

**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, 2019**  
**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**  
(State or other jurisdiction of  
incorporation or organization)

**04-3158289**  
(I.R.S. Employer  
Identification No.)

**19 Presidential Way, Woburn, MA**  
(Address of principal executive offices)

**01801**  
(Zip Code)

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

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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:

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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 is a shell company (as defined in Rule 12b-2 of the Act). Yes ☐ No ☒

The aggregate market value of the voting and non-voting common equity held by non-affiliates computed by reference to the price at which the common equity was last sold on the Nasdaq Capital Market on June 28, 2019 was \$8,012,418.

The number of shares outstanding of the registrant's common stock as of March 18, 2020 was 1,923,184.

#### **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 19, 2020, which is expected to be filed not later than 120 days after the fiscal year end covered by this Form 10-K.

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**YIELD10 BIOSCIENCE, INC.**  
**ANNUAL REPORT ON FORM 10-K**  
**For the Year Ended December 31, 2019**  
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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 and uncertainties associated with our restructuring plans, 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**

### **ITEM 1. BUSINESS**

#### **Overview**

Yield10 Bioscience, Inc. is an agricultural bioscience company that uses its "Trait Factory" and the Camelina oilseed "Fast Field Testing" system to develop high value seed traits for the agriculture and food industries. Yield10 is headquartered in Woburn, Massachusetts and has an Oilseed Center of Excellence in Saskatoon, Saskatchewan, Canada. Our goal is to efficiently develop superior gene traits for the major crops including corn, soybean, canola, and other crops to enable step-change increases in crop yield of at least 10-20 percent. Our "Trait Factory" encompasses discovery of gene targets using our GRAIN ("Gene Ranking Artificial Intelligence Network") big data mining platform, deployment of trait gene targets in the oilseed Camelina and generation of field performance data. The "Trait Factory" enables two complementary commercial opportunities with different paths to market. The first is trait licensing to the major seed companies for corn, soybean, canola and other crops. Data from our trait field testing in Camelina has enabled Yield10 to establish research license agreements with leading seed companies including Bayer Crop Science division of Bayer AG ("Bayer"), Forage Genetics International, LLC a division of Land O'Lakes, Inc. ("Forage Genetics") and JR Simplot Company ("Simplot"). These companies are progressing the development of Yield10 traits in soybean, forage sorghum, and potato, respectively. The second commercial opportunity is to improve the performance and value of Camelina as a platform to develop a commercial crop product business producing nutritional oils and PHA biomaterials. Using this approach, Yield10 can leverage the resources of the major seed companies to efficiently develop superior gene traits for the major crops and focus internal resources on trait gene discovery and the commercial development of Camelina products.

Our focus in the near term is to develop a revenue generating business using Camelina to produce nutritional oils. Yield10 has discovered a series of performance gene traits for Camelina focused on seed yield and oil content, the two primary drivers of value. Our plan is to focus on our traits deployed using genome editing which can be qualified as non-regulated under U.S. Department of Agriculture ("USDA") Animal and Plant Health Inspection Service ("APHIS") rules. In parallel, the Company plans to establish a program to develop herbicide tolerant Camelina lines. We believe this will enable Yield10 to develop a crop oil product business with a clear path to revenue and growth. This foundation will form a strong base to produce PHA biomaterials in the longer term for use in water treatment and plastics replacement applications. Yield10

believes crop based PHA biomaterials represent a compelling new market opportunity for agriculture addressing a non-traditional market with high upside potential.

Yield10 brings a unique history and skill set, captured in our GRAIN data mining gene discovery platform, for developing advanced crop traits and increasing the concentration of specific biochemicals of commercial interest in crops. Our plan is to also use GRAIN to develop a source of revenue from funded research and development collaborations for traits, products and crops not being directly pursued internally. We are currently engaged in a range of discussions with third parties with respect to different crops, traits and products in the feed, food and pharmaceutical sectors.

Over the last four years, we have been evaluating certain of our traits in greenhouse studies and field tests conducted in the United States and Canada. We currently have three non-exclusive research license agreements in place: with the Crop Science division of Bayer, for the evaluation of our C3003 and C3004 traits in soybean; with Forage Genetics for the evaluation of five yield traits in forage sorghum; and with Simplot for evaluation of three of our traits in potato. We have progressed our evaluation of C3003 and C3004 in field tests with Camelina and canola and plan to continue our field testing in the 2020 growing season. In Camelina we have demonstrated the potential of a series of traits, including C3003 and C3004 to significantly increase seed yield and genome edited traits including C3007-C3010 to increase seed oil content and filed a new patent application on a potentially breakthrough technology for producing PHA biomaterials.

According to a United Nations report, crop production must be increased by over 70 percent in the next 35 years to feed the growing global population, which is expected to increase from 7 billion to more than 9.6 billion by 2050. During that time period, there will be a reduction in available arable land as a result of infrastructure growth and increased pressure on scarce water resources. Consumption of meat, seafood, and dairy products is also expected to increase based on dietary changes associated with increasing wealth and living standards. This will result in increased demand for feed grains and forage crops. Seafood production is increasingly based on aquaculture where fish diets have been increasingly moving to crop-based feed ingredients due to the limited availability and cost of processed ocean harvested fish as feed. Fish oil is the main source of omega-3 fatty acids which are essential in the human diet. Omega-3 oils have been shown to help prevent heart disease and stroke, may help control lupus, eczema, and rheumatoid arthritis, and may play protective roles in cancer and other conditions. Oils high in omega-3 fatty acids are in increasing demand as the supply of fish oil from ocean harvest is under increasing pressure. Aquaculture and other feed markets represent a growing opportunity for Camelina oil, which is high in the omega-3 fatty acid alpha linolenic acid ("ALA").

Harvestable food production per acre and per growing season must be increased to meet this demand. At the same time, with the increasing focus on health and wellness, food safety and sustainability in developed countries, we anticipate a rise in demand for new varieties of food and food ingredients with improved nutritional properties. With crop intensification (less land available and more production needed), we expect that improved crop genetics based on new gene traits will be a key driver of increased productivity, potentially resulting in the best performing yield traits commanding disproportionate value and disrupting the seed sector. We expect farmers and growers to be the major beneficiaries of these drivers, which represent potential opportunities for increased revenue and crop diversification. Today the global food market has an estimated value of \$5 trillion.

Yield10 brings unique capabilities and experience in advanced metabolic engineering and systems biology to optimize photosynthesis and carbon efficiency in crops to increase grain or biomass yield. These capabilities were developed based on sustained investment over many years when the company was named Metabolix. As Metabolix, we solved complex biological problems in the industrial/synthetic biology space to produce bioplastics. By 2012, we had begun work to increase photosynthesis in crops as part of those activities, which led to the creation in 2015 of the current Yield10 business focused on crop yield. In mid-2016 we sold our fermentation-based bioplastics assets to focus on our agricultural innovations and the company was rebranded as Yield10 Bioscience in January 2017.

Exciting new genetic engineering technologies like clustered regularly interspaced short palindromic repeats ("CRISPR") technology and other approaches to genome editing hold promise to accelerate the deployment of novel traits into commercial crops. This CRISPR method of making insertions or deletions of DNA into plants without the use of foreign DNA has been described as "precision breeding." We signed a research license, with rights to convert to a commercial license, to CRISPR/Cas-9 technology in 2018 to support our genome editing program. We have achieved non-regulated status pursuant to 7 CFR part 340 for two genome edited traits designed to boost oil content in Camelina through the USDA-APHIS "Am I Regulated?" petitioning process and have petitions pending for new edited lines. Genome editing technology as well as the streamlined regulatory process supported by USDA-APHIS for certain types of plant traits may enable agricultural innovators such as Yield10 to deploy and field test new traits more quickly, potentially resulting in a shorter path

to market and reduced costs as compared to the more highly regulated path required for traditional biotechnology-derived traits.

SUMMARY OF OUR CROP YIELD TRAITS IN DEVELOPMENT	
R&D Area	Crops Under Evaluation
<b>Seed Yield Traits-Likely Regulated<sup>1</sup></b>	
C3003	Camelina, canola, soybean, corn, potato
C3011	Corn, Camelina and canola
<b>Seed Yield Traits-Likely Not-Regulated<sup>2</sup></b>	
C3004	Camelina, soybean, canola and corn
<b>Oil Enhancing Traits-Likely Not-Regulated<sup>2</sup></b>	
C3007	Camelina and canola
C3008a	Camelina (not-regulated <sup>4</sup> )
Oil trait combinations - C3008a, C3008b and C3009	Camelina (not-regulated <sup>4</sup> )
Additional oil traits and combinations	Research in progress (target crops to be determined)
C3014 and C3015 PHA biomaterials	Camelina in progress
<b>Yield Improvement Trait Discovery Platform (Traits Potentially Non-Regulated)<sup>3</sup></b>	
C4001	Camelina, forage, sorghum and corn
C4002	Sorghum and corn
C4003	Sorghum and corn
C4029	Sorghum

- 
- (1) C3003 and C3011 consist of microbial genes and are likely to be subject to regulation by USDA-APHIS.
  - (2) These traits are accessible using genome editing or other methods that do not result in the insertion of non-plant DNA. These approaches may be deemed not to be regulated by USDA-APHIS pursuant to 7CFR part 340 based on recent filings by us and other groups.
  - (3) Traits in this area were developed in our GRAIN platform and all are potentially deployable through approaches which may be not-regulated by USDA-APHIS pursuant to 7 CFR part 340.
  - (4) USDA-APHIS does not consider these lines submitted by Yield10 to be regulated pursuant to 7 CFR part 340. Commercial plant or plant lines or plant products derived from these lines may be regulated by the U.S. Food and Drug Administration ("FDA") or U.S. Environmental Protection Agency ("EPA").

One of the critical unmet needs in the agricultural sector is to increase the fundamental yield potential of crops to address global food security. Yield10's Trait Factory encompasses discovery of gene targets using our GRAIN big data mining platform, genetic engineering of Camelina to modify those trait gene targets and the generation of field data with the engineered crops. Performance and molecular data from the engineered crops are then fed back into the GRAIN system to enable refinement of specific gene targets and the identification of new trait gene targets. Data from the Camelina field studies is then leveraged to form relationships with leading seed companies to progress our trait genes in major crops. Modified Camelina lines with improved performance enter the development pipeline and progress on the regulated or non-regulated path to market depending on how the plants are genetically engineered. GRAIN is a powerful new tool developed primarily to focus on Yield10 trait targets. However, we believe we may also be able to generate a revenue stream by providing access to our GRAIN platform to third parties who are interested in other trait targets and/or crops Yield10 is not pursuing.

As we continue to develop the GRAIN platform, key elements of this system have proven effective and have enabled Yield10 to produce several promising crop yield traits in our development pipeline. Yield10 has achieved and published in peer reviewed journals scientific data from growth chamber and greenhouse studies showing that significant improvements to crop yield are possible. We have achieved these results by improving fundamental crop yield through enhanced photosynthetic carbon capture and increased carbon utilization efficiency to increase seed yield. Some examples of these traits and their impact on crop yield are shown below. In order to highlight the power of our advanced metabolic engineering/systems biology approach of improving fundamental carbon conversion processes in seed we developed the C3006 trait. C3006 required a complex combination of microbial genes to enhance carbon fixation from non-photosynthetic pathways in seed. This trait is based on a complex combination of 10 microbial genes which, when deployed into Camelina, more than doubled seed yield in greenhouse studies. Although the genetic complexity of C3006 creates a regulatory hurdle we believe this proof point demonstrates the value of our GRAIN platform and the potential to double Camelina seed yield. We plan to continue the development of the C3003 and C3004 traits as well as our C4000 series of yield traits in Camelina and support our licensees on their development work in corn, canola and potato.

Examples of our traits and their impact on crop yield in growth chamber and greenhouse studies	
<b>C3003/C3004 traits:</b>	23% - 65% increase in seed yield in oilseed crops (Camelina)
<b>C3006 advanced synthetic biology trait:</b>	128% increase in oilseed yield (Camelina)
<b>C4001, C4003 traits:</b>	Work ongoing; 70% increase in photosynthesis, 150% increase in biomass (switchgrass)

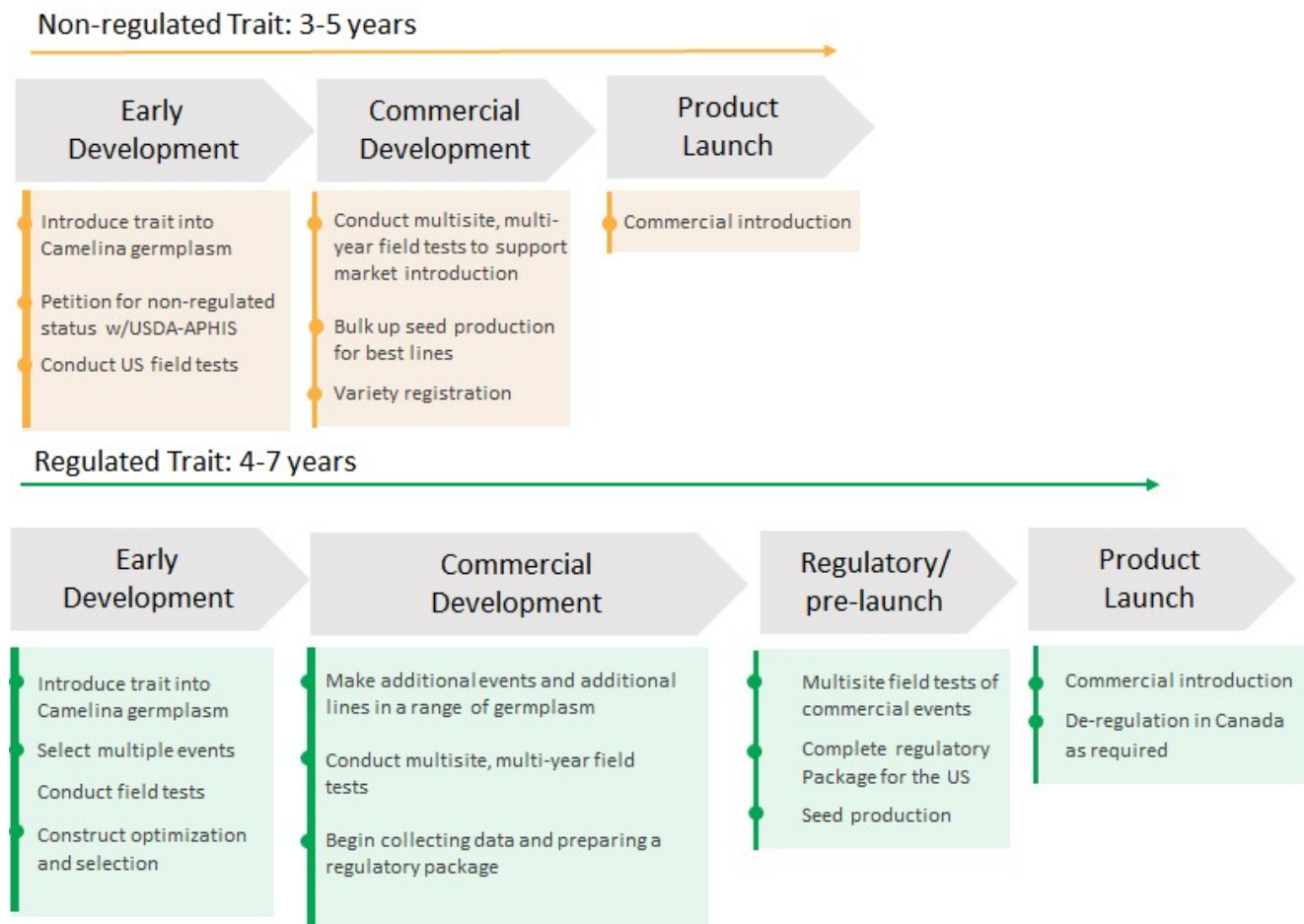
Yield10 has a pipeline of more than 10 novel yield traits in research and development and we expect to generate several proof points for our traits in various crops over the next two years.

We are building a portfolio of intellectual property around our crop yield technology and traits. As of December 31, 2019, we owned or held exclusive rights to 22 patents or pending patent applications worldwide related to advanced technologies for increasing yield in crops. 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. The first U.S. patent on this trait was issued in 2019. Our portfolio of patent applications also includes advanced technologies for increasing oil content in oilseed crops in-licensed globally and exclusively from the University of Missouri in 2018 and 2019 related to the yield trait genes C3007, C3010 and C3012. Yield10 filed a patent application in 2019 for our triple edit oil content traits C3008a, C3008b and C3009. We also recently filed a new patent application on a breakthrough technology for producing PHA biomaterials in oilseeds which offers the potential for very low-cost production of a new crop product with applications in water treatment and plastics replacement.

### Trait Development Process and Stages

Yield10 has effectively condensed the early phases of trait gene discovery with early development to accelerate the identification of trait leads. Novel trait gene targets, identified using our GRAIN discovery platform or in-licensed from academic institutions where proof-of-principle has been demonstrated, are deployed and evaluated in our Camelina Fast Field Testing platform. Depending on the characteristics of the trait gene, Camelina lines can be engineered using CRISPR genome editing (a non-regulated path) or traditional gene transformation technologies (a regulated path). For genome edited traits, once we have developed Camelina lines with the target trait we can file a petition with USDA-APHIS to confirm that the new Camelina lines meet the non-regulated criteria prior to field testing. For traditional traits defined as regulated at this stage of development, we can apply for regulatory approval and permits in order to carry out field testing. Following first field testing, non-regulated traits deployed in Camelina demonstrating improved yield performance in the field would then progress into the commercial development phase. This phase can be expected to last two to three years to complete activities associated with launching a new variety of Camelina. For regulated traits, the development process is considerably longer and is expected to be in the range of four to seven years based on the multiple steps required in the commercial development phase including event selection, optimization and executing steps in the regulatory approval process.









Based on using Camelina as our Fast Field Testing system, we currently have approximately 10 traits at different stages in our development pipeline. As we develop our business plan for commercial products made in Camelina based products such as oils and PHA biomaterials, we expect we will continually evaluate and prioritize our traits in development as we progress to product concepts and commercialization. A summary of our traits and their stage of development in the pipeline is presented below.

#### Non-Regulated Camelina Traits

Non-Regulated Trait	Product Concept	Early Development	Commercial Development	Product Launch
C3008a,b/ C3009	High oil content		→	
C3007	High oil content	→		
C3004 NR	Seed Yield/vigor	→		








## Regulated Camelina Traits

Regulated Trait	Trait Target	Early Development	Commercial Development	Regulatory Approval	Product Launch
C3003	Seed Yield				
C3004	Seed Yield/Vigor				
C3013	Seed Yield				
C3014/C3015	PHA biomaterials				

For the development of our traits in major crops such as corn, soybean, canola and others, our approach is to look for partners interested in evaluating our traits and enter into research license agreements to enable them to do so. Until such time as such licensees execute a commercial license with us, we consider our traits to be in the early development phase. Once our licensees execute a commercial license our expectation is that our licensees would place our traits in their development pipelines. We expect our licensees to use their internal capabilities and broad experience to pursue deregulation of the trait in their specific crop target, as they will want to integrate the trait with their regulatory processes, which often encompass complex trait stacking and global deregulation.

## Traits Being Developed by Licensees<sup>1</sup>

Partner	Crop/Trait	Agreement	2018	2019	2020	2021
Bayer Crop Science	Soybean/C3003 Soybean/C3004	Research License Collaboration				
Forage Genetic	Forage Sorghum Multiple traits	Research License Collaboration				
Corn Seed Co,	Corn Multiple Traits	Fee For Service				
JR Simplot	Potato Multiple Traits	Research License				

<sup>1</sup> The time line shown in the chart reflects the duration of each partner's research license agreements.

## The Unmet Need: Global Population Growth Outpacing Anticipated Global Food Supply

Yield10 is targeting a critical unmet need in agriculture based on the future disconnect between agricultural supply and the growing global population. According to a United Nations study, the global population is expected to exceed 9.6 billion people by 2050 and therefore there is a need to sustainably increase global food production including in grains, protein, seafood, dairy and edible oils to meet this demand. This will need to be achieved in the face of increased pressure on land and water resources in addition to increasingly variable weather patterns and growing environmental challenges. Solving this problem is a major global challenge requiring new crop innovation and technologies to fundamentally enhance crop productivity.

