlled manner, can develop in this way. **Didem:** I can say this, if everything is actually a game because they learn through play, if a game platform is made and if the factors that cause climate change, such as the factors related to the increase in greenhouse gases, are included in the game platform, and the child sees that there is a better environment when he eliminates them

			while playing, when he throws them out of the game, and that there is actually a better, sustainable environment when climate change decreases, This can actually make him notice things and not do things he shouldn't. **Kemal Hoca** There are inadequacies in the infrastructure of our university. No equipment or supplies of any kind. We are experiencing difficulties. This is very true. We make up for such deficiencies by purchasing services. **Aisha** The infrastructure in companies is better than in better universities. The infrastructure here is area-specific, that is, the company is trying to find the infrastructure that will meet its own needs in some way. Especially if he is convinced that he will make a profit from it. **Seydi Ali Doyuk:** We don't know exactly what the infrastructure is. I mean, the situation there... I say this for all professions: No sector should be ahead of either the academic community or the public sector. In fact, it should be the academic community and the public that will give direction. We are lagging behind the private sector. For this reason, it would be much better for academics and the private sector to be in close relations and to follow these innovations together. Today, you see, most of the private sector has taken precedence over the public sector. There are R&D studies that even

			surpass academic studies. Of course, I think that better points can be reached with joint work. **Ayşegül Balı:** As our professors said, the laboratories in the school are inadequate in many ways. But here is a cooperation that can be made. Our university can make it easier for students to do internships with some companies about this inadequate infrastructure, to work in those companies, and to learn how to use some devices. Such a cooperation solution can be done here. **Ahmet Kılınç:** In other words, at the university, first at the institutional level and then at the level of professors, the stakeholders of the sector, for example, the managements of organized industrial zones (OIZ) in both the public and private sectors. There is the Ministry of Trade, Industry and Technology. Related to this, for example, there are provincial directorates of trade and provincial directorates of agriculture on the basis of provincial directorates. Depending on the subjects they will study, these relationships can be established and such a thing can be done for some elective courses from the course time. For example, in elective courses, an infrastructure related to visiting industrial production sites and spending time here can be prepared with protocols. In other words, a protocol related to the companies in the OIZ, including the responsible public authority, can be prepared with the university and it can be ensured that children are out of school at certain hours. Thus, they can see the sector and analyze their needs. **Nurşen Çördük:** In order for it to be a laboratory, that is, to be applicable, our student laboratories must be really good. But at the

			moment, unfortunately, we do not have a laboratory equipped with new technology. We can't keep up with that technology. We are still trying to use the old infrastructure. Accordingly, our tools, equipment and materials are also outdated. Unfortunately, we can't keep up with it. **İlke Karakaş:** I think the biggest problem is the lack of devices and consumables, and the cost is too high to meet them. But there may be a solution for this: We can use a device we need from different units. Sometimes we can have problems with the teachers. As I said in this, the university can inform us of the device we need through a system and direct us to whichever faculty the university has. I think it could be a little better in terms of bilateral relations.
-What specific skills related to digital tools (e.g., bioinformatics, climate modeling) are there that should be included in the biotechnology program to prepare students for climate-related challenges?			**Çiğdem: Of** course, I said artificial intelligence, yes, it can be that, but for example, there must be geographical and information systems in such events. In other words, the child must have an idea about it in some way. Mapping, plotting habitats in terms of monitoring, and so on. I think that angle programs and mapping programs should be given to the child, albeit in a basic sense. **Abdullah: Since** I am only talking about the map at the moment, we said the map, but I think it should be in every area. The person needs to decide in which field he wants to work, but he must have a basic knowledge in every field. It should receive information on information technology and mapping, that is, every area should be accessible.

			Celal Can: In addition to these, I can also say that analyzing the data is very important here. It is very important to process and interpret the data obtained. Much of this is achieved through statistical tests. In this context, it is very important to teach the tools using statistical tests, how to process the data we have with these tools, and how to analyze and keep statistics of these data. Because we obtain the data, we collect very good data, but we cannot understand what this data means, what kind of result and interpretation we can make by using this data. Because we don't know what it shows until this data is processed. Therefore, it is very important to process this data and make statistical analyzes. **Çiğdem: It** is very important in every field. So if you don't, the data is lost. What Abdullah said is also very true. Maybe in such training methods, he will be in biotechnology fields such as artificial intelligence, geography names, statistics, he will receive basic training from all of them, but he will focus more on that subject in the field he specializes in. Maybe he will take more courses on that subject and specialize in it in a better way by doing it. But of course, all of these areas must be given a basic education. **Begum** First of all, the request process is troublesome, which means they don't share data. I needed help because we didn't learn statistics on this topic or the programs that use it at the undergraduate level. Statistics programs and artificial intelligence programs are important. **Ahmet Kılınç:** Now, students should be able to use and provide all the digital materials necessary for data collection. Sometimes it is with a project, sometimes it is with a university, and sometimes the

