UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the fiscal year ended December 31, 2022

or

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

Commission File Number 001-33133

YIELD10 BIOSCIENCE, INC.
(Exact name of registrant as specified in its charter)

Delaware	**04-3158289**
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification No.)
19 Presidential Way, Woburn, MA	**01801**
(Address of principal executive offices)	(Zip Code)

(Registrant's telephone number, including area code): **(617) 583-1700**

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock	YTEN	The Nasdaq Capital Market

Securities registered pursuant to Section 12(g) of the Act: **None**

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☐ No ☒

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes ☐ No ☒

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☒ No ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act:

Large accelerated filer ☐	Accelerated filer ☐
Non-accelerated filer ☒	Smaller reporting company ☒
	Emerging growth company ☐

If an emerging growth company, indicate by check mark if the registrant elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☐

If securities are registered pursuant to Section 12(b) of the Act, indicate by check mark whether the financial statements of the registrant included in the filing reflect the correction of an error to previously issued financial statements. ☐

Indicate by check mark whether any of those error corrections are restatements that required a recovery analysis of incentive-based compensation received by any of the registrant's executive officers during the relevant recovery period pursuant to §240.10D-1(b). ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act). Yes ☐ No ☒

The aggregate market value of the voting and non-voting common equity held by non-affiliates computed by reference to the price at which the common equity was last sold on the Nasdaq Capital Market on June 30, 2022 was $8,867,945.

The number of shares outstanding of the registrant's common stock as of March 13, 2023 was 5,074,085.

DOCUMENTS INCORPORATED BY REFERENCE

Pursuant to General Instruction G to Form 10-K, the information required by Part III, Items 10, 11, 12, 13 and 14 is incorporated herein by reference from the Company's proxy statement for the Annual Meeting of Stockholders to be held on May 25, 2023, which is expected to be filed not later than 120 days after the fiscal year end covered by this Form 10-K.

YIELD10 BIOSCIENCE, INC.
ANNUAL REPORT ON FORM 10-K
For the Year Ended December 31, 2022
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Forward-Looking Statements

This Annual Report on Form 10-K contains "forward-looking statements" within the meaning of 27A of the Securities Act of 1933, as amended (the "Securities Act"), and Section 21E of the Securities Exchange Act of 1934, as amended (the "Exchange Act"). These statements relate to our future plans, objectives, expectations and intentions and may be identified by words such as "may," "will," "should," "expects," "plans," "anticipate," "intends," "target," "projects," "contemplates," "believe," "estimates," "predicts," "potential," and "continue," or similar words.

Although we believe that our expectations are based on reasonable assumptions within the limits of our knowledge of our business and operations, the forward-looking statements contained in this document are neither promises nor guarantees. Our business is subject to significant risks and uncertainties and there can be no assurance that our actual results will not differ materially from our expectations. These forward-looking statements include, but are not limited to, statements concerning our business plans and strategies; expected future financial results and cash requirements; plans for obtaining additional funding; plans and expectations that depend on our ability to continue as a going concern; and plans for development and commercialization of our crop yield traits, technologies and intellectual property. Such forward-looking statements are subject to a number of risks and uncertainties that could cause actual results to differ materially from those anticipated including, without limitation, risks related to our limited cash resources, uncertainty about our ability to secure additional funding, risks related to the execution of our business plans and strategies, risks associated with the protection and enforcement of our intellectual property rights, as well as other risks and uncertainties set forth below under the caption "Risk Factors" in Part I, Item 1A, of this report.

The forward-looking statements and risk factors presented in this document are made only as of the date hereof and we do not intend to update any of these risk factors or to publicly announce the results of any revisions to any of our forward-looking statements other than as required under the federal securities laws.

Unless the context otherwise requires, all references in this Annual Report on Form 10-K to "Yield10 Bioscience," "Yield10," "we," "our," "us," "our company" or "the company" refer to Yield10 Bioscience, Inc., a Delaware corporation and its subsidiaries.

PART I

(With the exception of stock prices and earnings per share disclosures, all dollar amounts throughout this report are shown in thousands unless otherwise indicated.)

ITEM 1. BUSINESS

Overview

Yield10 Bioscience, Inc. ("Yield10" or the "Company") is an agricultural bioscience company focused on the large-scale production of low carbon sustainable products from processing Camelina seed using the oilseed Camelina sativa ("Camelina") as a platform crop. These seed products include:

- Camelina oil for use as a low carbon biofuel feedstock
- Omega-3 oils for nutrition
- PHA Bioplastics for biodegradable zero waste packaging solutions

The co-product from producing these seed products is Camelina meal which has a protein content of over 40% and is currently approved for use in a range of animal feed rations.

Our commercial plan is based on developing and releasing a series of proprietary elite Camelina seed varieties incorporating genetic traits from our development pipeline which are being designed to offer improved on-farm performance that we anticipate will lead to increased acreage adoption and seed product revenue. Yield10 is headquartered in Woburn, Massachusetts and has a Canadian subsidiary, Yield10 Oilseeds Inc., located in Saskatoon, Saskatchewan, Canada.

Camelina, an annual oilseed plant in the mustard family, was selected as our platform crop based on its unique attributes, including its excellent agronomic traits such as low water and fertilizer input, drought resistance and short life cycle, making it suitable as a rotation crop within the U.S. Northwest and regions of Canada, as well as a relay or cover crop

with corn and soybean in the U.S. Midwest. We estimate there is the potential for over 30 million acres of Camelina production in North America. Camelina, is in the same plant family as canola and naturally produces a relatively abundant harvest of oil-containing protein-rich seeds. Camelina is highly amenable to advanced genetic engineering and genome-editing technologies. Over the last twelve years, we have been developing improved Camelina seed varieties through identification and deployment of our gene trait discoveries followed by performance evaluation in field tests. Our new seed product traits include the PHA bioplastic trait developed by us and the omega-3 (EPA, DHA+EPA) oil traits on which we secured exclusive rights to a commercial license option in 2020.

Our capital light business model is based on contracting with growers to produce Camelina grain using our proprietary Camelina seed. Yield10 will have the exclusive right to purchase the harvested grain from these growers for downstream processing to separate and sell the seed products into the different markets. Our commercial launch plan is to leverage the growing global demand for biofuels to decarbonize the transportation sector, and in particular, the renewable diesel ("RD") and sustainable aviation fuel ("SAF") markets. We recognized early on that we could play an important role in the biofuel value chain through the use of our advanced Camelina platform to address a key industry bottleneck; the significant shortfall in the supply of low carbon intensity feedstock oil. The establishment of downstream value chain partnerships represents a critical step towards enabling Yield10 to scale this business. We expect to build the operating foundation of our products business by securing offtake agreements with downstream oilseed processing/biofuel partners. Sources of revenue from our first Camelina seed product will be based on the financial terms negotiated with these biofuel offtake partners. Here our goal is to link the base oil price for other commodity seed oils, such as soybean, and share in the economic value of the lower carbon intensity score of the Camelina oil. Initial revenue growth from this business will scale up based on increasing the number of acres of our Camelina planted during each growing season. Feedback from our grower outreach has identified weed control and soil residues from the herbicides used on prior crop as key limitations to the adoption of existing Camelina varieties. To achieve our revenue targets, improved Camelina varieties with new genetic traits are being accelerated through our development pipeline in order to offer farmers weed control and a seamless integration into their current crop rotations. We expect to be able to substantiate increasing revenue for our growers by introducing proprietary performance traits from the Yield10 pipeline, including higher seed oil content and seed yield traits that can increase the per acre harvest value of the Camelina grain. Improved grower income is expected to lead to increasing numbers of growers under contract, increased acres planted and higher product revenue and income for the Company.

Advancements in Camelina varieties, seed operations capabilities, grower network and supply chain developed for biofuels and underwritten by biofuel partnerships will position Yield10 for the subsequent launch of its second Camelina seed product omega-3 oils and in the future, PHA bioplastics.

As a first stage in our initial Camelina commercialization, during the third quarter of 2022, we engaged growers in contracts for the production of Camelina grain and Camelina seed having a total acreage of approximately 1,000 acres. These growers are located in the U.S. and Canada with each grower planting between 30 and 160 acres of our WDH2 (winter, cold tolerant) and WDH3 (winter, early maturing) seed varieties, with harvest expected to occur in the summer of 2023. We intend to use the seed harvest for toll crushing and further seed production that will provide us with seed inventory for future grower contracts during 2023 and beyond. Also, during 2022, we contracted with other growers to plant our E3902 (spring, high oil yield), WDH2 (winter, increased cold tolerance) and WDH3 (winter, early flowering) Camelina plant varieties to produce commercial planting seed. This activity is an essential part of our business model to produce commercial seed inventory for future grower contracts. We expect future grower contracts to cover Camelina grain production for large-scale grain processing to supply low-carbon intensity feedstock oil for the biofuel market and high-protein meal for the animal feed market.

We are currently pursuing the development of elite Camelina germplasm exhibiting herbicide tolerance, disease resistance and other traits that we believe in the near future, will form improved elite Camelina varieties for the biofuel market and will later be combined with the new seed product traits in development to expand our markets. We ultimately expect to have three types of elite Camelina seed varieties in contracted production to address our product markets.

We believe the market opportunity for biofuel feedstocks from our elite Camelina varieties, as well as our other proprietary seed products in development, including performance traits for use in other crops, is significant. We are targeting uses for our Camelina seed products in commercial applications such as: low-carbon feedstock oils for renewable diesel and sustainable aviation fuel, PHA bioplastics, and omega-3 oils for aquaculture and nutrition. In July 2022, we signed a nonbinding memorandum of understanding ("MOU") with Mitsubishi Corporation to evaluate the establishment of a partnership to supply, offtake and market Camelina as a low-carbon feedstock oil for biofuel, and in February 2023, we signed another nonbinding MOU with American Airlines to collaborate in the development of the value chain for Camelina

as a low-carbon feedstock oil for sustainable aviation fuel. We believe performance traits from our gene discovery and development platform (the "Trait Factory") and value-added product strategy will provide strong differentiation for Yield10's elite Camelina seed varieties, making them preferred by growers to address large product market opportunities as illustrated below. These traits will also be made available to leading seed companies for use in other crops to create licensing revenue.

Platform	Product	Main Markets	Revenue Potential	Status
Elite Camelina	Feedstock oil	▪ Renewable diesel ▪ Aviation biofuel **$27 billion**	$180 million - $1 billion	▪ Early Commercial ▪ Accelerating elite variety development ▪ Focus: US, Canada ▪ Biofuel partner outreach
Elite PHA Camelina	PHA Bioplastics Feedstock oil	▪ Single use plastic **$200 billion**	$3.6 billion	▪ Trait optimization ▪ Pilot process development ▪ Partner outreach
Elite Omega-3 Camelina	Omega-3 Oil (DHA+EPA)	▪ Aquaculture feed ▪ Nutrition **$4-6 billion**	$0.5 billion	▪ Pre-commercial development ▪ Partner outreach

1. Internal Company estimates of 2030 product revenue potential.

Our Camelina platform and each of our seed product targets are well-aligned with global trends in reducing carbon emissions and improving sustainability, including the need for:

- Producing low-carbon intensity biofuel feedstock oil for renewable diesel and aviation biofuel.
- Increasing the production of cover crops to reduce the climate change impact from agriculture.
- Producing PHA bioplastics to enable single use food service items and packaging with zero waste.
- Increasing global food security by:
  - producing land-based omega-3 (EPA, DHA+EPA) fatty acid oils for use in aquaculture and nutraceuticals;
  - increasing high quality protein production from Camelina seed; and
  - developing performance traits to increase yield and/or seed oil per acre for major food crops.

We have a pipeline of more than 10 novel yield and/or seed oil content performance traits currently in research and development. Today, we also have research agreements in place for a number of our yield trait gene candidates, including agreements with GDM Seeds (“GDM”) and JR Simplot Company (“Simplot”). These companies are currently progressing the development of our traits in soybean and potato. Our plan is to support these licensees as they work to generate proof points using our traits in their crops of interest. We also plan to find partners for our traits in canola, corn and other crops as we generate additional data and new trait leads using our Trait Factory.

We are building an intellectual property portfolio around our crop technologies and traits. As of December 31, 2022, we own or hold exclusive rights to 19 patent families, including 15 issued patents and 41 pending patent applications, related to advanced technologies for increasing crop performance and composition traits in oils and PHA bioplastics, in the United States and throughout the world. As part of our agreement with Rothamsted Research Limited ("Rothamsted"), we have an exclusive option to license two patent families, including six issued patents and four pending applications, including both the original patent filing for the production of EPA, DHA+EPA oil in Camelina and for an improvement patent filed after the agreement was signed. In November 2022, Yield10 and Rothamsted agreed to extend the exclusive option and license agreement until December 31, 2023.

The Unmet Need: Global Food Supply, Reducing Carbon Emissions and Producing Sustainable Products

According to a number of studies, including a report entitled “The Future of Food: Complexities and Compromises,” published December 6, 2020, by Morgan Stanley, the world's agri-food system needs to transform in order to produce 50% more food, eliminate malnutrition and cut 13 gigatons of greenhouse gas emissions by the year 2050. Agriculture will also need to become a source of low-carbon feedstocks for fuels, chemicals and plastics. This will result in a significant increase

in demand for feed grains, seed oils, protein, and farmed seafood with an increasing emphasis on sustainable growth metrics and climate change, as highlighted in the Morgan Stanley report.

Regulatory Incentives to Reduce Carbon Emissions: Converting biomass feedstocks to biofuels is an environmentally friendly process. When renewable biodiesel is used instead of traditional petroleum diesel, it helps reduce carbon emissions. Camelina oil has a particular advantage because of its low carbon footprint. The regulatory environment for carbon emissions is rapidly changing. Currently, there are existing regulatory incentives from regional greenhouse gas reduction mandates established for fuel producers. This includes California's Low Carbon Fuel Standards market, which measures the specific carbon index, or CI, of every type of fuel, assigns a credit/deficit for every gallon of fuel produced based on its CI, and requires all fuel producers selling into California to purchase enough credits to keep their portfolio CI score below an established baseline. Biofuel manufacturers are highly motivated to utilize compatible feedstocks with a low-carbon footprint in order to meet the regulatory standards to lower carbon emissions. As a benchmark, petroleum diesel has a reported CI of 100, soybean oil has a CI of 56, and in the case of Camelina oil, Sustainable Oils, a subsidiary of Global Clean Energy Holdings, Inc., recently reported a CI of 23.

Renewable Diesel and Sustainable Aviation Fuel: As part of the energy transition, a substantial increase in renewable diesel capacity in the United States and Canada is currently underway, with proposed and funded renewable diesel facilities having a total capacity of over 6 billion gallons of biofuels per year. Renewable diesel expansion has surged due to its low carbon footprint, federal and local subsidies, and its ability to be used as a drop-in replacement for petroleum diesel. Renewable diesel feedstock is supplied primarily from used cooking oil, animal fats (e.g., tallow), and vegetable oil, with the former two feedstock sources in short supply due to limited production capacity. Yield10 therefore expects the increase in demand for renewable diesel feedstock over the next few years will be filled by vegetable oils, which have a current global production and consumption demand of 50 billion gallons per year. Moreover, a third of vegetable oils produced globally today are palm oils, which do not qualify for many biofuels subsidies because of their high carbon footprint. Numerous studies and regulatory approvals have shown Camelina oil’s usefulness as a low-carbon feedstock oil for renewable diesel and sustainable aviation fuel. Residual Camelina protein meal remaining after oil extraction using cold crushing has been approved by regulatory authorities for use in animal feed applications in the U.S. and Canada. Camelina’s low-carbon footprint, and ability to be grown as a cover crop on otherwise fallow land, makes it an attractive choice to fill the renewable diesel feedstock supply gap. Based on the assumption of 60-100 gallons of Camelina oil per acre, 1 billion gallons of feedstock oil would require 10 to 15 million acres of Camelina production. When we later launch our elite PHA Camelina product, we estimate Camelina acreage could more than double. For comparison purposes, canola is currently grown on approximately 20 million acres per year in Canada. Although we have described the case for renewable diesel, feedstock demand for biodiesel and renewable aviation biofuel may also increase demand for Camelina oil.

Cover Crops: To meet growing demand for oils and protein, and to mitigate the negative environmental impacts of current farming practices, particularly in the corn belt, the development of cash cover crops or relay crops is another means to increase land productivity and address growing demand. Cover or relay crops are planted between harvest and sowing of major commodities, such as soybean, in effect increasing the number of harvests per growing season. Yield10 believes that Camelina, with its short growing season, has considerable potential to be used as a cover crop to reduce soil erosion, improve soil quality, and control diseases and pests and nutrient run-off from land that is used for row crop production. Camelina can also be used in crop rotation with other crops such as wheat, cereals, corn and soybean. Third party estimates indicate that Camelina has up to 30 million acres of potential as a cover crop in the United States midwest, and we believe that the product value-add from Yield10’s proprietary products will be a key differentiator for farmers making planting decisions. We plan to evaluate the CI of Camelina oil from cover cropping where we anticipate there may be further CI improvements from the positive environmental impact of cover cropping in general, although this remains to be demonstrated.

PHA Bioplastic, Alternatives to Plastic: Global plastic production today is estimated at 380 million tonnes per year. The largest market for this plastic is for packaging materials and food service items, which accounts for nearly half of all plastic waste generated globally, most of which is never recycled or incinerated. As a result, there is growing pressure from consumers, major brand owners and the financial sector to develop alternative materials and alternative end-of life solutions for plastics. This has resulted in additional capital investment to produce compostable materials like polylactic acid ("PLA") and fermentation based PHA bioplastics. PHA bioplastics are natural microbial high molecular weight polymeric storage

polymers. The value chain from microbial production to plastic product manufacturing, performance in use and end of life based on natural biodegradation has already been validated. PHAs can be recovered from the microbes which produce them, processed into standard plastic pellets and used in existing plastics processing equipment to make a range of food service items and packaging product forms. The commercialization of PHAs based on fermentation technologies continues to receive considerable investment, even though this approach has very high capital investment and operating costs that will limit supply and market penetration. We believe that in longer term, the direct production of PHA bioplastics in Camelina seed would represent a disruptive manufacturing technology for PHA bioplastics due to its significantly lower production costs and very large-scale potential. This opportunity could provide significant additional economic returns for farmers and would justify large acreage adoption of elite PHA Camelina as a cover crop and would support broad adoption of PHA Camelina materials for large markets including water treatment and sustainable biodegradable plastics replacement applications.

PHA Bioplastic, Water Treatment: In water treatment, the PHA biomaterial acts as a growth substrate and energy source for the denitrifying of bacteria, which convert nitrate, a primary cause of water pollution and algal growth, to nitrogen gas, which returns to the air. This application is technically straight-forward, requiring only the production and shipment of PHA biomaterials in pellet form. The model for this business is to supply the continuous replenishment of the PHA pellets. We believe that this application is less demanding on the purity and quality of the PHA produced and represents a favorable technical path to initial commercialization for PHA Camelina. This application may also serve as a market for PHA produced in the future for bioplastic applications, which do not meet the product specifications or ultimately as a way to generate value by “upcycling” post-consumer PHA bioplastic. Yield10 is in the early stages of developing the business model for this opportunity.

Omega-3 (EPA, DHA+EPA) Oils: The aquaculture sector will play a major role in meeting the growing global demand for fish, an important high value protein source in human diets. Sustainable land-based sources of key feed ingredients will need to be developed and adopted to support this demand. This includes high value specialty ingredients, including in particular new sources of omega-3 oils to replace oil from stagnating supplies of ocean-harvested fish used in feed production. Fish oil supplied from ocean-harvested fish is particularly important for farmed salmon. The Atlantic salmon aquaculture sector is expected to grow at 4% CAGR through 2026, reaching an annual harvest of over 3 million tonnes. The growth of the salmon farming sector along with additional demand from new nutraceutical markets for direct human consumption are expected to exceed the world's sustainable supply. In 2021, 4.7 million metric tonnes of fish feed was used globally for salmon aquafarming. Although it can vary by geographic location, during 1990 fish oil represented 24% of the contents making up fish feed. This equates to 2,487 million pounds of oil (fish and other sources of omega-3 rich oil) consumed annually in salmon feed production. Some industry experts predict the demand for omega-3 will increase by more than 7% per year over the next 5 years. The demand from salmon farming alone is expected to grow by approximately 4% per year going forward, according to the 2022 Salmon Farming Industry Handbook. Fish oil is also the key raw material source for producing purified omega-3 fatty acids for the growing use of these omega-3 acids in the nutrition, nutraceutical and pharmaceutical markets.

High Protein Meal: There is a growing global demand for additional protein sources for animal feed and food applications. Camelina seed can be processed using existing oilseed processing facilities to extract the oil, and the residual meal that remains is a high-quality protein. On a dry basis, the meal contains approximately 30-35% protein with a good amino acid profile for animal feed applications. Camelina meal has been approved for use in some animal feed applications, and we expect that with additional accelerated breeding using genome editing, the meal quality can be further enhanced to further improve its feed value and expand this application.

Trait Development and Licensing: Using our GRAIN system, we have identified and are evaluating novel yield trait genes to improve the field performance of Camelina that will be used in our products business. These traits will be made available to leading seed companies for use in other crops to create licensing revenue.

Business Strategy

In defining our business strategy, it is important to understand that Yield10 is not a seed company in the traditional sense of developing new seed varieties solely for sale to growers. Our goals are to 1) commercialize a series of seed products

based on developing proprietary varieties of Camelina seed for contract production, the output of which will enable the supply chain for our seed products, and 2) license our yield and seed oil content gene traits to major seed companies for other crops including corn, soybean and canola. Although our Camelina products will address key sustainability drivers, we believe they should reward farmers and increase profitability across the value chain. We also believe that any sustainability benefits will provide a marketing advantage for our future customers along with a potential upside from any available government credits. We also plan to continue to seek non-dilutive financing opportunities from government grants and funded partnerships. Although our Trait Factory may enable multiple commercial opportunities going forward, we will maintain our capital efficient approach, focusing internal resources on developing elite varieties of Camelina germplasm for biofuel feedstock, omega-3 oils and PHA bioplastics. Although we have relied primarily on Rothamsted to continue to develop and improve the omega-3 oil trait for Camelina, during 2023 we expect to become more directly involved in establishing the path to commercialization. Given our focus on establishing and growing our Camelina seed products business, we plan to rely on granting research licenses to interested seed companies for the development of our traits in the major food crops. Using this approach, we are developing the following three potential revenue streams:

- Camelina grain production to be sold into the biofuel oil markets; including the low carbon renewable diesel feedstock and the sustainable aviation fuel markets;
- Omega-3 Camelina grain production for high EPA omega-3 oil for nutrition and pharmaceutical markets; and
- R&D revenue from government grants and/or partners.

Target Crop: The Oilseed Camelina

Camelina was grown extensively in Europe, Russia and Central Asia since medieval times for oil and protein but was replaced by cultivation of rapeseed during the 1940s. Camelina has the potential to replicate the development of modern canola from rapeseed on an accelerated timeline based on modern biotechnologies, both components of our Trait Factory. Starting in the 1960s, the breeding of canola from rapeseed to the first generation was not completed until 1982, and was based on improving the oil for human consumption (low euricic acid in oil) and improving the protein meal (low glucosinolates) for use in animal feed. This was followed by incorporating herbicide tolerance and hybrid technologies in the 1990s. Today, canola is grown on 20 million acres in Canada and is estimated to generate around $25 billion for the Canadian economy, according to the Canola Council of Canada.

Camelina has not been subject to intensive plant breeding efforts or crop production improvements, so the full potential of this crop has not yet been achieved. Initial interest in using Camelina oil in biofuels resulted in additional investment in the development of the crop in North America. This work demonstrated that Camelina has several beneficial attributes; it is amenable to production practices used for canola, grows on marginal lands, has enhanced drought and cold tolerance, demonstrates early maturation and requires fewer inputs than other oilseed crops. Camelina is also naturally resistant to diseases that impact canola and its fast growing cycle makes this crop suitable for spring and winter planting in the Northwest U.S. and into Canada as an alternative rotation crop where the relatively overall short growing season would make double cropping very challenging. Further south, the longer overall growing season in the upper mid-west together with Camelina’s short growing season makes it an attractive winter oilseed for relay or cover cropping in corn and soybean rotations. Although the double cropping scenario is where we see the greatest long-term potential for Camelina, our current varieties and capabilities are better positioned for the initial commercial launch geography in the Northwest U.S. and western Canada.

Our vision is to complete development of Camelina lines containing herbicide tolerance ("HT") and downy mildew resistance ("DMR") traits, and to combine these new lines with our proprietary performance traits to increase Camelina seed oil content and yield for the existing oil and protein meal markets. We recognized early on the need to develop Camelina lines optimized for seamless integration into both crop and chemical rotations in our target geographies. For the Northwest U.S. and Canada, the herbicide tolerance traits selected for accelerated development were chosen to address critical farmer issues in our launch geography. The first requirement is for broadleaf and grassy weed control. An ideal herbicide trait package for growers would have the following key elements:

- Control of grassy weeds (GW-HT)

- Control of broadleaf weeds (BW-HT)
- Tolerance to soil residues of Group 2 herbicides of which there are two different types: sulfonylureas (SU-HT) and imidazolonones (IMI-HT) when combined SU/IMI-HT.

Camelina is already naturally tolerant to the grass herbicide Clethodin, so there is no need to develop traits in Camelina to provide tolerance to the chemical.

The BW-HT trait offers farmers an important tool for fighting broadleaf weeds that, if left uncontrolled, can reduce crop yields significantly and increase weed pressure on that land for subsequent crop plantings. Building on encouraging field trial results generated in the spring of 2022, we conducted contra-season field tests of our lead BW-HT trait in Camelina which also demonstrated herbicide tolerance. To speed up development we also selected potential commercial Camelina BW-HT lines displaying strong tolerance to the herbicide with no impact on seed yield for seed scale-up activities to produce seed for larger field tests planned for the spring of 2023. Our goal is to have elite HT Camelina varieties entering commercial production in the next few years followed shortly thereafter by triple stacked commercial BW-HT/SU/IMI-HT Camelina varieties.

SU-HT and IMI-HT are being developed to enable Camelina to be tolerant to Class 2 herbicides commonly used in that region for certain cereals and other crops. These weed control chemistries persist for longer in the soil which results in plant back restrictions for the next crop in the rotation and in some cases, this can be up to two years. Camelina is very sensitive to these herbicide residues which can prevent seed emergence and severely impair seed yields. Based on discussions with farmers we know the stacked HT/SU/IMI-HT trait package will be an important enabler for large acre adoption in this region. For these reasons we are advancing the development of Camelina lines with stacked HT/SU/IMI-HT traits. These traits and the availability of Clethodin for grassy weed control will provide Yield10 with an ideal herbicide package for the chosen commercial launch region. Greenhouse studies have already identified lead candidate lines with the stacked herbicide requirements and we are in the planning process to enable initial field trials in 2023.

Downy mildew is a common name for a widespread plant disease (pathogen) that if left uncontrolled, can generate significant losses in crop yields. In the near-term there are fungicide treatments that can control downy mildew disease. However, this approach adds grower cost so we are also developing genetic solutions using breeding, genetic modification and genome-editing to incorporate DMR traits into the plants. Development of our elite Camelina lines with HT and DMR traits is an important criteria needed for broad-based commercial acceptance of our Camelina plant varieties.

In the longer term, we believe optimizing the production of the PHA bioplastics in Camelina will enable large acreage production, initially in spring varieties, and over time, in winter varieties for use as a cash cover crop. Some estimates from the United States Department of Agriculture ("USDA") indicate a potential of up to 30 million acres of Camelina in the upper corn belt of the U.S., which would potentially make PHA Camelina the third largest crop in the U.S. Concurrent with this development of PHA Camelina, we plan to develop the high value omega-3 regulated trait based on our November 2020 agreement with Rothamsted. This omega-3 Camelina is at a high technology readiness level, and we are now progressing in early commercialization activities for this program.

To summarize, Camelina is an attractive choice of crop for the following reasons:

- Camelina, as an underdeveloped crop, has high technology upside potential to improve agronomics (including herbicide tolerance), seed yield, and seed value.
- There is a growing demand for crops that diversify the crop landscape, have a lower environmental footprint and have the potential to produce high value secondary products, opening new opportunities for farmers.
- Camelina is readily segregated from the major row crops and readily engineered using genetic engineering tools, making it an ideal platform for producing novel seed products.
- Yield10 has demonstrated that Camelina can be readily engineered to incorporate well-proven herbicide trait technologies with the potential to take advantage of the more favorable regulatory systems in place in the U.S. under the SECURE rule and under development in Canada.

- Camelina has been engineered to produce high levels of omega-3 (EPA and DHA+EPA) fatty acids as a drop-in replacement oil for fish oil in aquafeed markets as well as for use in nutraceutical and pharmaceutical applications.
- Camelina has potential to become a high value crop with very large non-traditional markets in water treatment and plastics. We first demonstrated proof-of-concept for PHA bioplastics in Camelina in our 2020 field tests, and the result was confirmed in our 2021 and 2022 field tests. This ability to produce PHA in Camelina is providing us with the potential to link a new high value Camelina crop with very large non-traditional markets in water treatment and plastics. Our internal analysis indicates this could drive very large acreage adoption. The higher per acre value enabled by Yield10's agronomic and product traits could make Yield10 the preferred production contractor for growers.

Production of Camelina seed in double cropping situations results in a favorable CI for the oil, making it an attractive feedstock for renewable diesel in geographies such as California where there are low carbon fuel standards in place and the economic value of carbon savings can be substantial. Low-carbon fuel standards are being established in other regions of the U.S., Canada and the E.U., which is increasing demand for renewable diesel feedstocks.

Camelina Seed Products Business

Our long-term vision is to develop and commercialize three types of elite Camelina varieties (Elite Camelina, Elite PHA Camelina, and Elite Omega-3 Camelina) as large acreage cover crops that will increase farm revenue and support the production of low carbon sustainable seed products with the additional positive environmental impact of reducing nutrient pollution from fertilizer use and increasing soil carbon content. Our plan is to:

- develop proprietary elite Camelina varieties offering superior returns to farmers and increased seed product revenue and margins to Yield10,
- contract production of Camelina grain with farmers for processing into seed products, and
- enter into offtake agreements for the Camelina grain products in each market segment.

To achieve this, Yield10 has been developing proprietary Camelina seed lines which are being progressed to elite Camelina variety status and ultimately to product commercialization. Gene traits currently in our development pipeline fall into three categories:

- input traits including traits for HT and DMR,
- performance traits from our GRAIN platform including traits to increase seed oil content and seed yield, and
- new seed product traits including PHA bioplastics and omega-3 (EPA, DHA+EPA) oil.

We plan to launch the new Camelina varieties incorporating these traits in the sequence illustrated below with the E3902/WD-HT Camelina being closest to commercial launch following the completion of two successful seasons of field trials. The trait demonstrated excellent tolerance to the herbicide which we plan to use for commercial production with no impairment of seed yield. The lead lines are now in seed scale up phase while our application for non-regulated status using the RSR process is pending with USDA-APHIS. In addition, we are progressing discussions with the herbicide producers to have Camelina added to their labels, an essential step towards enabling growers to use the herbicide with Yield10's new varieties.

The spring E3902/WD-HT varieties will be closely followed by winter WD-HT lines and then by lines containing stacked WD/IMI/SU-HT to enable broadleaf weed control and tolerance to soil residues of previously used herbicides.

Camelina Type	Seed Products	Gene Trait(s)	Camelina Varieties – Indicative Launch Sequence
Elite Camelina	Biofuel feedstock Protein meal	C3008a,b,C3009	E3902 →
		HT1	E3902/BW-HT →
		HT2	E3902/BW/SU/IMI-HT →
		Downy Mildew Resistance (DMR)	E3902/BW/SU/IMI-HT/DMR →
		Performance Traits (PT) Oil content, Seed yield	E3902/BW/SU/IMI-HT/DMR/PTs →
Elite PHA Camelina	PHA bioplastics Biofuel feedstock Protein meal	PHA	E3902/BW/SU/IMI-HT/DMR/PTs/PHA →
Elite Omega-3 Camelina	Omega-3 (EPA/DHA) oils Protein meal	Omega-3	E3902/BW/SU/IMI-HT/DMR/PTs/O3 →

We expect that our best Camelina lines currently progressing to elite variety status will be suitable for our initial commercial launch and the first tens of thousands of acres of contract production. These first Camelina seed varieties will be replaced over the next 2-4 years when the next generation varieties incorporating input traits, including herbicide tolerance and disease resistant genes, are available. We believe that successful implementation of the input traits will be important in order to achieve broad-based farmer adoption of our elite Camelina and to achieve expansion of production in the hundreds of thousands to millions of acres scale. Input traits currently progressing separately in our pipeline will eventually be combined, or "stacked," into our highest performing elite Camelina varieties in the future. Our goal is to have elite Camelina varieties enter commercial production in the next few years with stacked tolerance to three herbicides, stacked HT/SSU/IMI-HT traits and DMR. This development process with sequential release of improved elite Camelina varieties is illustrated above using our E3902 spring line. A similar process is being carried out in parallel for our lead winter Camelina lines. We have begun progressing early commercialization of the business based on the current best Camelina lines and the first seed product launch will be to supply feedstock oil for the renewable fuel market with the residual protein meal going into animal feed. We are currently working on seed scale up of our non-regulated spring and winter varieties of Camelina to establish our products operating business. Our commercial team has outreach to growers underway to build a grower network and to execute production contracts albeit at small scale. These activities are complemented by extensive business development outreach to seed processing facilities and prospective oil and protein meal offtake partners.

Our plan is to execute the sequential launch of our products from our Camelina oilseed platform as follows:

Products Produced by Processing Camelina Grain from Yield10 Varieties

Biofuel feedstock oil: Elite Camelina - stacked input traits and performance traits on current best varieties. In launching our Camelina products business, we plan to provide our seed to growers under contracts with Yield10, to use existing third-party oilseed processing assets through toll arrangements and to enter into offtake agreements with end users for the oil and protein meal to address current markets, including low-carbon feedstock oil for the biofuels and protein meal for animal feed. Our technology team will continue to develop improved varieties of elite Camelina germplasm with herbicide tolerance, disease resistance, seed yield and oil content traits currently progressing through our trait pipeline. Elite Camelina varieties will serve current markets and represent a foundation for the future commercialization of our PHA bioplastic and omega-3 traits, which we will develop separately and introduce into the elite varieties by plant breeding. In order to position Yield10 to execute on this plan, we harvested our first 50 acres of Camelina seed grown under contract in Montana in 2020. During 2021 and 2022, we conducted seed scale up activities with both spring and winter Camelina lines. During August 2022, we harvested 17 acres of winter Camelina seed grown under contract in Saskatoon that we have processed and provided to growers in the U.S. and Canada under contracts for the 2022/2023 winter season.

Nutritional Products

Omega-3 (EPA, DHA+EPA): Elite Omega-3 Camelina - omega-3 trait. Omega-3 fatty acids are found in foods such as fish and plant oils (flaxseed, soybean, canola and Camelina oils). The three main omega-3 fatty acids are alpha-linolenic acid ("ALA"), eicosapentaenoic acid ("EPA"), and docosahexaenoic acid ("DHA"). ALA is found primarily in plant oils and DHA and EPA are found in fish and other seafood. Omega-3 fatty acids provide many health benefits, including preventing and managing heart disease. The American Heart Association recommends that everyone eat fish at least twice a week, such as salmon that is high in omega-3 acids and/or adding fish oils supplements to their diets. The availability of ocean wild caught fish containing omega-3 oil used in nutritional oils and aquafarming is declining due to overfishing. We intend to launch a proprietary Camelina omega-3 seed product into the food and nutrition market based on the omega- 3 trait developed over the last 10 years by the Rothamsted Institute in the UK. Yield10 signed an Exclusive Collaboration and Option Agreement for this technology with Rothamsted in November 2020. In November 2022, Yield10 and Rothamsted agreed to extend this exclusive collaboration and option agreement until December 31, 2023. Rothamsted has progressed the omega-3 trait beyond the proof of concept stage with their completion of multiple field trials, oil production, and product validation in aquaculture feed and human nutrition studies. Under its agreement with us, Rothamsted is responsible for making improvements and further optimization of this exciting trait at their facilities in the UK. We believe the current omega-3 trait is already at a sufficient technology readiness level to begin commercialization activities for the aquaculture and nutrition markets. Yield10 will continue its focus on developing elite Camelina varieties with herbicide tolerance, disease resistance, higher yield and oil content, with the intent to breed the Rothamsted omega-3 product trait into this germplasm in the future. In the near term, Yield10 is working on the business strategy for this technology to enable production of elite omega-3 Camelina in Canada as early as the 2025 spring planting season.

PHA bioplastic: Elite PHA Camelina - PHA bioplastic trait. The second proprietary product we are developing as a sustainable replacement to petroleum-based products is the result of new technology for the large scale, low-cost production of natural biodegradable PHA bioplastic. By genetically reprogramming our Elite Camelina to produce PHA bioplastic in the seed, the harvested seed can be processed to simultaneously produce three coproducts: feedstock oil, PHA bioplastic and protein meal for animal feed. The typical costs for producing edible oils are a useful benchmark for the potential long-term cost structure for crop-based PHA bioplastics. In this scenario, crop-based PHAs could have a cost advantage over petroleum-based plastics. We successfully field tested prototype PHA bioplastic trait Camelina lines during the 2020 and 2021 growing seasons. In the 2022 growing season, we planted our best prototype PHA Camelina line at acre-scale for seed process development and plastic prototyping, however, we recognize that this version of our PHA trait is at an early technology readiness level. In parallel, we are developing the next generation versions of the PHA trait targeting 10% to 20% of total seed weight as PHA bioplastic and expect to achieve initial proof of concept for two PHA copolymer targets. We believe that by producing PHA bioplastic in Camelina seed as a third seed product along with processing the seed to produce oil and protein meal, we can achieve a cost structure with the benefits of integrated economics that optimize revenue as each market fluctuates with customer demand.

Protein meal for animal feed: Camelina meal is a high-quality and high-protein meal that has been approved by the U.S. Food and Drug Administration ("FDA"), as well as by the Canadian Food Inspection Agency ("CFIA") for feed use in poultry. It has also been approved by the FDA for feed use in beef cattle and by the CFIA for feed use in salmon and trout. Cold-pressed Camelina meal, which is the residual coproduct remaining after removing most of the oil, has been extensively studied for use in animal feed and proven to be well-tolerated by livestock. The meal also provides substantial health benefits when used as an animal feed. We believe Camelina meal, as a coproduct of our Elite Camelina, Elite PHA Camelina and Elite Omega-3 Camelina plant varieties, may represent a significant additional source of revenue.

R&D Revenue from Government Grants and/or Partners

Yield10 has historically sought and participated in government grants in collaboration with leading academic institutions to develop early crop innovations and to secure rights to intellectual property. We are currently a participant in a grant from the Department of Energy with Michigan State University, which is currently our primary source of grant revenue. As of December 31, 2022, $0.1 million remained to be earned under this sub-award. It is our intention to continue this practice where grant opportunities are consistent with progressing our commercial goals. Other potential sources of non-

product revenue include funded partnerships or collaborations with companies interested in the use of our GRAIN platform to identify gene targets for traits in crops of commercial interest and potential partners or customers in the Camelina products value chain.

Camelina Grain Product Revenue

In fall 2022, we signed growers' contracts with multiple growers for production at small scale ranging from 30 to 160 acres. The harvest of this grain production is expected to begin in the summer of 2023, at which time we anticipate that we will begin to recognize grain revenue in amounts scaled to the number of acres under contract. Future grain revenues will be based, among other things, on our ability to scale-up commercial seed production, engage with growers and seed retailers, and enter into offtake agreements with customers in the renewable diesel market.

Our History

We have a significant track record and expertise in the metabolic engineering (synthetic biology) of plants.

Our predecessor company Metabolix, co-founded by our CEO, was a pioneer in synthetic biology for the development of advanced PHA bioplastics production and applications technology using engineered microbes and fermentation, and as a result developed deep experience across the PHA bioplastics value chain. In addition, Metabolix supported a crop science research program to produce PHA bioplastic in crops as a potential low-cost production system and it was this crop science activity that became the foundation of Yield10. Historically, these efforts focused on producing the simplest member of the PHA family, known as PHB, which is a microbial carbon storage biopolymer, in high concentration within the seeds of oilseed crops or within the leaves of biomass crops such as switchgrass. PHA bioplastics are useful as biodegradable alternatives for petroleum-based plastics in many single use packaging and food service products.

Our Approach

Our GRAIN platform provides us with a unique approach for discovering novel yield trait genes and producing higher value sustainable products in Camelina.

We have integrated advanced metabolic flux modeling capabilities with transcriptome network analysis to form the foundation of our Gene Ranking Artificial Intelligence Network ("GRAIN") big data mining gene discovery platform. GRAIN is the gene discovery tool in our trait gene development platform, which encompasses three components: GRAIN target gene identification; modification of the target gene activity in Camelina using CRISPR genome-editing or traditional genetic engineering; and Camelina field testing. We refer to the integrated system as the Trait Factory, however, the GRAIN discovery tool is unique to Yield10. In the case of crops, the levers to increase seed yield are the metabolic infrastructure through which carbon flows from photosynthesis to seed production and the gene regulators or transcription factors, which control various pathways of plant metabolism. Over the last 20 years, the agricultural sector has generated vast numbers of data points. During this same period, however, there have been very few new crop traits produced. GRAIN is a next generation crop big data mining system based on over 30 years of advanced synthetic biology expertise and is protected by the Company as a trade secret. The system efficiently mines big data sets and prioritizes actionable gene targets to improve crop productivity. We have employed this approach to discover a range of potential yield trait genes and used the data from the traits generated in Camelina to create interest in our traits for major food crops through research license agreements. As an example, our new oil content gene trait target C3020 was previously an uncharacterized gene. GRAIN was able to select this gene target out of tens of thousands of Camelina genes and we consider the experimental results achieved with C3020 Camelina as a good proof point for the value of this platform.

We believe Camelina has high potential to become a large acreage commercial crop for producing low-carbon biofuel feedstock oils, PHA bioplastics and nutritional oils including omega-3 (EPA, DHA+EPA) oils in North and South America.

As part of an evolution to sustainable energy, a substantial increase in renewable diesel capacity in the United States and Canada is currently underway, with proposed and funded renewable diesel facilities having a total capacity of over 6 billion gallons of biofuels per year. Renewable diesel expansion has surged due to its low-carbon footprint, federal and local subsidies to reduce carbon emissions, and its ability to be used as a drop-in replacement for petroleum diesel. Renewable

diesel feedstock is supplied mainly from used cooking oil, animal fats (e.g., tallow), and vegetable oil, with the former two feedstock sources in short supply due to limited production capacity. Yield10 therefore expects to meet the demand of the increase in renewable diesel feedstock over the next few years. Moreover, a third of vegetable oils globally produced today are palm oils, which do not qualify for many biofuels subsidies because of their high carbon footprint. Numerous studies and regulatory approvals have shown Camelina oil's usefulness as a low-carbon feedstock oil for renewable diesel and sustainable aviation fuel. Residual Camelina protein meal remaining after oil extraction is approved by regulatory authorities for use in animal feed applications in the U.S. and Canada. Camelina's low-carbon footprint and its ability to be grown as a cover crop on otherwise fallow land make it an attractive choice to fill the renewable diesel feedstock supply gap. Based on the assumption of 60 to 100 gallons of Camelina oil per acre, 1 billion gallons of feedstock oil would require 10 to 15 million acres of Camelina production. For comparison purposes, canola production is currently around 20 million acres per year in Canada.

Camelina also has the potential to be a platform crop for the production of proprietary crop products. It is proven to be amenable to genetic engineering through Yield10's GRAIN platform, resulting in a number of oil and yield traits with demonstrated field trial success. Yield10 has also demonstrated proof-of-concept PHA bioplastic production in Camelina, both in the greenhouse in 2019, and in successful field trials in 2020 and 2021 producing 6% PHA bioplastic in the seed. In November 2020, Yield10 also signed an Exclusive Collaboration and Option Agreement with Rothamsted for an advanced trait technology for the production of omega-3 (EPA, DHA+EPA) oils in Camelina.

We believe that our Camelina development capabilities, together with our yield and oil content trait improvements, enable a strong competitive advantage in building an attractive Camelina products business focused on low-carbon biofuels feedstock oils. In the long term, the potential for production of PHA biomaterials in Camelina could provide economic returns for farmers to justify very large acreage adoption. PHA biomaterials also have the potential to reduce the CI of feedstock oils from carbon savings derived through the replacement of petroleum plastics and the low-cost production of these products. PHA biomaterials with the right cost structure have applications in very large markets not currently served by agriculture, including water treatment and biodegradable bioplastic applications. We believe crop-based production will enable broad-based global adoption of these materials.

We have assembled a pipeline of crop performance traits for development that are applicable to both Camelina and major commercial crops and have established research agreements with major seed companies.

