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

FORM 10-K

(Mark One)

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

For the fiscal year ended December 31, 2020

OR

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

Commission File Number 001-37383

Arcadia Biosciences, Inc.

(Exact name of Registrant as specified in its Charter)

Delaware **(State or other jurisdiction of incorporation or organization)**	**81-0571538** **(I.R.S. Employer Identification No.)**
202 Cousteau Place, Suite 105 **Davis, CA** **(Address of principal executive offices)**	**95618** **(Zip Code)**

(530) 756-7077
(Registrant's Telephone Number, Including Area Code)

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	RKDA	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 15(d) of the Act. YES ☐ NO ☒

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

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

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

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

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

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

Indicate by check mark whether the Registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). YES ☐ NO ☒

The aggregate market value of the voting and non-voting common equity held by non-affiliates of the Registrant as of June 30, 2020, the last business day of the Registrant's most recently completed second fiscal quarter, was approximately $33,300,000 (based on the closing price of $3.76 on June 30, 2020 on the NASDAQ Capital Market).

The number of shares outstanding of the Registrant's common stock on March 19, 2021, was 21,336,249 shares.

DOCUMENTS INCORPORATED BY REFERENCE

Information required by Part III of this Annual Report on Form 10-K is incorporated by reference to the Registrant's Definitive Proxy Statement for its 2021 Annual Meeting of Stockholders, which proxy statement will be filed with the Securities and Exchange Commission within 120 days after the end of the fiscal year covered by this Form 10-K.

INTRODUCTION

"Arcadia," the "Company," "we," "our" and "us" are used interchangeably to refer to Arcadia Biosciences, Inc. and its subsidiaries.

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K contains forward-looking statements within the meaning of the federal securities laws, which statements involve substantial risks and uncertainties. Forward-looking statements generally relate to future events, our future financial or operating performance, growth strategies, anticipated trends in our industry, the anticipated impact of the novel coronavirus on our business, and our potential opportunities, plans, and objectives. In some cases, you can identify forward-looking statements because they contain words such as "may," "will," "should," "expects," "plans," "anticipates," "could," "intends," "target," "projects," "contemplates," "believes," "estimates," "predicts," "potential," or "continue" or the negative of these words or other similar terms or expressions that concern our expectations, strategy, plans, or intentions. Forward-looking statements contained in this Annual Report on Form 10-K include, but are not limited to, statements about:

- our or our collaborators' ability to develop commercial products that incorporate our traits and complete the regulatory process for such products;
- our ability to earn revenues from the sale of products that incorporate our traits;
- our ability to maintain our strategic collaborations and joint ventures and enter into new arrangements;
- estimated commercial value for traits;
- market conditions for products, including competitive factors and the supply and pricing of competing products;
- compliance with laws and regulations that impact our business, and changes to such laws and regulations;
- our ability to maintain, protect, and enhance our intellectual property;
- our future capital requirements and our ability to satisfy our capital needs;
- industry conditions and market conditions;
- the preceding and other factors discussed in Part I, Item 1A, "Risk Factors," and other reports we may file with the Securities and Exchange Commission from time to time; and
- the factors set forth in Part II, Item 7, "Management's Discussion and Analysis of Financial Condition and Results of Operations."

We caution you that the foregoing list may not contain all of the forward-looking statements made in this Annual Report on Form 10-K.

You should not rely upon forward-looking statements as predictions of future events. We have based the forward-looking statements contained in this Annual Report on Form 10-K primarily on our current expectations and projections about future events and trends that we believe may affect our business, financial condition, results of operations and prospects. The outcome of the events described in these forward-looking statements is subject to risks, uncertainties and other factors described in the section titled "Risk Factors" and elsewhere in this Annual Report on Form 10-K. Moreover, we operate in a very competitive and rapidly changing environment. New risks and uncertainties emerge from time to time and it is not possible for us to predict all risks and uncertainties that could have an impact on the forward-looking statements contained in this Annual Report on Form 10-K. We cannot assure you that the results, events and circumstances reflected in the forward-looking statements will be achieved or occur, and actual results, events or circumstances could differ materially from those described in the forward-looking statements.

The forward-looking statements made in this Annual Report on Form 10-K relate only to events as of the date on which the statements are made. We undertake no obligation to update any forward-looking statements to reflect events or circumstances or to reflect new information or the occurrence of unanticipated events, except as required by law.

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PART I

Item 1. Business.

Overview

We are a leader in science-based approaches to developing high value crop improvements primarily in wheat, soy and hemp, designed to enhance farm economics by improving the performance of crops in the field, as well as their value as food ingredients, health and wellness products, and their viability for industrial applications. We have used advanced breeding techniques to develop these proprietary innovations which we are now commercializing through the sales of seed and grain food ingredients and products, hemp extracts, trait licensing and royalty agreements.

Our commercial strategy is to satisfy consumer nutrition, health and wellness demands with the superior functional benefits our crops deliver directly from the farm, enabling us to share premium economics throughout the ag-food supply chain and to build a world-class estate of high value traits and varieties.

According to ResearchandMarkets.com, the global wheat flour market in 2019 totaled $181 billion and is expected to reach $220 billion by 2027. It is also estimated by the U.S. Department of Agriculture (“USDA”), that approximately one-quarter of the FDA recommended calories consumed by people in the US are from wheat. Therefore, the market opportunity for nutritional improvements in wheat are significant not only because the wheat market itself is vast, but also because of the “share of stomach” wheat represents. Considering that most people today are not getting enough fiber or protein in their daily diets, the superior nutrient density of our non-GM GoodWheat™ (“GoodWheat”) technology can improve the dietary intake of average consumers, by increasing their fiber and protein consumption without changing the way they eat. We believe this proprietary advantage gives GoodWheat the potential to become a global standard in wheat.

We also believe the recent legalization of hemp in the U.S. and many other areas of the world has created a significant agricultural and financial opportunity that we can participate in meaningfully. The market has demonstrated broad demand for industrial, nutritional, health and wellness products from hemp, yet the genetics have not yet been optimized for industrial scale production setting up a vast, new opportunity for Arcadia to add value to the industry through seed and extract offerings.

The passage of the U.S. Agriculture Improvement Act of 2018 – also known as the Farm Bill – confirmed the federal legalization of hemp, the term given to non-psychoactive cannabis containing less than 0.3% tetrahydrocannabinol (THC). It also included provisions for legalizing on a federal level hemp’s cultivation, transport and sale for the first time in more than 75 years. Hemp, not previously distinguished by the federal government from cannabis, a Schedule 1 drug and banned as an agricultural crop, lacks substantive plant biology research and is limited by suboptimal genetics, highly fragmented germplasm and performance inconsistencies. We are targeting hemp-based solutions that allow farmers to reliably and consistently achieve compliance with USDA regulations, through varieties with improved functionality and application of specific attributes such as select cannabinoid contents for health and wellness, enhanced proteins profiles for plant-based dietary applications and industrial applications such as clothing and hempcrete. Arcadia conducts its business in only federal and state markets in which its activities are legal.

In addition to bringing new hemp varieties to market, we also see an attractive opportunity to service the growing consumer demand for CBD and other hemp-derived cannabinoids. According to a New Frontier Data report issued in March 2020, U.S. consumer spending on CBD is projected to grow from an estimated $14B USD in 2020 to $26B USD in 2025 with global demand accelerating significantly as countries formalize regulatory frameworks for the industry. Backed by our own consumer survey data, we believe our premium Hawaiian grown hemp provides a unique value proposition to consumers that will enable us to rapidly gain traction in the marketplace as we grow our B2B and branded retail business channels.

Arcadia GoodWheat™

In 2018, we launched our GoodWheat brand, a non-genetically modified (non-GM) portfolio of wheat products that enables food manufacturers to differentiate their consumer-facing brands. Consumer food companies are looking to simplify their food ingredient formulations and consumers are demanding “clean labeling” in their foods, paying more for foods having fewer artificial ingredients and more natural, recognizable and healthy ingredients. A 2017 survey by PR agency Ingredient Communications found that 73% of consumers are happy to pay a higher retail price for a food or drink product made with ingredients they recognize. Because GoodWheat increases the nutrient density directly in the primary grains and oils, it provides the mechanism for food formulation simplification naturally and cost effectively to meet evolving consumer demands.

The brand launch is a key element of the company’s go-to-market strategy to achieve greater value for its innovations by participating in downstream consumer revenue opportunities. We designed the brand to make an immediate connection with consumers that products made with GoodWheat meet their demands for healthier wheat options that also taste great. The GoodWheat brand encompasses our current and future non-GM wheat portfolio of high fiber Resistant Starch (RS) and Reduced Gluten wheat varieties, as well as future wheat innovations. In October 2019, the U.S. Patent and Trademark Office granted us the latest patents for extended shelf life wheat, the newest trait in our non-genetically modified wheat portfolio. This new trait was designed to promote whole wheat consumption by improving the shelf life and taste of whole grain wheat products.

With additional patents granted in 2020 we now hold more than 15 global patents on our high fiber Resistant Starch wheat, protecting both bread wheat and durum (pasta) wheat. Claims granted recently strengthen our intellectual property for our Resistant Starch portfolio of products.

We announced in August 2019 an agreement with Bay State Milling Company and Arista Cereal Technologies to bring to market our resistant starch GoodWheat in North America and other key markets, beginning in late 2019. In the daily American diet approximately 500 calories come from wheat products, 25% of the FDA’s recommended daily caloric intake for a woman and 20% for a man. The GoodWheat portfolio of specialty wheat varieties deliver new functional value through an ingredient already an important component of the human diet.

Arcadia GoodHemp™

In December 2019, we announced the launch of a new product line, GoodHemp, as the company's new commercial brand for delivering hemp seeds, transplants, flower and extracts. The acquisition of Industrial Seed Innovations (“ISI”) in August 2020 brought ISI’s portfolio of strong performing, federally compliant hemp varieties to Arcadia’s GoodHemp™ catalog. ISI’s popular Umpqua and Rogue seed varieties each bring unique and highly desirable characteristics to further differentiate Arcadia’s GoodHemp catalog. We have since introduced another variety, Santiam, to the market, and have built a pipeline that is expected to deliver new commercial varieties on an annual basis.