## The Yield Gap

According to several studies described in an article published in the Public Library of Science in 2013, crop yields may no longer be increasing in different regions of the globe, and current rates of crop yield increase based on traditional plant breeding approaches are expected to fall significantly behind the levels needed to meet the demand for global food production. The researchers found that the top four global crops-maize (corn), rice, wheat and soybean-are currently witnessing average yield improvements of only between 0.9 to 1.6 percent per year, far slower than the required rates to double their production by 2050 solely from incremental yield gains. At these rates, global production of maize, rice, wheat and soybean crops may be required to increase by about 67 percent, 42 percent, 38 percent and 55 percent, respectively, by

2050, in order to meet the anticipated increase in demand for food production caused by population growth. The yield increases needed to meet the demands of the growing global population show that a significant “yield gap” exists for each of the crops evaluated in the study.

Yield10 is focused on addressing the yield gap for major crops by using our Trait Factory to optimize photosynthesis and carbon efficiency in crops to increase grain or biomass yield. We have been working in the area of increasing photosynthetic carbon capture and crop yield technologies since 2012 and we have identified several potentially promising genes for increasing yield or improving crop performance.

## **Health and Wellness, Food Safety and Sustainability**

At the same time, with the increasing focus on health and wellness, food safety and sustainability in developed countries, we anticipate a rise in demand for new varieties of food and food ingredients with improved nutritional properties. Further, concerns about food safety have led to the concept of “seed to plate,” with a focus on stringent quality control along the entire value chain. If this concept takes hold with consumers, it is likely to require identity preservation from seed to harvest and involve contract farming. This concept is currently being implemented in agricultural biotechnology, in both canola and soybean which have been modified to alter the composition of the oil produced. High oleic canola and soybean oils are being marketed as “healthier” where the value driver is the ability to make marketing claims directly to the consumer.

Camelina oil naturally contains over 30% by weight of the omega-3 fatty acid and has recently been shown in clinical studies to be more effective than fish oil for controlling LDL cholesterol indicating potential use in reducing heart disease. This oil is also finding applications in aquaculture feed due to current constraints on the availability of omega-3 fish oil from ocean harvested fish. Yield10 believes that Camelina also has considerable potential as a cover crop to reduce soil erosion and nutrient run-off from land used for row crop production. In the longer term the production of PHA biomaterials in Camelina would represent an entirely new market opportunity for farmers. This opportunity could provide economic returns for farmers to justify large acreage adoption of Camelina as a cover crop and enable the low-cost production of this product for new markets including water treatment and sustainable biodegradable plastics replacement applications.

## **Business Strategy**

Our goal is to build a successful agricultural biotechnology company centered on demonstrating and capturing the value of our traits and technologies based on the following three potential revenue streams:

- Licensing of our yield and performance traits for use in major row crops;
- Product sales revenue from products produced in the oilseed Camelina; and
- R&D revenue for access to our GRAIN trait gene discovery platform.

Using our Trait Factory, we have identified and are evaluating novel yield trait genes to help address the growing global yield gap in food and feed crops. Crop yield is the key decision variable for farmers in making seed buying decisions, and as a result, is critical to the seed industry. Improvements in yield to the levels targeted by Yield10, for example 10-20 percent increases, would be expected to generate significant value to the seed and farm sectors. For example, Yield10 is targeting an approximately 10-20 percent increase in canola and soybean yields, which, if successfully deployed across North American acreage, could result in annual incremental crop value of up to \$10 billion. 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.

Yield10 plans to develop yield traits that enable farmers to increase their revenue, and also to license our trait innovations to the major agricultural companies so that they can be deployed in elite seed varieties. Performance traits result in increased harvest value, which is then shared based on the well-established value sharing model in the seed sector. Yield10 plans to continue to focus on its core competency of advanced trait gene discovery through the Trait Factory, while also building an independent, revenue generating, specialty products business based on the Camelina oilseed.

Our C3003 yield trait is an algal gene, and we believe that it will be regulated by USDA-APHIS as a biotech trait. In 2017, we signed a non-exclusive research license with the Crop Science division of Bayer AG (“Bayer”) (formerly Monsanto Company), to test C3003 and the first version of C3004 in soybean. In 2019, the license was expanded to cover a new discovery and intellectual property related to a new version of C3004. Similarly, in 2018 we signed a non-exclusive research license with Forage Genetics, to test a series of traits in forage sorghum. In 2019 we signed a non-exclusive research license with Simplot for the evaluation of our traits in potato. We have been progressing our traits internally in canola and in corn on a fee for service basis but plan to look for partners for our traits in both crops this year. Yield10 significantly expands

the development pipeline by enabling the licensees to progress our traits in major crops. Our focus is on securing a share of the upside value of our traits when we finalize the economic terms of license agreements at the point where the value of the trait is well understood.

We believe we can leverage our seed yield and oil content traits to add value to Camelina in North America in the near term. We will focus our initial development activities on the production of nutritional oils for human and aquaculture feed markets using traits that can be qualified as non-regulated by USDA-APHIS to build our commercial capabilities.

The production of PHA biomaterials in Camelina could open new markets and provide economic returns for farmers to justify large acreage adoption and enable the low-cost production of this natural biodegradable product for water treatment and plastics replacement applications. We believe crop-based production will enable an advantageous cost structure thereby eliminating one of the remaining significant barriers to entry for broad adoption of these biomaterials. By reprogramming Camelina to produce PHA in the seed, the harvested seed can then be processed to produce three products: oil, protein meal for animal feed, and PHA biomaterial. The typical costs for producing edible oils are a useful benchmark for the potential long-term cost structure for crop based PHAs. In this scenario, crop based PHAs would have a cost advantage over petroleum-based plastics.

In water treatment, the PHA biomaterial acts as a growth substrate and energy source for denitrifying 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. Yield10 is in the early stages of developing a revenue generating business model for this opportunity.

PHA biomaterials are also useful for functionally replacing petroleum-based plastics in a wide range of packaging applications. For example, the plastics industry produces more than 350 million tons of material per year globally. This sector is facing intensive scrutiny due to increasing plastic waste pollution in the environment. As natural biomaterials, PHAs fully degrade over time in the environment yet have good processing and physical properties and can be processed like plastics to produce articles with excellent shelf life in use. When we made the transition to the Yield10 business we divested our fermentation based PHA bioplastics assets and related applications technology. However, Yield10 retained the rights to PHA production in engineered crops. Yield10 plans to eventually look for partners to produce resin-grade PHA biomaterial for supply to the plastics sector but will focus the initial launch on water treatment applications.

We are at an early stage of developing a detailed plan for the Camelina business but believe it may have considerable potential for Yield10. Completing this business plan is a key goal for 2020.

## ***Our History***

***We have a significant track record and expertise in the metabolic engineering of microbes and have made significant progress translating this capability to plants.***

As part of the legacy biopolymers and biobased chemicals business of our predecessor company, Metabolix had supported a crop science research program to produce PHA biomaterials in crops as a potential low-cost production system. 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 in the seeds of oilseed crops or in the leaves of biomass crops such as switchgrass. The PHB biomaterial is useful as a natural water treatment product and as a replacement for petroleum-based plastics.

As we made progress on producing PHB in plants, we learned that basic carbon supply from photosynthesis was a bottleneck. To address this carbon shortfall, in 2012 we began developing new metabolic engineering and bioinformatics approaches to enhancing basic crop photosynthetic carbon capture. Discoveries from these two approaches became the foundation of our GRAIN crop trait discovery platform. We also began building intellectual property on novel yield trait gene technologies discovered in these programs and realized that our experience in re-engineering the flow of carbon in microorganisms could be applied to building better plants with higher yield potential. Improving the yield potential of major crops is an essential step to increase seed and/or biomass yield and, therefore, food production.

## **Our Approach**

### ***Our GRAIN platform provides us with a unique approach for discovering novel yield trait genes.***

We have integrated advanced metabolic flux modeling capabilities with transcriptome network analysis to form the foundation of our GRAIN big data mining gene discovery platform. This discovery platform is the core of our Trait Factory. 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 the various pathways. Over the last 20 years, the agricultural sector has generated vast numbers of data points. During this same period, there have been very few new crop traits produced. GRAIN 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.

### ***We developed the Camelina Fast Field Test model system to characterize, evaluate and de-risk novel yield trait genes.***

One of the challenges the agricultural industry has faced over the years is translating early crop science discovery into value generating traits. In part this is because results from greenhouse studies in model plants have not translated well into field results in major crops. Translating success with non-plant genes in major crops has been successful and the current biotechnology seed sector, which accounted for 457 million acres of crops worldwide in 2016, is based on using microbial genes in plants. The long timelines to progress early discoveries successfully into major crops and generate field data adds to the challenge.

For these reasons, Yield10 has put in place a process we call “Fast Field Testing” based on our Camelina oilseed platform. Camelina is an industrial oilseed well-suited to field trials, and we believe it is a promising new crop for farmers. It is also very fast to modify, develop genetically stable seed and scale up seed for field planting. Ideally, we hope to be able to progress from trait identification to field planting in about 12 months. Results from our field studies in Camelina can then be used to generate partner interest in progressing our traits in corn, soybean, canola and other crops through research license agreements.

### ***We are focused on identifying and developing technologies that will enable us to produce step-change improvements to crop yield and value.***

Yield10 is targeting a critical unmet need in agriculture based on the anticipated disconnect between agricultural supply and the growing global population. Food production must be increased by over 70 percent in the next 35 years to feed the growing global population, which is expected to increase from 7 billion to more than 9.6 billion by 2050. Global climate change is also resulting in regional shifts to historical growing conditions. Given the projection for population growth, recent studies show a “yield gap” for major food and feed crops that cannot be addressed by incremental improvements to yield brought about by traditional plant breeding and existing biotech traits. Current biotech traits deployed in crops by the seed industry are based primarily on using microbial-sourced genes to impart yield protection through herbicide, pest, disease and even drought resistance, whereas Yield10 is focused on increasing fundamental crop yield through enhanced carbon capture and utilization. The demand for edible vegetable oils and healthier edible oils is also increasing.

Yield10 is using the Trait Factory to optimize photosynthesis and carbon efficiency in crops to increase grain or biomass yield targeting step-change increases in the range of 10-20 percent in crop yield.

### ***We have assembled a pipeline of crop yield traits for development that are applicable to major commercial crops and established agreements with major seed companies.***

Our unique approach to crop yield 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 yield trait genes, we test our yield trait candidates using our Camelina platform. As a yield trait innovator, 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 our approach is 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 capture value for our yield trait discoveries and provide a path to commercialization for important new yield traits for major crops.***

Yield10 is working to advance our own developments as well as form business alliances to progress our traits through development, launch and commercialization. Key to our strategy is to retain, where practical, control of timelines and maximize, where possible, the opportunity for value creation and optionality around future value realization strategies. 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 can focus internal resources on trait gene discovery and developing an independent Camelina based products business.

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

In 2017 we granted a non-exclusive global research license to Bayer to evaluate our novel yield traits C3003 and C3004 in soybean. The license was expanded in 2019 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 research license with a similar structure to Forage Genetics, a leader in forage crops used for animal feed, to evaluate five traits in forage sorghum. In 2019 we granted a research license with a similar structure to Simplot, a leader in potato.

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, 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 2019, we continued to explore additional opportunities to expand the testing of our traits through similar arrangements with other companies and as part of our evolving strategy we now plan to look for partners in canola and corn.

***We have identified promising potential traits which can be modified using genome editing. We believe that such targets may be subject to less regulatory complexity in the U.S. during development and along the path to commercialization and may provide opportunities for licensing.***

Genome editing techniques, including CRISPR, which involve making small targeted changes to the DNA of a target organism, have been of interest to the agricultural biotechnology industry because this approach is believed to have the potential to significantly reduce development costs and regulatory timelines for crop trait development and market introduction. In 2018, we signed a non-exclusive research license for CRISPR/Cas-9 technology with the Broad Institute of MIT and Harvard and Pioneer, part of Corteva Agriscience.

USDA-APHIS has streamlined the regulatory path for genome edited plant lines that do not contain any remaining foreign DNA (i.e., DNA sequences not from the plant being engineered) from the procedure used to edit the plant. These plant lines may not be subject to certain USDA-APHIS crop regulations in the U.S. See the “Regulatory Requirements” section below. This significantly decreased the timeline and cost of developing and bringing some new traits to commercialization in the U.S. The GRAIN platform is particularly well suited to the challenge of identifying new gene targets for genome editing that can generate economic value. This has opened the potential for Yield10 to exploit a second tier of novel traits addressable with genome editing.

From its internal GRAIN discovery platforms and those in-licensed through academic collaborations, Yield10 has identified gene targets suitable for deployment in crops through genome editing. We have deployed genome editing technology based on our C3008a trait in Camelina as well as our triple edited-line based on our C3008a, C3008b and C3009 traits in Camelina, which were deemed non-regulated by USDA-APHIS in 2017 and 2018, respectively. In early 2020, we filed a petition for non-regulated status for a number of genome edited C3007 Camelina lines. C3007 is a trait in-licensed from the University of Missouri for increasing oil content. We also believe that our C3004 yield trait can be deployed in Camelina through a non-regulated process. Plants that are not regulated by USDA-APHIS may still be subject to regulation by the FDA or the EPA depending on certain characteristics and the plant’s intended uses. We believe our GRAIN platform for identifying genome editing targets as well as improved crops we could develop using this approach may enable us to form collaborations or enter into license arrangements with a broader set of potential commercial partners in order to bring these genome edited traits forward into development in the near-term.



***We believe Camelina has high potential as a commercial crop for producing nutritional oils and PHA biomaterials in North America.***

Based on our 10-year investment in the Camelina platform and trait proof points achieved to date, we believe Yield10 has established the foundation for a crop product business producing nutritional oils and PHA biomaterials. Camelina or *Camelina sativa* is an oilseed crop currently in limited cultivation in North America and Europe. Camelina oil has historically been used in food and production is increasing because of its natural omega-3 fatty acid content. Results from a randomized controlled study published in 2018 in the journal *Molecular Nutrition and Food Research* have shown that Camelina sativa oil, but not fatty fish or lean fish, improved serum lipid profile in subjects with impaired glucose metabolism. Camelina protein meal left over following oil extraction by cold crushing has been approved by regulatory authorities for use in animal feed applications in the U.S. and Canada. In the cold crushing process to extract oil, some of the omega oil remains in the meal, making it attractive for use as chicken feed because it increases the omega-3 content of eggs.

We believe that our Camelina development capabilities, together with our yield and oil content trait improvements, will enable an attractive Camelina products business focused on nutritional oils in the near-term. In the longer term, the potential for production of PHA biomaterials in Camelina could provide economic returns for farmers to justify very large acreage adoption and enable the low-cost production of this product. PHA biomaterials with the right cost structure have applications in very large markets not currently served by agriculture including water treatment and plastics replacement applications. We believe crop-based production will enable broad-based global adoption of these materials.

***Our Oilseed Operation based in Canada provides us with unique capabilities in the development of 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 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.

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

Yield10 named Sherri Brown, Ph.D., a former Monsanto Company executive, as a member of the Board of Directors on January 2020. Prior to joining the Board, Dr. Brown has served as a special commercial and technical advisor to the Company since 2018. Dr. Brown, who is currently a Managing Director at The Yield Lab, served from 1999-2017 in leadership positions at Monsanto, most involving the development and commercialization of new traits for corn and oilseed crops including soybean and canola.

Yield10 has pursued academic collaborations that have led to the discovery of novel yield trait genes. Researcher Danny Schnell, Ph.D. discovered the C3003 trait in an ARPA-e (a division of the U.S. Department of Energy ("DOE")) funded collaborative project at the University of Massachusetts in which Yield10 was a partner. In 2015, Prof. Schnell moved to Michigan State University where he is Chairperson, Department of Plant Biology and remains a collaborator on C3003. In 2018, Yield10 announced signing a global license agreement with the University of Missouri for advanced technology to boost oil content in oilseed crops, including C3007 and C3010, which are based on the discovery of a key regulatory mechanism controlling oil production in oilseed crops which can be used to increase oil content. Jay J. Thelen, Ph.D., Professor of Biochemistry at the University of Missouri, who discovered this mechanism, joined our Scientific Advisory Board in 2018.

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

Yield10 has 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 test these novel traits in Camelina. This work is valuable because traits developed in Camelina 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 new DOE grant led by Michigan State University to conduct research aimed at boosting oilseed yield in Camelina. We plan to continue to pursue government grants to defray research costs associated with our research and development activities.

***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 30, 2019, we had 25 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 over time commensurate with building value in our business and advancing our traits through development while at the same time tightly managing overhead costs.

## **Our “GRAIN” Technology Platform**

In the last two decades there has been a dramatic expansion of new genetic engineering and systems biology tools: genomics data, metabolic engineering, high-throughput analytical tools, including whole organism gene expression analysis and metabolomics, and powerful genome editing technologies. As a result, the seed sector has tested thousands of single genes and generated billion if not trillions of data points yet step change improvements in crop yield have remained elusive. Yield10 is bringing new approaches and innovation based on over 30 years of experience in advanced synthetic biology and metabolic systems modelling to improve inherent yield of major food and feed crops.

At a fundamental level, increasing crop yield is a complex two-step carbon optimization problem. Harvested seed is mostly carbon fixed from carbon dioxide in the air by photosynthesis with oxygen coming from water in the soil and smaller amounts of nitrogen and phosphate both of which are applied as fertilizer. Based on our experience optimizing carbon flow in living systems, we know that increasing seed yield will likely require multiple trait genes to increase carbon fixation by photosynthesis at the front-end and direct the increased fixed carbon to the seed.

Plant growth is based on a series of chemical reactions and these can be modeled to determine the best ways to optimize the yield of the targeted product. We have integrated advanced metabolic flux modeling capabilities with transcriptome network analysis to form the foundation of the GRAIN gene discovery platform. GRAIN is a powerful new data mining tool which the company has protected as a trade secret. Yield10 has used GRAIN to identify a pipeline of traits it is developing in Camelina to determine performance and then through a series of license arrangements with major seed companies in other crops. We also believe our integrated GRAIN platform can be used to successfully identify new targets for improving crop yield and are working to leverage the platform in the near-term to secure research and development funding from industry partners.

## **Traits in Development**

Based on our early innovations, the development of the fully integrated GRAIN trait gene discovery platform and the execution of our in-licensing strategy, Yield10 has established a strong pipeline of traits in development. By using our Camelina platform as a Fast Field Testing platform, to generate initial trait performance data, our traits are furthest along in Camelina. This has formed the foundation of our strategy to develop a Camelina based specialty products business. Data from Camelina field studies have also helped us to establish research license agreements with three seed companies (Bayer, Forage Genetics, Simplot) to enable them to progress our traits in major crops. Yield10 is progressing proprietary traits in corn through a service agreement. In 2019 Yield10 continued to progress the development of our C3000 series of seed yield and oil content traits as well as some of our C4000 series traits in the oilseed Camelina. We progressed several of these traits into major crops including corn, soybean, forage sorghum and potato through third party relationships and in canola using internal resources. In 2019, Yield10 announced the filing of a new patent application on a technology breakthrough for producing high levels of a PHA biomaterial, a product with very large market potential in oilseeds.

## **Novel Yield Trait Gene C3003**

C3003 is an algal gene, in-licensed from the University of Massachusetts. We believe based on GRAIN modelling that C3003 reduces the well-understood yield losses that occur through photorespiration, a side reaction of photosynthesis in C3 crops based on early positive results. C3 photosynthesis, the simplest type of plant photosynthetic system, exists in most agricultural crops used for human consumption, including canola, soybean, rice, wheat and potato. Yield10 is progressing the introduction of the C3003 trait gene as well as improvements to the C3003 trait in Camelina, canola, and corn.

Canola is an important North American oilseed crop harvested for its oil. We are targeting step-changes of 10-20% in the evaluation and development of novel traits to increase seed yield in canola. In our field tests of canola in 2018, we



achieved seed yield improvements in some events at the low end of this range (11%), and based on these results, we continued to progress C3003 into the preliminary commercial development phase in canola in 2019. Key activities in 2019 included field testing of the C3003 Canola lines from the 2018 trial and the development of additional commercial quality C3003 canola events. The 2019 growing season was particularly challenging with wide swings in weather patterns and as a result we were unable to generate statistically significant performance data. However, based on earlier results and our increasing understanding of the underlying biological mechanism, we remain committed to progressing the development of C3003. In 2019, we produced 15 additional high quality C3003 canola lines and plan to continue the field testing and development programs with this trait in Camelina and canola in 2020.

Under a research license, Bayer is working with C3003 in its soybean program as a strategy to improve seed yield. We anticipate that Bayer will generate field test data with C3003 pursuant to the research license. The Bayer license was expanded in 2019 to include a new discovery relating to C3004 that will enable them to begin deploying and testing this trait in their soybean program. Yield10 is working to identify additional partners for our traits in soybean.

