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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, 2021

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. ☐

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

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, 2021 was $33,637,211.

The number of shares outstanding of the registrant's common stock as of March 23, 2022 was 4,893,403.

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, 2022, 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, 2021
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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 that is developing the oilseed Camelina sativa ("Camelina") as a platform crop for large scale production of low-carbon sustainable seed products to address:

- petroleum replacement markets, in which we are developing Camelina oil for use as a biofuel feedstock and PHA Bioplastics produced in Camelina seed for use as a biodegradable bioplastic; and
- food and nutrition markets, in which we are developing omega-3 (DHA+EPA) oils produced in Camelina seed for aquaculture, nutraceuticals and protein meal for animal feed markets.

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 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.

Camelina is an annual oilseed plant in the mustard family and an essential component of our Trait Factory trait gene discovery and development platform, as it is highly amenable to advanced genetic engineering and genome-editing technologies. Camelina 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 its 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. Combined, we estimate there is the potential for over 30 million acres of Camelina production in North America. Camelina produces a relatively abundant harvest of oil-containing protein rich seeds. For nearly ten years, Yield10 has been developing improved Camelina seed varieties through identification and deployment of its gene trait discoveries followed by performance evaluation in field tests. Our new seed product traits include the PHA bioplastic trait developed by Yield10 and the omega-3 (DHA+EPA) oil traits for which we secured exclusive rights to a commercial license option on the technology in 2020.

Our Camelina commercial plan is based on developing and commercializing a series of proprietary elite Camelina seed varieties in an identity preserved capital light value chain using contract farming and seed processing with product offtake agreements. The improved elite Camelina varieties will incorporate genetic traits from our development pipeline to improve on-farm performance that will lead to increased acreage and seed product revenues. We made progress building our commercial team during the past year and are now in the early stages of launching our products business, focusing initially on our first elite Camelina plant varieties to supply the low-carbon biofuel feedstock oil and protein meal markets. We anticipate that this initial commercialization will be followed within a few years by the launch of our two proprietary, higher value new seed products, our PHA bioplastics and the omega-3 (DHA+EPA) oils. We expect the sequential launch of these products will allow us to establish the operating foundation of our commercial business and to grow our product revenues and profit margins through continuous improvement of our elite Camelina varieties as we introgress performance traits into future seed varieties.

We are currently pursuing the development of elite Camelina germplasm exhibiting herbicide tolerance, disease resistance and other traits that will, in the near future, 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 use for our Camelina seed products in commercial applications such as: low-carbon feedstock oils for renewable diesel, PHA bioplastics, and omega-3 oils for aquaculture and nutrition. Leading seed companies represent potential clients for our performance trait innovations that may be used in major crops, including corn, soybean and canola. We believe performance traits from our “Trait Factory” platform 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.

Platform	Product	Main Markets	Revenue Potential[1]	Status
Elite Camelina	Feedstock oil	▪ Renewable diesel ▪ Aviation biofuel **$27 billion**	$0.18 - $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
GRAIN trait gene discovery	Performance traits	▪ Improve yield in major food crops **~$10 billion**	$0.5 - $1 billion	Research license agreements Bayer CropScience, GDM, Forage Genetics, Simplot

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 ("CI") 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 (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 the Bayer Crop Science division of Bayer AG (“Bayer”), GDM Seeds (“GDM”), Forage Genetics International, LLC, a division of Land O’Lakes, Inc. (“Forage Genetics”) and JR Simplot Company (“Simplot”). These companies are currently progressing the development of our traits in soybean, forage sorghum, and potato. Our plan is to support these licensees over the next 8 - 20 months 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, 2021, we own or hold exclusive rights to 20 patent families, including 12 issued patents and 50 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 both the original patent filing for the production of DHA+EPA oil in Camelina and for an improvement patent filed after the agreement was signed.

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

According to a number of studies, including a recent 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 is especially advantaged 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 approval of Camelina oil, Sustainable Oils, a subsidiary of Global Clean Energy Holdings, Inc., recently reported a CI of 23.

Renewable Diesel: 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 5 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. 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. In the longer term, the direct production of PHA bioplastics in Camelina 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 (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. The aquaculture sector is expected to grow at 5% CAGR over the next ten years and to reach revenues of over $300 billion. Fish oil supplied from ocean harvested fish is particularly important for farmed salmon. 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 2019, 4.5 million metric tons of fish feed was used globally for salmon aquafarming. Although it can vary by geographic location, fish oil represents 24% of the contents making up this fish feed. This equates to 2,380 million pounds of fish oil consumed annually in salmon feed production. The demand for omega-3 is expected to double in the next 5 years. The demand from salmon farming alone is expected to be approximately 7% per year going forward, according to the *2020 Salmon Handbook*.

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 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. In addition, this field performance has the potential to improve the seed yield and oil content of other major food and feed crops. Improvements in yield to the levels targeted by Yield10, for example 10-20 percent increases in seed yield in Camelina, would significantly enhance the value of our Camelina products and could potentially translate into significant increases in yield in the major food and feed crops. For example, a 10-20 percent increase in canola and soybean yields, if successfully deployed across current North American acreage, could result in an annual incremental crop value of up to $10 billion. Gene traits which can increase seed oil content without reducing seed yield may be increasingly important given the demand for vegetable oil feedstocks for renewable diesel. In the licensing model, Yield10 would expect to receive up-front payments on the execution of a commercial license, milestone payments and royalties based on seed sales. By ultimately increasing the output of major food and feed crops and potentially reducing strains on scarce natural resources, we believe that Yield10's technologies will also contribute to addressing global food security.

Business Strategy

Our goals are to 1) commercialize a series of seed products based on developing elite 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 first and foremost that 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 and PHA bioplastics. In the near-term, we plan to rely on Rothamsted to continue to develop and improve the omega-3 oil trait for Camelina while Yield10 focuses on establishing the path to commercialization. Given our focus on establishing and growing our Camelina seed products business, we plan to rely on 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 Products Business;
- Trait development and licensing; 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 planting in the

Northwest U.S. and into Canada. In addition, the short growing season makes it a cash relay or cover crop candidate suitable for the upper mid-west corn belt.

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. HT offers farmers an important tool for fighting weeds that compete with their crops for water, nutrients, sunlight and space. If left uncontrolled, weeds can reduce crop yields significantly. Two herbicides commonly used to control weeds, HT1 and HT2, may also have a negative impact on the emergence and yield in Camelina without these traits. Crops containing HT traits are able to remain relatively unaffected by the application of herbicides. Our goal is to have elite Camelina varieties entering commercial production in the next few years with stacked tolerances to HT1 and HT2. Downy mildew is a common name for a widespread plant disease (pathogen) that if left uncontrolled, can generate significant losses in crop yields. One of the most effective and sustainable ways to manage downy mildew is to use 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 acre 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 will 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 believe it is suitable to begin commercialization activities.

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.
- 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 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.
- Camelina has been engineered to produce high levels of omega-3 (DHA+EPA) fatty acids as a drop-in replacement oil for fish oil in aquafeed markets and will replace the use of generic Camelina oil in this market.
- Camelina has been successfully deployed to increase seed yield and seed oil.

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 seed 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 (DHA+EPA) oil.

Camelina Type	Seed Products	Gene Trait(s)	Camelina Varieties – Indicative Launch Sequence
Elite Camelina	Biofuel feedstock Protein meal	C3008a,b,C3009	E3902 →
		HT1	E3902-HT1 →
		HT2	E3902-HT1-HT2 →
		Downy Mildew Resistance (DMR)	E3902-HT1-HT2-DMR →
		Performance Traits (PT) Oil content, Seed yield	E3902-HT1-HT2-DMR-PTs →
Elite PHA Camelina	PHA bioplastics Biofuel feedstock Protein meal	PHA	E3902-HT1-HT2-DMR-PT-**PHA** →
Elite Omega-3 Camelina	Omega-3 (EPA/DHA) oils Protein meal	Omega-3	E3902-HT1-HT2-DMR-PT-**OM3** →

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 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 two herbicides, HT1 and HT2 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 recently hired a head of seed operations and are currently working on seed scale up and non-regulated spring and winter varieties of Camelina to establish our products operating business. Our commercial team has extensive outreach to growers underway to build a grower network and to execute initial 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:

Petroleum Replacement Products

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 into early 2022, we conducted seed scale up activities with both spring and winter Camelina lines.

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 then 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. Although we plan to produce the best PHA Camelina line at larger scale during the 2022 growing season for seed process development and plastic proto-typing, 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.

Nutritional Products

Omega-3 (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. 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. 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.

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 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, proving 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.

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.

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 were 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 that is 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 (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 5 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 has been 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 has been 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 (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.

In December 2017 we signed our first agreement with Bayer, to evaluate our novel yield trait C3003 and C3004 in soybean. In 2019, the license was expanded to include a new discovery and intellectual property for C3004. Bayer is a leader in the development and commercialization of biotech-derived soybean seed. In 2018 we granted a non-exclusive research license to Forage Genetics, a leader in forage crops used for animal feed, for their evaluation of five traits in forage sorghum. In 2019 we granted a research license to Simplot, a leader in potato development and food sales, and in 2020, we signed a non-exclusive research license with GDM for the evaluation of three traits in soybean germplasm.