By 2025, the Brightfield Group, a hemp and CBD market research firm, projects U.S. sales of hemp-based CBD to reach $16.8 billion. Additionally, Markets and Markets estimates the non-cannabinoid, industrial hemp global market will exceed $26 billion by 2025.

In future years, we expect to bring to market proprietary and patent-protected varieties of hemp designed for their utility as fiber and hemp-based protein. While the addressable market for hemp in these markets still remains to be determined, it can be estimated that hemp would compete favorably for share in the $40.6 billion global protein extract and isolated protein market forecast in 2025 (source: MarketsandMarkets).

Verdeca HB4® Soybean

In 2012, we partnered with Bioceres, Inc. (“Bioceres”) an Argentina-based technology company, to form Verdeca LLC, (“Verdeca”) a U.S.-based joint venture company to deploy next-generation soybean traits developed to benefit soybean producers through quality improvement, stress mitigation and management practices. The HB4® soybean varieties deliver two layers of value for growers: drought and herbicide tolerance, offering resistance to a broad-spectrum herbicide utilized to prevent growth of a wide range of annual and perennial broadleaf weeds and grasses.

In November 2020, we sold our membership interest in Verdeca to Bioceres in a transaction in which we received cash, shares of Bioceres stock and a royalty stream of up to $10 million on HB4 soybean sales. An additional $2 million in cash is to be paid upon achievement by Verdeca of specific regulatory or commercial milestones. See Note 9 for more information regarding the consideration received.

Our Growth Strategy

We believe there are significant opportunities to grow our business by executing the following elements of our strategy:

- ***Scale up our GoodHemp seed sales, develop and introduce novel genetics in hemp.*** Arcadia has acquired superior germplasm, and through its own breeding program developed a suite of quality hemp seed varieties and is adding to its catalogue by developing more novel, compliant hemp seed varieties possessing productivity, pest resistance and crop quality attributes for license to cultivators, and for derivative products serving the nutraceutical and food industries. Because of our proven ability to develop innovative traits in some of the most complex plant genomes such as wheat, we believe turning our attention to the critical needs facing the rapidly evolving hemp industry greatly enhances our growth markets. In parallel, we are evaluating key partnerships to extend our capabilities vertically to maximize the value creation potential of our innovations.
- ***Accelerate the commercialization of our health and nutrition trait portfolio.*** In 2019, we introduced resistant starch and reduced gluten varieties of GoodWheat to the market and are scaling sales in 2021, working with multiple public breeding platforms and continuing to build partnerships across the wheat value chain, having met the FDA requirement for “high in fiber” and “good source of fiber” designations. We launched a product portfolio of GoodWheat pasta and flour products under the Three Farm Daughters brand with Three Farm Daughters LLLP, that includes artisan linguine, fusilli and fettuccine pasta, in addition to 100% wheat flour. There are more products in the pipeline as we continue to invest in our human resources and commercialization capabilities. As we become more consumer facing and commercially aligned with consumer food companies, greater in-house consumer product knowledge and industry experience will be required. We will continue to invest in acquisition, development and retention of the requisite management and industry experience and production and logistics capacity to fully participate in, and control, the route to market for our high value food ingredients. We will continue to build our commercialization expertise, refine go-to-market strategies and execute branding strategy.
- ***Evaluate acquisitive growth opportunities.*** We intend to evaluate potential acquisitions representing vertical integration opportunities with multiple benefits to Arcadia’s growth plans. These could include integrating further into our hemp and wheat supply chains to enhance margin capture and potentially reduce the impact of future supply chain shocks, as well as speed to market new product innovations and food formulations.

Our Products and Product Development Pipeline

We have improved the quality and nutritional value of plant-based ingredients while improving production efficiency using advanced plant breeding technologies and accelerating innovation through industry leading partners. Our innovations address the challenges facing our food systems as depicted below:

We believe our core competencies in plant genomics position Arcadia for unique innovations in new crops. We leverage a research and development team that has over 100 years of combined experience across best in class technology platforms. Our competitive advantages allow for accelerated discovery and market entry.

GoodWheat

Enhanced Quality Grains

Our GoodWheat brand redesigns wheat as a functional food adding value to the wheat supply chain by enabling a wider range of choices to meet consumer demands. We believe our GoodWheat products will allow consumers to enjoy unique health benefits in their favorite foods featuring wheat. Our GoodWheat product allows consumer food companies to deliver specialty products to discerning consumers. We have multiple programs aimed at developing wheat and other small grains with improved nutritional qualities. One such program generated multiple bread wheat and pasta wheat lines with very high levels of amylose, leading to increased levels of resistant starch. Resistant starch increases the total dietary fiber content of wheat and reduces its glycemic index, which are both desirable nutritional qualities that are important in the management of diabetes and healthy blood glucose levels. High fiber Resistant Starch wheat can deliver fiber and other benefits to refined white flour products and also whole grain food products. In 2016, the FDA approved the use of qualified health claims for corn-based resistant starch in the risk reduction of type-2 diabetes, thus establishing a key precedent for the health benefits associated with this fiber. According to the USDA's What We Eat in America Survey of 2015-2016, only 5% of the U.S. population meets the recommended level of dietary fiber. On average, Americans consume only 57% of the daily recommended levels. We believe improving the fiber content of wheat can deliver improved health benefits to a wide population.

A second program, in collaboration with Ardent Mills, aims at improving the flavor profile and shelf-life of whole wheat. A third program is aimed at reducing gluten in wheat and other grains. This program additionally targets improved protein quality and amino acid profile in wheat. All of these programs utilize our TILLING platform, and the resulting products are non-GM.

High Fiber Resistant Starch Wheat

Our high fiber resistant starch (RS) wheat provides a source of wheat with inherently high levels of resistant starch, increasing the total dietary fiber content of food products without the need for fiber additives from other sources. Currently, corn resistant starch is a product in two market segments: dietary fiber additives and modified starch additives. According to MarketsandMarkets, the global dietary fibers market is projected to reach $6.5 billion by 2022 and the modified starch market is projected to reach $12.4 billion in 2022. Major growth in these markets is being driven by the convenience health food sector and functional food sector. Flour from our RS wheat lines has resistant starch levels that are 12 to 20 times higher than the control wheat, and total dietary fiber, or TDF, which is more than eight times higher than the control. RS wheat flour has been tested in applications in bread, where loaf quality was comparable to bread made with conventional wheat flour, and pasta, where it had the highest consumer preference rankings in tests carried out by a major consumer products company.

RS wheat flour is currently being introduced to North American bakery and CPG companies by our partners, Bay State Milling. In markets outside North America, RS wheat is currently being tested in a range of additional bakery, ready-to-eat cereals and pasta products with industrial partners. We have many RS wheat lines that are being evaluated for optimal quality and agronomic characteristics.

Improved Shelf Life of Whole Grain Flour

The USDA recommends that “at least one serving of grains per day must be whole grain-rich” due to evidence that a diet containing whole grains provides a multitude of benefits, including lower risk of obesity, cardiovascular disease, and type-2 diabetes. Despite these health benefits, consumption of whole grain products is negatively affected by the bitter and rancid flavors and odors that accumulate in whole wheat flour after milling. Our improved stability and flavor wheat lines greatly reduced the production of rancid and bitter compounds in milled whole grain flour as it progresses through the supply chain. Whole wheat flour from these lines is being tested further for sensory characteristics and improved shelf life stability. This new trait could help improve the shelf life and flavor profile of whole grain products, thus reducing formulation costs and increasing consumer preference and palatability for whole grains.

Reduced Gluten (RG) Wheat

Many consumers are interested in reducing levels of gluten in their diet. Critically, for some, this is due to having Celiac disease (CD), an autoimmune disease that impacts many people worldwide with estimates from 1% of the population in Europe to 3.5% in Mexico. Furthermore, non-celiac gluten sensitivity (NCGS) impacts an estimated additional 6% of the population. Both CD and NCGS are characterized by sensitivity to dietary gluten. The only effective treatment of CD and NCGS requires removal of gluten sources from the diet. Since required adherence to a gluten-free diet is extremely difficult to accomplish for average consumers, efforts to develop alternative approaches are needed.

Research conducted by the Connell Group in 2018 indicates there is a significant portion of consumers (26% of general population) that choose to reduce gluten levels in their diet despite not having Celiac disease. Further internal qualitative research conducted in 2019 identified a valuable consumer segment recognized as “Gluten Reducers” who aspire to reduce gluten but are not strict gluten-free.

Arcadia is continuing to advance a new wheat variety with reduced gluten levels. Our proprietary, non-GM wheat variety developed using advanced screening and plant breeding techniques have reduced allergenic glutens and increased essential amino acids such as lysine, along with all the other health benefits of high protein wheat. Importantly, this variety also delivers impressively high fiber content at approximately 14 grams per serving compared to 2-3 grams per serving of traditional wheat, providing additional value to health-conscious consumers as well as optionality as we advance the commercialization of this project. We are breeding the trait into additional commercial wheat varieties and working with food processors to give people a choice to enjoy higher quality wheat in the products they love while reducing gluten in their diet.

Innovative hemp varieties

GoodHemp is our commercial pipeline of superior non-GMO hemp seed varieties. The varieties improve plant quality and productivity, working within federal legal guidelines. GoodHemp products deliver superior emergence and growth characteristics and are available as both seeds and seedlings. Our seed and clone specifications meet compliance requirements because of their low THC profiles, in addition to a multitude of other beneficial characteristics.

With the acquisition of Industrial Seed Innovations ("ISI") in August 2020, ISI's portfolio of strong performing hemp varieties became part of Arcadia's GoodHemp catalog. Umpqua is a CBD dominant variety that is designed to mature earlier than most existing varieties making it very attractive for northern latitudes. Rogue on the other hand is designed to mature later in the season resulting in ultra-high yielding plants in lower latitude geographies with longer growing seasons. We have since released Santiam, a CBD dominant variety designed for performance for the grower unique appeal to the consumer.