### **Novel Yield Trait Gene C3004**

While the role of C3004 is currently not well understood and we continue to investigate the role of the gene in plant metabolism, we believe that it may affect carbon partitioning (the flow of carbon from green photosynthetic tissue to seed development) in plants. Our ongoing research will continue to investigate the activity of C3004 alone and in combination with C3003 to produce increases in seed yield in crops.

We began our investigation of C3004 by preparing genetic constructs to increase the expression of the C3004 gene in Camelina. Stable C3004 Camelina lines were developed and we performed yield studies in a greenhouse and a controlled environment growth chamber. In these studies, increased expression of C3004 in Camelina resulted in a significant increase in plant growth and vigor, increased branching and seed yield, and in some cases increased individual seed weight. In 2019 we continued the development of additional C3004 Camelina lines, conducted greenhouse studies and our first field tests.

Our 2019 greenhouse studies included additional C3004 Camelina lines with different Camelina genetic backgrounds. We again observed increased vigor, branching and increases in seed yield consistent with our 2018 observations. In our 2019 field tests, photosynthetic measurements were taken during the growing season on C3004 Camelina lines at similar developmental stages. Five lines tested showed statistically significant increases in several important photosynthetic parameters for plants, including CO<sub>2</sub> fixation, electron transport rate, and the conversion of light energy to chemical energy (effective quantum yield). While field conditions throughout Western Canada were harsh, including severe drought, there were indications that the C3004 plants produced more seed than wildtype Camelina; however, substantial variability among the test plots under these severe conditions confounded the collection of statistically significant seed yield data from the study. In 2020, Yield10 plans to field test C3004 Camelina lines at an expanded number of sites to collect agronomic and seed yield data; we also plan to field test C3004 in canola for the first time is also planned. We currently have research license agreements in place with seed companies to evaluate the Camelina C3004 gene in soybean, corn and potato.

The version of the C3004 trait we have tested so far in our Camelina studies was genetically engineered using a traditional GMO approach; however, we believe that it may be possible to develop versions of C3004 Camelina that are non-regulated under current USDA-APHIS rules and expect this will form a key part of our Camelina commercial development effort.

### **Oil Enhancing Traits: C3007, C3008, C3009, C3010 and C3012**

Edible oils or vegetable oils are derived from fruits and vegetables, such as palm, soybean, rapeseed (canola) and sunflower. These oils are used in frying, baking, other types of cooking and in food preparation and flavoring such as salad dressings and bread dips. Edible oils are of increasing importance among health-conscious consumers as key functional ingredients which may reduce the risk of cardiovascular disorders along with potentially lowering the possibility of certain kinds of breast cancer. Based on these drivers the global edible oil market is anticipated to witness a substantial growth in demand for unrefined, unprocessed, healthy, and organic oil.

This is leading to the development and commercialization of modified soybean and canola oils with higher levels of healthier unsaturated fatty acids. Health benefits of omega-3 fatty acids from fish oil are creating additional interest in plant-based omega-3 vegetable oils as a nutritional constituent in the food industry on account of their exceptional anti-inflammatory and other health attributes. Camelina and flax naturally produce omega-3 oils and are seeing increased commercial interest and we believe that Yield10 is well positioned to become the leader in Camelina oil production.

Yield10 is progressing a series of traits targeted at increasing the oil content in Camelina where the oil is the main value driver. 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. Yield10 is building significant capabilities and intellectual property around key oil biosynthesis pathways in plants based on technologies for increasing oil content in seeds. In cases where the edible oil is the primary economic value driver for the crop, increasing oil content is a valuable trait. Improving the oil content and yield of Camelina seed would make this an attractive crop for producing omega-3 nutritional oils. Based on our study of metabolic pathways in oilseed crops, we believe there is an opportunity to apply genome editing to significantly increase oil content in oilseed crops including canola, soybean, sunflower and Camelina. We began the technical work in Camelina in 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 USDA-APHIS's 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 under 7 CFR part 340, clearing the way for field testing in the U.S. The first type is based on the inactivation of an enzyme expected to decrease turnover of oil in mature seeds and reduce free fatty acids in oil, a trait we have designated as C3008a. The other type is based on the inactivation of three enzymes to both enhance the production of oil and decrease turnover of oil in mature seeds and is designated as our triple edit, or C3008a, C3008b and C3009 trait containing line. We completed our first field trial with these edited Camelina lines in the U.S. during the 2019 growing season. Some of the Camelina lines with edits to the three genes produced an increase in oil content in individual seeds as well as an increase in seed oil content as a percentage of seed weight as compared to control plants. The best performing line produced an average 11.8 percent increase in oil per individual seed, an 8.7 percent increase in individual seed weight, and a 4.7 percent increase in seed oil content as a percentage of overall seed weight. No significant change in oil composition was observed. Yield10 is planning additional field tests with the best Camelina line in the 2020 growing season and is scaling up 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, promising targets focused on the central role of Acetyl-CoA Carboxylase ("ACCase") a key metabolic control point for oil production. In 2019, we signed an additional exclusive global license with University of Missouri for another ACCase related gene target we named C3012. We have produced genome edited versions of C3007 in Camelina and canola. We have also filed a petition with USDA-APHIS to confirm that the agency does not consider the Camelina lines to be regulated under 7 CFR part 340, which would clear the way for field testing. Pending confirmation from USDA-APHIS, we plan to test the C3007 Camelina genome edited lines in the field during the 2020 growing season.

#### **PHA Traits: C3014 and C3015**

While we continue the discovery of novel yield traits for licensing to seed companies and focus on deploying our non-regulated traits to improve the performance and value of Camelina to produce nutritional oils in the near-term, we believe there may be significant market opportunity for producing PHA biomaterials in Camelina in the future. PHA biomaterials (PHAs) are natural microbial high molecular weight polymeric storage polymers. These polymers are natural polyesters and can be recovered from the microbes which produce them and processed using standard plastics processing equipment into a range of product forms. PHAs have applications in a wide range of markets including animal nutrition, wastewater treatment and the replacement of petroleum plastics. Commercialization of PHAs based on fermentation technologies continues to receive considerable media and investment interest even although this approach has proven challenging due to the high capital and operating costs. Feedstock and energy costs dominate, the net result being PHA products with limited market adoption. We believe direct production of PHAs in crops can lead to low production costs and open large market opportunities. 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 site in a plant for producing PHA biomaterials. In 2019, Yield10 filed a U.S. Patent application for new technology potentially enabling low-cost production of PHA biomaterials in the seeds of Camelina. The new Yield10 patent application describes a discovery around maintaining the viability and vigor of Camelina seed programed 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% PHB in seeds of Camelina with good seedling viability in growth chambers. We believe crop-based production will enable an advantaged cost structure thereby eliminating a barrier to entry for broad adoption of these materials. The key concept was to introduce PHB as a new component of the seed composition and by processing the PHB producing seed, to produce oil, polymer, and protein rich seed meal. The combination of all three products improves the overall value proposition and we believe that in time this will result in PHA biomaterial costs in line with canola and soybean oils. Yield10 plans to develop and commercialize Camelina seed based PHA biomaterials for water

treatment applications and look for commercial partnering opportunities for plastics replacements markets. We currently have two new PHA biomaterial traits, C3014 and C3015, in our development pipeline and plan to carry out the first field tests in 2020 with these traits, pending regulatory approval. In the planned tests, we will also bulk up C3014 and C3015 Camelina seed for planting in the 2021 growing season so we can begin to scale production and produce crop based PHA samples for testing and demonstration purposes.

### C4000 Series Traits

We used our GRAIN platform to study global transcription factors and identify novel yield traits in the C4000 series. These traits may be powerful regulators of plant growth and represent a potentially valuable resource for identifying genome editing traits for crops. We have recently shown that traits from the C4000 series can significantly increase photosynthetic efficiency, above ground biomass, and below ground biomass production in our switchgrass plants engineered to overexpress the transcription factors. We reported these results for our novel C4001 and C4003 traits in 2018 in the journal *Plant Science*. Switchgrass plants expressing C4001 resulted in a total increase in biomass of 75-100 percent in leaves and stems as compared to controls. Expression of C4003 in switchgrass resulted in a total increase in biomass of 100-160 percent in leaves and stems as compared to control plants. Increasing biomass yield is important for forage crops such as sorghum, silage corn, and alfalfa.

We are progressing the development of certain of our C4000 series of traits in Camelina and corn. Depending on the field performance of the C4000 series Camelina lines, Yield10 plans to integrate them into a commercial Camelina seed business. Recognizing our limited internal capabilities and resources in corn, the Company plans to seek partners interested in progressing these traits in corn under a license agreement like the one in place with Bayer for soybean. 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 also began early development work in late 2018 to assess certain C3000 and C4000 series traits in corn through a third-party agricultural company.

We expect evaluation of C4000 series traits in these target crops will continue to advance in 2020. 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.

### Target Crop: The Oilseed Camelina sativa

As we continued to make progress on the development of our novel yield traits for major crops through research license agreements with major seed companies we have been working to develop Camelina based business opportunities for Yield10. Our vision is to use our proprietary non-regulated gene traits to improve Camelina seed oil content and yield in the near term to produce nutritional oils. In the longer term, we believe optimizing the production of PHA biomaterials in Camelina will enable large acre production as a cash cover crop. Some estimates from USDA indicate a potential of up to 30 million acres in the upper corn belt of the U.S., which would make Camelina the third largest crop in the U.S. Ideally, cash cover crops should improve the sustainability of food production by reducing nutrient pollution of our waterways and provide additional sources of revenue for farmers. A new product like PHA biomaterials may have the potential to create value-added bioproducts markets in water treatment and plastics replacement. Production of PHA biomaterials in cover crops may also provide environmental benefits in that it would reduce fertilizer run-off from farming on the front end, and produce a natural biodegradable product that can be used to reduce nitrate pollution from aquaculture and septic systems on the back end.

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

- There is a growing demand for crops that diversify the crop landscape, have lower environmental footprints and have the potential to produce high value secondary products, opening new opportunities for farmers.
- Camelina oil is rich in an omega-3 fatty acid (ALA) which is creating demand for the oil as a substitute for fish oil in aquaculture.
- Camelina is readily segregated from the major row crops and readily engineered using genetic engineering tools, making it an ideal platform for producing novel products.
- Camelina, as an underdeveloped crop has high technology upside potential to improve agronomics, seed yield and seed value.

Camelina (*Camelina sativa*) is currently in limited cultivation in North America and Europe and was grown extensively in Europe in medieval times for food and fuel. Interest in biofuels resulted in additional investment beginning in the mid-2000s, as a result of which several beneficial Camelina attributes have been shown. Camelina is amenable to production practices used for canola, grows on marginal lands, has enhanced drought and cold tolerance, displays early

maturation and requires fewer inputs than other oilseeds. The fast growth cycle is particularly attractive in areas in the Northwest U.S. and into Canada with shorter growing seasons. It is naturally resistant to diseases that impact canola and it performs well across Canada and parts of the U.S.

Camelina oil, like flax seed oil, is rich in omega-3 fatty acids which are essential in the human diet. There are three main types of omega-3 fatty acids, two of which EPA (Eicosapentaenoic acid) and DHA (docosahexaenoic acid), come mainly from fish. The third ALA (alpha-linolenic acid), the most common omega fatty acid in the Western diet, can come from fish or plant sources including nuts, flaxseed and Camelina. Omega-3 oils have been shown to help prevent heart disease and stroke, may help control lupus, eczema, and rheumatoid arthritis, and may play protective roles in cancer and other conditions. Recent clinical studies have shown that Camelina sativa oil, but not fatty fish, or lean fish improved serum lipid profile in subjects with impaired glucose metabolism in a randomized controlled study published in the journal *Molecular Nutrition and Food Research*, U. Schwab, et. al. (2018). In addition, seafood production is increasingly based on aquaculture, where using ocean harvested fish as feed is not sustainable and cannot meet the growing global demand. Aquaculture feed is now increasingly based on crop-based feed ingredients such as soy protein meal and soybean oil due to the availability and lower cost. However, fish oil, the primary source of the essential omega-3 fatty acids is the most difficult and expensive feed ingredient to replace. The high content of the omega-3 ALA makes it a preferred oil for use in aquaculture feed as compared to soybean oil. This is creating a growing market for Camelina oil.

Harvested Camelina seed is typically cold crushed to produce oil and an oil containing protein meal. In the United States an application for GRAS ("Generally Regarded as Safe" under FDA guidelines) status for Camelina oil was filed with FDA in and received a favorable response letter from the FDA in 2018. The Canadian Food Inspection Agency (CFIA) has approved the use of mechanically extracted Camelina as a feed ingredient for farmed salmon and trout, a policy change likely to benefit the aquaculture industry in Canada, where there is high demand for omega-3 oils. Camelina protein meal left over following oil extraction by cold crushing has also been approved for use in animal feed applications in the U.S. and Canada. The residual oil in the meal provides additional value as animal feed.

When Yield10 was launched, we started working on Camelina as the basis for our "Fast Field Testing" system. Prior to becoming Yield10, our oilseeds team had worked with Camelina for several years to develop it as a production platform for PHA biomaterials. We currently use Camelina to develop the initial field performance data for our gene trait targets identified using our GRAIN gene discovery tool because it is possible to go from trait gene concept to engineered stable seed suitable for field work. Camelina has a small seed size and is readily segregated from commodity crops including canola, soybean and corn and for these reasons we consider it highly unlikely that engineered Camelina seed will contaminate commodity crops slated for export markets.

These commodities are exported to geographies with strict regulations regarding the use and import of farm products which have been genetically engineered. The importance of avoiding contamination of commodity crops with new GMO varieties has resulted in companies delaying commercial release until any new trait is globally deregulated. This has resulted in a large increase in both the costs and the timelines to commercialize new GMO varieties of commodity crops. The approval processes in the U.S. and Canada, although different in each country, are more straightforward to navigate. The use of new tools such as genome editing is also receiving favorable treatment in the U.S. and some traits developed using this approach can be defined as non-regulated under USDA-APHIS rules. Yield10 has developed non-regulated Camelina lines with both single and three gene edits, taken them through the USDA-APHIS process and has executed field trials with them. Camelina has also been engineered by Yield10 to produce PHA biomaterials and by third parties to produce modified oils including fish oil replacements. We expect these crops will be considered regulated under the USDA-APHIS rules but also recognize the potential upside from the ongoing process to modernize these rules, taking into consideration the track record of safety and learning from the last 25 years.

Camelina is a relatively underdeveloped crop with no barriers to entry for companies like Yield10 to develop a Camelina based seed and products business. Due to the limited market opportunities for Camelina seed mainly focused on biofuels, this crop has not been subjected to intensive breeding efforts or the use of input traits like herbicide tolerance and disease resistance. We believe the growing interest in omega-3 oils will change this and because Yield10 has been using Camelina as a trait development tool we have in hand several proof points of the upside potential using our proprietary yield and oil content traits. We have demonstrated the potential to more than double Camelina seed yield with our complex C3006 trait. Our single gene C3003 and C3004 yield traits have also been shown to increase Camelina seed yield and because C3004 is a Camelina gene it has the potential to be re-engineered in Camelina to develop non-regulated Camelina lines with higher seed yield. In addition to the seed yield traits, we have progressed genome edited oil content traits which are showing promise for increased seed oil content, the primary economic value driver for Camelina seed.

## 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.

In considering our strategy to develop our technologies we segregate our trait genes into two classes: trait genes based on using non-plant genes to add new functionality to crops which are by definition genetically modified, or GM, due to the insertion of foreign recombinant DNA; and trait genes that we may be able to deploy in lines that are not considered regulated by USDA-APHIS, which encompass our trait genes that are based exclusively on plant genes. We see the opportunity to deploy our trait technology in a broader set of food and feed crops, many of which are not currently GM. We plan to pursue our GM trait genes in crops which are currently GM and where the economics can sustain the cost and timelines for deregulation. We are aware of the current USDA-APHIS GM crop regulation review and the reality that GM likely will remain an issue for some NGO groups regardless of the science. For our GM yield trait genes, we are targeting seed yield increases on the order of 10 to 20 percent over the current elite seed lines, increases which reflect the order of magnitude step-changes necessary to address global food security.

The crops we are targeting for development are described below.

**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 are grown and were introduced to the market in the 1990s. Approximately 24.7 million acres were planted in Canada and the U.S. in 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. With a 2017 harvest of 939 million bushels of canola (Statistics Canada) and assuming an average farm gate price of \$10.00 per bushel, a 20 percent yield increase in canola represents a total potential added annual value of \$1.9 billion that could be shared among the companies in the canola value chain.

**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 will be 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. Yield10 is targeting a 20 percent or greater increase in soybean seed yield. Assuming a 2018/2019 U.S. harvest of 4.5 billion bushels (USDA) and an average farm gate price of \$10.00 per bushel, a 20 percent yield increase in soybean represents a total potential added annual value of \$8.8 billion that could be shared among the companies in the soybean value chain.

**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. GM maize was grown for the first time in the U.S. and Canada in 1997. Currently, about 80 percent of maize/corn production in the U.S. is genetically modified. It was estimated that more than 83 million acres of corn were planted in North America in 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). Europe has limited production of GM corn, where Spain is a leading producer. In this case, the most widely used GM trait (Bt) protects against the corn borer insect. Special protocols must be followed in Europe to avoid mixing of GM corn with conventional corn. Corn has the more efficient C4 photosynthesis system and Yield10 is targeting a 10 percent yield increase in corn. With a projected 2018/2019 U.S. harvest of 14.4 billion bushels and an average per bushel price of \$3.50, a 10 percent yield increase in corn represents a total potential added annual value of \$5.1 billion that could be shared among the companies in the corn value chain.

**Potato** is the most important non-cereal staple food crop for humans after wheat and rice. In the United States the potato harvest acreage is around 1 million acres, the harvest value however is around \$6 billion, and the frozen French fry



sector has a value of around \$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 potato.

**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.

## **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. In 2016, 92 percent of the corn, 93 percent of the cotton and 94 percent of the 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 crops are subject to a significant amount of regulation in the U.S. and around the world. 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 as human food or animal feed must meet certain safety standards, but government regulations, regulatory systems and the politics 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”) and biotechnology-derived or genetically engineered plants that are 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 may be implicated, depending on the specific product and its potential applications or intended uses. EPA’s principal oversight role is for biotechnology-derived products that are intended for use as pesticides or herbicides, under the authorities granted to the agency under the Federal Insecticide, Fungicide, and Rodenticide Act and the Toxic Substances Control Act. Our business strategy for major grain crops is to develop yield and performance traits for licensing to the major seed companies. We have no current plans for the development of pesticide or herbicide GE traits that would be subject to the procedures and requirements of the EPA under these statutes.

Our seed traits and any future products that are successfully developed containing our seed traits, however, are or will be subject to USDA and FDA 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 for use in water treatment may potentially have EPA regulatory requirements, and the regulations relating to manufacturing and consumer protection will need to be addressed.

Within USDA, APHIS is responsible for protecting agricultural plants from pests, diseases and noxious weeds. Under the Plant Protection Act (“PPA”), USDA-APHIS has regulatory oversight over products of modern biotechnology that could pose such a risk to domestic agriculture and native plants. Accordingly, 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. These GE plants are called “regulated articles” in the relevant USDA-APHIS regulations, which are codified at 7 CFR part 340. The PPA and the implementing regulations in 7 CFR part 340 empower USDA-APHIS to regulate the import, handling, interstate movement and release into the environment of

regulated articles, including certain GE organisms undergoing confined experimental use or field trials. Regulated articles are reviewed to ensure that, under the proposed conditions of use, they do not present a plant pest risk by ensuring appropriate handling, confinement and disposal.

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.

If, however, USDA-APHIS determines that a GE plant is unlikely to present a greater plant pest risk than its unmodified counterpart, the newly developed crop will no longer be subject to the permitting and other regulatory processes that are overseen by the agency (*i.e.*, it will no longer be treated as a potential plant pest). Such a determination by the USDA-APHIS is called "not regulated" under the 7 CFR part 340 regulatory framework. The regulations establish detailed procedures for how a developer of a new GE plant may petition USDA-APHIS to determine if modified plant lines are not regulated under the 7 CFR part 340 framework, which is an official agency finding that the particular article is unlikely to pose a plant pest risk and therefore no longer needs to be regulated under 7 CFR part 340 and the PPA.