Traits Being Developed by Licensees[1]

Crop/Trait	Company	Agreement	2019	2020	2021	2022	2023
Soybean/C3003 Soybean/C3004	Bayer CropScience	Research License Collaboration	→	→	→	→	
Soybean Multiple traits	GDM	Research License Collaboration		→	→	→	→
Sorghum Multiple traits	Forage Genetics	Research License Collaboration	→	→	→	→	
Potato Multiple Traits	Simplot	Research License Collaboration		→	→	→	

[1] The time line shown in the chart reflects the duration of each partner's research license agreements.

These licenses are intended to provide market leaders in their respective crops with an attractive opportunity to test our traits and develop data at their own expense. At any time during the term of the license, they have the option to negotiate a broader agreement with us. At the same time, we have the right to sign licenses with other companies for these traits. This structure allows us the flexibility to expand the testing of our traits with investment by other companies and to potentially enter negotiations for development and commercial licenses when the value of our traits is better understood. In 2022, we plan to continue to explore additional opportunities to expand the testing of current and future trait discoveries through similar arrangements with other companies, and as part of our evolving strategy, we now plan to look for partners to progress our yield traits in canola and corn.

Our Oilseed Operation based in Canada provides us with unique capabilities in the development of Camelina oilseed crops.

We established our oilseeds subsidiary in Canada in 2010 to produce robust oilseed germplasm with engineered value-added traits for commercial crop production in western North America. Our oilseeds team is based in Saskatoon, Saskatchewan, with laboratories in the National Research Council (NRC) - Saskatoon facility and commercial greenhouse and laboratory facilities at nearby Innovation Place. Our team has successfully developed and implemented technology to improve and accelerate engineering and trait evaluation of Camelina and canola. The team also plays a key role in designing and conducting greenhouse and field tests required to effectively evaluate novel yield traits. In 2022, we plan to begin to establish seed operations capabilities to drive seed production activities in anticipation of building inventory for the commercial launch of our first Camelina varieties.

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 (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) 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 2) potential partners or customers in the Camelina products value chain.

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, 2021, we had 29 full-time employees, with the majority directly involved with our research and development activities. We believe that our organizational capabilities are aligned 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 is allowing 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.

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 is off-patent and 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 and plan to undertake our first field testing in 2022 in order to identify lead and back up lines for commercial development and regulatory approval.

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 2022 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.

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 (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 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 late 2021, the Ministry of Agriculture, Livestock and Fisheries in Argentina indicated that Camelina line E3902 would not be subject to regulation in that country. In 2022, we are conducting contra season seed scale up and planning further spring scale up of pure seed production in anticipation of potential commercial use.

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. Bayer and Simplot are working with C3003 in their soybean and potato programs, respectively. 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

Forage Genetics began work with certain of our C4000 series traits through a research license signed in 2018 to assess the potential of our traits to increase biomass in forage sorghum. Simplot is testing the C4001 trait in potato. We expect evaluation of C4000 series traits in these target crops will continue to advance during 2022. 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 can be 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 has an active business development activity underway 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 parallel, we have a research and development program underway to optimize and develop commercial quality PHA traits lines based on insights from the field tests and our GRAIN platform with a goal to achieve 10 - 20% PHA in seed.

Omega-3 (DHA+EPA) oil trait

The omega-3 (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.

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 for the last four years at different locations in 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.

Target Crops for Trait Licensing

Our research and early development work with our C3000 and C4000 series traits in Camelina and other crops suggests that our technology may be applicable to a wide range of crops harvested for food and animal feed uses. We believe that if novel yield traits could be successfully developed and commercialized in any of these crops, farmers would be able to improve the productivity of their land to meet rising demand for food and feed, thereby creating significant economic value.

The crops we are targeting for development are described below.

Soybean or *Glycine max* is an oilseed crop used for food, food ingredients, food additives and animal feed. The soybean can be harvested for oil used in food and industrial applications, and soybean meal is a significant source of protein for use mostly in animal feed but also for direct human consumption. Fermented soy foods include soy sauce and tempeh, and non-fermented food uses include soy milk and tofu. Soybeans are widely cultivated in North and South America, where a majority of the seed planted is genetically modified. An estimated 94.4 million acres of soybean were planted in the U.S. and Canada in the 2018/2019 growing season. According to the USDA, the U.S., Brazil and Argentina together represent approximately 80 percent of global soybean production. We are targeting a 20 percent or greater increase in soybean seed yield. Yield 10 has executed research license agreements with Bayer and GDM to enable evaluation of certain traits in soybean.

Potato is the most important non-cereal staple food crop for humans after wheat and rice. In the U.S. and Canada, the 2019 potato harvest acreage was approximately 1.3 million acres. The harvest value however was approximately $4.3 billion with the frozen french fry sector having a value of approximately $20 billion. Yield10 has no in-house R&D activities specific to potato but has executed a research license agreement with Simplot to enable the evaluation of three of our traits in this crop.

Forage Sorghum. Forage crops are grown expressly for biomass used for feeding livestock. Typical forage crops include both annual and perennial crops such as various grasses, silage corn, alfalfa and sorghum. Biotechnology traits have been previously introduced into silage corn and alfalfa. Other forage crops could be amenable to gene editing strategies to increase biomass yield per acre. We believe that our technology and traits that increase biomass may have application to forage crops. Yield10 has no in-house R&D activities specific to forage sorghum but has executed a research license agreement with Forage Genetics to enable them to evaluate five of our traits in this crop.

Canola (*Brassica napus)* is a cultivar of rapeseed which produces a higher value edible oil favored by consumers because it has a healthier fatty acid profile than corn or soybean oil. The canola crop was developed in Canada where it is primarily grown today with additional acreage grown in the U.S. Currently, the vast majority of the canola grown in North America contains two seed enhancement technologies, herbicide tolerance and hybrid seed. Both Roundup Ready (Monsanto, now Bayer) and Liberty-Link (Bayer) varieties of canola were introduced to the market in the 1990s and approximately 24.7 million acres were planted in Canada and the U.S. during the 2018 growing season. The Canola Council of Canada has set yield goals of 52 bushels/acre for 26 million metric tons of production to meet global market demand for canola by 2025. Yield10 is targeting a 10-20 percent or greater increase in canola seed yield. As one of Canada’s major field crops, canola is subject to variety registration, which is a regulatory requirement of the Seeds Act and is also administered by the CFIA. Any future sales of our seed traits or products in Canada will be done by a third-party collaborator or other partner, and that third party would be responsible for complying with registration requirements for the canola varieties, if applicable. Yield10 has field tested traits C3003, C3004 and C3007 in canola.

Corn is a crop grown globally and used for animal feed and for producing starch which can be used as a raw material for producing food ingredients and food additives, as well as for use in the production of paper, packaging materials and other items. Genetically Modified ("GM") maize was grown for the first time in the U.S. and Canada in 1997. Approximately 80 percent of maize/corn production in the U.S. today is genetically modified. It was estimated that more than 83 million acres of corn were planted in North America during the 2018 growing season. The traits commonly used in today’s corn cultivars provide insect resistance and herbicide tolerance. In many GM seeds sold today, these traits are stacked (“stacked” refers to the practice of adding multiple traits to an elite plant line). Corn already possesses the more efficient C4 photosynthesis system. Yield10 is targeting a 10 percent yield increase in corn. We have conducted early development of our traits in corn, and are seeking a collaboration or license with a third-party to develop and commercialize our traits in this crop.

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 C3007 for increased oil production in Camelina.

iv. The canola CRISPR edited line C3007 edited for improved oil production in canola.

v. During August 2020, the regulatory exemptions and confirmation process under the SECURE rule took effect. Since then, some 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.

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.

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 United States, 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 has identified 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 will be 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. During 2020 and 2021, we conducted field studies in Canada of multiple traits including our PHA bioplastic trait.

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 Bioscience 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.

At the end of 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 (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 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 DHA+EPA Camelina oil in different fish species. Their partners have included at least one major aquafeed company. Under the agreement, Yield10 is providing financial support for Prof. Napier's ongoing

research including further DHA+EPA trait improvement, field testing and nutritional studies. As part of the agreement, Yield10 has an exclusive two-year option to sign a global, exclusive or non-exclusive license agreement to the technology. 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 Massachusetts

Pursuant to a license agreement with the University of Massachusetts ("UMASS") dated as of June 30, 2015, we have an exclusive, worldwide license for certain patents and patent applications, including issued patents covering our yield trait gene C3003, relating to the manufacture of plants with enhanced photosynthesis. The agreement provides an exclusive, worldwide license to make, have made, use, offer for sale, sell, have sold and import any transgenic plant seed or plant grown therefrom or transgenic plant material developed for sale to a farmer or grower for planting in the field, which transgenic plant seed or plant grown therefrom or transgenic plant material is covered by, embodies or is derived from (in whole or in part) one or more issued or pending claims of the licensed patents or patent applications.