			opportunities of the private sector can be used. First of all, it is necessary to provide facilities that can analyze, collect, evaluate and process the data they obtain. Maybe the opportunities that can put it into production vary depending on the subject, but all of these digital opportunities can be provided to students. In other words, there may be computers, software programs, analysis devices, and laboratory facilities related to the subjects they are interested in. The resources of the private sector can also be used in relation to all these. **Ahmet Kılınç:** Because the resources of the university may not be enough for this. The private sector now has a laboratory, kits and analyses for each production site. The public has different examination and monitoring laboratories and facilities. By using these, the areas that children can go and benefit from throughout their education life, apart from internships, can be increased. **Ayşegül Balı:** Data interpretation can be studied in this regard. When we access the data, the following problem may arise here: How much do we know about data interpretation and data analysis? In my opinion, this part should be emphasized after reaching out to the parents. In other words, it is possible to analyze data, use statistical programs, and then draw meaningful conclusions from them.

Session 3 – HIGHLIGHTS

1- New ideas for waste management.
2- collaboration for interdisciplinary studies
3- Increase interaction between stakeholders in the sector.

Data Analysis

Session 4

Questions of Session 4	Themes	Sub-themes	Excerpts of participants
Q1 **-How can the programme be aligned with EU policies such as the European Green Deal and the Sustainable Development Goals (SDGs)?**	1. Biotechnology and Public-Private Partnership 2. Biotechnological Innovations in the Agriculture and Livestock Sector 3. Dissemination of Academic Studies for the Sector 4. Training and Support Models in Agriculture and Livestock 5. Small Farms and Economic Challenges 6. Education and Research Needs	1. Promotion and dissemination of biotechnology, 2. Lack of communication between the sector and academia, The interest of the private sector in Biotechnology by simplifying the academic language, 3. Increasing the number of seminars and workshops	**Çiğdem: Of** course, the biggest achievement of this event is that different disciplines come together to exchange ideas on some issues and their outputs are also published. Because in such events, of course, the project team and the students and academicians working with them usually come together in the same field or within the subject of that project and work on these outputs. However, the fact that different disciplines are talking on the subject and putting forward different ideas in today's studies can actually be said to be one of the most important outputs of this workshop. **Mr. Kemal: Sir** , I don't know the details, but at the end of the day, there is an effort that you have made; you are trying to make different institutions do something by combining certain disciplines. It will definitely contribute and I think it will contribute in a positive way. **Ahmet Kılınç:** We talked about it at the beginning, it is necessary to make the waste of one as the raw material of the other. Different projects can be developed related to this, or existing resources that we cannot use can be used instead of resources that are limited to production. Of course, it is also up to the university to ensure the relationship between them and the

	7. Contribution of Agricultural and Animal Products to the Economy 8. Ethical Issues and Their Effects on Society 9. Biotechnology and Genetic Technologies 10. Legal Regulations and Sustainability 11. Public Education and Awareness Raising 12. The Place and Acceptance of Biotechnology in Society 13. The Impact of Technological Products on Health and Environment 14. Increasing Public Awareness and	within the university 4. The effect of toxin feeds on animals and solution suggestions 5. The use of algae in animal feed 6. Encouraging local producers and supporting them with rewarding policies, Increasing agricultural policies and state-supported training activities, Increasing cooperation between public and local producers 7. Creation of new graduate	students. It is the guidance of the university that can be in contact with other institutions and provide them with these resources and gain them. **Seydi Ali Doyuk:** In the education that will be given to the students at the university, what our professors give here is to convey to the students how to reach the source in a good way. After teaching them how to access this resource with questions such as which source is required for what, where they will use the data they receive, and at which stages of which sector they have them, our students will already be able to reach this easily. In fact, what the academic community wants to give is to teach the student how to access a resource with their basic rights. Students will improve themselves accordingly. **Ayşegül Balı:** Project competitions can be developed in this regard. Students can be encouraged. Project competitions can be turned into lessons and trainings can be given in different fields. As it is currently being done in our department.