In February 2021 four GoodHemp varieties, Umpqua, Rogue, Santiam and Potomac were evaluated and received approval by the National Association of Official Seed Certifying Agencies (AOSCA) variety review board. This represented a significant milestone serving as independent validation that our GoodHemp varieties are distinct, uniform and genetically stable. This certification also enables these GoodHemp varieties to be exported and sold in Canada through our distribution partner Tritium 3H, pending approval from Health Canada.

Nutritional Oils

Gamma Linolenic Acid (GLA) Oil

Under a license agreement with Abbott Laboratories, we developed a new source of vegetable oil with very high levels of gamma linolenic acid, or GLA, an omega-6 fatty acid. To our knowledge, our GLA safflower oil product has the highest concentration of GLA available in any plant oil at 65%; conventional plant oils range from 10 to 22% GLA. We sell the oil in the United States to manufacturers of dietary supplements, nutritional supplements, medical foods, dog food, and other products. GLA safflower oil is also approved in Canada as a natural health product. Our key customers include significant participants in those markets. As part of a series of transactions with Bioceres in November 2020, we extended an exclusive license for future GLA production and sales to Bioceres and will continue to sell the inventory we have on hand.

GLA has multiple clinically demonstrated nutritional and medical benefits, including anti-inflammatory effects, improving skin conditions such as atopic dermatitis and healthy weight management. Our GLA oil may be beneficial when incorporating it into certain foods, dietary supplements, or medical products where conventional sources of GLA are not sufficiently concentrated to deliver amounts that are cost- and performance-effective.

Joint Ventures

Verdeca

In 2012, we partnered with Bioceres, an Argentina-based technology company, to form Verdeca, a U.S.-based joint venture company to deploy next-generation soybean traits, of which we own 50%. We selected Bioceres as our partner in soybeans, the world's fourth largest crop by area grown, due to their desirable trait portfolio, their presence in key South American markets, and the significant presence of large soybean growers in their ownership structure. In November, 2020, we sold our membership interest in Verdeca to Bioceres in a transaction in which we received cash, shares of Bioceres stock and a royalty stream of up to $10 million on HB4 soybean sales. An additional $2 million in cash is to be paid upon achievement by Verdeca of specific regulatory or commercial milestones.

Archipelago Ventures Hawaii, LLC

In August 2019, we formed a new joint venture to serve the Hawaiian, North American and Asian hemp markets, Archipelago Ventures Hawaii, LLC ("Archipelago"). This new venture between Arcadia and Legacy Ventures Hawaii ("Legacy") combines Arcadia's extensive genetic expertise and seed innovation history with Legacy's growth capital and strategic advisory expertise in the Hawaiian markets. Additionally, Legacy brings to the

partnership years of proven success in extraction, product formulation and sales of cannabinol oil and distillate products through its equity partner, Vapen CBD. Legacy was originally formed to be a vehicle for its partners to pursue hemp opportunities within the Hawaiian Islands.

Archipelago creates a vertically integrated supply chain, from seed to sale, we believe the first of its kind in Hawaii, and has three important strategic imperatives: (1) ensure a reliable supply chain during critical scale up of the global hemp market, a major risk mitigation for success, (2) ensure high quality throughout the supply chain, from genetics to the field and field to the customer, and (3) ensure being well-positioned to address the unique needs and opportunities of the Hawaiian market.

Research and Development

Product Development Platforms

With our food and wellness products now entering the market, we are firmly in the commercialization phase of our corporate lifecycle. Moreover, our proven platform technologies in wheat and hemp have broad application across multiple new food and product executions representing significant value enhancement potential. For example, our Three Farm Daughter's pasta and flour products are just two out of potentially hundreds where our nutrition dense GoodWheat can meaningfully improve the nutrition panel and provide cleaner labels on foods like crackers, snack bars, pancakes, and breads, just to name a few. Therefore, we are de-emphasizing new trait discovery R&D and are increasing our focus on food-science innovation to fully leverage the value in our exiting superior wheat and hemp genetics. We are evolving our organizational capabilities to match this strategy progression to include in-house food formulation and CPG supply chain expertise.

Our R&D program to date has been centered around ArcaTech, our proprietary, rapid prototyping and product development pipeline, focused on trait discovery. It is from this system we developed the base platform traits and technologies which we can now leverage as the basis for innovating new food and wellness ingredients to serve the vast addressable markets in wheat and hemp. Therefore, the primary focus of our R&D platform will now be food science innovation, nutrition and wellness product innovation. We will still have residual breeding and introgression work to perform as we complete the agricultural requirements for traits existing in our R&D programs as well new food formulations require.

Food Formulation Innovation. We will expand the application of our innovation platform to build on our pipeline of products focused on health and wellness. Our innovation team is focused on using science-based solutions to leverage our wheat and hemp varieties to develop an array of food products and wellness ingredients. Because we are innovating from directly from our own well-established plant technology traits, we expect this extension of our involvement will provide more meaningful improvements. Through this extended application of the innovation platform, it enables us to be involved in multiple parts of the value chain to ensure the final products adequately capture the spectrum of enriched performance. With our hyper-focused team of scientists, researchers, technicians and chefs, we are positioned to accelerate our reach as wheat and hemp offer unique opportunities for innovative product launches.

Controlled plant growth. The controlled plant growth group manages our growth chamber facilities, where plants are grown under precisely controlled conditions, and our greenhouse facility, consisting of approximately 26,000 square feet of high-quality greenhouse space. They also carry out a number of essential functions to support breeding and prototype evaluation including the phenotypic evaluation of plants, controlled crosses, accelerated breeding protocols, rapid phenotyping as well as conducting seed increases for commercial sale. Additionally, for hemp projects, this team manages our cannabinoid chemistry pipeline, which enables high throughput characterization of cannabinoids and terpenes across all research hemp populations. Our growth chamber facilities are located at our headquarters in Davis, California, and our greenhouses are located nearby in Yolo county California.

Molecular analysis and accelerated breeding. The molecular analysis team plays a critical role in enabling the rapid deployment of our traits into commercially relevant germplasm by deploying genetic markers to track our proprietary gene alleles as we introgress them into new germplasm. This enables us to rapidly develop and select lines for advancement into field evaluation and to expand the commercial offerings of our GoodWheat product lines.

Research, Field Trials, Breeder & Foundation Seed Production. Our trait evaluation and development group is based in Davis, California and conducts remote field operations in American Falls, Idaho; Yuma, Arizona; Brawley, California and multiple locations in Montana, North Dakota, Oregon and Washington. The trait evaluation and development group have extensive field and specialized statistical analytical capabilities that we deploy to support field trial execution and data analysis internally and with our collaborators. Late-stage regional and agronomic trials are intended to develop extensive data on a limited number of potential commercial plant varieties and develop the best crop management practices suited for these commercial products. Similarly, regulatory trials develop data for use in submissions for regulatory review and may involve plant varieties developed by our collaborators or our own oil quality and grain quality programs.

Commercial Seed, and Grain Production. The commercial development group is based in Davis, California. The group conducts grower field trials and manages the commercial seed and grain production throughout the United States working through seed production specialists and growers and elsewhere globally with our collaborators and joint venture partners. Grower field evaluations are designed to test new commercial seed varieties for yield and agronomic performance and as well as characterizing performance of seed and grain quality attributes.

Regulatory Data Generation. Our Analytical Services and Regulatory Science group is located in Davis, California and provides automated DNA preparations, genomic blot analyses, lipid profiling, metabolomics and protein purification services and develops data for use in product selection and validation, certification of SONOVA, GoodWheat and other product specifications, and regulatory submissions. These data support regulatory submissions and provide core trait regulatory packages to our collaborators for use in their crop-specific regulatory applications.

Biological Materials Inventory and Tracking. Our proprietary Pedigree and Inventory Management System, or PIMS, tracks the genetic, phenotypic and location information for all our plant materials. PIMS encompasses genetic elements such as genes and promoters, GM seeds and plant material received by us, as well as seeds and plants developed by us and used in trait development. The performance of our plant materials is recorded through a variety of laboratory and field observations, and the data are stored within PIMS. The location of all plant materials is tracked throughout the plant life cycle. This includes specific seeds planted within a specific plot of a specific field trial, harvest, seed storage location and use by, or distribution of plant material to, our collaborators or elsewhere. PIMS interfaces with our Biotechnology Quality Management System, or BQMS, to manage all movement and release of regulated GM plant materials. This ensures all our plant materials are accounted for, tracked and inventoried, which enables us to maintain control over and documentation of all plant materials.

Intellectual Property

We rely on patents and other proprietary right protections, including trade secrets and contractual protection of our proprietary know-how and confidential information, to preserve our competitive position.

As of December 31, 2020, and in summary, we owned or exclusively controlled 109 issued patents and 61 pending patent applications worldwide. These totals reflect the following: (i) with respect to the U.S. territory, we owned 20 and exclusively in-licensed 4 U.S. issued patents, and we owned 10 U.S. patent applications relating to our trait technologies and business methods; and (ii) in connection with foreign territories, we owned 25 and exclusively in-licensed 59 foreign issued patents, and owned 50 pending foreign patent applications. With respect to all of the foregoing patent assets, our exclusive licenses afford us control over the prosecution and maintenance of the licensed patents and patent applications. These numbers do not include in-licensed patents for which we either do not have exclusive rights (such as certain enabling technology licenses), or for which we have exclusive rights only in a limited field of use or do not control prosecution and maintenance of the licensed patents.

As of December 31, 2020, we had eight registered trademarks in the United States and also six registered trademarks in various other countries.

Key Collaborations

We have established numerous trait collaborations and have developed close relationships with industry-leading seed and consumer product companies. Our partnerships with global strategic seed and consumer product players enable us to further participate in the development and commercialization of innovative products that promise to play significant roles in improving global crop efficiency and enhancing human health. We believe that the expertise and opportunities created by these collaborations represent important assets to our business. Below is a summary of selected collaborative partnerships that we view as key to the achievement of our near-term and mid-term business objectives.

Ardent Mills

In November 2018, we announced our collaboration with Ardent Mills, LLC to develop and commercialize wheat innovations. Ardent Mills, LLC is North America's leading flour-milling and ingredient company. Our first project focuses on extending the shelf life and improving the flavor of whole wheat products.