Pursuant to the UMASS license agreement, we are required to use diligent efforts to develop licensed products throughout the field of use and to introduce licensed products into the commercial market. In that regard, we are obligated to fulfill certain development and regulatory milestones relating to C3003, including completion of multi-site field demonstrations of a crop species in which C3003 has been introduced, and filing for regulatory approval of a crop species in which C3003 has been introduced within a specified period. Our failure to achieve any milestone provided for under the agreement would give UMASS the right to terminate the agreement, following a notice period, unless we are able to reach agreement with UMASS as to a potential adjustment to the applicable milestone.

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

We may terminate the agreement at any time upon 90 days prior written notice to UMASS. Either party may terminate for material breach immediately upon written notice for a breach that is not cured within 60 days after receiving written notice of the breach. In addition, UMASS may terminate this agreement with respect to certain patent rights immediately upon written notice in the event we contest the validity or enforceability of such patent rights.

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 interest for large scale production in North America to produce feedstocks for biodiesel since the biofuels boom in the early 2000's. This interest changed over the ensuing years as more information was developed about its potential for food oils and as a supplement for fish oil in the production of aquafeed due to its natural content of the omega-3 fatty acid ALA. We anticipate that the growing interest in sourcing non-food, low CI feedstocks for renewable diesel will create renewed interest and potentially competition in Camelina. This may be particularly true of its use as a winter cover crop, enabling a second oil harvest for each acre. The general interest in cover crops has been steadily increasing over the last several years and this has resulted in at least one venture funded company actively developing alternatives to Camelina. CoverCress Inc., located in St. Louis, Missouri, has been active for several years developing the oilseed 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 of Atlanta, Georgia (which acquired the PHA assets of P&G in 2007). Danimer has a bioplastics compounding business that produces PHAs from fermentation of seed oils and has developed revenue generating 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 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 457 million acres worldwide were planted with GM crops during 2016, the most recent year for which data is available. The planting of GM crops is centered in the Americas with North America at approximately 45 percent of the acres and South America at approximately 43 percent. China and India follow with approximately 8 percent and the balance of the total worldwide GM crop acreage during 2016 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 2016, 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 research firm, Research and Markets, the total global seed business was estimated at $68 billion in 2017 and is projected to grow to more than $100 billion by 2022. According to an ISAAA report, the global GM seed business represented a $17 billion market in 2017 and biotech crops were grown on approximately 469 million acres that year. 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 is dominated by large multinational companies and their subsidiaries including BASF Corporation, Bayer, DuPont de Nemours, Inc., Syngenta AG 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. Many of these companies were recently involved in consolidation of the sector with the merger of DuPont de Nemours, Inc. and Dow Chemical Company, the acquisition of Syngenta AG by the China National Chemical Corporation, and the acquisition of The Monsanto Company by Bayer in 2018.

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., Marrone Bio Innovation, Inc., and Pairwise Plants LLC, many of which have greater resources and experience than we have. Both Calyxt (Nasdaq: CLXT) and the private company Cibus recently changed their business models to focus on trait discovery and development.

Intellectual Property

Our continued success depends in large part on our proprietary technology. As of December 31, 2021, we owned or held exclusive rights to 20 patent families, including 12 issued patents and 50 pending patent applications, related to advanced technologies for increasing yield in crops, in the United States and throughout the world. As part of the agreement with Rothamsted, we have an exclusive option on three patent families. 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, 2021, we had 29 full-time employees. Of those employees, 23 were in research and development. Among our staff, 14 hold Ph.D.'s and 13 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 we maintain 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 and 2021 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 ongoing 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, 2021, our accumulated deficit was $386,131. 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, 2021, we had unrestricted cash, cash equivalents and short-term investments of $15,990. During the year ended December 31, 2021, we raised $11,993, net of offering costs of $747, through the sale of 1,040,000 shares of common stock at an issuance price of $12.25. These shares of common stock were offered pursuant to a registration statement on Form S-3 (File No. 333-237539), that was declared effective on April 10, 2020. Also during the year ended December 31, 2021, 481,973 warrants issued in our November 2019 securities offering were exercised by warrant holders providing us with additional cash of $3,856. We estimate that our cash resources will be sufficient to fund operations and meet our obligations into the first 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.

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, which has been our primary source of grant revenue over the past five years. The final year of the grant ends on September 14, 2022, 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 ongoing 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. In response to the ongoing coronavirus pandemic, we have modified our business practices, including in response to legislation, executive orders and guidance from government entities and healthcare authorities. These directives include the temporary closing of businesses, travel bans and restrictions, social distancing and quarantines. During the outbreak of COVID-19, we limited employee, researcher and supplier access to the research facility we share with the National Research Council of Canada and our other leased facilities located in Saskatchewan, Canada. Our Canadian operations, to date, have not yet been significantly impacted by the coronavirus pandemic. Our research and development facility in Woburn was closed during a portion of the pandemic, and we were operated our laboratories on a staggered schedule in order to help prevent the spread of the disease. To date, we have also able to move forward with planning and operational steps required to implement our field trials in Canada and the United States. It is possible, however, that current and potential future closures of our research facilities, if they continue for an extended time period, could adversely impact our anticipated time frames for completing field trials and other work we plan to accomplish during 2022.

Additional adverse effects of the coronavirus pandemic could include quarantines, disruptions of or restrictions on our ability and/or the ability of our collaborators' personnel to travel or conduct normal business activities, as well as additional closures of our facilities or the facilities of our collaborators for an indefinite period of time.

As COVID-19 continues to affect individuals and businesses around the globe, we could experience disruptions that could severely impact our business, research and field testing trials, including:

- interruption of field testing activities due to quarantines or other limitations on travel imposed or recommended by federal or state governments, employers and others;
- limitations on employee resources that would otherwise be focused on the conduct of our research and field testing;
- delays in receiving approval from regulatory authorities related to our seed traits;
- delays in field testing sites receiving the supplies and materials needed to conduct our trials;
- interruption in global shipping that may affect the transport of materials needed for our research; and
- limitations on government and academic grants that support our research programs.

Additionally, our results of operations could be adversely affected to the extent that COVID-19, or any other epidemic, harms our business or the economy in general either domestically or in any other region in which we do business. The extent to which COVID-19 affects our operations will depend on future developments, which are highly uncertain and cannot be predicted with confidence, including the duration of the outbreak, new information that may emerge concerning the severity of COVID-19 and the actions to contain COVID-19 or treat its impact, among others, which could have an adverse effect on our business and financial condition. Current predictions suggest that the impact of sustained business closures and quarantines resulting from the coronavirus on the global economy will be severe, and this may have a material adverse effect on our business and our ability to secure funding. As we continue to actively monitor the situation, we may take further actions that affect our operations.

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, if inflation or other factors were to significantly increase our business costs, it may be difficult for us to continue our research and development. Inflation could also adversely affect the ability of our customers to purchase our products. 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.

Our business operations could be adversely affected by the impact of the war in Ukraine.

Russia invaded Ukraine in February 2022 which has resulted in significant uncertainty in the commodities market and has impacted oil prices. The extent and duration of the military action, resulting sanctions and resulting future market disruptions, including declines in world stock markets and the currency valuations are impossible to predict, but could be significant. Ukraine is a major agricultural producer and if the Russian invasion impacts the commodities produced in Ukraine, it could result in higher commodities prices in the United States, which could impact our ability to grow our seed products. In addition, the conflict could impact oil prices which could have an impact on gasoline prices and demand in the United States. Further, sanctions imposed by the United States and other countries could have negative impacts on our economy and negatively impact our business. These impacts could be far reaching and could last for a significant period of time which could negatively impact our operations. 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 enhance photosynthetic efficiency of crops 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 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 you 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 four patents on our C3003 gene in-licensed from the University of Massachusetts, three patents on C4001 and other novel yield traits, and two patents relating to our historical business. Our currently issued patents have expiration dates ranging from 2033 through 2041. New pending patent applications owned by or licensed to us relating to crop yield improvements have earliest effective filing dates ranging from 2014 through 2020 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 by several companies, including us and our competitors, in this field, 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 23, 2022, our officers, directors and stockholders who hold at least 5 percent of our stock beneficially own a combined total of approximately 39.6 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 23, 2022. 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 23, 2022, Jack W. Schuler (and his related entities) beneficially owned approximately 30.3 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, Metabolix Oilseeds, Inc. ("MOI"), located in Saskatoon, Saskatchewan, Canada, leases approximately 7,700 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. MOI'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, 2022.

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.

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 23, 2022, there were 4,893,403 shares of our common stock outstanding held by 38 stockholders of record.

Unregistered Sales of Securities

On January 3, 2022, we issued 5,074 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, 2021, 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. On January 15, 2020, the Company effected a 1-for-40 reverse stock split of its common stock. Unless otherwise indicated, all share amounts, per share data, share prices, and conversion rates set forth in these notes and the accompanying financial statements have, where applicable, been adjusted to reflect this reverse stock split.