	Educational Strategies	programs (such as climate change, biotechnology) 8. Creation of training programs in cooperation with the public, sector and academia 9. Reducing the efficiency and cost of agricultural and animal products, increasing animal production 10. Artificial intelligence and technological and public awareness 11. Development of public platforms to discuss ethical issues	

		12. Use of new generation breeding techniques and creation of regulations 13. Elimination of prejudices against genetically modified organisms (GMOs) 14. Lack of knowledge about biotechnology and genetic engineering, the need for information and training of public institutions 15. In order to raise public awareness, special trainings for professional and social groups and	

		raising awareness of people who understand the language of the people. The impact of social structure and the importance of marketing strategies on the acceptance of technologies and biotechnological products by the public. 16. Educating children and young people about biotechnology, environmental awareness and healthy living. 17. The importance of legal regulations for the use of technological products,	

		informing public institutions and society.	
-How can universities and industry work together to develop interdisciplinary programs that combine the fields of biotechnology, climate science, and policy?			**Çiğdem:** Now, of course, it is very important for the sector and the university to come together. Because at the university, the work of many people in the academic sense takes place. Some technology fairs and seminars are held on these. Of course, scientists can explain their work to the sector. And in those fairs, sector representatives can actually come together with academicians, that is, universities, to work on some issues that will be beneficial to their sectors. Of course, there is a huge plus to this. It both increases the recognition of the university in the academic sense and enables academics to have a greater impact on their fields of study. Because the use of a work that has become a research article in the laboratory in the sector, that is, in the industry, increases the prevalence and impact of this work and its added value. As I said, with fairs, seminars or some protocols between the sector and the university, such bilateral relations can be increased more. **Celal Can:** In addition, we can say the following: Universities are ultimately the places where science is done and an idea is formed. In the sector, there are areas where these ideas turn into work and turn into products. Especially as in our subject, it will be much more beneficial for Turkey to produce more products and obtain more patents. Therefore, it is very important that the ideas produced and the thoughts produced are not idle, and that the majority of these thoughts turn into products. The things that will ensure this transformation are the agreements made by universities

			with the sectors and the bilateral relations they have made, which will enable these ideas to turn into products and accelerate this process. **Abdullah: The** advantage of the industry and the university working together is that as university academics, when you are working on improving something, the people in the industry are the ones who know the problems in this area best. In the joint studies carried out with the university, it creates a more effective area by conveying to the university what is an urgent problem in the sector, the most important problem, and working on it. **Ayşe:** For this, the most important issue that should be in the private sector is consciousness. If there is consciousness, the private sector can go to university and knock on its door. But the university also needs to respond positively. I have a graduate student with my own team. When he went to his professor and said, "I want to do a thesis about the industry I work in," his advisor did not approve, saying that he did not know what would come out of the study. Unfortunately, there are university professors who have this point of view. Both sides need to be aware, but most of all, the private sector needs to be aware. **Mr. Kemal:** It can be done by organizing workshops in this way, for example, by sharing what you have done with our professors in academia, government employees and people in the private sector. Because we all look at things from different angles, and sometimes we can focus a lot on one thing, we can't see some of it. So we can come together and see the sides that each other can't see. When we close our eyes and probe such an elephant, when we all touch a part of it, its tail or its ear, then the verb is fully defined. Joint project work is required. In this way, final reports and

			articles can be extracted. The link between academia, industry and the public needs to be kept strong. For this connection, some platforms must be established to bring them together. This could be a call for project applications, start workshops first and maybe move towards project calls. **Seydi Ali Doyuk: When** we look at it as a private sector cooperation, the university's participation in its activities and studies creates a link between the private sectors. For other questions, my friends have already mentioned them many times. In other words, we should be together with the sector. **Ayşegül Balı:** TÜBİTAK has projects in this regard: There are joint studies with the industry such as 2209-B and TÜBİTAK Star. These can be increased. In other words, it can be ensured that academics cooperate differently in this regard and students can be included in collaborations in this way. **Sinem:** My opinion on this subject may be as follows: In other words, it is not possible to give this under the name of a direct course. Because this is not a graduation subject that can only be evaluated with a specialization. In fact, it's what we've always talked about all along. Because what you call the green consensus text is a text created by very different disciplines when we open it and read it. In other words, there are geologists, environmental engineers, geographers, biologists, different engineering, agriculture; that is, it is a multidimensional text. Therefore, instead of suggesting this as a course, I can propose, for example, that this is a certificate program to be held with the participation of participants or experts from various fields, officials of various institutions, people working on this subject from the sector. You know, this is not something that should necessarily be done together and face-to-face. Again, it can also be done online. A system can be established such as a seminar, like a workshop, like a workshop, with a