Our unique approach to crop yield or seed oil content trait discovery utilizing our GRAIN platform, which integrates advanced metabolic engineering concepts to address critical bottlenecks in carbon metabolism, has enabled us to discover a series of yield genes with potential use for producing step-change improvements in crop yield. Through our research and early development efforts we have identified and begun characterizing our C3000 and C4000 series of traits. To initially characterize the potential of yield or seed oil content trait genes, we test our trait candidates using our Camelina platform. Our objective is to identify novel yield traits that act at a fundamental level in crop metabolism to provide the potential for broad deployment of our traits across multiple crop types. Following our work with these trait genes in Camelina, we seek to enter into license agreements or form collaborations with major agricultural companies so they can incorporate our novel yield traits into their seed products.

We believe our business model will allow us to develop our Camelina products business and capture value for important new yield traits for major crops.

We are working to advance our own trait developments in Camelina for our seed products business as well as to form business alliances to progress our traits through development, launch and commercialization in major food crops. Key to our strategy is to retain control of timelines and to maximize, where possible, the opportunity for future value creation. We are focused on identifying and signing additional research and development collaborations to accelerate commercial development of our promising yield traits. Based on this strategy, Yield10 intends to focus internal resources on trait gene discovery and developing improved versions of our elite Camelina varieties for our seed products business.

We have signed non-exclusive research licenses for our novel yield traits with agriculture industry leaders.

Yield10's approach to capturing value from the utilization of its proprietary traits in major food and feed crops is to enter into research licenses with large seed companies to maximize the numbers of acres in which the traits are adopted. Our capital efficient approach for trait development in major food and feed crops is to utilize field results obtained from our work with traits in Camelina to create interest from large seed companies. We then execute non-exclusive research licenses for traits of interest, enabling these companies to progress our traits within their crop(s) of interest. These research agreements have a limited term and require data sharing with Yield10. If the work performed under these research agreements is successful, the seed companies have the right to negotiate a commercial agreement.

We have a network of commercial science advisors and collaborators to provide us with insight and opportunities to advance our industry alliances, crop research and development, and key intellectual property.

Yield10 has pursued academic collaborations that have led to the discovery of novel yield trait genes. In 2018 and 2019, Yield10 announced signing global license agreements with the University of Missouri for advanced technology to boost oil content in oilseed crops, including C3007, C3010, and C3012, which are based on the discovery of a key regulatory mechanism controlling oil production in oilseed crops and which can be used to increase oil content. In conjunction with the Rothamsted collaboration agreement, Prof. Johnathan Napier, a world-leading scientist in the development of sustainable plant omega-3 (EPA, DHA+EPA) oil traits, also joined our advisory team.

We plan to seek U.S. and Canadian government grants and/or partners to support our research and development goals.

Yield10 has historically sought and participated in government research grants in collaboration with leading academic institutions to develop early crop innovations and to secure rights to intellectual property. We have been awarded grants over the last several years supporting research on strategies to improve the efficiency of photosynthesis, increase seed oil content, identify novel yield traits, and to test these novel traits in Camelina. This work is valuable because traits developed in Camelina also have the potential to be developed and deployed in other oilseed crops. For example, in 2017, we were selected as a sub-awardee on a DOE grant led by Michigan State University to conduct research aimed at boosting oilseed yield in Camelina. During 2020 and 2021, we received three small Canadian government research grants awarded through the Industrial Research Assistance Program administered by National Research Council Canada. We plan to continue to pursue government grants to defray research costs associated with our research and development activities. Other potential sources of non-product revenue include 1) potential partners or customers in the Camelina products value chain, and 2) funded partnerships or collaborations with companies interested in the use of our GRAIN platform to identify gene targets for traits in crops of commercial interest.

We are operating with a lean organizational footprint, which is evaluating our novel yield traits in greenhouse and field tests while maintaining efficient use of cash resources.

As of December 31, 2022, we had 30 full-time employees, with the majority directly involved with our research and development activities. We believe that our organizational capabilities align with our research priorities and are complemented by our use of third-party infrastructure and certain service providers. With this approach we can leverage third-party infrastructure and capability without having to spend the time and capital needed to recreate them in-house. This allows us to focus our limited resources on deploying our core strengths against our key development goals. We expect to grow our research and development operations and commercial seed operations over time commensurate with building value in our business and advancing our traits through commercialization while at the same time tightly managing overhead costs.

We are building capabilities in seed scale-up and certified seed production to build an inventory of Camelina seed to supply to growers under contract for producing grain suitable for offtake into the biofuels market.

As we advance field testing of our Camelina varieties, we will choose Camelina lines as lead and back-up candidates for commercialization. For instance, field tests can be conducted for a Camelina line with 20 to 100 grams of seed. As a line is selected for possible commercial sales, inventory of the seed must then be ramped up. The rule of thumb we use is that a one-acre planting of Camelina will produce sufficient seed to enable planting of 150 to 200 acres. In 2021/2022 we conducted seed scale-up activities for WDH3, our winter short cycle Camelina line as well as for WDH2, our winter cold tolerant line. During the third quarter of 2022, we engaged growers in contracts for the production of our WDH2 and WDH3

Camelina grain and Camelina seed having a total acreage of approximately 1,000 acres. These growers are located in the U.S. and Canada and planted between 30 and 160 acres each, with harvest expected to occur in the summer of 2023. We intend to use the seed harvest for toll crushing and further seed production that will provide us with seed inventory for future grower contracts during 2023 and beyond.

For certain spring and winter varieties in development for commercialization, including WDH2, WDH3, E3902 and certain candidate herbicide tolerant lines, we are conducting contract seed scale-up and production in contra-season at sites in South America and plan to continue seed scale-up activities in spring 2023.

Traits in Development

Yield10 has established a strong pipeline of performance and product traits in development. In late 2020, we added programs for the deployment of input traits including herbicide tolerance and disease resistance traits for Camelina into our pipeline and prioritized this development to enable larger scale production of elite Camelina varieties for biofuel feedstock production. We also prioritized development of performance traits for increasing seed oil content ahead of seed yield traits.

INPUT TRAITS

Herbicide Tolerance and Downy Mildew Resistance

We are progressing the development of genetic traits for tolerance to Class 10 and Class 2 herbicides in Camelina. We plan to use the Class-10 herbicide glufosinate tolerance gene for management of broadleaf weeds for commercial production. We are developing glufosinate tolerant Camelina because it will fit in well with crop rotations. The genetic trait we are using has a long history of safe use in other crops including canola. We believe this approach could potentially enable faster regulatory approvals for the trait in Camelina under the SECURE Rule in the United States. We have multiple candidate glufosinate tolerant Camelina lines in our pipeline. In spring 2022, we conducted our first field testing of candidate herbicide tolerant Camelina lines in order to identify lead and back up lines for commercial development and regulatory approval. We have selected lines for further testing and seed scale-up at two sites located in the southern U.S. over winter 2022/2023, and have plans to conduct further testing and seed scale up in spring 2023.

Class 2 herbicides (imidazolonones ("IMI") and sulfonyl ureas ("SU")) are used extensively in the geographic regions we are targeting for Camelina production. Soil residues from their use in the previous growing season can impair Camelina growth. For this reason, we are progressing Class 2 tolerance traits in our Camelina pipeline based on modified versions of the ALS gene ("acetolactate synthase") to produce tolerance to both types of Class 2 herbicides. Our approach is intended to leverage trait genetics and the well-established roadmap from the successful development of IMI and SU resistance in other commercial crops.

We are progressing traits for tolerance to the fungal pathogen downy mildew, which can negatively impact Camelina seed yields. In 2021, we acquired the rights to a Camelina line with DMR and plan to evaluate it in 2023 on land having significant levels of this fungal pathogen. We also have two backup Camelina lines demonstrating partial resistance and a funded breeding program ongoing for producing additional DMR lines.

Each of these input traits are being developed independently, however once validated, our plan is to stack these traits into our current, best elite Camelina varieties.

In late 2020, we initiated an intensive effort to develop herbicide tolerance traits in Camelina. In our spring 2022 field testing program, we indicated that we would be evaluating over 30 candidate Camelina lines that have been engineered for tolerance to over-the-top spray of a commercial broadleaf weed herbicide. In August 2022, we reported that we observed good herbicide tolerance to an established broadleaf herbicide at 1 time or 2 times the spray rate that is typically applied commercially to herbicide tolerant canola. The over-the-top spraying consisted of 2 spray applications of the broadleaf herbicide at different times of the Camelina growth cycle. In February 2023, we reported that we retested our lead commercial candidate HT spring Camelina lines in field trials in the Southern U.S. and the previous successful results were replicated. We further reported these HT spring Camelina lines were also tolerant to the application of a grassy weed control product.

In our spring 2022 field test program, we also tested a Camelina line for tolerance to IMIs. In August 2022, we reported that our candidate IMI tolerant line has normal growth in the presence of IMI soil residues applied to the soil at 1-time or 2-times the commercially used rates, whereas the control line shows impaired growth. In 2022, our researchers developed multiple E3902 spring Camelina lines with "stacked" herbicide tolerance traits. In February 2023, we reported results from greenhouse studies indicating that we have achieved proof-of-concept for creating E3902 Camelina lines with tolerance to both over-the-top herbicide application and soil residual herbicide. We plan to conduct our first field tests of stacked herbicide tolerant E3902 spring Camelina lines in spring 2023. Our researchers have also developed candidate broadleaf herbicide tolerant winter Camelina in WDH2 and WDH3 germplasm. In recently completed greenhouse studies, these candidate winter Camelina lines demonstrated tolerance to spray application of commercial levels of a commonly used broadleaf herbicide. These events are on-track for field testing in winter 2023/2024. We are also developing “stacked” herbicide tolerance traits in our winter Camelina lines with the goal of conducting our first field tests in winter 2023/2024.
We plan to collect data on tolerance to the herbicides, seed yield and oil content data on these Camelina lines in the months ahead.

PERFORMANCE TRAITS

Seed Oil Enhancing Traits: C3007, C3008, C3009, C3010, C3012 and C3020

Yield10 is progressing a series of novel traits targeted at increasing the oil content in Camelina. We are building significant capabilities and intellectual property around key oil biosynthesis pathways in plants based on technologies for increasing oil content in seeds. Improving the oil content and yield of Camelina seed would increase the value per acre for this crop for the production of generic oils for biofuel markets in the near term and omega-3 (EPA, DHA+EPA) oils in the future. Based on the results we obtain with Camelina, we may be able to license these traits to seed companies for use in other oilseed crops, including canola and soybean.

We began the technical work in Camelina during 2016 with our C3008a, C3008b and C3009 traits, which regulate the production and degradation of oils in oilseed crops. In 2017 and 2018, we received confirmation from the U.S. Department of Agriculture - Animal and Plant Health Inspection Service's ("USDA-APHIS") Biotechnology Regulatory Services ("BRS") that two types of our genome-edited Camelina plant lines developed using CRISPR/Cas-9 genome editing technology for increased oil content were not considered to be regulated articles under 7 CFR part 340, clearing the way for field testing in the U.S. Edits to three different gene types were made to truncate the resulting encoded proteins. These edits were designed to enhance the production of oil and decrease its turnover in mature seeds. The best line containing these modifications is designated as our triple-edited, or C3008a, C3008b and C3009 trait containing spring Camelina line E3902. We completed our first field trial with these edited Camelina lines in the U.S. during the 2019 growing season and these trials were repeated in 2020 and 2021 with the E3902 line consistently showing an approximately 4.7 percent increase in seed oil content as a percentage of overall seed weight. No significant change in oil composition was observed. In 2021, the Ministry of Agriculture, Livestock and Fisheries in Argentina indicated that Camelina line E3902 would not be subject to regulation in that country. We are performing activities related to seed scale-up with Camelina line E3902 including pure seed production in anticipation of potential commercial use. In 2022, the Ministry of Agriculture on Agricultural Protection in Chile indicated that Camelina line E3902 would not be subject to regulation in Chile.

In 2018, we signed an exclusive global license agreement with the University of Missouri for advanced oilseed technology, including the C3007 and C3010 gene traits, which are promising targets focused on the central role of Acetyl-CoA Carboxylase ("ACCase") a key metabolic control point for oil production. We have produced several CRISPR genome edited versions of C3007 in both Camelina and canola. Camelina contains three copies of three different BADC genes, BADC-1, BADC-2 and BADC-3 while canola contains two versions of each gene. Through a series of submissions to USDA-APHIS, we have developed several lines of Camelina and canola that USDA-APHIS BRS does not consider to be regulated under 7 CFR part 340. In addition, in late 2021 the Ministry of Agriculture, Livestock and Fisheries in Argentina indicated that two C3007 Camelina lines would not be subject to regulation in that country.

Yield10 researchers achieved proof of concept showing that four novel gene targets identified using the GRAIN platform impact seed development and/or oil content. In greenhouse testing in 2020, one of the three targets, C3020, produced a 10% increase in seed oil content when engineered with increased activity in Camelina. Data obtained from increasing activity of the other three targets, C3019, C3021, and C3022 indicates these represent good targets for CRISPR

genome-editing. Pure field grown seed of C3020 was produced in 2021 for subsequent larger scale evaluation in field tests. Results from the 2021 field production showed up to a 9 percent increase in oil content.

Novel Yield Trait Genes C3003 and C3004

Internal development work with performance traits C3003 and C3004 has been paused to focus resources on the development of our input traits and oil content traits. C3003 is an algal gene, in-licensed from the University of Massachusetts. We believe, based on GRAIN modeling and early positive results, that C3003 reduces the well-understood yield losses that occur through photorespiration, a side reaction of photosynthesis in C3 crops. Simplot is working with C3003 in their potato programs. Our C3004 gene trait was identified based on molecular genetic analysis of C3003 Camelina. In studies conducted between 2018 and 2021, stable C3004 Camelina lines with increased expression of C3004 resulted in a significant increase in plant growth and vigor, increased branching and seed yield, and in some cases increased individual seed weight. We currently have research license agreements in place with seed companies to evaluate the Camelina C3004 gene in soybean and potato.

C4000 Series Traits

Simplot is testing the C4001 trait in potato. We expect evaluation of C4000 series traits in these target crops will continue to advance during 2023. Traits in this series and the proof points we expect to generate may provide us with an opportunity to selectively partner with others for the development of these traits in major commercial food, feed, and forage crops.

PRODUCT TRAITS

PHA Bioplastic Trait

PHA bioplastics are produced today using sugar or vegetable oil feedstocks by fermentation of microorganisms. Fermentation-based production of PHAs is constrained by the high capital cost of manufacturing facilities and the high processing costs resulting from feedstock conversion losses due to the inefficiency of converting sugar or oils to PHA. For example, it requires over 3 pounds of sugar to produce 1 pound of PHA or 1.5 - 2 pounds of vegetable oil to produce 1 pound of PHA, making the feedstock cost alone very high. These types of processes also require other manufacturing inputs and are energy intensive. We believe crop-based production will enable an advantaged cost structure thereby eliminating a barrier to entry for large-scale adoption of PHA materials for use as renewable, biodegradable plastic replacement in many single use food serviceware and packing applications. Another application of PHAs includes wastewater treatment.

Seeds are natural, stable storage sites for large amounts of oil and proteins deposited by plants to nourish seedlings following seed germination in the field. The stability of seeds at ambient temperatures allows them to be readily harvested, transported and stored prior to processing, and makes them the ideal vehicle for crop seed production of PHA bioplastics. The key concept is to introduce the PHA bioplastic as a new component of the seed composition and by processing the PHA bioplastic producing seed, to produce oil, polymer, and protein rich seed meal. We believe this can be done in a capital efficient manner using incremental capital added to an existing oilseed facility. The combination of all three products improves the overall value proposition and we believe that in time this will result in PHA bioplastics costs ultimately in line with canola and soybean oils. Yield10 plans to develop and commercialize Camelina seed-based PHA bioplastics by selling a resin grade PHA bioplastic raw material to the bioplastics industry. The Company is actively pursuing business development opportunities to identify and secure partnerships for plastics replacement markets.

Yield10 filed a U.S. patent application in 2019 for new technology potentially enabling low-cost production of PHA biomaterials in the seeds of Camelina. The Yield10 patent application describes a discovery around maintaining the viability and vigor of Camelina seed programmed to produce high levels of the PHA biomaterial PHB. By introducing the three genes encoding the pathway for producing PHA from the plant metabolite acetyl-CoA, we have demonstrated the production of up to 10 percent PHB in seeds of Camelina with good seedling viability in growth chambers. We currently have two PHA biomaterial traits, C3014 and C3015, in our development pipeline and we carried out successful field tests in 2020 and 2021. We are now progressing to scale up the best prototype line, based on the C3015 trait, which showed PHA levels of up to 6%

seed weight, to begin early product prototyping and market development studies for feed and water treatment applications. In 2022, we completed a 3-acre scale-up of this line. In parallel, we have a research and development program underway to optimize and develop commercial quality PHA trait lines based on insights from the field tests and our GRAIN platform with a goal to achieve 10 - 20% PHA in seed.

Omega-3 (EPA, DHA+EPA) oil trait

The omega-3 (EPA, DHA+EPA) oil trait, for which Yield10 has secured an option to commercial rights, is being developed by the research team at Rothamsted as part of their program to develop a sustainable drop-in replacement for fish oil used in the production of aquaculture feed. Yield10 is providing financial support to the ongoing Rothamsted program and has secured an exclusive option to commercialize the technology and improvements made during the term of the agreement. In November 2022, Yield10 and Rothamsted agreed to a no-cost extension of the exclusive option and license agreement until December 31, 2023.

The most important omega-3 fatty acids for human health are ALA, DHA and EPA and the primary source of these is fish in the diet. These omega-3 fatty acids are produced by algae, where they are thought to protect their cell membranes in cold water. The algal omega-3 oils progress up the food chain and accumulate in fish and eventually into the human diet. Northern Hemisphere fish oil contains approximately 10% DHA and 10% EPA. Camelina oil already contains the omega-3 fatty acid ALA and the Rothamsted Institute has developed engineered Camelina lines, which produce approximately 20% of DHA+EPA fatty acids, similar to the composition of Northern Hemisphere fish oil. A number of these Camelina lines have been successfully field tested by Rothamsted and us during the last four years at different locations within the UK, Canada and the U.S. with oil samples produced for salmon and human feeding studies. Rothamsted is continuing its research program to further improve the oil composition of Camelina oil with the goal of developing a land-based production system for a Camelina oil composition as a drop in replacement for Southern Hemisphere fish oils, which has an DHA+EPA fatty acid content in the oil of approximately 30%. We believe there may be intellectual property challenges related to the production of omega-3 oils in crops in North America until certain existing patents in Canada expire during 2025. We are currently progressing business development activities to determine the feasibility of progressing the omega-3 Camelina in North America in the near term. However, in the interim, Yield10 will focus its research and development efforts on developing advanced Camelina germplasm with the intention to introduce the omega-3 trait in the future.

Regulatory Requirements

Since the first successful commercialization of a biotechnology-derived agricultural crop in the 1990s, many new crop varieties have been developed and made available to farmers in the U.S. and worldwide. U.S. farmers have rapidly adopted many of these new biotechnology-derived varieties. According to the USDA, in 2020 over 90 percent of U.S. corn, upland cotton and soybeans planted in the U.S. were varieties produced through traditional forms of genetic engineering. A significant percentage of the production of other crops planted and harvested in the U.S., such as alfalfa, papaya and sugar beet are also biotechnology-derived.

Biotechnology-derived or genetically engineered ("GE") crops are subject to a significant amount of regulation in the U.S. and worldwide. Field tests and field trials of such crops need to ensure that traits in development do not escape or mix with native plants, and crops that may be used in human and animal food chain must meet certain safety standards. Government regulations, regulatory systems and the political environment that influence them vary significantly among jurisdictions.

For purposes of this discussion, the term “GE” includes both biotechnology-derived or genetically engineered plants that are modified by the insertion of recombinant DNA (“Traditional Genome Modification”). Biotechnology-derived or genetically engineered plants can also be modified through the application of more modern techniques of genome editing. We have seed traits that fall within each of these two generalized categories of GE plants, as summarized above under the subheading “Traits in Development.”

United States Regulation

The U.S. government agencies primarily responsible for overseeing the products of modern agricultural biotechnology are the USDA, the FDA and the EPA. Depending on its characteristics, a product may be subject to the jurisdiction of one or more of these agencies under the federal government's 1986 Coordinated Framework for the Regulation of Biotechnology, as updated. Regulatory officials from the three agencies regularly communicate and exchange information to ensure that any safety or regulatory issues that may arise are appropriately resolved within the scope of authority afforded to each agency under their respective statutes. Other environmental laws or regulations also apply, depending on the specific product and its potential applications or intended uses. Our business strategy for major grain crops is to develop yield and performance traits for licensing to the major seed companies.

Our seed traits and any future products that are successfully developed containing our seed traits are subject to USDA, FDA and EPA regulatory requirements. Those requirements will vary depending on the particular seed trait and the type and intended use of any product that will be commercialized. Future products that we plan to produce and sell, for example deployment of herbicide tolerant traits, are likely to have EPA regulatory requirements, and the regulations relating to manufacturing and consumer protection will also need to be addressed.

Within USDA, APHIS administers the regulations in 7 CFR part 340, ''Introduction of organisms and products altered or produced through genetic engineering which are plant pests or which there is reason to believe are plant pests.'' These regulations govern the introduction (importation, interstate movement, or release into the environment) of certain GE organisms. Along with the EPA and the FDA, APHIS is responsible for the oversight and review of GE organisms.

On May 18, 2020, the USDA updated the biotechnology regulations in the Plant Protection Act (7 C.F.R. Part 340) and set up a new paradigm called the Sustainable, Ecological, Consistent, Uniform, Responsible, Efficient ("SECURE") rule. This Act establishes updated regulations for importation, interstate movement, and environmental release of GE organisms and products. It provides exemptions for plants if the genetic modification is solely a deletion of any size, or the genetic modification is a single base pair substitution or if the genetic modification is solely introducing nucleic acid sequences from within the plant's natural gene pool. Exemptions also apply if the modification is from editing nucleic acid sequences in a plant to correspond to a sequence known to occur in that plant's natural gene pool or if the plant is an offspring of a GE plant and does not retain the genetic modification in the GE plant parent. In addition to the above, § 340.1(c) states that modified plants would not be subject to the regulations if they have plant-trait mechanism of action ("MOA") combinations that are the same as those of modified plants for which APHIS has conducted a regulatory status review and found not to be subject to the regulations under part 340. The focus rests on the organism itself rather than the methods and technologies used to generate it, which is important given improvements in delivery and genome editing modalities over the past 33 years.

Seed traits developed using Traditional Genome Modification, such as our C3003 yield trait that leverages the biological functions of an algal gene, are regulated under 7 CFR part 340. Regulated articles are subject to extensive USDA-APHIS oversight, including but not limited to permitting requirements for import, handling, interstate movement and release into the environment. In recent years, we have obtained determinations from USDA-APHIS that some of our genome edited lines are exempted from the 7 CFR part 340 framework administered by the agency. In cases (i) through (iv) below, USDA-APHIS's Biotechnology Regulatory Services approved our petitions and confirmed that each of these novel plant lines would not be treated as a regulated article through the previous APHIS "Am I Regulated?" process.

(i) The single trait C3008 Camelina plant line, developed using CRISPR genome editing technology for increased oil content.

(ii) The triple-edited Camelina line E3902 that combines three gene traits, C3008a, C3008b and C3009, to increase oil production.

(iii) The Camelina CRISPR edited line edited for the C3007 trait for increased oil production in Camelina.

(iv) The canola CRISPR edited line edited for the C3007 trait for improved oil production in canola.

To our knowledge, our triple-edited Camelina line E3902 which was determined to not be regulated under 7 CFR part 340 in September 2018, is the first CRISPR-edited triple-trait plant determined by the agency to be not to be regulated under 7 CFR part 340. Since 2018, our CRISPR-edited lines that are exempt from regulation by APHIS (under 7 CFR part 340) have been studied in field tests conducted in the U.S. We expect to continue to make appropriate use of SECURE Rule procedures to clarify the regulatory status of our new GE seed traits as they are developed.

In 2020, the regulatory exemptions and confirmation process under the SECURE rule took effect, representing the first comprehensive revision of APHIS' biotechnology regulations since 1987. The revisions enable APHIS to regulate organisms developed using genetic engineering for plant pest risk with greater precision and reduces the regulatory burden for developers of organisms that are unlikely to pose plant pest risks. Once a specific plant developed through genetic engineering is found not to require regulation, new varieties of the plant containing the same genetic modification would similarly not be regulated. Since the new process was enacted, certain of our CRISPR edited Camelina C3007 lines have been confirmed by APHIS as being exempt from regulation by USDA-APHIS under 7 CFR part 340. In addition, in 2022 we filed a request under the SECURE Rule for Regulatory Status Review (RSR) with USDA-APHIS Biotechnology Regulatory Services (BRS) for herbicide tolerant Camelina. As of March 2023, a response from the agency is pending.

The EPA is responsible under the Federal Insecticide, Fungicide and Rodenticide Act for regulating pesticides with public health uses, as well as ensuring that these products do not pose unintended or unreasonable risks to humans, animals and the environment. For herbicide-tolerant crops the EPA regulates the herbicide while the USDA-APHIS regulates the crops. The EPA establishes tolerances for the allowable amount of herbicide residues that may remain on the crop. Tolerances, as defined by the EPA, are "the maximum amount of a pesticide allowed to remain in or on a food" as part of the process of regulating pesticides.

Separate from approval for genetic modifications from USDA-APHIS regulations under 7 CFR part 340, a GE plant also will be regulated by the FDA if it is intended to be used as human food or animal feed. The FDA regulates the safety of food for humans and animals, and foods derived from GE plants must meet the same food safety requirements as foods derived from traditionally bred plants (also called "conventional foods").

Since 1992, the FDA has had in place a voluntary consultation process for developers of bioengineered food ("Biotechnology Consultations"). Final agency decisions and other information from these Biotechnology Consultations are made publicly available by the FDA. Biotechnology Consultations are data-intensive and examine the new food product's safety and nutritional profile, among other issues. Generally, the FDA has found that such food products do not pose unique health risks to humans or animals, but if a novel allergen or other distinction from the conventional food is present in the new plant variety, the agency may require specific label statements on the product to ensure that consumers are made aware of material differences between GE and conventional versions. The FDA primarily derives its regulatory power from the Federal Food, Drug, and Cosmetic Act, which has been amended over time by several subsequent laws. Among other oversight and inspection responsibilities, the FDA regulates ingredients, packaging, and labeling of foods, including nutrition and health claims and the nutrition facts panel. Foods are typically not subject to premarket review and approval requirements, with limited exceptions.

As part of a broader effort to modernize its regulatory approach to all biotechnology-derived products, the FDA is currently re-evaluating its regulatory approach in light of the increasing prevalence of certain genome edited plants. In January 2017, the FDA asked for public input to help inform its thinking about human and animal foods derived from new plant varieties produced using genome editing techniques. Among other things, the FDA's request for comments asked for data and information in response to questions about the safety of foods from genome edited plants, such as whether certain categories of genome edited plants present food safety risks different from other plants produced through traditional plant breeding.

In October 2018, FDA leadership issued a document entitled the "Plant and Animal Biotechnology Innovation Action Plan" (the "Action Plan") that identified three key priorities for the agency in this area: 1) advancing human and animal health by promoting product innovation and applying modern, efficient and risk-based regulatory pathways; 2) strengthening public outreach and communication regarding the FDA's approach to innovative plant and animal biotechnology; and 3) increasing engagement with domestic and international partners on biotechnology issues. The Action Plan also stated that the FDA has reviewed the comments and other information it received in response to the January 2017 request for comments, and that it intends to develop guidance for the industry explaining how the FDA's existing regulatory policy for foods derived from new plant varieties applies to foods produced using genome editing. The FDA also stated in the Action Plan that it intends to begin updating the existing procedures for voluntary Biotechnology Consultations to reflect the agency's 25 years of experience with foods derived from biotechnology plants and to incorporate any additional issues related to genome editing of food crops. Such procedural updates are expected to be developed and implemented over the next two years.

Canadian Regulation

In Canada, GE crops, and the food products into which they are incorporated, are regulated by multiple government agencies under a federal framework for the regulation of biotechnology products that is similar to the U.S. system. First, the CFIA is the lead agency for ensuring that a new agricultural biotechnology crop will not pose new risks to Canadian plants, animals, and other agricultural commodities. The Plant Biosafety Office ("PBO") is responsible for conducting environmental assessments of biotechnology-derived plants, referred to as "plants with novel traits" ("PNT"). Authority for the PBO includes both approving confined field trials with the PNT through permits and authorizing their “unconfined release” as a first step towards commercialization. PNTs are defined in the Canadian Seeds Regulations (i) as plants into which a trait or traits have been intentionally introduced, and (ii) where the trait is new in Canada and has the potential to impact the environment. The CFIA also has in place a remutation policy, whereby plants containing the same mutation as a previously authorized plant of the same species are included in the authorization of the original PNT and are therefore subject to the same conditions.

Under the Food and Drugs Act and related regulations, Health Canada is responsible for reviewing a pre-market safety assessment that must be submitted by the manufacturer or importer of a “novel food,” a term of art that includes any PNT or other biotechnology-derived foods. The safety assessment should provide assurances that the novel food is safe when prepared or consumed according to its intended use before it enters the Canadian market and food system. A multi-disciplinary team of experts from Health Canada evaluates the data and information about the novel food and make a determination regarding whether it is safe and nutritious before it can be sold in Canada, as well as whether any restrictions are warranted under applicable law or the product’s safety profile. Health Canada’s final decision documents regarding the safety of these novel foods are made available to the public by the government. As in the U.S., approval of a PNT or a novel food product does not take into account the method with which such product was produced. Rather, Health Canada employs a product-based (as opposed to a process-based) approach to its regulatory oversight of such emerging foods and food ingredients.

As the lead agency for public health and safety, Health Canada also works in conjunction with the CFIA on food labeling oversight when it identifies a potential health or safety issues with a food that could be mitigated through labeling or other disclosures. For example, if the biotechnology-derived food contains a new allergen that is otherwise not present in the conventional version of the food, then specific label statements are required to alert consumers to that important health information. However, the CFIA has primary oversight over non-health issues related to food labeling, packaging, and advertising. Accordingly, the CFIA is the lead agency for ensuring that food labeling and advertising meet the legal requirements of the Food and Drugs Act, and that labeling representations do not create a potential risk of fraud or consumer confusion and are compliant with Canada’s voluntary disclosure standard for GE food ingredients.

Environment Canada is also available to serve as a regulatory “safety net” if a novel product does not naturally fall within the jurisdiction of the CFIA, Health Canada, or the Pest Management Regulatory Agency that oversees pesticide products.

Our work involving the development, greenhouse testing, and field testing of novel yield trait genes in crop plants requires certain government and municipal permits, and we must ensure compliance with all applicable regulations, including regulations relating to GE crops. With laboratories and greenhouses in both the U.S. and Canada, we are also subject to regulations governing the shipment of seeds and other plant material (including GE seeds and GE plant material) between our facilities in the U.S. and Canada, including USDA-APHIS and CFIA permits for the import and phytosanitary certificates for the export of plant materials that could pose a risk to domestic agriculture.

Having deployed our own research and development operations in Saskatoon, Canada in 2010, we have been conducting field studies of various yield traits in that country since 2016 under PNT permits issued by Canadian regulators. In recent years, we have conducted field studies in Canada of multiple traits including our PHA bioplastic trait, under PNT permits.

Regulation in Other Jurisdictions

Other jurisdictions and governmental authorities, including in South America and Asia, are increasingly taking an interest in regulating agricultural products of biotechnology. Regulatory approaches vary by jurisdiction, including the existing public health framework and phytosanitary laws in the country, and other less tangible factors such as cultural and religious norms that may have an impact on individual country risk assessments and decision-making. We cannot predict future changes in the global regulatory landscape regarding GE plants subjected to Traditional Genome Modification or GE

plants subjected to genome editing. Further, although U.S. and Canadian regulatory authorities have taken similar approaches to overseeing both traditional biotechnology-derived plants and genome edited plants under their national plant health and biosafety laws, regulation of all GE plants in the EU is significantly more stringent than in North America. U.S. and Canadian regulators have also determined that genome edited GE plants pose fewer risks that those subjected to Traditional Genome Modification. A July 2018, Court of Justice of the European Union legal ruling indicates that the existing European regulations for GE plants modified by the insertion of recombinant DNA should be strictly applied to genome edited plants as well. There is thus a sharp distinction between how European and North American regulatory agencies oversee novel seed traits, including those that are generated using the more modern techniques of genome editing. Although we are not currently targeting European markets for the development or commercialization of our products, the EU approach to regulating GE plants without regard to the scientific distinctions between Traditional Genome Modification and directed genome editing could be adopted by emerging oversight regimes for GE products in other jurisdictions. However, an increasing number of countries that dominate GE crop production such as Argentina, Brazil and China are adopting a more favorable regulatory approach towards genome edited plants that do not contain foreign DNA by equating the crops to conventionally bred varieties. This approach first implemented by Argentina, followed by many other countries, demonstrates the evolving landscape for GE crops informed by over 25 years of regulation and GE crop production.

In 2020, Japan published final guidelines for genome edited plants and food that state that these can be sold to the public, without the need for pre-market authorization provided they meet the criteria of being similar to products of traditional breeding.

In December 2021, Yield10 received a favorable determination from the Argentine Biosafety Commission that our genome edited Camelina lines, E3902 and the two C3007 lines, developed for increased oil content, were similar to conventional bred Camelina varieties and are not regulated under the biotechnology resolution No. 763/11 of the Ministry of Agriculture, Livestock and Fisheries in Argentina. In practice, the Argentinian authorities have confirmed that because the genome edited Camelina lines do not contain any foreign inserted DNA, these varieties can be marketed in Argentina like conventional Camelina varieties without the need for any pre-market authorizations.

In fourth quarter 2022, the Agricultural Protection Division – Forestry and Seeds in Chile indicated that our genome edited E3902 Camelina line is not under the scope of the Chilean Biotechnology Crops Resolution No. 1523 of 2001, and its amendments regarding GMOs confirming that this line is considered not regulated (non-GM) in Chile and can be cultivated like conventional crops.

In January 2022, the Chinese Ministry of Agriculture and Rural Affairs published new guidelines for the review and approval of genome edited crops and products paving the way for faster commercialization in that country.

In-License Agreements

Exclusive Collaboration Agreement with Rothamsted Research

On November 12, 2020, Yield10 signed an exclusive collaboration agreement with Rothamsted to support Rothamsted's Flagship Program to develop omega-3 oils in Camelina. The technology developed by Rothamsted could enable the sustainable, plant-based production of omega-3 (EPA, DHA+EPA) nutritional oils that closely mimic the composition of Southern Hemisphere fish oil, an important ingredient in the production of aquaculture feed. Omega-3 oils are also essential for human nutrition and have demonstrated benefits in heart health. Rothamsted is a world-leading nonprofit research center based in Harpenden, UK, that focuses on strategic agricultural science to the benefit of farmers and society worldwide. Over the last decade, the team led by Professor Johnathan Napier, Ph.D., Science Director, has demonstrated the production of EPA, DHA+EPA oils in Camelina seed. In addition, Prof. Napier's team has carried out multi-year field trials and multiple feeding studies with research partners using the EPA, DHA+EPA Camelina oil in different fish species. Their partners have included at least one major aquafeed company. Under the agreement, Yield10 has provided financial support for Prof. Napier's ongoing research including further EPA, DHA+EPA trait improvement, field testing and nutritional studies. As part of the agreement, Yield10 received an exclusive two-year option to sign a global, exclusive or non-exclusive license agreement to the technology. In November 2022, Yield10 and Rothamsted agreed to extend the collaboration agreement, including the license option, without additional funding support, through December 31, 2023. Under this collaboration, Yield10 will monitor the ongoing progress by Rothamsted while developing the business plan for the initial commercial launch, which is expected to serve the salmon feed market in Chile.

License Agreement with the University of Missouri

Pursuant to a license agreement with the University of Missouri ("UM") dated as of May 17, 2018, we have an exclusive, worldwide license to two novel gene technologies to boost oil content in crops. Both technologies are based on significant new discoveries around the function and regulation of ACCase, a key rate-limiting enzyme involved in oil production. The first technology, named C3007, is a gene for a negative controller that inhibits the enzyme activity of ACCase. The second technology, named C3010, is a gene which, if over-expressed, results in increased activity of ACCase. The UM license was expanded during May 2019 to include an exclusive worldwide license to a third gene in the ACCase complex, that we have designated C3012, that may complement the activity of C3007 to boost oil content in crops.

Pursuant to the UM license agreement, we are required to use diligent efforts to develop licensed products throughout the licensed field and to introduce licensed products into the commercial market. In that regard, we are obligated to fulfill certain research, development, and regulatory milestones relating to C3007, C3010 and C3012, including completion of multi-site field demonstrations of a crop species in which C3007, C3010 and C3012 have been introduced, and filing for regulatory approval of a crop species in which C3007, C3010 and C3012 have been introduced within a specified period. Our failure to achieve any milestone provided for under the license agreement would give UM the right to terminate the license agreement or render it nonexclusive, unless we are able to reach agreement with UM as to the potential adjustment of the applicable milestone.

We are obligated to pay UM a license execution payment, milestone payments relating to any regulatory filings and approvals covered by the license agreement, royalties on any sales of licensed products following regulatory approval, as well as a percentage of any sublicense royalties related to the licensed products.

We may terminate the license agreement at any time upon 90 days' prior written notice to UM. Either party may terminate the license agreement upon written notice for a breach that is not cured within 30 days after receiving written notice of the breach. In addition, UM may terminate the license agreement with respect to certain patent rights immediately upon written notice in the event we contest the validity or enforceability of such patent rights.

Competitive Landscape for our Business

- Camelina Oilseed and Alternative Cover Crops
- PHA Biomaterials
- Omega-3 Oil
- Trait Licensing: Agricultural Industry Landscape

Camelina Oilseed and Alternative Cover Crops*:* Camelina, because it is not currently a major food crop, has been of recent interest in North America for large-scale production of feedstock oil for biofuels, both renewable diesel and sustainable aviation fuel. We believe that there is a growing interest among oilseed crushers and energy companies in sourcing non-food, low CI feedstock oil for supplying the biofuel market. Camelina is attractive, not only as a spring rotation crop, but also as a winter cover crop, enabling a second oil harvest annually for each acre planted. The general interest in cover crops has been steadily increasing over the last several years. The companies focusing on Camelina include Sustainable Oils, S&W Seed, and Smart Earth. There have also been recent investments in oilseed cover crop alternatives to Camelina including the development of carinata by NuSeed and the efforts by CoverCress Inc. over the last several years to develop pennycress as a cover crop for the mid-west corn and soybean belt.

PHA Bioplastics: Third party PHA producers are pursuing fermentation-based production systems to produce PHA bioplastics for the biodegradables market. These producers include Cheil Jedang, or CJ, of South Korea (which acquired the fermentation and polymer processing technology from Yield10 in 2016 when we were still named Metabolix Inc.), Kaneka of Japan, and Danimer Scientific. Danimer has a bioplastics compounding business that produces PHAs from fermentation of seed oils and has developed revenuegenerating relationships with a number of brand owners and consumer products companies. There are also a number of smaller pre-commercial PHA bioplastic companies, all of which, to our knowledge, are based on fermentation platforms in North America and in China. Although these companies use genetically engineered microbes and feedstocks from GMO crops for their fermentation processes, some brand owners may prefer to accept the higher cost structure for the fermentation-derived PHA bioplastic as compared to PHA Camelina because they are not made from a GMO crop.

Omega-3 Oil: The growing demand for alternative sustainable sources of fish oil for human nutrition, pharmaceutical, and aquafeed applications has made this an attractive area for investment by several companies. Alternative sources include microbial fermentation processes commercialized by Veramaris (the joint venture between Evonic and DSM, with a production facility in Blair, Nebraska) and by Archer Daniels Midland Co. (with a production facility in Clinton, Iowa). On the crop-based production side, two different genetically engineered varieties of the oilseed canola have been developed and approved by USDA-APHIS to address this growing demand. BASF Plant Sciences has developed a canola variety that produces low amounts of the omega-3 fatty acid EPA and the Australian company Nuseed has developed a canola variety that produces the omega-3 fatty acid DHA in the oil. BASF currently has patents on genes for the production of omega-3 oils in canola dating back to applications made on or before 2005. NuSeed exclusively licensed patents on the production of omega-3 oils in canola from Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO). We believe the Rothamsted technology which enables production of omega-3 EPA, DHA+EPA oil has higher potential as a drop-in replacement for fish oil in aquafeed.

Trait Licensing: Agricultural Industry Landscape: Following advances in biotechnology in the 1970s through the early 1990s, the first GM crops were commercially introduced in the U.S. in the mid-1990s. Today, the U.S. leads the world in the adoption of GM crops in terms of crop value and acreage planted. GM crops (also referred to as GMO or Agbiotech) have had both supporters and detractors over the years. Consumer sentiment about the safety of GM crops have limited the introduction and adoption of GM crops in Europe. However, recent studies by the National Academy of Science continue to support the 20-year history of safe use of GM crops.

The International Service for the Acquisition of Agri-Biotech Applications (ISAAA), an industry research group, reported that 470 million acres worldwide were planted with GM crops during 2019, the most recent year for which data is available. The planting of GM crops is centered in the Americas with North America and South America each representing approximately 44 percent of the total worldwide acres. China and India follow with approximately 8 percent and the balance of the total worldwide GM crop acreage during 2019. The remaining GM acreage was planted in the EU and the rest of world. The primary GM crops in the U.S. are corn, soybean, cotton and sugar beet. In Canada, the oilseed crop canola is the primary GM crop. Cotton is the primary GM crop grown in India and China.

In contrast to the Americas, the EU has been resistant to the adoption of GM crops and has relied heavily on plant breeding programs for capturing crop yield improvements over the last 20 years. In 2019, Spain was the largest producer of GM crops in Europe, based on cultivation of GM corn representing approximately 20 percent of the country's crop that year. Certain GM crops have been approved for cultivation in some European countries, while other countries have imposed outright bans on cultivation of GM crops.

According to the market sector research and analytics firm, Markets and Markets, the total global seed market was estimated at $63 billion in 2021 and is projected to grow to more than $86 billion by 2026. According to the ISAAA, in 2019 the global adoption of biotech crops was recorded for 72 countries with 29 planting and an additional 43 importing for food, feed, and processing. That year, a total of 190.4 million hectares of biotech crops were grown in 29 countries. The top five biotech crop growing countries worldwide are the United States, Brazil, Argentina, Canada, and India. The traits being commercialized today by the agricultural industry mainly address crop protection, which involves preventing crop damage by weeds, insects and other pests that lower expected crop yield. As technology has advanced, "trait stacking," or the practice of adding multiple traits to an elite plant line, has become commonplace as a strategy to protect yield. As the industry has developed, the practice of inter-licensing traits between research and development driven seed companies has led to a proliferation of branded seed products on the market today.

The GM seed business in North America is dominated by large multinational companies and their subsidiaries including BASF Corporation, Bayer Crop Science, Corteva Agriscience, Syngenta, and AgReliant Genetics, LLC. These companies have significant resources, extensive experience and track records of successfully developing, testing and commercializing high performing seed lines as well as new traits for GM crops. They offer farmers conventional and biotechnology seeds as well as crop protection chemicals, biologicals, fertilizers and other products and technologies aimed at supporting the on-farm efficiency of managing crops in the field as well as managing the overall cost of crop production through to successful harvest.

Privately owned, U.S. retail seed companies play a key role in the industry by developing, marketing and selling high performing seed to U.S. farmers. These companies include Beck's Hybrids and Stine Seed, which have capabilities in both biotechnology and plant breeding. They source traits from the multinational companies and input these traits into elite plant germplasm to produce seeds optimized for a variety of soil, climate and field conditions. Both companies offer a broad arrange of GM corn and soybean products to their customers.

Recent advances in biotechnology, including gene editing, have led to the formation of companies focusing on yield trait discovery, biologicals for pest control, agbiome strategies and precision agriculture. There are startups, privately held and publicly traded companies involved in this space. Such companies include AgBiome LLC, Arcadia Biosciences, Inc., Benson Hill Biosystems, Inc., BioCeres S.A., Calyxt, Inc., Cibus Ltd., Evogene Ltd., Inari Agriculture, Inc., Indigo Agriculture, Inc., Kaiima Bio-Agritech Ltd., and Pairwise Plants LLC, many of which have greater resources and experience than we have.

Intellectual Property

Our continued success depends in large part on our proprietary technology. As of December 31, 2022, we owned or held exclusive rights to 19 patent families, including 15 issued patents and 41 pending patent applications, related to advanced technologies for increasing yield in crops, in the United States and throughout the world. As part of our agreement with Rothamsted, we have an exclusive option to license two patent families, RR213 and RR305, including six issued patents and four pending applications, including both the original patent filing for the production of EPA, DHA+EPA oil in Camelina and for an improvement patent filed after the agreement was signed. Our portfolio of patent applications includes plant science technologies we have in-licensed globally and exclusively from the University of Massachusetts related to the yield trait gene C3003 and other advanced technologies based on advanced metabolic engineering methods to improve carbon capture and selectively control carbon partitioning in plants. Our portfolio of patent applications also includes advanced technologies for oilseed crops that we in-licensed globally and exclusively from the University of Missouri in 2018 and 2019 related to the yield trait genes C3007, C3010 and C3012.