Overview

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:

- petroleum replacement markets, in which we are developing Camelina oil for use as a biofuel feedstock and PHA Bioplastics produced in Camelina seed for use as a biodegradable bioplastic; and
- food and nutrition markets, in which we are developing omega-3 (DHA+EPA) oils produced in Camelina seed for aquaculture, nutraceuticals and protein meal for animal feed markets.

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 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, Metabolix Oilseeds, Inc. (“MOI”), 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 MOI during the period from December 20, 2020 to March 13, 2021. During the first quarter of 2021, MOI submitted claims for eligible payroll costs and recognized grant revenue for the full amount of the award.

During 2020, MOI received two short-term grants, similar to the 2021 IRAP grant, both of which provided financial research assistance, in the amounts of $67 and $86, respectively, for eligible payroll costs. MOI submitted claims for the eligible costs during 2020 and the full amount of these grants was recognized as grant revenue during the year ended December 31, 2020.

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 September 15, 2017. Cumulative funding for this sub-award in the amount of $2,957 has been appropriated by the U.S. Congress through the final contractual year ending in September 2022. During the years ended December 31, 2021 and December 31, 2020, we recognized revenue of $575 and $646, respectively, from this sub-award.

As of December 31, 2021, revenue proceeds of $510 remain to be earned from the MSU sub-award. This includes amounts for reimbursement to our subcontractors, as well as reimbursement for our employees' time, benefits and other expenses related to future performance. The status of government grants outstanding at December 31, 2021 is shown in the following table.

Program Title	Funding Agency	Total Government Funds	Total revenue recognized through December 31, 2021	Remaining amount to be recognized as of December 31, 2021	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	$ 2,447	$ 510	September 15, 2022
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
Funding from National Research Council Canada through its Industrial Research Assistance Program (NRC-IRAP) entitled "Innovation Assistance Program"	National Research Council Canada	67	67	—	June 24, 2020
Funding from National Research Council Canada through its Industrial Research Assistance Program (NRC-IRAP) entitled "Innovation Assistance Program"	National Research Council Canada	86	86	—	December 19, 2020
Total		$ 3,149	$ 2,639	$ 510	

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.

MOI performs research services for Yield10 under a research services agreement subject to intercompany transfer pricing regulations established in the U.S. and Canada. These regulations require that MOI earn an arms-length profit from these research services, calculated in accordance with tax regulations, and results in the annual generation of taxable income in Canada. MOI files separate federal and provincial income tax returns in Canada and has accumulated research tax credit carry forwards that may be used to offset future taxable income. We have recorded these Canadian research credits as a deferred tax asset within our consolidated balance sheet at December 31, 2021 and December 31, 2020 based on our judgment that MOI will continue to earn taxable income in the future and the deferred tax asset will be realized. We have concluded, therefore, that a valuation allowance against MOI's deferred tax asset related to its research credits would not be appropriate. This judgment may change in the future due to changes in MOI's taxable income or changes in U.S. and Canadian tax laws.

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, 2021 and 2020

Revenue

	Year ended December 31,		
	2021	**2020**	**Change**
Grant revenue	$ 614	$ 799	$ (185)

Grant revenue was $614 and $799 for the years ended December 31, 2021 and 2020, respectively. During the years ended December 31, 2021 and December 31, 2020, we recognized $575 and $646, respectively, from the Company's DOE sub-award with MSU and $39 and $153, respectively, from short-term research grants awarded to MOI through the Canadian Industrial Research Assistance Program.

We anticipate that grant revenue will decrease during the year ended December 31, 2022 in comparison to the year ended December 31, 2021, as a result of lower grant appropriations of $510 remaining to be earned during the final nine months of our MSU sub-award that ends in September 2022. We currently cannot assess whether additional U.S. or Canadian government research grants will be awarded to us during 2022. 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.

Operating Expenses

	Year ended December 31,		
	2021	**2020**	**Change**
Research and development expenses	$ 6,201	$ 5,361	$ 840
General and administrative expenses	6,105	5,047	1,058
Total operating expenses	$ 12,306	$ 10,408	$ 1,898

Research and Development Expenses

Research and development expense increased by $840, or 16%, from $5,361 during the year ended December 31, 2020 to $6,201 during the year ended December 31, 2021. The 2021 increase is primarily due to higher employee compensation and benefits expense of $574 and higher crop field trial and research services expense of $420. More specifically, the increase in employee compensation and benefits is due to a $305 increase in stock-based compensation expense (a non-cash expense) related to employee stock awards issued during 2021 and a $179 increase in employee payroll and insurance benefits resulting from hiring additional research staff during the year ended December 31, 2021. We also incurred $88 in employee recruiting and relocation expenses during the year in connection with hiring the new staff. Crop field trial expenses increased by $271 during the year ended December 31, 2021 as a result of our expanded Camelina field trials conducted in the U.S., Canada and Argentina. We also increased third-party research services by $139 during the year ended December 31, 2021, primarily as a result of DNA sequencing analysis required for regulatory purposes. During the year ended December 31, 2020, we incurred a charge of $141 for the write-off of leasehold improvements and office furniture used in our research and development operations as a consequence of amending our Woburn, Massachusetts lease to return excess space to the landlord. We did not incur similar charges during the year ended December 31, 2021.

Based on current planning and forecasting, we anticipate that our research and development expenses during the year ended December 31, 2022 will increase to levels above expenses incurred during the year ended December 31, 2021 as we continue our efforts to develop Camelina plant varieties for the following markets; feedstock oil for renewable diesel, PHA bioplastic, omega-3 oil for nutraceuticals and aquaculture and protein meal for animal feed. Our forecast related to research and development expense is subject to change and may be impacted by our ability to raise additional cash to support our planned operations, 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.

General and Administrative Expenses

General and administrative expenses were $6,105 and $5,047 for the fiscal years ended December 31, 2021 and December 31, 2020, respectively. The increase of $1,058, or 21%, was primarily due to increased employee compensation and benefits, higher consulting fees for Camelina business development activities and higher premiums paid for directors and officers ("D&O") liability insurance. These increases in expense were partially offset by lower legal fees during the year ended December 31, 2021. Employee compensation and benefits increased by $738, from $2,024 during the year ended December 31, 2020 to $2,762 during the year ended December 31, 2021, and was primarily the result of a $631 increase in stock-based compensation expense related to stock awards issued during 2021 and a $125 increase in employee payroll and benefits from hiring additional staff. Consulting fees increased by $268 during the year ended December 31, 2021 in comparison to the year ended December 31, 2020 and was the result of engaging outside parties to assist with early stage business development activities for our Camelina plant varieties. Business insurance costs increased by $145 during the year ended December 31, 2021 and were driven by higher D&O premiums affecting the insurance markets. Investor relations expense also increased by $86 during the year ended December 31, 2021 due to costs associated with our efforts to communicate the Company's strategic direction. Legal fees decreased by $214 during the year ended December 31, 2021, reflective of a lower level of legal service activity.

Based on current planning and forecasting, we anticipate that our general and administrative expenses during the year ended December 31, 2022 will increase to levels above expenses incurred during the year ended December 31, 2021. The change will primarily be the result of increased business development and seed operations activities for our Camelina plant varieties, including increases in employee compensation and benefits expense from recent and planned future personnel hiring, seed scale up operations and other early stage commercial activities. Our forecast related to general and administrative expense is subject to change and may be impacted by our ability to raise additional cash 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,		
	2021	2020	Change
Gain on investment in related party	$ 700	$ —	$ 700
Change in fair value of warrants	—	(957)	957
Loan forgiveness income	—	333	(333)
Other income (expense), net	(3)	83	(86)
Total other income (expense), net	$ 697	$ (541)	$ 1,238

Gain on Investment in Related Party

During 1999, the Company entered into a technology sublicense agreement with Tepha, Inc. ("Tepha"), a privately held company engaged in the development of medical products. At the time the sublicense was executed, a director of Yield10 was also the president, chief executive officer and a director of Tepha. Three other members of Yield10's board of directors also served on the board of directors of Tepha, of which one continued to serve until completion of the merger discussed below. 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). The sublicense agreement with Tepha ended in 2016.

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, we received cash consideration of $700 in exchange for the surrender of our Tepha Shares upon the closing of the sale of Tepha to Becton Dickinson. We recorded the $700 as a gain on investment in related party within other income (expense) for the year ended December 31, 2021.

Change in Fair Value of Warrants

The fair value of the liability classified warrants issued in our November 2019 securities offerings was subject to mark-to-market adjustment on subsequent balance sheet dates. On January 15, 2020, we remeasured the fair value of the warrant liability in connection with the Company's 1-for-40 reverse stock split, recording a loss from the change in fair value of $957. The reverse stock split increased the number of shares of common stock available for issuance resulting in reclassification of the warrant liability to equity.

Loan Forgiveness Income

During April 2020, we received $333 in loan proceeds through the Paycheck Protection Program Flexibility Act ("PPP Loan"), established pursuant to the CARES Act. During our fiscal quarter ended September 30, 2020, we utilized the entire PPP Loan amount for expenses that met the qualifications for loan forgiveness and recorded the full amount of the loan within other income (expense) within our consolidated statement of operations.