			system such as a webinar, and at the end of it, maybe an exam and a certificate can be established. I can suggest something like this. Because, as I said, assigning this to a single professor in the scope of a course does not make much sense to me. Because I look at it from a different angle. Aslı Hoca and I graduated from the same university, from the same class. He looks at it from a very different angle. Because our specialties are different; We may both be biologists, but our inner perspective is very different. Therefore, we need to evaluate from different disciplines. **İbrahim BÜYÜKGAGA:** I will take the part of how it can be harmonized and briefly continue from the point where my teacher left off. In other words, it can only be harmonized by inviting people at the decision-maker level to the workshops to be held. We can put every issue on the table and discuss it. Of course, we can come to a certain decision, but we stay here. Because there are no decision-makers here. Decision-makers need to be here, they need to be able to see the problem, they need to see the solution proposals and put them into a solution. **Elif:** I agree with you. Especially such seminars and workshops can be really advantageous for students. Besides, when applying to us afterwards, seeing such things on our CV somewhere is actually a plus for employers. And for us, it effectively provides different perspectives on a subject in a short time. In other words, instead of spreading it over a semester and putting it in a course, or instead of being in different ways, getting an education focused on a single field in a shorter time actually provides us with a perspective. **Fatma Beyza:** Maybe I can say something about the sustainable development goals. We had done a project related to this and explained the sustainable development goals to private schools in Çanakkale, primary,

			secondary and kindergarten children in public schools. We were really surprised when we told them because most of the kids actually heard it from somewhere and dominated it. At the time, the word sustainable had just come out, and we were really surprised that the kids knew. Because we are just mastering them at university age. Such a generation is coming up now, and I think how can I activate these sustainable development goals? I mean, I'm taking this lesson, but it's relevant, what can I do about it? It would be nice if we focused on things like what item can I activate at work?
-How can we make the transfer of research findings in the field of biotechnology to industrial practice more effective in the fight against climate change? What are your recommendations and best practices?			**Çiğdem: Actually,** it is very important to be able to access the products made at home. This is done by publicizing the work done in biotechnology as much as possible. Maybe that's where PR comes in. In other words, the recognition of these works is important; In fact, perhaps some students outside the field may be interested in these fields. I mean, a student in the fine arts painting department might actually be interested in biotechnology. Maybe he will share other ideas on that subject. But in fact, one of our biggest problems is this: Since we explain and publish our work in very technical terms and in a difficult way, people who listen to the good actually move away. So it sounds boring, he doesn't understand, and so on. In fact, perhaps the event will be more interesting than the summary. He'll want to be involved in the project, he'll have other ideas, but when it becomes complicated, people can run away. I mean, I experience this a lot in my field. In other words, as much as possible, it can be in the form of these seminars to reach both the sector and other students within the university or academics at work, whatever is simpler, uncomplicated, without very technical terms. Perhaps seminars can be held on very interesting topics. If the seminar is well publicized, the widespread impact can be many. Of course, the participation of the public can actually be ensured here. There

			can be cooperation in the form of universities, the public and the industry. Of course, seminars are actually the biggest thing we can do within the university. In other words, you know, going to every department to give seminars or workshops at work, organizing symposiums in the future, and discussing the issues there can actually provide a greater output and widespread effect. **Aisha:** Actually, there are concerns in the livestock sector about toxins in food. The same toxin can pass from an animal fed with a toxin-containing feed to milk and humans. This situation is not controlled. At a recent meeting I attended in Antalya, a feed company talked about a toxin-binding chemical. Instead of using this kind of chemical, I asked this company if there were no studies that would prevent the growth of toxin-producing fungi while the plants were still in the field. It is necessary to carry out such studies. **Seydi Ali Doyuk:** Actually, my professor is doing a lot of academic work. Publications that have entered the index are being tried to be made. Posts with ratings. Of course, all of these publications are discarded in English, and the industry is not aware of this, nor is there any information about it. Of course, these studies must be published in certain environments or on the university's own pages in a language that our people can understand. Because the publications remain only the work of that academician. He says that I have one publication in the index, but apart from this scientific study, they need to be put into articles in a way that will guide the sector. **Ahmet Kılınç: Actually,** I think the answer is very simple. The studies requested by the private sector will be carried out, the works other than that will not be approved and no funds will be established. In other words,

			there will be people from the private sector in the commission, where the studies that will bring economic benefits to the business will be accepted. In the upper commission, we can say that the approval part of the projects is approved not only by the university, but also by a commission that includes the private sector, the public and other stakeholders, and if these outputs are at a level that meets the demands of the private sector, they are accepted. **Seydi Ali Doyuk:** In other words, it should also take into account how much the work done will contribute to the economy. It will be in line with the realities of the country and the work will really be according to the demand of the private sector according to the needs of the country. If you do these studies, the country will develop and everything will be good, then the private sector will start to run behind the university. **Ayşegül Balı:** In other words, as we mentioned in the previous question, if more support is given to joint studies with the industry, there are calls made by TÜBİTAK for the needs of the country, that is, for popular topics, especially agriculture and biotechnology. If more private sectors are included in those calls, if the calls for the areas that they will use and turn to are increased, cooperation can be increased in this way.
How can we guarantee the scalability and			**Celal Can:** In fact, the Ministry of Agriculture and Forestry has some studies on this issue. There are also studies that I have witnessed and seen. There is a practice called "Good Agricultural Policies" in which experts in certain fields are assigned to such hamlets and villages, and they tell the farmers