USDA-APHIS conducts a comprehensive science-based review of the petition to assess, among other things, plant pest risk, environmental considerations pursuant to the National Environmental Policy Act, and any potential impacts on endangered species. The duration of the petition process varies based on a number of factors, including the agency's familiarity with similar GE products, the type and scope of the environmental review conducted, and the number and types of public comments received. If, upon the completion of the review, USDA-APHIS approves the petition and the product is no longer deemed a "regulated article," the developer may commercialize the product, subject to any conditions set forth in the USDA-APHIS written decision issued in response to the petition for determination of non-regulated status.

As previously described, our seed traits developed using Traditional Genome Modification are regulated under 7 CFR part 340 and are subject to USDA-APHIS permitting requirements. In recent years, however, we and others have submitted various petitions to USDA-APHIS to determine whether particular GE plants developed through the use of different genome editing techniques meet the not regulated status under the 7 CFR part 340 framework administered by the agency. In general, lines developed using genome editing approaches have been deemed not to be regulated by USDA-APHIS under 7 CFR part 340. The USDA also announced in March 2018 that it would not require an assessment on products that use modern forms of mutagenesis if it is 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.

Historically, changes to the U.S. regulatory paradigm for agricultural biotechnology have been infrequent, are typically preceded by notice, and are most often subject to public comment, but there can be no guarantee that the USDA-APHIS governing regulations and policies will not change.

We have submitted two petitions under 7 CFR part 340 for a determination of the regulatory status (also known as the "Am I Regulated?" letter) to USDA-APHIS's Biotechnology Regulatory Services in order to confirm that the following two traits designed to increase oil content are not going to be regulated by the agency: (i) the single trait C3008 Camelina plant line, developed using CRISPR genome editing technology for increased oil content; and (ii) the triple-edited Camelina line that combines three gene traits, C3008a, C3008b and C3009, to increase oil production. In both cases, 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.

To our knowledge, our triple-edited Camelina line 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. Given our business strategy to develop certain multi-trait genome edited plant lines, this achievement should facilitate our ability to put more of our novel yield traits through the petitioning process and the agency's scientifically driven decision-making process, with the expected end result of having lines containing more of our traits treated as not to be regulated under 7 CFR part 340 (as compared to our seed traits developed using Traditional Genome Modification, which are regulated articles). We expect to continue to make appropriate use of the "Am I Regulated" letter procedures to clarify the regulatory status of our new GE seed traits as they are developed.



Also, we tested the C3008 single-trait Camelina line in a 2018 field evaluation that took place in the United States following a notification in 2017 that the line would not be regulated under 7 CFR part 340.

Separate from the plant breeding and planting issues and USDA-APHIS regulation 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 as (i) 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 or 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 will evaluate 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 2018, we conducted field studies of C3003 in canola, Camelina and soybean at field sites in Canada.

Finally, as one of Canada's major field crops, canola in particular 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 would 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.

### ***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, 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 than those subjected to Traditional Genome Modification, while a recent EU 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. It is possible that emerging oversight regimes for GE products in other jurisdictions could follow the EU approach and impose similar strict requirements for the release of such products into the environment and their incorporation into human food or other consumer products.

Regulation of biotechnology-derived products in the EU is primarily based on Directive 2001/18/EC (the “2001 EC Directive”). The 2001 EC Directive defines “genetically modified organisms” (“GMOs”) broadly as “organism[s], with the exception of human beings, in which the genetic material has been altered in a way that does not occur naturally by mating and/or natural recombination.” In July 2018, the Court of Justice of the European Union (CJEU) issued an important ruling clarifying that the 2001 EC Directive and its pre-market authorization and associated risk assessment requirements required for such “GMOs” should also apply in full to organisms developed using more modern “directed” mutagenesis techniques.

The July 2018 CJEU decision is being interpreted to cover all modern genome editing tools such as CRISPR-Cas9, TALEN and oligonucleotide-directed mutagenesis. This recent clarification by the CJEU regarding the scope of EU regulations suggests that novel seed trait developers who are seeking to bring genome edited seed traits to commercial markets in the EU will face hurdles comparable to what has historically been required in Europe for introducing and commercializing Traditional Genome Modification traits.

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. 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 GE plants similar to that of the EU.

### **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 under 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.

## **Agricultural Industry Landscape**

Following advances in biotechnology in the 1970s through early 1990s, the first genetically modified ("GM") crops were commercially introduced in the U.S. in the years 1994 and 1995. Today, the U.S. leads the world in the adoption of GM crops in terms of crop value and acreage planted. GM crops have had both their supporters and their detractors over the years. Consumer sentiment including concerns 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 in 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 in 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 \$17.2 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, 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 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. These companies 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.

## **Intellectual Property**

Our continued success depends in large part on our proprietary technology. As of December 31, 2019, we owned or held exclusive rights to 22 patents and pending patent applications worldwide related to advanced technologies for increasing yield in crops. Our portfolio of patent applications includes plant science technologies we have in-licensed globally and exclusively from the University of Massachusetts and North Carolina State University 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 Company's business strategy, industry position or deployment options.

## **Employees**

As of December 31, 2019, we had 25 full-time employees. Of those employees, 21 were in research and development. Among our staff, 11 hold Ph.D.'s and 12 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 are 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. We consider our relationship with our employees to be good.

## **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](http://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

*Our business is subject to numerous risks. 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 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, 2019, our accumulated deficit was \$364.9 million. 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 the Yield10 Bioscience 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 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, 2019, we held unrestricted cash, cash equivalents and short-term investments of \$11.1 million. In March 2019, we closed on a registered direct offering of our common stock, raising \$2.6 million, net of offering costs, and in November 2019, we closed on a public offering and a concurrent private placement of our securities, raising \$10.2 million, net of offering costs. Through March 20, 2020, we received an additional \$1.6 million from investor exercises of 204,796 outstanding warrants. We follow 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 the Company's ability to continue as a going concern for one year after the date its financial statements are issued. We have concluded, that the Company has sufficient cash and short-term investments to fund its operations into the second quarter of 2021.

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 and we may pursue one or more of a variety of financing options, including public or private equity financing, secured or unsecured debt financing, equity or debt bridge financing, as well as licensing or other collaborative arrangements. There can be no assurance that our financing efforts will be successful. If we are not able to secure such additional capital resources or otherwise fund our operations, we will be forced to 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 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 (the "Code"), 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.

***We have changed our corporate strategy to focus on the crop science industry, and our technologies in this area are at a very early stage of development. We may never commercialize a technology or product that will generate meaningful, or any, revenues.***

In July 2016, our Board of Directors approved a plan to implement a strategic restructuring under which Yield10 Bioscience has become our core business. As part of the restructuring, we discontinued our biopolymer operations, eliminated positions in our biopolymer operations and corporate organization, and sold certain of our biopolymer business assets.

The crop science products and technologies we are currently developing as a result of our strategic repositioning are at a very early stage of development, and the process of developing them is lengthy and uncertain. 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.

On June 25, 2019, we received a deficiency letter from Nasdaq which provided us a grace period of 180 calendar days, or until December 23, 2019, to regain compliance with the minimum bid price requirement. We subsequently received an additional 180 days (until June 22, 2020) to regain compliance with the requirement. On January 9, 2020, our stockholders approved an amendment to our Amended and Restated Certificate of Incorporation, as amended, authorizing a reverse stock split of our common stock. A 1-for-40 ratio for the reverse stock split was subsequently approved by our Board of Directors, and the reverse stock split took effect on January 15, 2020. As a result of the reverse stock split, every forty shares of our common stock were automatically combined and converted into one issued and outstanding share of our common stock, with no change in the par value per share. As of January 30, 2020, we had regained compliance with the minimum bid price requirement.

***Currently, our primary source of our revenue is government grants; continued availability of government grant funding is uncertain and contingent on 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. Any of our existing grants or new grants that we may obtain in the future may be terminated or modified.

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 and results of operations could be adversely affected by public health epidemics, including the recent and ongoing coronavirus outbreak.***

A novel strain of coronavirus was reported to have originated in Wuhan, Hubei Province, China in December 2019, and has been rapidly spreading across the globe, including in the United States and Canada. Any outbreak of contagious disease such as the coronavirus or other adverse public health developments could have a material and adverse effect on our business operations. Such adverse effects 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 closures of our facilities or the facilities of our collaborators for an indefinite period of time (including shutdowns that may be requested or mandated by governmental authorities). Any temporary closures of facilities would likely affect our development efforts and operating results, and any disruption to the operations of our collaborators would likely impact our development efforts and operating results. The extent to which the coronavirus may impact our results will depend on future developments, which are highly uncertain and cannot be predicted, and on new information that may emerge concerning the severity of the coronavirus. However, 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.

#### **Risks Relating to our Yield10 Bioscience Crop Science Program**

***The crop science product development cycle is lengthy and uncertain, and our progress will depend heavily on our ability to attract third-party investment in research under license agreements and on our ability to establish future 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 will be required to successfully develop and commercialize our innovations. Our initial development strategy is to make it attractive for established agricultural industry companies to invest financial and technical resources to introduce our traits into their elite germplasm for event selection and evaluation under research licenses. For example, in 2017 we entered into a non-exclusive research license with Monsanto, which was subsequently acquired by Bayer AG ("Bayer"), pursuant to which we granted Monsanto a non-exclusive research license to evaluate our novel C3003 and C3004 yield traits in soybean. We expanded the agreement with Bayer in 2019 to cover a new discovery and intellectual property related to C3004. In 2018, we granted a non-exclusive research license to Forage Genetics, a subsidiary of Land O'Lakes, Inc., to evaluate five of our novel yield traits in forage sorghum. The traits included in the research license include C3003 as well as four traits from our GRAIN platform, C4001, C4002, C4003 and C4029. In 2019, we granted a non-exclusive research license to J.R. Simplot Company to evaluate C3003, C3004 and C4001 in potato. 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 will 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 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 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 neither survive the development process nor ultimately receive any 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 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.

Many factors that may adversely affect the success of our field trials 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.

***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 reduces 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. These genetically engineered plants are called “regulated articles” in the relevant USDA-APHIS regulations, which control the import, handling, interstate movement and release into the environment of regulated articles, including certain genetically engineered organisms undergoing confined experimental use or field trials. Seed traits developed using the insertion of recombinant DNA, such as our C3003 yield trait that leverages the biological functions of an algal gene, are regulated articles and are therefore 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 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. In general, genome editing approaches to novel plant trait development have been considered not regulated by USDA-APHIS. In particular, we have submitted two petitions (also known as the “Am I Regulated?” letter) to USDA-APHIS’s Biotechnology Regulatory Services in order to confirm that the following two oil content traits are not going to be regulated by the agency under 7 CFR part 340: (i) the single trait C3008 Camelina plant line, developed using CRISPR genome editing technology for increased oil content; and (ii) the triple-edited Camelina line that combines three gene traits, C3008a, C3008b and C3009, to increase oil production. In both cases, USDA-APHIS approved our petitions and confirmed in writing that each of these novel plant lines would not be treated as a regulated article.

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. 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”).



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 genetically engineered and conventional versions. When such a determination cannot be made, the novel plant variety may become subject to FDA premarket review and approval as a food additive.

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. Subsequently, in October 2018, FDA leadership issued a document entitled the "Plant and Animal Biotechnology Innovation Action Plan" ("Action Plan") that identified three key priorities for the agency in this area and stated that the FDA has reviewed the comments and other information it received in response to the January 2017 request for comments. The FDA also stated that it intended to develop guidance for industry explaining how the FDA's existing regulatory policy for foods derived from new plant varieties applies to foods produced using genome editing. Although the expected draft guidance has not yet been released for public comment, on March 4, 2020 FDA, USDA, and EPA launched a new initiative to help consumers better understand foods created through genetic engineering, called "Feed Your Mind," which aims to answer the most common questions that consumers have about such crops. The FDA also stated in the 2018 Action Plan that it intended 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. Subsequently, in February 2019, FDA completed its first consultation on a genome edited plant variety (a soybean variety modified to have increased levels of oleic acid).

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. First, the Canadian Food Inspection Agency ("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 CFIA's 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. Second, 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. Health Canada will evaluate 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. 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.

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 genetically engineered 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 between our facilities in the U.S. and Canada, including USDA-APHIS permits for the import and export of plant materials that could pose a risk to domestic

agriculture. We also have been conducting field studies of various yield traits in Canada since 2016 under PNT permits issued by Canadian regulators.

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 and in the consumption and labeling of 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 yield trait genes.***

The potential for unintended but unavoidable trace amounts, sometimes called "adventitious presence," of yield trait genes 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 or our future collaborators' 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 relate to our historical business as well as two patents on our C3003 gene in-licensed from the University of Massachusetts and our C4001 U.S. patent, both of which were issued in 2019 and have expiration dates ranging from 2020 through 2035, plus any patent extensions which may be granted in the U.S. for regulatory approval delays. New outstanding patent applications owned by or licensed to us relating to crop yield improvements have filing dates ranging from 2013 through 2019, including the recently filed new patent application on a breakthrough technology for producing PHA biomaterials in crops. This patent 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, and no products using this technology have reached the market. In 2018, we entered into a non-exclusive research license agreement jointly with the Broad Institute of MIT and Harvard and Pioneer, part of Corteva Agriscience™, Agriculture Division of DowDuPont Inc., for the use of CRISPR-Cas9 genome-editing technology for crops in order to demonstrate the utility of our yield trait genes in this field. The joint license covers intellectual property consisting of approximately 48 patents and patent applications on CRISPR-Cas9 technology controlled by the Broad Institute and Corteva Agriscience. Under the agreement, we have the option to renew the license on an annual basis and the right, subject to specified conditions, to

convert the research license to a commercial license in the future, although there can be no assurance that we will be able to secure such commercial license on acceptable terms. CRISPR technology is uniquely suited to agricultural applications as it enables precise changes to plant DNA without the use of foreign DNA to incorporate new traits. Plants developed using CRISPR genome-editing technology have the potential to be considered not regulated by USDA-APHIS under 7 CFR part 340 for development and commercialization in the U.S., which could result in shorter developmental timelines and lower costs associated with commercialization of new traits in the U.S. as compared to regulated crops. 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 the 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 your rights as a stockholder. 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 extremely 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.

***Our recently implemented reverse stock split could adversely affect the market liquidity of our common stock.***

On January 9, 2020, our stockholders approved an amendment to our Amended and Restated Certificate of Incorporation, as amended, and authorized our Board of Directors, if in their judgment they deemed it necessary, to effect a reverse stock split of our common stock at a ratio in the range of 20:1 to 50:1. This reverse stock split became effective on January 15, 2020, with a ratio of 40:1. We cannot predict whether the reverse stock split will increase the market price for our common stock on a sustained basis. The history of similar stock split combinations for companies in like circumstances is varied, and we cannot predict whether:

- the reverse stock split will result in a sustained per share price that will attract brokers and investors who do not trade in lower priced stocks;



- the reverse stock split will result in a per share price that will increase our ability to attract and retain employees and other service providers; or
- the market price per share will remain at a level in excess of the \$1.00 minimum bid price as required by Nasdaq, or that we will otherwise continue to meet the requirements of Nasdaq for continued inclusion for trading on The Nasdaq Capital Market.

***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 18, 2020, our officers, directors and stockholders who hold at least 5% of our stock beneficially own a combined total of approximately 46.7 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 18, 2020. 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 18, 2020, Jack W. Schuler (and his related entities) beneficially owned approximately 45.9 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 previously leased approximately 30,000 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. In November 2019, we entered into a modification of the Woburn lease in which we permanently returned 7,409 square feet of underutilized space to the landlord for the seven-year duration of the lease. In exchange for returning the space, the landlord agreed to fund modifications and upgrades to the remaining office space. The Company will have no further financial obligations for the vacated space and lease rental charges, including utility, maintenance and real estate tax charges, have been proportionally reduced. The security deposit was also proportionally reduced to \$229,000. All other significant terms of the lease remained unchanged.

The Company has a sublease agreement with a subsidiary of CJ CheilJedang Corporation ("CJ") for CJ's sublease of 9,874 square feet of the Company's Woburn facility. The subleased space was determined to be in excess of our needs as a result of its strategic shift and the related restructuring of its operations initiated 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 \$103,000 in the form of an irrevocable letter of credit. The CJ sublease is unaffected by our recent lease modification.

We also lease approximately 13,700 square feet of office and laboratory space at 650 Suffolk Street, Lowell, Massachusetts. Our lease for this facility expires in May 2020 and we do not anticipate incurring significant charges in returning this space to the landlord. Our wholly-owned subsidiary, Metabolix Oilseeds, Inc. ("MOI"), located in Saskatoon, Saskatchewan, Canada, leases approximately 7,000 square feet of office, laboratory and greenhouse space. MOI's leases for these facilities expire at various times through September 30, 2020.

**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 18, 2020, there were 1,923,184 shares of our common stock outstanding held by 37 stockholders of record.

#### Equity Compensation Plan Information

Please see Part III, Item 12, for information regarding securities authorized for issuance under our equity compensation plans.

#### Unregistered Sales of Securities

On January 7, 2020, we issued 3,715 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, 2019, there were no repurchases made by us or on our behalf, or by any "affiliated purchasers," of shares of our common stock.

### ITEM 6. SELECTED CONSOLIDATED FINANCIAL DATA

Not applicable.

### 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 retroactively to reflect this reverse stock split.*

#### Overview

Yield10 is an agricultural bioscience company headquartered in Woburn, Massachusetts with an oilseed development Center of Excellence in Saskatoon, Saskatchewan, Canada. Yield10 uses its "Trait Factory" to develop high value seed traits for the agriculture and food industries. Specifically, Yield10 is developing superior gene traits for the major grain crops including corn, soybean, canola, wheat and rice. We believe that successful gene traits may enable step-change increases in crop yield in certain crops, which we consider to be an increase of at least 10-20 percent. While maintaining its focus on the development of novel yield traits for key grain crops based on a licensing model, the Company has recently begun to execute the second part of its strategy which is to develop independent business opportunities in the specialty oils and niche crop space using the oilseed Camelina. The target of this effort is sustainable business solutions to support agriculture, global food production and other specialty applications. Yield10 brings a unique history and skill set captured in its GRAIN platform for developing advanced crop traits and increasing the concentration of specific biochemicals of commercial interest in crops. Our plan is to use GRAIN to develop a source of revenue from funded research and development collaborations. We also plan to develop a source of revenue from funded research and development collaborations. We are currently engaged in a range of discussions with third parties with respect to different crops, traits and products in the feed, food and pharmaceutical sectors.

## Government Grants

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 projected five-year grant will be awarded on an annual basis with the first year commencing September 15, 2017. Although funding for the first three years under this sub-award has been appropriated through September 2020 for \$1,698, we anticipate that each of the remaining two years will be awarded annually to Yield10 through September 14, 2022 for total sub-award funding of \$2,957, provided the U.S. Congress continues to appropriate funds for the program, we are able to make progress towards meeting grant objectives and we remain in compliance with other terms and conditions of the sub-award.

As of December 31, 2019, proceeds of \$473 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.

Program Title	Funding Agency	Total Government Funds	Total revenue recognized through December 31, 2019	Remaining amount to be recognized as of December 31, 2019	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	\$ 1,698	\$ 1,225	\$ 473	September 15, 2020

## Critical Accounting Estimates and Judgments

Our consolidated financial statements are prepared in accordance with accounting principles generally accepted in the United States of America. The preparation of these consolidated financial statements requires us to make estimates and assumptions that affect the reported amounts of assets, liabilities, revenue, costs and expenses, and related disclosures. We evaluate our estimates and assumptions on an ongoing basis. Our actual results may differ from these estimates.

We believe that our significant accounting policies, which are described in Note 2 to our consolidated financial statements, involve a degree of judgment and complexity. Accordingly, 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.

## Grant Revenue

Government research grants currently represent our sole source of revenue. We recognize government grants as revenue because the grants are central to the Company's ongoing crop science program. Revenue is earned as research expenses related to the grants are incurred and 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, 2019 and December 31, 2018. Funds received from government grants in advance of work being performed are recorded as deferred revenue until earned.

## Performance-Based Compensation Accrual

Our employee compensation program includes a potential for bonus payments based on company and individual performance against annual goals that are established early in the fiscal year by management and the Company's Board of Directors. Bonus payments are generally paid at the end of February following the most recently completed fiscal year. The Compensation Committee is responsible for reviewing annual performance against goals and approving bonus payments for the Company's executive officers. Annual cash bonuses are accrued evenly throughout the fiscal year unless management and/or the Compensation Committee determine that bonus compensation payments are unlikely to be paid at the existing rate. In that event, we make a cumulative year-to-date adjustment to our bonus accrual and adjust quarterly accruals for the remainder of the year in order to achieve a bonus compensation accrual at year-end that matches expected bonus payments. Our quarterly performance-based compensation expense and accrual balances may vary significantly during the year as performance judgments change and we revise our estimates.