Interest Income (expense), net

Other income (expense) for the years ended December 31, 2021 and December 31, 2020 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. Investment income recorded from U.S. federal treasury notes was negligible during the year ended December 31, 2021 due to their insignificant yield rates.

Liquidity and Capital Resources

Since our inception, we have incurred significant expenses related to our research, development and commercialization efforts. With the exception of 2012, we have recorded annual losses since the Company's initial founding, including our fiscal year ended December 31, 2021. As of December 31, 2021, we had an accumulated deficit of $386,131. Our total unrestricted cash, cash equivalents and short-term investments as of December 31, 2021, totaled $15,990 as compared to $9,702 at December 31, 2020. As of December 31, 2021, we had no outstanding debt.

Our cash, cash equivalents and short-term investments at December 31, 2021, were held for working capital purposes. As of December 31, 2021, 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, 2021, we were in compliance with this policy.

Material Cash Requirements

We currently anticipate net cash usage of $12,000 to $12,500 to fund operations during 2022, including our expanded research and development activities and our preparations for the future commercial launch of our Camelina products.

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 annual 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. 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, 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.

Fiscal Year 2021 Cash Usage

Net cash used in operating activities was $9,253 during the year ended December 31, 2021, compared to net cash used by operating activities during 2020 of $8,659. Net cash used by operations during the year ended December 31, 2021 primarily reflects the net loss of $11,031, cash payments made to reduce the Company's lease liabilities of $457 and our payment of 2020 bonus compensation of $460 during early 2021. Non-cash charges offsetting a portion of the net loss include 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 resulting from amortization of our right-of-use assets. The net cash usage for operating activities during the year ended December 31, 2020 of $8,659 was primarily the result of the Company's net loss of $10,206, cash payments to reduce the Company's lease liabilities of $601 and our payment of 2019 bonus compensation of $344. Non-cash charges offsetting a portion of the net loss included depreciation and amortization expense of $182, a loss recorded from our revaluation of the Company's warrant liability of $957, forgiveness of our PPP Loan of $333, losses from the write-off of fixed assets of $206, stock-based compensation expense of $739, our 401(k) stock matching contribution expense of $109 and non-cash lease expense of $429.

Net cash of $4,578 was used in investing activities during the year ended December 31, 2021, compared to net cash used in investing activities during 2020 of $645. During the year ended December 31, 2021, the Company purchased $10,639 in short-term investments, primarily U.S. Treasury notes and federal agency bonds. Also during 2021, $6,250 of our short-term investments matured and converted to cash. During the year ended December 31, 2020, we purchased $9,279 in similar short-term investments and investments totaling $8,700 matured and converted to cash.

Net cash of $15,746 was provided by financing activities during the year ended December 31, 2021, compared to net cash provided by financing activities of $7,279 during the year ended December 31, 2020. 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. During the year ended December 31, 2020, we completed a public offering of 951,835 shares of our common stock at a public offering price of $4.25 per share, for gross proceeds of $4,045. Concurrent with this public offering, we completed a separate private placement offering of 396,450 shares of our common stock to certain existing shareholders at the same $4.25 price as the public offering noted above. Gross proceeds from this private placement were $1,685. Issuance costs incurred for the concurrent offerings totaled $425. During the year ended December 31, 2020, we also recorded cash proceeds of $1,658 from the exercise of 207,296 warrants and we received cash proceeds of $333 from the forgiven PPP loan issued through the CARES Act.

Related Party Transactions

During 1999, the Company entered into a technology sublicense agreement with Tepha, 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 the surrender of 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, 2021 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, 2021. 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, 2021, 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 2022 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 2022 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” in our proxy statement for the 2022 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 2022 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 2022 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.		Form 10-K (Exhibit 4.1)	3/25/2020	001-33133
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@	Exclusive License Agreement, dated as of June 30, 2015, between the Company and the University of Massachusetts.	Form 10-K (Exhibit 10.19)	3/30/2017	001-33133
10.13	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
10.14	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
10.15@	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
10.16	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
10.17	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
10.18	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
14.1	Yield10 Bioscience, Inc. Code of Business Conduct and Ethics.	Form 10-K (Exhibit 14.1)	3/28/2019	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, 2021 formatted in XBRL; (i) Consolidated Balance Sheets, December 31, 2021 and December 31, 2020; (ii) Consolidated Statements of Operations, Years Ended December 31, 2021 and 2020; (iii) Consolidated Statements of Comprehensive Income (Loss), Years Ended December 31, 2021 and 2020; (iv) Consolidated Statements of Cash Flows, Years Ended December 31, 2021 and 2020; (v) Consolidated Statements of Stockholders' Equity for the Years Ended December 31, 2021 and 2020; 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) would be competitively harmful if publicly disclosed.

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.

YIELD10 BIOSCIENCE, INC.

March 25, 2022 By: /s/ OLIVER P. PEOPLES

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

POWER OF ATTORNEY

We, the undersigned directors and officers of Yield10 Bioscience, Inc., hereby severally constitute and appoint Oliver P. Peoples, Charles B. Haaser, and Lynne H. Brum, and each of them singly, our true and lawful attorneys, with full power to them, and to each of them singly, to sign for us and in our names in the capacities indicated below, this Annual Report on Form 10-K, and any and all amendments to said Annual Report, and to file or cause to be filed the same, with all exhibits thereto and other documents in connection therewith, with the SEC, granting unto said attorneys, and each of them, full power and authority to do and perform each and every act and thing requisite and necessary to be done in connection therewith, as fully to all intents and purposes as each of us might or could do in person, and hereby ratifying and confirming all that said attorneys, and each of them, or their substitute or substitutes, shall do or cause to be done by virtue of this Power of Attorney.

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 25, 2022
/s/ CHARLES B. HAASER Charles B. Haaser	Vice President, Finance, and Chief Accounting Officer (Principal Financial and Accounting Officer)	March 25, 2022
/s/ SHERRI M. BROWN Sherri M. Brown	Director	March 25, 2022
/s/ RICHARD W. HAMILTON Richard W. Hamilton, Ph.D.	Director	March 25, 2022
/s/ ANTHONY J. SINSKEY Anthony J. Sinskey, Sc.D.	Director	March 25, 2022
/s/ ROBERT L. VAN NOSTRAND Robert L. Van Nostrand	Chairman	March 25, 2022

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, 2021 and 2020, 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, 2021 and 2020, 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. 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 25, 2022

YIELD10 BIOSCIENCE, INC.

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

	December 31, 2021	December 31, 2020
Assets		
Current Assets:		
Cash and cash equivalents	$ 5,329	$ 3,423
Short-term investments	10,661	6,279
Accounts receivable	164	86
Unbilled receivables	34	27
Prepaid expenses and other current assets	436	527
Total current assets	16,624	10,342
Restricted cash	264	264
Property and equipment, net	890	921
Right-of-use assets	2,354	2,712
Other assets	283	283
Total assets	$ 20,415	$ 14,522
Liabilities and Stockholders' Equity		
Current Liabilities:		
Accounts payable	$ 83	$ 60
Accrued expenses	1,136	1,297
Lease liabilities	514	457
Total current liabilities	1,733	1,814
Lease liabilities, net of current portion	2,649	3,163
Other liabilities	7	13
Total liabilities	4,389	4,990
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, 2021 and 2020, and 4,881,851 and 3,334,048 shares issued and outstanding at December 31, 2021 and 2020, respectively	49	33
Additional paid-in capital	402,283	384,758
Accumulated other comprehensive loss	(175)	(159)
Accumulated deficit	(386,131)	(375,100)
Total stockholders' equity	16,026	9,532
Total liabilities and stockholders' equity	$ 20,415	$ 14,522

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,	
	2021	**2020**
Revenue:		
Grant revenue	$ 614	$ 799
Total revenue	614	799
Expenses:		
Research and development	6,201	5,361
General and administrative	6,105	5,047
Total expenses	12,306	10,408
Loss from operations	(11,692)	(9,609)
Other income (expense):		
Gain on investment in related party	700	—
Change in fair value of warrants	—	(957)
Loan forgiveness income	—	333
Other income (expense), net	(3)	83
Total other income (expense)	697	(541)
Loss from operations before income taxes	(10,995)	(10,150)
Income tax provision	(36)	(56)
Net loss	$ (11,031)	$ (10,206)
Basic and diluted net loss per share	$ (2.33)	$ (4.30)
Number of shares used in per share calculations:		
Basic and diluted	4,731,833	2,373,265

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,	
	2021	**2020**
Net loss	$ (11,031)	$ (10,206)
Other comprehensive loss:		
Change in unrealized loss on investments, net of income tax	(8)	—
Change in foreign currency translation adjustment, net of income tax	(8)	(33)
Total other comprehensive loss	(16)	(33)
Comprehensive loss	$ (11,047)	$ (10,239)