economic viability of biotechnological solutions for smallholder farmers? How can we scale biotechnological research and results from the micro level to the macro level? How can we better align biotechnology research with regional and global policy frameworks for climate change?			there how to improve their agriculture to the people dealing with animal husbandry. In this way, they can make their work more effective and learn how to reduce costs. In this way, studies are carried out by the Ministry of Agriculture and Forestry to inform the public. This is actually a very nice, very good thing. Because, in general, agriculture in such channels progresses in the way of seeing from the father and seeing from the grandfather, just as the past generation did it, it is the same today and the same in the future. In other words, if a mistake is made, that wrong continues for generations. However, appointing experts in such fields to prevent these mistakes and telling the truth will increase the productivity of the soil used and increase the yield of the crop taken from that soil. It will make a great contribution not only to the farmer in particular, but also to the economy of the country. When we look at this at the social level, not at the individual level, the fact that many farmers turn from these mistakes will make a great contribution when looking at the big picture. To the country's economy and, of course, to the climate crisis. **Abdullah:** There are TKDKs at the point of reaching local producers, as Mr. Celal said, and agricultural credit cooperatives, because they are more accessible to these local producers. Reaching these people requires us to work with public institutions. **Çiğdem:** Yes, of course. Now, of course, there should be some rewarding policy in order to encourage local producers in the work to be done with local producers. Because if you upload an extra job package to that manufacturer, the probability of doing it can be a little low. In other words, it needs to be a mechanism to encourage him with his work. In other words, you can buy a technological device from outside without paying any money in your own

			field and apply it. And everybody's got their phone, and you can get a little incentive to put it in that app every day. Because there are a lot of problems we face in his general life. With some people, when they give a different workload in a lot of workload, they don't actually approach it. So that's why there may be some problems with auditing. Therefore, there may be incentive methods. Of course, survey studies are also used in such studies at first. Surveys are conducted on the producers in that village and a certain result comes out of that survey. For example, they don't think that the use of this pesticide is harmful. In general, this conclusion comes out. According to that result, according to the results of the survey studies, maybe a biotechnological intervention can come there. In other words, I think support can be provided to identify the situation and bring a solution for it. **Abdullah:** Sir, as we just said, we need to support the producer, to try something new. Taking this biotechnological approach is costly, to be clear. So it's hard to put it into practice. At that point, since the person or institution that will do this is already the state, it can be applied as a pilot. This approach can then be started by producers in other places to see the difference here. **Celal Can:** I would like to point out. I also talked about this subject with our teacher; Enabling a farmer to use a product without charging a fee, which is an effective aspect. However, this also has an outcome: There are grants given by the state, which are still continuing today. Here, the state gives animals to a person who breeds cattle. However, it does not guarantee the

			milk produced from this animal, it does not guarantee the purchase of this milk. What happens in this way? You know, okay, the animal is in his hands, he raises the animal, he gets the milk. But this time, because the state does not give the guarantee, it has to sell it to the private sectors at very low prices. It's not enough to just give away a product, in this context. The state should also guarantee that the outputs from the product will be taken back. A farmer should be supported and encouraged in this regard. **Aisha:** On small-scale farms, they may not be able to allocate money to R&D because their profit share is very low. They may need government assistance. They may not be able to continue with such matters without an incentive. You can persuade them by saying: "If you continue to behave like this, your productivity will decrease after 3 years." It may also be European Union or other international support programs. However, I think they will also need information and assistance in applying for these incentive programs with government assistance. If you say the name of our students when you want to speak, they will lose. Because, Ceren, actually, sir, as you said, going with a solution that is definite in the eyes of the public may play a good role in convincing them a little more. But I don't know if this will be possible. When we say "Yes, this will happen" in such a clear and precise way, for example, maybe we should think about it too. There are housewives, there are mothers, there are uncles sitting in cafes, there are teachers, there are children, there are imams, there are soldiers, there are farmers. We are talking about a complex community in such nature. The risk is that some of the... **Ahmet Kılınç:** It's the same thing here. Economy. Now, what is the input of the peasant, the small farmer? Here is diesel, fertilizer, seed, I throw it away. And if he is engaged in animal husbandry, feed. So in the livestock