We continue to seek, develop and evaluate new technologies and related intellectual property that might enhance our business strategy, industry position or deployment options.

Human Capital Resources

As of December 31, 2022, we had 30 full-time employees. Of those employees, 24 were in research and development. Among our staff, 15 hold Ph.D.'s and 11 hold masters' or bachelors' degrees in their respective disciplines. Our technical staff has expertise in the following areas: plant genetics, plant biology, microbial genetics, bioinformatics, metabolic engineering and systems biology. Our headquarters is located in Massachusetts, and our wholly-owned subsidiary, Yield10 Oilseeds Inc. ("YOI"), maintains a research and development facility, including greenhouse facilities, in Saskatoon, Canada. None of our employees are subject to a collective bargaining agreement and we consider our relationship with our employees to be good.

Talent Acquisition and Retention

We recognize that our employees largely contribute to our success. To this end, we support business growth by seeking to attract and retain best-in-class talent. We use internal and external resources to recruit highly skilled candidates for open positions. We believe that we are able to attract and retain superior talent as measured by our minimal turnover rate and high employee service tenure.

Total Rewards

Our total rewards philosophy has been to create investment in our workforce by offering a competitive compensation and benefits package for the two geographies in which we have offices. We provide employees with compensation packages that include base salary, annual incentive bonuses, and long-term equity incentive awards. We also offer comprehensive employee benefits, such as life, disability, and health insurance as well as flexible spending accounts, paid time off, and a 401(k) plan. It is our expressed intent to be an employer of choice in our industry by providing a market-competitive compensation and benefits package.

Health, Safety, and Wellness

The health, safety, and wellness of our employees is a priority in which we have always invested and will continue to do so. We provide our employees with access to a variety of innovative, flexible, and convenient health and wellness programs. Program benefits are intended to provide protection and security, so employees can have peace of mind concerning events that may require time away from work or that may impact their financial well-being.

These investments and the prioritization of employee health, safety, and wellness took on particular significance in 2020 through 2022 in light of COVID-19. To protect and support our team members, we implemented health and safety measures that included maximizing personal workspaces, altering work schedules, and providing personal protective equipment. To aid in containing the spread of COVID-19, we also implemented remote-work options and limited employee travel. We continue to monitor this rapidly evolving situation and will continue to seek programs to educate and assist employees whenever possible.

Diversity, Equity, and Inclusion

We believe a diverse workforce is critical to our success. Our mission is to value differences in races, ethnicities, religions, nationalities, genders, ages, and sexual orientations, as well as education, skill sets and experience. We are focused on inclusive hiring practices, fair and equitable treatment, organizational flexibility, and training and resources.

Corporate History and Investor Information

In 1992, our Company was incorporated in Massachusetts under the name Metabolix, Inc. In September 1998, we reincorporated in Delaware and in January 2017, we changed our name to Yield10 Bioscience, Inc. to reflect our change in mission around innovations in agricultural biotechnology focused on developing disruptive technologies for step-change improvements in crop yield. Financial and other information about our Company is available on our website at www.yield10bio.com.

We make available on our website, free of charge, copies of our Annual Report on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K, and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act as soon as reasonably practicable after filing such material electronically or otherwise furnishing it to the Securities and Exchange Commission (the "SEC"). In addition, the SEC maintains an internet site that contains reports, proxy and information statements, and other information regarding issuers that file electronically with the SEC. Our filings with the SEC may be accessed through the SEC's website at http://www.sec.gov.

ITEM 1A. RISK FACTORS

Risk Factor Summary

Our business is subject to numerous risks. We encourage you to carefully review the full risk factors contained in this Annual Report on Form 10-K. Some of the principal risk factors are summarized below:

- We have a history of net losses and our future profitability is uncertain.
- We will need to secure additional funding to finance our operations and may not be able to do so when necessary, and/or the terms of any financings may not be advantageous to us.
- Our seed products and crop science technologies are at an early stage of development. We may never commercialize a technology or product that will generate meaningful, or any, revenues.
- There can be no assurance that we will be able to comply with the continued listing standards of The Nasdaq Capital Market.
- Currently, our primary source of our revenue is government grants; continued availability of grant funding is uncertain and contingent on compliance with the requirements of the grant.
- Our financial condition and results of operations could be adversely affected by public health epidemics, including the continued evolution of the coronavirus outbreak.

- Unfavorable global economic conditions could adversely affect our business, financial condition or results of operations.
- Our business operations could be adversely affected by the impact of the war in Ukraine.
- The crop science product development cycle is lengthy and uncertain, and our progress will depend on our ability to attract third-party investment in research under license agreements and on our ability to establish collaborative partnerships to develop and commercialize our innovations.
- Any potential collaborative partnerships that we may enter into in the future may not be successful, which could adversely affect our ability to develop and commercialize our innovations.
- Our crop science program may not be successful in developing commercial products or if our future collaborators are successful in developing commercial products that incorporate our traits, such products may not achieve commercial success.
- Our estimates of market opportunity and forecasts of market growth may prove to be inaccurate, and even if the markets in which we may compete in the future achieve growth, our business could fail to achieve the same growth rates as others in the industry.
- If ongoing or future field trials conducted by us or our future collaborators are unsuccessful, we may be unable to complete the regulatory process for, or commercialize, our products in development on a timely basis.
- Adverse weather conditions, natural disasters, crop disease, pests and other natural conditions can impose significant costs and losses on our business.
- Competition in the market for traits and seeds is intense and requires continuous technological development, and, if we are unable to compete effectively, our financial results will suffer.
- Our business is subject to various government regulations in the United States and Canada; the regulatory requirements for our future products in development are evolving and are subject to change, and if there are adverse changes to the current regulatory framework, our or our future collaborators' ability to market our traits could be delayed, prevented or limited.
- If we or our future collaborators are unable to comply with and timely complete the regulatory process in the United States and Canada for our future products in development, our or our future collaborators' ability to market our traits could be delayed, prevented or limited.
- The regulatory environment for genetically engineered crops in jurisdictions outside the United States and Canada varies greatly, and some jurisdictions have more restrictive regulations that could delay, prevent or limit our or our future collaborators' ability to market our traits.
- Consumer resistance to genetically engineered crops may negatively affect the ability to commercialize future crops containing our traits, as well as our public image, and may reduce any future sales of seeds containing our yield traits.
- Government policies and regulations, particularly those affecting the agricultural sector and related industries, could adversely affect our operations and our ability to generate future revenues and to achieve profitability.
- The products of third parties, or the environment itself, may be negatively affected by the unintended appearance of our trait genes, novel seed compositions and novel seed products.
- Loss of or damage to our elite novel trait events and plant lines would significantly slow our product development efforts.
- Our insurance coverage may be inadequate to cover all the liabilities we may incur.
- We rely on third parties to conduct, monitor, support, and oversee field trials and, in some cases, to maintain regulatory files for those products in development, and any performance issues by third parties, or our inability to engage third parties on acceptable terms, may impact our ability to complete the regulatory process for or commercialize such products.
- If we lose key personnel or are unable to attract and retain necessary talent, we may be unable to develop or commercialize our products under development.

- Our business and operations would suffer in the event of system failures.
- Patent protection for our technologies is both important and uncertain.
- Third parties may claim that we infringe their intellectual property, and we could suffer significant litigation or licensing expense as a result.
- Portions of our crop science technology are owned by or subject to retained rights of third parties.
- We may not be successful in obtaining necessary rights to additional technologies for the development of our products through acquisitions and in-licenses.
- Our license agreements include milestone and royalty payments that we are required to make to third parties.
- The intellectual property landscape around genome editing technology, such as CRISPR, is highly dynamic and uncertain, and any resolution of this uncertainty could have a material adverse effect on our business.
- We rely in part on trade secrets to protect our technology, and our failure to obtain or maintain trade secret protection could harm our business.
- Raising additional funds may cause dilution to our existing stockholders, restrict our operations or require us to relinquish rights to our technologies.
- Trading volume in our stock can fluctuate and an active trading market for our common stock may not be available on a consistent basis to provide stockholders with adequate liquidity. Our stock price may be volatile, and our stockholders could lose a significant part of their investment.
- Provisions in our certificate of incorporation and by-laws and Delaware law might discourage, delay or prevent a change of control of our company or changes in our management and, therefore, depress the trading price of our common stock.
- Concentration of ownership among our officers, directors and principal stockholders may prevent other stockholders from influencing significant corporate decisions and depress our stock price.

We caution you that the following important factors, among others, could cause our actual results to differ materially from those expressed in forward-looking statements made by us or on our behalf in filings with the SEC, press releases, *communications with investors and oral* statements. *Any or all of our forward-looking statements contained in this Annual Report on Form 10-K and in any other public statements we make may* turn *out to be wrong. They can be affected by inaccurate assumptions we might make or by known or unknown risks and uncertainties. Many factors mentioned in the discussion below will be important in determining future results. Consequently, no forward-looking statement can be guaranteed. Actual future results may differ materially from those anticipated in forward-looking statements. We undertake no obligation to update any forward-looking statements, whether as a result of new information, future events or otherwise. You are advised, however, to consult any further disclosure we make in our reports filed with the SEC.*

Risks Relating to our Financial Position

We have a history of net losses and our future profitability is uncertain.

We have recorded losses every year since our inception, with the exception of 2012. As of December 31, 2022, our accumulated deficit was $399,697. Since 1992, we have been engaged primarily in research and development and early-stage commercial activities. Because our crop science technology is at an early stage of development, we cannot be certain that our business will generate sufficient revenue to become profitable. We expect to continue to have significant losses and negative cash flow for at least the next several years, as we incur additional costs and expenses for the continued development of our technology, including the ongoing expenses of research, development, commercialization and administration. The amount of money we spend will impact our need for capital resources as well as our ability to become profitable and this will depend, in part, on the number of new technologies that we attempt to develop. We may not achieve any or all of these goals and, thus, we cannot provide assurances that we will ever be profitable or achieve significant, or any, product revenues.

We will need to secure additional funding to finance our operations and may not be able to do so when necessary, and/or the terms of any financings may not be advantageous to us.

As of December 31, 2022, we had unrestricted cash, cash equivalents and short-term investments of $4,347. We estimate that our cash resources will be sufficient to fund operations and meet our obligations into the second quarter of 2023. We follow the guidance of ASC Topic 205-40, *Presentation of Financial Statements-Going Concern*, in order to determine whether there is substantial doubt about our ability to continue as a going concern for one year after the date our financial statements are issued. Based on our current cash forecast, we expect that our present capital resources will not be sufficient to fund our planned operations for that period of time, which raises substantial doubt as to the Company's ability to continue as a going concern. This forecast of cash resources is forward-looking information that involves risks and uncertainties, and the actual amount of expenses could vary materially and adversely as a result of a number of factors. Our ability to continue operations after our current cash resources are exhausted will depend upon our ability to obtain additional financing through, among other sources, public or private equity financing, secured or unsecured debt financing, equity or debt bridge financing, warrant holders' ability and willingness to exercise the Company's outstanding warrants, additional research grants or collaborative arrangements with third parties, as to which no assurances can be given. We do not know whether additional financing will be available on terms favorable or acceptable to us when needed, if at all. If additional funds are not available when required, we will be forced to curtail our research efforts, explore strategic alternatives and/or wind down our operations and pursue options for liquidating our remaining assets, including intellectual property and equipment.

We continue to face significant challenges and uncertainties and, as a result, our available capital resources may be consumed more rapidly than currently expected due to any or all of the following:

- lower than expected revenues from grants and licenses related to our technologies;
- changes we may make to the business that affect ongoing operating expenses;
- further changes we may make to our business strategy;
- changes in our research and development spending plans; and
- other items affecting our forecasted level of expenditures and use of cash resources.

We will require additional capital resources to support the implementation of our business strategy. There can be no assurance that our financing efforts will be successful.

If we issue equity or debt securities to raise additional funds in the future, we may incur fees associated with such issuances, our existing stockholders may experience dilution from the issuance of new equity securities, we may incur ongoing interest expense and be required to grant a security interest in our assets in connection with any debt issuance, and the new equity or debt securities may have rights, preferences and privileges senior to those of our existing stockholders. In addition, utilization of our net operating loss and research and development credit carryforwards may be subject to significant annual limitations under Section 382 of the Internal Revenue Code of 1986, as amended, due to ownership changes resulting from equity financing transactions. If we raise additional funds through collaboration, licensing or other similar arrangements, it may be necessary to relinquish valuable rights to our potential products or proprietary technologies or grant licenses on terms that are not favorable to us.

Our seed products and crop science technologies are at an early stage of development. We may never commercialize a technology or product that will generate meaningful, or any, revenues.

The crop science products and technologies we are currently developing are at an early stage of development, and the process of developing them is lengthy and uncertain. If we fail to introduce and commercialize a seed product that meets customers’ expectations, our growth prospects may be materially and adversely affected. In addition, our current management has limited experience in developing technologies for the crop science industry and has never commercialized a product or technology in this industry. We may never reach a point at which our efforts result in products that allow us to achieve revenue from their license or sale.

There can be no assurance that we will be able to comply with the continued listing standards of The Nasdaq Capital Market.

We cannot assure you that we will be able to comply with the standards that we are required to meet in order to maintain a listing of our common stock on The Nasdaq Capital Market ("Nasdaq"). Nasdaq listing rules require us to maintain certain closing bid price, stockholders' equity and other financial metric criteria in order for our common stock to continue trading on Nasdaq. For example, Nasdaq Listing Rule 5550(a)(4) requires companies to maintain a minimum of 500,000 publicly held shares. Nasdaq Listing Rule 5550(a)(2) requires listed securities to maintain a minimum bid price of $1.00 per share, and Listing Rule 5810(c)(3)(A) provides that a failure to meet the minimum bid price requirement exists if the deficiency continues for a period of 30 consecutive business days. To meet the criteria for continued listing under the equity standard, Nasdaq Listing Rule 5550(b)(1) requires companies to demonstrate stockholders' equity of at least $2.5 million.

Currently, our primary source of our revenue is government research grants; continued availability of grant funding is uncertain and contingent on our compliance with the requirements of the grant.

Historically, a portion of our revenue has been generated from payments to us from government entities in the form of government grants, whereby we are reimbursed for certain expenses incurred in connection with our research and development activities, subject to our compliance with the specific requirements of the applicable grant, including rigorous documentation requirements. To the extent that we do not comply with these requirements, the expenses that we incur may not be reimbursed. Our existing grant or new grants that we may obtain in the future may be terminated or modified. We are a participant in a grant from the Department of Energy with Michigan State University, as amended, which has been our primary source of grant revenue over the past five years. The final year of the grant ends on September 14, 2023, and we may be unable to obtain a new grant to replace the loss of this source of grant revenue.

Our ability to obtain grants or incentives from government entities in the future is subject to the availability of funds under applicable government programs and approval of our applications to participate in such programs. The application process for these grants and other incentives is highly competitive. We may not be successful in obtaining any additional grants, loans or other incentives. Recent political focus on reducing spending at the U.S. federal and state levels may continue to reduce the scope and amount of funds dedicated to crop science products, if such funds will continue to be available at all. To the extent that we are unsuccessful in being awarded any additional government grants in the future, we would lose a potential source of revenue.

Our government grants may subject us to government audits, which could expose us to penalties if we have failed to comply with the terms of the grants.

We may be subject to audits by government agencies as part of routine audits of our activities funded by our government grants. As part of an audit, these agencies may review our performance, cost structures and compliance with applicable laws, regulations and standards and the terms and conditions of the grant. If any of our costs are found to be allocated improperly, the costs may not be reimbursed, and any costs already reimbursed for such contract may have to be refunded. Accordingly, an audit could result in a material adjustment to our results of operations and financial condition. Moreover, if an audit uncovers improper or illegal activities, we may be subject to civil and criminal penalties and administrative sanctions.

Our financial condition, research and development efforts, and results of operations could be further adversely affected by the continued evolution of the coronavirus outbreak.

Any outbreak of contagious diseases, such as COVID-19, or other adverse public health developments, could have a material and adverse effect on our business operations. The continued evolution of COVID-19 and its variants, as well as periodic spikes in infection rates and local outbreaks, in spite of safety measures or vaccinations, could cause disruptions to our operations or those of third parties with whom we engage. The COVID-19 pandemic has led to global supply chain challenges, which could adversely impact our ability to conduct business in the manner and timelines presently planned. As new variants of the virus appear, especially variants that are more easily spread, cause more serious outcomes, or are resistant to existing vaccines, new health orders and safety protocols could further impact our operations. We will continue to monitor developments of the pandemic and continuously assess its potential further impact on our operations to prevent any

disruptions to the conduct of our business. In the event of a prolonged continuation of the pandemic, it is not clear what the potential impact may be on our business, financial position and financial performance.

Unfavorable global economic conditions could adversely affect our business, financial condition or results of operations.

Our results of operations could be adversely affected by general conditions in the global economy and in the global financial markets, including changes in inflation, interest rates and overall economic conditions and uncertainties. For instance, for the twelve months ended December 31 2022, the U.S. Bureau of Labor Statistics reported that the Consumer Price Index for All Urban Consumers increased 6.5 percent. The existence of inflation in the economy has resulted in, and may continue to result in, higher interest rates and capital costs, supply shortages, increased cost of labor, weakening exchange rates and other similar effects. Recently inflation has increased throughout the U.S. economy. Inflation can adversely affect us by increasing the costs of our research and developments, administration and other costs of doing business. Inflation could also adversely affect the ability of growers to enter into and fulfill their obligations under Camelina grain production agreements with the Company. An economic downturn, including as a result of COVID-19, could result in a variety of risks to our business, including weakened demand for our products and our inability to raise additional capital when needed on acceptable terms, if at all. A weak or declining economy could also strain our manufacturers and suppliers, possibly resulting in supply disruption. Any of the foregoing could harm our business and we cannot anticipate all of the ways in which the current economic climate and financial market conditions could adversely impact our business.

The ongoing war between Russia and Ukraine may adversely affect our business, financial condition or results of operations.

The short and long-term implications of the ongoing war between Russia and Ukraine are difficult to predict at this time. To date, we have not experienced any material interruptions in our infrastructure, supplies, technology systems, or networks needed to support our operations. However, Ukraine, and the Black Sea region in general, are a major exporter of wheat and corn to the world, and the disruption of supply could cause volatility in prices and margins of these commodities and related products. Ukraine is also the largest supplier of sun seed and sun oil in the world, which cannot be completely replaced from other geographic regions. The conflict in Ukraine has created disruptions in global supply chains and is expected to create dislocations of key agricultural commodities. While Yield10 has no direct business operations or assets within either Ukraine or Russia, the Company's plans and operating results could be adversely affected by a number of factors, including the crop growing decisions made by farmers in the U.S., Canada, and South America as a consequence of supply shortages and rising commodity prices. These rising prices may negatively impact our ability to contract suitable acreage for future crop trials or could delay our plans to commercialize Yield10's first Camelina plant varieties.

The risk of cybersecurity incidents has increased in connection with the ongoing war. For example, the war has been accompanied by cyberattacks against the Ukrainian government and other countries in the region. The proliferation of malware from the war into systems unrelated to the war, or cyberattacks against U.S. companies in retaliation for U.S. sanctions against Russia or U.S. support of Ukraine, could also adversely affect our operations. In accordance with industry standards, we insure ourselves against many types of risks, including cybersecurity risks. While this insurance may mitigate certain of the risks associated with the ongoing Ukraine-Russia war, our level of insurance may not cover all losses we could incur. The potential effects of these conditions could have a material adverse effect on our business, results of operations and financial condition.

We will continue to monitor this fluid situation and develop contingencies as necessary to address any disruptions to our business operations as they develop.

Risks Relating to our Yield10 Bioscience Crop Science Program

The crop science product development cycle is lengthy and uncertain, and our progress will depend significantly on our ability to attract third-party investment in research under license agreements and on our ability to establish collaborative partnerships to develop and commercialize our innovations.

The technology and processes used in our crop science program and the application of our technology to develop Camelina as a platform crop for large scale production of low-carbon sustainable seed products to address applications in petroleum replacement, food and nutrition markets, are at an early stage of development. Research and development in the

seed, agricultural biotechnology, and larger agriculture industries is expensive and prolonged and entails considerable uncertainty. Completion of development work with respect to our products will require a significant investment of both time and money, if it can be completed at all. We expect that collaborations with established agricultural industry companies may be required to successfully develop and commercialize our innovations. We may not be successful in establishing or maintaining suitable additional relationships with established agricultural industry companies for research licenses in the future, and there can be no assurance that any such relationships will result in future collaboration agreements to develop and commercialize our innovations, with terms that are satisfactory to us or at all. In addition, industry collaborators have significant resources and development capabilities and may develop products and technologies that compete with or negatively impact the development and commercialization of our technologies.

Any potential collaborative partnerships that we may enter into in the future may not be successful, which could adversely affect our ability to develop and commercialize our innovations.

We expect that collaborations with established agricultural industry companies may be required for us to successfully develop and commercialize our innovations. The agriculture industry is highly concentrated and dominated by a small number of large companies, which could impact efforts to form the collaborations that we will need in order to complete the development of our products. To the extent that we pursue such arrangements, we will face significant competition in seeking appropriate partners. Moreover, such arrangements are complex and time-consuming to negotiate, document, implement and maintain. We may not be successful in establishing or implementing such arrangements. The terms of any partnerships, joint ventures or other collaborative arrangements that we may establish may not be favorable to us.

The success of any future collaborative partnerships is uncertain and will depend heavily on the efforts and activities of our potential partners. Such arrangements are subject to numerous risks, including the risks that:

- our partners may have significant discretion in determining the efforts and resources that they will apply to the arrangement;
- our partners may not pursue the development and commercialization of our product candidates based on trial results, changes in their strategic focus, competing priorities, availability of funding, or other external factors;
- our partners may delay or abandon field trials, fail to conduct field trials that produce sufficient conclusory data, provide insufficient funding for field trials, or repeat or conduct new field trials;
- partners who have marketing, manufacturing and distribution rights with respect to a product may not commit sufficient resources to, or otherwise may not perform satisfactorily in carrying out, these activities;
- to the extent that such arrangements provide for exclusive rights, we may be precluded from collaborating with others;
- our partners may not properly maintain or defend our intellectual property rights, or may use our intellectual property or proprietary information in a way that gives rise to actual or threatened litigation that could jeopardize or invalidate our intellectual property or proprietary information or expose us to potential liability;
- disputes may arise between us and a partner that causes the delay or termination of the research, development or commercialization of our current or future products, or that results in costly litigation or arbitration that diverts management attention and resources;
- such arrangements may be terminated, and, if terminated, may result in a need for additional capital for our independent pursuit of matters previously covered by such arrangement;
- our partners may own or co-own intellectual property that results from our arrangement; and
- a partner’s sales and marketing activities or other operations may not be in compliance with applicable laws resulting in civil or criminal proceedings.

Our crop science program may not be successful in developing commercial products.

We and our potential future collaborators may spend many years and dedicate significant financial and other resources developing traits or other seed products that will never be commercialized. Seeds containing the traits that we develop may never become commercialized for any of the following reasons:

- our traits may not be successfully validated in the target crops;
- our traits may not achieve our targeted yield improvements;
- we may not be able to secure sufficient funding to progress our traits through development and commercial validation;
- our traits may not have the desired effects sought by future collaborators for the relevant crops;
- development and validation of traits, particularly during field trials, may be adversely affected by environmental or other circumstances beyond our control;
- we or our future collaborators may be unable to obtain the requisite regulatory approvals for the seeds containing our traits, to the extent regulatory approvals are required;
- competitors may launch competing or more effective seed traits or seeds;
- a market may not exist for seeds containing our traits or such seeds may not be commercially successful;
- future collaborators may be unable to fully develop and commercialize products containing our seed traits or may decide, for whatever reason, not to commercialize such products;
- we may be unable to patent our traits in the necessary jurisdictions; and
- our efforts to develop niche crop products based on our Camelina platform, including specialty oils and PHB biomaterials, are in the early stages and may not be successful.

If any of these things were to occur, it could have a material adverse effect on our business and our results of operations. Research and development in the crop science industry is expensive and prolonged and entails considerable uncertainty. Because of the stringent product performance and safety criteria applied in development of crop science products, products currently under development may not survive the development process or may ultimately not receive requisite regulatory approvals that may be needed to market such products. Even when such approvals are obtained, there can be no assurance that a new product will be commercially successful. In addition, research undertaken by competitors may lead to the launch of competing or improved products, which may affect sales of any products that we are able to develop.

Even if we or our future collaborators are successful in developing commercial products that incorporate our traits, such products may not achieve commercial success.

Our strategy depends upon our or our future collaborators' ability to incorporate our traits into a wide range of crops in significant markets and geographies. Even if we or our future collaborators are able to develop commercial products that incorporate our traits, any such products may not achieve commercial success for one or more of the following reasons, among others:

- products may fail to be effective in particular crops, geographies, or circumstances, limiting their commercialization potential;
- our competitors, or competitors of our collaborators, may launch competing or more effective traits or products;
- significant fluctuations in market prices for agricultural inputs and crops could have an adverse effect on the value of our traits;

- farmers are generally cautious in their adoption of new products and technologies, with conservative initial purchases and proof of product required prior to widespread deployment, and accordingly, it may take several growing seasons for farmers to adopt our or our collaborators' products on a large scale;
- we may not be able to produce high-quality seeds in sufficient amounts to meet demand; and
- we may not be able to secure the financial or other resources needed to achieve commercial success.

Our financial condition and results of operations could be materially and adversely affected if any of the above were to occur.

Our estimates of market opportunity and forecasts of market growth may prove to be inaccurate, and even if the markets in which we may compete in the future achieve growth, our business could fail to achieve the same growth rates as others in the industry.

Market opportunity estimates and market growth forecasts are subject to significant uncertainty and are based on assumptions and estimates that may not prove to be accurate. Our estimates and forecasts relating to the size and expected growth of the global seed industry and the biotechnology seeds market, and the market size for any products that we may develop in our Camelina products business, such as PHA biomaterials, and the estimated ranges of incremental value increase that a novel, newly developed crop trait may produce, may prove to be inaccurate. Even if the markets in which we may compete in the future achieve these opportunity estimates and market growth forecasts, our business could fail to grow at similar rates, if at all.

If ongoing or future field trials conducted by us or our future collaborators are unsuccessful, we may be unable to complete the regulatory process for, or commercialize, our products in development on a timely basis.

The successful completion of multi-year, multi-site field trials is critical to the success of product development and marketing efforts for products containing our traits. If our ongoing or future field trials, or those of our future collaborators, are unsuccessful or produce inconsistent results or unanticipated adverse effects on crops, or if we or our collaborators are unable to collect reliable data, regulatory review of products in development containing our traits could be delayed or commercialization of products in development containing our traits may not be possible. In addition, more than one growing season may be required to collect sufficient data to develop or market a product containing our traits, and it may be necessary to collect data from different geographies to prove performance for customer adoption. Even in cases where field trials are successful, we cannot be certain that additional field trials conducted on a greater number of acres, or in different crops or geographies, will be successful. Generally, we or our research licensees conduct these field trials, or we pay third parties, such as farmers, consultants, contractors, and universities, to conduct field trials on our behalf. Poor trial execution or data collection, failure to follow required agronomic practices, regulatory requirements, or mishandling of products in development by our collaborators or these third parties could impair the success of these field trials.

Adverse weather conditions, natural disasters, crop disease, pests and other natural conditions can impose significant costs and losses on our business.

Many factors that may adversely affect the success of our field trials, seed inventory and seed production are beyond our control, including weather and climatic variations, such as drought or floods, severe heat or frost, hail, tornadoes and hurricanes, uncommon or unanticipated pests and diseases, or acts of protest or vandalism. For example, if there were a prolonged or permanent disruption to the electricity, climate control, or water supply operating systems in our greenhouses or laboratories, the crops in which we or our collaborators are testing our traits and the samples we or our collaborators store in freezers, both of which are essential to our research and development activities including field tests, could be severely damaged or destroyed, adversely affecting these activities and thereby our business and results of operations. Unfavorable weather conditions including drought or excessive rain, or fluctuations in temperature, which we have experienced from time to time in our field trials, can also reduce both acreages planted and incidence, or timing of, certain crop diseases or pest infestations, each of which may halt or delay our field trials. Any field test failure we may experience may not be covered by insurance and, therefore, could result in increased cost for the field trials and development of our traits, which may negatively impact our business, results of operations, and ability to secure financing. Such factors outside of our control can create substantial volatility relating to our business and results of operations.

In addition, seed crops are vulnerable to crop disease and to pests, which may vary in severity and effect, depending on the stage of production at the time of infection or infestation, the type of treatment applied and climatic conditions. Unfavorable growing conditions can reduce both crop size and quality and may reduce our available inventory.

Competition in the market for traits and seeds is intense and requires continuous technological development, and, if we are unable to compete effectively, our financial results will suffer.

We face significant competition in the markets in which we operate. The markets for traits and agricultural biotechnology products are intensely competitive and rapidly changing. In most segments of the seed and agricultural biotechnology market, the number of products available to consumers is steadily increasing as new products are introduced. At the same time, the expiration of patents covering existing products reduce the barriers to entry for competitors. We may be unable to compete successfully against our current and future competitors, which may result in price reductions, reduced margins and the inability to achieve market acceptance for any products that we or our future collaborators commercialize containing our traits. In addition, most of our competitors have substantially greater financial, marketing, sales, distribution, research and development, and technical resources than we have, and some of our potential future collaborators have more experience in research and development, regulatory matters, manufacturing, and marketing. We anticipate increased competition in the future as new companies enter the market and new technologies become available. Our technologies may be rendered obsolete or uneconomical by technological advances or entirely different approaches developed by one or more of our competitors, which will prevent or limit our ability to generate revenues from the commercialization of our traits being developed.

Our business is subject to various government regulations in the United States and Canada, the regulatory requirements for our future products in development are evolving and are subject to change, and if there are adverse changes to the current regulatory framework, our or our future collaborators' ability to market our traits could be delayed, prevented or limited.

In the United States and Canada, where our seed traits and biotechnology-derived plant lines are developed and field tested, changes in regulatory requirements applicable to our seed traits or future products in development containing our traits could result in a substantial increase in the time and costs associated with developing and commercializing future products containing our traits, and could materially affect our ability to meet our desired development timelines or to develop and commercialize a future product containing our traits at all.

In the United States, our seed traits and any future products that are successfully developed containing our seed traits are or will be subject to USDA and FDA regulatory requirements. The USDA and FDA requirements will vary depending on the particular seed trait and the intended use of any product that will be commercialized. Our business strategy is focused on crop yield traits and we have no current plans for the development of pesticide or herbicide traits, which would be subject to regulation by the EPA.

Within USDA, the APHIS is responsible for protecting agricultural plants under the Plant Protection Act. USDA-APHIS regulates organisms and products that are known or are suspected to be plant pests or to pose a plant pest risk, including those that have been altered or produced through various genetic engineering techniques. The USDA-APHIS has proposed regulations that could impact our business. For example, in recent years, we and others have submitted various petitions to USDA-APHIS to determine whether particular biotechnology-derived plants developed through the use of different genome editing techniques may be considered to be not regulated under the framework administered by the agency.

The USDA also announced in March 2018 that it would not require an assessment on products that used modern forms of mutagenesis if it was clear these outcomes could occur in nature. The USDA stated at that time that it did not "have any plans to regulate plants that could otherwise have been developed through traditional breeding techniques as long as they are developed without the use of a plant pest as the donor or vector and they are not themselves plant pests." This USDA policy statement applies to genetic deletions of any size, which would include genome editing through CRISPR-Cas9 and other emerging technologies, although it remains to be seen how this policy announcement will be implemented by USDA-APHIS and what practical effect that may have on seed trait developers like us and our competitors.

There can be no guarantee that the USDA-APHIS governing regulations and policies will not change again in the future. We cannot predict whether advocacy groups will challenge existing regulations and USDA determinations, whether

the USDA will alter its interpretations of existing regulations, modify existing regulations or promulgate new regulations, or whether additional laws will come into effect. If these or other developments resulted in adverse changes to the current regulatory framework, our seed traits or future products in development containing our traits could be subjected to more burdensome regulatory standards, thereby substantially increasing the time and costs associated with developing and commercializing any future products. Moreover, we cannot assure you that USDA-APHIS will analyze any of our future yield traits or products in development containing our traits in a manner consistent with its analysis of our genome edited yield traits to date. Complying with the USDA's plant pest regulations for traits that are classified as "regulated articles," including the permitting requirements for field testing and environmental release, is a costly, time-consuming process and could substantially delay or prevent the commercialization of any future products containing traits that we expected to be deemed non-regulated by USDA-APHIS under 7 CFR part 340.

In addition to USDA-APHIS regulation of plant breeding and planting, a biotechnology-derived plant also will be regulated by the FDA if it is intended to be used as human food or animal feed. The FDA regulates the safety of food for humans and animals, and foods derived from novel plant varieties must meet the same food safety requirements as foods derived from traditionally bred plants (also called conventional foods). Since 1992, the FDA has had in place a voluntary consultation process for developers of bioengineered food ("Biotechnology Consultations").

We have not participated in any Biotechnology Consultations or engaged in any informal discussions with the FDA about our novel yield traits, whether those traits have been developed using genome editing or traditional genome modification using the insertion of recombinant DNA. Any delay in the regulatory consultation process, or a determination by the FDA that future product candidates containing our traits raise different safety issues than the relevant conventional crop and therefore must be approved by the agency as a new food additive through an intensive premarket safety review process, could increase the costs associated with or delay or prevent the commercialization of the future product candidate. Such delays may lead to reduced acceptance by farmers, food manufacturers or the public and an increase in competitor products that may directly compete with ours. Further, if the FDA enacts new regulations or policies with respect to genome edited plants in particular, such policies could result in additional compliance costs or delay or prevent the commercialization of any potential commercial products containing our seed traits, which could adversely affect our ability to generate revenues and to achieve profitability.

In Canada, genetically engineered crops and the food products into which they are incorporated are regulated by multiple government agencies under a federal framework for the regulation of biotechnology products that is similar to the U.S. system. Any commercialization of our yield crops in Canada is expected to be done by a third-party collaborator or other partner and complying with Health Canada's pre-market notification requirement and safety assessment for novel foods would be the obligation of that third-party collaborator.

Complying with the Canadian regulations is a costly, time-consuming process and could substantially delay or prevent the commercialization of our products. In addition, we cannot assure that CFIA and Health Canada regulations or the agencies' implementation of those regulations will not change, or that the legislative framework in Canada for biotechnology-derived crops, whether for genome edited plants or plants modified using the insertion of recombinant DNA, will not be amended or otherwise changed in a manner that could result in additional compliance costs or delay, or prevent the commercialization of any potential commercial products containing our seed traits, which could adversely affect our ability to generate revenues and to achieve profitability.

Failure to comply with applicable regulatory requirements may, among other things, result in fines, suspensions of regulatory approvals, product recalls, product seizures, operating restrictions and criminal prosecution.

If we or our future collaborators are unable to comply with and timely complete the regulatory process in the United States and Canada for our future products in development, our or our future collaborators' ability to market our traits could be delayed, prevented or limited.

We apply for and maintain the regulatory permits in the United States and Canada necessary for our operations, particularly those covering our field trials. We anticipate that we or our future collaborators will apply for and maintain regulatory approvals, if any, necessary for the commercialization of any future products containing our seed traits. Even if we and our collaborators make timely and appropriate applications for regulatory permits for our field trials, government delays in issuing such permits can significantly affect the development timelines for our traits, particularly if the planting period for a crop growing season expires before the necessary permits are obtained.

The regulatory process is expensive and time-consuming, and the time required to complete the process is difficult to predict and depends upon numerous factors, including the substantial discretion of the regulatory authorities. We have not completed all phases of the regulatory process for any of our traits in development. Our traits could require a significantly longer time to complete the regulatory process than expected, or may never gain approval, even if we and our collaborators expend substantial time and resources seeking such approval. The time required for regulatory approval, or any delay or denial of such approval, could negatively impact our ability to generate revenues and to achieve profitability and finance our ongoing operations. In addition, changes in regulatory review policies during the development period of any of our traits, changes in, or the enactment of, additional regulations or statutes, or changes in regulatory review practices for a submitted product application may cause a delay in obtaining approval or result in the rejection of an application for regulatory approval. Regulatory approval, if obtained, may be made subject to limitations on the intended uses for which we or our collaborators may market a future product containing our traits. These limitations could adversely affect our potential revenues.

The regulatory environment for genetically engineered crops in jurisdictions outside the United States and Canada varies greatly, and some jurisdictions have more restrictive regulations that could delay, prevent or limit our or our future collaborators' ability to market our traits.

Other jurisdictions and governmental authorities, including in South America and Asia, are increasingly taking an interest in regulating agricultural products of biotechnology. Regulatory approaches vary by jurisdiction as a result of the existing public health frameworks and phytosanitary laws, as well as other less tangible factors such as cultural and religious norms that may have an impact on individual country risk assessments and decision-making. Each jurisdiction may have its own regulatory framework, which may include restrictions and regulations on planting and growing genetically engineered plants, import of grain and other plant products, and in the consumption and labeling of feed and foods derived from such novel plants, and which may apply to future products containing our traits. We cannot predict future changes in the global regulatory landscape regarding genetically engineered plants or commercial products incorporating such novel plant varieties. The regulatory environment for such plants is greatly uncertain outside of the U.S. and Canada, and some jurisdictions have more restrictive regulations that could delay, prevent or limit our or our future collaborators' ability to market our traits.

For example, regulation of all genetically engineered plants in the European Union ("EU") is far more stringent than in the U.S. and Canada. U.S. and Canadian regulators have determined that genome edited plants pose fewer risks than traditional biotechnology-derived plants subjected to modification through the insertion of recombinant DNA. In contrast, a recent EU legal ruling indicated that the existing EU regulations for genetically engineered plants modified by the insertion of recombinant DNA, which were already more stringent than corresponding U.S. and Canadian regulations, should be strictly applied to genome edited plants as well. As a result, there is a sharp distinction between how EU and U.S. and Canadian regulatory agencies oversee novel seed traits, and in particular those that are generated using the more modern techniques of genome editing.

Although we are not currently targeting EU markets for the development or commercialization of future products containing our traits, emerging oversight regimes for genetically engineered products in other jurisdictions may follow the EU approach and impose similarly strict requirements for the release of such products into the environment and their incorporation into human food or other consumer products. Such jurisdictions may also elect to regulate genetically engineered plants without distinguishing between traditional biotechnology-derived plants modified with recombinant DNA and genome edited plants. There is no guarantee that countries for which we may have or may develop future marketing plans would not take a stricter legal and regulatory approach to controlling genetically engineered plants similar to that of the EU, which could increase regulatory costs and delay, prevent or limit our or our future collaborators' ability to market our traits in such jurisdictions.

Consumer resistance to genetically engineered crops may negatively affect the ability to commercialize future crops containing our traits, as well as our public image, and may reduce any future sales of seeds containing our yield traits.

Food and feed made from genetically engineered seeds and plants are not accepted by some consumers, and in certain countries production of certain genetically engineered crops is effectively prohibited, including throughout the EU, due to concerns over such products' effects on food safety and the environment. Advocacy groups have engaged in publicity campaigns and filed lawsuits in various countries against companies and regulatory authorities, seeking to halt regulatory approval activities or influence public opinion against genetically engineered and/or genome edited products. Actions by

consumer groups and others also may disrupt research and development or production of genetically engineered plants, seeds or food products that incorporate such novel plant varieties. The high public profile of the biotechnology industry in food and feed production, and a lack of consumer acceptance of the types of products to which we have devoted substantial development resources, could have a negative impact on the commercial success of any of products incorporating our traits that may successfully complete the development process, as to which no assurance can be given, and could materially and adversely affect our ability to obtain future collaborations and to finance our crop science program. Further, we could incur substantial liability and/or legal expenses if there are claims that genetically engineered crops damage the environment or contaminate other farm crops. This could distract our management and cause us to spend resources defending against such claims.

Government policies and regulations, particularly those affecting the agricultural sector and related industries, could adversely affect our operations and our ability to generate future revenues and to achieve profitability.

Agricultural production and trade flows are subject to government policies and regulations. Governmental policies and approvals of technologies affecting the agricultural industry, such as taxes, tariffs, duties, subsidies, incentives and import and export restrictions on agricultural commodities and commodity products can influence the planting of certain crops, the location and size of crop production, and the volume and types of imports and exports. Future government policies in the United States, Canada or in other countries could discourage farmers from using any of our products that may successfully complete the development process, as to which no assurance can be given. Similarly, these policies could discourage food processors from purchasing harvested crops containing our traits or could encourage the use of our competitors' products, which would put us at a commercial disadvantage and could negatively impact our ability to generate any revenues and to achieve profitability.

The products of third parties, or the environment itself, may be negatively affected by the unintended appearance of our trait genes, novel seed compositions and novel seed products.

The potential for unintended but unavoidable trace amounts, sometimes called "adventitious presence," of trait genes, novel seed compositions and novel seed products in conventional seed, or in the grain or products produced from conventional or organic crops, could affect acceptance by the general public or by the agricultural industry of these traits. Trace amounts of yield trait genes may unintentionally be found outside our containment area in the products of third parties, which may result in negative publicity and claims of liability brought by such third parties against us. Furthermore, in the event of an unintended dissemination of our genetically engineered materials to the environment, we could be subject to claims by multiple parties, including environmental advocacy groups, as well as governmental actions such as mandated crop destruction, product recalls or additional stewardship practices and environmental cleanup or monitoring. The occurrence of any of these events could have a material adverse effect on our business and results of operations.

Loss of or damage to our elite novel trait events and plant lines would significantly slow our product development efforts.

We have a collection of elite novel trait events and plant lines in which we are developing traits for incorporation into elite germplasm and potential seed products. Our elite novel trait events and plant lines are a key strategic asset since they form the basis for the introgression of our traits into plant breeding programs. If we suffer loss or damage to our elite novel trait events and plant lines, our research and development activities could be negatively impacted.

Our insurance coverage may be inadequate to cover all the liabilities we may incur.

We face the risk of exposure to liability claims if any products that are successfully developed containing our seed traits, as to which no assurance can be given, are defective and if any product that we develop or any product that uses our technologies or incorporates any of our traits causes injury. Although we carry insurance at levels customary for companies in our industry, such coverage may become unavailable or be inadequate to cover all liabilities we may incur. There can be no assurance that we will be able to continue to maintain such insurance, or obtain comparable insurance at a reasonable cost, if at all. If we are unable to obtain sufficient insurance coverage at an acceptable cost or otherwise, or if the amount of any claim against us exceeds the coverage under our policies, we may face significant expenses.

We rely on third parties to conduct, monitor, support, and oversee field trials and, in some cases, to maintain regulatory files for those products in development, and any performance issues by third parties, or our inability to engage third parties on acceptable terms, may impact our ability to complete the regulatory process for or commercialize such products.

We rely on third parties to conduct, monitor, support, and oversee field trials. As a result, we have less control over the timing and cost of these trials than if we conducted these trials with our own personnel. If we are unable to maintain or enter into agreements with these third parties on acceptable terms, or if any such engagement is terminated prematurely, we may be unable to conduct and complete our trials in the manner we anticipate. In addition, there is no guarantee that these third parties will devote adequate time and resources to our studies or perform as required by our contract or in accordance with regulatory requirements, including maintenance of field trial information regarding our products in development. If any of these third parties fail to meet expected deadlines, fail to transfer to us any regulatory information in a timely manner, fail to adhere to protocols, or fail to act in accordance with regulatory requirements or our agreements with them, or if they otherwise perform in a substandard manner or in a way that compromises the quality or accuracy of their activities or the data they obtain, then field trials of our traits in development may be extended or delayed with additional costs incurred, or our data may be rejected by the applicable regulatory agencies. Ultimately, we are responsible for ensuring that each of our field trials is conducted in accordance with the applicable protocol and with legal, regulatory and scientific standards, and our reliance on third parties does not relieve us of our responsibilities. We could be subject to penalties, fines and liabilities if our third-party contractors fail to perform as required.

If our relationship with any of these third parties is terminated, we may be unable to enter into arrangements with alternative parties on commercially reasonable terms, or at all. Switching or adding service providers can involve substantial cost and require extensive management time and focus. Delays may occur, which can materially impact our ability to meet our desired development timelines. If we are required to seek alternative service arrangements, the resulting delays and potential inability to find a suitable replacement could materially and adversely impact our business.

In addition, there has been an increasing trend towards consolidation in the agricultural biotechnology industry. Consolidation among our competitors and third parties upon whom we rely could lead to changes in the competitive landscape, capabilities, and strategic priorities among potential service providers, which could have an adverse effect on our business and operations.

If we lose key personnel or are unable to attract and retain necessary talent, we may be unable to develop or commercialize our products under development.