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,	
	2021	**2020**
Cash flows from operating activities		
Net loss	$ (11,031)	$ (10,206)
Adjustments to reconcile net loss to cash used in operating activities:		
Depreciation and amortization	220	182
Change in fair value of warrants	—	957
Loan forgiveness income	—	(333)
Loss on disposal of fixed assets	—	206
Expense for 401(k) company common stock match	112	109
Stock-based compensation	1,675	739
Noncash lease expense	358	429
Deferred tax asset	35	56
Changes in operating assets and liabilities:		
Accounts receivable	(78)	(14)
Unbilled receivables	(7)	(7)
Prepaid expenses and other assets	63	(69)
Accounts payable	23	(219)
Accrued expenses	(160)	99
Other liabilities	(6)	13
Lease liabilities	(457)	(601)
Net cash used in operating activities	(9,253)	(8,659)
Cash flows from investing activities		
Purchase of property and equipment	(189)	(76)
Proceeds from sale of property and equipment	—	10
Purchase of investments	(10,639)	(9,279)
Proceeds from sale and maturity of short-term investments	6,250	8,700
Net cash used in investing activities	(4,578)	(645)
Cash flows from financing activities		
Proceeds from warrants exercised	3,856	1,658
Proceeds from PPP loan	—	333
Proceeds from securities offerings, net of issuance costs	11,993	5,305
Taxes paid on employees' behalf related to vesting of stock awards	(103)	(17)
Net cash provided in financing activities	15,746	7,279
Effect of exchange rate changes on cash, cash equivalents and restricted cash	(9)	(37)
Net increase (decrease) in cash, cash equivalents and restricted cash	1,906	(2,062)
Cash, cash equivalents and restricted cash at beginning of year	3,687	5,749
Cash, cash equivalents and restricted cash at end of year	$ 5,593	$ 3,687
Supplemental Cash Flow Disclosure:		
Interest paid	$ 9	$ 8

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

YIELD10 BIOSCIENCE, INC.

CONSOLIDATED STATEMENTS OF CONVERTIBLE PREFERRED STOCK AND STOCKHOLDERS' EQUITY
(In thousands, except share amounts)

	Series B Convertible Preferred Stock		Series A Convertible Preferred Stock		Common Stock					
	Shares	Par Value	Shares	Par Value	Shares	Par Value	Additional Paid-In Capital	Accumulated Other Comprehensive Income (Loss)	Accumulated Deficit	Total Stockholders' Equity
Balance, December 31, 2019	5,750	$ —	796	$ —	933,423	$ 9	$ 360,926	$ (126)	$ (364,894)	$ (4,085)
Stock-based compensation expense	—	—	—	—	—	—	864	—	—	864
Issuance of common stock for 401(k) match	—	—	—	—	20,788	—	112	—	—	112
Issuance of common stock upon vesting of restricted stock units	—	—	—	—	6,006	—	—	—	—	—
Taxes paid on employees' behalf related to vesting of stock awards	—	—	—	—	—	—	(17)	—	—	(17)
Issuance of common stock for warrant exercises	—	—	—	—	207,296	2	1,656	—	—	1,658
Issuance of common stock upon conversion of Series A Convertible Preferred Stock	—	—	(796)	—	99,500	2	(2)	—	—	—
Issuance of common stock upon conversion of Series B Convertible Preferred Stock	(5,750)	—	—	—	718,750	7	(7)	—	—	—
Reclassification of warrant liability to equity	—	—	—	—	—	—	15,934	—	—	15,934
Issuance of common stock for private and public offerings, net of offering costs of $425	—	—	—	—	1,348,285	13	5,292	—	—	5,305
Effect of foreign currency translation	—	—	—	—	—	—	—	(33)	—	(33)
Net loss	—	—	—	—	—	—	—	—	(10,206)	(10,206)
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 public stock offering, net of offering costs of $747	—	—	—	—	1,040,000	11	11,982	—	—	11,993
Effect of foreign currency translation and unrealized loss on investments	—	—	—	—	—	—	—	(16)	—	(16)
Net loss	—	—	—	—	—	—	—	—	(11,031)	(11,031)
Balance, December 31, 2021	—	$ —	—	$ —	4,881,851	$ 49	$ 402,283	$ (175)	$ (386,131)	$ 16,026

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 (DHA+EPA) oils produced in Camelina seed for aquaculture and nutraceuticals; and 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.

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, 2021. During the year ended December 31, 2021, the Company was successful in raising capital to fund its operations, ending the year with unrestricted cash, cash equivalents and short-term investments of $15,990.

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

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

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, Metabolix Oilseeds, Inc. ("MOI") and Yield10 Bioscience Securities Corp.

Reverse Stock Split

On January 15, 2020, the Company effected a 1-for-40 reverse stock split of its common stock. Unless otherwise indicated, all share amounts, per share data, share prices, and conversion rates set forth in these notes and the accompanying consolidated financial statements have, where applicable, been adjusted retroactively to reflect this reverse stock split.

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, 2021	December 31, 2020
Cash and cash equivalents	$ 5,329	$ 3,423
Restricted cash	264	264
Total cash, cash equivalents and restricted cash	$ 5,593	$ 3,687

Amounts included in restricted cash represent those required to be set aside by contractual agreement. Restricted cash of $264 at December 31, 2021 and December 31, 2020, 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, 2021 and December 31, 2020.

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, 2021, all of the Company's accounts and unbilled receivables of $198 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, 2020, $86 of the Company's total billed and unbilled receivables of $113 were due from a Canadian research grant awarded to MOI through the Industrial Research Assistance Program. The remaining balance of $27 was due from the MSU subcontract. The MSU sub-award represented 94% of government grant revenue earned during the year ended December 31, 2021.

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Fair Value Measurements

The carrying amounts of the Company's financial instruments as of December 31, 2021 and December 31, 2020, 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.

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.

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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 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, 2021 and December 31, 2020. 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 amortization, and stock-based compensation. Costs incurred in connection with government research grants are recorded as research and development expenses.

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 operations 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 Company follows the two-class method when computing net loss per share, when it has issued shares that meet the definition of participating securities. The two-class method determines net income per share for each class of common and participating securities according to dividends declared or accumulated and participating rights in undistributed earnings. The two-class method requires income available to common stockholders to be allocated between common and participating securities based on their respective rights to receive dividends. In periods of net loss, a participating security that does not have a contractual obligation to share in the loss is not allocated a portion of the net loss when determining loss per share under the two-class method.

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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,	
	2021	2020
Options	722,765	339,108
Restricted stock awards	9,430	8,500
Warrants	2,361,726	2,843,699
Total	3,093,921	3,191,307

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 benefits as of December 31, 2021 and 2020.

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 December 2019, the FASB issued Accounting Standards Update No. 2019-12, *Income Taxes (Topic 740): Simplifying the Accounting for Income Taxes*. This standard removes certain exceptions to the general principles in Topic 740 and simplifies certain other aspects of the accounting for income taxes. This standard became effective for the Company on January 1, 2021, and did not have a material impact on the Company's consolidated financial statements and related disclosures.

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

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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 is currently evaluating the impact this guidance will have on its consolidated financial statements.

3. INVESTMENTS

The Company's investments consist of the following:

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

	Accumulated Cost at December 31, 2020	Unrealized		Market Value at December 31, 2020
		Gain	(Loss)	
Short-term investments				
U.S. government and agency securities	$ 6,279	$ —	$ —	$ 6,279
Total	$ 6,279	$ —	$ —	$ 6,279

All short-term investments are classified as available for sale as of December 31, 2021 and December 31, 2020. The Company held no long-term investments at December 31, 2021 and December 31, 2020.

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, 2021 and December 31, 2020 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, 2021 and December 31, 2020.

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, 2021 and December 31, 2020 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, 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

	Fair value measurements at December 31, 2020			
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, 2020**
Assets				
Cash equivalents:				
Money market funds	$ 2,873	$ —	$ —	$ 2,873
Short-term investments:				
U.S. government and agency securities	—	6,279	—	6,279
Total assets	$ 2,873	$ 6,279	$ —	$ 9,152

There were no transfers of financial assets or liabilities between category levels for the years ended December 31, 2021 and December 31, 2020.

During November 2019, the Company issued Series A Warrants and Series B Warrants in two concurrent securities offerings that were considered free standing financial instruments, were legally detachable and separately exercisable from the common and preferred stock issued in the two offerings. The Company initially determined that all of the Series A Warrants and Series B Warrants should be classified as a warrant liability in accordance with ASC 480, *Distinguishing Liabilities from Equity*, and recognized at their inception date fair value due to the insufficiency of common shares available to permit their exercise. The warrant liability met Level 3 classification criteria for classification within the fair value hierarchy. On January 15, 2020, the Company filed an amendment to its Certificate of Incorporation with the State of Delaware to effect a 1-for-40 reverse stock split. As a result of the reverse stock split, the Company's number of authorized but unissued shares of Common Stock increased significantly and the Series A Warrants and Series B Warrants became eligible for exercise, resulting reclassification of the warrant liability to equity. Prior to reclassification as equity, on January 15, 2020, the Company adjusted the warrant liability to its then $15,934 fair value using the Black-Scholes valuation model, recording a loss on the adjustment to fair value of $957.