By using patented Arcadia trait technology, the storage life of whole wheat flour can be extended by slowing the enzymatic processes that reduce shelf life. Because milled flour from wheat carrying Arcadia's trait technology oxidizes more slowly, it also minimizes the bitterness associated with most whole wheat products. This trait is expected to help improve the taste of whole wheat products and help reduce waste.

The extended shelf life wheat trait was developed using our proprietary non-GM wheat genetic diversity TILLING library, an extensive and exclusive resource of trait lines with high-density variations in genetic composition and gene function. Because it is non-GM, the trait has wide application potential across both conventional and organic farming practices. We recently received a U.S. patent for the technology which extends the storage life of whole wheat flour by minimizing oxidation, the latest in our portfolio of wheat trait improvements. We will continue further collaboration with Ardent Mills, LLC and university partners to bring this trait to commercialization in products.

Corteva Agriscience

In August 2017, we entered into a new strategic collaboration with Corteva AgriScience to jointly develop and commercialize a breakthrough improved wheat quality trait in North America. The collaboration leverages our TILLING platform with Corteva Agriscience's enabling technology platforms, high-quality elite germplasm and global commercial channels.

Under the collaboration, the companies will further develop and commercialize an improved wheat quality trait, which has completed initial field trials and is advancing to next-stage field trials. Corteva AgriScience will introgress Arcadia's trait into its proprietary elite germplasm lines and manage all aspects related to the trait commercialization. Certain development costs will be co-funded, and we will share in the commercial value resulting from products produced.

Arista Cereal Seeds Pty Ltd and Bay State Milling Company

In August 2019, we entered into a binding term sheet with Arista and BSM to resolve the parties' disputes, including the Delaware Action and the 716 Interference proceeding. Under the binding term sheet, Bay State Milling Company will become the exclusive commercial partner for our high fiber wheat in North America under Bay State Milling's HealthSense™ brand portfolio, while Arista receives exclusive rights under our high fiber wheat intellectual property in certain geographies, including Australia and Europe. We will continue to market our high fiber wheat under our GoodWheat portfolio of specialty wheat ingredients in other international markets. In December 2019, the three parties entered into a settlement agreement reflecting the terms of the binding term sheet.

Competition

The markets for seed traits and agricultural biotechnology products are highly competitive, and we face significant direct and indirect competition in several aspects of our business. Competition for improving plant

genetics comes from conventional and advanced plant breeding techniques, as well as from the development of advanced biotechnology traits. Other potentially competitive sources of improvement in crop yields include improvements in crop protection chemicals, fertilizer formulations, farm mechanization, other biotechnology, and information management. Programs to improve genetics and chemistry are generally concentrated within a relatively small number of large companies, while non-genetic approaches are underway with broader set of companies.

In general, we believe that our competitors generally fall into the following categories:

- *Specialty health and nutrition ingredient companies*: In response to the growing consumer demand for healthier food alternatives, a number of agricultural and food-based companies are augmenting their product and market strategies to bring new quality food ingredients to market. Calyxt, Inc. (formerly known as Cellectis Plant Sciences, Inc) is an agriculture biotechnology company that has a similar strategy as ours and is using gene-editing technology to create healthier specialty food ingredients and agriculturally advantageous food crops.
- *Large Agricultural Biotechnology, Seed, and Chemical Companies:* According to Phillips McDougall, the leading 10 seed and trait companies as a group invested $3.9 billion in seed and trait research and development in 2017. This includes conventional and advanced plant breeding, as well as biotechnology and gene-editing trait development. According to Phillips McDougall, only a limited number of companies have been actively involved in new trait discovery, development, and commercialization: Corteva (formerly DuPont Pioneer and Dow), Syngenta, BASF, Bayer (including former Monsanto), KWS, and Genective (a joint venture between KWS and Limagrain). Many of these companies have substantially larger budgets for gene discovery, research, development, and product commercialization than we do. Some of these companies also have substantial resources and experience managing the regulatory process for new GM seed traits. Each of Corteva, Syngenta, and Bayer, which accounted for 87% of the 2017 seed trait research and development spend noted above, also have significant chemical crop protection background and businesses. The trait pipelines of these companies are heavily weighted toward biotic stress traits, although they also have significant programs aimed at development of abiotic stress traits and increasingly on output traits such as nutritional content. While these companies have internal programs that may compete with our own, they also seek new traits externally and, as such, some of them either currently are, or may in the future be, our collaborators.
- *Trait Research and Development Companies:* There are a number of companies that specialize in research and development of agricultural yield and product quality traits, and we believe that a dozen or more companies, including Ebbu (acquired by Cannopy Growth), Front Range Biosciences, Segra, Yield 10, Arista, Benson Hill Biosystems, Evogene, Keygene, Oregon CBD, High Grade Hemp, and Trilogene, among others, are competitors in our field. We believe that these companies typically focus on a limited number of traits, and do not generally have the product development and regulatory infrastructure necessary to bring traits to market. Therefore, we believe they typically license trait technologies to large industry players with in-house development and regulatory capabilities at a relatively early stage of development. In the development of nutritional traits using non-GM methods, companies like Calyxt and Arista Cereal Technologies are competitors who are also developing quality traits in wheat and other crops.
- *Companies Focused on the Development and Commercialization of Microbial Crop Enhancements:* The use of microbial products to enhance crop performance via application to soil, seed, or to crops directly is an area where increased research and development activity has been underway for the past decade or more. We believe that there are more than 20 companies of varying size working in this space. There have been a number of acquisitions, including Becker Underwood by BASF, and joint collaborations in this space but multiple independent companies remain, including Verdesian, Marrone Bioinnovations, Biagro Agrinos, Indigo Agriculture, and Bioconsortia. While these companies could be considered to compete with us as their products seek to improve crop yields, we believe that such products and our traits may be additive, or synergistic, to our future products in terms of increasing crop yields.

- *Producers of feminized hemp seed:* Within the nascent hemp seed industry, there have been numerous producers of hemp seed, both large and small, not able to weather the volatility in the market. A few of the producers remaining whom we consider competitors include Oregon CBD, Front Range Biosciences, Trilogene Seeds and High-Grade Hemp Seed, Hemptown USA, among others.
- *Companies Selling Wheat Products:* As we enter the direct to consumer and retail markets with our GoodWheat products, we believe we face significant competition from a variety of consumer-packaged goods companies. Our competitors in the pasta market range from companies like Banza and Ancient Harvest who offer high-nutrition pasta alternatives to large, traditional pasta producers including Barilla and De Cecco. We will face similar competition with our flour products.

Employees

As of December 31, 2020, we had 11 full-time employees dedicated to research and development. Our research and development team possesses technical expertise in molecular biology, biochemistry, genetics, genetic engineering, analytical chemistry, and plant physiology. Our research and development activities are conducted principally at our Davis, California facility, with ongoing field trials conducted in American Falls, Idaho; Brawley, California; Yuma, Arizona; Molokai, Hawaii; and numerous other locations throughout the United States, as well as locations managed by our collaborators worldwide. We have made, and will continue to make, substantial investments in research and development. Our research and development expenses were $8.0 million and $7.1 million in the years ended December 31, 2020 and 2019, respectively.

As of December 31, 2020, we had 58 full-time employees, of whom four hold doctorate degrees. Approximately 11 employees are engaged in research and development and 47 in management, operations, commercial operations, accounting/finance, legal and administration. We believe our employee relations to be good. None of our employees are represented by a labor union or collective bargaining agreement.

Facilities

Our corporate headquarters are located in Davis, California, in a facility consisting of approximately 21,480 square feet of office, laboratory and growth chamber space under a lease which expires on March 31, 2030. This facility accommodates research and development, operations, commercial operations, analytical services, and administrative activities. Our administrative offices in Phoenix, Arizona, consist of 2,976 square feet under a lease expires on December 31, 2021. The facility accommodates our finance and other administrative activities. We lease greenhouse space and farmland for agricultural use in Northern California and Oregon, as well as farmland in Southern California, Idaho and Hawaii. We also lease office and warehouse space in Idaho under a lease that expires on December 31, 2023.

We believe that our leased facilities are adequate to meet our current needs and that, if needed, suitable additional or alternative space will be available to accommodate our operations.

Item 1A. Risk Factors.

You should carefully consider the following risk factors, in addition to the other information contained in this report on Form 10-K, including the section of this report titled "Management's Discussion and Analysis of Financial Condition and Results of Operations" and our financial statements and related notes. If any of the events described in the following risk factors and the risks described elsewhere in this report occurs, our business, operating results and financial condition could be seriously harmed. This report on Form 10-K also contains forward-looking statements that involve risks and uncertainties. Our actual results could differ materially from those anticipated in the forward-looking statements as a result of factors that are described below and elsewhere in this report.

Risks Related to Our Hemp Business

We will be subject to a myriad of different laws and regulations governing hemp and our inability to comply with such laws in a cost-effective manner may have an adverse effect on our business and result of operations.

Laws and regulations governing the use of hemp in the United States are broad in scope, subject to evolving interpretations, and subject to enforcement by a myriad of regulatory agencies and law enforcement entities. Under the Agriculture Improvement Act of 2018, also known as the 2018 Farm Bill, a state or Indian tribe that desires to have primary regulatory authority over the production of hemp in the state or territory of the Indian tribe must submit a plan to monitor and regulate hemp production to the Secretary of the USDA. The Secretary must then approve the state or tribal plan after determining if the plan complies with the requirements set forth in the Agriculture Improvement Act of 2018. The Secretary may also audit the state or Indian tribe's compliance with the federally-approved plan. If the Secretary does not approve the state or Indian tribe's plan, then the production of hemp in that state or territory of that Indian tribe will be subject to a plan established by USDA. USDA published a final rule on January 19, 2021, that provided regulations for the production of hemp in the USA that went into effect on March 22, 2021. We anticipate that some states will seek to have primary regulatory authority over the production of hemp. States that seek such authority may create new laws and regulations that limit or restrict the use of hemp.