## 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.

Determining the appropriate fair value model and calculating the fair value of stock-based payment awards requires the use of highly subjective assumptions, including the expected life of the stock-based payment awards and stock price volatility. We use the Black-Scholes option-pricing model to value our service-based option grants and to determine the related compensation expense. Generally, we recognize the fair value of stock awards evenly over their vesting periods provided the individual receiving the award meets continuing service conditions. The assumptions used in calculating the fair value of stock-based awards represent management's best estimates, but the estimates involve inherent uncertainties and the application of management judgment. See Note 10 to the consolidated financial statements for further discussion on the key assumptions used to determine the fair values of option grants pursuant to the Black-Scholes option pricing model.

## Income Taxes

Due to the Company's history of annual income tax losses, it has never incurred significant income tax expenses. The Company has, however, recorded significant deferred income tax assets for net operating loss carry forwards and research tax credits that are available to offset future income taxes. Deferred income taxes are measured by applying currently enacted tax rates to the differences between financial statement and income tax reporting. We routinely assess the realizability of the Company's deferred tax assets and have historically concluded that it is unlikely that these deferred tax assets will be realized under accounting standards and therefore we have maintained a full valuation allowance. MOI is our wholly-owned research and development subsidiary located in Canada. MOI performs research services for us under a research services agreement subject to intercompany transfer pricing regulations that annually results in MOI reporting taxable income in Canada. MOI files separate federal and provincial income tax returns in Canada and has accumulated research credits that may be used to offset future taxable income. For the year ended December 31, 2019, we have concluded, based on our assumption of MOI's continued profitability derived from intercompany transfer pricing, that the subsidiary will more likely than not continue to show taxable income in future tax years. We have concluded, as a result, that a full valuation allowance against MOI's deferred tax asset related to the research credits is no longer appropriate.

## Securities Offerings

On November 19, 2019, we closed on two securities offerings that included a public offering and a private placement. The public portion of the offerings included sale of common stock, Series A Convertible Preferred Stock and warrants to purchase common stock. The private placement included the sale of Series B Convertible Preferred Stock and warrants to purchase common stock. See Note 9 to the consolidated financial statements for further discussion on the November 2019 Concurrent Securities Offerings. We primarily followed the guidance of ASC 480, *Distinguishing Liabilities from Equity*, and ASC 815, *Derivatives and Hedging*, in reaching conclusions that the Series A Convertible Preferred Stock, the Series B Convertible Preferred Stock and the warrants issued in the offering should be recorded in permanent equity, temporary equity and liabilities, respectively, in our consolidated balance sheet as of December 31, 2019. We also applied applicable accounting guidance in order to calculate the fair value of the warrants sold in the offerings and determined that the Black-Scholes fair value of the liability classified warrants exceeded the proceeds received in the offering. This resulted in a charge of \$13,018 to other income (expense) on the date of issuance. At December 31, 2019, we completed a mark-to-market revaluation of the warrants and recorded a gain of \$9,541 within other income (expense) for the year ended December 31, 2019.

## Comparison of the Years Ended December 31, 2019 and 2018

### Revenue

	Year ended December 31,		Change
	2019	2018	
Grant revenue	\$ 806	\$ 556	\$ 250

Total revenue was \$806 and \$556 for the years ended December 31, 2019 and 2018, respectively, and was derived solely from our research grants. Grant revenue for the year ended December 31, 2019 was earned from the Company's DOE

sub-award with Michigan State University. During the year ended December 31, 2018, \$419 in grant revenue was earned from the MSU sub-award and \$137 was earned from the Company's completed DOE Camelina grant.

We anticipate that MSU grant revenue will decrease approximately 20 percent over the next twelve months based on annual budget appropriations awarded under the grant. Our forecast related to grant revenue is subject to change should we apply for, and receive, new grants during 2020.

## Expenses

	Year ended December 31,		Change
	2019	2018	
Research and development expenses	\$ 4,848	\$ 4,783	\$ 65
General and administrative expenses	4,554	5,092	(538)
Total expenses	\$ 9,402	\$ 9,875	\$ (473)

## Research and Development Expenses

Research and development expenses of \$4,848 and \$4,783 for the years ended December 31, 2019 and 2018, respectively, remained consistent with a negligible increase of \$65 between the two years. During the year ended December 31, 2019, however, employee compensation and benefits increased by \$233, primarily as a result of increased employee payroll of \$255 from the addition of headcount and our recording of \$157 in bonus expense. We did not record bonuses during the year ended December 31, 2018. These increases in employee payroll and bonus expense were partially offset by a \$196 reduction in stock compensation expense. Facility related expenses decreased by \$260 from \$1,009 during the year ended December 31, 2018 to \$749 during the year ended December 31, 2019. The decrease is primarily due to a \$263 reduction in lease expense as a result of modifying our Woburn facility lease in November 2019 to return 7,409 square feet to the landlord for the remaining seven-year term of the lease.

Based on our current financial forecasts, we expect research and development expenses will increase during 2020 as we add research personnel to support our strategic objectives. Our forecasts related to research and development expenses are subject to significant change as events and opportunities occur during 2020 that could result in modifications to our business plans.

## General and Administrative Expenses

General and administrative expenses were \$4,554 and \$5,092 for the fiscal years ended December 31, 2019 and December 31, 2018, respectively. The decrease of \$538, or 11%, was primarily due to reductions in employee compensation and facility related expenses. Employee compensation and benefits decreased by \$142 from \$1,968 during the year ended December 31, 2018 to \$1,826 during the year ended December 31, 2019 and is explained by a \$329 reduction in stock compensation expense, partially offset by our recording of \$183 in 2019 bonus expenses. We did not record bonus expense during the year ended December 31, 2018. Facility related expenses decreased by \$335 from \$1,192 during the year ended December 31, 2018 to \$857 during the year ended December 31, 2019. During 2018, we recorded a one-time lease impairment charge of \$255 for our Lowell, Massachusetts facility. During 2019, our lease expense for the Woburn facility decreased by \$127, primarily as a result of the lease modification previously discussed.

We expect our general and administrative expenses during 2020 will remain at a level consistent with 2019. Our forecasts related to general and administrative expenses are subject to significant change as events and opportunities occur during 2020 that could result in modifications to our business plans.



## Other Income (Expense), net

	Year ended December 31,		Change
	2019	2018	
Loss on issuance of securities	\$ (13,018)	\$ —	\$ (13,018)
Offering costs	(1,254)	—	(1,254)
Change in fair value of warrants	9,541	—	9,541
Interest income	96	158	(62)
Other income (expense), net	21	(24)	45
Total other income (expense), net	<u>\$ (4,614)</u>	<u>\$ 134</u>	<u>\$ (4,748)</u>

### *Loss on Issuance of Securities*

On November 19, 2019, we closed on concurrent securities offerings that included both a public offering and private placement. The securities issued in the offerings included a total of 2,875,000 warrants that received liability classification and were determined to have a Black-Scholes fair value of \$24,518 on the date of issuance. The gross proceeds of the public and private offerings were first allocated to the warrants. In accordance with applicable accounting guidance, the warrants were recorded at their full fair value and the difference between the fair value and the proceeds of \$13,018 was recorded to other income (expense). See Note 9 - Capital Stock and Warrants, in our audited financial statements for the year ended December 31, 2019.

### *Offering Costs*

As discussed above, the proceeds of the combined November 2019 offerings were allocated solely to the liability classified warrants. All of the offering costs of \$1,254 were therefore assigned to the warrants and expensed immediately to other income (expense) in according with accounting guidance related to debt issuance costs.

### *Change in Fair Value of Warrants*

The fair value of the liability classified warrants issued in the November 2019 offerings are subject to mark-to-market adjustment on each balance sheet date. We remeasured the fair value of the warrant liabilities at December 31, 2019 and recognized a gain of \$9,541 within other income (expense). The significant reduction in Black-Scholes valuation was primarily the result of the closing market price of the Company's stock declining from \$10.82 on November 14, 2019 to \$6.86 on December 31, 2019.

### *Interest Income*

Interest income for the years ended December 31, 2019 and December 31, 2018 was derived from investment income earned from the Company's cash equivalents and short-term investments.

## Liquidity and Capital Resources

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.

Since our inception, we have incurred significant expenses related to our research, development and commercialization efforts. With the exception of 2012, when we recognized \$38,885 of deferred revenue from a terminated joint venture, we have recorded annual losses since the Company's initial founding, including our fiscal year ended December 31, 2019. As of December 31, 2019, we had an accumulated deficit of \$364,894. Our total unrestricted cash, cash equivalents and short-term investments as of December 31, 2019, totaled \$11,117 as compared to \$5,769 at December 31, 2018. As of December 31, 2019, we had no outstanding debt.

Our cash, cash equivalents and short-term investments at December 31, 2019, were held for working capital purposes. As of December 31, 2019, we had restricted cash of \$332, which consisted of \$307 held in connection with the lease agreement for our Woburn, Massachusetts facility and \$25 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 limits, concentration limits, and liquidity requirements. As of December 31, 2019, we were in compliance with this policy.

We currently anticipate \$9,000 - \$9,500 of cash usage during 2020 to fund our operations and to make capital purchases to support our research. In November 2019, we closed on two concurrent securities offerings that included a public offering and a private placement, raising \$10,246, net of issuance costs of \$1,254. In March 2019, we closed on a registered direct offering of our common stock raising \$2.6 million, net of offering costs. In addition, from January 1, 2020 through March 18, 2020, we have received approximately \$1.6 million in proceeds from investor exercises of warrants. We estimate that our current cash resources, including funds received from the completed warrant exercises, will be sufficient to fund operations and meet our obligations, when due, into the second quarter of 2021. 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. 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 the Company's ability to continue as a going concern for one year after the date our 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, 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 the Company when needed, if at all. If adequate additional funds are not available when required, we may 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.

Net cash used in operating activities was \$8,654 during the year ended December 31, 2019, compared to net cash used by operating activities during 2018 of \$8,754. Net cash used by operations during the year ended December 31, 2019 primarily reflects the net loss of \$12,956 and lease payments and modifications made to reduce the Company's lease liabilities of \$2,244, partially offset by non-cash expenses, including the Company's loss on issuance of securities of \$13,018 representing the difference between the fair value of the liability classified warrants issued in the Company's November securities offering and the proceeds received from the offering, an offsetting non-cash gain of \$9,541 as a result of remeasuring the fair value of the warrants on December 31, 2019, stock-based compensation expense of \$656, depreciation expense of \$203, 401(k) stock matching contribution expense of \$98 and non-cash lease expense of \$1,625 resulting from amortization of our leased right-of-use assets.

Net cash of \$3,015 was used in investing activities during the year ended December 31, 2019, compared to net cash used in investing activities during 2018 of \$2,788. During the year ended December 31, 2019, the Company purchased \$5,704 in short-term investments, including U.S. Treasury notes and federal agency bonds. Also during 2019, \$2,750 of short-term investments matured and converted to cash.

Net cash of \$14,079 was provided by financing activities during the year ended December 31, 2019, compared to net cash provided by financing activities of \$118 during the year ended December 31, 2018. During March 2019, we completed a registered direct offering of 60,541 shares of our common stock at an offering price of \$48.40 per share, receiving cash proceeds from the transaction of \$2,583, net of issuance costs of \$349. During November 2019, we also closed on two concurrent securities offerings that included a public offering and a private placement. Gross proceeds from the two offerings totaled \$11,500, before issuance costs of \$1,254, that were recorded as an expense within other income (expense) in the Company's consolidated statement of operations for the year ended December 31, 2019. During the years ended December 31, 2019 and 2018, the Company paid taxes of \$4 and \$6, respectively, related to our net settlement of employee

vested stock awards. These taxes include payment of minimum federal, state or Canadian provincial income tax withholdings associated with employee restricted stock units ("RSUs") that vested during each year. As RSUs vest, we withhold a number of shares with an aggregate fair market value equal to the minimum tax withholding amount from the common stock issuable at the vest date.

### **Off-Balance Sheet Arrangements**

As of December 31, 2019, we had no off-balance sheet arrangements as defined in Item 303(a)(4) of the SEC's Regulation S-K.

### **Related Party Transactions**

The Company did not engage in any transactions during the years ended December 31, 2019 and December 31, 2018 that qualify as related party transactions.

### **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, 2019 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, 2019. In making this assessment, management used the criteria set forth in the 2013 *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, 2019, 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.

### PART III

Pursuant to General Instruction G to Form 10-K, the information required for 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 19, 2020, which is expected to be filed not later than 120 days after the fiscal year end covered by this Form 10-K.

### 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		Description
<a href="#">2.1</a>	(11)	Purchase Agreement between Metabolix, Inc. and CJ Research Center LLC, dated September 16, 2016.
<a href="#">3.1.1</a>	(16)	Amended and Restated Certificate of Incorporation, as amended, of the Registrant.
<a href="#">3.1.2</a>	(20)	Certificate of Amendment to the Amended and Restated Certificate of Incorporation of the Registrant.
<a href="#">3.1.3</a>	(19)	Certificate of Designation of Preferences, Rights and Limitations with respect to the Series A Preferred Stock.
<a href="#">3.1.4</a>	(19)	Certificate of Designation of Preferences, Rights and Limitations with respect to the Series B Preferred Stock.
<a href="#">3.2</a>	(12)	Amended and Restated By-laws of the Registrant.
<a href="#">4.1</a>	*	Description of Securities of the Registrant.
<a href="#">4.1.2</a>	(1)	Specimen Stock Certificate for shares of the Registrant's Common Stock.
<a href="#">4.1.5</a>	(14)	Form of Investor Warrant to Purchase Common Stock.
<a href="#">4.6</a>	(15)	Form of Series A Common Warrant to purchase shares of Common Stock.
<a href="#">4.7</a>	(19)	Form of Common Stock Purchase Warrant.
<a href="#">10.1</a>	†(1)	2006 Stock Option and Incentive Plan.
<a href="#">10.1.1</a>	†(1)	2006 Stock Option and Incentive Plan, Form of Incentive Stock Option Agreement.

<a href="#">10.1.2</a>	†(1)	2006 Stock Option and Incentive Plan, Form of Non-Qualified Stock Option Agreement.
<a href="#">10.1.3</a>	†(1)	2006 Stock Option and Incentive Plan, Form of Director Non-Qualified Stock Option Agreement.
<a href="#">10.2</a>	†(6)	2014 Stock Option and Incentive Plan, Revised and Restated.
<a href="#">10.2.1</a>	†(7)	2014 Stock Option and Incentive Plan, Form of Incentive Stock Option Award.
<a href="#">10.2.2</a>	†(7)	2014 Stock Option and Incentive Plan, Form of Non-Qualified Stock Option Award.
<a href="#">10.2.3</a>	†(7)	2014 Stock Option and Incentive Plan, Form of Restricted Stock Unit Award.
<a href="#">10.2.4</a>	†(16)	2018 Stock Option and Incentive Plan.
<a href="#">10.2.5</a>	†(17)	2018 Stock Option and Incentive Plan, Form of Stock Option Agreement.
<a href="#">10.2.6</a>	†*	2018 Stock Option and Incentive Plan, Form of Restricted Stock Unit Agreement.
<a href="#">10.3</a>	†(13)	Employment Agreement between the Company and Oliver P. Peoples dated March 28, 2017.
<a href="#">10.4</a>	†(13)	Employment Agreement between the Company and Charles B. Haaser dated March 28, 2017.
<a href="#">10.5</a>	†(13)	Employment Agreement between the Company and Lynne H. Brum dated March 28, 2017.
<a href="#">10.6</a>	†(13)	Employment Agreement between the Company and Kristi Snell dated March 28, 2017.
<a href="#">10.7</a>	†(13)	Noncompetition, Confidentiality and Inventions Agreement between the Company and each of Oliver Peoples, Charles Haaser, Lynne H. Brum and Kristi Snell, dated March 28, 2017.
<a href="#">10.8</a>	†(1)	Form of Indemnification Agreement between the Registrant and its Directors and Officers.
<a href="#">10.9</a>	†(5)	Non-Qualified Stock Option Agreement between the Company and Joseph Shaulson dated December 19, 2013.
<a href="#">10.10</a>	†(5)	Restricted Stock Unit Award Agreement between the Registrant and Joseph Shaulson dated March 24, 2014.
<a href="#">10.11</a>	(2)	Lease between Fortune Wakefield, LLC and Metabolix, Inc. dated March 30, 2007.
<a href="#">10.11.1</a>	(3)	First Amendment of Lease between Fortune Wakefield, LLC and Metabolix, Inc. dated February 29, 2012.
<a href="#">10.11.2</a>	(4)	Second Amendment of Lease between Fortune Wakefield, LLC and Metabolix, Inc. dated October 24, 2013.
<a href="#">10.12</a>	(8)	Standstill Agreement dated June 19, 2015 between the Company and Jack W. Schuler, Renate Schuler and the Schuler Family Foundation.
<a href="#">10.13</a>	(10)	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.
<a href="#">10.14</a>	@(13)	Exclusive License Agreement, dated as of June 30, 2015, between the Company and the University of Massachusetts.
<a href="#">10.15</a>	(13)	Sublease between CJ Research Center LLC and the Company, dated as of September 16, 2016.



<a href="#">10.16</a>	(14)	Form of Securities Purchase Agreement dated July 3, 2017 between the Company and the Purchasers named therein.
<a href="#">10.17</a>	@(16)	Exclusive License Agreement, dated May 17, 2018, between the Company and the University of Missouri.
<a href="#">10.18</a>	(18)	Form of Securities Purchase Agreement dated March 14, 2019 between the Company and the Investors named therein.
<a href="#">10.19</a>	(19)	Securities Purchase Agreement, dated as of November 14, 2019, by and between Yield10 Bioscience, Inc. and the Investors listed on Schedule I thereto.
<a href="#">14.1</a>	(17)	Yield10 Bioscience, Inc. Code of Business Conduct and Ethics.
<a href="#">21.1</a>	(17)	Subsidiaries of the Registrant.
<a href="#">23.1</a>	*	Consent of RSM US LLP, an independent registered public accounting firm.
<a href="#">31.1</a>	*	Certification Pursuant to Rule 13a-14(a) or Rule 15d-14(a) of the Securities Exchange Act of 1934.
<a href="#">31.2</a>	*	Certification Pursuant to Rule 13a-14(a) or Rule 15d-14(a) of the Securities Exchange Act of 1934.
<a href="#">32.1</a>	*	Certification Pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
101.1	*	The following financial information from the Yield10 Bioscience, Inc. Annual Report on Form 10-K for the year ended December 31, 2019 formatted in XBRL; (i) Consolidated Balance Sheets, December 31, 2019 and December 31, 2018; (ii) Consolidated Statements of Operations, Years Ended December 31, 2019 and 2018; (iii) Consolidated Statements of Comprehensive Income (Loss), Years Ended December 31, 2019 and 2018; (iv) Consolidated Statements of Cash Flows, Years Ended December 31, 2019 and 2018; (v) Consolidated Statements of Stockholders' Equity for the Years Ended December 31, 2019 and 2018; and (vi) Notes to Consolidated Financial Statements.
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.

† Indicates a management contract or any compensatory plan, contract or arrangement.

\* Filed herewith

@ Confidential treatment has been granted for certain portions of this document.