The following tables show a reconciliation of the beginning and ending balances for the Level 3 warrant liability for the year ending December 31, 2020.

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	Year ended December 31, 2020
Warrant liability, December 31, 2019	$ 14,977
Recognized loss from mark-to-market adjustment prior to reclassification of warrant liability to equity	957
Reclassification from warrant liability to equity	(15,934)
Warrant liability, December 31, 2020	$ —

5. Property and Equipment, Net

Property and equipment consist of the following:

	Year ended December 31,	
	2021	2020
Equipment	$ 581	$ 766
Furniture and fixtures	43	43
Leasehold improvements	1,420	1,414
Software	14	22
Total property and equipment, at cost	2,058	2,245
Less: accumulated depreciation and amortization	(1,168)	(1,324)
Property and equipment, net	$ 890	$ 921

Depreciation and amortization expense for the years ended December 31, 2021 and December 31, 2020, was $220 and $182, respectively.

6. Accrued Expenses

Accrued expenses consist of the following:

	Year ended December 31,	
	2021	2020
Employee compensation and benefits	$ 452	$ 620
Leased facilities	71	188
Professional services	264	235
Field trials and related expenses	97	52
Other	252	202
Total accrued expenses	$ 1,136	$ 1,297

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 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 $125 remains outstanding as of December 31, 2021. Included within the agreement, the Company has an exclusive two-year option to sign a global, exclusive or non-exclusive license agreement to the technology. The current agreement terminates automatically on its second anniversary unless terminated earlier in accordance with the terms of the agreement.

License Agreement with the University of Massachusetts ("UMASS")

Pursuant to a license agreement with UMASS dated as of June 30, 2015 and subsequently amended, the Company has an exclusive, worldwide license under certain patents and patent applications, including issued patents covering the Company's yield trait gene C3003, relating to the manufacture of plants with enhanced photosynthesis. The agreement provides an exclusive, worldwide license to make, have made, use, offer for sale and import any transgenic plant seed or plant grown from transgenic plant material for sale to a farmer or grower that is derived from (in whole or in part) one or more issued or pending claims of the licensed patents or patent applications.

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

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

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.

Facility Leases

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

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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, 2021, and December 31, 2020, 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, 2021 and December 31, 2020.

8. License Agreements

In August 2020, the Company entered into a non-exclusive research agreement with GDM ("GDM"), a company specialized 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.

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 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 2018, the Company granted a three-year, non-exclusive license to Forage Genetics International, LLC ("Forage Genetics"), 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. The key objective of the licensing agreement is to provide Forage Genetics with novel traits to test alone and/or in any combination in sorghum that may lead to the identification of new yield traits for potential future licensing from the Company for development and commercial deployment. In September 2021, the Company and Forage Genetics amended the license agreement in order to extend it for a fourth year.

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 has the non-exclusive right to begin work with C3003 in its soybean program as a strategy to improve seed yield. Bayer may also conduct research with the Company's C3004 yield trait, a trait accessible through genome editing, in combination with C3003 to evaluate the effectiveness of the combination in improving seed yield in soybean. In August 2019, the Company expanded its 2017 non-exclusive research license with Bayer, for soybean crop research to include a new discovery related to its C3004 yield trait gene.

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

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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.

On August 26, 2020, the Company completed a public offering of 951,835 shares of its common stock at a public offering price of $4.25 for total gross proceeds of $4,045 before issuance costs of $425.

Private Placement

Concurrent with the registered public offering completed on August 26, 2020, as described above, the Company completed a separate private placement offering of 396,450 shares of its common stock to certain existing shareholders at the same $4.25 price offered to investors in the public offering. Proceeds from this private placement were $1,685.

Reverse Stock Split

On January 15, 2020, the Company completed a 1-for-40 reverse stock split ("reverse stock split") of its common stock by filing a certificate of amendment (the "Charter Amendment") with the State of Delaware to amend its certificate of incorporation. The ratio for the reverse stock split was determined by the Company's board of directors following approval by stockholders at the Company's special meeting held on January 9, 2020. The reverse stock split had the effect of increasing the Company's common shares available for issuance by reducing issued and outstanding common shares by a divisible factor of 40 while its authorized shares remained at its current 60 million shares. Proportional adjustments were made to the Company's outstanding stock options and warrants and to the number of shares issued and issuable under the Company's equity compensation plans.

November 2019 Concurrent Securities Offerings

On November 19, 2019, the Company closed on concurrent public and private securities offerings that included the following: common stock, Series A Convertible Preferred Stock, Series B Convertible Preferred Stock, Series A Warrants and Series B Warrants. Combined gross cash proceeds from the offerings totaled $11,500, before issuance costs of $1,254.

As of the November 19, 2019 closing date of the two offerings, the Company did not have sufficient authorized and available shares of common stock to permit conversion of the Series B Convertible Preferred Stock sold in the private placement or to permit the exercise of the 2,875,000 combined Series A Warrants and Series B Warrants issued under both the public and the private offerings. The Series B Convertible Preferred Shares and the warrants were not convertible or exercisable until more shares of common stock became available for issuance through the Company's filing of the Charter Amendment for the Reverse Stock Split described above. Upon the filing of the amendment on January 15, 2020, all of the Series B Convertible Preferred Stock sold in the private placement automatically converted into 718,750 shares of common stock and the Series A Warrants and Series B Warrants issued in both offerings became eligible for exercise.

At the time of their issuance, the Company determined that all of the Series A Warrants and Series B Warrants should be classified as a warrant liability and recorded at an inception date fair value of $24,518 due to the insufficiency of common shares available to permit their exercise. The Company re-measured the fair value of the warrants on December 31, 2019 and again on January 15, 2020 (the date of filing the Charter Amendment to increase available shares of common stock), resulting in, respectively, the recognition of a gain of $9,541 followed by a loss of $957, due to the change in fair value at each valuation date. By filing the Charter Amendment and effecting the 1-for-40 Reverse Stock Split, the Company's outstanding common shares were reduced by a divisible factor of 40 while authorized common shares remained at the current 60 million shares. As a result of this corporate action, sufficient shares of authorized, but unissued shares of common stock became available for Series A and Series B warrant holders to exercise their warrants resulting in their reclassification from warrant liability to equity on the date of filing the Charter Amendment.

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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.

Description of Series A Convertible Preferred Stock

The November 2019 public offering of the Company's securities included the issuance of 2,504 shares of Series A Convertible Preferred Stock. Each Series A Convertible Preferred Share was convertible into 125 shares of common stock at a conversion price of $8.00 per share. All of the 2,504 shares of the Series A Convertible Preferred Stock converted to 313,000 shares of common stock by April 30, 2020.

Description of Series B Convertible Preferred Stock

The November 2019 private offering of the Company's securities included the issuance of 5,750 shares of Series B Convertible Preferred Stock. Each share of Series B Convertible Preferred Stock was convertible into 125 shares of common stock at a conversion price of $8.00 per share. All of the Series B Convertible Preferred Stock converted automatically to 718,750 shares of common stock on January 15, 2020, upon the Company's filing of a Charter Amendment for the reverse stock split described above.

When converted, the shares of Series A Convertible Preferred Stock and Series B Convertible Preferred Stock were restored to the status of authorized but unissued shares of preferred stock, subject to reissuance by the board of directors.

Warrants

The following table summarizes information with regard to outstanding warrants to purchase common stock as of December 31, 2021:

Issuance	Number of Common Shares Issuable Upon Exercise of Outstanding Warrants	Exercise Price	Expiration Date
November 2019 Public Offering - Series A	352,703	$ 8.00	May 19, 2022
November 2019 Public Offering - Series B	395,528	$ 8.00	May 19, 2027
November 2019 Private Placement - Series A	718,750	$ 8.00	May 19, 2022
November 2019 Private Placement - Series B	718,750	$ 8.00	May 19, 2027
December 2017 Public Offering - Series A	160,975	$ 90.00	December 21, 2022
July 2017 Registered Direct Offering	14,270	$ 201.60	January 7, 2024
Consultant	750	$ 116.00	September 11, 2024
Total	2,361,726		

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, 2021	December 31, 2020
Stock Options	722,765	339,108
RSUs	9,430	8,500
Warrants	2,361,726	2,843,699
Total number of common shares reserved for future issuance	3,093,921	3,191,307

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, 2021, 364 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, 2021, 16,108 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, 2021, 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. Total shares added to the 2018 Plan from these annual additions through January 2022 have amounted to 469,998. At its annual meetings of stockholders held on May 19, 2020 and May 24, 2021, stockholders approved amendments to add 250,000 and 300,000 more shares, respectively, to the 2018 Plan. As of December 31, 2021, a total of 745,184 options and restricted stock awards have been issued from the 2018 Stock Plan, and as of that date, 715,244 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 $1,675 and $739 for the years ended December 31, 2021 and 2020, respectively. At December 31, 2021, there was approximately $4,036 of stock-based compensation expense related to unvested awards not yet recognized which is expected to be recognized over a weighted average period of 2.96 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.