We are highly dependent on our key technical and scientific personnel, who possess unique knowledge and skills related to our research and technology. If we were to lose the services of these individuals, we may be unable to readily find suitable replacements with comparable knowledge and the experience necessary to advance the research and development of our products. Because of the unique talents and experience of many of our scientific and technical staff, competition for our personnel is intense. The loss of key personnel or our inability to hire and retain personnel who have the required expertise and skills could have a material adverse effect on our research and development efforts, our business, and our ability to secure additional required financing.

Our business and operations would suffer in the event of system failures.

We utilize information technology systems and networks to process, transmit and store electronic information in connection with our business activities. As use of digital technologies has increased, cyber incidents, including deliberate attacks and attempts to gain unauthorized access to computer systems and networks, have increased in frequency and sophistication. These threats pose a risk to the security of our systems and networks and the confidentiality, availability and integrity of our data. There can be no assurance that we will be successful in preventing cyber-attacks or successful in mitigating their efforts.

Despite the implementation of security measures, our internal computer systems and those of our contractors and consultants are vulnerable to damage from such cyber-attacks, including computer viruses, unauthorized access, natural disasters, terrorism, war and telecommunication and electrical failures. Such an event could cause interruption of our operations. For example, the loss of data from completed field tests for our yield traits could result in delays in our regulatory approval efforts and significantly increase our costs. To the extent that any disruption or security breach were to

result in a loss of or damage to our data, or inappropriate disclosure of confidential or proprietary information, we could suffer reputational harm or face litigation, or adverse regulatory action and the development of our product candidates could be delayed.

Risks Relating to Intellectual Property

Patent protection for our technologies is both important and uncertain.

Our commercial success may depend in part on our obtaining and maintaining patent protection for our technologies in the United States and other jurisdictions, as well as successfully enforcing and defending this intellectual property against third-party challenges. If we are not able to obtain or defend patent protection for our technologies, then we will not be able to exclude competitors from developing or marketing such technologies, and this could negatively impact our ability to generate sufficient revenues or profits from product sales and/or licensing to justify the cost of development of our technologies and to achieve or maintain profitability. Our currently issued patents include five patents on our C3003 gene in-licensed from the University of Massachusetts, three patents on C4001 and other novel yield traits, and one patent relating to our historical business. Our currently issued patents have expiration dates ranging from 2033 through 2038. New pending patent applications owned by or licensed to us relating to crop yield improvements have earliest effective filing dates ranging from 2013 through 2023 and include a new patent application on a breakthrough technology for producing PHA biomaterials in crops. This patent application would have an expiration date in 2040 if granted, however, we may not be able to obtain sufficiently broad claims to cover the new invention.

Our patent position involves complex legal and factual questions. Accordingly, we cannot predict the breadth of claims that may be allowed or enforced in our patents or in third-party patents. Patents may not be issued for any pending or future pending patent applications owned by or licensed to us, and claims allowed under any issued patent or future issued patent owned or licensed by us may not be valid or sufficiently broad to protect our technologies. Moreover, we may be unable to protect certain of our intellectual property in the United States or in foreign countries. Foreign jurisdictions may not afford the same protections as U.S. law, and we cannot ensure that foreign patent applications will have the same scope as the U.S. patents. There will be many countries in which we will choose not to file or maintain patents because of the costs involved. Competitors may also design around our patents or develop competing technologies.

Additionally, any issued patents owned by or licensed to us now or in the future may be challenged, invalidated, or circumvented. We could incur substantial costs to bring suits or other proceedings in which we may assert or defend our patent rights or challenge the patent rights of third parties. An unfavorable outcome of any such litigation could have a material adverse effect on our business and results of operations.

Third parties may claim that we infringe their intellectual property, and we could suffer significant litigation or licensing expense as a result.

Various U.S. and foreign issued patents and pending patent applications owned by third parties exist in areas relevant to our products and processes. We could incur substantial costs to challenge third-party patents. If third parties assert claims against us or our customers alleging infringement of their patents or other intellectual property rights, we could incur substantial costs and diversion of management resources in defending these claims, and the defense of these claims could have a material adverse effect on our business. In addition, if we are unsuccessful in defending against these claims, these third parties may be awarded substantial damages, as well as injunctive or other equitable relief against us, which could effectively block our ability to make, use, sell, distribute, or market our technologies and services based on our technologies in the United States or abroad. Alternatively, we may seek licenses to such third-party intellectual property. However, we may be unable to obtain these licenses on acceptable terms, if at all. Our failure to obtain the necessary licenses or other rights could prevent the sale, manufacture, or distribution of some of our products based on our technologies and, therefore, could have a material adverse effect on our business.

Portions of our crop science technology are owned by or subject to retained rights of third parties.

We have licensed and optioned from academic institutions certain patent rights that may be necessary or important to the development and commercialization of our crop science technology. These licenses and options may not provide exclusive rights to use such intellectual property in all fields of use in which we may wish to develop or commercialize our

technology. If we fail to timely exercise our option rights and/or we are unable to negotiate license agreements for optioned patent rights on acceptable terms, the academic institutions may offer such patent rights to third parties. If we fail to comply with our obligations under these license agreements, or if we are subject to a bankruptcy or insolvency proceeding, the licensor may have the right to terminate the license. In some circumstances, we may not have the right to control the preparation, filing and prosecution of licensed patent applications or the maintenance of the licensed patents. Therefore, we cannot be certain that these patents and applications will be prosecuted, maintained and enforced in a manner consistent with the best interests of our business. Furthermore, the research resulting in certain of our licensed and optioned patent rights was funded by the U.S. government. As a result, the government may have certain rights to such patent rights and technology.

We may not be successful in obtaining necessary rights to additional technologies for the development of our products through acquisitions and in-licenses.

We may be unable to acquire or in-license additional technologies from third parties that we decide we need in order to develop our business. A number of more established companies may also pursue strategies to license or acquire crop science technologies that we may consider attractive. These established companies may have a competitive advantage over us due to their size, cash resources and greater development and commercialization capabilities. Any failure on our part to reach an agreement for any applicable intellectual property could result in a third party acquiring the related rights and thereby harm our business.

In addition, companies that perceive us to be a competitor may be unwilling to assign or license rights to us. We also may be unable to license or acquire relevant crop science technologies on terms that would allow us to make an appropriate return on our investment.

We expect that competition for acquiring and in-licensing crop science technologies that are attractive to us may increase in the future, which may mean fewer suitable opportunities for us as well as higher acquisition or licensing costs. If we are unable to successfully obtain rights to suitable crop science technologies on reasonable terms, or at all, our business and financial condition could suffer.

Our license agreements include royalty payments that we are required to make to third parties.

We are party to license agreements that require us to remit royalty payments and other payments related to our licensed intellectual property. Under our in-license agreements, we may pay upfront fees and milestone payments and be subject to future royalties. We cannot precisely predict the amount, if any, or timing of royalties we may owe in the future. Furthermore, we may enter into additional license agreements in the future, which may also include royalty, milestone and other payments.

The intellectual property landscape around genome editing technology, such as CRISPR, is highly dynamic and uncertain, and any resolution of this uncertainty could have a material adverse effect on our business.

The field of genome editing, especially in the area of CRISPR technology, is still in its infancy. Due to the intense research and development that is taking place in this field by several companies, including us and our competitors, the intellectual property landscape is in flux, and it may remain uncertain for the coming years. There has been, and may continue to be, significant intellectual property related litigation and proceedings relating to this area in the future. If it is later determined that any patent rights using the CRISPR technology that we obtained under license are invalid or owned by other parties, this could have a material adverse effect on our business.

We rely in part on trade secrets to protect our technology, and our failure to obtain or maintain trade secret protection could harm our business.

We rely on trade secrets to protect some of our technology and proprietary information, especially where we believe patent protection is not appropriate or obtainable as is the case for our GRAIN trait gene discovery platform. However, trade secrets are difficult to protect. Litigating a claim that a third-party had illegally obtained and was using our trade secrets would be expensive and time consuming, and the outcome would be unpredictable. Moreover, if our competitors

independently develop similar knowledge, methods and know-how, it will be difficult for us to enforce our rights and our business could be harmed.

Risks Relating to Owning our Common Stock

Raising additional funds may cause dilution to our existing stockholders, restrict our operations or require us to relinquish rights to our technologies.

Execution of our business plan requires additional financing. If we raise additional funds through equity offerings or offerings of equity-linked securities, including warrants or convertible debt securities, we expect that our existing stockholders will experience significant dilution, and the terms of such securities may include liquidation or other preferences that adversely affect the rights of current stockholders. Debt financing, if available, may subject us to restrictive covenants that could limit our flexibility in conducting future business activities, including covenants limiting or restricting our ability to incur additional debt, dispose of assets, or make capital expenditures. We may also incur ongoing interest expense and be required to grant a security interest in our assets in connection with any debt issuance. If we raise additional funds through strategic partnerships or licensing agreements with third parties, we may have to relinquish valuable rights to our technologies or grant licenses on terms that are not favorable to us.

Trading volume in our stock can fluctuate and an active trading market for our common stock may not be available on a consistent basis to provide stockholders with adequate liquidity. Our stock price may be volatile, and our stockholders could lose a significant part of their investment.

The public trading price for our common stock will be affected by a number of factors, including:

- any change in the status of our Nasdaq listing;
- the need for near-term financing to continue operations;
- reported progress in our efforts to develop crop related technologies, relative to investor expectations;
- changes in earnings estimates, investors' perceptions, recommendations by securities analysts or our failure to achieve analysts' earnings estimates;
- quarterly variations in our or our competitors' results of operations;
- general market conditions and other factors unrelated to our operating performance or the operating performance of our competitors;
- future issuances and/or sales of our securities;
- announcements or the absence of announcements by us, or our competitors, regarding acquisitions, new products, regulatory developments, significant contracts, commercial relationships or capital commitments;
- commencement of, or involvement in, litigation;
- any major change in our board of directors or management;
- changes in governmental regulations or in the status of our regulatory approvals;
- announcements related to patents issued to us or our competitors and to litigation involving our intellectual property;
- a lack of, or limited, or negative industry or security analyst coverage;
- uncertainty regarding our ability to secure additional cash resources with which to operate our business;
- a decision by our significant stockholders to increase or decrease their holdings in our common stock;
- short-selling or similar activities by third parties; and

- other factors described elsewhere in these risk factors.

As a result of these factors, our stockholders may not be able to resell their shares at, or above, their purchase price. In addition, the stock prices of many technology companies have experienced wide fluctuations that have often been unrelated to the operating performance of those companies. Any negative change in the public's perception of the prospects of industrial or agricultural biotechnology companies could depress our stock price regardless of our results of operations. These factors may have a material adverse effect on the market price and liquidity of our common stock and affect our ability to obtain required financing.

Provisions in our certificate of incorporation and by-laws and Delaware law might discourage, delay or prevent a change of control of our company or changes in our management and, therefore, depress the trading price of our common stock.

Provisions of our certificate of incorporation and by-laws and Delaware law may discourage, delay or prevent a merger, acquisition or other change in control that stockholders may consider favorable, including transactions in which our stockholders might otherwise receive a premium for their shares of our common stock. These provisions may also prevent or frustrate attempts by our stockholders to replace or remove our management.

In addition, Section 203 of the Delaware General Corporation Law ("DGCL") prohibits a publicly-held Delaware corporation from engaging in a business combination with an interested stockholder, which generally refers to a person which together with its affiliates owns, or within the last three years has owned, 15 percent or more of our voting stock, for a period of three years after the date of the transaction in which the person became an interested stockholder, unless the business combination is approved in a prescribed manner.

The existence of the foregoing provisions and anti-takeover measures could limit the price that investors might be willing to pay in the future for shares of our common stock. They could also deter potential acquirers of our company, thereby reducing the likelihood that our stockholders could receive a premium for their common stock in an acquisition.

Concentration of ownership among our officers, directors and principal stockholders may prevent other stockholders from influencing significant corporate decisions and depress our stock price.

Based on the number of shares outstanding as of March 7, 2023, our officers, directors and stockholders who hold at least 5 percent of our stock beneficially own a combined total of approximately 30.8 percent of our outstanding common stock, including shares of common stock subject to stock options and warrants that are currently exercisable or are exercisable within 60 days after March 7, 2023. If these officers, directors, and principal stockholders or a group of our principal stockholders act together, they will be able to exert a significant degree of influence over our management and affairs and control matters requiring stockholder approval, including the election of directors and approval of mergers, business combinations or other significant transactions. The interests of one or more of these stockholders may not always coincide with our interests or the interests of other stockholders. For instance, officers, directors, and principal stockholders, acting together, could cause us to enter into transactions or agreements that we would not otherwise consider. Similarly, this concentration of ownership may have the effect of delaying or preventing a change in control of our company otherwise favored by our other stockholders. As of March 7, 2023, Jack W. Schuler (and his related entities) beneficially owned approximately 23.7 percent of our common stock. To the extent that this or any other significant stockholders oppose any proposal put forth for stockholder approval by our board of directors, they control a sufficient percentage of our outstanding shares to cause such proposal to either fail or be very difficult to achieve without their support. This, in turn, could have a negative effect on the market price of our common stock. It could also prevent our stockholders from realizing a premium over the market price for their shares of common stock. The concentration of ownership also may contribute to the low trading volume and volatility of our common stock.

ITEM 1B. UNRESOLVED STAFF COMMENTS

None.

ITEM 2. PROPERTIES

We do not own any real property. We are party to a lease agreement pursuant to which we lease 22,213 square feet of office and research and development space located at 19 Presidential Way, Woburn, Massachusetts. This lease began on June 1, 2016 and will end on November 30, 2026, and does not include any options for the early termination or the extension of the lease. We have provided the landlord with a security deposit of $229.

We have a sublease agreement with a subsidiary of CJ CheilJedang Corporation ("CJ") for CJ's sublease of 9,874 square feet of our Woburn facility. The subleased space was determined to be in excess of our needs as a result of our strategic shift and the related restructuring of our operations during 2016. The sublease is coterminous with our master lease. CJ pays rent and operating expenses equal to its pro-rata share of the amounts payable to the landlord by us, as adjusted from time-to-time in accordance with the terms of the master lease. CJ has provided us with a security deposit of $103 in the form of an irrevocable letter of credit.

Our wholly-owned subsidiary, YOI, located in Saskatoon, Saskatchewan, Canada, leases approximately 9,600 square feet of office, laboratory and greenhouse space located within Innovation Place at 410 Downey Road and within the research facility of National Research Council Canada located at 110 Gymnasium Place. These leases do not contain renewal or early termination options. YOI's leases for these facilities generally have terms of one year, and are extended annually through amendment. Most of these leases will expire on various dates through September 30, 2023.

ITEM 3. LEGAL PROCEEDINGS

From time to time, the Company may be subject to legal proceedings and claims in the ordinary course of business. We are not currently aware of any such proceedings or claims that we believe will have, individually or in the aggregate, a material adverse effect on our business, financial condition or results of operations.

ITEM 4. MINE SAFETY DISCLOSURES

Not applicable.

INFORMATION ABOUT OUR DIRECTORS AND EXECUTIVE OFFICERS

Directors

Robert L. Van Nostrand
Chairman of the Board of Directors

Oliver P. Peoples, Ph.D.
President and Chief Executive Officer

Sherri M. Brown, Ph.D.
Independent Consultant

Richard W. Hamilton, Ph.D.
Chief Executive Officer and Director at Prosper DNA, Inc.

Willie Loh, Ph.D.
Independent Consultant

Anthony J. Sinskey, Sc.D.
Professor of Microbiology, Massachusetts Institute of Technology

Executive Officers

Oliver P. Peoples, Ph.D.
President and Chief Executive Officer

Lynne H. Brum

Vice President, Planning and Corporate Communications

Charles B. Haaser
Vice President, Finance, Chief Accounting Officer and Treasurer

Kristi D. Snell, Ph.D.
Vice President, Research and Chief Science Officer

PART II

ITEM 5. MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES

Market Information

Our common stock is traded on the Nasdaq Capital Market under the symbol "YTEN."

Stockholders

As of March 8, 2023, there were 5,069,380 shares of our common stock outstanding held by 27 stockholders of record.

Unregistered Sales of Securities

On January 4, 2023, we issued 17,578 shares of common stock to participants in our Yield10 Bioscience, Inc. 401(k) Plan as a matching contribution. The issuance of these securities was exempt from registration pursuant to Section 3(a)(2) of the Securities Act.

Issuer Purchases of Equity Securities

During the quarter ended December 31, 2022, there were no repurchases made by us or on our behalf, or by any "affiliated purchasers," of shares of our common stock.

ITEM 6. [RESERVED]

ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

The following discussion and analysis should be read in conjunction with the Consolidated Financial Statements and Notes thereto included in this Annual Report on Form 10-K. All dollar amounts are stated in thousands.

Overview

Yield10 Bioscience, Inc. ("Yield10" or the "Company") is an agricultural bioscience company focused on the large-scale production of low carbon sustainable products from processing Camelina seed using the oilseed Camelina sativa ("Camelina") as a platform crop. These seed products include:

- Camelina oil for use as a low carbon biofuel feedstock
- Omega-3 oils for nutrition
- PHA Bioplastics for biodegradable zero waste packaging solutions

The co-product from producing these seed products is Camelina meal which has a protein content of over 40% and is currently approved for use in a range of animal feed rations.

Our commercial plan is based on developing and releasing a series of proprietary elite Camelina seed varieties incorporating genetic traits from our development pipeline which offer improved on-farm performance that we anticipate will lead to increased acreage adoption and seed and grain product revenue. We also plan to create additional value for our shareholders by licensing yield and seed oil traits from our pipeline to large seed companies for commercialization in major food crops, including corn, soybean and canola. Yield10 is headquartered in Woburn, Massachusetts and has an Oilseed Center of Excellence in Saskatoon, Saskatchewan, Canada.

Government Grants

On February 26, 2021, Yield10 Oilseeds, Inc. (“YOI”), the Company’s wholly-owned Canadian research subsidiary, received a research grant through the Industrial Research Assistance Program ("IRAP") administered by National Research Council Canada ("NRC"). The objective of the grant was to provide financial research assistance to innovative, early-stage

small and medium-sized enterprises. Under the terms of the agreement, NRC agreed to contribute up to a maximum of $39 for payroll costs incurred by YOI during the period from December 20, 2020 to March 13, 2021. During the first quarter of 2021, YOI submitted claims for eligible payroll costs and recognized grant revenue for the full amount of the award.

During 2018, we entered into a sub-award with Michigan State University ("MSU") to support a Department of Energy ("DOE") funded grant entitled "*A Systems Approach to Increasing Carbon Flux to Seed Oil.*" Our participation under this five-year grant has been awarded incrementally on an annual basis with the first year commencing on September 15, 2017. Funding for this sub-award for the full grant amount of $2,957 was appropriated by the U.S. Congress through the contractual year ending in September 2022. During the years ended December 31, 2022 and December 31, 2021, we recognized $450 and $575, respectively, from this sub-award.

As of December 31, 2022, proceeds of $60 remain to be recognized under our MSU sub-award as shown in the table below. During June 2022, the parties amended the sub-award to extend its termination date to September 15, 2023, to allow Yield10 time to utilize the remaining grant funds.

Program Title	Funding Agency	Total Government Funds	Total revenue recognized through December 31, 2022	Remaining amount to be recognized as of December 31, 2022	Contract/Grant Expiration
Subcontract from Michigan State University project funded by DOE entitled "A Systems Approach to Increasing Carbon Flux to Seed Oil"	Department of Energy	$ 2,957	$ 2,897	$ 60	September 15, 2023
Funding from National Research Council Canada through its Industrial Research Assistance Program (NRC-IRAP) entitled "Innovation Assistance Program"	National Research Council Canada	39	39	—	March 13, 2021
Total		$ 2,996	$ 2,936	$ 60	

Critical Accounting Estimates and Judgments

Our consolidated financial statements are prepared in accordance with accounting principles generally accepted in the United States of America ("GAAP"). The preparation of these consolidated financial statements often requires us to make judgments and accounting estimates that can materially affect the amounts reported in the consolidated financial statements and accompanying notes. These judgments and estimates can have a significant effect on the financial statements because they result primarily from estimates about the effects of matters that are inherently uncertain. We make these estimates and judgments based on guidance provided by current GAAP, historical experience and various other assumptions that we believe to be reasonable under the circumstances. Our actual results may differ from these estimates.

We believe that the specific accounting policies and significant judgments described below are the most critical to aid in fully understanding and evaluating our consolidated financial condition and results of operations.

Stock-Based Compensation

The accounting standards for stock-based compensation require that all stock-based awards be recognized as an expense in the consolidated financial statements and that such expense be measured based on the fair value of the award. We use the Black-Scholes option-pricing model to value our service-based option grants and to determine the related compensation expense to be recognized over each award's vesting period. Calculating the fair value of stock-based payment awards using modeling techniques requires the use of assumptions. These assumptions represent our best estimates, but the estimates involve inherent uncertainties and the application of judgment. We adjust our modeling assumptions when valuing new stock awards based on actual experience.

Income Taxes

Due to the Company's history of annual income tax losses, it has never incurred significant income tax expense. We have, however, historically recorded and disclosed in our financial statements significant deferred income tax assets for net operating loss carry forwards and research tax credits that may be available to offset future taxable income. We routinely assess the realizability of the Company's deferred tax assets and have historically concluded that it is unlikely that deferred tax assets derived from our U.S. operations will be realized under current accounting standards and therefore we have consistently maintained a full valuation allowance against these tax assets. Our U.S. deferred tax assets are also subject to

substantial annual limitation under Section 382 of the Internal Revenue Code of 1986 due to stock ownership changes that have occurred, primarily as a result of our securities offerings. The calculation of Section 382 limitations is highly judgmental and the calculations are complex. Based on an analysis completed during 2021, we have concluded that all of our historical U.S. deferred tax assets generated through November 31, 2019 are no longer available to us for future use to offset taxable income.

Through December 31, 2022, YOI performed research and development services for Yield10 under a research services agreement subject to intercompany transfer pricing regulations established in the U.S. and Canada. These regulations required that YOI earn an arms-length profit from the research services, calculated in accordance with U.S. and Canadian tax regulations. YOI has historically filed for research tax credit carryforwards in the past that have been used to offset its taxable income generated as a result of the intercompany profit. These accumulated Canadian research credits were recorded as a deferred tax asset within our consolidated balance sheet at December 31, 2021, based on our judgment that YOI would continue to earn taxable income in the future and the deferred tax asset would be realized. However, in our current estimation, the negative evidence related to the Company's decline in its cash and short-term investment balances through the end of 2022 now outweighs the positive evidence of YOI's historic earnings. We believe that it is now more likely than not that the remaining deferred tax assets will not be utilized and, as such, we have recorded a full valuation allowance against the remaining deferred tax asset in Canada.

Securities Offerings

We offer our securities for sale to public and private investors from time to time. The structure of these offerings can be relatively straight-forward or they can be highly complex, requiring significant judgment in their accounting treatment and financial reporting. Our historical offerings completed to date have included different classes of securities, including common stock, convertible preferred stock and warrants with various exercise prices and terms. Depending on the facts and circumstances of each offering, including; the offering and market price of our common stock, the amount of cash proceeds received, the fair value determination of each type of security issued, the availability of authorized and unissued common shares to support conversion of preferred shares or the exercise of the warrants, the specific terms of securities purchase agreements and other factors that may come into consideration, the shares of an offering may be recorded as permanent or temporary equity within our balance sheets. The fair value of warrants issued in an offering, under certain situations, may be recorded as a liability and be subject to mark-to-market adjustments on each balance sheet date based on changes in their fair value determined using the Black-Scholes valuation model. We carefully analyze our securities offerings to ensure that we record them in accordance with current accounting guidance.

Lease Accounting

As a lessee, we follow the lease accounting guidance codified in ASC 842. Under this guidance, a lease is classified as a finance lease if any of five criteria described in the guidance apply to the lease. Any lease not classified as a finance lease is classified as an operating lease with expense recognition occurring on a straight-line basis over the term of the lease. The application of this guidance requires judgment. Under ASC 842, a lease liability is recorded on the commencement date of a lease and is calculated as the present value of the remaining lease payments, using the interest rate implicit in the lease, or if that rate is not readily determinable, using the lessee's incremental borrowing rate. A right-of-use asset equal to the lease liability is also recorded with adjustments made, as necessary, for lease prepayments, lease accruals, initial direct costs and lessor lease incentives that may be present within the terms of the lease. If a lease subject to ASC 842 is amended, the right-of-use asset and lease liability are adjusted, if appropriate. These mathematical calculations to comply with ASC 842 can be complex.

Comparison of the Years Ended December 31, 2022 and 2021

Revenue

	Year ended December 31,		
	2022	**2021**	**Change**
Grant revenue	$ 450	$ 614	$ (164)

Grant revenue was $450 and $614 for the years ended December 31, 2022 and 2021, respectively. All of the grant revenue recorded during the year ended December 31, 2022 was derived from the Company's DOE sub-award with MSU.

During the year ended December 31, 2021, grant revenue of $575 and $39 was recognized from the DOE sub-award and the short-term NRC grant that was awarded to YOI in February 2021, respectively.

We anticipate that grant revenue will decrease during the year ended December 31, 2023 in comparison to the year ended December 31, 2022, as a result of lower remaining grant appropriations of $60 that we expect to earn during the first quarter of 2023 from our MSU sub-award that ends in September 2023. We currently cannot assess whether additional U.S. or Canadian government research grants will be awarded to us during 2023. Our forecast related to grant revenue is subject to change, however, should we receive new grants or if our ability to earn revenue from our existing grant is negatively impacted by the COVID-19 pandemic.

We contracted with growers in Canada and the U.S. for small-scale Camelina winter grain production in the fall of 2022, for approximately 1,000 total acres, to supply oil to the renewable diesel fuel market. Harvest of this first winter commercial grain production is expected to occur in the summer of 2023, at which time we anticipate that we may begin to recognize grain revenue in amounts scaled to the grain yield and the number of acres under contract. Future grain revenue derived from our upcoming spring 2023 grower agreements and future growing seasons will be based, among other things, on our ability to scale up commercial seed production, engage with growers and enter into offtake agreements with customers in the renewable diesel market.

Operating Expenses

	Year ended December 31,		
	2022	2021	Change
Research and development expenses	$ 7,750	$ 6,201	$ 1,549
General and administrative expenses	6,151	6,105	46
Total operating expenses	$ 13,901	$ 12,306	$ 1,595

Research and Development Expenses

Research and development expense increased by $1,549, or 25%, from $6,201 during the year ended December 31, 2021 to $7,750 during the year ended December 31, 2022. The 2022 increase is primarily due to higher employee compensation and benefits expense, expanded crop trial costs, higher third-party research services, costs associated with pre-commercial Camelina seed production and increased facility-related expenses. Employee compensation and benefits increased by $497 from $3,547 during the year ended December 31, 2021 to $4,044 during the year ended December 31, 2022. The increase is primarily the result of a $600 increase in payroll charges generated from annual employee compensation increases and our hiring of additional staff. Stock-based employee compensation expense also increased by $82 during the year ended December 31, 2022 due to employee stock options awarded during the past year. Lower recruiting related expenses of $74 offset a portion of these increased employee related expenses. Crop trial expense increased by $366 during the year ended December 31, 2022 in comparison to the year ended December 31, 2021 and primarily stems from our evaluation of Camelina plant varieties, including those demonstrating herbicide tolerance. Third-party research services increased by $154 during the year ended December 31, 2022 in comparison to the previous year and is primarily the result of DNA sequencing and other analytical work undertaken for regulatory purposes. During the year ended December 31, 2022, we also incurred $226 in charges for pre-commercial Camelina seed production, including seed multiplication, cleaning, packaging and storage costs. We did not have similar expenses during the year ended December 31, 2021. Facility-related expenses increased by $138 during the year ended December 31, 2022, primarily as a result of our leasing additional laboratory and greenhouse space in support of our Camelina research activities in Saskatoon, Saskatchewan, Canada.

Based on current planning and forecasting, we anticipate that our research and development expenses during the year ended December 31, 2023 will increase above levels incurred during the year ended December 31, 2022, as we continue our efforts to develop and commercialize Camelina plant varieties for the following markets: feedstock oil for renewable diesel, PHA bioplastics, omega-3 oil for nutraceuticals, and aquaculture fish feed and as a protein meal to be used in animal feed markets. The increased expenses will include employee compensation and benefits from recent and future personnel hiring, further expansion of our crop trial programs, seed scale up and pre-commercial Camelina production activities. Our forecast related to research and development expense is subject to change and may be impacted by our ability to raise additional working capital to support our planned operations, the potential impact of the COVID-19 pandemic or the advent of third-party collaborations or other business opportunities that could alter our plans.

General and Administrative Expenses

General and administrative expenses were $6,151 and $6,105 for the fiscal years ended December 31, 2022 and December 31, 2021, respectively. The increase of $46, or 1%, was primarily due to increased employee compensation and benefits expense that increased by $66, from $2,762 during the year ended December 31, 2021 to $2,828 during the year ended December 31, 2022. The net increase was primarily the result of a $146 increase in stock-based compensation expense partially offset by reductions in employee payroll and bonus expenses of $32 and lower recruiting-related expenses of $56.

Based on current planning and forecasting, we anticipate that our general and administrative expenses during the year ended December 31, 2023 will increase to levels above expenses incurred during the year ended December 31, 2022, as we scale up activities in support of our commercial growth, including increasing employee headcount, legal expenses, license payments and travel-related expenses in support of business development. Our forecast related to general and administrative expense is subject to change and may be impacted by our ability to raise additional working capital to support our plans, the potential impact of the COVID-19 pandemic or the advent of new third-party collaborations or other business opportunities that could alter our plans.

Other Income (Expense), net

	Year ended December 31,		
	2022	2021	Change
Gain on investment in related party	$ —	$ 700	$ (700)
Other income (expense), net	41	(3)	44
Total other income (expense), net	$ 41	$ 697	$ (656)

Gain on Investment in Related Party

During 1999, Yield10 entered into a technology sublicense agreement with Tepha, Inc. ("Tepha"), a privately held related party engaged in the development of medical products. Yield10 received 648,149 shares of Series A Convertible Preferred Stock of Tepha ("Tepha Shares") during 2002 as consideration for outstanding license payments due to Yield10 totaling $700. During 2005, the Company determined the value of the Tepha Shares was impaired resulting in their write off through a charge to other income (expense). In May 2021, the board of directors of Tepha approved and authorized the merger of Tepha with Becton Dickinson Global Holdings, Inc. ("Becton Dickinson"). On July 26, 2021, Yield10 received cash consideration of $700 in exchange for the surrender of its Tepha Shares upon the closing of the sale of Tepha to Becton Dickinson. As a result, the Company recorded the $700 as a gain on investment in related party within other income (expense) during the year ended December 31, 2021.

Interest Income (expense), net

Other income (expense) for the years ended December 31, 2022 and December 31, 2021 was derived primarily from investment income earned from the Company's cash equivalents and investments offset by interest expense and investment management fees incurred during the year.

Liquidity and Capital Resources

Since our inception, we have incurred significant expenses related to our research, development and commercialization efforts, which in recent years have been focused on Camelina. With the exception of 2012, we have recorded annual losses since the Company's initial founding, including our fiscal year ended December 31, 2022. As of December 31, 2022, we had an accumulated deficit of $399,697. Our total unrestricted cash, cash equivalents and short-term investments as of December 31, 2022, totaled $4,347 as compared to $15,990 at December 31, 2021. As of December 31, 2022, we had no outstanding debt.

Our cash, cash equivalents and short-term investments at December 31, 2022 were held for working capital purposes. As of December 31, 2022, we had restricted cash of $264, which consisted of $229 held in connection with the lease agreement for our Woburn, Massachusetts facility and $35 held in connection with our corporate credit card program.

Investments are made in accordance with our corporate investment policy, as approved by our Board of Directors. The primary objective of this policy is to preserve principal, and consequently, investments are limited to high quality

corporate debt, U.S. Treasury bills and notes, money market funds, bank debt obligations, municipal debt obligations and asset-backed securities. The policy establishes maturity and concentration limits, and liquidity requirements. As of December 31, 2022, we were in compliance with this policy.

Material Cash Requirements

Subject to obtaining additional working capital funding, we currently anticipate net cash usage of $13,000 to $14,000 to fund our operations during 2023, including our expanded research and development, administrative and Camelina commercial launch activities.

We require cash to fund our working capital needs, to purchase capital assets, to pay our lease obligations and other operating costs. The primary sources of our liquidity have historically included equity financings, government research grants and income earned on cash equivalents and short-term investments.

We routinely enter into contractual commitments with third parties to support our operating activities. The more significant of these commitments includes real estate operating leases for our office, laboratory and greenhouse facilities located in the U.S. and Canada. In addition, we typically enter into annual premium funding arrangements through our insurance broker that allows us to spread the payment of our directors' and officers' liability and other business insurance premiums over the terms of the policies. Our material commitments also include arrangements with third party growers located in North and South America for the execution of crop trials and seed scale-up activities to further our trait development goals and to progress the commercial development of our Camelina plant varieties. The aggregate cost of these contracted crop activities is substantial. In the fall of 2022, we also began entering into Camelina grain production contracts for the winter 2022/2023 season that contain minimum guaranteed payments per acre as an incentive for growers to work with us. From time-to-time, we also enter into exclusive research licensing and collaboration arrangements with third parties for the development of intellectual property related to trait development. These long-term agreements typically include initial licensing payments and future contingent milestone payments associated with regulatory filings and approvals as well as potential royalty payments based on future product sales. Generally, these licensing arrangements contain early termination provisions within the terms of the respective agreements.

The Company has no off-balance sheet arrangements as defined in Item 303(b) of Regulation S-K of the Securities Exchange Act of 1934.

Going Concern

We follow the guidance of ASC Topic 205-40, *Presentation of Financial Statements-Going Concern*, in order to determine whether there is substantial doubt about our ability to continue as a going concern for one year after the date our financial statements are issued. Based on our current cash forecast, we expect that our present capital resources will not be sufficient to fund our planned operations for at least that period of time, which raises substantial doubt as to the Company's ability to continue as a going concern. This forecast of cash resources is forward-looking information that involves risks and uncertainties, and the actual amount of expenses could vary materially and adversely as a result of a number of factors. Our ability to continue operations after our current cash resources are exhausted will depend upon our ability to obtain additional financing through, among other sources, public or private equity financing, secured or unsecured debt financing, equity or debt bridge financing, warrant holders' ability and willingness to exercise the Company's outstanding warrants, and additional government research grants or collaborative arrangements with third parties, as to which no assurances can be given. We do not know whether additional financing will be available on terms favorable or acceptable to us when needed, if at all. If additional funds are not available when required, we will be forced to curtail our research efforts, explore strategic alternatives and/or wind down our operations and pursue options for liquidating our remaining assets, including intellectual property and equipment.

If we issue equity or debt securities to raise additional funds, (i) the Company may incur fees associated with such issuance, (ii) our existing stockholders will experience dilution from the issuance of new equity securities, (iii) the Company may incur ongoing interest expense and be required to grant a security interest in Company assets in connection with any debt issuance, and (iv) the new equity or debt securities may have rights, preferences and privileges senior to those of our existing stockholders. In addition, utilization of our net operating loss and research and development credit carryforwards may be subject to significant annual limitations under Section 382 of the Internal Revenue Code of 1986 due to ownership changes resulting from future equity financing transactions. If we raise additional funds through collaboration, licensing or other similar arrangements, it may be necessary to relinquish valuable rights to our potential products or proprietary technologies or grant licenses on terms that are not favorable to the Company.

At-The-Market ("ATM") Program

On January 24, 2023, we entered into an Equity Distribution Agreement (the "Sales Agreement") with Maxim Group LLC ("Maxim"), under which we may offer and sell shares of our common stock, $0.01 par value per share, having an aggregate offering price of up to $4,200 from time to time through Maxim, acting exclusively as the Company's sales agent (the "Offering"). On January 24, 2023, we filed a prospectus supplement with the Securities and Exchange Commission in connection with the Offering under our existing Registration Statement on Form S-3 (File No 333-254830), which was declared effective on April 2, 2021. We intend to use the net proceeds of the Offering primarily for working capital and general corporate purposes. Maxim will be entitled to compensation at a fixed commission rate of 2.75% of the gross sales price per share sold. In addition, we agreed to reimburse Maxim for its costs and out-of-pocket expenses incurred in connection with its services, including the fees and out-of-pocket expenses of its legal counsel.

We are not obligated to make any sales under the Sales Agreement and no assurance can be given that we will sell any shares,, or the dates on which any such sales will take place. The Sales Agreement will continue until the earliest of (i) twelve (12) months following the date of the Sales Agreement, (ii) the sale of shares thereunder having an aggregate offering price of $4,200, and (iii) the termination by us upon ten (10) days written notice or by Maxim immediately upon written notification to the Company.

From January 24, 2023 through March 14, 2023, we issued 94,665 shares of common stock in connection with the ATM at per share prices between $3.03 and $4.08, resulting in net proceeds to the Company of approximately $290 after subtracting sales commissions.

Fiscal Year 2022 Cash Usage

Net cash used in operating activities was $11,404 during the year ended December 31, 2022, compared to net cash used by operating activities during 2021 of $9,253. Net cash used by operations during the year ended December 31, 2022 primarily reflects the net loss of $13,566, cash payments made to reduce the Company's lease liabilities of $520 and our payment of 2021 bonus compensation of $378 during early 2022. Non-cash charges offsetting a portion of the net loss include depreciation and amortization expense of $263, stock-based compensation expense of $1,903, our 401(k) stock matching contribution expense of $133 and non-cash lease expense of $393 resulting from amortization of our right-of-use asset. The net cash usage for operating activities during the year ended December 31, 2021 of $9,253 was primarily the result of the Company's net loss of $11,031, cash payments to reduce the Company's lease liabilities of $463 and our payment of 2020 bonus compensation of $460. Non-cash charges offsetting a portion of the net loss included depreciation and amortization expense of $220, stock-based compensation expense of $1,675, our 401(k) stock matching contribution expense of $112 and non-cash lease expense of $358.

Net cash of $8,522 was provided by investing activities during the year ended December 31, 2022, compared to net cash used for investing activities during 2021 of $4,578. During the year ended December 31, 2022, the Company purchased $2,445 in short-term investments, primarily U.S. Treasury notes and federal agency bonds. Also during 2022, $11,121 of our short-term investments matured and converted to cash. During the year ended December 31, 2021, we purchased $10,639 in similar short-term investments and investments totaling $6,250 matured and converted to cash.

Net cash of $37 was used by financing activities during the year ended December 31, 2022, compared to net cash provided by financing activities of $15,746 during the year ended December 31, 2021. During the year ended December 31, 2021, the Company completed a public offering of 1,040,000 shares of its common stock at a price of $12.25 per share, receiving proceeds of $12,740 before issuance costs of $747. Also during 2021, a total of 481,973 Series A and Series B warrants issued in the Company's November 2019 securities offering were exercised by warrant holders, providing $3,856 in cash proceeds.

Related Party Transactions

During 1999, the Company entered into a technology sublicense agreement with Tepha, which was a related party engaged in the development of medical products. Yield10 received 648,149 shares of Series A Convertible Preferred Stock

of Tepha during 2002 as consideration for outstanding license payments due to Yield10 totaling $700. In July 2021, Tepha merged with Becton Dickinson and we received cash consideration of $700 in exchange for our Tepha Shares.

Recent Accounting Standards Changes

For a discussion of recent accounting standards please read Note 2, Summary of Significant Accounting Policies, to our consolidated financial statements included in this report.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURE ABOUT MARKET RISK

Not applicable.

ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

The consolidated financial statements and related financial statement schedules required to be filed are indexed on page F-1 and are incorporated herein.

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE

None.

ITEM 9A. CONTROLS AND PROCEDURES

Effectiveness of Disclosure Controls and Procedures

As of the end of the period covered by this Annual Report on Form 10-K, under the supervision of our Chief Executive Officer and our Chief Accounting Officer, we evaluated the effectiveness of our disclosure controls and procedures, as such term is defined in Rule 13a-15(e) and Rule 15d-15(e) under the Exchange Act. Based on this evaluation, our Chief Executive Officer and our Chief Accounting Officer concluded that as of December 31, 2022 our disclosure controls and procedures were effective to provide reasonable assurance that the information we are required to disclose in reports that we file or submit under the Exchange Act (1) is recorded, processed, summarized and reported within the time periods specified in SEC rules and forms, and (2) is accumulated and communicated to our management, including our Chief Executive Officer and our Chief Accounting Officer, as appropriate to allow timely decisions regarding required disclosure. Our disclosure controls and procedures include components of our internal control over financial reporting. Management's assessment of the effectiveness of our internal control over financial reporting is expressed at the level of reasonable assurance because a control system, no matter how well designed and operated, can provide only reasonable, but not absolute, assurance that the control system's objectives will be met.

Management's Annual Report on Internal Control over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting, as defined in Rules 13a-15(f) and 15d-15(f) of the Exchange Act. Our internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. Our internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of our assets; (ii) provide reasonable assurance that transactions are recorded to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are made only in accordance with authorizations of our management and directors; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of our assets that could have a material effect on our financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Management assessed the effectiveness of our internal control over financial reporting as of December 31, 2022. In making this assessment, management used the criteria set forth in the 2017 *Internal Control—Integrated Framework* issued by the Committee of Sponsoring Organizations of the Treadway Commission.

Based on its assessment of internal control over financial reporting, management has concluded that, as of December 31, 2022, our internal control over financial reporting was effective to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles.

Changes in Internal Control over Financial Reporting

There have been no changes in our internal control over financial reporting identified in connection with the evaluation required by Rule 13a-15(d) of the Exchange Act that occurred during our last fiscal quarter in the period covered by this Annual Report on Form 10-K that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

ITEM 9B. OTHER INFORMATION

None.

ITEM 9C. DISCLOSURE REGARDING FOREIGN JURISDICTIONS THAT PREVENT INSPECTIONS

Not applicable.

PART III

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

The response to this item is incorporated by reference from the discussion responsive thereto under the captions “Directors and Executive Officers,” “Corporate Governance and Board Matters” and “Code of Business Conduct and Ethics” in our proxy statement for the 2023 annual meeting of stockholders.

ITEM 11. EXECUTIVE COMPENSATION

The response to this item is incorporated by reference from the discussion responsive thereto under the captions “Executive Compensation,” “Director Compensation,” “Corporate Governance and Board Matters” and “Compensation Risk Assessment” in our proxy statement for the 2023 annual meeting of stockholders.

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS

The response to this item is incorporated by reference from the discussion responsive thereto under the captions “Security Ownership of Certain Beneficial Owners and Management,” “Securities Authorized for Issuance under Equity Compensation Plans” and "Proposal 2: Approval of an Amendment to the Company's 2018 Stock Option and Incentive Plan" in our proxy statement for the 2023 annual meeting of stockholders.

ITEM 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE

The response to this item is incorporated by reference from the discussion responsive thereto under the captions “Certain Relationships and Related Person Transactions,” “Corporate Governance and Board Matters” and “The Board of Directors and its Committees” in our proxy statement for the 2023 annual meeting of stockholders.

ITEM 14. PRINCIPAL ACCOUNTANT FEES AND SERVICE

The response to this item is incorporated by reference from the discussion responsive thereto under the caption “Independent Registered Public Accountants” in our proxy statement for the 2023 annual meeting of stockholders.

PART IV

ITEM 15. EXHIBITS, FINANCIAL STATEMENT SCHEDULES

(a) The following documents are filed as part of this Report:

(1) **Financial Statements**

See Index to Financial Statements on page F-1.

(2) **Supplemental Schedules**

All schedules have been omitted because the required information is not present in amounts sufficient to require submission of the schedule, or because the required information is included in the consolidated financial statements or notes thereto.

(3) **Exhibits**

See Item 15(b) below.