- (1) Incorporated by reference herein to the exhibits to the Company's Registration Statement on Form S-1/A filed on September 21, 2006 (File No. 333-135760)
- (2) Incorporated by reference herein to the exhibits to the Company's Quarterly Report on Form 10-Q for the quarter ended March 31, 2007 (File No. 001-33133)
- (3) Incorporated by reference herein to the exhibits to the Company's Quarterly Report on Form 10-Q for the quarter ended March 31, 2012 (File No. 001-33133)
- (4) Incorporated by reference herein to the exhibits to the Company's 2013 Annual Report on Form 10-K filed March 28, 2014 (File No. 001-33133)
- (5) Incorporated by reference herein to the exhibits to the Company's Quarterly Report on Form 10-Q for the quarter ended March 31, 2014 (File No. 001-33133)
- (6) Incorporated herein by reference to the Company's Quarterly Report on Form 10-Q for the quarter ended June 30, 2015 (File No. 001-33133)
- (7) Incorporated by reference herein to the exhibits to the Company's 2014 Annual Report on Form 10-K filed March 25, 2015 (File No. 001-33133)
- (8) Incorporated by reference herein to the exhibits to the Company's Report on Form 8-K filed on June 17, 2015 (File No. 001-33133)
- (9) Incorporated by reference herein to the exhibits to the Company's Report on Form 8-K filed on October 7, 2015 (File No. 001-33133)
- (10) Incorporated by reference herein to the exhibits to the Company's Report on Form 8-K filed on January 26, 2016 (File No. 001-33133)
- (11) Incorporated by reference herein to the exhibits to the Company's Report on Form 8-K filed on September 21, 2016 (File No. 001-33133)
- (12) Incorporated by reference herein to the exhibits to the Company's Report on Form 8-K filed on January 6, 2017 (File No. 001-33133)
- (13) Incorporated by reference herein to the exhibits to the Company's Annual Report on Form 10-K filed March 30, 2017 (File No. 001-33133)
- (14) Incorporated by reference herein to the exhibits to the Company's Report on Form 8-K filed on July 5, 2017 (File No. 001-33133)
- (15) Incorporated by reference herein to the exhibits to the Company's Registration Statement on Form S-1/A filed December 15, 2017 (File No. 333-221283)
- (16) Incorporated by reference herein to the exhibits to the Company's Quarterly Report on Form 10-Q for the quarter ended June 30, 2018 (File No. 001-33133)
- (17) Incorporated by reference herein to the exhibits to the Company's Annual Report on Form 10-K filed March 28, 2019 (File No. 001-33133)
- (18) Incorporated by reference herein to the exhibits to the Company's Report on Form 8-K filed on March 15, 2019 (File No. 001-33133)
- (19) Incorporated by reference herein to the exhibits to the Company's Report on Form 8-K filed on November 20, 2019 (File No. 001-33133)
- (20) Incorporated by reference herein to the exhibits to the Company's Report on Form 8-K filed on January 15, 2020 (File No. 001-33133)

## ITEM 16. FORM 10-K SUMMARY

Registrants may voluntarily include a summary of information required by Form 10-K under this Item 16. We have elected not to include such summary.

### SIGNATURES

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

March 24, 2020	YIELD10 BIOSCIENCE, INC.
	By: <u>/s/ OLIVER P. PEOPLES</u>
	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.

<u>Name</u>	<u>Title</u>	<u>Date</u>
<u>/s/ OLIVER P. PEOPLES</u> Oliver P. Peoples, Ph.D.	President and Chief Executive Officer and Director (Principal Executive Officer)	March 24, 2020
<u>/s/ CHARLES B. HAASER</u> Charles B. Haaser	Vice President, Finance, and Chief Accounting Officer (Principal Financial and Accounting Officer)	March 24, 2020
<u>/s/ SHERRI M. BROWN</u> Sherri M. Brown	Director	March 24, 2020
<u>/s/ RICHARD W. HAMILTON</u> Richard W. Hamilton, Ph.D.	Director	March 24, 2020
<u>/s/ JOSEPH SHAULSON</u> Joseph Shaulson	Director	March 24, 2020
<u>/s/ ANTHONY J. SINSKEY</u> Anthony J. Sinskey, Sc.D.	Director	March 24, 2020
<u>/s/ ROBERT L. VAN NOSTRAND</u> Robert L. Van Nostrand	Chairman	March 24, 2020

**YIELD10 BIOSCIENCE, INC.**  
**Index to Consolidated Financial Statements**

<a href="#">Report of Independent Registered Public Accounting Firm</a>	<a href="#">F- 2</a>
<a href="#">Consolidated Balance Sheets as of December 31, 2019 and 2018</a>	<a href="#">F- 3</a>
<a href="#">Consolidated Statements of Operations for the Years Ended December 31, 2019 and 2018</a>	<a href="#">F- 4</a>
<a href="#">Consolidated Statements of Comprehensive Loss for the Years Ended December 31, 2019 and 2018</a>	<a href="#">F- 5</a>
<a href="#">Consolidated Statements of Cash Flows for the Years Ended December 31, 2019 and 2018</a>	<a href="#">F- 6</a>
<a href="#">Consolidated Statements of Series B Convertible Preferred Stock and Stockholders' (Deficit) Equity for the Years Ended December 31, 2019 and 2018</a>	<a href="#">F- 7</a>
<a href="#">Notes to Consolidated Financial Statements</a>	<a href="#">F- 8</a>

## **Report of Independent Registered Public Accounting Firm**

To the Shareholders 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, 2019 and 2018, the related consolidated statements of operations, comprehensive loss, series B convertible preferred stock and stockholders' (deficit) 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, 2019 and 2018, 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.

### **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.

/s/ RSM US LLP

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

Boston, Massachusetts

March 24, 2020



**YIELD10 BIOSCIENCE, INC.**

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

	<b>December 31, 2019</b>	<b>December 31, 2018</b>
<b>Assets</b>		
Current Assets:		
Cash and cash equivalents	\$ 5,417	\$ 3,023
Short-term investments	5,700	2,746
Accounts receivable	72	94
Unbilled receivables	20	66
Prepaid expenses and other current assets	475	448
Total current assets	11,684	6,377
Restricted cash	332	332
Property and equipment, net	1,243	1,385
Right-of-use assets	3,141	4,766
Other assets	318	100
Total assets	\$ 16,718	\$ 12,960
<b>Liabilities, Convertible Preferred Stock and Stockholders' (Deficit) Equity</b>		
Current Liabilities:		
Accounts payable	\$ 279	\$ 117
Accrued expenses	1,326	680
Lease liabilities	602	844
Total current liabilities	2,207	1,641
Lease liabilities, net of current portion	3,619	5,621
Warrant liability (Note 9)	14,977	—
Total liabilities	20,803	7,262
Commitments and contingencies (Note 7)		
Series B Convertible Preferred Stock (\$0.01 par value per share); 5,750 and 0 shares issued and outstanding at December 31, 2019 and December 31, 2018, respectively (Note 9)	—	—
Stockholders' (Deficit) Equity:		
Series A Convertible Preferred Stock (\$0.01 par value per share); 796 and 0 shares issued and outstanding at December 31, 2019 and December 31, 2018, respectively	—	—
Common stock (\$0.01 par value per share); 60,000,000 shares authorized at December 31, 2019 and 2018, respectively, and 933,423 and 250,631 shares issued and outstanding at December 31, 2019 and 2018, respectively	9	3
Additional paid-in capital	360,926	357,743
Accumulated other comprehensive loss	(126)	(110)
Accumulated deficit	(364,894)	(351,938)
Total stockholders' (deficit) equity	(4,085)	5,698
Total liabilities, convertible preferred stock and stockholders' (deficit) equity	\$ 16,718	\$ 12,960

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)

	<b>Years Ended December 31,</b>	
	<b>2019</b>	<b>2018</b>
Revenue:		
Grant revenue	\$ 806	\$ 556
Total revenue	806	556
Expenses:		
Research and development	4,848	4,783
General and administrative	4,554	5,092
Total expenses	9,402	9,875
Loss from operations	(8,596)	(9,319)
Other income (expense):		
Loss on issuance of securities (Note 9)	(13,018)	—
Offering costs (Note 9)	(1,254)	—
Change in fair value of warrants (Note 9)	9,541	—
Interest income	96	158
Other income (expense), net	21	(24)
Total other income (expense)	(4,614)	134
Net loss from operations before income tax benefit	(13,210)	(9,185)
Income tax benefit	254	—
Net loss	\$ (12,956)	\$ (9,185)
Basic and diluted net loss per share	\$ (35.50)	\$ (36.99)
Number of shares used in per share calculations:		
Basic & diluted	364,967	248,312

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

**YIELD10 BIOSCIENCE, INC.****CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS**  
**(In thousands)**

	<b>Years Ended December 31,</b>	
	<b>2019</b>	<b>2018</b>
Net loss	\$ (12,956)	\$ (9,185)
Other comprehensive income (loss):		
Change in foreign currency translation adjustment	(16)	(25)
Total other comprehensive loss	(16)	(25)
Comprehensive loss	<u>\$ (12,972)</u>	<u>\$ (9,210)</u>

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

**YIELD10 BIOSCIENCE, INC.**

**CONSOLIDATED STATEMENTS OF CASH FLOWS**  
(In thousands)

	<b>Years Ended December 31,</b>	
	<b>2019</b>	<b>2018</b>
<b>Cash flows from operating activities</b>		
Net loss	\$ (12,956)	\$ (9,185)
Adjustments to reconcile net loss to cash used in operating activities:		
Depreciation	203	196
Loss on issuance of securities	13,018	—
Change in fair value of warrants	(9,541)	—
Expense for 401(k) company common stock match	98	102
Stock-based compensation	656	1,181
Noncash lease expense	1,625	588
Deferred tax provision	(254)	—
Changes in operating assets and liabilities:		
Accounts receivable	22	(40)
Unbilled receivables	46	(1)
Prepaid expenses and other assets	9	(128)
Accounts payable	162	41
Accrued expenses	502	(1,072)
Lease liabilities	(2,244)	(436)
Net cash used in operating activities	(8,654)	(8,754)
<b>Cash flows from investing activities</b>		
Purchase of property and equipment	(61)	(42)
Purchase of investments	(5,704)	(11,496)
Proceeds from sale and maturity of short-term investments	2,750	8,750
Net cash used by investing activities	(3,015)	(2,788)
<b>Cash flows from financing activities</b>		
Proceeds from warrants exercised	—	124
Proceeds from securities offerings, net of issuance costs	14,083	—
Taxes paid on employees' behalf related to vesting of stock awards	(4)	(6)
Net cash provided by financing activities	14,079	118
Effect of exchange rate changes on cash, cash equivalents and restricted cash	(16)	(25)
Net increase (decrease) in cash, cash equivalents and restricted cash	2,394	(11,449)
Cash, cash equivalents and restricted cash at beginning of period	3,355	14,804
Cash, cash equivalents and restricted cash at end of period	\$ 5,749	\$ 3,355
<b>Supplemental Cash Flow Disclosure:</b>		
Interest paid	\$ 7	\$ 19
<b>Supplemental Disclosure of Non-cash Information:</b>		
Right-of-use assets acquired in exchange for lease liabilities	\$ —	\$ 194

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

**YIELD10 BIOSCIENCE, INC.**

**CONSOLIDATED STATEMENTS OF SERIES B CONVERTIBLE PREFERRED STOCK AND STOCKHOLDERS'  
(DEFICIT) 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' (Deficit) Equity
<b>Balance, December 31, 2017</b>	—	\$ —	1,826	\$ 818	227,219	\$ 2	\$ 355,520	\$ (85)	\$ (342,753)	\$ 13,502
Non-cash stock-based compensation expense	—	—	—	—	—	—	1,181	—	—	1,181
Issuance of common stock for 401(k) match	—	—	—	—	1,638	—	107	—	—	107
Issuance of stock for restricted stock unit vesting, net of 65 shares withheld for employee taxes	—	—	—	—	110	—	(6)	—	—	(6)
Issuance of common stock upon conversion of Series A Convertible Preferred Stock	—	—	(1,826)	(818)	20,287	1	817	—	—	—
Issuance of common stock upon exercise of Class B Warrants	—	—	—	—	1,377	—	124	—	—	124
Effect of foreign currency translation	—	—	—	—	—	—	—	(25)	—	(25)
Net loss	—	—	—	—	—	—	—	—	(9,185)	(9,185)
<b>Balance, December 31, 2018</b>	—	\$ —	—	\$ —	250,631	\$ 3	\$ 357,743	\$ (110)	\$ (351,938)	\$ 5,698
Non-cash stock-based compensation expense	—	—	—	—	—	—	521	—	—	521
Issuance of common stock for 401(k) match	—	—	—	—	2,885	—	89	—	—	89
Issuance of stock for restricted stock unit vesting, net of 55 shares withheld for employee taxes	—	—	—	—	116	—	(4)	—	—	(4)
Issuance of common stock for registered direct offering, net of \$349 offering costs	—	—	—	—	60,541	—	2,583	—	—	2,583
Issuance of common and preferred stock in connection with public offering	—	—	2,504	—	405,750	4	(4)	—	—	—
Issuance of preferred stock in connection with private offering	5,750	—	—	—	—	—	—	—	—	—
Issuance of common stock upon conversion of Series A Convertible Preferred Stock	—	—	(1,708)	—	213,500	2	(2)	—	—	—
Effect of foreign currency translation	—	—	—	—	—	—	—	(16)	—	(16)

Net loss	—	—	—	—	—	—	—	—	(12,956)	(12,956)
<b>Balance, December 31, 2019</b>	5,750	\$ —	796	\$ —	933,423	\$ 9	\$ 360,926	\$ (126)	\$ (364,894)	\$ (4,085)

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. is an agricultural bioscience company that uses its "Trait Factory" and the Camelina oilseed "Fast Field Testing" system to develop high value seed traits for the agriculture and food industries. The Company's goal is to efficiently develop superior gene traits for the major crops including corn, soybean, canola, and other crops to enable step-change increases in crop yield of at least 10-20 percent. The "Trait Factory" encompasses discovery of gene targets using the GRAIN ("Gene Ranking Artificial Intelligence Network") big data mining platform, deployment of trait gene targets in the oilseed Camelina and generation of field performance data. The "Trait Factory" enables two complementary commercial opportunities with different paths to market. The first is trait licensing to the major seed companies for corn, soybean, canola and other crops. Data from the Company's trait field testing in Camelina has enabled Yield10 to establish research license agreements with leading seed companies including Bayer, Forage Genetics and Simplot. These companies are progressing the development of Yield10 traits in soybean, forage sorghum, and potato, respectively. The second is to improve the performance and value of Camelina as a platform to develop a commercial crop product business producing nutritional oils and PHA biomaterials. Using this approach, Yield10 can leverage the resources of the major seed companies to efficiently develop superior gene traits for the major crops and focus internal resources on trait gene discovery and the commercial development of Camelina products.

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, 2019.

During the year ended December 31, 2019, the Company was successful in raising adequate capital to fund its operations, ending the year with unrestricted cash, cash equivalents and short-term investments of \$11,117. In March 2019, the Company closed on a registered direct offering of its common stock, raising \$2,582, net of offering costs, and in November 2019, the Company closed on concurrent public and private offerings of its securities, raising an additional \$10,246, net of offering costs. Through March 20, 2020, Yield10 received a further \$1,638 million in cash from the exercise of 204,796 investor warrants issued in the November 2019 offering. 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 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 government 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 its operations and pursue options for liquidating its remaining assets, including intellectual property and equipment. Based on its current cash forecast, including funds received after year-end from the exercise of warrants, management has determined that the Company's present capital resources will be sufficient to fund its planned operations into the second quarter of 2021. 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

**YIELD10 BIOSCIENCE, INC.****NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS****(In thousands, except for share and per share amounts)**

necessary to relinquish valuable rights to its potential products or proprietary technologies or grant licenses on terms that are not favorable to the Company.

**2. Summary of Significant Accounting Policies****Basis of Presentation**

The accompanying consolidated financial statements have been 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 Canadian subsidiary, Metabolix Oilseeds, Inc.

**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 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 accounting principles generally accepted in the United States of America ("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 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 condensed consolidated balance sheets included herein:

	<b>December 31, 2019</b>	<b>December 31, 2018</b>
Cash and cash equivalents	\$ 5,417	\$ 3,023
Restricted cash	332	332
Total cash, cash equivalents and restricted cash	<u>\$ 5,749</u>	<u>\$ 3,355</u>

Amounts included in restricted cash represent those required to be set aside by contractual agreement. Restricted cash of \$332 at December 31, 2019 and December 31, 2018 primarily consists of funds held in connection with the Company's lease agreement for its Woburn, Massachusetts facility.

**Investments**

**YIELD10 BIOSCIENCE, INC.****NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS****(In thousands, except for share and per share amounts)**

Short-term investments represent holdings of available-for-sale marketable debt securities 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, 2019 and December 31, 2018.

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' (deficit) equity until realized or until a determination is made that an other-than-temporary decline in market value has occurred. 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 subsidiaries 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 Income (Loss)**

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

**Concentration of Credit Risk**

Financial instruments that potentially subject the Company to concentrations of credit risk primarily consist of cash and cash equivalents, 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.

The Company's receivables related to government grants are believed to have a low risk of default. At December 31, 2019, the Company's accounts and unbilled receivables of \$92 include \$62 due from research grants with the U.S. government under which the Company serves as a subcontractor. At December 31, 2018, all of the Company's accounts and unbilled receivables of \$160 were from grants with the U.S. government.

**Fair Value Measurements**

The carrying amounts of the Company's financial instruments as of December 31, 2019 and December 31, 2018, which include cash equivalents, 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.

**YIELD10 BIOSCIENCE, INC.****NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS****(In thousands, except for share and per share amounts)****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. As of December 31, 2019, and December 31, 2018, less than 10% of the Company's combined total assets were located outside of the United States. During the year ended December 31, 2019 and December 31, 2018, the reported net income (loss) from the Company's foreign subsidiaries was less than 10% of the combined net income (loss) of the consolidated Company.

**Property and Equipment**

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

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

The Company records incentive payments received from its landlords as a lease incentive obligation and amortizes these amounts as reductions to lease expense over the lease term.

**Impairment of Long-Lived Assets**

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

**Grant Revenue**

The Company's source of continuing revenue is from its government research grants in which it serves as either the primary contractor or as a subcontractor. These grants are considered an ongoing major and central operation of the Company's business. Revenue is earned as research expenses related to the grants are incurred. Revenue earned on 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, 2019 and December 31, 2018. 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, product trials, facility related expenses, depreciation, and stock-based compensation. Costs incurred in connection with government research grants are recorded as research and development expenses.

**YIELD10 BIOSCIENCE, INC.****NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS**  
**(In thousands, except for share and per share amounts)****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 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 share-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 income (loss) per share is computed by dividing net income (loss) available to common shareholders by the weighted-average number of common shares outstanding. Diluted net loss per share is computed by dividing net income 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. In periods when a net loss is reported, such as the Company's fiscal years ending December 31, 2019 and 2018, all common stock equivalents are excluded from the calculation because they would have an anti-dilutive effect in the calculation of loss per share; meaning the loss per share would be reduced. Therefore, in periods when a loss is reported, there is no difference in basic and dilutive loss per share. 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. During November 2019, the Company completed an offering of its securities that included Series A Convertible Preferred Stock and Series B Convertible Preferred Stock meeting the definition of participating securities (See Note 9). However, due to the Company's net loss during the year ended December 31, 2019, no allocation of the net loss was allocated to the preferred shares as the holders of the preferred shares do not have a contractual obligation to fund losses and loss per share has been computed and presented based on the loss being fully assigned to the Company's weighted average outstanding common shares during the year. There were no amounts allocated to participating securities during the year ended December 31, 2018, as the Company had no outstanding securities that met the definition of participating securities.

The number of shares of potentially dilutive common stock presented on a weighted average basis, related to options, restricted stock units, convertible preferred stock and warrants (prior to consideration of the treasury stock method) that were excluded from the calculation of dilutive shares since the inclusion of such shares would be anti-dilutive for the years ended December 31, 2019 and 2018, respectively, are shown below:

**YIELD10 BIOSCIENCE, INC.**

**NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS**

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

	<b>Year Ended December 31,</b>	
	<b>2019</b>	<b>2018</b>
Options	54,430	32,359
Restricted stock awards	42	214
Series A Convertible Preferred Stock	18,420	—
Series B Convertible Preferred Stock	82,705	—
Warrants	180,467	243,327
Total	<u>336,064</u>	<u>275,900</u>

**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 the deferred tax asset 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 12 for further discussion of income taxes. The Company had no amounts recorded for any unrecognized tax benefits as of December 31, 2019 and 2018.

**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 February 2016, the FASB issued ASU No. 2016-02, which requires lessees to recognize most leases on their balance sheet as right-of-use assets and lease liabilities. In July 2018, the FASB issued ASU No. 2018-10, "*Codification Improvements to Topic 842, Leases*" ("ASU 2018-10"), which provided narrow amendments to clarify how to apply certain aspects of the new lease standard, and ASU No. 2018-11, "*Leases (Topic 842 - Targeted Improvements)*" ("ASU 2018-11"), which addressed implementation issues related to the new lease standard. The new guidance was effective for annual reporting periods beginning after December 15, 2018 and interim periods within those fiscal years. Under the new standard, disclosures are required to enable users of financial statements to better assess the amount, timing, and uncertainty of cash flows arising from leases. Topic 842 required filers to adopt the new standard using a modified retrospective approach under either of two transition methods; (1) to apply the new lease requirements at the beginning of the earliest period presented, or (2) to apply the new lease requirements at the effective date. The Company adopted the new standard on January 1, 2019 and elected to adjust its 2018 and 2017 financial statements in order to make them comparable to its 2019 financial statements. Adoption of Topic 842 had a material impact on the Company's previously reported 2018 and 2017 financial statements. See Note 11.