Federal and state laws and regulations on hemp may address production, monitoring, manufacturing, distribution, and laboratory testing to ensure that that the hemp has a delta-9 tetrahydrocannabinol concentration of not more than 0.3% on a dry weight basis. Federal laws and regulations may also address the transportation or shipment of hemp or hemp products, as the Agriculture Improvement Act of 2018 prohibits states and Indian tribes from prohibiting the transportation or shipment of hemp or hemp products produced in accordance with that law through the state or territory of the Indian tribe, as applicable. We may be subject to many different state-based regulatory regimens for hemp, all of which could require us to incur substantial costs associated with compliance requirements. Our research and development operations will be restricted to only where such operations are legal on the local, state and federal levels.

The DEA issued an interim final rule to codify statutory amendments to the controlled substances act made by the 2018 farm bill. It is possible that the DEA will make additional changes in a final rule that may have a material impact on our hemp business and our ability to operate.

The Food and Drug Administration has published guidance related to the CBD and hemp-extract business but has not formally released a regulatory framework for the industry. It is possible that the FDA will provide additional guidance or implement future regulations that may have a material impact on our hemp business.

In addition, it is possible that additional regulations may be enacted in the future in the United States and globally that will be directly applicable to our research and development operations. We cannot predict the nature of any future laws, regulations, interpretations, or applications, nor can we determine what effect additional governmental regulations or administrative policies and procedures, when and if promulgated, could have on our business.

We may be forced to dispose of hemp we produce should a harvested crop test in excess of 0.3% THC levels.

The USDA's Final Rule for hemp cultivation mandates that states test hemp crops and dispose of "hot" crops that exceed 0.3% THC. If a producer has produced cannabis exceeding the acceptable hemp THC level, the material must be disposed of in accordance with USDA regulations. Arcadia is responsible for the costs of disposal of non-compliant crops for which it is the producer, which could potentially be significant should a large number of acres test positive.

There is limited operating history in the legal hemp or cannabis industry, which makes it difficult to accurately assess our future growth prospects.

The legal hemp and cannabis industry is an evolving industry that may not develop as expected. Furthermore, our operations continue to evolve as we continually assess new strategic opportunities for our business within this industry. Assessing the future prospects of this industry is challenging in light of both known and unknown risks and difficulties we may encounter. Growth prospects in the legal hemp and cannabis industry can be affected by a wide variety of factors including:

- Competition from other similar companies;
- Fluctuations in the market price of hemp seeds and CBD oil;
- Regulatory limitations on the types of research and development with respect to cannabis;
- Other changes in the regulation of cannabis and legal hemp use; and
- Changes in underlying consumer behavior, which may affect the demand of our legal hemp and cannabis traits.

We may not be able to successfully address the above factors, which could negatively impact our intended business plans and financial statements.

Because we have only recently begun our legal hemp operations, we anticipate our operating expenses will increase prior to earning meaningful revenue from these operations.

As we execute our business plan with respect to legal hemp, we anticipate significant increases in our operating and production expenses, and we may not realize significant revenues from such operations. As a result, the Company may incur significant financial losses with respect to such operations in the foreseeable future. There is no history upon which to base any assumption as to the likelihood that these operations will prove successful.

Negative press from being in the hemp/cannabis space could have a material adverse effect on our business, financial condition, and results of operations.

The hemp plant and the cannabis/marijuana plant are both part of the same *cannabis sativa* genus/species of plant, except that hemp, by definition, has less than 0.3% THC content, but the same plant with a higher THC content is cannabis/marijuana, which is legal under certain state laws, but which is not legal under federal law. The similarities between these plants can cause confusion, and our activities with legal hemp may be incorrectly perceived as us being involved in federally illegal cannabis. Also, despite growing support for the cannabis industry and legalization of cannabis in certain U.S. states, many individuals and businesses remain opposed to the cannabis industry. Any negative press resulting from any incorrect perception that we have entered into the cannabis space could result in a loss of current or future business. It could also adversely affect the public's perception of us and lead to reluctance by new parties to do business with us or to own our common stock. We cannot assure you that additional business partners, including but not limited to financial institutions and customers, will not attempt to end or curtail their relationships with us. Any such negative press or cessation of business could have a material adverse effect on our business, financial condition, and results of operations.

Risks Related to Our Business and Our Other Industries

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

Our results of operations could be adversely affected by general conditions in the global economy and in the global financial markets. A global financial crisis or a global or regional political disruption could cause extreme volatility in the capital and credit markets. For example, outbreaks of epidemic, pandemic, or contagious diseases, such as the current COVID-19 pandemic, could disrupt our business. Business disruptions could include disruptions to the productivity of our employees working remotely and restrictions on their travel may hinder their ability to meet with potential customers and close transactions, as well as temporary closures of the facilities of suppliers or contract growers in our supply chain. While we've seen very recent signs of improvement, hemp growers have been slower to make decisions to purchase hemp seeds due to economic uncertainty and wheat consumer packaged goods companies have been heavily focused on production over R&D evaluation as demand for staples like pasta and flour have increased. In addition, the COVID-19 outbreak may result in a severe economic downturn and has already significantly affected the financial markets of many countries. A severe or prolonged economic downturn or political disruption could result in a variety of risks to our business, including our ability to raise capital when needed on acceptable terms, if at all. A weak or declining economy or political disruption could also strain our manufacturers or suppliers, possibly resulting in supply disruption, or cause our customers to delay making payments for our services. Any of the foregoing could harm our business and we cannot anticipate all of the ways in which the political or economic climate and financial market conditions could adversely impact our business.

We or our partners may not be successful in developing commercial products that incorporate our traits and for which there is consumer demand.

Our future growth depends on our ability to monetize the trait assets we've created by bringing products to market that incorporate our technology, as well as licensing these traits to our collaborators to develop and commercialize seeds and products that contain our traits. The development process could take longer than we anticipate or could ultimately fail to achieve commercial success for any of the following reasons, including but not limited to: non-competitive pricing, ineffective advertising and marketing campaigns, increased competition, failure to align with consumer tastes and lack of brand acceptance.

If products containing our traits are never commercialized or are not well-received in the marketplace, our ability to generate revenues and become profitable, as well as our long-term growth strategy, would be materially and adversely affected. Even if we or our collaborators are able to develop commercial products that incorporate our traits, any such products may not achieve commercial success as quickly as we project, or at all.

We have a history of significant losses, which we expect to continue, and we may never achieve or maintain profitability.

We have incurred significant net losses since our formation in 2002 and expect to continue to incur net losses for the foreseeable future. We incurred net losses of $6.0 million, and $28.9 million for the years ended December 31, 2020 and 2019, respectively. As of December 31, 2020, we had an accumulated deficit of $211.8 million. Net cash used in operations was $30.2 million and $17.2 million for the years ended December 31, 2020 and 2019, respectively. We expect to continue to incur losses. Because we have incurred and will continue to incur significant costs and expenses for these efforts before we obtain any incremental revenues from the sale of seeds or products incorporating our traits, our losses in future periods could be even more significant. In addition, we may find our development and commercialization efforts are more expensive than we anticipate or that they do not generate revenues in the time period we anticipate, which would further increase our losses. If we are unable to adequately control the costs associated with operating our business, including costs of development and commercialization of our traits, our business, financial condition, operating results, and prospects will suffer.

We may require additional financing and may not be able to obtain such financing on favorable terms, if at all, which could force us to delay, reduce, or eliminate our research and development activities.

We will continue to need capital to fund our development projects, the commercialization of our products, and to provide working capital to fund other aspects of our business. If our capital resources are insufficient to meet our capital requirements, we will have to raise additional funds. If future financings involve the issuance of equity securities, our existing stockholders would suffer dilution. If we are able to raise debt financing, we may be subject to restrictive covenants that limit our operating flexibility. We may not be able to raise sufficient additional funds on terms that are favorable to us, if at all. If we fail to raise sufficient funds and continue to incur losses, our ability to fund our operations, take advantage of strategic opportunities, develop and commercialize products or technologies, or otherwise respond to competitive pressures could be significantly limited. If this happens, we may be forced to delay or terminate research and development programs or the commercialization of products or curtail operations. If adequate funds are not available, we will not be able to successfully execute on our business strategy or continue our business.

Our gross profit margins on the products we've recently introduced containing our GoodWheat as an ingredient may be impacted by a variety of factors, including but not limited to, variations in raw materials and packaging pricing, customer requirements, market acceptance rate and promotional support costs.

We expect that our gross profit as a percentage of net sales could fluctuate as a result of a number of factors, including product pricing, retail discounts, and the availability and cost of ingredients and packaging. In addition, our gross profit margin may be impacted by shifts in the overall mix of products having a higher or lower profit margin. If we are not able to increase our selling prices or reduce product sizes sufficiently, or in a timely manner, to offset increased raw material, packaging, or other input costs, or if our sales volume decreases significantly, there could be a negative impact on our financial condition and results of operations. Should the rate of market acceptance of our products be slower than anticipated, we may incur additional expense by increasing promotional activities.

Competition in 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 products containing our traits. In addition, several of our competitors have substantially greater financial, marketing, sales, distribution, research and development, and technical resources than us, and some of our 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.

We rely on third parties to conduct, monitor, support, and oversee field trials and commercial production 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 collaborators' ability to complete the regulatory process for or commercialize such products.

We rely on third parties, including farmers, to conduct, monitor, support, and oversee field trials and commercial production. As a result, we have less control over the timing and cost of these activities than if we conducted them 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 and commercial production in the manner we anticipate. In addition, there is no guarantee that these third parties will devote adequate time and resources to our activities or perform as required by our contract or in accordance with regulatory requirements, including maintenance of field trial or production information. If these third parties fail to meet expected deadlines, fail to transfer to us any regulatory or other 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 and commercial production of our products in development may be extended or delayed with additional costs incurred, or our data may be rejected by the USDA or FDA, the U.S. Environmental Protection Agency, or EPA, or other regulatory agencies. Ultimately, we are responsible for ensuring that each of our field trials and commercial production is conducted in accordance with the applicable protocol, legal, regulatory and scientific standards, and our reliance on third parties does not relieve us of our responsibilities.

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 growers or other suppliers can involve substantial cost and require extensive management time and focus. In addition, there is a natural transition period when a new farmer or other third party commences work. As a result, delays may occur, which can materially impact our ability to meet our desired development or commercial timelines. If we are required to seek alternative supply arrangements, the resulting delays and potential inability to find a suitable replacement could materially and adversely impact our business.