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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		
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	$ —
Vested and expected to vest at December 31, 2021	722,765	19.22	8.79	$ —
Exercisable at December 31, 2021	213,156	43.15	8.07	$ —

The weighted average grant date fair value per share of options granted during fiscal years 2021 and 2020, was $8.99 and $5.31, respectively. No options were exercised during 2021 and 2020, 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, 2021 was 8.79 years.

For the years ended December 31, 2021, and 2020, 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,	
	2021	2020
Expected dividend yield	—	—
Risk-free rate	0.7% - 1.7%	0.5% - 1.9%
Expected option term (in years)	6.1 - 10.0	6.1 - 10.0
Volatility	118% - 128%	111% - 129%

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 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, 2021 and December 31, 2020, the Company withheld vested shares with a fair value of $102 and $17, respectively, to pay for minimum tax withholding associated with RSU vesting.

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A summary of RSU activity for the year ended December 31, 2021 is as follows:

	Number of RSUs	Weighted Average Remaining Contractual Life (years)
Outstanding at December 31, 2020	8,500	
Awarded	18,862	
Released	(17,932)	
Forfeited	—	
Outstanding at December 31, 2021	9,430	0.16
Weighted average remaining recognition period (years)	0.16	

11. LEASES

Lease Accounting

As a lessee, the Company follows the lease accounting guidance codified in ASC 842. Under ASC 842, 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 Company's existing lease subject to ASC 842 meets the standards for operating lease classification.

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. 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.

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, 2021, the Company's lease liability related to its Woburn facility will mature as follows:

Year ended December 31,	Undiscounted Cash Flows
2022	$ 726
2023	749
2024	771
2025	793
2026	747
Total undiscounted future lease payments	3,786
Amount of lease payments representing interest	(623)
Total lease liabilities	$ 3,163
Short-term lease liabilities	$ 514
Long-term lease liabilities	$ 2,649

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Quantitative Disclosure of Lease Costs

	Year Ended December 31,	
	2021	**2020**
Lease cost:		
Operating lease cost	$ 605	$ 688
Short-term lease cost	655	676
Sublease income	(616)	(560)
Total lease cost, net	$ 644	$ 804

Other information as of:	**December 31, 2021**	**December 31, 2020**
Weighted-average remaining lease term (years)	4.9	5.9
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 result 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 $3,786 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.

Through May 2020, the Company leased approximately 13,702 square feet of unused office and laboratory space located in Lowell, Massachusetts. The lease terminated in accordance with the terms of the lease agreement and the facility was returned to the landlord. No further expenses are anticipated under this lease.

The Company's wholly-owned subsidiary, MOI, located in Saskatoon, Saskatchewan, Canada, leases approximately 7,700 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 contain renewal or early termination options. MOI's leases for these facilities expire on various dates through September 2022.

12. Cares Act Loan

During 2020 the Company received $333 in loan proceeds through the Paycheck Protection Program Flexibility Act ("PPP"), established pursuant to the CARES Act. Under the CARES Act and the PPP, a borrower could apply for and be granted forgiveness for all or a part of its PPP loan. The amount of loan proceeds eligible for forgiveness was based on a formula that took into account a number of factors, including the amount of loan proceeds used by the borrower during the twenty-four-week period after the loan origination for certain purposes, including payroll costs, rent payments on certain leases and certain qualified utility payments. During the year ended December 31, 2020, Yield10 utilized the entire PPP

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Loan amount for qualifying expenses and received a favorable determination to its application for loan forgiveness for the full amount of the loan.

13. 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,	
	2021	2020
Domestic	$ (11,062)	$ (10,287)
Foreign	67	137
Net loss from operations before income tax provision	$ (10,995)	$ (10,150)

The components of the income tax provision consisted of the following for the years ended December 31, 2021 and 2020:

	Year Ended December 31,	
	2021	2020
Current Tax Provision:		
Federal	$ —	$ —
State	—	—
Foreign	—	—
Total current	—	—
Deferred Tax Benefit:		
Federal	—	—
State	—	—
Foreign	36	56
Total deferred	36	56
Total tax provision	$ 36	$ 56

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

	Year Ended December 31,	
	2021	2020
Deferred Tax Assets:		
Net operating loss carryforward	$ 5,533	$ 28,425
Capitalization of research and development expense	—	938
Credit carryforwards	565	2,431
Capital loss carryover	—	646
Stock compensation	886	764
Lease liability	864	993
Other temporary differences	106	338
Total deferred tax assets	7,954	34,535
Valuation allowance	(6,961)	(33,377)
Net deferred tax assets	993	1,158
Deferred Tax Liabilities:		
Depreciation	(185)	(216)
Right-of-use asset	(643)	(741)
Net deferred taxes	$ 165	$ 201

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,	
	2021	2020
Federal income tax at statutory federal rate	21.0 %	21.0 %
State taxes	5.9 %	5.1 %
Permanent differences	(0.2)%	0.2 %
Tax credits	2.0 %	1.7 %
Foreign rate differential	(0.1)%	(0.1)%
Impact of ownership change	(267.0)%	0.0 %
Non-deductible equity transactions	0.0 %	(2.0)%
Stock compensation	(2.1)%	(2.6)%
Other	(0.1)%	0.0 %
Change in valuation allowance	240.3 %	(23.9)%
Total	(0.3)%	(0.6)%

Tax Attributes

At December 31, 2021, the Company had U.S. net operating loss carryforwards ("NOLs") for federal and state income tax purposes of approximately $20,242 and $20,279, respectively. All of the $20,242 of federal NOLs will carry forward indefinitely. The Company's state NOL carryforwards will begin to expire on various dates through 2041. The Company also had available research and development and investment tax credits for federal and state income tax purposes of approximately $257 and $183, respectively. These federal and state credits will begin to expire on various dates through

2041. In Canada, the Company has cumulative research tax credits totaling $165 that will begin to expire on various dates through 2036.

Management of the Company has evaluated the positive and negative evidence bearing upon the realizability of its deferred tax assets, 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 deferred tax assets. Accordingly, a full valuation allowance has been established against the U.S. net deferred tax assets. Alternatively, the Company has concluded that it is more likely than not that the net deferred tax assets of its wholly-owned Canadian subsidiary, MOI, totaling $165, will be recognized in the future as a result of annual taxable income generated through MOI's research services and transfer pricing agreements with its U.S. parent.

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 2018 through 2021 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, 2021 and 2020, 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 Bioscience, Inc. 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, 2021 and December 31, 2020 approximated $1,032 and $999, respectively.

14. 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 13,611, and 20,788 shares of common stock during the years ended December 31, 2021, and December 31, 2020, respectively, and recorded $112, and $108, respectively, of related expense. Company contributions are fully vested upon issuance.

15. Government Research Grants

Canadian Research Grants

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On February 26, 2021, MOI 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 MOI during the period December 20, 2020 - March 13, 2021. During the first quarter of 2021, MOI submitted claims for eligible payroll costs and recognized grant revenue for the full amount of the award.

During 2020, MOI received two short-term grants, similar to the 2021 IRAP grant, both of which provided financial research assistance, in the amounts of $67 and $86, respectively, for eligible payroll costs. MOI submitted claims for the eligible costs during 2020 and the full amount of these grants was received and recognized as grant revenue during the year ended December 31, 2020.

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. Cumulative funding for this sub-award in the amount of $2,957 has been appropriated by the U.S. Congress through the final contractual year ending in September 2022. During the years ended December 31, 2021 and December 31, 2020, Yield10 recognized grant revenue of $575 and $646, respectively, from this sub-award.

As of December 31, 2021, proceeds of $510 remain to be earned from the MSU sub-award amounts awarded to date. This includes amounts for reimbursement to our subcontractors, as well as reimbursement for employees' time, benefits and other expenses related to future performance.

16. 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, 2021			
Revenue	$ 575	$ 39	$ 614
Identifiable long-lived assets	$ 821	$ 69	$ 890
Year Ended December 31, 2020			
Revenue	$ 646	$ 153	$ 799
Identifiable long-lived assets	$ 866	$ 55	$ 921

17. Related Party Transaction

During 1999, the Company entered into a technology sublicense agreement with Tepha, Inc. ("Tepha"), a privately held company engaged in the development of medical products. At the time the sublicense was executed, a director of Yield10 was also the president, chief executive officer and a director of Tepha. Three other members of Yield10's board of directors also served on the board of directors of Tepha, of which one continued to serve until completion of the merger of Tepha discussed below. 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). The sublicense agreement with Tepha ended in 2016.

In May 2021, the board of directors of Tepha approved and authorized the merger of Tepha with Becton Dickinson Global Holdings, Inc. On July 26, 2021, Yield10 received cash consideration of $700 in exchange for the surrender of its

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Tepha Shares upon the closing of the merger. The Company recorded the $700 as a gain on investment in related party within other income (expense) for the year ended December 31, 2021.