In May 2014, the FASB issued ASU No. 2014-09, *Revenue from Contracts with Customers (Topic 606)*. The ASU is the result of a joint project by the FASB and the International Accounting Standards Board ("IASB") to clarify the principles for recognizing revenue and to develop a common revenue standard for GAAP and International Financial Reporting Standards ("IFRS") that would: remove inconsistencies and weaknesses in the treatment of this area between GAAP and



**YIELD10 BIOSCIENCE, INC.****NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS****(In thousands, except for share and per share amounts)**

IFRS, provide a more robust framework for addressing revenue issues, improve comparability of revenue recognition practices across entities, jurisdictions, industries, and capital markets, improve disclosure requirements and resulting financial statements, and simplify the presentation of financial statements. The core principle of the new guidance is that an entity should recognize revenue to depict the transfer of promised goods or services in an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods or services. The Company adopted the new standard effective January 1, 2018 using the modified retrospective method and determined that its grant revenue, which is its sole source of revenue, does not fall within the guidance of the new standard. The Company will review future customer revenue agreements against the guidance provided by ASU No. 2014-09 to ensure that revenue is recorded appropriately.

New pronouncements that are not yet effective but may impact the Company's financial statements in the future are described below.

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 has subsequently issued amendments to ASU 2016-13, which have the same effective date and transition date of January 1, 2020. These standards require that credit losses be reported using an expected losses model rather than the incurred losses model that is currently 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. These standards limit 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 Company is evaluating the potential impact of the standard on its consolidated financial position, results of operations and related disclosures.

In August 2018, the FASB issued ASU No. 2018-13, *Fair Value Measurement (Topic 820): Disclosure Framework - Changes to the Disclosure Requirements for Fair Value Measurement*. This standard modifies certain disclosure requirements on fair value measurements and will become effective for the Company on January 1, 2020. The Company is evaluating the potential impact of the standard on its consolidated financial position and results of operations and related disclosures.

In November 2018, the FASB issued ASU No. 2018-18, *Collaborative Arrangements (Topic 808): Clarifying the Interaction between Topic 808 and Topic 606*. This standard makes targeted improvements for collaborative arrangements as follows:

- Clarifies that certain transactions between collaborative arrangement participants should be accounted for as revenue under ASC 606, *Revenue from Contracts with Customers*, when the collaborative arrangement participant is a customer in the context of a unit of account. In those situations, the guidance in ASC 606 should be applied, including recognition, measurement, presentation and disclosure requirements;
- Adds unit-of-account guidance to ASC 808, *Collaborative Arrangements*, to align with the guidance in ASC 606 (that is, a distinct good or service) when an entity is assessing whether the collaborative arrangement or a part of the arrangement is within the scope of ASC 606; and
- Precludes a company from presenting transactions with collaborative arrangement participants that are not directly related to sales to third parties with revenue recognized under ASC 606 if the collaborative arrangement participant is not a customer.

This standard will become effective for the Company on January 1, 2020; however, early adoption is permitted. A retrospective transition approach is required for either all contracts or only for contracts that are not completed at the date of initial application of ASC 606, with a cumulative adjustment to opening retained earnings, as of January 1, 2019. The Company is currently evaluating the potential impact that this standard may have on its consolidated financial position, results of operations and related disclosures.

**3. INVESTMENTS**

The Company's investments consist of the following:

**YIELD10 BIOSCIENCE, INC.**

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

	Accumulated Cost at December 31, 2019	Unrealized		Market Value at December 31, 2019
		Gain	(Loss)	
Short-term investments				
Government securities	\$ 5,700	\$ —	\$ —	\$ 5,700
Total	\$ 5,700	\$ —	\$ —	\$ 5,700

	Accumulated Cost at December 31, 2018	Unrealized		Market Value at December 31, 2018
		Gain	(Loss)	
Short-term investments				
Government securities	\$ 2,746	\$ —	\$ —	\$ 2,746
Total	\$ 2,746	\$ —	\$ —	\$ 2,746

**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. In addition, during November 2019 the Company issued Series A Warrants and Series B Warrants in its concurrent securities offerings, that are considered free standing financial instruments that are legally detachable and separately exercisable from the common and preferred stock issued in the two offerings (see Note 9). The Company 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 meets Level 3 classification criteria for classification within the fair value hierarchy. 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, 2019 and December 31, 2018 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, 2019 and December 31, 2018.

The fair values of the Series A Warrants and Series B Warrants were determined using the Black-Scholes valuation model. The warrants issued in the concurrent public and private offerings possess similar terms, with the exception of the expiration dates between the Series A Warrants and Series B Warrants. The expected volatility and the risk free discount rate used in the Black-Scholes model were determined based on the Company's historical market price published on the Nasdaq Capital Markets and from published U.S. Treasury yield curves, respectively, for a period matched to the contractual term of each warrant series. The resulting aggregate issuance date fair value on the warrant issuance date was determined to be \$24,518. The fair value of the warrant liability at December 31, 2019 was determined to be \$14,977, resulting in a recognized gain of \$9,541 from the change in fair value that is shown within other income (expense) in the Company's consolidated statement of operations for the year ended December 31, 2019.

**YIELD10 BIOSCIENCE, INC.**

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

	Series A Warrants		Series B Warrants	
	At December 31, 2019	At Inception	At December 31, 2019	At Inception
Fair market of common stock (per share)	\$6.86	\$10.82	\$6.86	\$10.82
Expected term (years)	2.3	2.5	7.3	7.5
Risk free rate	1.62%	1.59%	1.83%	1.73%
Volatility	127%	127%	115%	115%

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, 2019 and December 31, 2018 and indicate the fair value hierarchy of the valuation techniques utilized to determine such fair value.

	Fair value measurements at reporting date using			
	Quoted prices in active markets for identical assets	Significant other observable inputs	Significant unobservable inputs	Balance as of
Description	(Level 1)	(Level 2)	(Level 3)	December 31, 2019
<b><u>Assets</u></b>				
Cash equivalents:				
Money market funds	\$ 2,622	\$ —	\$ —	\$ 2,622
U.S. government and agency securities	—	1,750	—	1,750
Short-term investments:				
U.S. government and agency securities	—	5,700	—	5,700
Total assets	\$ 2,622	\$ 7,450	\$ —	\$ 10,072
<b><u>Liabilities</u></b>				
Warrant liability	\$ —	\$ —	\$ 14,977	\$ 14,977
Total liabilities	\$ —	\$ —	\$ 14,977	\$ 14,977

	Fair value measurements at reporting date using			
	Quoted prices in active markets for identical assets	Significant other observable inputs	Significant unobservable inputs	Balance as of
Description	(Level 1)	(Level 2)	(Level 3)	December 31, 2018
<b><u>Assets</u></b>				
Cash equivalents:				
Money market funds	\$ 2,663	\$ —	\$ —	\$ 2,663
Short-term investments:				
U.S. government agency securities	—	2,746	—	2,746
Total assets	\$ 2,663	\$ 2,746	\$ —	\$ 5,409

There were no transfers of financial assets or liabilities between category levels for the years ended December 31, 2019 and December 31, 2018.

**YIELD10 BIOSCIENCE, INC.**

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

**5. Property and Equipment, Net**

Property and equipment consist of the following:

	<b>Year ended December 31,</b>	
	<b>2019</b>	<b>2018</b>
Equipment	\$ 852	\$ 907
Furniture and fixtures	119	119
Leasehold improvements	1,748	1,749
Software	53	72
Total property and equipment, at cost	2,772	2,847
Less: accumulated depreciation	(1,529)	(1,462)
Property and equipment, net	\$ 1,243	\$ 1,385

Depreciation expense for the years ended December 31, 2019 and December 31, 2018, was \$203 and \$196, respectively.

**6. Accrued Expenses**

Accrued expenses consist of the following:

	<b>Year ended December 31,</b>	
	<b>2019</b>	<b>2018</b>
Employee compensation and benefits	\$ 669	\$ 98
Leased facilities	51	50
Professional services	327	234
Other	279	298
Total accrued expenses	\$ 1,326	\$ 680

**7. Commitments and Contingencies**

**Contractual Commitments**

In connection with the wind down of its biopolymer operations during 2016, the Company ceased pilot production of biopolymer material and reached agreements with the owner-operators of its biopolymer production facilities regarding the early termination of their services. The Company made the final payments of \$489 against these early contract termination obligations during 2018.

**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.

**YIELD10 BIOSCIENCE, INC.**

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

**Guarantees**

As of December 31, 2019, and December 31, 2018, 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, 2019 and December 31, 2018.

**8. License Agreements**

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 studies performed by the Company in greenhouse or field tests, these traits have shown a range of promising activities such as good agronomic performance, increased photosynthesis, increased seed yield, and/or increased biomass production.

In August 2019, the Company expanded its 2017 non-exclusive research license with the Crop Science Division of Bayer AG (formerly Monsanto Company) ("Bayer"), for soybean crop research to include a new discovery related to its C3004 yield trait gene. Under the original 2017 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 September 2018, the Company granted a 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 C4000 series traits have been shown to significantly increase photosynthesis and biomass in research conducted by the Company. 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.

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

**YIELD10 BIOSCIENCE, INC.****NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS**  
**(In thousands, except for share and per share amounts)****9. Capital Stock and Warrants****Common Stock***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. Proportional adjustments were made to the Company's outstanding stock options 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 securities offerings, receiving combined gross cash proceeds of \$11,500, before issuance costs of \$1,254. The offerings included a public offering and private placement.

The public portion of the offering included sales of Class A Units or Class B Units as follows:

- 405,750 Class A Units priced at a public offering price of \$8.00 per unit, with each unit consisting of one share of common stock, par value \$0.01 per share, a Series A Warrant to purchase one share of common stock at an exercise price of \$8.00 per share, expiring two and one-half-years from the closing date of the offering, and a Series B Warrant to purchase one share of common stock at an exercise price of \$8.00 per share, expiring seven and one-half-years from the closing date of the offering. The 405,750 Class A Units sold include the full exercise of the underwriter's over-allotment option of 93,750 Class A Units.
- 2,504 Class B Units, priced at a public offering price of \$1,000 per unit, with each unit consisting of one share of Series A Convertible Preferred Stock, par value \$0.01 per share, convertible at any time at the holder's option into 125 shares of common stock, par value \$0.01 per share, Series A Warrants to purchase 125 shares of common stock at an exercise price of \$8.00 per share, expiring two and one-half-years from the closing date of the offering, and Series B Warrants to purchase 125 shares of common stock at an exercise price of \$8.00 per share, expiring seven and one-half-years from the closing date of the offering. The Series A Convertible Preferred Stock is convertible into shares of common stock at any time at a price of \$8.00 per share. As of December 31, 2019, 1,708 of the Series A Convertible Preferred Stock had converted to 213,500 shares of the Company's common stock.
- Gross proceeds from the sale of Class A Units and Class B Units totaled \$5,750.

In the concurrent private placement, certain existing shareholders purchased the following securities:

- 5,750 Units, priced at \$1,000 per unit, each unit consisting of one share of the Company's Series B Convertible Preferred Stock, par value \$0.01, Series A Warrants to purchase 125 shares of common stock at an exercise price of \$8.00 per share, expiring two and one-half-years from the closing date of the offering, and Series B Warrants to purchase 125 shares of common stock at an exercise price of \$8.00 per share, expiring seven and one-half-years from the closing date of the offering.
- At issuance, the Series B Convertible Preferred Stock had various superior rights to the Company's other securities, including the Series A Convertible Preferred Stock sold under the public portion of the concurrent offerings. Upon issuance, the Series B Convertible Preferred Stock was contingently redeemable for cash at the election of the holders if the Charter Amendment to effect a reverse stock split did not occur within twelve months of issuance. The Series B Convertible Preferred Stock also had cumulative quarterly dividend rights, payable starting March 31, 2020, pursuant to which the Series B Convertible Preferred stockholders were entitled



# YIELD10 BIOSCIENCE, INC.

## NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS

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to receive a dividend initially equal to 2 percent of stated value, plus all accrued and unpaid dividends. The dividends were payable in additional shares of Series B Convertible Preferred Stock and the dividend rate increased 2 percent quarterly as long as the Series B Convertible Preferred Stock remained outstanding. In the event of a liquidation of the Company, the Series B Convertible Preferred stockholders would be paid the greater of the stated value of the shares plus accrued dividends to the point of liquidation prior to payment to junior securities holders, including common stock and the amount payable on the number of shares of common stock the Series B Convertible Preferred Stock holders would be entitled to on an as-if converted basis.

- Gross proceeds from the private placement also totaled \$5,750.

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. Under the terms of the offerings, the Series B Convertible Preferred Shares and the Series A Warrants and Series B 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. Upon the filing of the Charter Amendment on January 15, 2020, 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 under both offerings became eligible for exercise.

The accounting for the concurrent securities offerings is highly complex and required significant analysis and judgment in the application of the appropriate accounting guidance. The Company determined that the Series A Convertible Preferred Stock qualified for presentation as permanent equity on the Company's balance sheet as of December 31, 2019. Upon review of the Series B Convertible Preferred Stock, the Company determined that the contingent redemption rights of the Series B Convertible Preferred stockholders are outside the control of the Company and result in the classification of the Series B Convertible Preferred Stock as temporary equity in the Company's balance sheet at December 31, 2019.

The Company determined that the Series A Warrants and Series B Warrants are free standing financial instruments that are legally detachable and separately exercisable from the common and preferred stock issued in the concurrent offerings. The Company determined that all of the warrants should be classified as non-current warrant liabilities recognized at their inception date fair value due to the insufficiency of common shares available to permit their exercise. The fair value of the Series A Warrants and Series B Warrants was determined by the Company using the Black-Scholes valuation model. The computation of expected volatility and the risk-free discount rate were determined based on the Company's historical market price published on the Nasdaq Capital Markets and from published U.S. Treasury yield curves, respectively, for a period matched to the contractual term of each warrant series. The resulting aggregate issuance date fair value on the warrant issuance date was determined to be \$24,518.

	Series A Warrants	Series B Warrants
Expected term (years)	2.5	7.5
Risk free rate	1.59%	1.73%
Volatility	127%	115%

The proceeds of the public and private offerings were first allocated to the warrants based on their full fair value. As the proceeds from each of the offerings were less than the fair value of their respective warrant liability, the warrants were recorded at their full fair value and the difference between the fair value and the proceeds of \$13,018 was recorded to other income (expense) in the Company's consolidated statement of operations for the year ended December 31, 2019. No allocation of residual offering proceeds remained to be allocated to the common and preferred shares sold in the offerings.

The fair value of the warrant liabilities was subsequently re-measured at December 31, 2019 resulting in the recognition of a gain of \$9,541 within other income (expense) in the consolidated statement of operations for the year then ended. The significant reduction in valuation was primarily the result of the decline in the market price of the Company's stock during the period. The other Black-Scholes inputs did not change appreciably from those used for the initial valuation.

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Upon the filing of the Charter Amendment in January 2020, the warrants will qualify for equity classification and will be reclassified from warrant liability to additional paid-in capital.

As a result of the proceeds of the combined offerings being allocated solely to the liability classified warrants, all of the offering costs of \$1,254 were assigned to the warrants and then immediately expensed to other income (expense) in the consolidated statement of operations for the year ended December 31, 2019.

*March 2019 Registered Direct Offering*

On March 18, 2019, the Company completed a registered direct offering of its common stock. Proceeds from the transaction were \$2,932 before issuance costs of \$349. Investors participating in the transaction purchased a total of 60,541 shares of common stock at a price of \$48.40 per share.

*Increase in Authorized Shares of Common Stock*

On May 23, 2018, the Company held its 2018 Annual Meeting, at which stockholders approved an amendment to the Certificate of Incorporation to increase from 40,000,000 shares to 60,000,000 shares the aggregate number of shares of common stock that are authorized to be issued. As a result of this vote, on May 23, 2018, the Company filed a Certificate of Amendment to its Certificate of Incorporation with the Secretary of State of the State of Delaware to increase the number of authorized shares. Also, at the Annual Meeting, stockholders approved the adoption of the Company's 2018 Stock Plan. The 2018 Stock Plan reserves for issuance 32,500 shares of the Company's common stock for grants of incentive stock options, nonqualified stock options, stock grants and stock-based awards. Shares available under the 2018 Stock Plan were increased on the first day of January 2019 and 2020 in an amount equal to 5% of the outstanding shares of common stock on the day prior to the increase in each respective year or such smaller number of shares of common stock as determined by the board of directors.

**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 concurrent offerings of the Company's securities included the issuance of 2,504 shares of Series A Convertible Preferred Stock. Each Series A Convertible Preferred Share is convertible into 125 shares of common stock at a conversion price of \$8.00 per share, subject to adjustments as a result of stock dividends and stock splits. Material provisions of the Series A Convertible Preferred stock include the following:

- The Series A Convertible Preferred Stock is not redeemable.
- Holders of the Series A Convertible Preferred Stock may convert their preferred shares to common stock at any time. Subject to certain conditions, the Company can force a conversion based on certain market price and trading volume criteria.
- Conversion of the Series A Convertible Preferred Stock is prohibited if, as a result of a conversion, the holder, together with its affiliates, would beneficially own a number of shares of common stock in excess of 4.99% (or at the election of the purchaser prior to the date of issuance, 9.99%) of the shares of the Company's common stock then outstanding after giving effect to such exercise.
- Holders of the Series A Convertible Preferred Stock have no voting rights. However, Series A Convertible Preferred stockholders have certain protective voting rights that are designed to prevent adverse changes to their ownership rights without their approval.
- In the event of a liquidation, the holders of Series A Convertible Preferred Shares are entitled to participate on an as-converted-to-common stock basis with holders of common stock in any distribution of assets of the Company to the holders of the common stock.

**YIELD10 BIOSCIENCE, INC.**

**NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS**

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- Holders of Series A Convertible Preferred Stock are entitled to receive dividends equal to (on an as-if-converted basis) and in the same form and manner as dividends paid on shares of the Company's common stock.

During the year ended December 31, 2019, 1,708 shares of the Series A Convertible Preferred Stock have been converted to 213,500 shares of common stock.

*Description of Series B Convertible Preferred Stock*

The November 2019 concurrent offerings 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 is convertible into 125 shares of common stock at a conversion price of \$8.00 per share, subject to adjustments as a result of stock dividends and stock splits. Material provisions of the Series B Convertible Preferred stock include the following:

- On, or after the twelve-month anniversary date of issuance, holders of Series B Convertible Preferred Stock may elect to have the Company redeem all or a portion of their Series B Convertible Preferred Stock at a price per share equal to the stated value of the shares plus all accrued and unpaid regular dividends thereon to the date of redemption notice.
- Subject to certain conditions, the Company can force a conversion based on certain market price and trading volume criteria.
- The Series B Convertible Preferred Stock was not convertible into common stock until shareholders approved the reverse stock split and the Company filed the Charter Amendment. The Charter Amendment was filed on January 15, 2020. Upon the effectiveness of the reverse stock split, the Series B Convertible Preferred Stock automatically converted to common stock.
- Holders of the Series B Convertible Preferred Stock have no voting rights. However, Series B Convertible Preferred stockholders have certain protective voting rights that are designed to prevent adverse changes to their ownership rights without their approval. The Series B Convertible Preferred stockholders also have a right to approve specified corporate transactions that could result in a material change in the Company's business or the issuance of securities that are more senior to the Series B Convertible Preferred Stock.
- Holders of Series B Convertible Preferred Stock have a cumulative quarterly dividend right, payable starting March 31, 2020, pursuant to which they are entitled to receive a dividend equal initially to (i) 2 percent of the stated value of the Series B Convertible Preferred Stock plus (ii) all accrued and unpaid dividends. The dividends are payable in additional shares of Series B Convertible Preferred Stock. The dividend rate increases by 2 percent on each quarterly dividend payment date for as long as the Series B Convertible Preferred Stock remains outstanding.
- In the event of a liquidation, the holders of Series B Convertible Preferred Stock have a liquidation preference that stipulates they would be paid \$1,000 per share of Series B Convertible Preferred Stock plus the amount of the accrued dividends to the point of liquidation, prior to any payment to holders of junior securities, including common stock.

The Series B Convertible Preferred Stock automatically converted to 718,750 shares of common stock on January 15, 2020, upon the Company's filing of a Charter Amendment as a result of shareholder approval for the reverse stock split.