Most of our collaborators have significant resources and development capabilities and may develop their own products that compete with or negatively impact the advancement or sale of products containing our traits.

Most of our collaborators are significantly larger than us and may have substantially greater resources and development capabilities. As a result, we are subject to competition from many of our collaborators, who could develop or pursue competing products and traits that may ultimately prove more commercially viable than our traits. In addition, former collaborators, by virtue of having had access to our proprietary technology, may utilize this insight for their own development efforts, despite the fact that our collaboration agreements prohibit such use. The development or launch of a competing product by a collaborator may adversely affect the advancement and commercialization of any traits we develop and any associated research and development and milestone payments and value-sharing payments we receive from the sale of products containing our traits.

Our joint venture agreements could present a number of challenges that may have a material adverse effect on our business, financial condition, and results of operations.

Our joint venture arrangements may present financial, managerial, and operational challenges, including potential disputes, liabilities, or contingencies and may involve risks not otherwise present when operating independently, including:

- our joint venture partners may have business interests, goals or cultures that are or become inconsistent with our business interests, goals or culture;
- our joint venture partners may share certain approval rights,

- we may incur liabilities or losses as a result of an action taken by the joint venture or our joint venture partners;
- our joint venture partners may take action contrary to our instructions, requests, policies or objectives, which could reduce our return on investment, harm our reputation or restrict our ability to run our business; and
- disputes between us and our joint venture partners may result in delays, litigation or operational impasses.

The risks described above or the failure to continue any joint venture or joint development arrangement or to resolve disagreements with our current or future joint venture partners could materially and adversely affect our ability to transact the business that is the subject of such joint venture, which would in turn negatively affect our financial condition and results of operations.

We and our collaborators may disagree over our right to receive payments under our collaboration agreements, potentially resulting in costly litigation and loss of reputation.

Our ability to receive payments under our collaboration agreements depends on our ability to clearly delineate our rights under those agreements. We typically license our intellectual property to our collaborators, who then develop and commercialize seeds with improved traits. However, a collaborator may use our intellectual property without our permission, dispute our ownership of certain intellectual property rights, or argue that our intellectual property does not cover, or add value to, their marketed product. If a dispute arises, it may result in costly patent office procedures and litigation, and our collaborator may refuse to pay us while the dispute is ongoing. Furthermore, regardless of any resort to legal action, a dispute with a collaborator over intellectual property rights may damage our relationship with that collaborator and may also harm our reputation in the industry.

Even if we are entitled to payments from our collaborators, we may not actually receive these payments, or we may experience difficulties in collecting the payments to which we believe we are entitled. After our collaborators launch commercial products containing our licensed traits, we will need to rely on the good faith of our collaborators to report to us the sales they earn from these products and to accurately calculate the payments we are entitled to, a process that will involve complicated and difficult calculations. Although we seek to address these concerns in our collaboration agreements by reserving our right to audit financial records, such provisions may not be effective.

Our business is subject to various government regulations and if we or our collaborators are unable to timely complete the regulatory process for our products in development, our or our collaborators' ability to market our traits could be delayed, prevented or limited.

Our business is generally subject to two types of regulations: regulations that apply to how we and our collaborators operate and regulations that apply to products containing our traits. We apply for and maintain the regulatory permits necessary for our operations, particularly those covering our hemp seed breeding, seed production, and crop production operations or field trials, while we or our collaborators apply for and maintain regulatory approvals necessary for the commercialization of products containing our seed traits. The large-scale field trials that our collaborators conduct during advanced stages of product development are subject to regulations similar to those to which we are subject. 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 products, particularly if the planting period for a crop growing season expires before the necessary permits are obtained. Pursuant to our collaboration agreements, our collaborators also apply for the requisite regulatory approvals prior to commercialization of products containing our traits. In most of our key target markets, regulatory approvals must be received prior to the importation of genetically modified products. These regulatory processes may be complex; for example, the U.S. federal government's regulation of biotechnology is divided among the EPA, which regulates activity related to the use of plant pesticides and herbicides, the USDA, which regulates the import, field testing, interstate movement, and environmental release of specific technologies that may be used in the creation of genetically modified plants, and the FDA, which regulates foods derived from new plant varieties.

In addition to regulation by the U.S. government, products containing our biotech traits may be subject to regulation in each country in which such products are tested or sold. International regulations may vary from country to country and from those of the United States. The difference in regulations under U.S. law and the laws of foreign countries may be significant and, in order to comply with the laws of foreign countries, we may have to implement global changes to our products or business practices. Such changes may result in additional expense to us and either reduce or delay product development or sales. Additionally, we or our collaborators may be required to obtain certifications or approvals by foreign governments to test and sell the products in foreign countries.

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. 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. A delay or denial of regulatory approval could delay or prevent our ability to generate revenues and to achieve profitability. 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 indicated uses for which we or our collaborators may market a product. These limitations could adversely affect our potential revenues. 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. We have on certain occasions notified the USDA of instances of noncompliance with regulations. Although these occasions did not result in any enforcement actions, we may have occasions of noncompliance in the future that result in USDA or other governmental agency enforcement action.

Loss of or damage to our germplasm collection would significantly slow our product development efforts.

We have developed and maintain a comprehensive collection of germplasm through strategic collaborations with leading institutions, which we utilize in our non-GM programs. Germplasm comprises collections of genetic resources covering the diversity of a crop, the attributes of which are inherited from generation to generation. Germplasm is a key strategic asset since it forms the basis of seed development programs. To the extent that we lose access to such germplasm because of the termination or breach of our collaboration agreements, our product development capabilities would be severely limited. In addition, loss of or damage to these germplasm collections would significantly impair our research and development activities. Although we restrict access to our germplasm at our research facilities to protect this valuable resource, we cannot guarantee that our efforts to protect our germplasm collection will be successful. The destruction or theft of a significant portion of our germplasm collection would adversely affect our business and results of operations.

The regulatory environment outside the United States varies greatly from jurisdiction to jurisdiction and there is less certainty how some of our products will be regulated.

We may use gene-editing and TILLING technology to develop some of our product portfolio. The regulatory environment around gene-editing and TILLING in plants for food ingredients is greatly uncertain outside of the United States and varies greatly from jurisdiction to jurisdiction. Each jurisdiction may have its own regulatory framework regarding genetically modified foods, which may include restrictions and regulations on planting and growing genetically modified plants and in the consumption and labeling of genetically modified foods, and which may encapsulate our products. To the extent regulatory frameworks outside of the United States are not receptive to our gene-editing and TILLING technologies, this may limit our ability to expand into other global markets.

Complying with the regulatory requirements outside the United States will be costly and time-consuming, and there is no guarantee we will be able to commercialize our products outside the United States.

We cannot predict whether or when any jurisdiction will change its regulations with respect to our products. Advocacy groups have engaged in publicity campaigns and filed lawsuits in various countries against companies and regulatory authorities, seeking to halt regulatory approval or clearance activities or influence public opinion against genetically engineered and/or gene-edited products. In addition, governmental reaction to negative publicity concerning our products could result in greater regulation of genetic research and derivative products or regulatory costs that render our products cost prohibitive.

The scale of the commodity food industry may make it difficult to monitor and control the distribution of our products. As a result, our products may be sold inadvertently within jurisdictions where they are not approved for distribution. Such sales may lead to regulatory challenges or lawsuits against us, which could result in significant expenses and management attention.

We depend on our key personnel and, if we are not able to attract and retain qualified scientific and business personnel, we may not be able to grow our business or develop and commercialize our products.

Our future performance depends on the continued services and contributions of our management team and other key employees, the loss of whose services might significantly delay or prevent the achievement of our scientific or business objectives. The replacement of any member of our management team involves significant time and costs and such loss could significantly delay or prevent the achievement of our business objectives. A member of our leadership team who has been our employee for many years and therefore, has significant experience and understanding of our business, would be difficult to replace.

Additionally, the majority of our workforce is involved in development and commercial activities. Our business is therefore dependent on our ability to recruit and maintain a highly skilled and educated workforce with expertise in a range of disciplines, including plant genetics, agronomics, agribusiness, marketing, and other subjects relevant to our operations. All of our current employees are at-will employees, and the failure to retain or hire skilled and highly educated personnel could limit our growth and hinder our research and development efforts.

Our business is subject to the risks of earthquakes, fire, flood, crop losses, epidemics, and other catastrophic natural events, and security breaches, including cybersecurity incidents.

Our headquarters, certain research and development operations and our seed storage warehouse are located in Davis, California. Production of hemp and wheat is conducted in California, Hawaii, Oregon, Idaho and other locations. Our seed, grain and hemp crops are vulnerable to adverse weather conditions, including windstorms, floods, drought and temperature extremes, which are common but difficult to predict. In addition, the crops are vulnerable to crop disease and to pests, which may vary in severity and effect, depending on the stage of production at the time of infection or infestation, the type of treatment applied and climatic conditions. Unfavorable growing conditions can reduce both crop size and quality. Weather conditions, disease or pest infestation could damage the crop in spite of precautions we would normally take to avoid such losses. Our SONOVA product inventory is stored in a single cold storage facility in Northern California. We take precautions to safeguard our facilities, including insurance, health and safety protocols, and off-site storage of critical research results and computer data. However, a natural disaster, such as a fire, flood, or earthquake, could cause substantial delays in our operations, damage or destroy our equipment, inventory, or development projects, and cause us to incur additional expenses. The insurance we maintain against natural disasters may not be adequate to cover our losses in any particular case.

We utilize and critically rely upon information technology systems in all aspects of our business, including increasingly large amounts of data to support our products and advance our research and development. Failure to effectively prevent, detect, and recover from the increasing number and sophistication of information security threats could result in theft, misuse, modification, and destruction of information, including trade secrets and confidential business information, and cause business disruptions, delays in research and development, and reputational damage, which could significantly affect our results of operations and financial condition.

A lack of availability of water in any of our production areas could impact our business.