(b) The following exhibits are filed as part of, or incorporated by reference into, this Annual Report on Form 10-K:

Exhibit Number	Exhibit Description	Filed Herewith	Incorporated by Reference herein from Form or Schedule	Filing Date	SEC File/ Reg. Number
2.1	Asset Purchase Agreement between Metabolix, Inc. and CJ Research Center LLC, dated September 16, 2016.		Form 8-K (Exhibit 2.1)	9/21/2016	001-33133
3.1.1	Amended and Restated Certificate of Incorporation, as amended, of the Registrant.		Form 10-Q (Exhibit 3.1)	8/9/2018	001-33133
3.1.2	Certificate of Amendment to the Amended and Restated Certificate of Incorporation of the Registrant.		Form 8-K (Exhibit 3.1)	1/15/2020	001-33133
3.1.3	Certificate of Designation of Preferences, Rights and Limitations with respect to the Series A Preferred Stock.		Form 8-K (Exhibit 3.1)	11/20/2019	001-33133
3.1.4	Certificate of Designation of Preferences, Rights and Limitations with respect to the Series B Preferred Stock.		Form 8-K (Exhibit 3.2)	11/20/2019	001-33133
3.2	Amended and Restated By-laws of the Registrant.		Form 10-Q (Exhibit 3.1)	11/10/2021	001-33133
4.1	Description of Securities of the Registrant.	X			
4.2	Specimen Stock Certificate for shares of the Registrant's Common Stock.		Form 10-Q (Exhibit 4.1)	11/12/2020	001-33133
4.3	Form of Investor Warrant to Purchase Common Stock.		Form 8-K (Exhibit 4.1)	7/5/2017	001-33133
4.4	Form of Series A Common Warrant to purchase shares of Common Stock.		Form S-1/A (Exhibit 4.3)	12/15/2017	333-221283
4.5	Form of Common Stock Purchase Warrant.		Form 8-K (Exhibit 4.1)	11/20/2019	001-33133
10.1†	2006 Stock Option and Incentive Plan.		Form S-1/A (Exhibit 10.3)	10/20/2006	333-135760
10.1.1†	2006 Stock Option and Incentive Plan, Form of Incentive Stock Option Agreement.		Form S-1/A (Exhibit 10.3.1)	10/20/2006	333-135760
10.1.2†	2006 Stock Option and Incentive Plan, Form of Non-Qualified Stock Option Agreement.		Form S-1/A (Exhibit 10.3.2)	10/20/2006	333-135760
10.1.3†	2006 Stock Option and Incentive Plan, Form of Director Non-Qualified Stock Option Agreement.		Form S-1/A (Exhibit 10.3.3)	10/20/2006	333-135760

10.2†	2014 Stock Option and Incentive Plan, Revised and Restated.		Form 10-Q (Exhibit 10.1)	8/13/2015	001-33133
10.2.1†	2014 Stock Option and Incentive Plan, Form of Incentive Stock Option Award.		Form 10-K (Exhibit 10.3.1)	3/25/2015	001-33133
10.2.2†	2014 Stock Option and Incentive Plan, Form of Non-Qualified Stock Option Award.		Form 10-K (Exhibit 10.3.2)	3/25/2015	001-33133
10.2.3†	2014 Stock Option and Incentive Plan, Form of Restricted Stock Unit Award.		Form 10-K (Exhibit 10.3.3)	3/25/2015	001-33133
10.3†	Amended and Restated 2018 Stock Option and Incentive Plan.		Form 10-Q (Exhibit 10.1)	8/11/2021	001-33133
10.3.1†	Amended and Restated 2018 Stock Option and Incentive Plan, Form of Stock Option Agreement.		Form 10-K (Exhibit 10.2.5)	3/28/2019	001-33133
10.3.2†	2018 Stock Option and Incentive Plan, Form of Restricted Stock Unit Agreement.		Form 10-K (Exhibit 10.2.6)	3/25/2020	001-33133
10.4†	Employment Agreement between the Company and Oliver P. Peoples dated March 28, 2017.		Form 10-K (Exhibit 10.3)	3/30/2017	001-33133
10.5†	Employment Agreement between the Company and Charles B. Haaser dated March 28, 2017.		Form 10-K (Exhibit 10.4)	3/30/2017	001-33133
10.6†	Employment Agreement between the Company and Lynne H. Brum dated March 28, 2017.		Form 10-K (Exhibit 10.6)	3/30/2017	001-33133
10.7†	Employment Agreement between the Company and Kristi Snell dated March 28, 2017.		Form 10-K (Exhibit 10.8)	3/30/2017	001-33133
10.8†	Form of Employee Noncompetition, Confidentiality and Inventions Agreement between the Company and its Employee.		Form 10-K (Exhibit 10.9)	3/30/2017	001-33133
10.9†	Form of Indemnification Agreement between the Registrant and its Directors and Officers.		Form S/1/A (Exhibit 10.14)	10/20/2006	333-135760
10.10	Standstill Agreement dated June 19, 2015 between the Company and Jack W. Schuler, Renate Schuler and the Schuler Family Foundation.		Form 8-K (Exhibit 10.1)	6/17/2015	001-33133
10.11	Lease Agreement between the Company and ARE MA Region No. 20, LLC dated January 20, 2016 for the premises located at 19 Presidential Way, Woburn, MA.		Form 8-K (Exhibit 10.1)	1/26/2016	001-33133
10.12	Sublease between CJ Research Center LLC and the Company, dated as of September 16, 2016.		Form 10-K (Exhibit 10.20)	3/30/2017	001-33133
10.13	Form of Securities Purchase Agreement dated July 3, 2017 between the Company and the Purchasers named therein.		Form 8-K (Exhibit 10.1)	7/5/2017	001-33133
10.14@	Exclusive License Agreement, dated May 17, 2018, between the Company and the University of Missouri.		Form 10-Q (Exhibit 10.2)	8/9/2018	001-33133
10.15	Form of Securities Purchase Agreement dated March 14, 2019 between the Company and the Investors named therein.		Form 8-K (Exhibit 10.1)	3/15/2019	001-33133
10.16	Securities Purchase Agreement, dated as of November 14, 2019, by and between Yield10 Bioscience, Inc. and the Investors listed on Schedule I thereto.		Form 8-K (Exhibit 10.1)	11/20/2019	001-33133
10.17	Securities Purchase Agreement, dated as of August 22, 2020, by and between Yield10 Bioscience, Inc. and the Investors listed on Schedule I thereto.		Form 8-K (Exhibit 10.1)	8/25/2020	001-33133
10.18	Collaboration and Option Agreement, dated November 12, 2020, by and between Yield10 Bioscience, Inc. and Rothamsted Research Institute, as amended.	X			

10.19	Equity Distribution Agreement, dated January 23, 2023, by and between the Company and Maxim Group LLC.		Form 8-K (Exhibit 1.1)	1/24/23	001-33133
21.1	Subsidiaries of the Registrant.		Form 10-K (Exhibit 21.1)	3/16/2021	001-33133
23.1	Consent of RSM US LLP, an independent registered public accounting firm.	X			
31.1	Certification Pursuant to Rule 13a-14(a) or Rule 15d-14(a) of the Securities Exchange Act of 1934.	X			
31.2	Certification Pursuant to Rule 13a-14(a) or Rule 15d-14(a) of the Securities Exchange Act of 1934.	X			
32.1	Certification Pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.	X			
101.1	The following financial information from the Yield10 Bioscience, Inc. Annual Report on Form 10-K for the year ended December 31, 2022 formatted in XBRL; (i) Consolidated Balance Sheets, December 31, 2022 and December 31, 2021; (ii) Consolidated Statements of Operations, Years Ended December 31, 2022 and 2021; (iii) Consolidated Statements of Comprehensive Income (Loss), Years Ended December 31, 2022 and 2021; (iv) Consolidated Statements of Cash Flows, Years Ended December 31, 2022 and 2021; (v) Consolidated Statements of Stockholders' Equity for the Years Ended December 31, 2022 and 2021; and (vi) Notes to Consolidated Financial Statements.	X			
101.INS	XBRL Instance Document.				
101.SCH	XBRL Taxonomy Extension Schema.				
101.CAL	XBRL Taxonomy Extension Calculation Linkbase.				
101.DEF	XBRL Taxonomy Extension Definition Linkbase.				
101.LAB	XBRL Taxonomy Extension Label Linkbase.				
101.PRE	XBRL Taxonomy Extension Presentation Linkbase.				

† Management contract or compensatory plan or arrangement.

@ Certain confidential portions of this Exhibit were omitted by means of marking such portions with brackets ("[***]") because the identified confidential portions (i) are not material and (ii) is the type of information that the Company treats as private or confidential.

ITEM 16. FORM 10-K SUMMARY

Not applicable.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the Registrant has duly caused this report to be signed on its behalf by the undersigned thereunto duly authorized.

March 14, 2023

YIELD10 BIOSCIENCE, INC.

By: /s/ OLIVER P. PEOPLES

Oliver P. Peoples, Ph.D.
President and Chief Executive Officer
(Principal Executive Officer)

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant and in the capacities and on the dates indicated.

Name	Title	Date
/s/ OLIVER P. PEOPLES Oliver P. Peoples, Ph.D.	President and Chief Executive Officer and Director (Principal Executive Officer)	March 14, 2023
/s/ CHARLES B. HAASER Charles B. Haaser	Vice President, Finance, and Chief Accounting Officer (Principal Financial and Accounting Officer)	March 14, 2023
/s/ SHERRI M. BROWN Sherri M. Brown	Director	March 14, 2023
/s/ RICHARD W. HAMILTON Richard W. Hamilton, Ph.D.	Director	March 14, 2023
/s/ WILLIE LOH Willie Loh, Ph.D.	Director	March 14, 2023
/s/ ANTHONY J. SINSKEY Anthony J. Sinskey, Sc.D.	Director	March 14, 2023
/s/ ROBERT L. VAN NOSTRAND Robert L. Van Nostrand	Chairman	March 14, 2023

YIELD10 BIOSCIENCE, INC.
Index to Consolidated Financial Statements

Report of Independent Registered Public Accounting Firm

To the Stockholders and the Board of Directors of Yield10 Bioscience, Inc.

Opinion on the Financial Statements
We have audited the accompanying consolidated balance sheets of Yield10 Bioscience, Inc. and its subsidiaries (the Company) as of December 31, 2022 and 2021, the related consolidated statements of operations, comprehensive loss, stockholders' equity and cash flows for each of the years then ended, and the related notes to the consolidated financial statements (collectively, the financial statements). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2022 and 2021, and the results of its operations and its cash flows for the years then ended, in conformity with accounting principles generally accepted in the United States of America.

Emphasis of Matter-Going Concern
The accompanying financial statements have been prepared assuming that the Company will continue as a going concern. As discussed in Note 1 to the financial statements, the Company has suffered recurring losses from operations and does not have sufficient liquidity to meet forecasted costs. This raises substantial doubt about the Company's ability to continue as a going concern. Management's plans in regard to these matters also are described in Note 1. The financial statements do not include any adjustments that might result from the outcome of this uncertainty.

Basis of Opinion
These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. The Company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. As part of our audits we are required to obtain an understanding of internal control over financial reporting but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

Critical Audit Matters
Critical audit matters are matters arising from the current period audit of the financial statements that were communicated or required to be communicated to the audit committee and that: (1) relate to accounts or disclosures that are material to the financial statements and (2) involved our especially challenging, subjective, or complex judgments. We determined that there are no critical audit matters.

/s/ RSM US LLP

We have served as the Company's auditor since 2017.

Boston, Massachusetts
March 14, 2023

YIELD10 BIOSCIENCE, INC.

CONSOLIDATED BALANCE SHEETS
(In thousands, except share and per share amounts)

	December 31, 2022	December 31, 2021
Assets		
Current Assets:		
Cash and cash equivalents	$ 2,356	$ 5,329
Short-term investments	1,991	10,661
Accounts receivable	—	164
Unbilled receivables	30	34
Prepaid expenses and other current assets	641	436
Total current assets	5,018	16,624
Restricted cash	264	264
Property and equipment, net	775	890
Right-of-use assets	1,961	2,354
Other assets	67	283
Total assets	$ 8,085	$ 20,415
Liabilities and Stockholders' Equity		
Current Liabilities:		
Accounts payable	$ 109	$ 83
Accrued expenses	926	1,136
Lease liabilities	575	514
Total current liabilities	1,610	1,733
Lease liabilities, net of current portion	2,075	2,656
Total liabilities	3,685	4,389
Commitments and contingencies (Note 7)		
Stockholders' Equity:		
Preferred stock ($0.01 par value per share); 5,000,000 shares authorized; no shares issued or outstanding	—	—
Common stock ($0.01 par value per share); 60,000,000 shares authorized at December 31, 2022 and 2021, and 4,944,202 and 4,881,851 shares issued and outstanding at December 31, 2022 and 2021, respectively	49	49
Additional paid-in capital	404,277	402,283
Accumulated other comprehensive loss	(229)	(175)
Accumulated deficit	(399,697)	(386,131)
Total stockholders' equity	4,400	16,026
Total liabilities and stockholders' equity	$ 8,085	$ 20,415

The accompanying notes are an integral part of these consolidated financial statements.

YIELD10 BIOSCIENCE, INC.

CONSOLIDATED STATEMENTS OF OPERATIONS
(In thousands, except share and per share amounts)

	Years Ended December 31,	
	2022	**2021**
Revenue:		
Grant revenue	$ 450	$ 614
Total revenue	450	614
Expenses:		
Research and development	7,750	6,201
General and administrative	6,151	6,105
Total expenses	13,901	12,306
Loss from operations	(13,451)	(11,692)
Other income (expense):		
Gain on investment in related party	—	700
Other income (expense), net	41	(3)
Total other income (expense)	41	697
Loss from operations before income taxes	(13,410)	(10,995)
Income tax provision	(156)	(36)
Net loss	$ (13,566)	$ (11,031)
Basic and diluted net loss per share	$ (2.76)	$ (2.33)
Number of shares used in per share calculations:		
Basic and diluted	4,914,565	4,731,833

The accompanying notes are an integral part of these consolidated financial statements.

YIELD10 BIOSCIENCE, INC.

CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS
(In thousands)

	Years Ended December 31,	
	2022	**2021**
Net loss	$ (13,566)	$ (11,031)
Other comprehensive loss:		
Change in unrealized gain (loss) on investments, net of income tax	7	(8)
Change in foreign currency translation adjustment, net of income tax	(61)	(8)
Total other comprehensive loss	(54)	(16)
Comprehensive loss	$ (13,620)	$ (11,047)

The accompanying notes are an integral part of these consolidated financial statements.

YIELD10 BIOSCIENCE, INC.

CONSOLIDATED STATEMENTS OF CASH FLOWS
(In thousands)

	Years Ended December 31,	
	2022	**2021**
Cash flows from operating activities		
Net loss	$ (13,566)	$ (11,031)
Adjustments to reconcile net loss to cash used in operating activities:		
Depreciation and amortization	263	220
Expense for 401(k) company common stock match	133	112
Stock-based compensation	1,903	1,675
Noncash lease expense	393	358
Deferred tax asset	165	35
Changes in operating assets and liabilities:		
Accounts receivable	164	(78)
Unbilled receivables	4	(7)
Prepaid expenses and other assets	(160)	63
Accounts payable	26	23
Accrued expenses	(209)	(160)
Lease liabilities	(520)	(463)
Net cash used in operating activities	(11,404)	(9,253)
Cash flows from investing activities		
Purchase of property and equipment	(154)	(189)
Purchase of investments	(2,445)	(10,639)
Proceeds from sale and maturity of short-term investments	11,121	6,250
Net cash provided by (used in) investing activities	8,522	(4,578)
Cash flows from financing activities		
Proceeds from warrants exercised	—	3,856
Proceeds from securities offerings, net of issuance costs	—	11,993
Taxes paid on employees' behalf related to vesting of stock awards	(37)	(103)
Net cash (used in) provided by financing activities	(37)	15,746
Effect of exchange rate changes on cash, cash equivalents and restricted cash	(54)	(9)
Net (decrease) increase in cash, cash equivalents and restricted cash	(2,973)	1,906
Cash, cash equivalents and restricted cash at beginning of year	5,593	3,687
Cash, cash equivalents and restricted cash at end of year	$ 2,620	$ 5,593
Supplemental Cash Flow Disclosure:		
Interest paid	$ 10	$ 9

The accompanying notes are an integral part of these consolidated financial statements

YIELD10 BIOSCIENCE, INC.

CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(In thousands, except share amounts)

	Common Stock					
	Shares	Par Value	Additional Paid-In Capital	Accumulated Other Comprehensive Income (Loss)	Accumulated Deficit	Total Stockholders' Equity
Balance, December 31, 2020	3,334,048	$ 33	$ 384,758	$ (159)	$ (375,100)	$ 9,532
Stock-based compensation expense	—	—	1,685	—	—	1,685
Issuance of common stock for 401(k) match	13,611	—	109	—	—	109
Issuance of common stock upon vesting of restricted stock units	12,219	—	—	—	—	—
Taxes paid on employees' behalf related to vesting of stock awards	—	—	(102)	—	—	(102)
Issuance of common stock for warrant exercises	481,973	5	3,851	—	—	3,856
Issuance of common stock in connection with stock offering, net of offering costs of $747	1,040,000	11	11,982	—	—	11,993
Effect of foreign currency translation	—	—	—	(16)	—	(16)
Net loss	—	—	—	—	(11,031)	(11,031)
Balance, December 31, 2021	4,881,851	$ 49	$ 402,283	$ (175)	$ (386,131)	$ 16,026
Stock-based compensation expense	—	—	1,903	—	—	1,903
Issuance of common stock for 401(k) match	36,706	—	128	—	—	128
Issuance of common stock upon vesting of restricted stock units	25,645	—	—	—	—	—
Taxes paid on employees' behalf related to vesting of stock awards	—	—	(37)	—	—	(37)
Effect of foreign currency translation and unrealized loss on investments	—	—	—	(54)	—	(54)
Net loss	—	—	—	—	(13,566)	(13,566)
Balance, December 31, 2022	4,944,202	$ 49	$ 404,277	$ (229)	$ (399,697)	$ 4,400

The accompanying notes are an integral part of these consolidated financial statements

YIELD10 BIOSCIENCE, INC.

NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS
(In thousands, except for share and per share amounts)

1. Nature of Business and Basis of Presentation

Yield10 Bioscience, Inc. ("Yield10" or the "Company") is an agricultural bioscience company that is developing the oilseed Camelina sativa ("Camelina") as a platform crop for large scale production of low carbon sustainable seed products to address 1) petroleum replacement markets: Camelina oil for use as a biofuel feedstock and PHA bioplastics produced in Camelina seed for use as a biodegradable bioplastic; and 2) food and nutrition markets: omega-3 (EPA, DHA+EPA) oils produced in Camelina seed for aquaculture and nutraceuticals; and for protein meal for animal feed markets. The commercial plan is based on developing and releasing a series of proprietary elite Camelina seed varieties incorporating genetic traits from the Company's development pipeline which offer improved on-farm performance that will lead to increased acreage and seed product revenue. Yield10 also plans to create additional value for its shareholders by licensing yield and seed oil traits from the Company's pipeline to large seed companies for commercialization in major food crops, including corn, soybean and canola. Yield10 is headquartered in Woburn, Massachusetts and has an Oilseed Center of Excellence in Saskatoon, Saskatchewan, Canada. Yield10's wholly-owned Canadian subsidiary, Metabolix Oilseeds Inc., changed its name to Yield10 Oilseeds Inc. ("YOI") effective July 12, 2022, in order to better align the name with the Company's branding.

The accompanying consolidated financial statements have been prepared on a basis which assumes that the Company will continue as a going concern and which contemplates the realization of assets and satisfaction of liabilities and commitments in the normal course of business. With the exception of a single year, the Company has recorded losses since its initial founding, including its fiscal year ending December 31, 2022. The Company ended 2022 with unrestricted cash, cash equivalents and short-term investments of $4,347.

The Company follows the guidance of Accounting Standards Codification ("ASC") Topic 205-40, *Presentation of Financial Statements-Going Concern*, in order to determine whether there is substantial doubt about its ability to continue as a going concern for one year after the date its consolidated financial statements are issued. The Company's ability to continue operations after its current cash resources are exhausted depends on its ability to obtain additional financing through, among other sources, public or private equity financing, secured or unsecured debt financing, equity or debt bridge financing, warrant holders' ability and willingness to exercise the Company's outstanding warrants, additional research grants or collaborative arrangements with third parties, as to which no assurance can be given. Management does not know whether additional financing will be available on terms favorable or acceptable to the Company when needed, if at all. If adequate additional funds are not available when required, management will be forced to curtail the Company's research efforts, explore strategic alternatives and/or wind down the Company's operations and pursue options for liquidating its remaining assets, including intellectual property and equipment. Based on its current cash forecast, management has determined that the Company's present capital resources will not be sufficient to fund its planned operations for at least one year from when these consolidated financial statements are available to be issued, which raises substantial doubt as to the Company's ability to continue as a going concern. This forecast of cash resource is forward-looking information that involves risks and uncertainties, and the actual amount of expenses could vary materially and adversely as a result of a number of factors.

If the Company issues equity or debt securities to raise additional funds, (i) the Company may incur fees associated with such issuance, (ii) its existing stockholders may experience dilution from the issuance of new equity securities, (iii) the Company may incur ongoing interest expense and be required to grant a security interest in Company assets in connection with any debt issuance, and (iv) the new equity or debt securities may have rights, preferences and privileges senior to those of the Company’s existing stockholders. In addition, utilization of the Company’s net operating loss and research and development credit carryforwards may be subject to significant annual limitations under Section 382 of the Internal Revenue Code of 1986, as amended, (the "Internal Revenue Code") due to ownership changes resulting from equity financing transactions. If the Company raises additional funds through collaboration, licensing or other similar arrangements, it may be necessary to relinquish valuable rights to its potential products or proprietary technologies or grant licenses on terms that are not favorable to the Company.

On January 30, 2020, the World Health Organization ("WHO") announced a global health emergency because of a new strain of coronavirus originating in Wuhan, China ("COVID-19") and the risks to the international community as the virus spreads globally beyond its point of origin. In March 2020, the WHO classified COVID-19 outbreak as a pandemic, based on the rapid increase in exposure globally. The full impact of the COVID-19 pandemic continues to evolve as of the

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date of this report. As such, the full magnitude that the pandemic will have on the Company's financial condition, liquidity and future results of operations is uncertain. While management currently expects the impact of COVID-19 to be temporary, there is uncertainty around the duration and its broader impact on the economy and therefore the effects it will have on Yield10's financial condition, liquidity, operations, suppliers, industry, and workforce in future periods.

2. Summary of Significant Accounting Policies

Basis of Presentation

The accompanying consolidated financial statements are presented in U.S. dollars and are prepared in accordance with accounting standards set by the Financial Accounting Standards Board ("FASB"). The FASB sets generally accepted accounting principles ("GAAP") that the Company follows to ensure its financial condition, results of operations, and cash flows are consistently reported. References to GAAP issued by the FASB in these notes to the consolidated financial statements are to the FASB Accounting Standards Codification ("ASC").

Principles of Consolidation

The Company's consolidated financial statements are prepared in accordance with accounting principles generally accepted in the United States of America. The consolidated financial statements include the accounts of the Company and its wholly-owned subsidiaries. All intercompany transactions were eliminated, including transactions with its subsidiaries, Yield10 Oilseeds Inc. and Yield10 Bioscience Securities Corp.

Use of Estimates

The preparation of financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the consolidated financial statements and the reported amounts of revenues and expenses during the reporting periods. Actual results could differ from those estimates.

Cash, Cash Equivalents and Restricted Cash

The Company considers all highly liquid investments purchased with an original maturity date of ninety days or less at the date of purchase to be cash equivalents.

The following table provides a reconciliation of cash, cash equivalents and restricted cash reported within the Company's consolidated balance sheets included herein:

	December 31, 2022	December 31, 2021
Cash and cash equivalents	$ 2,356	$ 5,329
Restricted cash	264	264
Total cash, cash equivalents and restricted cash	$ 2,620	$ 5,593

Amounts included in restricted cash represent those required to be set aside by contractual agreement. Restricted cash of $264 at December 31, 2022 and December 31, 2021, primarily consists of funds held in connection with the Company's lease agreement for its Woburn, Massachusetts facility.

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Investments

Investments represent holdings of available-for-sale marketable debt securities acquired in accordance with the Company's investment policy. The Company considers all investments purchased with an original maturity date of ninety days or more at the date of purchase and a maturity date of one year or less at the balance sheet date to be short-term investments. All other investments are classified as long-term. The Company held no long-term investments at December 31, 2022 and 2021.

Investments in marketable debt securities are recorded at fair value, with any unrealized gains and losses reported within accumulated other comprehensive income as a separate component of stockholders' equity until realized or until a determination is made that an other-than-temporary decline in market value has occurred. Other-than-temporary impairments of equity investments are recognized in the Company's statements of operations if the Company has experienced a credit loss and has the intent to sell the investment or if it is more likely than not that the Company will be required to sell the investment before recovery of the amortized cost basis. Realized gains and losses, dividends, interest income and declines in value judged to be other-than-temporary credit losses are included in other income (expense). The amortized cost of debt securities is adjusted for amortization of premiums and accretion of discounts to maturity. Such amortization and accretion together with interest on securities are included in interest income on the Company's consolidated statements of operations. The cost of marketable securities sold is determined based on the specific identification method and any realized gains or losses on the sale of investments are reflected as a component of other income (expense).

Foreign Currency Translation

Foreign denominated assets and liabilities of the Company's wholly-owned foreign subsidiary are translated into U.S. dollars at the prevailing exchange rates in effect on the balance sheet date. Revenues and expenses are translated at average exchange rates prevailing during the period. Any resulting translation gains or losses are recorded in accumulated other comprehensive income (loss) in the consolidated balance sheet. When the Company dissolves, sells or substantially sells all of the assets of a consolidated foreign subsidiary, the cumulative translation gain or loss of that subsidiary is released from comprehensive income (loss) and included within its consolidated statement of operations during the fiscal period when the dissolution or sale occurs.

Comprehensive Loss

Comprehensive loss is comprised of net loss and certain changes in stockholders' equity that are excluded from net loss. The Company includes unrealized gains and losses on debt securities and foreign currency translation adjustments in other comprehensive loss.

Concentration of Credit Risk

Financial instruments that potentially subject the Company to concentrations of credit risk primarily consist of cash and cash equivalents, restricted cash, short-term investments and accounts receivable. The Company has historically invested its cash equivalents in highly rated money market funds, corporate debt, federal agency notes and U.S. treasury notes. Investments are acquired in accordance with the Company's investment policy which establishes a concentration limit per issuer.

At December 31, 2022, the Company's unbilled receivables of $30 were due from Michigan State University ("MSU") for support to a Department of Energy funded grant under which the Company serves as a subcontractor. The Company believes these receivables have a low risk of default. At December 31, 2021, all of the Company's accounts and unbilled receivables of $198 were due from MSU for support of the DOE grant.

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Fair Value Measurements

The carrying amounts of the Company's financial instruments as of December 31, 2022 and December 31, 2021, which include cash equivalents, restricted cash, accounts receivable, unbilled receivables, accounts payable, and accrued expenses, approximate their fair values due to the short-term nature of these instruments. See Note 4 for further discussion on fair value measurements.

Segment Information

The accounting guidance for segment reporting establishes standards for reporting information on operating segments in annual financial statements. The Company is an agricultural bioscience company operating in one segment, which is the development of new technologies to enable step-change increases in crop yield to enhance global food security and production of specialty oils and niche crops. The Company's chief operating decision-maker does not manage any part of the Company separately, and the allocation of resources and assessment of performance are based on the Company's consolidated operating results.

Property and Equipment

Property and equipment are stated at cost less accumulated depreciation and amortization. Repairs and maintenance are charged to operating expense as incurred. Depreciation and amortization is computed using the straight-line method over the estimated useful lives of the assets once they are placed in service as follows:

Asset Description	Estimated Useful Life (years)
Equipment	3
Furniture and fixtures	5
Software	3
Leasehold improvements	Shorter of useful life or term of lease

Lease Accounting

As a lessee, the Company follows the lease accounting guidance codified in ASC 842. A lease is classified as a finance lease if any of five criteria described in the guidance apply to the lease and any lease not classified as a finance lease is classified as an operating lease with expense recognition occurring on a straight-line basis over the term of the lease. Under ASC 842, the Company records a lease liability on the commencement date of a lease calculated as the present value of the lease payments, using the interest rate implicit in the lease, or if that rate is not readily determinable, using the Company's incremental borrowing rate. A right-of-use asset equal to the lease liability is also recorded with adjustments made, as necessary, for lease prepayments, lease accruals, initial direct costs and lessor lease incentives that may be present within the terms of the lease. The Company adopted the short-term lease exception that permits lessees to omit leases with terms of twelve months or less from the accounting requirements of ASC 842, *Leases*.

Impairment of Long-Lived Assets

Long-lived assets, such as property and equipment and right-of-use assets, are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable. Accounting guidance further requires that companies recognize an impairment loss only if the carrying amount of a long-lived asset is not recoverable based on its undiscounted future cash flows and measure an impairment loss as the difference between the carrying amount and fair value of the asset.

Grant Revenue

The Company's source of continuing revenue is from its government research grants in which it serves as either the primary contractor or as a subcontractor. These grants are considered an ongoing major and central operation of the Company's business. Revenue is earned as research expenses related to the grants are incurred. Revenue earned on

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government grants, but not yet invoiced as of the balance sheet date, are recorded as unbilled receivables in the accompanying consolidated balance sheets for the years ended December 31, 2022 and December 31, 2021. Funds received from government grants in advance of work being performed, if any, are recorded as deferred revenue until earned.

Research and Development

All costs associated with internal research and development are expensed as incurred. Research and development expenses include, among others, direct costs for salaries, employee benefits, subcontractors, crop trials, regulatory activities, facility related expenses, depreciation, and stock-based compensation. Costs incurred for seed multiplication and processing are included within research and development expense until the Company completes its transition to established commercial operations, at which time these costs are expected to be recorded within inventory. Costs incurred in connection with government research grants are recorded as research and development expense.

General and Administrative Expenses

The Company's general and administrative expense includes costs for salaries, employee benefits, facilities expenses, consulting and professional service fees, travel expenses, depreciation and amortization expenses and office related expenses incurred to support the administrative and business development of the Company.

Intellectual Property Costs

The Company includes all costs associated with the prosecution and maintenance of patents within general and administrative expenses in the consolidated statement of operations.

Stock-Based Compensation

All stock-based payments to employees, members of the Board of Directors and non-employees are recognized within operating expense based on the straight-line recognition of their grant date fair value over the period during which the recipient is required to provide service in exchange for the award. See Note 10 for a description of the types of stock-based awards granted, the compensation expense related to such awards and detail of equity-based awards outstanding.

Basic and Diluted Net Loss per Share

Basic net loss per share is computed by dividing net loss available to common shareholders by the weighted-average number of common shares outstanding. Diluted net loss per share is computed by dividing net loss available to common shareholders by the weighted-average number of dilutive common shares outstanding during the period. Diluted shares outstanding is calculated by adding to the weighted shares outstanding any potential (unissued) shares of common stock from outstanding stock options and warrants based on the treasury stock method, as well as weighted shares outstanding of any potential (unissued) shares of common stock from restricted stock units and the conversion of preferred stock. In periods when a net loss is reported, all common stock equivalents are excluded from the calculation because they would have an anti-dilutive effect, meaning the loss per share would be reduced. Therefore, in periods when a loss is reported, basic and dilutive loss per share are the same. Common stock equivalents include stock options, restricted stock awards, convertible preferred stock and warrants.

The following potentially dilutive securities were excluded from the calculation of diluted net loss per share due to their antidilutive effect:

	Year Ended December 31,	
	2022	2021
Options	979,748	722,765
Restricted stock awards	27,123	9,430
Warrants	1,129,298	2,361,726
Total	2,136,169	3,093,921

Income Taxes

The Company accounts for income taxes using the asset and liability method, which requires the recognition of deferred tax assets and liabilities for the expected future tax consequences of events that have been recognized in the consolidated financial statements or in the Company's tax returns. Under this method, deferred tax assets and liabilities are determined based on the difference between the financial statement and tax basis of assets and liabilities using enacted tax rates in effect for the year in which the differences are expected to reverse. A valuation allowance is provided to reduce deferred tax assets to a level which, more likely than not, will be realized.

The Company accounts for uncertain tax positions using a "more-likely-than-not" threshold for recognizing and resolving uncertain tax positions. The evaluation of uncertain tax positions is based on factors that include, but are not limited to, changes in tax law, the measurement of tax positions taken or expected to be taken in tax returns, the effective settlement of matters subject to audit, new audit activity and changes in facts or circumstances related to a tax position. The provision for income taxes includes the effects of any resulting tax reserves or unrecognized tax benefits that are considered appropriate as well as the related net interest and penalties, if any. The Company evaluates uncertain tax positions on a quarterly basis and adjusts the level of the liability to reflect any subsequent changes in the relevant facts surrounding the uncertain positions.

See Note 13 for further discussion of income taxes. The Company had no amounts recorded for unrecognized tax expense or benefits as of December 31, 2022 and 2021.

Recent Accounting Standards Changes

From time to time, new accounting pronouncements are issued by the Financial Accounting Standards Board ("FASB") or other standard setting bodies that the Company adopts as of the specified effective date.

In November 2021, the FASB issued ASU 2021-10, *Government Assistance (Topic 832) - Disclosures by Business Entities about Government Assistance*. This ASU requires annual disclosures that are expected to increase the transparency of transactions with a government accounted for by applying a grant or contribution accounting model by analogy, including (1) the nature of the transactions and the form in which assistance has been received, (2) the accounting policy applied, and (3) the balance sheet and income statement line items that are affected by the transactions, and the amounts applicable to each financial statement line item. This ASU became effective for annual periods beginning after December 15, 2021. The adoption of this standard did not materially impact the Company’s consolidated financial statements for the year ended December 31, 2022.

The following new pronouncement is not yet effective but may impact the Company's consolidated financial statements in the future.

In June 2016, the FASB issued ASU No. 2016-13, *Financial Instruments-Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments.* The FASB subsequently issued amendments to ASU 2016-13, which have the same effective date and transition date as the initial pronouncement. This standard requires entities to estimate an expected lifetime credit loss on financial assets ranging from short-term trade accounts receivable to long-term financings and report credit losses using an expected losses model rather than the incurred losses model that was previously used, and establishes additional disclosures related to credit risks. For available-for-sale debt securities with unrealized losses, this standard now requires allowances to be recorded instead of reducing the amortized cost of the investment. This standard limits the amount of credit losses to be recognized for available-for-sale debt securities to the amount by which carrying value exceeds fair value and requires the reversal of previously recognized credit losses if fair value increases. The guidance is effective for fiscal years beginning after December 15, 2022 for SEC filers that are eligible to be smaller reporting companies under the SEC’s definition, and interim periods within those fiscal years. The Company does not expect the adoption of this guidance to have a material impact on its consolidated financial statements.

3. INVESTMENTS

The Company's investments consist of the following:

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	Accumulated Cost at December 31, 2022	Unrealized Gain	Unrealized (Loss)	Market Value at December 31, 2022
Short-term investments				
U.S. government and agency securities	$ 1,992	$ —	$ (1)	$ 1,991
Total	$ 1,992	$ —	$ (1)	$ 1,991

	Accumulated Cost at December 31, 2021	Unrealized Gain	Unrealized (Loss)	Market Value at December 31, 2021
Short-term investments				
U.S. government and agency securities	$ 10,669	$ —	$ (8)	$ 10,661
Total	$ 10,669	$ —	$ (8)	$ 10,661

All short-term investments are classified as available for sale as of December 31, 2022 and December 31, 2021. The Company held no long-term investments at December 31, 2022 and December 31, 2021.

4. Fair Value Measurements

The Company has certain financial assets recorded at fair value which have been classified as Level 1 and Level 2 within the fair value hierarchy as described in the accounting standards for fair value measurements. Fair value is the price that would be received from the sale of an asset or the price paid to transfer a liability in an orderly transaction between independent market participants at the measurement date. Fair values determined by Level 1 inputs utilize observable data such as quoted prices in active markets for identical instruments. Fair values determined by Level 2 inputs utilize data points other than quoted prices in active markets that are observable either directly or indirectly. Fair values determined by Level 3 inputs utilize unobservable data points in which there is little or no market data, which require the reporting entity to develop its own assumptions. The fair value hierarchy level is determined by the lowest level of significant input.

The Company’s financial assets classified as Level 2 at December 31, 2022 and December 31, 2021 were initially valued at the transaction price and subsequently valued utilizing third-party pricing services. Because the Company’s investment portfolio may include securities that do not always trade on a daily basis, the pricing services use many observable market inputs to determine value including reportable trades, benchmark yields and benchmarking of like securities. The Company validates the prices provided by the third-party pricing services by reviewing their pricing methods and obtaining market values from other pricing sources. After completing the validation procedures, the Company did not adjust or override any fair value measurements provided by these pricing services as of December 31, 2022 and December 31, 2021.

The tables below present information about the Company’s assets and liabilities that are measured at fair value on a recurring basis as of December 31, 2022 and December 31, 2021 and indicate the fair value hierarchy of the valuation techniques utilized to determine such fair value.

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	Fair value measurements at December 31, 2022			
Description	**Quoted prices in active markets for identical assets (Level 1)**	**Significant other observable inputs (Level 2)**	**Significant unobservable inputs (Level 3)**	**Balance as of December 31, 2022**
Assets				
Cash equivalents:				
Money market funds	$ 1,633	$ —	$ —	$ 1,633
Short-term investments:				
U.S. government and agency securities	—	1,991	—	1,991
Total assets	$ 1,633	$ 1,991	$ —	$ 3,624

	Fair value measurements at December 31, 2021			
Description	**Quoted prices in active markets for identical assets (Level 1)**	**Significant other observable inputs (Level 2)**	**Significant unobservable inputs (Level 3)**	**Balance as of December 31, 2021**
Assets				
Cash equivalents:				
Money market funds	$ 4,878	$ —	$ —	$ 4,878
Short-term investments:				
U.S. government and agency securities	—	10,661	—	10,661
Total assets	$ 4,878	$ 10,661	$ —	$ 15,539

There were no transfers of financial assets or liabilities between category levels for the years ended December 31, 2022 and December 31, 2021.

5. Property and Equipment, Net

Property and equipment consist of the following:

	Year ended December 31,	
	2022	**2021**
Equipment	$ 533	$ 581
Furniture and fixtures	59	43
Leasehold improvements	1,425	1,420
Software	—	14
Total property and equipment, at cost	2,017	2,058
Less: accumulated depreciation and amortization	(1,242)	(1,168)
Property and equipment, net	$ 775	$ 890

Depreciation and amortization expense for the years ended December 31, 2022 and December 31, 2021, was $263 and $220, respectively.

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6. Accrued Expenses

Accrued expenses consist of the following:

	Year ended December 31,	
	2022	2021
Employee compensation and benefits	$ 39	$ 452
Leased facilities	81	71
Professional services	264	264
Field trials and related expenses	273	97
Other	269	252
Total accrued expenses	$ 926	$ 1,136

7. Commitments and Contingencies

Contractual Commitments

Exclusive Collaboration Agreement with Rothamsted Research ("Rothamsted")

On November 12, 2020, the Company signed an exclusive collaboration agreement with UK-based Rothamsted to support Rothamsted's program to develop omega-3 oils in Camelina sativa. Under the agreement, Yield10 is providing Rothamsted with financial support for ongoing research including further EPA, DHA+EPA trait improvement, field testing and nutritional studies. The Company will pay Rothamsted quarterly research funding and option fees of $31 for two years totaling $250, of which $31 remains outstanding as of December 31, 2022. Included within the agreement, the Company had an exclusive two-year option to sign a global, exclusive or non-exclusive license agreement to the technology. In November 2022, Yield10 and Rothamsted agreed to extend the collaboration agreement, including the license option, without additional funding support, through December 31, 2023.

License Agreement with the University of Missouri ("UM")

Pursuant to a license agreement with UM dated as of May 17, 2018, Yield10 has an exclusive, worldwide license to two novel gene technologies to boost oil content in crops. Both technologies are based on significant new discoveries around the function and regulation of ACCase, a key rate-limiting enzyme involved in oil production. The UM license was expanded during May 2019 to include an exclusive worldwide license to a third gene in the ACCase complex, that the Company has designated C3012, that may complement the activity of C3007 to boost oil content in crops.

Pursuant to the UM license agreement, the Company is required to use diligent efforts to develop licensed products throughout the licensed field and to introduce licensed products into the commercial market. The Company's failure to achieve any milestone provided for under the license agreement would give UM the right to terminate the license agreement or render it nonexclusive, unless the Company is able to reach agreement with UM as to the potential adjustment of the applicable milestone.

The Company is obligated to pay UM a license execution payment, milestone payments relating to any regulatory filings and approvals covered by the license agreement, royalties on any sales of licensed products following regulatory approval, as well as a percentage of any sublicense royalties, if any, related to the licensed products. The Company or UM may terminate the license agreement in accordance with the terms of the agreement.

Guaranteed Minimum Payments to Growers.

As an incentive for growers located in Canada and the U.S. to enter into Camelina commercial grain production contracts with the Company for the 2022/2023 winter season, Yield10 offered minimum guaranteed payments per acre that

reduce the growers' risk of financial loss. These minimum payments, which are being accrued on a straight-line basis over the expected winter growing season, are conditional upon each grower fulfilling their contractual responsibilities and are reduced by the price of Yield10's Camelina planting seed and the contractual price that the Company will pay for the actual amount of grain that is harvested. Although the Company anticipates that the payment of these guaranteed amounts will not be required under normal growing conditions, for the 2022/2023 winter season the maximum amount of these grain production guarantees is approximately $320. As of December 31, 2022, the Company has recorded an accrual of approximately $25 for these minimum guaranteed payments, net of the growers' obligation to pay for the planting seed.

Facility Leases

The Company leases facilities under non-cancelable leases expiring at various dates through November 30, 2026. See Note 11.

Litigation

From time to time, the Company may be subject to legal proceedings and claims in the ordinary course of business. The Company is not currently aware of any such proceedings or claims that it believes will have, individually or in the aggregate, a material adverse effect on the business, financial condition or the results of operations.

Guarantees

As of December 31, 2022, and December 31, 2021, the Company did not have significant liabilities recorded for guarantees.

The Company enters into indemnification provisions under various agreements with other companies in the ordinary course of business, typically with business partners, contractors, and customers. Under these provisions, the Company generally indemnifies and holds harmless the indemnified party for losses suffered or incurred by the indemnified party as a result of its activities. These indemnification provisions generally survive termination of the underlying agreement. The maximum potential amount of future payments the Company could be required to make under these indemnification provisions is unlimited. However, to date Yield10 Bioscience has not incurred material costs to defend lawsuits or settle claims related to these indemnification provisions. As a result, the estimated fair value of these agreements is minimal. Accordingly, the Company has no liabilities recorded for these agreements as of December 31, 2022 and December 31, 2021.

8. License Agreements

In September 2017, the Company granted a license to Bayer to evaluate the Company's novel C3003 and C3004 yield traits in soybean. Under this license, Bayer had the non-exclusive right to work with C3003 in its soybean program as a strategy to improve seed yield. In December 2022, the Company and Bayer terminated the license in accordance with its terms.

In September 2018, the Company granted a four-year, non-exclusive license, as amended, to Forage Genetics International, LLC, a subsidiary of Land O'Lakes, Inc., to evaluate five of the Company's novel traits in forage sorghum. The traits included in the research license include C3003 as well as four traits from the Company's GRAIN platform; C4001, C4002, C4003 and C4029. In September 2022, the license terminated in accordance with its terms.

In October 2019, the Company granted a non-exclusive license to J. R. Simplot ("Simplot"), to evaluate three of the Company's novel traits in potato. Under the license agreement, Simplot plans to conduct research with the yield traits C3003, C3004 and C4001 within its research and development program as a strategy to improve crop performance and sustainability. In September 2022, the Company and Simplot amended the license agreement in order to extend it for a fourth year.

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In August 2020, the Company entered into a non-exclusive research agreement with GDM ("GDM"), a company specializing in plant genetics, to evaluate novel traits in soybean. Under the terms of the agreement, GDM is working with the Company's yield traits within its research and development program as a strategy to improve soybean yield performance and sustainability. The research agreement includes three novel yield traits in the first phase with the potential to expand the program to more traits in the future.

None of these research arrangements provide significant licensing revenue to the Company while the third parties perform trait evaluations.

9. Capital Stock and Warrants

Common Stock

Registered Public Offerings

On February 3, 2021, the Company completed a public offering of 1,040,000 shares of its common stock at a public offering price of $12.25 per share for total gross proceeds of $12,740 before issuance costs of $747.

Preferred Stock

The Company's certificate of incorporation, as amended and restated, authorizes it to issue up to 5,000,000 shares of $0.01 par value preferred stock.

Warrants

The following table summarizes information with regard to outstanding warrants to purchase common stock as of December 31, 2022:

Issuance	Number of Common Shares Issuable Upon Exercise of Outstanding Warrants	Exercise Price	Expiration Date
November 2019 Public Offering - Series B	395,528	$ 8.00	May 19, 2027
November 2019 Private Placement - Series B	718,750	$ 8.00	May 19, 2027
July 2017 Registered Direct Offering	14,270	$ 201.60	January 7, 2024
Consultant	750	$ 116.00	September 11, 2024
Total	1,129,298		

Effective May 19, 2022, 1,071,453 Series A warrants issued in the Company's November 2019 public and private securities offerings expired in accordance with the terms of the respective purchase agreement under which the securities had been issued. In addition, 160,975 Series A warrants issued in the Company's December 2017 securities offering also expired in accordance with the terms of their securities purchase agreement.

During the year ended December 31, 2021, a combined total of 481,973 Series A and Series B warrants issued in the Company's November 2019 securities offering were exercised by warrant holders, providing the Company with $3,856 in cash proceeds.