			sector, if we are going to do something, there may be projects related to the development of feeds and additives that can be converted into more meat, milk, and this will reduce the cost. For example, projects related to the usability of algae as animal feed, for example, animal feed that can be grown in the fields, can actually reduce the farmer's inputs. Whatever we do, seeds that consume less water, will need less fertilizer, seeds that are more resistant to temperature, drought... If biotechnology ultimately offers cost-effective solutions, solutions that will make inputs cheaper, I think that small farmer will get it anyway. **Ayşegül Balı:** As a result, it is more difficult for small-scale farmers to reach this. In other words, innovations, studies... If patent studies and enterprise studies are increased, if promotions are made in this way, perhaps it can be easier for them to reach. **Sinem:** I have an opinion on this. For example, it may sound a little utopian, but you know there is something you said at the beginning. I would like to give an example from there because I like it very much. At first, people found it very utopian, as you said, "You know, we started with five thousand decares, then we went up to nine thousand five hundred decares." Maybe this may sound utopian now, but I actually have such a dream. For example, I don't know how it can be done in this sense. I mean, I don't know the legislation part of this, but master's and doctorate programs can be opened in this field, and we have seven compulsory courses that will normally be taken during a master's program. In other words, the student must graduate by taking seven courses. I think that a graduate program can be opened in cooperation with three of these seven courses from an academician, two of the four from a public servant, and the other two from a sector, for example, at the point of climate change and combat. So I can't

			do much at this point. You know, since we are more of a data provider, industrial practice is not an area that I dominate much, it is a field that requires more engineering. **İbrahim Büyükgaga:** Things can come into play here. Supporting manufacturers are supported, there is no change in the support type in the support model. That's what we're doing right now. So now let me briefly explain the support system that used to be. That's how much diesel support is, that's how much fertilizer support is. We have a base price in the new support model. I'm throwing it away, you're producing in your memory, you're getting a declaration of three hundred pounds. You support three hundred liras, you can get it. There is a second point: If you meet these conditions, it will be a hundred liras. If you do these and that, it turns out to be one thousand two hundred pounds. In other words, you can get three hundred liras of support by planting wheat, and you can get one thousand two hundred liras. If you use biological fertilizers, you can get three times the support right now. You get nine hundred pounds, not three hundred. If you do this in dry agricultural areas, if there is a lot of restriction, you get one thousand two hundred liras. But as a result, the grown crop is from the grove in all of them. This can be done. Here the supporting type model can be changed. Encouraging those who use biological fertilizers, increasing the number of cals, our small-scale producers can be supported or guided in this way. **İbrahim Büyükgaga:** If I grow these products, if I grow this product, is it so supported? When you change these products in this memory, if you grow them, it will get double. Water is limited, and if you use biologics, I take it. There's this part, I bought this. I mean, it's time for a layer. There's nothing wrong with that. That budget increases and decreases. Either you can't

			squeeze it somewhere in agricultural production, that is, somewhere that is not the salary of a civil servant.
-What is the role of public perception and acceptance of biotechnology in the application of biotechnology in the fight against climate change? What are the potential ethical concerns associated with the use of advanced biotechnological tools in the fight against climate change, and how can they be addressed?			**Çiğdem:** Now, ethical problems are, of course, some of the situations you see in daily life. It is actually a harmful situation for society that some phenomena that are created with artificial intelligence or created by technological methods with those methods are shown as if they are non-existent. In other words, there may be situations that will change both judgments, prejudices and perceptions about climate change. Sometimes such situations happen. In fact, this is ethically wrong. In other words, showing unethical situations as if they happened may be the first item. In other words, shall we call it fake news or a misperception? Managing perception is important in artificial intelligence. Of course, let's look at how there can be ethical issues in the use of other technological products on climate change. In fact, ethics is very important in the scientific sense. Maybe I can say that the technological tools used are not calibrated to each other. In other words, a technological device makes some measurements using each other's people. Someone else is measuring the same place in a different way with another technological device. Now, this is actually the integration and calibration of biotechnological instruments, which is also important. I think that can lead to ethical problems. In other words, in order to confirm accuracy, technological devices must also be compatible with each other. The brands may be different, the operation may be different, but as a result, calibration and accreditation must be done correctly. That's what I would say. **Celal Can:** I would like to mention the following issue about ethics in science. While a solution is usually produced in a hurry, it may not be expected that the product obtained will be fully tested. In some cases, an