When converted, the shares of Series A Convertible Preferred Stock and Series B Convertible Preferred Stock are 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, 2019:

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Issuance	Number of Common Shares Issuable Upon Exercise of Outstanding Warrants	Exercise Price	Balance Sheet Classification	Expiration Date
November 2019 Public Offering - Series A	718,750	\$ 8.00	Liability	May 19, 2022
November 2019 Public Offering - Series B	718,750	\$ 8.00	Liability	May 19, 2027
November 2019 Private Placement - Series A	718,750	\$ 8.00	Liability	May 19, 2022
November 2019 Private Placement - Series B	718,750	\$ 8.00	Liability	May 19, 2027
December 2017 Public Offering - Series A	160,975	\$ 90.00	Equity	December 21, 2022
July 2017 Registered Direct Offering	14,270	\$ 201.60	Equity	January 7, 2024
Consultant	750	\$ 116.00	Equity	September 11, 2024
Total	3,050,995			

After December 31, 2019, and through March 20, 2020, Yield10 received a further \$1,638 in cash from the exercise of 204,796 warrants issued in the November 2019 offering. During 2018 a total of 1,378 Series B warrants from the Company's December 2017 public offering were exercised resulting in the issuance of 1,378 shares of common stock and the Company's receipt of \$124 in cash proceeds. On September 21, 2018, the remaining unexercised Series B warrants from the December 2017 public offering expired in accordance with their terms.

### Reserved Shares

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

	December 31, 2019	December 31, 2018
Stock Options	62,065	43,633
RSUs	—	171
Series A Convertible Preferred Stock - November 2019 Public Offering	99,500	—
Warrants	175,995	185,827
Total number of common shares reserved for future issuance	337,560	229,631

As of the December 31, 2019, the Company did not have sufficient authorized and available shares of common stock to permit conversion of the 718,750 Series B Convertible Preferred Stock sold in the November 2019 private placement or to permit the exercise of the 2,875,000 combined Series A Warrants and Series B Warrants issued in the concurrent public and private offerings. Shares of common stock became available for issuance through the Company's filing of a Charter Amendment for the reverse stock split on January 15, 2020. The Series B Convertible Preferred Stock and the Series A Warrants and Series B Warrants have therefore been excluded from the table of reserved shares shown above.

### 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, nonqualified stock options, stock appreciation rights, deferred stock awards, restricted stock awards, unrestricted

# YIELD10 BIOSCIENCE, INC.

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

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, 2019, 509 of these options remain outstanding and eligible for future exercise.

The 2014 Plan provides for the granting of incentive stock options, nonqualified 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 (the "2018 Stock Plan"). A total of 16,896 options have been awarded from the 2014 Plan and as of December 31, 2019, 16,699 of these options remain outstanding and eligible for future exercise. A total of 3,619 restricted stock awards have been awarded from the 2014 Plan and as of December 31, 2019, none of these restricted stock awards are unvested and outstanding. No further stock awards may be issued from the 2014 Plan.

The 2018 Stock Plan reserves for issuance 32,500 shares of the Company's common stock for grants of incentive stock options, nonqualified stock options, stock grants and stock-based awards. Shares available under the 2018 Stock Plan may be increased on the first day of January 2019 and 2020 in an amount equal to 5% of the outstanding shares of common stock on the day prior to the increase in each respective year or such smaller number of shares of common stock as determined by the Board of Directors. The Company's Board of Directors approved the addition of 12,532 and 46,672 shares, respectively, to the 2018 Stock Plan which represented 5% of the outstanding shares of common stock on December 31, 2019 and December 31, 2018. As of December 31, 2019, a total of 44,884 options have been awarded from the 2018 Stock Plan, and as of that date, 44,378 options 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 \$656 and \$1,181 for the years ended December 31, 2019 and 2018, respectively. At December 31, 2019, there was approximately \$1,225 of stock-based compensation expense related to unvested awards not yet recognized which is expected to be recognized over a weighted average period of 2.87 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, or 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.

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, 2018	43,633	\$ 254.00		
Granted	18,923	35.31		
Exercised	—	—		
Forfeited	(444)	54.30		
Expired	(47)	13,202.22		
Balance at December 31, 2019	62,065	178.95	8.13	\$ —
Vested and expected to vest at December 31, 2019	62,065	178.95	8.13	\$ —
Exercisable at December 31, 2019	31,927	300.03	7.40	—

# YIELD10 BIOSCIENCE, INC.

## NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS

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The weighted average grant date fair value per share of options granted during fiscal years 2019 and 2018, was \$30.77, and \$53.04, respectively. No options were exercised during 2019 and 2018, 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, 2019 was 8.13 years.

For the years ended December 31, 2019, and 2018, 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,	
	2019	2018
Expected dividend yield	—	—
Risk-free rate	1.7% - 2.5%	2.6% - 3.1%
Expected option term (in years)	6.0 - 10.0	5.5 - 5.9
Volatility	107% - 124%	107% - 110%

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 vesting period based on each RSU's award date market value. The Company did not award any RSUs during the years ended December 31, 2019 and December 31, 2018.

The Company pays minimum required income tax withholding associated with RSUs for its employees. As the RSUs vest, the Company will withhold a number of shares 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. During the years ended December 31, 2019 and December 31, 2018, the Company withheld vested shares with a fair value of \$4 and \$6 to pay for minimum tax withholding associated with RSU vesting.

A summary of RSU activity for the year ended December 31, 2019 is as follows:

	Number of RSUs	Weighted Average Remaining Contractual Life (years)
Outstanding at December 31, 2018	171	
Awarded	—	
Released	(171)	
Forfeited	—	
Outstanding at December 31, 2019	—	—
Weighted average remaining recognition period (years)	—	



**YIELD10 BIOSCIENCE, INC.****NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS**  
**(In thousands, except for share and per share amounts)****11. LEASES***New Lease Accounting*

Topic 842 became effective for annual reporting periods beginning after December 15, 2018. The Company adopted Topic 842 on January 1, 2019 and elected to apply the new lease accounting requirements to the earliest period presented in its comparative financial statements, using the modified retrospective approach. The guidance also required additional financial statement disclosures to enable users of financial statements to better assess the amount, timing, and uncertainty of cash flows arising from leases. Topic 842 replaced the previous lease accounting and reporting guidance of ASC Topic 840, *Leases*, ("ASC Topic 840") and required lessees to reflect a right-of-use asset and a lease liability on their balance sheet for leases with terms of more than twelve months.

Application of Topic 842 to the accompanying financial statements for 2019 and 2018 resulted in it reporting right-of-use assets of \$3,141 and \$4,766 and lease liabilities of \$4,221 and \$6,465 for real estate and equipment leases as of December 31, 2019 and December 31, 2018, respectively. The Company also eliminated \$1,005 in lease incentive obligations from its balance sheet as of December 31, 2018, as a result of the discontinuation of the previous guidance under ASC Topic 840. The impact of the application of the new pronouncement to the Company's statement of operations for the years ended December 31, 2019 and December 31, 2018 was immaterial.

Under Topic 842, leases are classified as either operating or finance leases, with classification based on criteria similar to previous lease accounting guidance, but without the explicit quantitative determining factors used to establish a lease as either a capital or an operating lease. The Company reviewed its 2019 and 2018 leases falling within the scope of Topic 842 and determined that all of these leases met the criteria for classification as operating leases.

Lease liabilities are recorded as of their commencement date and are 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. Right-of-use assets are equal to the lease liability with adjustments made, as necessary, for lease prepayments, lease accruals, initial direct costs, lessor lease incentives and any lease impairments that may be present. Topic 842 further requires that lease expense for operating leases be calculated on a straight-line basis and reported as a single operating expense within income from operations.

Topic 842 provides a number of transitional practical expedients designed to assist lessees with initial implementation. The Company made the following elections in applying Topic 842.

- *Short-term lease exception.* Active leases as of January 1, 2018, and new leases entered into thereafter with terms of twelve months or less were and will be excluded from accounting under Topic 842.
- *Package of practical expedients.* These expedients, which must be elected in their entirety, permit a company to continue its historical accounting during the transition period for contractual arrangements containing embedded leases in lieu of performing a re-evaluation of the agreements in order to separate lease and non-lease components. The package of expedients also permits a company to maintain its previous accounting classification for transitional leases as either operating or finance leases without reassessment under the new guidance. Lastly, the package of practical expedients does not require reassessment and capitalization of initial direct costs incurred to establish a lease.

In applying the guidance of Topic 842 to the years ended December 31, 2019 and December 31, 2018, the Company did not elect the available hindsight expedient with respect to the determination of lease terms used in the calculation of lease liabilities and right-of-use assets by considering the actual outcome of lease renewals.

In November 2019, the Company entered into a lease modification with the landlord for its headquarters located in Woburn, Massachusetts, as described further below. As a result of returning 7,409 square feet of space to the landlord for the remaining seven-year lease term, the Company remeasured and reduced its associated right-of-use asset and lease liability by \$1,011 and \$1,401, respectively and recorded a charge to lease expense of \$390.

# YIELD10 BIOSCIENCE, INC.

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

### Maturity Analysis of Lease Liabilities

At December 31, 2019, the Company's lease liabilities will mature as follows:

Year ended December 31,	Undiscounted Cash Flows
2020	\$ 884
2021	704
2022	726
2023	749
2024	771
Thereafter	1,540
Total undiscounted future lease payments	5,374
Discount	(1,153)
Total lease liabilities	\$ 4,221
Short-term lease liabilities	\$ 602
Long-term lease liabilities	\$ 3,619

At December 31, 2019, real estate and equipment leases represent approximately 99% and 1%, of the Company's lease liabilities, respectively.

### Quantitative Disclosure of Lease Costs

	Year ended December 31,	
	2019	2018
<b>Lease cost:</b>		
Operating lease cost	\$ 640	\$ 1,319
Short-term lease cost	569	480
Sublease income	(539)	(474)
Total lease cost, net	\$ 670	\$ 1,325

Operating lease cost of \$640 is shown net of a reduction of \$390 related to the Company's modification to its Woburn, Massachusetts lease described above.

Other information as of:	December 31, 2019	December 31, 2018
Weighted-average remaining lease term (years)	6.7	7.4
Weighted-average discount rate	7.24%	6.75%

### Real Estate Leases

During 2016, the Company entered into a lease agreement for its headquarters, pursuant to which the Company leased approximately 29,622 square feet of office and research and development space located at 19 Presidential Way, Woburn, Massachusetts. The lease began on June 1, 2016 and will end on November 30, 2026. The lease agreement does not include any options for the early termination or the extension of the lease. The Company provided the landlord with a security deposit in the form of a letter of credit in the amount of \$307. Pursuant to the lease, the Company will also pay certain taxes and operating costs associated with the premises throughout the term of the lease. During the buildout of the rented space, the landlord paid \$889 for tenant improvements to the facility and an additional \$444 for tenant improvements that result in increased rental payments by the Company. Upon the adoption of Topic 842, these improvements were recorded as a reduction in the valuation of the right-of-use asset.

# YIELD10 BIOSCIENCE, INC.

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In November 2019, the Company entered into a modification to the Woburn lease in which Yield10 permanently returned 7,409 square feet of underutilized space to the landlord for the seven-year duration of the lease. In exchange for returning the space, the landlord agreed to fund modifications and upgrades to the remaining office space retained by the Company. The modifications were completed in February 2020 and after that point the Company has no further financial obligations for the vacated space and lease rental charges, including utility, maintenance and real estate tax charges, were proportionally reduced. The security deposit was also proportionally reduced to \$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 unaffected by the Company's recent lease modification with the landlord and remains coterminous with the Company's master lease. CJ will pay pro rata rent and operating expenses equal 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 \$5,374 shown in the lease maturity analysis table above. CJ provided the Company with a security deposit of \$103 in the form of an irrevocable letter of credit.

The Company also leases approximately 13,702 square feet of office and laboratory space at 650 Suffolk Street, Lowell, Massachusetts. The lease for this facility, as amended, expires in May 2020. During July 2018, the Company discontinued further use of the Lowell space, and as a result, the Company recorded a non-cash lease exit charge of \$255 for the facility in accordance with ASC Topic 420-10, *Exit or Disposal Obligations*. The exit charge was recorded as an increase in the Company's lease expense and a reduction to the associated right-of-use asset. The Company will continue to make monthly rental payments for the Lowell facility through its expiration in May 2020. The Company does not anticipate incurring significant charges in returning this space to the landlord.

The Company's wholly-owned subsidiary, Metabolix Oilseeds, Inc. ("MOI"), located in Saskatoon, Saskatchewan, Canada, leases approximately 7,000 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 the leases contain renewal or early termination options. MOI's leases for these facilities expire on various dates through September 30, 2020.

## 12. Income Taxes

### *Income Taxes and Deferred Tax Assets and Liabilities*

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

	Year Ended December 31,	
	2019	2018
Domestic	\$ (13,394)	\$ (12,288)
Foreign	184	3,103
Net loss from operations before income tax benefit	\$ (13,210)	\$ (9,185)

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The components of the income tax benefit consisted of the following for the years ended December 31, 2019 and 2018:

	<b>Year Ended December 31,</b>	
	<b>2019</b>	<b>2018</b>
<b>Current Tax Benefit:</b>		
Federal	\$ —	\$ —
State	—	—
Foreign	—	—
Total current	—	—
<b>Deferred Tax Benefit:</b>		
Federal	—	—
State	—	—
Foreign	(254)	—
Total deferred	(254)	—
Total tax provision (benefit)	\$ (254)	\$ —

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

	<b>Year Ended December 31,</b>	
	<b>2019</b>	<b>2018</b>
<b>Deferred Tax Assets:</b>		
Net operating loss carryforward	\$ 25,799	\$ 24,261
Capitalization of research and development expense	1,162	1,385
Credit carryforwards	2,332	2,664
Capital loss carryover	646	—
Stock compensation	915	966
Lease liability	1,141	—
Other temporary differences	303	695
Total deferred tax assets.	32,298	29,971
Valuation allowance	(30,953)	(29,672)
Net deferred tax assets	1,345	299
<b>Deferred Tax Liabilities:</b>		
Depreciation	(246)	(299)
Right-of-use asset	(845)	—
Net deferred taxes	\$ 254	\$ —

# YIELD10 BIOSCIENCE, INC.

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

### Tax Rate

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

	Year Ended December 31,	
	2019	2018
Federal income tax at statutory federal rate	21.0 %	21.0 %
State taxes	2.0 %	8.0 %
Permanent differences	(0.4)%	(0.1)%
Tax credits	0.6 %	3.1 %
Canada credit audit adjustment	(2.6)%	0.0 %
Foreign rate differential	(0.1)%	0.0 %
Non-deductible equity transactions	(7.5)%	0.0 %
Stock compensation	(0.9)%	(3.6)%
Other	(0.7)%	0.6 %
Change in valuation allowance	(9.5)%	(25.2)%
German subsidiary dissolution	0.0 %	(3.8)%
Total	1.9 %	0.0 %

### Tax Attributes

At December 31, 2019, the Company had U.S. net operating loss carryforwards (NOLs) for federal and state income tax purposes of approximately \$95,626 and \$90,461, respectively. Included in the \$95,626 of federal net operating losses are losses of \$17,817 that will carry forward indefinitely. The remaining federal net operating losses of \$77,809 will begin to expire in 2033. The Company's state net operating loss carryforwards will begin to expire on various dates through 2039. The Company also had available research and development and investment tax credits for federal and state income tax purposes of approximately \$1,404 and \$860, respectively. These federal and state credits will begin to expire on various dates through 2039. In Canada, the Company has cumulative research tax credits totaling \$254 that will begin to expire on various dates through 2035.

Management of the Company has evaluated the positive and negative evidence bearing upon the realizability of its deferred tax assets, which are comprised principally of net operating loss carryforwards and research and development credits. 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. deferred tax assets. During 2019 the Company reduced the amount of credits available based upon the conclusion of a tax audit in Canada. As a result, management re-assessed the Company's reduced deferred tax assets and its recent profit history and concluded that it is more likely than not that the Company will recognize the benefit of all the remaining Canadian deferred tax assets. As such, an income tax benefit to reverse the valuation allowance previously established in Canada has been recorded during the fourth quarter of 2019.

Utilization of the net operating loss and research and development credit carryforwards may be subject to a substantial annual limitation under Section 382 of the Internal Revenue Code of 1986 due to ownership change limitations that have occurred previously or that could occur in the future. These ownership changes may limit the amount of net operating loss and research and development credit carryforwards that can be utilized annually to offset future taxable income and tax, respectively. The Company completed an evaluation of its ownership changes through December 31, 2015 and determined that an ownership change occurred on August 22, 2014 in connection with an equity offering. As a consequence of this ownership change, the Company's NOLs, tax credit carryforwards and other tax deductions allocable to the tax periods preceding the ownership change became subject to limitation under Section 382. The Company has reduced its associated

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deferred tax assets accordingly. The Company has not yet completed an evaluation of ownership changes for the years 2016 through 2019. To the extent an ownership change occurs in the future, the net operating loss, credit carryforwards and other deferred tax assets may be subject to further limitations.

*Other*

During the year ended December 31, 2018, the Company dissolved its wholly-owned German subsidiary, Metabolix GmbH, that has been inactive since 2014. As a result of this decision, in 2018 the Company wrote off the German deferred tax assets and related full valuation allowance resulting in no impact to the tax provision. The majority of the assets were net operating loss carryforwards.

The tax years 2016 through 2019 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 net operating losses 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, 2019 and 2018, 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, 2019 and December 31, 2018 approximated \$778 and \$593, respectively.

**13. Employee Benefits**

The Company maintains a 401(k) savings plan in which substantially all of its regular U.S. employees are eligible to participate. Participants may contribute up to 60% of their annual compensation to the plan, subject to eligibility requirements and annual IRS limitations. The Company's plan provides for a matching contribution in common stock of up to 4.5% of a participant's total compensation dependent upon the level of participant contributions made during the plan year. Pursuant to this plan, the Company issued 2,885, and 1,638 shares of common stock during the years ended December 31, 2019, and December 31, 2018, respectively, and recorded \$98, and \$102, respectively, of related expense. Company contributions are fully vested upon issuance.

**14. U.S. Department of Energy Grants**

On April 17, 2018 the Company entered into a sub-award with Michigan State University ("MSU") to support a Department of Energy funded grant entitled "*A Systems Approach to Increasing Carbon Flux to Seed Oil*." The Company's participation under this grant commenced on September 15, 2017 and as of December 31, 2019, the first three years of the sub-award totaling \$1,698 have been authorized. The Company anticipates that additional two option years will be awarded annually to Yield10 through September 14, 2022 for total sub-award funding of \$2,957, provided the U.S. Congress continues to appropriate funds for the program, the Company is able to make progress towards meeting grant objectives and it remains in compliance with other terms and conditions of the sub-award. During the years ended December 31, 2019 and December 31, 2018, the Company recognized \$806 and \$419, respectively, in revenue related to this sub-award.

In 2015, the Company entered into a multi-year \$1,997 grant agreement entitled, *Production of High Oil, Transgene Free Camelina Sativa Plants through Genome Editing*, with the U.S. Department of Energy for the development of Camelina sativa feedstock. The Company used the funds to perform research to increase oil content and/or seed yield to maximize oil yields per acre. The Company recognized revenue from the grant over the term of the agreement as it incurred related research and development costs and it met its prorated cost-sharing obligation of approximately \$500. During the years ended

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## NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS

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December 31, 2019 and December 31, 2018, the Company recognized \$0 and \$137, respectively, in revenue related to this grant. The grant ended September 30, 2018 and all revenue under the grant has been recognized.

### 15. Geographic Information

The geographic distribution of the Company's revenues and long-lived assets from continuing operations is summarized as follows:

	U.S.	Canada	Eliminations	Total
Year Ended December 31, 2019				
Net revenues to unaffiliated customers	\$ 806	\$ —	\$ —	\$ 806
Inter-geographic revenues	—	1,883	(1,883)	—
Net revenues	<u>\$ 806</u>	<u>\$ 1,883</u>	<u>\$ (1,883)</u>	<u>\$ 806</u>
Identifiable long-lived assets	\$ 1,186	\$ 57	\$ —	\$ 1,243
Year Ended December 31, 2018				
Net revenues to unaffiliated customers	\$ 556	\$ —	\$ —	\$ 556
Inter-geographic revenues	—	1,418	(1,418)	—
Net revenues	<u>\$ 556</u>	<u>\$ 1,418</u>	<u>\$ (1,418)</u>	<u>\$ 556</u>
Identifiable long-lived assets	\$ 1,372	\$ 13	\$ —	\$ 1,385

Foreign revenue is based on the country in which the Company's subsidiary that earned the revenue is domiciled. During 2019, grant revenue earned from the Company's Michigan State University sub-award totaled \$806, or 100% of the Company's total revenue.