Reserved Shares

The following shares of common stock were reserved for future issuance upon exercise of stock options, vesting of Restricted Stock Units ("RSUs") and conversion of outstanding warrants:

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	December 31, 2022	December 31, 2021
Stock Options	979,748	722,765
RSUs	27,123	9,430
Warrants	1,129,298	2,361,726
Total number of common shares reserved for future issuance	2,136,169	3,093,921

10. Stock-Based Compensation

Stock Option Plans

The Company adopted a stock plan in 2006 (the "2006 Plan"), which provided for the granting of incentive stock options, non-qualified stock options, stock appreciation rights, deferred stock awards, restricted stock awards, unrestricted stock awards, cash-based awards and dividend equivalent rights. In October 2014, the 2006 Plan was terminated, and the Company adopted a new plan (the "2014 Plan"). No further grants or awards were subsequently made under the 2006 Plan. A total of 3,662 options were awarded from the 2006 Plan and as of December 31, 2022, 159 of these options remain outstanding and eligible for future exercise.

The 2014 Plan provides for the granting of incentive stock options, non-qualified stock options, stock appreciation rights, deferred stock awards, restricted stock awards, unrestricted stock awards, cash-based awards and dividend equivalent rights. In May 2018, the 2014 Plan was terminated, and the Company adopted a new 2018 Stock Option and Incentive Plan, which was amended in May 2020 (the "2018 Stock Plan"). A total of 16,896 options were awarded from the 2014 Plan and as of December 31, 2022, 15,990 of these options remain outstanding and eligible for future exercise. A total of 3,619 restricted stock awards were awarded from the 2014 Plan and as of December 31, 2022, all of these restricted stock awards have vested. No further stock awards may be issued from the 2014 Plan.

The 2018 Stock Plan initially reserved for issuance 32,500 shares of the Company's common stock for grants of incentive stock options, non-qualified stock options, stock grants and other stock-based awards. In accordance with the terms of the 2018 Stock Plan, beginning on the first day in January 2019, the Company's Board of Directors has annually approved the addition of shares to the 2018 Stock Plan in amounts equal to 5% of the outstanding shares of the Company's common stock on the day prior to the increase. Effective January 1, 2022 and January 1, 2021, Yield10's Board of Directors approved the addition of 247,210 and 244,092 shares, respectively. At its annual meeting of stockholders held on May 24, 2021, stockholders approved an amendment to add 300,000 more shares to the Company's 2018 Stock Plan. As of December 31, 2022, a total of 1,059,719 options and restricted stock awards have been issued from the 2018 Stock Plan, and as of that date, 990,243 options and restricted stock awards remain outstanding.

Expense Information for Stock Awards

The Company recognized stock-based compensation expense, related to employee stock awards, including awards to non-employees and members of the Board of Directors, of $1,903 and $1,675 for the years ended December 31, 2022 and 2021, respectively. At December 31, 2022, there was approximately $3,189 of stock-based compensation expense related to unvested awards not yet recognized which is expected to be recognized over a weighted average period of 2.42 years.

Stock Options

Options granted under the 2006 Plan, 2014 Plan and 2018 Stock Plan generally vest ratably over periods of one to four years from the date of hire for new employees, the date of award for existing employees, or date of commencement of services with the Company for non-employees, and generally expire ten years from the date of issuance. The Company's policy is to issue new shares upon the exercise of stock options.

YIELD10 BIOSCIENCE, INC.

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A summary of the activity related to the shares of common stock covered by outstanding options is as follows:

	Number of Shares	Weighted Average Exercise Price	Remaining Contractual Term (in years)	Aggregate Intrinsic Value
Balance at December 31, 2020	339,108	$ 32.39	9.02	$ —
Granted	386,017	10.08		
Exercised	—	—		
Forfeited	(1,509)	12.92		
Expired	(851)	1,131.62		
Balance at December 31, 2021	722,765	$ 19.22	8.79	$ —
Granted	260,285	3.72		
Exercised	—	—		
Forfeited	(1,859)	7.55		
Expired	(1,443)	712.92		
Balance at December 31, 2022	979,748	$ 14.10	8.15	$ —
Vested and expected to vest at December 31, 2022	979,748	$ 14.10	8.15	$ —
Exercisable at December 31, 2022	437,039	$ 23.03	7.69	$ —

The weighted average grant date fair value per share of options granted during fiscal years 2022 and 2021, was $3.31 and $8.99, respectively. No options were exercised during 2022 and 2021, and therefore the intrinsic value for exercised options during the two years was not applicable. The weighted average remaining contractual term for options outstanding as of December 31, 2022 was 8.15 years.

For the years ended December 31, 2022, and 2021, the Company determined the fair value of stock options using the Black-Scholes option-pricing model with the following assumptions for option grants, respectively:

	Year Ended December 31,	
	2022	2021
Expected dividend yield	—	—
Risk-free rate	1.6% - 4.3%	0.7% - 1.7%
Expected option term (in years)	6.2 - 10.0	6.1 - 10.0
Volatility	116% - 126%	118% - 128%

The Company determined its volatility assumption based on actual market price fluctuations experienced during its trading history. The risk-free interest rate used for each grant is equal to the U.S. Treasury yield curve in effect at the time of grant for instruments with a term similar to the expected life of the related option. The expected term of the options is based upon evaluation of historical and expected future exercise behavior.

The stock price volatility and expected terms utilized in the calculation involve management's best estimates at that time, both of which impact the fair value of the option calculated under the Black-Scholes methodology and, ultimately, the expense that will be recognized over the life of the option. The accounting standard for stock-based compensation requires that the Company recognize compensation expense for only the portion of options that vest. The Company recognizes stock option forfeitures resulting from award terminations in the period in which the forfeiture occurs.

Restricted Stock Units ("RSUs")

The Company records stock compensation expense for RSUs on a straight-line basis over their requisite service period, which approximates the vesting period, based on each RSU's award date market value. As RSUs vests, the Company

(In thousands, except for share and per share amounts)

withholds a number of shares from its employees with an aggregate fair market value equal to the minimum tax withholding amount (unless the employee makes other arrangements for payment of the tax withholding) from the common stock issuable at the vest date. The Company then pays the minimum required income tax for the employees. During the years ended December 31, 2022 and December 31, 2021, the Company withheld vested shares with a fair value of $37 and $102, respectively, to pay for minimum tax withholding associated with RSU vesting.

A summary of RSU activity for the year ended December 31, 2022 is as follows:

	Number of RSUs	Weighted Average Remaining Contractual Life (years)
Outstanding at December 31, 2021	9,430	
Awarded	54,250	
Released	(36,557)	
Forfeited	—	
Outstanding at December 31, 2022	27,123	0.11
Weighted average remaining recognition period (years)	0.11	

11. LEASES

Maturity Analysis of Lease Liabilities

The Company's Woburn, Massachusetts facility is the only lease included in the Company's right-of-use assets and corresponding lease liabilities. No other active real estate or equipment leases fall within the scope of ASC 842. At December 31, 2022, the Company's lease liability related to its Woburn facility will mature as follows:

Year ended December 31,	Undiscounted Cash Flows
2023	$ 749
2024	771
2025	793
2026	747
Total undiscounted future lease payments	3,060
Amount of lease payments representing interest	(410)
Total lease liabilities	$ 2,650
Short-term lease liabilities	$ 575
Long-term lease liabilities	$ 2,075

Quantitative Disclosure of Lease Costs

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	Year Ended December 31,	
	2022	**2021**
Lease cost:		
Operating lease cost	$ 605	$ 605
Short-term lease cost	696	655
Sublease income	(605)	(616)
Total lease cost, net	$ 696	$ 644

Other information as of:	**December 31, 2022**	**December 31, 2021**
Weighted-average remaining lease term (years)	3.9	4.9
Weighted-average discount rate	7.25%	7.25%

Real Estate Leases

During 2016, the Company entered into a lease agreement, as amended, for its headquarters, pursuant to which the Company leased 22,213 square feet of office and research and development space located at 19 Presidential Way, Woburn, Massachusetts. The lease will terminate on November 30, 2026 and does not include options for an early termination or for an extension of the lease. Pursuant to the lease, the Company is required to pay certain pro rata taxes and operating costs associated with the premises throughout the term of the lease. During the initial buildout of the rented space, the landlord paid for tenant improvements to the facility that resulted in increased rental payments by the Company. As required by ASC 842, these improvements were recorded as a reduction in the valuation of the associated right-of-use asset. The Company has provided the landlord with a security deposit of $229.

In October 2016, the Company entered into a sublease agreement with a subsidiary of CJ CheilJedang Corporation ("CJ") with respect to CJ's sublease of 9,874 square feet of its leased facility located in Woburn, Massachusetts. The sublease space was determined to be in excess of the Company's needs. The CJ sublease is coterminous with the Company's master lease and CJ will pay pro rata rent and operating expenses proportionate to the amounts payable to the landlord by the Company, as adjusted from time to time in accordance with the terms of the master lease. Future CJ sublease payments have not been presented as an offset to total undiscounted future lease payments of $3,060 shown in the lease maturity analysis table above. CJ provided the Company with a security deposit of $103 in the form of an irrevocable letter of credit.

The Company's wholly-owned subsidiary, YOI, located in Saskatoon, Saskatchewan, Canada, leases approximately 9,600 square feet of office, laboratory and greenhouse space located within Innovation Place at 410 Downey Road and within the research facility of National Research Council Canada located at 110 Gymnasium Place. None of these leases contains renewal or early termination options. YOI's leases for these facilities expire on various dates through September 2023.

12. Income Taxes

Income Taxes and Deferred Tax Assets and Liabilities

The components of loss from operations before provision for income taxes consist of the following:

	Year Ended December 31,	
	2022	**2021**
Domestic	$ (13,504)	$ (11,062)
Foreign	94	67
Net loss from operations before income tax provision	$ (13,410)	$ (10,995)

YIELD10 BIOSCIENCE, INC.

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The components of the income tax provision consisted of the following for the years ended December 31, 2022 and 2021:

	Year Ended December 31,	
	2022	**2021**
Current Tax Provision:		
Federal	$ —	$ —
State	—	—
Foreign	—	—
Total current	—	—
Deferred Tax Benefit:		
Federal	—	—
State	—	—
Foreign	156	36
Total deferred	156	36
Total tax provision	$ 156	$ 36

Significant components of the Company's deferred tax assets are as follows:

	Year Ended December 31,	
	2022	**2021**
Deferred Tax Assets:		
Net operating loss carryforward	$ 6,953	$ 5,533
Capitalization of research and development expense	1,841	—
Credit carryforwards	799	565
Stock compensation	1,043	886
Lease liability	733	864
Other temporary differences	—	106
Total deferred tax assets	11,369	7,954
Valuation allowance	(10,739)	(6,961)
Net deferred tax assets	630	993
Deferred Tax Liabilities:		
Depreciation	(94)	(185)
Right-of-use asset	(536)	(643)
Net deferred taxes	$ —	$ 165

YIELD10 BIOSCIENCE, INC.

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Tax Rate

The items accounting for the difference between the income tax (provision) benefit computed at the federal statutory rate of 21% and the provision for income taxes were as follows:

	Year Ended December 31,	
	2022	2021
Federal income tax at statutory federal rate	21.0 %	21.0 %
State taxes	5.9 %	5.9 %
Permanent differences	(0.3)%	(0.2)%
Tax credits	2.0 %	2.0 %
Foreign rate differential	(0.1)%	(0.1)%
Impact of ownership change	0.0 %	(267.0)%
Non-deductible equity transactions	0.0 %	0.0 %
Stock compensation	(1.6)%	(2.1)%
Other	0.0 %	(0.1)%
Change in valuation allowance	(28.1)%	240.3 %
Total	(1.2)%	(0.3)%

Tax Attributes

At December 31, 2022, the Company had U.S. net operating loss carryforwards ("NOLs") for federal and state income tax purposes of approximately $25,460 and $25,414, respectively. All of the $25,460 of federal NOLs will carry forward indefinitely. The Company's state NOL carryforwards will begin to expire on various dates through 2042. The Company also had available research and development and investment tax credits for federal and state income tax purposes of approximately $417 and $312, respectively. These federal and state credits will begin to expire on various dates through 2042. In Canada, the Company has cumulative research tax credits totaling $132 that will begin to expire on various dates through 2037.

Management of the Company has evaluated the positive and negative evidence bearing upon the realizability of its deferred tax assets ("DTA"), which is comprised principally of NOL carryforwards. Under the applicable accounting standards, management has considered the Company's history of losses and concluded that it is more likely than not that the Company will not recognize the benefits of U.S. federal and state DTAs. Accordingly, a full valuation allowance has been established against the U.S. net DTAs. The Company has also concluded, based on its financial projections, that it is more likely than not the $132 of DTAs of its wholly-owned Canadian subsidiary, YOI, may not be recognized in the future, resulting in the Company's recording of a full valuation allowance against the assets.

Utilization of the NOL and research and development credit ("R&D Credit") carryforwards may be subject to a substantial annual limitation under Section 382 of the U.S. Internal Revenue Code of 1986 (the "Code") due to ownership change limitations, as defined by the Code, that have occurred previously or that could occur in the future. These ownership changes may limit the amount of NOL and R&D Credit carryforwards that can be utilized annually to offset future U.S. taxable income and tax, respectively. The Company evaluated its Section 382 ownership changes through May 31, 2021 and has determined that the most recent change that occurred in November 2019 resulted in all NOL and R&D Credit carryforwards outstanding as of that date becoming fully limited. The Company has reduced its associated deferred tax assets accordingly. To the extent an ownership change occurs in the future, the NOL, R&D Credit carryforwards and other deferred tax assets recorded after the November 2019 ownership change may also be subject to limitations.

Other

The tax years 2019 through 2022 remain open to examination by major taxing jurisdictions to which the Company is subject, which are primarily in the U.S. The statute of limitations for NOLs utilized in future years will remain open beginning in the year of utilization.

The Company's policy is to record estimated interest and penalties related to uncertain tax positions as income tax expense. As of December 31, 2022 and 2021, the Company had no accrued interest or penalties recorded related to uncertain tax positions.

No additional provision has been made for U.S. income taxes related to the undistributed earnings of the wholly-owned subsidiaries of Yield10 or for unrecognized deferred tax liabilities for temporary differences related to investments in subsidiaries as the amounts are not significant. As such, earnings are expected to be permanently reinvested, the investments are essentially permanent in duration, or the Company has concluded that no additional tax liability will arise as a result of the distribution of such earnings. A liability could arise if amounts are distributed by such subsidiaries or if such subsidiaries are ultimately disposed. It is not practical to estimate the additional income taxes related to permanently reinvested earnings or the basis differences related to investment in subsidiaries. Unremitted earnings at December 31, 2022 and December 31, 2021 approximated $1,081 and $1,032, respectively.

13. Employee Benefits

The Company maintains a 401(k) savings plan in which substantially all of its regular U.S. employees are eligible to participate. Participants may contribute up to 60% of their annual compensation to the plan, subject to eligibility requirements and annual IRS limitations. The Company's plan provides for a matching contribution in common stock of up to 4.5% of a participant's total compensation dependent upon the level of participant contributions made during the plan year. Pursuant to this plan, the Company issued 36,706, and 13,611 shares of common stock during the years ended December 31, 2022, and December 31, 2021, respectively, and recorded $133, and $112, respectively, of related expense. Company contributions are fully vested upon issuance.

14. Government Research Grants

Canadian Research Grant

On February 26, 2021, YOI received a research grant through the Industrial Research Assistance Program ("IRAP") administered by National Research Council Canada ("NRC"). The objective of the grant was to provide financial research assistance to innovative, early-stage small and medium-sized enterprises. Under the terms of the agreement, NRC agreed to contribute up to a maximum of $39 for payroll costs incurred by YOI during the period December 20, 2020 - March 13, 2021. During the first quarter of 2021, YOI submitted claims for eligible payroll costs and recognized grant revenue for the full amount of the award.

U.S. Research Grants

During 2018, the Company entered into a sub-award with Michigan State University ("MSU") to support a Department of Energy ("DOE") funded grant entitled "*A Systems Approach to Increasing Carbon Flux to Seed Oil.*" The Company's participation under this five-year grant has been awarded incrementally on an annual basis with the first year commencing September 15, 2017. Total funding for this sub-award in the amount of $2,957 was appropriated by the U.S. Congress through the final contractual year ending in September 2022. During the years ended December 31, 2022 and December 31, 2021, Yield10 recognized grant revenue of $450 and $575, respectively, from this sub-award.

As of December 31, 2022, final proceeds of $60 remain to be earned from the MSU sub-award. During June 2022, the parties amended the sub-award to extend its termination date to September 14, 2023, allowing Yield10 time to utilize the remaining grant funds.

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15. Geographic Information

The geographic distribution of the Company's revenues and long-lived assets are summarized in the table below. Foreign revenue is based on the country in which the Company's subsidiary that earned the revenue is domiciled.

	U.S.	Canada	Total
Year Ended December 31, 2022			
Revenue	$ 450	$ —	$ 450
Identifiable long-lived assets	$ 671	$ 104	$ 775
Year Ended December 31, 2021			
Revenue	$ 575	$ 39	$ 614
Identifiable long-lived assets	$ 821	$ 69	$ 890

16. Related Party Transaction

During 1999, Yield10 entered into a technology sublicense agreement with Tepha, Inc. ("Tepha"), a privately held related party engaged in the development of medical products. Yield10 received 648,149 shares of Series A Convertible Preferred Stock of Tepha ("Tepha Shares") during 2002 as consideration for outstanding license payments due to Yield10 totaling $700. During 2005, the Company determined the value of the Tepha Shares was impaired resulting in their write off through a charge to other income (expense). In May 2021, the board of directors of Tepha approved and authorized the merger of Tepha with Becton Dickinson Global Holdings, Inc. ("Becton Dickinson") and on July 26, 2021, Yield10 received cash consideration of $700 in exchange for the surrender of its Tepha Shares upon the closing of the sale of Tepha to Becton Dickinson. As a result, the Company recorded the $700 as a gain on investment in related party within other income (expense) during the year ended December 31, 2021.

17. Subsequent Event

At-The-Market ("ATM") Program

On January 24, 2023, the Company entered into an Equity Distribution Agreement (the "Sales Agreement") with Maxim Group LLC ("Maxim") under which the Company may offer and sell shares of its common stock, $0.01 par value per share, having an aggregate offering price of up to $4,200 from time to time through Maxim, acting exclusively as the Company's sales agent (the "Offering"). On January 24, 2023, the Company filed a prospectus supplement with the Securities and Exchange Commission in connection with the Offering under its existing Registration Statement on Form S-3 (File No 333-254830), which was declared effective on April 2, 2021. The Company intends to use the net proceeds of the Offering primarily for working capital and general corporate purposes. Maxim will be entitled to compensation at a fixed commission rate of 2.75% of the gross sales price per share sold. In addition, the Company agreed to reimburse Maxim for its costs and out-of-pocket expenses incurred in connection with its services, including the fees and out-of-pocket expenses of its legal counsel.

The Company is not obligated to make any sales under the Sales Agreement and no assurance can be given that the Company will sell, or the dates on which any such sales will take place. The Sales Agreement will continue until the earliest of (i) twelve (12) months following the date of the Sales Agreement, (ii) the sale of shares thereunder having an aggregate offering price of $4,200, and (iii) the termination by the Company upon the provision of ten (10) days written notice or by Maxim immediately upon written notification to the Company.

From January 24, 2023 through March 14, 2023, the Company issued 94,665 shares of common stock in connection with the ATM at per share prices between $3.03 and $4.08, resulting in net proceeds to the Company of approximately $290 after subtracting sales commissions.

Exhibit 4.1

DESCRIPTION OF THE REGISTRANT'S SECURITIES REGISTERED PURSUANT TO SECTION 12 OF THE SECURITIES EXCHANGE ACT OF 1934

Yield10 Bioscience, Inc. (the "Company" or "we") has one class of securities registered under Section 12 of the Securities Exchange Act of 1934, as amended: our common stock, par value $0.01 per share.

DESCRIPTION OF COMMON STOCK

We are authorized to issue 60,000,000 shares of common stock, par value $0.01 per share.

The following description of our common stock is a summary and does not purport to be complete. You should refer to our amended and restated certificate of incorporation and our amended and restated by-laws, both of which are incorporated by reference as exhibits to the Company's Annual Report on Form 10-K of which this exhibit is a part. The summary below is also qualified by provisions of applicable law.

General

The holders of our common stock are entitled to one vote per share on all matters submitted to a vote of our stockholders and do not have cumulative voting rights. Subject to preferences that may be applicable to any preferred stock outstanding at the time, the holders of outstanding shares of common stock are entitled to receive ratably any dividends declared by our board of directors out of assets legally available. Upon our liquidation, dissolution or winding up, holders of our common stock are entitled to share ratably in all assets remaining after payment of liabilities and the liquidation preference of any then outstanding shares of preferred stock. Holders of common stock have no preemptive or conversion rights or other subscription rights. There are no redemption or sinking fund provisions applicable to our common stock.

Transfer Agent and Registrar

The transfer agent and registrar for our common stock is American Stock Transfer & Trust Company, LLC, with offices at 6201 15th Avenue, Brooklyn, New York 11219.

Stock Exchange Listing

Our common stock is listed for quotation on the Nasdaq Capital Market under the symbol "YTEN."

CERTAIN PROVISIONS OF DELAWARE LAW AND OF THE COMPANY'S CERTIFICATE OF INCORPORATION AND BYLAWS

Anti-Takeover Provisions

We are subject to Section 203 of the Delaware General Corporation Law. Subject to certain exceptions, Section 203 prevents a publicly held Delaware corporation from engaging in a "business combination" with any "interested stockholder" for a three-year period following the time that this stockholder becomes an interested stockholder, unless the interested stockholder attained such status with the approval of our board of directors or unless the business combination is approved in a prescribed manner. A "business combination" includes, among other things, a merger or consolidation involving us and the "interested stockholder" and the sale of more than 10% of our assets. In general, an "interested stockholder" is any entity or person beneficially owning 15% or more of our outstanding voting stock and any entity or person affiliated with or controlling or controlled by such entity or person.

Charter Documents

Our amended and restated certificate of incorporation and amended and restated by-laws include a number of provisions that may have the effect of delaying, deferring or discouraging another party from acquiring control of our company or preventing changes in our management, including the following:

- *Issuance of Undesignated Preferred Stock*. Our board of directors has the authority, without further action by the stockholders, to issue up to 5,000,000 shares of undesignated preferred stock with rights, preferences and privileges designated from time to time by our board of directors without further action by stockholders. These rights, preferences and privileges could include dividend rights, conversion rights, voting rights, terms of redemption, liquidation preferences and sinking fund terms, any or all of which may be greater than the rights of common stock.

- *Size of the Board of Directors and Filling Vacancies*. The number of directors constituting our board of directors may be set only by resolution adopted by a majority vote of our entire board of directors. Any vacancy on our board of directors, however occurring, including a vacancy resulting from an increase in the size of the board of directors, may only be filled by the affirmative vote of a majority of our directors then in office, even if less than a quorum.

- *Classified Board.* Our board of directors is divided into three classes of directors, with staggered three-year terms. Only one class of directors will be elected at each annual meeting of our stockholders, with the other classes continuing for the remainder of their respective three-year terms.

- *No Cumulative Voting.* Our amended and restated certificate of incorporation, as amended, and amended and restated by-laws do not permit cumulative voting in the election of directors. Cumulative voting allows a stockholder to vote a portion, or all of its shares for one or more candidates. The absence of cumulative voting makes it more difficult for a minority stockholder to gain a seat.

- *Removal of Directors.* Directors can only be removed by our stockholders for cause and removal of a director will require a 75% stockholder vote.

- *No Written Consent of Stockholders.* All stockholder actions are required to be taken by a vote of the stockholders at an annual or special meeting. Stockholders may not take action by written consent in lieu of a meeting. The inability of stockholders to take action by written consent means that a stockholder would need to wait until the next annual or special meeting to bring business before the stockholders for a vote.

- *Special Meetings of Stockholders.* Special meetings of our stockholders may be called only by our board of directors acting pursuant to a resolution approved by the affirmative vote of a majority of the directors then in office. Only those matters set forth in the notice of the special meeting may be considered or acted upon at a special meeting of our stockholders.

- *Advance Notice Requirements for Stockholder Proposals and Director Nominations.* Our amended and restated by-laws provide advance notice procedures for stockholders seeking to bring business before our annual meeting of stockholders or to nominate candidates for election as directors at our annual meeting of stockholders. These procedures provide that notice must be given in writing not later than the close of business on the 90th day nor earlier than the close of business on the 120th day prior to the first anniversary of the preceding year's annual meeting. These procedures may have the effect of precluding the conduct of certain business at a meeting if the proper procedures are not followed or may discourage or deter a potential acquirer from conducting a solicitation of proxies to elect its own slate of directors or otherwise attempt to obtain control of us.

- *Amendment to Amended and Restated Certificate of Incorporation and By-laws.* Any amendment, repeal or modification of certain provisions of our amended and restated certificate of incorporation or amended and restated by-laws requires a 75% stockholder vote. Provisions requiring such supermajority vote include, among other things, any amendment, repeal or modification of the provisions relating to the classification of our board of directors, the requirement that stockholder actions be effected at a duly called annual or special meeting of our stockholders and the designated parties entitled to call a special meeting of our stockholders.

Exhibit 10.18

CERTAIN CONFIDENTIAL INFORMATION CONTAINED IN THIS DOCUMENT, MARKED BY [***], HAS BEEN OMITTED BECAUSE THE INFORMATION IS BOTH NOT MATERIAL AND IS THE TYPE OF INFORMATION THAT THE REGISTRANT TREATS AS PRIVATE OR CONFIDENTIAL.

OPTION AGREEMENT

ROTHAMSTED RESEARCH INSTITUTE

THIS OPTION AGREEMENT ("AGREEMENT") is made and entered into on the day that the second PARTY signs it below ("EFFECTIVE DATE") by **ROTHAMSTED RESEARCH LIMITED** a company limited by guarantee incorporated and registered in England and Wales with company number 2393175 and a not for profit charity with charity number 802038, whose registered office is at West Common, Harpenden, Hertfordshire AL5 2JQ, United Kingdom ("ROTHAMSTED") and **YIELD10 BIOSCIENCE INC.**, a corporation organized under the laws of the State of Delaware having offices at 19 Presidential Way, Woburn, MA 01801 (hereafter "COMPANY"). ROTHAMSTED and COMPANY may sometimes be referred to herein as a "PARTY" or "PARTIES" as the case may be.

WHEREAS, ROTHAMSTED has an ownership interest in the OPTION PATENT RIGHTS and OPTION KNOW-HOW (collectively, the "TECHNOLOGY"); and

WHEREAS, COMPANY is desirous of obtaining an exclusive OPTION to research and develop the TECHNOLOGY to determine COMPANY'S interest in entering into good faith negotiations for (inter alia) an exclusive royalty-bearing license under the OPTION PATENT RIGHTS to research, develop and commercialize LICENSED PRODUCTS in the OPTION TERRITORY; and

WHEREAS, ROTHAMSTED is desirous of granting such an option to COMPANY in accordance with the terms of this AGREEMENT.

NOW, THEREFORE, in consideration of the foregoing premises and the mutual promises contained herein and the payments specified hereunder, the PARTIES hereto agree as follows:

Article I. DEFINITIONS

Section 1.01 "AFFILIATE" means (a) any business entity more than fifty percent (50%) owned by LICENSEE, (b) any business entity which owns more than fifty percent (50%) of LICENSEE, or (c) any business entity that is more than fifty percent (50%) owned by a (i) business entity that owns more than fifty percent (50%) of LICENSEE or (ii) business entity of which LICENSEE owns more than fifty percent (50%).

Section 1.02 "CONTROLS" or "CONTROLLED BY" means, with respect to any KNOW-HOW or PATENT RIGHTS, the possession by a PARTY of the right to transfer or grant a license, sublicense or other rights to such KNOW-HOW or PATENT RIGHTS, as provided herein, without violating the terms of any agreement or arrangement with another party.

Section 1.03 "COVERED BY" means, when referring to an IMPROVEMENT or LICENSED PRODUCT: (a) with respect to a patent, that, in the absence of a license granted to a person under a

claim included in such patent, the practice by such person of a specified activity with respect to such IMPROVEMENT or LICENSED PRODUCT would infringe such claim (without regard to the validity or enforceability of such claim), or (b) with respect to a patent application, that, in the absence of a license granted to a person under a claim included in such patent application, the practice by such person of a specified activity with respect to such IMPROVEMENT or LICENSED PRODUCT would infringe such claim if such patent application were to issue as a patent.

Section 1.04 "EXPLOIT" means to make, have made, import, use, sell, offer for sale, research, develop, have developed, commercialize or have commercialized, register, hold or keep (whether for disposal or otherwise), import, export, transport, distribute, promote, market or have sold or otherwise dispose of.

Section 1.05 "IMPROVEMENTS" shall mean all additions, improvements, adaptations, modifications or enhancements to any part of the TECHNOLOGY. For clarity, IMPROVEMENTS include, without limitation, "Improvements", "Non-Severable Improvements" and "Severable Improvements" (as such terms are defined in the COLLABORATION AGREEMENT) including without limitation such Improvements deemed "Arising Intellectual Property" (as defined in the COLLABORATION AGREEMENT).

Section 1.06 "KNOW-HOW" means, collectively, any knowledge, information, techniques, technology, trade secrets, inventions, discoveries, methods, know-how, data, results, analytical and quality control data and results, regulatory documents, and other information, compositions of matter, cells, cell lines, assays, plants and other physical, biological, genetic or chemical material (whether patentable or not).

Section 1.07 "LICENSED PRODUCT" means a product that (i) is COVERED by a VALID CLAIM of the OPTION PATENT RIGHTS and/or (ii) incorporates or uses the OPTION KNOW-HOW.

Section 1.08 "NON-COMMERCIAL RESEARCH PURPOSES" means the use or practice of the OPTION PATENT RIGHTS and/or OPTION KNOW-HOW for research, teaching, educational, or academic purposes in the OPTION FIELD which are undertaken at ROTHAMSTED or at a non-profit, academic, educational, or governmental institution, or with or funded by a commercial entity for such non-commercial purposes. Without limiting the foregoing, subject to Section 2.01 and Section 6.02 NON-COMMERCIAL RESEARCH PURPOSES includes the use or practice of the TECHNOLOGY for research (including sponsored research) that leads, or may lead, to patentable or unpatentable inventions that may be licensed or otherwise transferred, either directly or indirectly, to third parties.

Section 1.09 "OPTION KNOW-HOW" means KNOW-HOW owned or CONTROLLED BY ROTHAMSTED as of the Effective Date or developed during the Term relating to omega-3 oil traits including without limitation the production and applications of omega-3 fatty acid oils in plants including without limitation the KNOW-HOW listed in Appendix A. For clarity, OPTION KNOW-HOW includes without limitation "Know-how" arising under and as defined in the COLLABORATION AGREEMENT.

Section 1.10 "OPTION FIELD" means the evaluation and development of the production of plant seed oils containing omega-3 long chain polyunsaturated fatty acids as described in the OPTION PATENT RIGHTS defined herein and any IMPROVEMENTS.

Section 1.11 "OPTION PATENT RIGHTS" means ROTHAMSTED's rights and interests in and to (a) issued patents and pending patent applications (which, for purposes of this AGREEMENT, include certificates of invention, applications for certificates of invention and priority rights) in any country or region listed in Appendix A including any divisionals, continuations, continuations-in-part, substitutions, patents of addition, reissues, revivals, extensions, re-examinations or renewal applications related to, or claiming priority to, the foregoing (including any supplemental patent certificates) or any confirmation patent or registration patent, and all patents issuing on, and all foreign counterparts of, any of the foregoing, (b) any PATENT RIGHTS COVERING IMPROVEMENTS developed during the TERM of this AGREEMENT and (c) any PATENT RIGHTS encompassed within "Arising Intellectual Property" as defined in the COLLABORATION AGREEMENT.

Section 1.12 "OPTION PERIOD" means the period commencing on the EFFECTIVE DATE of this AGREEMENT and ending on the later of (a) two (2) years thereafter, i.e., the second anniversary of the Effective Date, such period extendable by additional periods of up to one year with the prior written agreement of the PARTIES and (b) thirty (30) days after receipt of the FINAL REPORT.

Section 1.13 "OPTION TERRITORY" means worldwide.

Section 1.14 "PATENT EXPENSES" means all reasonable out-of-pocket expenses, costs, and attorneys' fees ROTHAMSTED has incurred for the preparation, filing, prosecution and maintenance of the OPTION PATENT RIGHTS, including but not limited to interferences, derivation proceedings, re-examinations, reissues, oppositions, supplemental examinations, *inter partes* reviews, and post grant reviews.

Section 1.15 "PATENT RIGHTS" means rights and interests in and to issued patents and pending patent applications (which, for purposes of this AGREEMENT, include certificates of invention, applications for certificates of invention and priority rights) in any country or region, including any divisionals, continuations, continuations-in-part, substitutions, patents of addition, reissues, revivals, extensions, re-examinations or renewal applications related to, or claiming priority to, the foregoing (including any supplemental patent certificates) or any confirmation patent or registration patent, and all patents issuing on, and all foreign counterparts of, any of the foregoing.

Section 1.16 "TAX" means value added tax (VAT) in the UK or any equivalent tax chargeable whether in the UK or elsewhere.

Section 1.17 "VALID CLAIM" means, with respect to any country or jurisdiction a claim of an issued and unexpired patent (as may be extended through supplementary protection certificate or patent term extension or the like) that has not been cancelled, revoked, held invalid or unenforceable by a decision of a patent office or other government authority of competent jurisdiction from which no appeal can be taken (or from which no appeal was taken within the allowable time period) and which claim has not been disclaimed, denied or admitted to be invalid or unenforceable through reissue, re-examination or disclaimer or otherwise.

Article II. OPTION GRANT, TECH TRANSFER

Section 2.01 Option Grant. During the OPTION PERIOD, ROTHAMSTED hereby grants to COMPANY and COMPANY accepts, subject to the terms and conditions hereof, an (a) exclusive license to internally evaluate the TECHNOLOGY solely for purposes of determining its interest in licensing the TECHNOLOGY and (b) exclusive option to negotiate a license in the OPTION PATENT RIGHTS and/or the OPTION KNOW-HOW in each case to research, develop, commercialize and otherwise EXPLOIT LICENSED PRODUCTS in the OPTION TERRITORY as set forth in Section 2.02 below ("OPTION"). The OPTION PERIOD may be extended if mutually agreed to in writing by ROTHAMSTED and COMPANY. During the OPTION PERIOD, and any extensions thereof, COMPANY shall have the right to use and shall use good faith efforts to evaluate the technical, economic, and commercial aspects of the TECHNOLOGY in accordance with (and at the locations set out in) the evaluation plan set out in Appendix C, but shall not have the right to use TECHNOLOGY for the sale, supply or commercialization of any products or services. During the OPTION PERIOD, ROTHAMSTED will not grant (without the prior written consent of COMPANY) to any other third party any license or other rights under the TECHNOLOGY including without limitation for the sale or commercialization of products or services in the OPTION FIELD in the OPTION TERRITORY. COMPANY shall provide reports of progress and share data on the evaluation contemplated by this Section 2.01 in such detail as demonstrates said good faith efforts being applied by COMPANY [***].

Section 2.02 Exercise of Option. At any time during the OPTION PERIOD, and any extensions thereof, COMPANY may exercise its OPTION to begin good faith negotiations for a license agreement providing (a) a milestone and royalty-bearing, exclusive or nonexclusive license to OPTION PATENT RIGHTS and/or (b) a royalty bearing exclusive or nonexclusive license to the OPTION KNOW-HOW to research, develop, commercialize and otherwise EXPLOIT LICENSED PRODUCTS in OPTION TERRITORY ("LICENSE AGREEMENT") by giving ROTHAMSTED written notice of the same. In the event that COMPANY does not timely exercise its OPTION, or if the PARTIES fail to execute a LICENSE AGREEMENT within the NEGOTIATION PERIOD, or if COMPANY fails to apply good faith efforts in accordance with Section 2.01 then the OPTION shall lapse, COMPANY shall forfeit its rights hereunder and ROTHAMSTED shall be free to negotiate with and to enter into exclusive or non-exclusive license agreements with third parties for the OPTION PATENT RIGHTS and/or OPTION KNOW-HOW.

Section 2.03 Separate Agreement. Should COMPANY elect to exercise its OPTION to negotiate a license to TECHNOLOGY, all terms and conditions, license fees, and royalty rates of such license shall be negotiated as a separate agreement within the framework headline terms and conditions set forth in this AGREEMENT including Appendix B. The LICENSE AGREEMENT if executed, will include other standard and customary terms normally contained in similar license agreements granted by ROTHAMSTED. The PARTIES shall negotiate the LICENSE AGREEMENT in good faith. Such LICENSE AGREEMENT shall be finalized [***] following COMPANY's exercise of the option ("NEGOTIATION PERIOD"), and if not so finalized solely as a result of COMPANY'S actions or failures to act then the OPTION shall lapse as specified in Section 2.02.

Section 2.04 Reserved Rights. At all times during the OPTION PERIOD, NEGOTIATION PERIOD, and any extensions thereof, ROTHAMSTED reserves the right to make, use or otherwise practice the OPTION PATENT RIGHTS and OPTION KNOW-HOW for NON-COMMERCIAL RESEARCH PURPOSES. ROTHAMSTED also reserves the right to transfer tangible research

materials and intangible materials incorporating the TECHNOLOGY to other non-profit, academic, educational, or governmental institutions for such NON-COMMERCIAL RESEARCH PURPOSES during the OPTION PERIOD, NEGOTIATION PERIOD, and any extensions thereof.

Section 2.05 COMPANY Research. COMPANY shall from time to time during the OPTION PERIOD make available to ROTHAMSTED details of its research into camelina yield traits ("CAMELINA RESEARCH"), and COMPANY grants to ROTHAMSTED the right to use and practice such research solely for research, teaching, educational, or academic purposes which are undertaken at ROTHAMSTED or at a non-profit, academic, educational, or governmental institution, or with or funded by a commercial entity for such non-commercial purposes. The PARTIES agree that CAMELINA RESEARCH shall be COMPANY CONFIDENTIAL INFORMATION.

Section 2.06 Technology Transfer. At COMPANY's request ROTHAMSTED will provide COMPANY with access to any OPTION KNOW-HOW that ROTHAMSTED owns or CONTROLS that is necessary or useful for the production or commercialization of omega-3 fatty acid oils in Camelina including without limitation the KNOW-HOW identified in Appendix A. Where any materials are to be transferred between the Parties, the Parties acting reasonably and in good faith will negotiate and enter into a material transfer agreement consistent with this Agreement prior to any such transfer taking place.

Article III. PAYMENT AND FEES

Section 3.01 Option Fee and Research Funding. In consideration of the grant of the OPTION in accordance with Section 2.01, during the OPTION PERIOD COMPANY shall provide total non-refundable, non-creditable funding of [***] to be paid [***] installments as set forth in the table below to be used solely to support the research activities set forth in the separate sponsored research agreement by and between the PARTIES on or around the same date as this AGREEMENT ("COLLABORATION AGREEMENT") materially in the form attached hereto as Appendix E.

Payment	**Payment Due Date**
[***]	[***]
[***]	[***]
[***]	[***]

Section 3.02 Patent Expenses. [***]

Section 3.03 How Payments are Made. All payments to ROTHAMSTED pursuant to this AGREEMENT shall be paid in US Dollars within [***] of receipt of an invoice therefor. Such payments shall be without deduction of exchange, collection or other charges. Such payments shall be made payable to ROTHAMSTED. Invoices shall be submitted by UK mail to COMPANY at:

Yield10 Bioscience
19 Presidential Way
Woburn, MA 01801
USA
[***]

Or by e-mail to:

[***]
[***]

Payment shall be sent to the following bank account opened in the name of ROTHAMSTED at [***]:

Name of Account Holder	Account number	Sort code	Currency	IBAN	SWIFT
[***]	[***]	[***]	[***]	[***]	[***]

Section 3.04 Taxes. All amounts due under this AGREEMENT from COMPANY (a) shall be paid in full without any set-off, counterclaim, deduction or withholding (other than any deduction or withholding of tax as required by law) and (b) exclude amounts in respect of Tax, which COMPANY shall additionally be liable to pay to ROTHAMSTED at the prevailing rate (if applicable), subject to receipt of a valid Tax invoice.

Section 3.05 Late Payment. If COMPANY fails to make any payment due to ROTHAMSTED under this AGREEMENT by the due date for payment, then, without limiting ROTHAMSTED's right to terminate under Section 5.02: (a) COMPANY shall pay interest on the overdue sum from the due date until payment of the overdue sum, whether before or after judgment at a rate of [***]; and (b) ROTHAMSTED may suspend all research and development activities until payment has been made in full.

Article IV. DOMESTIC AND FOREIGN PATENT FILING AND MAINTENANCE

Section 4.01 Ownership. ROTHAMSTED shall have full, complete and sole ownership of any pending applications and issued patents included in the OPTION PATENT RIGHTS and subject to Section 4.02 ROTHAMSTED shall be responsible for their preparation, filing, prosecution (including any interferences, reissue proceedings, inter partes reviews and reexaminations) and maintenance (collectively, "PROSECUTION"). All KNOW-HOW and IMPROVEMENTS and any intellectual property rights therein related to the TECHNOLOGY generated during the OPTION PERIOD: (a) by ROTHAMSTED shall be owned ROTHAMSTED; (b) by COMPANY shall be owned by COMPANY but shall be the subject of an automatic irrevocable, payment-free license from COMPANY to ROTHAMSTED for NON-COMMERCIAL RESEARCH PURPOSES within the OPTION FIELD; and (c) jointly by COMPANY and ROTHAMSTED shall be jointly owned by the PARTIES.

Section 4.02 Control. As of the Effective Date, ROTHAMSTED has primary responsibility at the expense of COMPANY for the PROSECUTION of all OPTION PATENT RIGHTS, using patent counsel reasonably acceptable to COMPANY. ROTHAMSTED shall consult with COMPANY as to the PROSECUTION of all OPTION PATENT RIGHTS reasonably prior to any deadline or action with the United States Patent & Trademark Office or any foreign patent office and shall furnish COMPANY with copies of relevant documents reasonably in advance of consultation. COMPANY shall use its reasonable endeavours to revert to ROTHAMSTED at least [***] prior to any applicable, procedural, regulatory or statutory deadline, it being agreed that ROTHAMSTED may proceed at its discretion if COMPANY has not actively participated in the consultation by such time. ROTHAMSTED will instruct its counsel to communicate directly with patent counsel for

COMPANY, and to fully consider any suggestions or revisions that would tend to support or expand the scope of claims sought, provided counsel was qualified to practice in the relevant jurisdiction (it being understood that the USA shall be considered a single jurisdiction for the purposes of this section). However, any actions or revisions that would tend to narrow the scope of claims sought would be subject to approval by ROTHAMSTED. If ROTHAMSTED wishes to abandon any patent or patent application within the OPTION PATENT RIGHTS, ROTHAMSTED shall provide COMPANY with reasonable prior notice of the intended abandonment, and assign such right to COMPANY, which may elect, at its expense, to PROSECUTE the relevant OPTION PATENT RIGHTS with no further license or royalty obligations to ROTHAMSTED with respect to such OPTION PATENT RIGHTS. COMPANY shall cooperate with ROTHAMSTED in such PROSECUTION. COMPANY agrees to hold any information provided to it under this Section 4.02 confidential in accordance with Section 6.05 and to use the information provided by ROTHAMSTED only for the purpose of advancing the OPTION PATENT RIGHTS and shall return all such information to ROTHAMSTED if the PARTIES do not complete the LICENSE AGREEMENT.

Section 4.03 Patent Expenses. For PATENT EXPENSES incurred after the EFFECTIVE DATE during the OPTION PERIOD or during the NEGOTIATION PERIOD (if any) set forth in Section 2.03 [***].

Article V. TERM and TERMINATION

Section 5.01 Term. Unless earlier terminated as permitted by this AGREEMENT, the term of this AGREEMENT (the "TERM") will commence upon the Effective Date and continue in full force and effect until (a) in the event COMPANY does not exercise its OPTION during the OPTION PERIOD, the expiration of the OPTION PERIOD and (b) in the event COMPANY does exercise its OPTION during the OPTION PERIOD, the earlier of (i) the execution of the LICENSE AGREEMENT and (ii) the expiration of the NEGOTIATION PERIOD. For clarity, termination of this AGREEMENT shall cause the COLLABORATION AGREEMENT to terminate automatically

Section 5.02 Insolvency. This AGREEMENT may be terminated at any time prior to the expiration of the OPTION PERIOD by either PARTY upon the other PARTY's filing or institution of bankruptcy, reorganization, liquidation or receivership proceedings, or upon an assignment of a substantial portion of the assets for the benefit of creditors by the other PARTY; provided, that, in the case of any involuntary bankruptcy proceeding such right to terminate shall only become effective if the PARTY consents to the involuntary bankruptcy or such proceeding is not dismissed within [***] after the filing thereto.