Adequate quantities and correct timing of the application of water are vital for most agriculture to thrive. Whether particular farms are experiencing water shortages depends, in large part, on their location. However, continuing drought conditions can threaten all farmland other than those properties with their own water sources. Domestic regulations regarding water usage and rights may also limit the availability of water. Moreover, if the farmers and others who purchase our seed to grow crops cannot get an adequate supply of water, or if the cost of water makes it uneconomical for the farmers to grow the crops, we may not be able to sell our seed, which could have an adverse impact on our results of operations.

Our use of hazardous materials exposes us to potential liabilities.

Certain of our operations involve the storage and controlled use of hazardous materials, including laboratory chemicals, herbicides, and pesticides. This requires us to conduct our operations in compliance with applicable environmental and safety standards, and we cannot completely eliminate the risk of accidental contamination from hazardous materials. In the event of such contamination, we may be held liable for significant damages or fines, which could have a material adverse effect on our business and operating results.

Most of the licenses we grant to our collaborators to use our proprietary genes in certain crops are exclusive within certain jurisdictions, which limits our licensing opportunities.

Most of the licenses we grant our collaborators to use our proprietary genes in certain crops are exclusive within specified jurisdictions, so long as our collaborators comply with certain diligence requirements. That means that once genes are licensed to a collaborator in a specified crop or crops, we are generally prohibited from licensing those genes to any third party. The limitations imposed by these exclusive licenses could prevent us from expanding our business and increasing our product development initiatives with new collaborators, both of which could adversely affect our business and results of operations.

We are subject to the risk of becoming an investment company under the Investment Company Act of 1940.

On November 12, 2020, we acquired 1,875,000 shares of common stock of Bioceres Crop Solutions Corp. (“Biox Shares”) in connection with the sale of our membership interest in Verdeca to Bioceres, Inc. and our licensing of certain technology to Bioceres Inc. Our ownership of the Biox Shares could subject us to regulation under the Investment Company Act of 1940 (the “Investment Company Act”).

Section 3(a)(1)(C) of the Investment Company Act defines an investment company as any issuer that “is engaged or proposes to engage in the business of investing, reinvesting, owning, holding or trading in securities, and owns or proposes to acquire investment securities having a value exceeding 40% of the value of such issuer’s total assets (exclusive of U.S. government securities and cash items)” (the “40% Threshold”). While we do not intend to engage primarily in the business of investing, reinvesting, owning, holding or trading in investment securities, the value of the Biox Shares relative to our other assets could change over time and cause us to exceed the 40% Threshold. Rule 3a-2 under the Investment Company Act provides one-year relief from the registration requirements of the Investment Company Act to an issuer that, on a transient basis, is deemed to be an investment company. The transient investment company exemption is available to a company no more than once every three years. If we exceed the 40% Threshold because our ownership of the Biox Shares, we will need to dispose of a sufficient amount of the Bios Shares in order to Company with the Investment Company act. Such disposal of the Biox Shares may be on terms that are unfavorable to us and could adversely impact our financial position and results of operations.

If we are unable to comply with Rule 3a-2 and are deemed to be an investment company, the consequences of failing to register under the Investment Company Act would be significant. For example, investment companies that fail to register under the Investment Company Act are prohibited from conducting business in interstate commerce. The ramifications of registering as an investment company, both in terms of the restrictions imposed on us and the cost of compliance, would be significant. For example, in addition to expenses related to initially registering as an investment company, the Investment Company Act also would impose various restrictions with regard to our ability to enter into affiliated transactions, the diversification of our assets, and our ability to borrow money. If we became subject to the Investment Company Act at some point in the future, our ability to continue pursuing our business plan would be severely limited.

Our ownership of the Biox Shares could cause the value of our assets and our results of operation to vary significantly.

The value of the Biox Shares on our balance sheet will be based upon the market value of the Biox Shares as of the end of each quarter. As the Biox Shares trade on the NYSE American stock exchange, their value is subject to fluctuation over time. This fluctuation could be significant, which would materially affect our total assets and results of operations from quarter to quarter, independent of the performance of our core business.

Our commercial success depends on our ability to protect our intellectual property and our proprietary technologies and on the ability to operate without infringing the patents and other proprietary rights of third parties.

Our success will depend in part on our ability to obtain and maintain patent protection both in the United States and in other countries for any products we successfully develop. The patents and patent applications in our patent portfolio are either owned by us, exclusively licensed to us, or co-owned by us and others and exclusively licensed to us. Our ability to protect any products we successfully develop from unauthorized or infringing use by third parties depends substantially on our ability to obtain and maintain valid and enforceable patents. Due to evolving legal standards relating to the patentability, validity and enforceability of patents covering biotechnology inventions and the scope of claims made under these patents, our ability to obtain and enforce patents is uncertain and involves complex legal and factual questions. Accordingly, rights under any issued patents may not provide us with sufficient protection for any products we successfully develop or provide sufficient protection to afford us a commercial advantage against our competitors or their competitive products or processes. In addition, we cannot guarantee that any patents will be issued from any pending or future patent applications owned by or licensed to us. Even if patents have been issued or will be issued, we cannot guarantee that the claims of these patents are, or will be, valid or enforceable, or provide us with any significant protection against competitive products or otherwise be commercially valuable to us.

The U.S. Congress passed the Leahy-Smith America Invents Act, or the America Invents Act, which was signed into law in September 2011. The America Invents Act reforms U.S. patent law in part by changing the standard for patent approval from a “first to invent” standard to a “first inventor to file” standard and developing a post-grant review system. This new legislation affects U.S. patent law in a manner that may impact our ability to obtain or maintain patent protection for current or future inventions in the U.S. or otherwise cause uncertainty as to our patent protection.

We may not have identified all patents, published applications or published literature that may affect our business, either by blocking our ability to commercialize our traits, by preventing the patentability of our traits by us, our licensors or co-owners, or by covering the same or similar technologies that may invalidate our patents, limiting the scope of our future patent claims or adversely affecting our ability to market our products. For example, patent applications are maintained in confidence for at least 18 months after their filing. In some cases, patent applications remain confidential in the United States Patent and Trademark Office (“USPTO”) for the entire time prior to issuance of a U.S. patent. Patent applications filed in countries outside the United States are not typically published until at least 18 months from their first filing date. Similarly, publication of discoveries in the scientific or patent literature often lags behind actual discoveries. Therefore, we cannot be certain that we or our licensors or co-owners were the first to invent, or the first inventors to file, patent applications on our processes, products or their uses. In the event that another party has filed a U.S. patent application covering the same invention as one of our patent applications or patents, we may have to participate in an adversarial proceeding, known as an interference, declared by the USPTO to determine priority of invention in the United States.

If we or one of our collaborators are sued for infringing the intellectual property rights of a third party, such litigation could be costly and time consuming and could prevent us or our collaborators from developing or commercializing our products.

Our ability to generate significant revenues from our products depends on our and our collaborators’ ability to develop, market and sell our products and utilize our proprietary technology without infringing the intellectual property and other rights of any third parties. In the United States and abroad there are numerous third-party patents and patent applications that may be applied toward our proprietary technology, business processes, or developed traits, some of which may be construed as containing claims that cover the subject matter of our products or intellectual property. Because of the rapid pace of technological change, the confidentiality of patent applications in some jurisdictions (including U.S. provisional patent applications), and the fact that patent applications can take

many years to issue, there may be currently pending applications that are unknown to us that may later result in issued patents upon which our products in development or proprietary technologies infringe. Similarly, there may be issued patents relevant to our products in development of which we are not aware. These patents could reduce the value of the traits we develop or the plants containing our traits or, to the extent they cover key technologies on which we have unknowingly relied, require that we seek to obtain licenses or cease using the technology, no matter how valuable to our business. We may not be able to obtain such a license on commercially reasonable terms. If any third-party patent or patent application covers our intellectual property or proprietary rights and we are not able to obtain a license to it, we and our collaborators may be prevented from commercializing products containing our traits.

As the agricultural biotechnology industry continues to develop, we may become party to, or threatened with, litigation or other adverse proceedings regarding intellectual property or proprietary rights in our technology, processes, or developed traits. Third parties may assert claims based on existing or future intellectual property rights and the outcome of any proceedings is subject to uncertainties that cannot be adequately quantified in advance. Any litigation proceedings could be costly and time consuming, and negative outcomes could result in liability for monetary damages, including treble damages and attorneys' fees, if we are found to have willfully infringed a patent. There is also no guarantee that we would be able to obtain a license under such infringed intellectual property on commercially reasonable terms or at all. A finding of infringement could prevent us or our collaborators from developing, marketing or selling a product or force us to cease some or all of our business operations. Even if we are successful in these proceedings, we may incur substantial costs and the time and attention of our management and scientific personnel may be diverted as a result of these proceedings, which could have a material adverse effect on us. Claims that we have misappropriated the confidential information or trade secrets of third parties could similarly have a negative impact on our business.

Our success will depend in part on our ability to uphold and enforce patents or patent applications owned or co-owned by us or licensed to us, which cover products we successfully develop. Proceedings involving our patents or patent applications could result in adverse decisions regarding:

- ownership of patents and patent applications;
- rights concerning licenses;
- the patentability of our inventions relating to our products; and/or
- the enforceability, validity or scope of protection offered by our patents relating to our products.

Even if we are successful in these proceedings, we may incur substantial costs and divert management's time and attention in pursuing these proceedings, which could have a material adverse effect on us.

We are subject to governmental export and import controls that could impair our ability to compete in international markets due to licensing requirements and subject us to liability if we are not in compliance with applicable laws.

Our products and products in development are subject to export control and import laws and regulations, including the U.S. Export Administration Regulations, U.S. Customs regulations, and various economic and trade sanctions regulations administered by the U.S. Treasury Department's Office of Foreign Assets Controls. Exports of our products and technology must be made in compliance with these laws and regulations. If we fail to comply with these laws and regulations, we and certain of our employees could be subject to substantial civil or criminal penalties, including the possible loss of export or import privileges; fines, which may be imposed on us and responsible employees or managers; and, in extreme cases, the incarceration of responsible employees or managers.