			approach such as "Let's quickly solve this, let's implement this" can be taken. Therefore, the use of such tests without completion, it can be a drug, it can be a breeding plant, or it can be any product that will be used against this crisis. It is also a huge ethical problem that it is started to be used in nature without fully testing. Because we don't know what impact this will have on the next generation. Cumulatively, when we are trying to solve one problem, we can lead to much bigger problems. Therefore, although we are trying to find a solution, even though we are doing this to protect nature, nature is actually in motion and I think that we should proceed much more carefully and in a much more planned way because we cannot see what awaits us in the next step. And a small thing that deviates from the plan has the potential to cause much bigger problems for nature and humanity in the future. **Abdullah:** As I just said to my friend Jalal, CRISPR technology is a tremendous technology. It is not used in the world, it is not applied, but when we look at it as our country, its use is prohibited because it qualifies the GMO class. Because of this, we are lacking in the world at some points. In fact, the European Union is also in this area. **Ahmet:** So they don't exactly accept it. When we look at this situation, we look at Europe from the whole of our country. In fact, in the reviews part, yes, this is something that really seems ethically unethical from our point of view, the deglazing technology. **Abdullah:** What I want is that, you know, when we look at the voting in the outside world, it's a very useful technology. Why can't we use this

			technology in our country? This is the main problem. While you can use it more effectively. **Çiğdem:** Legally, it will probably be opened. In other words, legal regulations are very important. In other words, in every area we talk about here, he was always stuck in the audit and sustainability of the business. So, in a sense, it will be solved by legal regulations. **Abdullah:** In terms of legal regulations, sir, I start by looking at the people and institutions that I talk to. This is unknown to CRISPR technology. Or what is GMO, it is unknown. What is GMO, is unknown. Because of this, there is a problem caused by a lack of information. Therefore, public institutions and organizations should be informed at this point. **Çiğdem:** Actually, there are many projects here in the European Union, here are many places actually factories, university campuses, green campuses, sustainable buildings, ecological buildings, etc. I mean, there are a lot of such applications. Sometimes things need to be made mandatory at work. So unless it becomes mandatory, sometimes people are afraid to take a step, a step forward in a technological sense. I mean, because it feels like an unknown. Let me say to some mechanisms, or even to public institutions, some universities, you know, technology can be scary.

			But their use may need to be made mandatory. I said they don't know now. Yes, in many institutions, of course, there is no staff who knows as much as an expert in the field. So you specialize in one area, you know, bachelor's, master's, and so on. You do research and become an expert in that subject. Of course, no one can be expected to know that much. But the main thing is not not to know. In other words, it means being closed to education. It is to be closed. Therefore, it is necessary to cooperate with such public institutions and explain them. In fact, this is our most important duty. This is the importance of such workshops. I mean, here are the directors from the Ministry of Agriculture and so on. In other words, by exchanging different ideas, they actually learn many things that they will benefit from. So being open to learning is the biggest point. Maybe that's it. **Ceren:** It may be a little more useful to go with a method that proposes a definitive solution to the public. In addition, it is necessary to provide special trainings to different professions and social groups. From the clergy to the teachers, this work can be done. It may be important to raise the awareness of someone who understands the language of the people. **Aisha:** We talked about something like this in a marketing meeting. When marketing something (which is Coca Cola's motto), "advertise locally, win globally." For example, they said that you cannot sell cherry fruit juice anywhere in the world. It's a red drink, after all, you can't sell it anywhere.

			But it is sold in Turkey because it is very accepted because it is similar to the drinks made by our elders. Other fruit juices abroad are also not accepted in Turkey. The structure of society should also be taken into account in the development of such strategies. Professional help can be obtained from a marketing department in this regard. If we work in a multidisciplinary manner, we need to work in a multidisciplinary manner while presenting it. **Mr. Kemal:** One of the biggest problems in the public's acceptance of these biotechnology-modified products, at least one of the problems I have observed, is the health effects. It's like if we eat these genetically modified products, we're going to get cancer. I think the way to persuade the public is to give informative speeches from people in the field of health because they are the people who are competent in that field. If honest posts are explained that they are not harmful to health, they can be effective. **Ahmet Kılınç**: I think we can solve the information pollution here if we can eliminate it, that is, if everything can be explained correctly. The economy has taken precedence over everything else. The public accepts this. Of course, there is a reaction at first, but then he agrees. You just have to get it right. In other words, it is necessary to be able to provide accurate information. The right people need to come out and tell them. In particular, those academics who constantly come out recommending unlabeled, uncontrolled products to people as organic should now take their hands off a little and stay away