Section 5.03 Termination for Cause. Either PARTY may terminate this AGREEMENT by giving the other PARTY written notice if the other PARTY is in material breach of any provision hereof (including default on any payment due to ROTHAMSTED hereunder); provided, however, that if the other PARTY cures said default or breach within [***] after said notice shall have been given, this AGREEMENT shall continue in full force and effect.

Section 5.04 Termination without Cause. COMPANY may terminate this AGREEMENT at any time by providing ROTHAMSTED [***] advance written notice of termination. In the event COMPANY terminates this AGREEMENT without cause COMPANY will continue to reimburse ROTHAMSTED for any PATENT EXPENSES in Section 4.03 prior to the date of termination and for the [***] following the date of termination.

Section 5.05 Termination for Patent Challenge. If COMPANY asserts the invalidity or unenforceability of any claim included in the OPTION PATENT RIGHTS, including by way of litigation or administrative proceedings, either directly or through any other party, then ROTHAMSTED shall have the right, but not the obligation, to terminate this AGREEMENT in accordance with Section 5.02. For clarity, COMPANY shall not be in breach of this Section 5.04 if it provides information or documents to a third party as required under a court order, judicial, administrative or similar process that are used by such third party in a patent challenge.

Article VI. GENERAL

Section 6.01 ROTHAMSTED Representations. ROTHAMSTED represents that the right, title and interest in the TECHNOLOGY developed by its employees during the course of their employment vests in ROTHAMSTED and that it has power to grant the OPTION and licenses set forth in this AGREEMENT.

Section 6.02 Third Party Agreements. Each PARTY covenants it shall not, and shall cause its AFFILIATES not to, during the TERM enter into, any oral or written agreement or arrangement that would be intentionally and materially inconsistent with its obligations under this AGREEMENT.

Section 6.03 Publicity. Each PARTY agrees not to (a) identify the other PARTY in any promotional advertising or other promotional materials to be disseminated to the public or any portion thereof, (b) use the name of any of the other PARTY's faculty member, employees, agents, officers, directors, or students or (c) use any trademark, service mark, trade name, or symbol of the other PARTY or that is associated with either of them, without the other PARTY'S prior written consent.

Section 6.04 Indemnity by COMPANY. COMPANY shall at all times during the Term of this AGREEMENT and thereafter, indemnify, defend and hold ROTHAMSTED, its current or former Trustees, officers, employees and affiliates, harmless from any third party claim, proceeding, suit, demand, expense, loss, penalty, judgment, or liability of any kind whatsoever, including but not limited to any product liability claims, such as those involving the death of or injury to any person or persons or damage to property, including costs, expenses and reasonable attorneys' fees, resulting from, related to, arising out of, or in connection with (a) COMPANY's evaluation, production, use, EXPLOITATION or consumption of the TECHNOLOGY; (b) a breach of any obligation, representation, or warranty by COMPANY hereunder; (c) any violation of applicable law by COMPANY; or (d) the exercise of COMPANY's rights under this AGREEMENT.

Section 6.05 Confidentiality. The confidentiality provisions described herein in Appendix D shall (a) govern any disclosure of Confidential Information (as defined in Appendix D) made under this AGREEMENT and (b) replace any prior confidentiality agreements between the PARTIES relating to the TECHNOLOGY including without limitation the Non-Disclosure Agreement dated 4 April 2019 ("PRIOR AGREEMENTS") which are hereby terminated as of the Effective Date. For clarity, any information disclosed and defined as confidential information under the PRIOR AGREEMENTS shall be considered CONFIDENTIAL INFORMATION as defined in this AGREEMENT.

Section 6.06 **Disclaimer of Warranties. THE TECHNOLOGY AND CAMELINA RESEARCH ARE DELIVERED "AS IS" IN EVERY RESPECT. NEITHER PARTY NOR ITS CURRENT OR FORMER CURATORS, OFFICERS, EMPLOYEES, AND AFFILIATES MAKE ANY REPRESENTATIONS OR EXTEND ANY WARRANTIES OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTIES**

OF COMMERCIAL UTILITY, MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, THE ABSENCE OF LATENT OR OTHER DEFECTS, WHETHER OR NOT DISCOVERABLE, THE SCOPE, VALIDITY OR ENFORCEABILITY OF ANY PATENT RIGHTS, WHETHER ISSUED OR PENDING, OR THAT THE MANUFACTURE, USE, IMPORTATION OR SALE OF THE TECHNOLOGY OR THAT THE PRACTICE OF THE PATENT RIGHTS, KNOW-HOW OR CAMELINA RESEARCH WILL NOT INFRINGE OR MISAPPROPRIATE ANY PATENT, COPYRIGHT, TRADEMARK, OR OTHER RIGHTS OF ANY THIRD PARTY.

Section 6.07 **Damages Exclusion / Limitation of Remedies. IN NO EVENT SHALL EITHER PARTY OR ITS CURRENT OR FORMER CURATORS, OFFICERS, EMPLOYEES, AND AFFILIATES BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, OR SPECIAL LOSS, EXEMPLARY, OR PUNITIVE DAMAGES OF ANY KIND, REGARDLESS OF THE FORM OF ACTION, WHETHER IN CONTRACT OR IN TORT, INCLUDING NEGLIGENCE OR OTHERWISE, AND INCLUDING ECONOMIC DAMAGE OR INJURY TO PROPERTY AND LOST PROFITS, ATTORNEYS' AND EXPERTS' FEES, REGARDLESS OF WHETHER IT MAY BE ADVISED, MAY HAVE OTHER REASON TO KNOW, OR IN FACT SHALL KNOW OF THE POSSIBILITY. COMPANY AGREES THAT ROTHAMSTED'S TOTAL LIABILITY FOR ANY DAMAGES OR CLAIMS ARISING OUT OF OR RELATED TO THIS AGREEMENT SHALL NOT EXCEED THE AMOUNT OF THE OPTION FEE PAID BY COMPANY TO ROTHAMSTED.**

Section 6.08 Consulting. In the event COMPANY wishes to engage the inventors as consultants, such an arrangement shall be separate and apart from this AGREEMENT but shall be in keeping with ROTHAMSTED'S policy on consulting and ownership of intellectual property developed by ROTHAMSTED employees.

Section 6.09 Assignment. This AGREEMENT is binding upon and shall enure to the benefit of ROTHAMSTED, its successors and assigns. However, this AGREEMENT shall be personal to COMPANY, and it is not assignable by COMPANY to any other person or entity without the prior written consent of ROTHAMSTED, such consent to be in ROTHAMSTED's sole discretion, but not to be unreasonably withheld, conditioned or delayed. Any purported sale, transfer or assignment without ROTHAMSTED's prior written consent shall be void ab initio, and this AGREEMENT shall immediately terminate. For purposes of this Section 6.09, "transfer" shall include any transfer by operation of law or otherwise. Notwithstanding the foregoing, COMPANY may assign this AGREEMENT without ROTHAMSTED'S consent (a) to an AFFILIATE of the COMPANY, or (b) pursuant to an acquisition or sale of all or substantially all its business to which the TECHNOLOGY relates.

Section 6.10 Notices. All notices under this AGREEMENT shall be deemed to have been fully given when done in writing and deposited in the United Kingdom or United States mail (whichever is relevant), registered or certified, and addressed as follows:

If to ROTHAMSTED: ROTHAMSTED RESEARCH LIMITED
West Common
Harpenden
Hertfordshire AL5 2JQ
United Kingdom

[***]

If to COMPANY: Yield10

19 Presidential Way
Woburn, MA 01801
USA
[***]

or such other address as either PARTY may request in writing.

Section 6.11 No Waiver. None of the terms, covenants, and conditions of this AGREEMENT can be waived except by the written consent of the PARTY waiving compliance. A failure by one of the PARTIES to this AGREEMENT to assert its rights for or upon any breach or default of this AGREEMENT shall not be deemed a waiver of such rights nor shall any such waiver be implied from acceptance of any payment. No such failure or waiver in writing by any one of the PARTIES hereto with respect to any rights, shall extend to or affect any subsequent breach or impair any right consequent thereon. The failure on the part of either PARTY to exercise or enforce any right conferred upon it hereunder shall not be deemed to be a waiver of any such right nor operate to bar the exercise or enforcement thereof at any time or times thereafter.

Section 6.12 Amendments. This AGREEMENT cannot be amended except in writing by mutual agreement of the PARTIES.

Section 6.13 Choice of Law and Venue. This AGREEMENT shall be construed, interpreted, and applied in accordance with the laws of England and Wales. The PARTIES agree that any action arising under this AGREEMENT shall be brought in the courts of London, England, and agree not to challenge personal jurisdiction in that forum.

Section 6.14 Severability. If any sentence, paragraph, clause or combination of the same is found by a court of competent jurisdiction to be in violation of any applicable law or regulation, or is unenforceable or void for any reason whatsoever, such sentence, paragraph, clause or combinations of the same shall be severed from the AGREEMENT and the remainder of the AGREEMENT shall remain binding upon the PARTIES.

Section 6.15 Counterparts. This AGREEMENT may be executed in two or more counterparts, each of which shall be deemed an original and all of which together shall constitute but one and the same instrument.

Section 6.16 Survival. Termination of this AGREEMENT for any reason shall not release either PARTY from any obligation theretofore accrued. All provisions of this AGREEMENT that would reasonably be expected to survive the termination or expiration of this AGREEMENT shall do so, including Article III (Payment and Fees), Section 4.01 (Ownership), Article V (Termination), and Article VI (General) survive the termination of this AGREEMENT.

Section 6.17 Entire Agreement. This AGREEMENT and the COLLABORATION AGREEMENT constitute the entire and only agreement between the PARTIES for TECHNOLOGY and all other prior negotiations, representations, agreements, and understandings including without limitation the PRIOR AGREEMENTS are superseded hereby. No agreements altering or supplementing the terms hereof may be made except by a written document signed by both PARTIES.

Section 6.18 Precedence. In the event of any conflict between the terms and provisions of this AGREEMENT and the terms and provisions of the COLLABORATION AGREEMENT the terms and provisions of this AGREEMENT will prevail.

IN WITNESS WHEREOF, the PARTIES hereto have executed this AGREEMENT in duplicate originals by their duly authorized officers or representatives.

ROTHMSTED RESEARCH LIMITED	YIELD10 BIOSCIENCE, INC.
BY: _____	BY: _____
NAME: [***]	NAME: [***]
TITLE: [***]	TITLE: [***]
DATE: [***]	DATE: [***]

APPENDIX A. ROTHAMSTED TECHNOLOGY

Patent Rights

Case Ref.	Reference	Title	Country	Application No.	Application Date	Priority date	Case Status	Grant No.	Next Renewal Date	Outstanding deadlines
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]		[***]	
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]		[***]	
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]		[***]	
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]		[***]	
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]			
[***]	[***]	[***]	[***]		[***]	[***]	[***]			
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	

[***]	[***]	[***]					[***]			
[***]	[***]	[***]					[***]			
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]		
[***]	[***]	[***]	[***]	[***]		[***]	[***]	[***]		
[***]	[***]	[***]	[***]	[***]		[***]	[***]	[***]		
[***]	[***]	[***]	[***]	[***]		[***]	[***]	[***]		
[***]	[***]	[***]	[***]	[***]		[***]	[***]	[***]		
[***]	[***]	[***]	[***]	[***]		[***]	[***]	[***]		

Know-How

At COMPANY's request ROTHAMSTED will provide access to materials including but not limited to [***]. A non-exhaustive list of genetic parts (promoters, genes, terminators) and possible combinations is shown in Sections 12-14, Part A1. Similarly, materials listed in [***] describe examples of additional gene combinations useful in Camelina.
Examples of proprietary know-how include, but not limited to, [***] – examples from the peer-reviewed literature are listed below, as are the key publications on the [***]. A further component of such studies is the know-how associated with preparation, submission and revision of dossiers associated with the scientific and ethical approvals required.

APPENDIX B

Upon exercise of the OPTION by COMPANY in Section 2.02 of this AGREEMENT, COMPANY and ROTHAMSTED will negotiate in good faith to agree and execute a definitive licensing agreement for the TECHNOLOGY as set forth in Section 2.03 of this AGREEMENT. The intent of this Appendix B is to describe certain items of the proposed agreement between the PARTIES. The PARTIES recognize that the verbiage on the items listed below must be negotiated and is contingent upon legal review and approval. This APPENDIX B does not contain all matters upon which agreement must be reached and is not intended to be a binding or enforceable agreement. A binding and enforceable agreement will not occur unless and until all necessary management/corporate approvals have been obtained and the PARTIES have negotiated, duly authorized, approved, executed and delivered the appropriate definitive agreements and all conditions therein have been satisfied or waived.

License Execution fee:
[***]

Sales/Earned/Running Royalties

[***]

Sub-Licensing Royalty:

A sublicensing royalty of [***] of all sublicensing revenue received by COMPANY.

Royalty Stacking and Combination Products language:

Anti-stacking Deduction. In the event that COMPANY is legally required to make running royalty payments to one or more third parties for license(s) of third party intellectual property rights necessary or useful to making, using, offering for sale, selling or importing a given LICENSED PRODUCT, COMPANY may deduct up to [***] of such third-party royalties from any running royalty payments that are due to ROTHAMSTED under Section 4.3 on Yield10 Net Sales of such Licensed Product in the same Royalty Period. However, in no event will royalties to ROTHAMSTED be reduced to less than [***] of the applicable amounts set forth under Section entitled “Sales/Earned/Running Royalties” above. Upon request by ROTHAMSTED, COMPANY shall provide ROTHAMSTED with such records, information or access to personnel as are necessary to account for such third party royalties triggering the anti-stacking deduction, subject always to COMPANY remaining compliant with all applicable laws and obligations towards third parties.

Royalty Adjustment for Combination Product. Royalties payable under the section entitled “Sales/Earned/Running Royalties” above on COMPANY net sales of Combination Products will be reduced as follows. The royalty shall [***] However, in no event will royalties to ROTHAMSTED be reduced to less than [***] of the applicable amounts set forth set forth under the section entitled “Sales/Earned/Running Royalties” above for Combination Product Net Sales for any reason. Such adjustment cannot be made together with an anti-stacking deduction under the Section entitled “Anti-stacking Deduction” above. If the adjustment factor above cannot be

calculated for any reason the PARTIES will negotiate in good faith an alternative mechanism for an equitable adjustment of the running royalties payable on COMPANY net sales of the Combination Products. This provision does not apply to the royalty on Sublicensee net sales. As used herein, "COMBINATION PRODUCT" means a LICENSED PRODUCT sold in combination with another product that is not a LICENSED PRODUCT.

Minimum Annual Royalties: Year	Minimum Annual Royalty Payment
[***]	[***]
[***]	[***]
[***]	[***]
[***]	[***]
[***]	[***]
[***]	[***]

In any given year, royalties paid to the ROTHAMSTED as Sales Royalties or Sublicensing Royalties will be fully deductible against minimum annual royalties paid in the same year, but there shall be no carry forward.

Milestone Payments: A one-time milestone payment of [***] for the first regulatory filing for commercial production of a LICENSED PRODUCT in any country. A one-time milestone payment of [***] on obtaining the first regulatory approval for a LICENSED PRODUCT in any country for the commercial production of a LICENSED PRODUCT. A milestone payment of [***] on achieving cumulative net sales of LICENSED PRODUCTS of [***]. For clarity, each milestone will be paid only paid once.

Patent Expenses. After the EFFECTIVE DATE, LICENSEE shall reimburse ROTHAMSTED for all PATENT EXPENSES.

The LICENSE AGREEMENT will contain additional customary terms and conditions agreed to by the PARTIES, including representations and warranties (for ROTHAMSTED limited as to ownership of the OPTION PATENT RIGHTS AND OPTION KNOW-HOW), indemnification provisions and dispute resolution provisions.

APPENDIX C
Evaluation Plan

The following is an outline of the steps Yield10 will take, recognizing some of the challenges and competitive landscape, in developing a strategic plan to commercialize the technology in the shortest timeframe.

[***]

Yield10 will provide quarterly updates to Rothamsted on progress on each of these targets.

APPENDIX D - CONFIDENTIALITY PROVISIONS

1. DEFINITIONS AND INTERPRETATION

1.1 The following definitions and rules of interpretation apply in this Appendix D:
Business Day: a day other than a Saturday, Sunday or public holiday in England when banks in London are open for business.

Confidential Information: has the meaning given in *Clause 2*.

Discloser: a PARTY to this AGREEMENT when it discloses its Confidential Information, directly or indirectly, to the other PARTY.

Holding company: has the meaning given in *Clause 1.2(e)*.

Purpose: exercise of a PARTY'S rights and obligations under this AGREEMENT.

Recipient: a PARTY to this AGREEMENT when it receives Confidential Information, directly or indirectly, from the other PARTY.

Representative(s): in relation to each PARTY and any AFFILIATE or member of its AFFILIATE:

a) its officers and employees that need to know the Confidential Information for the Purpose;

b) its professional advisers or consultants who are engaged to advise that PARTY and/or any member of its AFFILIATE about the Purpose;

c) its contractors and sub-contractors engaged by that PARTY and/or any member of its AFFILIATE about the Purpose; and

d) any other person to whom the other PARTY agrees in writing that Confidential Information may be disclosed about the Purpose.

Subsidiary: has the meaning given in *Clause 1.2(e)*.

1.2 Interpretation:

a) A reference to a statute or statutory provision is a reference to it as amended or re-enacted. A reference to a statute or statutory provision includes any subordinate legislation made under that statute or statutory provision, as amended or re-enacted.

b) Any words following the terms including, include for example or any similar expression shall be construed as illustrative and shall not limit the sense of the words, description, definition, phrase or term preceding those terms.

c) A reference to writing or written includes email.

d) A reference to a company shall include any company, corporation or other body corporate, wherever and however incorporated or established.

e) A reference to a holding company or a subsidiary means a holding company or a subsidiary as defined in section 1159 of the Companies Act 2006 and a company shall be treated, for the purposes only of the membership requirement contained in section 1159(1)(b) and (c), as a member of another company even if its shares in that other company are registered in the name of:

(i) another person (or its nominee) by way of security or about the taking of security; or

(ii) its nominee.

f) Any obligation on a PARTY not to do something includes an obligation not to allow that thing to be done.

2. CONFIDENTIAL INFORMATION

2.1 "Confidential Information" means all confidential information relating to the Purpose which the Discloser or its Representatives or any of its AFFILIATES, or their Representatives directly or indirectly discloses, or makes available, to the Recipient or its Representatives or any of its AFFILIATES, or their Representative, before, on or after the date of this AGREEMENT. This includes:

a) the fact that discussions and negotiations are taking place concerning the Purpose and the status of those discussions and negotiations;

b) the existence and terms of this AGREEMENT;

c) all confidential or proprietary information relating to:

(i) the business, affairs, customers, clients, suppliers including plans, intentions, or market opportunities of the Discloser or of any of the Discloser's AFFILIATES; and

(ii) the operations, processes, product information, know-how, agricultural, mathematical scientific and technical information including materials, designs, trade secrets or software of the Discloser, or of any of the Discloser's AFFILIATES;

d) any information, findings, data or analysis derived from Confidential Information;

e) any other information that is identified as being of a confidential or proprietary nature but excludes any information referred to in Clause 2.2.

2.2 Information is not Confidential Information if:

a) it is, or becomes, generally available to the public other than as a direct or indirect result of the information being disclosed by the Recipient or its Representatives or by any of the Recipient's AFFILIATES or their Representatives in breach of this AGREEMENT (except that any compilation of otherwise public information in a form not publicly known shall still be treated as Confidential Information);

b) it was available to the Recipient on a non-confidential basis prior to disclosure by the Discloser;

c) it was, is, or becomes available to the Recipient on a non-confidential basis from a person who, to the Recipient's knowledge, is not under any confidentiality obligation in respect of that information;

d) it was lawfully in the possession of the Recipient before the information was disclosed by the Discloser; or

e) it is developed by or for the Recipient independently of the information disclosed by the Discloser; or

f) the PARTIES agree in writing that the information is not confidential

3. CONFIDENTIALITY OBLIGATIONS

3.1 In return for the Discloser making Confidential Information available to the Recipient, the Recipient undertakes to the Discloser that it shall:

a) keep the Confidential Information secret and confidential;

b) not use or exploit the Confidential Information in any way except for the Purpose;

c) not directly or indirectly disclose or make available any Confidential Information in whole or in part to any person, except as expressly permitted by, and in accordance with this AGREEMENT; and

d) not copy, reduce to writing or otherwise record the Confidential Information except as strictly necessary for the Purpose. Any such copies, reductions to writing and records shall be the property of the Discloser.

3.2 The Recipient shall establish and maintain adequate security measures (including any reasonable security measures proposed by the Discloser from time to time) to safeguard the Confidential Information from unauthorised access or use.

4. PERMITTED DISCLOSURE

4.1 Disclosure to Representatives

a) The Recipient may disclose the Confidential Information to its Representatives, any of its AFFILIATES, or their Representatives on the basis that it:

(i) informs those Representatives, AFFILIATES or their Representatives of the confidential nature of the Confidential Information before it is disclosed; and

(ii) procures that those Representatives, AFFILIATES or their Representatives comply with the confidentiality obligations in *Clause 3.1* as if they were the Recipient.

b) The Recipient shall be liable for the actions or omissions of the Representatives, any of its AFFILIATES or their Representatives in relation to the Confidential Information as if they were the actions or omissions of the Recipient.

4.2 The Recipient may, if it has reasonable grounds to believe that the Discloser is involved in activity that may constitute a criminal offence under the Bribery Act 2010, disclose the Discloser's

Confidential Information to the Serious Fraud Office without first notifying the Discloser of such disclosure.

4.3 The PARTIES acknowledge that Rothamsted is a public authority for the purposes of either the Freedom of Information Act 2000 or the Freedom of Information (Scotland) Act 2002 (the "FOI Legislation"). If a PARTY receives a request under the FOI Legislation to disclose any of the other PARTY's Confidential Information, it will notify and consult with the other PARTY. The other PARTY will respond within [***] of receiving such notice if the notice requests assistance in determining whether an exemption applies to the disclosure of the Confidential Information requested under the FOI Legislation

5. MANDATORY DISCLOSURE

5.1 Subject to the provisions of this *Clause 5*, a PARTY may disclose Confidential Information to the minimum extent required by:

a) an order of any court of competent jurisdiction or any regulatory, judicial, governmental or similar body or any taxation authority of competent jurisdiction;

b) the rules of any listing authority or stock exchange on which its shares or those of any of its AFFILIATES are listed or traded; or

c) the laws or regulations of any country to which its affairs or those of any of its AFFILIATES are subject.

5.2 Before a PARTY discloses any Confidential Information pursuant to *Clause 5.1* it shall, to the extent permitted by law, use all reasonable endeavours to give the other PARTY as much notice of this disclosure as possible. Where notice of such disclosure is not prohibited and is given in accordance with *Clause 5.2*, that PARTY shall consider the reasonable requests of the other PARTY in relation to the content of this disclosure.

5.3 If a PARTY is unable to inform the other PARTY before Confidential Information is disclosed pursuant to *Clause 5.1* it shall, to the extent permitted by law, inform the other PARTY of the full circumstances of the disclosure and the information that has been disclosed as soon as reasonably practicable after such disclosure has been made.

6. RETURN OR DESTRUCTION OF CONFIDENTIAL INFORMATION

6.1 Upon the expiration or termination of this AGREEMENT, if so requested by the Discloser at any time by notice in writing to the Recipient, the Recipient shall:

a) destroy or return to the Discloser all documents and materials (and any copies) containing, reflecting, incorporating or based on the Discloser's Confidential Information;

b) erase all the Discloser's Confidential Information from its computer and communications systems and devices used by it, or which is stored in electronic form; and

c) to the extent technically and legally practicable, erase all the Discloser's Confidential Information which is stored in electronic form on systems and data storage services provided by third parties so that such computer archive copies are incapable of being accessed by any employee

of the recipient or by any third party without permission provided by the recipients' IT systems administrator; and

d) certify in writing to the Discloser that it has complied with the requirements of this *Clause 6.1*.

6.2 Nothing in *Clause 6.1* shall require the Recipient to return or destroy any documents and materials containing or based on the Discloser's Confidential Information that the Recipient is required to retain by applicable law, or to satisfy the requirements of a regulatory authority or body of competent jurisdiction or the rules of any listing authority or stock exchange, to which it is subject. The provisions of this AGREEMENT shall continue to apply to any documents and materials retained by the Recipient pursuant to this *Clause 6.2*.

7. RESERVATION OF RIGHTS AND ACKNOWLEDGEMENT

7.1 Each PARTY reserves all rights in its Confidential Information. The disclosure of Confidential Information by one PARTY does not give the other PARTY or any other person any license or other right in respect of any Confidential Information beyond the rights expressly set out in this AGREEMENT.

7.2 Except as expressly stated in this AGREEMENT, neither PARTY makes any express or implied warranty or representation concerning its Confidential Information, including but not limited to the accuracy or completeness of the Confidential Information.

7.3 The disclosure of Confidential Information by the PARTIES shall not form any offer by, or representation or warranty on the part of, that PARTY to enter any further agreement with the other PARTY.

8. INADEQUACY OF DAMAGES

Without prejudice to any other rights or remedies that each PARTY may have, each PARTY acknowledges and agrees that damages alone would not be an adequate remedy for any breach of the terms of this AGREEMENT by the other PARTY. Accordingly, each PARTY shall be entitled to the remedies of injunctions, specific performance or other equitable relief for any threatened or actual breach of this AGREEMENT. In the event of a breach or threatened breach by a PARTY, the offending PARTY shall reimburse the affected PARTY for any costs, expenses, claims, damages and settlement made, demands or liabilities arising directly out of a breach and finally awarded by a court of competent jurisdiction. Nothing contained in this AGREEMENT shall be construed as prohibiting the affected PARTY from pursuing any other remedies available to them for a breach or threatened breach.

Appendix E – Collaboration Agreement
[remainder of page left blank on purpose]

DATED 2020

Rothamsted Research Limited (1)

and

Yield10 Bioscience (2)

COLLABORATION AGREEMENT
Legal Reference RRES 20202

Contents

THIS AGREEMENT is made on 2020

BETWEEN:

(1) **Rothamsted Research Limited**, a company limited by guarantee incorporated and registered in England and Wales with company number 2393175 and a not for profit charity no. 802038, whose registered office is at West Common, Harpenden, Hertfordshire, AL5 2JQ, United Kingdom ("**Rothamsted**"); and

(2) **Yield10 Bioscience Inc** incorporated and registered in USA with company number CIK#: 0001121702 whose registered office is at 19 Presidential Way, Woburn, Ma 01801 ("**Industry Partner**"),

each a "**Party**" and together, "**the Parties**".

BACKGROUND:

(A) The Parties wish to work together to carry out a collaborative research and development project on plant based Omega-3 fish oil development as more particularly defined in Annex 1 ("**Project**").

(B) The Parties are entering into the Option Agreement in conjunction with this Agreement.

IT IS AGREED:

1 <u>Interpretation</u>

1.1 The following definitions and rules of interpretation apply in this agreement:

"**ADR Notice**" has the meaning given in clause 14.3.

"**Adverse Impact**" means a substantial adverse impact on a Party's ability to perform the Agreement in accordance with its terms or the law or a substantial increase in costs incurred by a Party in complying with its obligations under this Agreement.

"**Affected Party**" has the meaning given in clause 15.1.

"**Affiliates**" means in relation to a Party, any entity that controls, is controlled by or is under common control with that Party. For the purpose of this Agreement an entity shall be deemed to "control" another entity if it owns, directly or indirectly, 50% or more of the outstanding voting securities or capital stock of such entity or any other comparable equity or ownership interest with respect to an entity other than a corporation.

"**Applicable Laws**" means all laws, rules, regulations, codes of practice, research governance or ethical guidelines or other requirements of regulatory authorities as amended from time to time.

"**Arising Intellectual Property**" means all Intellectual Property Rights that arise or are obtained or developed by either Party, or by a contractor on behalf of either Party, in the course of or in connection with the Project.

"**Background Intellectual Property**" means any Intellectual Property Rights (other than Arising Intellectual Property) owned by or licensed to either Party before the Project Start Date or not created in the course of or in connection with the Project, including subsequent modifications and enhancements to such Intellectual Property Rights and including any such rights existing in the Materials.

"**Brexit Notice**" has the meaning given in clause 30.2. "Brexit Trigger Event" has the meaning given in clause 30.4.

"**Business Day**" means a day other than a Saturday, Sunday or public holiday in England when banks in London are open for business.

"**Confidential Information**" means all confidential information (however recorded or preserved) disclosed by a Party or its representative to the other Party, including but not limited to:

(a) the existence and terms of this Agreement;

(b) any information that would be regarded as confidential by a reasonable business person relating to:

(i) the business, finances, affairs, customers, clients, suppliers, plans, intentions or market opportunities of the Disclosing Party or any member of the group of companies to which the Disclosing Party belongs;

(ii) the Intellectual Property Rights, technology, operations, processes, product information, Know-how, designs, trade secrets or software of the Disclosing Party (or of any member of the group of companies to which the Disclosing Party belongs); and

(iii) any information developed by the Parties in the course of carrying out this Agreement (including but not limited to the Results and the subject matter of other Arising Intellectual Property).

"**Control**" means has the meaning given in section 1124 of the Corporation Tax Act 2010, and the expression "**Change of Control**" shall be construed accordingly.

"**Data Protection Legislation**" means any data protection legislation from time to time in force in the UK including the Data Protection Act 2018 or any successor legislation and (for so long as and to the extent that the law of the European Union has legal effect in the UK) the General

Data Protection Regulation ((EU) 2016/679) and any other directly applicable European Union regulation relating to privacy.

"**Disclosing Party**" has the meaning set out in clause 9.2 in respect of the Confidential Information.

"**Dispute**" has the meaning given in clause 14.1.

"**Dispute Notice**" has the meaning given in clause 14.1.

"**Force Majeure Event**" means any circumstance not within a Party's reasonable control including, without limitation acts of God, flood, drought, earthquake or other natural disaster, epidemic or pandemic, terrorist attack, civil war, civil commotion or riots, war, threat of or preparation for war, armed conflict, imposition of sanctions, embargo, or breaking off of diplomatic relations, nuclear, chemical or biological contamination, any law or any action taken by a government or public authority (including without limitation imposing an export or import restriction, quota or prohibition, or failing to grant a necessary licence or consent), any labour or trade dispute, strikes, industrial action or lockouts (other than in each case by the Party seeking to rely on this clause, or companies in the same group as that Party) and non-performance by suppliers or subcontractors (other than by companies in the same group as the Party seeking to rely on this clause) but for the avoidance of doubt excluding a Brexit Trigger Event.

"**Improvements**" means all additions, improvements, adaptations, modifications or enhancements to any part of the subject matter in which a Party's Background Intellectual Property exists.

"**Intellectual Property Rights**" means all patents and patent applications, right to inventions, copyright and related rights, trademarks, trade names and domain names, rights in get up, rights in goodwill or to sue for passing off, rights in designs, rights in computer software, database rights, rights in confidential information (including Know-how) and any other intellectual property rights, in each case whether registered or unregistered and including all applications (or rights to apply) for, and renewals or extensions of, and rights to claim priority from, such rights and all similar or equivalent rights or forms of protection which may now or in the future subsist in any part of the world.

"**Jointly Owned Intellectual Property**" has the meaning given in clause 7.2.2.

"**Know-how**" means any unpatented technical and other information which is not in the public domain including any:

(a) trade secrets, information comprising or relating to concepts, data, discoveries, formulae, ideas, inventions, research models or specifications;

(b) methods, research plans, procedures for experiments and tests and results of experimentation and testing; and

(c) information about biological or chemical structure or functions.

"**Materials**" means the materials (including but not limited to any biological materials or any constructs, strains, derivatives, portions or progeny of the same) that Transferor may provide to the Transferee under or in connection with the Project and this Agreement as set out in Annex 1 and any Know-how relating to the same.

"**Non-Severable Improvements**" means any Improvement which if used or practised without licence from the Party who owns or controls the relevant Background Intellectual Property would infringe that Party's Intellectual Property Rights.

"**Project**" has the meaning given in Background (A).

"**Project End Date**" means the date set out in Annex 1.

"**Project Period**" means the period from the Project Start Date to the Project End Date unless earlier terminated in accordance with clause 12 (Termination) or extended by written agreement between the Parties in accordance with clause 19 (Variation).

"**Project Start Date**" means the date set out in Annex 1.

"**Publication Restriction Period**" has the meaning given in clause 10.3.

"**Receiving Party**" means has the meaning set out in clause 9.2 in connection with Confidential Information.

"**Representatives**" means employees, officers, consultants, agents and any visiting workers (including for the avoidance of doubt, that Party's Scientific Leader).

"**Resources**" means, in relation to a Party, the information, Know-how, services, resources, manpower or other tangibles or intangibles that such Party provides in accordance with this agreement in relation to a Project including any Materials a Party is to provide as set out in Annex 1.

"**Results**" means the information, data, Know-how, results, inventions, software and other Intellectual Property Rights identified or first reduced to practice or writing within the scope of the Project and as a result of the delivery of the Project under this Agreement.

"**Scientific Leader**" means the individuals set out in Annex 1 (or their successors) appointed for the day to day management of the Project.

"**Severable Improvements**" means any Improvement which if used or practised without licence from the Party who owns or controls the relevant Background Intellectual Property would not infringe that Party's Intellectual Property Rights.

"**Solely Owned Intellectual Property**" has the meaning given in clause 7.2.1.

"**Transferee**" has the meaning given in clause 4.

"**Transferor**" has the meaning given in clause 4.

1.2 Any words following the terms **including**, **include**, **in particular**, **for example** or any similar expression shall be construed as illustrative and shall not limit the sense of the words, description, definition, phrase or term preceding those terms.

1.3 Unless the context otherwise requires, words in the singular shall include the plural and in the plural shall include the singular.

1.4 References to clauses and Annexes are to the clauses and Annexes of this Agreement and references to paragraphs are to paragraphs of the relevant Annex.

1.5 A reference to a statute or statutory provision is a reference to it as amended, extended or re-enacted from time to time.

1.6 If there is any conflict, ambiguity or inconsistency between the terms of the documents listed below, the following order of priority shall apply:

1.6.1 The License Agreement (as defined in the Option Agreement);

1.6.2 The Option Agreement entered into by the Parties on or around the date of this Agreement substantially in the form set out in Schedule 1;

1.6.3 the main body of this Agreement; then

1.6.4 the Annexes.

2 Commencement and duration

2.1 This Agreement shall commence on the Project Start Date and shall continue for the Project Period unless earlier terminated in accordance with clause 12.

3 Project Management

3.1 Annex 1 sets out details of the Project agreed between the Parties as at the date of this Agreement and details of the funding for the Project.

3.2 Each Party shall:

3.2.1 use its reasonable endeavours to complete its part of the Project by such date as may be agreed and set out Annex 1;

3.2.2 perform the obligations allocated to it in Annex 1 including by providing the Resources in accordance with any agreed timeframes or milestones;

3.2.3 use reasonable care and skill in performing its relevant obligations;

3.2.4 comply with good industry practice;

3.2.5 comply with all Applicable Laws;

3.2.6 obtain and maintain consents, licences and permissions (statutory, regulatory, contractual or otherwise) that are necessary to enable it to comply with such obligations;

3.2.7 ensure that the Resources it provides conform with descriptions and specifications (if any) set out in this agreement or otherwise agreed between the Parties;

3.2.8 if on the other Party's premises, comply with that Party's health and safety and site regulations made known to it; and

3.2.9 supply to the other Party information and assistance reasonably requested by it relating to the Project as is necessary to enable that other Party to perform its own obligations in relation to the Project.

3.3 The Scientific Leaders at Rothamsted and Industry Partner named in Annex 1 have joint responsibility for the execution of the Project in a way that is compliant with the terms and conditions described in this Agreement and the Annexes.

3.4 Each Party shall procure that its Scientific Leader signs the declaration set out in the signature clause to acknowledge that he or she has read and understood the terms of this Agreement.

4 Material Transfer

4.1 Any Materials provided by one Party ("**Transferor**") to the other ("**Transferee**") during the Project Period shall be supplied strictly for use in connection with the Project and shall only be transferred between Party's Scientific Leaders when necessary for the purpose of the Project. When transferring Materials, the terms set out in this clause 4 shall apply.

4.2 Unless otherwise agreed between the Parties, Materials will be provided by the Transferor solely for use in the Project, at the premises of the Transferee only.

4.3 The Transferee undertakes that any Materials provided will be used:

4.3.1 only by the Transferee's Scientific Leader and such of its Representatives under the direct supervision of the Transferee's Scientific Leader as are required to perform the Project. The Materials will not be provided to any other scientist or institution (public or private) without the prior written permission from the Transferor; and

4.3.2 at all times in accordance with all Applicable Laws.

4.4 The Transferee acknowledges that the Materials are experimental in nature and will be provided by the Transferor without warranties of any kind expressed or implied.

4.5 The Transferor and its Representatives and associated undertakings accept no liability for damages which might arise in connection with the use, storage or disposal by the Transferee of the Materials.

4.6 The Transferee shall:

4.6.1 keep accurate records as to the use of the Materials;

4.6.2 save as provided for in this Agreement, not use, or cause or permit the use of, the Materials, directly or indirectly:

(i) in any human subject;

(ii) in any manner that confers on any third party any Intellectual Property Rights in or to the Materials, or that creates obligations to disclose the Results to any third party; or

(iii) for any commercial purposes, including the incorporation of the Materials into products intended for commercial sale;

4.6.3 not transfer or distribute any Materials to any third party without the prior written consent of the Transferor. The Transferee shall refer third party requests for the Materials to the Transferor; and

4.6.4 not analyse, attempt to modify, reverse-engineer or otherwise seek to determine the structure or sequence of any Materials without the Transferor's prior written consent save as expressly provided for in this Agreement or in accordance with the requirements of the Project.

4.7 All experimental work within the Project and any destruction of Materials pursuant to clause 13.2 will be carried out in accordance with all applicable local, national and international legislation and any instructions from the Transferor relating to the safe handling, use and disposal of potentially hazardous materials.

4.8 For the avoidance of doubt, the Parties acknowledge and agree that the Transferor shall retain all right, title and interest in and to the Materials and to any Intellectual Property Rights that exist in the same.

5 Fees and Expenses

5.1 Funding for the Project will be provided as set forth in Article III of the Option Agreement.

6 Background Intellectual Property

6.1 All Background Intellectual Property contributed by a Party is and shall remain the exclusive property of the Party owning it (or, where applicable, the third party from whom its right to use the Background Intellectual Property has derived).

6.2 The Parties agree that any Intellectual Property Rights in Improvements shall vest as follows:

6.2.1 Non-Severable Improvements: the Intellectual Property Rights in such Improvements shall vest in the Party that owns or controls the relevant Background Intellectual Property and each Party shall execute all such documents and do all things necessary to vest the title and interest in the aforesaid Non-Severable Improvement in the relevant Party and assist where reasonably required in the application for registration of the same provided always that where the sole purpose of the Project as set out in Annex 1 is expressed to be the Improvement of the subject matter of the relevant Background Intellectual Property, the Intellectual Property Rights in such Improvements shall be deemed to be Arising Intellectual Property and dealt with in accordance with clause 7.2; and

6.2.2 Severable Improvements: the Intellectual Property Rights in such Improvements shall be Arising Intellectual Property and dealt with in accordance with clause 7.2.

6.3 Industry Partner shall have an option to acquire a license to Rothamsted's Non-Severable Improvement as set forth in the Option Agreement.

6.4 Each Party grants to the other for the Project Period, a royalty-free, worldwide, non-transferable (except to Affiliates), non-exclusive, irrevocable licence to use its Background Intellectual Property (including in any Non-Severable Improvements forming part of the Background Intellectual Property) for the sole purpose of the performance of the Project, such licence includes the right to sub licence to an Affiliate only where needed for the sole performance of the Project.

6.5 On expiry of the Project Period, each Party grants the other Party a royalty-free, worldwide, non-transferable (except to Affiliates), non-sub licensable, non-exclusive, irrevocable licence to use the other Party's Background Intellectual Property (including in any Non-Severable Improvements forming part of the Background Intellectual Property) provided that:

6.5.1 in the case of Industry Partner, the licence is limited to internal research and development only; and

6.5.2 in the case of Rothamsted, the licence is limited to teaching and academic research and development which is not commercially sponsored.

6.6 For the avoidance of doubt, the licences provided for in clauses 6.4 and 6.5 shall not permit use of the Background Intellectual Property by any Party for any commercial exploitation of the Arising Intellectual Property without prior written agreement of the Parties.

7 <u>Arising Intellectual Property</u>

7.1 Each Party shall promptly notify the other Parties of all Arising Intellectual Property that the notifying Party generates in the Project.

7.2 Arising Intellectual Property shall vest in and be owned as follows:

7.2.1 to the extent that the Arising Intellectual Property is generated or developed by a Party alone, then it shall vest in and be owned absolutely by that Party ("**Solely Owned Intellectual Property**"); or

7.2.2 to the extent that the Arising Intellectual Property is generated or developed jointly by the Parties, then it shall vest in and be owned jointly by both Parties in equal and indivisible shares ("**Jointly Owned Intellectual Property**"), and the Parties shall execute all such documents and do all things necessary to vest the title and interest in the aforesaid Arising Intellectual Property in the manner specified in this clause 7.2.

7.3 In the event that it is or may be possible to obtain any registered Intellectual Property Rights in any Jointly Owned Intellectual Property, the Parties shall agree in writing a Party to be responsible for the filing and prosecution on behalf of the Parties in their joint names of applications for registration, and the maintenance and renewal of any registrations, in such countries as the Parties agree in writing, provided that:

7.3.1 if one Party wishes to apply for registration in any country or countries but the other does not, that Party may do so at its sole cost and expense on behalf of all Parties and in their joint names, and the Parties shall provide the applying Party with all necessary assistance, information, and instruction;

7.3.2 no Party shall amend or abandon any registration in respect of which the Parties are jointly registered as owners unless, in the case of an amendment, a Party shall have given its prior written consent or, in the case of abandonment, the other Party shall be given the opportunity to maintain the registration at its own cost; and

7.3.3 the Party making an application for registration shall consult with the other Party at reasonable intervals concerning the application for and maintenance of such registration.

7.4 Unless otherwise agreed in writing, the Parties agree that they shall each only be entitled to use its share of the Jointly Owned Intellectual Property to the other Party on the same terms as the licence set out in clause 7.5.

7.5 Each Party hereby grants to each of the other Party, a royalty-free, worldwide fully paid up, irrevocable, non-transferable (except to Affiliates), non-exclusive, right and licence in perpetuity, with the right to sublicense to Affiliates only, to use it's the Solely Owned Intellectual Property for the purpose only of:

7.5.1 in the case of Industry Partner, its internal research and development;

7.5.2in the case of Rothamsted, for teaching and academic research and development which is not commercially sponsored and so far as necessary to give effect to the provisions of clause 8;

provided that in each case, any commercial use of Arising Intellectual Property is explicitly excluded from the scope of such licences.

7.6 Industry Partner shall have an option to acquire a license to Rothamsted's Solely Owned Intellectual Property or its share of the Jointly Owned Intellectual Property as set forth in the Option Agreement

7.7 During the term of this Agreement Company shall be responsible for all costs and expenses for the preparation, filing, prosecution (including any interferences, reissue proceedings, inter partes reviews and reexaminations) and maintenance of Jointly Owned Intellectual Property.

8 Not for Profit Knowledge Sharing

8.1 The Parties agree that Rothamsted may share the Results (including any Know-how or Arising Intellectual Property) with selected not-for-profit organisations on a case by case basis provided that prior to such information being shared:

8.1.1 Rothamsted notifies Industry Partner of the identity of the not-for-profit organisation and the nature of the information to be shared; and

8.1.2 Rothamsted ensures that the information shared is marked as confidential and the not-for-profit organisation is required to enter into confidentiality obligations at least equivalent to those set out in this Agreement.

9 Confidentiality

9.1 Each Party undertakes that it shall not for the duration of the Agreement and for a period of [***] following the Project End Date, use or disclose to any person any Confidential Information other than as necessary to exercise its rights or perform its obligations under and in accordance with this Agreement and except as permitted by clause 9.2.

9.2 A Party (**Disclosing Party**) may disclose or make available Confidential Information to the other Party (**Receiving Party**). The Receiving Party may disclose the Disclosing Party's Confidential Information:

9.2.1 to its Representatives and students who need to know such information for the purposes of exercising the Party's rights or carrying out its obligations under or in connection with this Agreement. Each Party shall procure that its Representatives or students to whom it discloses the other Party's Confidential Information:

(i) have been informed of the confidential nature of the Confidential Information and shall comply with the Receiving Party's obligations under this clause 9; and

(ii) safeguard the Confidential Information from unauthorised use, access, or disclosure using at least the degree of care the relevant Party uses to protect its similarly sensitive information and in no event less than a reasonable degree of care;

9.2.2 as may be required by law, a court of competent jurisdiction or any governmental or regulatory authority, and in these circumstances the Receiving Party shall:

(i) promptly, and before such disclosure (where reasonably practicable to do so and otherwise immediately afterwards), notify the Disclosing Party in writing of such requirement so that the Disclosing Party can seek a protective order or other remedy; and

(ii) disclose only that portion of the Confidential Information that the Receiving Party is legally required to disclose;

9.2.3 in accordance with and subject to the provisions of clauses 8 and 10.