			from making people aware of this misconsciousness. If the public is told correctly, it will be understood. **Seydi Ali Doyuk**: As my manager said, it is very important to use some things correctly rather than explaining them correctly. So it's like non-dairy cheese... So if you do that, you start to be not accepted by the public after a while. If you produce something really healthy, people may accept it after a certain period of time, but if you start to produce things like reduced-milk cheeses or meatless sausages for industrial and commercial reasons, people will gradually move away. **Ahmet Kılınç**: If people are hungry, if people can't get it, after all. In total, every food consists of protein, carbohydrate and fat. If you give it in the right proportion, it's artificial, which is already the case with many processed foods today. If that's a step up from that, people get used to it just as they got used to it. **Ayşegül Balı**: In fact, there is a prejudice in the public about biotechnological solutions, just because we did not have much information about the solutions for a long time. Studies can be carried out on this subject to break this prejudice. In other words, the public can be informed in more detail. **Sinem**: There are some standardization studies at the international level. In other words, there are studies carried out in some countries, European countries, which I follow closely. But as far as I know, I am not yet very dominant, but there is no such standardization study in our country yet. I just think it's a ban. I think this needs to be talked about a little bit and I think it needs to

			be discussed. So yes, maybe a standard will be introduced. Maybe its applicability to a certain extent and to a certain region, its applicability to a certain scale can be put on the agenda. But at work, larger-scale areas may be riskier. So, of course, issues that will be discussed and decided, but I definitely think that a standardization should be introduced. This needs to be explained to the public. Transparently. "Look, there are such and such pros, but there are also such cons. That's why we're allowing you this much." We think that this should definitely be conveyed to the public. **İbrahim BÜYÜKGAGA:** As we struggle with the issues he describes, there is also a sector in front of you. There is an industry that produces chemical products. It is not so easy for you to deal with them, to struggle with them. As I said, it takes a lot of patience. We should never take a step back. After a certain step, they start to invest in that channel. It needs to be spread out over time. We need to be patient. But I want you to know that you struggle with these as much as you do with telling them. **Sinem**: So this is also a very important market; since the presence of chemicals, for example, is an area that I am interested in, a lot of pollutants are produced on a micro scale. I mean, microparticles, a lot of things at the nanoscale, I mean, they have a lot of serious advantages, and they have an incredible range of uses. We can say that it benefits us a lot at many points that make our lives much easier in electrical and electronics. But there is also the fact that it is of course not recyclable. So we are faced with such a reality. Yes, for example, my teacher Fatih just mentioned it. Bioplastics began to be produced. So that they can take their place and be decomposable. But I mean, it's a little bit of a thing, you know, it's actually the lesser evil. So again, it's damaging, unfortunately. Because we're talking about something that goes

			all the way into your cell. I mean, I'm speaking as a human being, and that's true of course for other living groups. Therefore, at that point, I think those standards need to be brought immediately. But I agree with what you said, after those standards are introduced, it will not be easy. So it won't be very easy in the process. We can prevent it by being patient and explaining more, giving more education, and starting education at a younger age. **İbrahim BÜYÜKGAGA:** The same method is currently available in training on the effective and efficient use of food and water. Elementary school students under the age of twenty or work began to give there in the military. Because there is no point in giving over a certain age. Yes. **Sinem**: So you are very lucky in Turkey. We can sit here and discuss and talk about these things. We had the chance to access this training, but there are those who did not have access to it. So that's why it's very difficult for us to expect these people to gain that consciousness as fast as you do. Because everyone's living conditions are incredibly different. In other words, the standard of living is always human. So it's going to take some time, but it's going to happen. So one day it will happen, necessarily.

Quality Evaluation

Profession	Academician	Student	Industry representative	NGO representative	Other
Q1	29.4%	52.9%	5.9%		11.8%
Questions	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Q2	1			2	14
Q3	1			1	15
Q4	1			1	15
Q5	1			2	14
Q6	1			2	14
Q7	1			1	15

COMMENTS ON THE QUALITY EVALUATION

The participant distribution for the workshop as follows: 52.9% of the participants were students, 29.4% were academicians, 5.9% were sector representatives and 11.8% were from other sectors. 82.4% of the participants strongly agreed, and 11.8% agreed, that the workshop was well-organized. However, 5.9% of the participants strongly disagreed. 88.2% of the participants strongly agreed, and 5.9% agreed, that the discussions and shared information on the effects of climate change on agricultural product yields were valuable. Conversely, 5.9% of the participants strongly disagreed with this view. 88.2% of the participants strongly agreed and 5.9% agreed, that the discussions and information shared during the workshops on evaluating industrial and agricultural biotechnology solutions for climate change and disaster mitigation were valuable. Conversely, 5.9% of the participants strongly disagreed with this view. 82.4% of the participants strongly agreed and 11.8% agreed that the discussions and shared information on future research areas and industrial solutions to climate change challenges in biotechnology are valuable, while 5.9% strongly disagreed. 82.4% of the participants strongly agreed 11.8% agreed that the question-and-answer sessions were conducive to idea development and sufficiently comprehensive, while 5.9% strongly disagreed. 88.2% of the participants strongly agreed and 5.9% agreed that each participant was able to exchange information and ideas during the discussion. Conversely, 5.9% of the participants strongly disagreed with this view.