9.3 The prohibition in clause 9.1 shall cease to apply to information which:

9.3.1 is or becomes generally available to the public (other than as a result of its disclosure by the Receiving Party or its representatives in breach of this Agreement);

9.3.2 was available to the Receiving Party on a non-confidential basis before disclosure by the Disclosing Party;

9.3.3 was, is or becomes available to the Receiving Party on a non-confidential basis from a person who, to the Receiving Party's knowledge, is not bound by a confidentiality obligation with the Disclosing Party or otherwise prohibited from disclosing the information to the Receiving Party;

9.3.4 the Parties agree in writing is not confidential or may be disclosed; or

9.3.5 is developed by or for the Receiving Party independently of the information disclosed by the Disclosing Party.

9.4 Save as permitted by this Agreement, no Party shall use any other Party's Confidential Information for any purpose other than to exercise its rights and perform its obligations under or in connection with this Agreement.

9.5 For the avoidance of doubt, and save as expressly set out in this Agreement, the Confidential Information is proprietary to the Disclosing Party, and the Receiving Party acknowledges that no disclosure of the Confidential Information by the Disclosing Party gives the Receiving Party any Intellectual Property Rights of any kind in relation to the Confidential Information. The Parties further agree that the Disclosing Party will own any copies of all or any part of the Confidential Information that the Receiving Party makes and the Receiving Party shall label any copies in a tangible medium with a notice that they are the property of the Disclosing Party.

10 Publication

10.1 The Parties may publicise in general terms the fact that the Parties are collaborating on a project. Nevertheless, neither Party shall use the name, logos or trade names or product trademarks owned by the other Party in any form of Publication or disclose any Confidential Information without prior written consent of that Party.

10.2 Industry Partner acknowledges that the Project will form part of the actual carrying out of a primary charitable purpose at Rothamsted, that is the advancement of academic research. The Parties agree that any proposed Publication relating to the Project will be managed as per the following procedures.

10.3 In accordance with normal academic practice, all Representatives of Rothamsted shall be permitted to publish or discuss in internal seminars any Arising Intellectual Property owned by any Party and to give advice internally or respond to queries on the same internally within Rothamsted provided that where such publication is intended during the Project Period and for a period of [***] following the Project End Date ("**Publication Restriction Period**"), the procedures laid down in clause 10.4 shall be complied with.

10.4 During the Publication Restriction Period:

10.4.1 all proposed publications (including, but not limited to, scientific publications, patent applications and non-confidential presentations) shall be submitted by Rothamsted in writing to Industry Partner for review at least [***] before submission for publication or before presentation, as the case may be;

10.4.2 within [***] of receipt of the proposed publication from Rothamsted in accordance with clause 10.3, Industry Partner may (acting reasonably) require:

(i) the deletion from the publication of any Background Intellectual Property of Industry Partner;

(ii) an amendment to the publication through which commercially sensitive Background Intellectual Property of Industry Partner is disguised, to the satisfaction of Industry Partner; or

(iii) the delay of the publication if in Industry Partner's reasonable opinion the delay is necessary in order for it to seek patent or similar protection for any Arising Intellectual Property in accordance with its respective rights in clause 6. Any such delay imposed on publication shall not last longer than is reasonably necessary for Industry Partner to obtain the required protection; and shall not exceed [***] from the date of receipt by Industry Partner of the proposed publication,

provided that, where no response is received by Rothamsted from Industry Partner within the timescale specified in this clause 10.4, Rothamsted shall be free to assume that Industry Partner has no objection to the proposed publication.

10.5 Each Party agrees that any publication in a scientific/academic journal shall give due acknowledgement to the financial and/or intellectual contribution of the relevant Party in accordance with standard scientific practice.

11 <u>Limitation of Liability</u>

11.1 To the fullest extent permitted by law, any warranties, representations, conditions and other terms implied by statute or common law are excluded from this Agreement, except as expressly provided in this Agreement.

11.2 Without limiting the effect of clause 11.1, Rothamsted disclaims any express or implied warranties of merchantability or fitness for a particular purpose.

11.3 Without limiting the effect of clause 11.1, COMPANY disclaims any express or implied warranties of merchantability or fitness for a particular purpose.

11.4 Nothing in this Agreement shall limit or exclude either Party's liability for:

11.4.1 death or personal injury caused by its negligence, or the negligence of its personnel, agents or subcontractors;

11.4.2 fraud or fraudulent misrepresentation; and

11.4.3 breach of the terms implied by section 2 of the Supply of Goods and Services Act 1982 (title and quiet possession) and any other liability which cannot be limited or excluded by Applicable Laws.

11.5 Subject to clause 11.4, neither Party shall be liable to the other Party, whether in contract, tort (including negligence), for breach of statutory duty, or otherwise, arising under or in connection with this Agreement for loss of profits, loss of business, loss of agreements or contracts, loss of use or corruption of software, data or information or any indirect or consequential loss.

11.6 Subject to clause 11.4, each Party's total liability to the other Party, whether in contract, tort (including negligence), breach of statutory duty, or otherwise, arising under or in connection with this Agreement shall be limited to the payments set forth in Section 3.01 of the Option Agreement.

12 <u>Term and Termination</u>

12.1 Term. Unless earlier terminated as permitted by this Agreement, the term of this Agreement (the "**Term**") will commence upon the Effective Date and continue in full force and effect until the later of (a) completion of the Project or (b) the expiration or termination of the Option Agreement.

12.2 This Agreement may be terminated as set forth in Sections 5.02, 5.03 and 5.05 of the Option Agreement it being agreed that all references to "this Agreement" shall be read as references to this Collaboration Agreement.

13 <u>Consequences of Termination</u>

13.1 Termination of this Agreement shall not affect any rights, remedies, obligations or liabilities of the Parties that have accrued up to the date of termination, including the right to claim

damages in respect of any breach of the Agreement which existed at or before the date of termination.

13.2 Upon termination or expiry of this Agreement:

13.2.1 each of the Parties shall within [***] return to the other Party, or if the other Party so requests by notice in writing, destroy (in accordance with all applicable local, national and international legislation relating to the safe handling, use and disposal of potentially hazardous materials), all of the other Party's property, including all Confidential Information, Materials and copies thereof in its custody or control at the date of termination or expiry and shall certify that it has done so, and shall make no further use of such Confidential Information and Materials and copies thereof; and

13.2.2 the provisions of clauses 6, 7, 8, 9, 10, 13, 14, 16, 17, 19, 20, 21, 22, 23, 27, 28, 31 and 32 shall survive termination (for any reason) or expiry of this Agreement as shall any clauses which expressly or by implication are intended to remain in force on or after termination or expiry of this Agreement; and

13.2.3 for the avoidance of doubt, where the Option Agreement remains in full force and effect, the Industry Partner shall remain bound to make the payments as set forth in Section 3.01 of the Option Agreement.

14 <u>Escalation and Dispute Resolution</u>

14.1 If either Party has any issues, concerns or complaints arising under or in connection with this Agreement ("**Dispute**"), that Party shall give written notice of the Dispute to the relevant contact of the other Party as set out below ("**Dispute Notice**") and those personal shall seek to resolve the Dispute by a process of consultation;

14.1.1 For Rothamsted: Dispute Notices shall be served on: Head of Legal; and

14.1.2 For Yield10 Biosciences Dispute Notices shall be served on:

Oliver Peoples, President and CEO

14.2 If the Dispute cannot be resolved by the persons named in clause 14.1 within [***], the matter shall be escalated to the Chief Executive Officer of Rothamsted and the Chief Executive ROLE for Industry Partner.

14.3 If the Chief Executive Officer of Rothamsted and the Chief Executive Officer for Industry Partner are for any reason unable to resolve the Dispute within[***] of it being referred to them, the parties agree to enter into mediation in good faith to settle the Dispute in accordance with the CEDR Model Mediation Procedure. Unless otherwise agreed between the parties within [***] of service of the Dispute Notice, the mediator shall be nominated by CEDR. To initiate the mediation, a party must serve notice in writing ("**ADR notice**") to the other party to the Dispute, referring the dispute to mediation. A copy of the ADR notice should be sent to CEDR. Unless

otherwise agreed between the parties, the mediation will start not later than [***] after the date of the ADR notice.

14.4 No party may commence any court proceedings under clause 32 (Jurisdiction) in relation to the whole or part of the Dispute until [***] after service of the ADR notice, provided that the right to issue proceedings is not prejudiced by a delay.

14.5 If the Dispute is not resolved within [***] after service of the ADR notice, or either party fails to participate or ceases to participate in the mediation before the expiry of that [***] or the mediation terminates without resolution before the expiry of that [***] period, the Dispute shall be finally resolved by the courts of England and Wales in accordance with clause 32 (Jurisdiction) in this Agreement.

15 Force majeure

15.1 Provided it has complied with clause 15.2, if a Party is prevented, hindered or delayed in or from performing any of its obligations, other than an obligation to make payments to the other Party, under this Agreement by a Force Majeure Event ("**Affected Party**"), the Affected Party shall not be in breach of this Agreement or otherwise liable for any such failure or delay in the performance of such obligations. The time for performance of such obligations shall be extended accordingly and the corresponding obligations of the other Party will be suspended, and its time for performance of such obligations extended, to the same extent as those of the Affected Party.

15.2 The Affected Party shall:

15.2.1 as soon as reasonably practicable after the start of the Force Majeure Event but no later than [***] from its start, notify the other Party of the Force Majeure Event, the date on which it started, its likely or potential duration, and the effect of the Force Majeure Event on its ability to perform any of its obligations under the Agreement; and

15.2.2 use all reasonable endeavours to mitigate the effect of the Force Majeure Event on the performance of its obligations.

15.3 If the Force Majeure Event prevents, hinders or delays the Affected Party's performance of its obligations for a continuous period of more than [***], the Party not affected by the Force Majeure Event may terminate this Agreement by giving [***] written notice to the Affected Party.

16 <u>Inadequacy of Damages</u>

16.1 Without prejudice to any other rights or remedies that each Party may have, each Party acknowledges and agrees that damages alone would not be an adequate remedy for any breach of this Agreement by the other Party. Accordingly, each Party shall be entitled to the remedies of injunction, specific performance or other equitable relief for any threatened or actual breach of this Agreement.

17 <u>Data Protection</u>

17.1 To the extent that the Parties process any Personal Data of the other Party in connection with this Agreement or a Project, each Party shall be acting as a Controller and shall comply with its obligations under the Data Protection Legislation.

18 Anti-Bribery & Corruption

18.1 Each Party shall:

18.1.1 comply with all Applicable Laws, statutes, regulations, and codes relating to anti-bribery and anti-corruption including but not limited to the Bribery Act 2010;

18.1.2 not engage in any activity, practice or conduct which would constitute an offence under sections 1, 2 or 6 of the Bribery Act 2010 if such activity, practice or conduct had been carried out in the UK;

18.1.3 promptly report to the representatives of the other Party any request or demand for any undue financial or other advantage of any kind received by it in connection with the performance of this Agreement.

18.2 Each Party shall ensure that any person associated with it who is performing services in connection with this Agreement or any Project does so only on the basis of a written contract which imposes on and secures from such person terms equivalent to those imposed on the Parties in this clause 18 ("**Relevant Terms**"). The Party shall be responsible for the observance and performance by such persons of the Relevant Terms, and shall be directly liable to the other Party for any breach by such persons of any of the Relevant Terms.

19 Variation

19.1 No variation of this Agreement shall be effective unless it is in writing and signed by the Parties (or their authorised representatives).

20 Waiver

20.1 A waiver of any right or remedy under this Agreement or by law is only effective if given in writing and shall not be deemed a waiver of any subsequent right or remedy.

20.2 A failure or delay by a Party to exercise any right or remedy provided under this Agreement or by law shall not constitute a waiver of that or any other right or remedy, nor shall it prevent or restrict any further exercise of that or any other right or remedy. No single or partial exercise of any right or remedy provided under this Agreement or by law shall prevent or restrict the further exercise of that or any other right or remedy.

21 Rights and remedies

21.1 Except as expressly provided in this Agreement, the rights and remedies provided under this Agreement are in addition to, and not exclusive of, any rights or remedies provided by law.

22 Severance

22.1 If any provision or part-provision of this Agreement is or becomes invalid, illegal or unenforceable, it shall be deemed deleted, but that shall not affect the validity and enforceability of the rest of this Agreement.

22.2 If any provision or part-provision of this Agreement is deemed deleted under clause 22.1 the Parties shall negotiate in good faith to agree a replacement provision that, to the greatest extent possible, achieves the intended commercial result of the original provision.

23 Entire agreement

23.1 This Agreement and the Option Agreement constitute the entire agreement between the Parties and supersedes and extinguishes all previous agreements, promises, assurances, warranties, representations and understandings between them, whether written or oral, relating to its subject matter.

23.2 Each Party agrees that it shall have no remedies in respect of any statement, representation, assurance or warranty (whether made innocently or negligently) under this Agreement that is not set out in this Agreement. Each Party agrees that it shall have no claim for innocent or negligent misrepresentation or negligent misstatement based on any statement in this Agreement.

24 Assignment and other dealings

24.1 Save as otherwise set out in this Agreement, neither Party shall assign, transfer, mortgage, charge, subcontract, delegate, declare a trust over or deal in any other manner with any or all of its rights and obligations under this Agreement without the prior written consent of the other Party (such consent not to be unreasonably withheld, conditioned or delayed).

25 Subcontracting

25.1 Rothamsted may, in its discretion, sub-contract the provision of any material part of the Project with the prior written consent of Industry Partner (such consent not to be unreasonably withheld, conditioned or delayed).

26 No partnership or agency

26.1 Nothing in this Agreement is intended to, or shall be deemed to, establish any partnership or joint venture between any of the Parties, constitute any Party the agent of another Party, or authorise any Party to make or enter into any commitments for or on behalf of any other Party.

26.2 Each Party confirms it is acting on its own behalf and not for the benefit of any other person.

27 Third party rights

27.1 This Agreement does not give rise to any rights under the Contracts (Rights of Third Parties) Act 1999 to enforce any term of this Agreement.

27.2 The rights or the Parties to rescind or vary this Agreement are not subject to the consent of any person.

28 Notices

28.1 Any notice or other communication given to a Party under or in connection with this Agreement shall be in writing and shall be delivered by hand or by pre-paid first-class post or other next working day delivery service at its registered office (if a company) or its principal place of business (in any other case).

28.2 Any notice or communication shall be deemed to have been received:

28.2.1 if delivered by hand, on signature of a delivery receipt or at the time the notice is left at the proper address; and

28.2.2 if sent by pre-paid first-class post or other next working day delivery service, at [***] after posting or at the time recorded by the delivery service.

28.3 This clause does not apply to the service of any proceedings or other documents in any legal action or, where applicable, any arbitration or other method of dispute resolution.

28.4 A notice given under this Agreement is not valid if sent by email.

29 Counterparts & Electronic Signature

29.1 This Agreement may be executed in any number of counterparts, each of which when executed and delivered shall constitute a duplicate original, but all the counterparts shall together constitute the one agreement.

29.2 Transmission of an executed counterpart of this Agreement (but for the avoidance of doubt not just a signature page) by email (in PDF, JPEG or other agreed format) shall take effect as delivery of an executed counterpart of this Agreement. If this method of delivery is adopted, without prejudice to the validity of the Agreement thus made, each Party shall provide the others with the original of such counterpart as soon as reasonably possible thereafter.

29.3 No counterpart shall be effective until each Party has executed and delivered at least one counterpart.

29.4 The Parties agree that this Agreement may be executed by electronic signature (whatever form the electronic signature takes) and that such method of signature is conclusive evidence of the each Party’s intention to be bound by this Agreement as if signed by each Party’s manuscript signature.

30 Brexit

30.1 If a Brexit Trigger Event occurs which is or is likely to have an Adverse Impact on a Party, the impacted Party may:

30.1.1 require the other Party to negotiate an amendment to this Agreement to alleviate the Adverse Impact, in accordance with clause 30.2; and

30.1.2 if renegotiation fails, terminate this Agreement in accordance with clause 30.3.

30.2 An impacted Party may initiate a negotiation under clause 30.1 by a notice ("**Brexit Notice**") to the other Party giving details of the relevant Brexit Trigger Event and the Adverse Impact. On delivery of a Brexit Notice:

30.2.1 the Parties shall meet within [***] of the date of the Brexit Notice to discuss in good faith amendments to this Agreement;

30.2.2 the impacted Party shall provide any further information reasonable requested by the other Party on the Adverse Impact and Brexit Trigger Event relied on; and

30.2.3 the Parties shall record any amendments agreed to this Agreement in writing in accordance with clause 19.

30.3 If the Parties fail to agree a variation within [***] of the date of the Brexit Notice, either Party may give the other Party [***] written notice to terminate this Agreement. On Termination of this Agreement under this clause 30, clause 13 (Consequences of Termination) shall apply.

30.4 "**Brexit Trigger Event**" means one of the following events occurring within [***] after and caused by the UK ceasing to be a Member State of the European Union:

30.4.1 a change in Law or new requirement to comply with any existing Law or exiting Law ceasing to apply to a Party. For these purposes, 'Law' means any legal provision a Party must comply with including any law, statute, subordinate legislation within the meaning of section 21(1) of the Interpretation Act 1978, enforceable EU right within the meaning of section 2 of the European Communities Act 1972, bye-law, regulation, order, mandatory guidance or code of practice, judgment of a court of law, or requirement of any regulatory body, whether in the UK or elsewhere;

30.4.2 in any jurisdiction, the loss of, a change to or the imposition of a new requirement for any licence or consent required by a Party to perform its obligations under this Agreement;

30.4.3 in any jurisdiction, the imposition of or a change to a duty, tax or levy imposed on a Party which affects its commercial ability to be comply with its obligations under this Agreement; or

30.4.4 any other change to the business or economic environment in which a Party operates other than as provided for in clauses 30.4.1, 30.4.2 or 30.4.3.

30.5 Save as expressly provided in this clause 30, a Brexit Trigger Event shall not terminate or alter (or give any Party a right to terminate or alter) this contract, or invalidate any of its terms or

discharge or excuse performance under it. If there is an inconsistency between the provisions of this clause and any other provision of this Agreement, the provisions of this clause shall prevail.

31 Governing law

31.1 This Agreement and any dispute or claim (including non-contractual disputes or claims) arising out of or in connection with it or its subject matter or formation shall be governed by and construed in accordance with the laws of England and Wales.

32 Jurisdiction

32.1 Subject to clause 14, each Party irrevocably agrees that the courts of London, England shall have exclusive jurisdiction to settle any dispute or claim (including non-contractual disputes or claims) arising out of or in connection with this Agreement or its subject matter or formation.

This Agreement has been entered into on the date stated at the beginning of it.

EXECUTION OF THIS AGREEMENT

Authorised signatories

For Yield10 Bioscience Inc:	For Rothamsted Research Limited:
NAME: [***] POSITION: [***] DEPARTMENT: [***]	NAME: [***] TITLE: [***] DEPARTMENT: [***]

SCIENTIFIC LEADER DECLARATION

Declaration by the Scientific Leaders for the purpose of clause 3.4

I acknowledge that I have read and understood the terms and conditions of this Agreement and agree to use reasonable endeavours to comply with the terms and conditions.

For Yield10 Bioscience Inc:

NAME: [***]
POSITION: [***]

For Rothamsted Research Limited:

NAME: [***]
POSITION: [***]
DEPARTMENT: [***]

Annex 1. Project Particulars

1. Project title:

Camelina-based Omega-3 fish oil development

2. Project Start Date: 3. Project End Date:

[***]	[***]

4. Rothamsted Scientific Leaders: 5. Industry Partner Scientific Leaders:

[***]	[***]

6. Location of work:

Rothamsted Research

7. Technical objectives of the Project:

[***]

8. Work Plan and allocation of tasks by Party:

See text below in blue

9. Milestones (including delivery dates):

See attached

10. Rothamsted Deliverables: 11. Industry Partner Deliverables:

1. The Progress Reports and the Final Report, in each case as defined and set forth in the Option Agreement. 2. Quarterly meetings with Industry Partner to review each Progress Report and a meeting within [***] of Industry Partner's receipt of the Final Report to review same.	None

12. Background that each partner brings to the Project:

	Rothamsted	**Industry Partner**
Know-How	[***]	[***] and a plan to commercialize the technology
Materials	[***]	None
Other	None	None

13. Biological Materials:

If any Biological Material will be provided or exchanged for the Project, please specify: a) The exact type of Biological Material concerned (e.g. seeds, virus, fungi, bacteria) b) The origin of the material and its legal status if known (e.g. property of one of the Parties or of a third party, or freely accessible in the public domain) c) The material's mode of protection (e.g. patent, variety rights) if known

14. Total cost of the Project and breakdown by year:

Total project cost is [***] to be paid as set forth in the Option Agreement.

15. Sources of funding for the Project:

- Industry Partner

Making Fish Oils in Plants: A new sustainable source of heart-healthy omega-3 oils

Omega-3 fish oils, or more precisely, omega-3 long chain polyunsaturated fatty acids such as EPA and DHA, are proven to be health-beneficial to humans, reducing the risk of cardiovascular disease (CVD) and other metabolic diseases such as obesity and type-2 diabetes. These pathologies are now recognised as a global pandemic which threatens the health of hundreds of millions. Although omega-3 fish oils are recognised by health professionals as being crucial for correct human nutrition, the primary source of them is limited and finite. As the global population continues to increase, so does demand, and oceanic sources of fish oils are even now insufficient to ensure every person on this planet receives the recommended daily amount of these vital nutrients. In an effort to solve this problem, [***] based at Rothamsted Research, has embarked on an ambitious programme to genetically engineer plants with the capacity to make these health-beneficial omega-3 fish oils, which no plants normally make. Perhaps surprisingly, fish don't actually make omega-3 fish oils, instead it is marine microbes such as algae which make them (with fish just accumulating them through their diet). We identified the [***] and introduced them into plants. By adding [***] it was possible to engineer plants to do something that they cannot normally do – make omega-3 fish oils.

As a consequence of over fifteen years' dedicated effort, Rothamsted has now generated [***] – this is equivalent to (or better) than levels found in oceanically-sourced fish oils. Our plant-based source of omega-3 fish oils can contribute to both better human nutrition (helping to reduce the risk of CVD) and also relieving pressure on global fish stocks. In addition, this new source of omega-3 oils can help solve the sustainability problems being faced by the aquaculture (fish-farming) industry, who use the vast majority of all oceanically sourced fish oils.

The stage is now set to move this proven prototype out of a research phase and onto a commercialisation path.

Market Opportunity

The omega-3 fish oils market is currently an approximate 1 million metric tonnes supplied almost exclusively from marine sources such as anchovy. Around 80% of annual supply is utilised as an ingredient in aquafeed, with the balance utilised for direct human consumption in markets that include dietary supplements, pharmaceuticals and infant nutrition. Based on current commodity prices, the total revenue of global omega-3 fish oil businesses is in excess of $3 billion per annum.

Currently constraining growth in this sector, extraction of marine-sourced omega-3 fish oils are regulated by strict quotas to protect against over-fishing. Furthermore, with the growing awareness of the negative impact of human activities on our oceans, alternatives with reduced environmental footprint compared to commercial fishing fleets are desirable, as are new sources of omega-3 fish oils which are more sustainable. **From the consumer's perspective, a product that is both health-beneficial and environmentally-responsible is becoming more and more important.**

As a result, there is a strong market need for new non-marine sources of omega-3 fish oils to meet growing supply requirements from both aquafeed and human consumption markets.

The Rothamsted Omega-3 Programme

Progress achieved by Rothamsted:

- [***]

The project is ready for progression from late-stage research to a commercial development programme that includes both agricultural de-regulation and feed ingredient de-regulation. It is assumed that the commercial development programme would be based in a geographic area that is more amenable to, and accepting of, GM crops most likely the [***] The primary market for the resulting plant-derived omega-3 fish oils would be aquaculture, initially focussed on [***]

Rothamsted has investigated in some detail the development timelines and related budget to ready the project for commercial launch in the aquafeed market assuming agricultural development in N. America. The timelines anticipate commercial launch in either [***] and a relatively modest development budget, which can be broken down into two phases: 1) selection of lead event (i.e. best performing plant) 2) regulatory approval, with the bulk of costs being associated with the latter.

Programme of Research.

Purpose: [***]

Previously we have identified a [***] that direct the seed-specific accumulation of EPA and DHA in Camelina. Whilst there are some possibilities that the resulting constructs and lines could be commercialised, this would require third party licenses. However, we believe that we can improve on that benchmark (defined in our peer-reviewed publication Han et al., 2020) as well as avoiding third-party IP and have embarked on further rounds of iteration to elevate the levels of EPA and DHA. Additional enhancements are envisaged including [***]. The current status of the programme is shown graphical in the attached Gannt chart and defined below. For clarity, whilst the chart shows both past and future activities, the narrative below is for the next [***], commencing [***]. Several pre-existing resources have previously been generated, most notably a library of “parts” (i.e. genes and regulatory elements) which have also been assembled (via Golden Gate) into transformation-ready binary vectors for introduction into Camelina. Please note that timings are considered to be realistic estimates, but subject to variation as a consequence of working with biological material and their interaction with environmental factors during field trials. Also these timelines do not reflect current restrictions arising from Covis-19, though it is hoped that these will have been lifted by [***].

[***]

[***]

[***]

[***]

[***]

Rothamsted Research (RRes) Camelina-based Omega-3 fish oil commercial development timeline – past & future (to be read in conjunction with the associated Research Plan)

[***]

FIRST AMENDMENT TO OPTION AGREEMENT

This First Amendment to Option Agreement (the "Amendment"), effective as of ("Amendment Effective Date"), is made by and between **ROTHAMSTED RESEARCH LIMITED** a company limited by guarantee incorporated and registered in England and Wales with company number 2393175 and a not for profit charity with charity number 802038, whose registered office is at West Common, Harpenden, Hertfordshire AL5 2JQ, United Kingdom ("ROTHAMSTED") and **YIELD10 BIOSCIENCE INC.**, a corporation organized under the laws of the State of Delaware having offices at 19 Presidential Way, Woburn, MA 01801 (hereafter "COMPANY"). ROTHAMSTED and COMPANY may sometimes be referred to herein as a "PARTY" or "PARTIES" as the case may be.

WHEREAS, the PARTIES entered into an Option Agreement effective as of November 12, 2020 (the "Option Agreement");

WHEREAS, the PARTIES entered into a Collaboration Agreement effective as of November 12, 2020 (the "Collaboration Agreement");

WHEREAS, due to a Force Majeure Event (as defined in the Collaboration Agreement) ROTHAMSTED was unable to complete the work plan outlined in Annex 1 of the Collaboration Agreement;

WHEREAS, the PARTIES are entering into a First Amendment to Collaboration Agreement on even date herewith; and

WHEREAS, the PARTIES desire to amend the Option Agreement in accordance with Section 6.12 thereof.

NOW THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the PARTIES agree to amend the Option Agreement as follows.

1. Capitalized terms not otherwise defined herein will have the meaning given to them in the Option Agreement.

2. Revision to Article 1 (DEFINITIONS).

- Section 1.12 is hereby deleted in its entirety and replaced with the following:

  "OPTION PERIOD" means the period commencing on the EFFECTIVE DATE of this AGREEMENT (i.e., November 12, 2020) and ending on the later of (a) three (3) years thereafter, i.e., the third anniversary of the Effective Date, such period extendable by additional periods of up to one year with the prior written agreement of the PARTIES and (b) thirty (30) days after receipt of all PART B PROGRESS REPORTS and the PART B FINAL REPORT (each as defined in the Collaboration Agreement).

3. Revisions to Article III (PAYMENTS AND FEES)

- Section 3.01 is hereby amended to add the following sentence at the end of the first sentence:

"The Parties acknowledge and agree that as of the Amendment Effective Date all payments other than Payment 8 due under this Section 3.01 have been paid in full and that no further payments under this Section 3.01 other than Payment 8 will be due to ROTHAMSTED upon completion of the Project."

- The fourth row of the table in Section 3.01 is hereby deleted in its entirety and replaced with the following:

[***]	[***]

4. Rothamsted Technology. The Parties agree that Appendix A (Rothamsted Technology) to the Option Agreement shall be deleted in its entirety and replaced with Appendix A attached hereto.
5. Revisions to Article VI (GENERAL).

- Section 6.10 (Notices) is hereby deleted in its entirety and replaced with the following: "6.10.1 A notice given to a Party under or in connection with this Agreement:

6.10.1.1 shall be in writing and in English;

6.10.1.2 shall be signed by or on behalf of the Party giving it;

6.10.1.3 shall be sent to the party for the attention of the contact and at the address, email address listed in Section 6.10.2, or such other address, email address as that Party may notify in accordance with Section 6.10.2.3;

6.10.1.4 shall be sent by a method listed in Section 6.10.3; and

6.10.1.5 unless proved otherwise is deemed received as set out in Section 6.10.3 if prepared and sent in accordance with this Section.

6.10.2 The addresses and email addresses for service of notices are:

6.10.2.1 Rothamsted Research Limited

a) Address: Rothamsted Research Limited, West Common, Harpenden, Hertfordshire, AL5 2JQ, United Kingdom

b) For the attention of: [***]

c) e-mail to [***] and [***]

6.10.2.2 Yield 10 Bioscience Inc.

a) Address: 19 Presidential Way, Woburn, 01801 MA, USA

b) For the attention of: [***]

c) Email address(es): [***]

6.10.2.3 A party may change its details above by giving notice, the change taking effect for the Party notified of the change at 9.00 am on the later of:

a) the date, if any, specified in the notice as the effective date for the change; or

b) the date five Business Days after deemed receipt of the notice.

6.10.3 This Section 6.10.3 sets out the delivery methods for sending a notice to a Party under this Agreement and, for each delivery method, the date and time when the notice is deemed to have been received:

6.10.3.1 if delivered by hand, at the time the notice is left at the address; or

6.10.3.2 if sent by pre-paid first class post or other next working day delivery service providing proof of postage, at 9.00 am on the second Business Day after posting; or

6.10.3.3 if sent by pre-paid airmail providing proof of postage at 9.00 am on the fifth Business Day after posting; or

6.10.3.4 if sent by email, at the time of transmission, provided that no 'failed delivery' message has been issued by the recipient or received by the sender.

If deemed receipt under Section 6.10.3.4 would occur outside business hours in the place of receipt, it shall be deferred until business hours resume. In this Section 6.10.3.4, business hours means 9.00 am to 5.00 pm on a Business Day in the place of receipt.

6.10.4 Section 6.10 does not apply to the service of any proceedings or other documents in any legal action or, where applicable, any arbitration or other method of dispute resolution."

6. Upon its execution and delivery, this Amendment shall amend, modify and supersede, to the extent of any inconsistencies, the provisions of the Option Agreement. Except as expressly modified by this Amendment, the Option Agreement shall remain in full force and effect.

7. The Option Agreement, this Amendment, the Collaboration Agreement and the First Amendment to Collaboration Agreement embody the entire understanding of the PARTIES and there are no promises, terms, conditions or obligations, oral or written, expressed or implied, other than those contained in the Option Agreement and this Amendment.

8. This Amendment may be executed in one or more counterparts by the PARTIES by signature of a person having authority to bind the PARTY, each of which when executed

and delivered by facsimile, electronic transmission or by mail delivery, will be an original and all of which shall constitute but one and the same instrument.

9. **General**. All provisions of the Option Agreement regarding third party rights, signing by counterparts, amendments/variations, governing law and jurisdiction and other general provisions shall apply to this Amendment as if set out in full and so that references in those provisions to 'this agreement' shall be construed as references to this Amendment.

[Schedule to follow]

Appendex A Rothamsted Technology

Patent Rights

Case Ref.	Reference	Title	Country	Application No.	Application Date	Priority date	Case Status
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]
[***]	[***]	[***]					[***]
[***]	[***]	[***]					[***]

[Signature page follows.]

IN WITNESS WHEREOF, the PARTIES have caused this Amendment to be executed by their duly authorized representatives as of the Amendment Effective Date.

ROTHAMSTED RESEARCH LIMITED

By: _____

NAME: [***]

TITLE: [***]

YIELD10 BIOSCIENCE, INC.

By: _____

NAME: [***]

TITLE: [***]

FIRST AMENDMENT TO COLLABORATION AGREEMENT

This First Amendment to Collaboration Agreement (the "**Amendment**"), effective as of 09 November 2022 | 07:54:32 PST

("**Amendment Effective Date**"), is made by and between **ROTHAMSTED RESEARCH LIMITED** a company limited by guarantee incorporated and registered in England and Wales with company number 2393175 and a not for profit charity with charity number 802038, whose registered office is at West Common, Harpenden, Hertfordshire AL5 2JQ, United Kingdom ("ROTHAMSTED") and **YIELD10 BIOSCIENCE INC.,** a corporation organized under the laws of the State of Delaware having offices at 19 Presidential Way, Woburn, MA 01801 (hereafter "COMPANY"). ROTHAMSTED and COMPANY may sometimes be referred to herein as a "PARTY" or "PARTIES" as the case may be.

WHEREAS, the PARTIES entered into a Collaboration Agreement effective as of November 12, 2020 (the "**Collaboration Agreement**");

WHEREAS, the PARTIES entered into an Option Agreement effective as of November 12, 2020 (the "**Option Agreement**");

WHEREAS, due to a Force Majeure Event ROTHAMSTED was unable to complete the work plan outlined in Annex 1 of the Collaboration Agreement;

WHEREAS, the PARTIES are entering into a First Amendment to Option Agreement on even date herewith; and

WHEREAS, the PARTIES desire to amend the Collaboration Agreement in accordance with Section 19 thereof.

NOW THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the PARTIES agree to amend the Collaboration Agreement as follows.

1. Capitalized terms not otherwise defined herein will have the meaning given to them in the Collaboration Agreement.

2. Revision to Clause 3 (Project Management).

- Clause 3.5 is hereby added as follows:

"The Parties acknowledge and agree that as of the Amendment Effective Date all work on the Project has been completed other than as set forth in Annex 1 – Part B."

3. Revision to Clause 5 (Fees and Expenses).

- Clause 5.2 is hereby added as follows.

  "The Parties acknowledge and agree that as of the Amendment Effective Date the funding for the Project has been paid in full other than Payment 8 (as set forth in Section 3.01 of the Option Agreement) and that no payments will be due to Rothamsted for completing the

Project as set forth in Annex 1 – Part B other than Payment 8 (as set forth in Section 3.01 of the Option Agreement)."

4. Revision to Clause 12 (Term and Termination).

- Clause 12.1 is hereby deleted in its entirety and replaced with the following:

"Term. Unless earlier terminated as permitted by this Agreement, the term of this Agreement (the "**Term**") will commence upon the Effective Date and continue in full force and effect until the expiration or termination of the Option Agreement."

5. Revisions to Clause 13 (Consequences of Termination).

- Clause 13.2.2 is hereby amended to include clauses 1.2-1.6 and 11 as surviving clauses.
- Clause 13.2.3 is hereby deleted.

6. Annex 1 is hereby renamed "Annex 1 – Part A".

7. "Annex 1 – Part B" attached hereto is hereby added to the Collaboration Agreement following Annex 1 – Part A.

8. Revisions to Clause 28 (Notices).

- Clause 28 is hereby deleted in its entirety and replaced with the following:

"28.1 A notice given to a Party under or in connection with this Agreement:

28.1.1 shall be in writing and in English;

28.1.2 shall be signed by or on behalf of the Party giving it;

28.1.3 shall be sent to the party for the attention of the contact and at the address, email address listed in clause 28.2, or such other address, email address as that Party may notify in accordance with clause 28.2.3;

28.1.4 shall be sent by a method listed in clause 28.3; and

28.1.5 unless proved otherwise is deemed received as set out in clause 28.3 if prepared and sent in accordance with this clause.

28.2 The addresses and email addresses for service of notices are:

28.2.1 Rothamsted Research Limited

a) Address: Rothamsted Research Limited, West Common, Harpenden, Hertfordshire, AL5 2JQ, United Kingdom

b) For the attention of: [***]

c) e-mail to [***] and [***]

28.2.2 Yield 10 Bioscience Inc.

a) Address: 19 Presidential Way, Woburn, 01801 MA, USA

b) For the attention of: [***]

c) Email address(es): [***]

28.2.3 A party may change its details above by giving notice, the change taking effect for the Party notified of the change at 9.00 am on the later of:

a) the date, if any, specified in the notice as the effective date for the change; or

b) the date five Business Days after deemed receipt of the notice.

28.3 This clause 28.3 sets out the delivery methods for sending a notice to a Party under this Agreement and, for each delivery method, the date and time when the notice is deemed to have been received:

28.3.1 if delivered by hand, at the time the notice is left at the address; or

28.3.2 if sent by pre-paid first class post or other next working day delivery service providing proof of postage, at 9.00 am on the second Business Day after posting; or 28.3.3 if sent by pre-paid airmail providing proof of postage at 9.00 am on the fifth Business Day after posting; or

28.3.4 if sent by email, at the time of transmission, provided that no 'failed delivery' message has been issued by the recipient or received by the sender.

If deemed receipt under clause 28.3.4 would occur outside business hours in the place of receipt, it shall be deferred until business hours resume. In this clause 28.3.4, business hours means 9.00 am to 5.00 pm on a Business Day in the place of receipt.

28.4 Clause 28 does not apply to the service of any proceedings or other documents in any legal action or, where applicable, any arbitration or other method of dispute resolution."

9. Upon its execution and delivery, this Amendment shall amend, modify and supersede, to the extent of any inconsistencies, the provisions of the Collaboration Agreement. Except as expressly modified by this Amendment, the Collaboration Agreement shall remain in full force and effect.

10. The Collaboration Agreement, this Amendment, the Option Agreement and the First Amendment to Option Agreement embody the entire understanding of the PARTIES and there are no promises, terms, conditions or obligations, oral or written, expressed or implied, other than those contained in the Collaboration Agreement and this Amendment.

11. This Amendment may be executed in one or more counterparts by the PARTIES by signature of a person having authority to bind the PARTY, each of which when executed and delivered by facsimile, electronic transmission or by mail delivery, will be an original and all of which shall constitute but one and the same instrument.

12. General. All provisions of the Collaboration Agreement regarding third party rights, signing by counterparts, amendments/variations, governing law and jurisdiction and other

general provisions shall apply to this Amendment as if set out in full and so that references in those provisions to ‘this agreement’ shall be construed as references to this Amendment.

[Signature page follows.]

IN WITNESS WHEREOF, the PARTIES have caused this Amendment to be executed by their duly authorized representatives as of the Amendment Effective Date.

ROTHAMSTED RESEARCH LIMITED

By: _____

NAME: [***]

TITLE: [***]

YIELD10 BIOSCIENCE, INC.

By: _____

NAME: [***]

TITLE: [***]

Annex 1 – Part B

Project Title	Camelina-based Omega-3 fish oil development		
Project Start Date	Amendment Effective Date		
Estimated Project End Date	[***]		
Rothamsted Scientific Leaders	[***]		
Industry Partner Scientific	[***]		
Location of work	Rothamsted Research		
Technical objectives of the Project	[***]		
Work Plan and allocation of tasks by Party	**See below.**		
Milestones (including delivery dates)	**See below.**		
Rothamsted Deliverables	(a) On a quarterly basis (beginning on the [***] anniversary of the Amendment Effective Date and continuing until the completion of the Project) Rothamsted shall provide within [***] of the end of the applicable quarter a written progress report summarizing the studies performed and a copy of the results obtained during the immediately prior quarter ("**PART B PROGRESS REPORT**"). (b)Within [***] of the completion of the Project a written report summarizing all of the studies performed and a copy of all of the results of the Project ("**PART B FINAL REPORT**").		
Industry Partner Deliverables	**None**		
Background that each partner brings to the Project		**Rothamsted**	**Industry Partner**
	Know-How	**[***]**	**[***]**
	Materials	**[***]**	None
	Other	None	None
Biological Materials	**See below.**		
Total cost of Part B of the Project to be paid as set forth in the Option Agreement	**[***]**		

Work Plan/Milestones

Purpose: [***]

Previously we have identified [***] that direct the seed-specific accumulation of EPA and DHA in Camelina. Whilst there are some possibilities that the resulting constructs and lines could be

commercialised, this would require third party licenses. However, we believe that we can improve on that benchmark (defined in our peer-reviewed publication Han et al., 2020) as well as avoiding third-party IP and have embarked on further rounds of iteration to elevate the levels of EPA and DHA. Additional enhancements are envisaged including [***]. The current status of the programme is shown graphical in the attached Gannt chart and defined below. For clarity, whilst the chart shows both past and future activities, the narrative below is for the next [***], commencing [***]. Several pre-existing resources have previously been generated, most notably a library of "parts" (i.e. genes and regulatory elements) which have also been assembled (via Golden Gate) into transformation-ready binary vectors for introduction into Camelina. Please note that timings are considered to be realistic estimates, but subject to variation as a consequence of working with biological material and their interaction with environmental factors during field trials. Also these timelines do not reflect current restrictions arising from Covid-19, though it is hoped that these will have been lifted by [***].

[***]

[***]

[***]

[***]

[***]

Updated Programme – [***]

Although potential problems resulting from the Covid19 pandemic were anticipated in the Original Programme of Work executed in [***], the extent of this was significantly underestimated both in terms of direct access to Rothamsted infrastructure (laboratories etc) and provision of CRO services such as gene synthesis and construct assembly; many of these companies (including our trusted supplier Genscript), are based in China and experienced significant interruption to normal business functions . The latter particularly impacted on the generation of the [***], which also encountered some technical challenges associated with the Golden Gate assembly – this activity was scheduled for completion by [***] but this was not delivered until [***]. This had a knock-on delay for all the subsequent activities. Consequently, the following revised work plan has been generated. For clarity, this revised timeline starts from the delivery of the [***].

[***]

[***]

[***]

Task	*Description*	[***]	[***]	[***]	[***]	[***]	[***]	[***]	[***]
1	[***]								
2	[***]								
3	[***]								
4	[***]								
5	[***]								

6	[***]								
7	[***]								
8	[***]								
9	[***]								

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We consent to the incorporation by reference in the Registration Statements on Form S-1 (No. 333-237420 and 333-249388), Form S-3 (No.333-254830) and Form S-8 (No. 333-138631, 333-145232, 333-155115, 333-157869, 333-165405, 333-172724, 333-181268, 333-187589, 333-194858, 333-194859, 333-202983, 333-217052, 333-226731, 333-231474, 333-235858, 333-238764, 333-254826, 333-256849, and 333-264737) of Yield10 Bioscience, Inc. of our report dated March 14, 2023, relating to the consolidated financial statements of Yield10 Bioscience, Inc., appearing in this Annual Report on Form 10-K of Yield10 Bioscience, Inc., for the year ended December 31, 2022.

/s/RSM US LLP

Boston, Massachusetts
March 14, 2023

EXHIBIT 31.1

CERTIFICATIONS

I, Oliver P. Peoples certify that:

1. I have reviewed this annual report on Form 10-K of Yield10 Bioscience, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

(a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

(b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

(c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

(d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

(a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

(b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

March 14, 2023

/s/ OLIVER P. PEOPLES

Name: Oliver P. Peoples

Title: *President and Chief Executive Officer (Principal Executive Officer)*

EXHIBIT 31.2

CERTIFICATIONS

I, Charles B. Haaser, certify that:

1. I have reviewed this annual report on Form 10-K of Yield10 Bioscience, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

(a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

(b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

(c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

(d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

(a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

(b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

March 14, 2023

/s/ CHARLES B. HAASER

Name: Charles B. Haaser

Title: *Chief Accounting Officer*
(Principal Financial and Accounting Officer)

EXHIBIT 32.1

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350,
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the annual report on Form 10-K (the "Report") of Yield10 Bioscience, Inc. (the "Company") for the year ended December 31, 2022 as filed with the Securities and Exchange Commission on the date hereof, we, Oliver P. Peoples, President, Chief Executive Officer and Principal Executive Officer of the Company and Charles B. Haaser, Chief Accounting Officer and Principal Financial and Accounting Officer of the Company, certify, pursuant to 18 U.S.C. 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, to my knowledge that:

1. the Report fully complies with the requirements of Section 13(a) or 15(d), as applicable, of the Securities Exchange Act of 1934, as amended, and

2. the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

This certification is being provided pursuant to 18 U.S.C. 1350 and is not to be deemed a part of the Report, nor is it to be deemed to be "filed" for any purpose whatsoever.

YIELD10 BIOSCIENCE, INC.

March 14, 2023

By: /s/ OLIVER P. PEOPLES

Oliver P. Peoples
President and Chief Executive Officer (Principal Executive Officer)

March 14, 2023

By: /s/ CHARLES B. HAASER

Charles B. Haaser
Chief Accounting Officer (Principal Financial and Accounting Officer)