In addition, changes in our products or solutions or changes in applicable export or import laws and regulations may create delays in the introduction and sale of our products and solutions in international markets, prevent our customers from deploying our products and solutions or, in some cases, prevent the export or import of our products and solutions to certain countries, governments or persons altogether. Any change in export or import laws and regulations, shift in the enforcement or scope of existing laws and regulations, or change in the countries, governments, persons or technologies targeted by such laws and regulations, could also result in decreased use of our products and solutions, or in our decreased ability to export or sell our products and solutions to existing or potential customers. Any decreased use of our products and solutions or limitation on our ability to export or sell our products and solutions would likely adversely affect our business, financial condition and results of operations.

Adverse outcomes in future legal proceedings could subject us to substantial damages and adversely affect our results of operations and profitability.

We may become party to legal proceedings, including matters involving personnel and employment issues, personal injury, environmental matters, and other proceedings. Some of these potential proceedings could result in substantial damages or payment awards that exceed our insurance coverage. We will estimate our exposure to any future legal proceedings and establish provisions for the estimated liabilities where it is reasonably possible to estimate and where an adverse outcome is probable. Assessing and predicting the outcome of these matters will involve substantial uncertainties. Furthermore, even if the outcome is ultimately in our favor, our costs associated with such litigation may be material. Adverse outcomes in future legal proceedings or the costs and expenses associated therewith could have an adverse effect on our results of operations.

We may be required to pay substantial damages as a result of product liability claims for which insurance coverage is not available.

We are subject to product liability claims with respect to our SONOVA and GoodWheat products, and as additional products integrating our traits reach commercialization, product liability claims may increasingly be a commercial risk for our business. Product liability claims against us or our collaborators selling products that contain our traits, or allegations of product liability relating to seeds containing traits developed by us, could damage our reputation, harm our relationships with our collaborators, and materially and adversely affect our business, results of operations, financial condition, and prospects. Furthermore, while our collaboration agreements typically require that our collaborators indemnify us for the cost of product liability claims brought against us as a result of our collaborator's misconduct, such indemnification provisions may not always be enforced, and we may receive no indemnification if our own misconduct contributed to the claims.

We may seek to expand through acquisitions of and investments in other brands, businesses, and assets. These acquisition activities may be unsuccessful or divert management's attention.

We may consider strategic and complementary acquisitions of and investments in other agricultural biotechnology brands, businesses or other assets, and such acquisitions or investments are subject to risks that could affect our business, including risks related to:

- the necessity of coordinating geographically disparate organizations;
- implementing common systems and controls;
- integrating personnel with diverse business and cultural backgrounds;
- integrating acquired manufacturing and production facilities, technology and products;
- combining different corporate cultures and legal systems;
- unanticipated expenses related to integration, including technical and operational integration;
- increased costs and unanticipated liabilities, including with respect to registration, environmental, health and safety matters, that may affect sales and operating results;
- retaining key employees;
- obtaining required government and third-party approvals;
- legal limitations in new jurisdictions;
- installing effective internal controls and audit procedures;
- issuing common stock that could dilute the interests of our existing stockholders;
- spending cash and incurring debt;
- assuming contingent liabilities; and
- creating additional expenses.

We may not be able to identify opportunities or complete transactions on commercially reasonable terms, or at all, or actually realize any anticipated benefits from such acquisitions or investments. Similarly, we may not be able to obtain financing for acquisitions or investments on attractive terms. In addition, the success of any acquisitions or investments also will depend, in part, on our ability to integrate the acquisition or investment with our existing operations.

As a result of being a public company, we are obligated to develop and maintain proper and effective internal control over financial reporting. We may not complete our analysis of our internal control over financial reporting in a timely manner, or these internal controls may not be determined to be effective, which may adversely affect investor confidence in our company and, as a result, the value of our common stock.

Pursuant to Section 404(a) of the Sarbanes-Oxley Act of 2002 ("the Act") and the related rules adopted by the SEC and the Public Company Accounting Oversight Board, starting with the second annual report that we filed with the SEC after the consummation of our public offering, our management is required to report on the effectiveness of our internal control over financial reporting. Section 404(b) of the Act requires that our independent registered public accounting firm will also need to attest to the effectiveness of our internal control over financial reporting if we qualify as an accelerated filer or a large accelerated filer.

In connection with the preparation of our financial statements for the years ended December 31, 2020 and 2019, we identified certain internal control deficiencies that did not rise to the level of a significant deficiency or material weakness, on an individual basis or in the aggregate. We are continuously improving our internal control environment. As a result, we may experience higher than anticipated operating expenses, as well as higher auditor fees during and after the implementation of these changes. If we are unable to implement any of the required changes to our internal control over financial reporting effectively or efficiently or are required to do so earlier than anticipated, it could adversely affect our operations, financial reporting, and results of operations and could result in an adverse opinion on internal controls from our independent registered public accounting firm.

Our ability to use our net operating loss carryforwards to offset future taxable income may be subject to certain limitations.

Under Section 382 of the Internal Revenue Code of 1986, as amended, or the Code, a corporation that undergoes an "ownership change" is subject to limitations on its ability to utilize its NOLs to offset future taxable income. A significant portion of our existing NOLs are limited due to an ownership change under IRC Section 382 that we experienced as a result of the common shares issued in connection with the June 2018 Offering. Future changes in our stock ownership, some of which are outside of our control, could result in an ownership change under Section 382 of the Code. If we undergo an ownership change in the future, our ability to utilize NOLs could be further limited by Section 382 of the Code. Furthermore, our ability to utilize NOLs of companies that we may acquire in the future may be subject to limitations. There is also a risk that, due to regulatory changes, such as suspensions on the use of NOLs, or other unforeseen reasons, our existing NOLs could expire or otherwise be unavailable to offset future income tax liabilities. For these reasons, we may not be able to realize a tax benefit from the use of our NOLs, whether or not we obtain profitability.

Risks Related to Ownership of Our Common Stock

Sales of a substantial number of shares of our common stock in the public market, or the perception that these sales might occur, could cause our stock price to decline.

Sales of a substantial number of our common stock in the public market, or the perception that these sales might occur, could cause the market price of our common stock to decline and could impair our ability to raise capital through the sale of additional equity securities. As of December 31, 2020, there were 13,450,861 shares of our common stock outstanding, of which approximately 12,264,830 shares were held by non-affiliates. All of our common stock is freely transferable, except shares held by our "affiliates," as defined in Rule 144 under the Securities Act.

We may also issue common stock or options to purchase shares of our common stock that under our 2015 Omnibus Equity Incentive Plan and our 2015 Employee Stock Purchase Plan. Securities issued under these plans

will be registered under a Form S-8 and are freely tradable upon issuance. There were 502,973 options exercisable as of December 31, 2020 at a weighted average exercise price of $22.20.

Our stock price has been and may continue to be volatile, and you could lose all or part of your investment.

The market price of our common stock since our initial public offering has been and may continue to be volatile. Since shares of our common stock were sold in our initial public offering in May 2015 at a price of $160.00 per share, our stock price has ranged from $2.30 to $176.00, through December 31, 2020. The market price of our common stock is subject to wide fluctuations in response to various risk factors, some of which are beyond our control and may not be related to our operating performance, including:

- addition or loss of significant customers, collaborators or distributors;
- changes in laws or regulations applicable to our industry or traits;
- additions or departures of key personnel;
- the failure of securities analysts to cover our common stock after an offering;
- actual or anticipated changes in expectations regarding our performance by investors or securities analysts;
- price and volume fluctuations in the overall stock market;
- volatility in the market price and trading volume of companies in our industry or companies that investors consider comparable;
- share price and volume fluctuations attributable to inconsistent trading volume levels of our shares;
- our ability to protect our intellectual property and other proprietary rights;
- sales of our common stock by us or our stockholders;
- the expiration of contractual lock-up agreements;
- litigation involving us, our industry, or both;
- major catastrophic events; and
- general economic and market conditions and trends.

Further, the stock markets have experienced extreme price and volume fluctuations that have affected and continue to affect the market prices of equity securities of many companies. These fluctuations often have been unrelated or disproportionate to the operating performance of those companies. In addition, the stock prices of many seed and agricultural biotechnology companies have experienced wide fluctuations that have often been unrelated to the operating performance of those companies. These broad market and industry fluctuations, as well as general economic, political, and market conditions such as recessions, interest rate changes, or international currency fluctuations, may cause the market price of our common stock to decline. If the market price of our common stock fluctuates or declines, you may not realize any return on your investment and may lose some or all of your investment.

We expect our operating results to vary significantly from quarter to quarter, which may cause our stock price to fluctuate widely.

We expect our quarterly operating results to fluctuate widely and unpredictably for the following reasons, among others:

- our significant customer concentration;
- the variable timing, stage, and results of our and our collaborators’ development, and regulatory activities;
- the effectiveness of our marketing and advertising efforts;

- the impact of seasonality in agricultural operations on our sales of hemp seeds and products that incorporate our wheat traits;
- adjustments to inventory due to excess or slow-moving;
- supplier, manufacturing, or quality problems; and
- variance in the timing of customer and distributor orders for our products.

Further, a large proportion of our costs are fixed, due in part to our significant research and development costs and general and administrative expenses. Thus, even a small decline in revenues could disproportionately affect our quarterly operating results and could cause such results to differ materially from expectations. Any unanticipated change in revenues or operating results is likely to cause our stock price to fluctuate since such changes reflect new information available to investors and analysts.

Because we do not expect to pay any dividends for the foreseeable future, investors may be forced to sell their stock to realize a return on their investment.

We do not anticipate that we will pay any dividends to holders of our common stock for the foreseeable future. Any payment of cash dividends will be at the discretion of our board of directors and will depend on, among other things, our results of operations, cash requirements, financial condition, contractual restrictions including compliance with covenants under our debt agreements, and other factors that our board of directors may deem relevant. Our ability to pay dividends might be restricted by the terms of any indebtedness that we incur in the future. In addition, certain of our current outstanding debt agreements prohibit us from paying cash dividends on our common stock. Consequently, you should not rely on dividends to receive a return on your investment.

Item 1B. Unresolved Staff Comments.

Not applicable.

Item 2. Properties.

Our corporate headquarters are located in Davis, California, in a facility consisting of approximately 21,480 square feet of office, laboratory and growth chamber space under a lease which expires on March 31, 2030. This facility accommodates research and development, operations, commercial operations, analytical services, regulatory and administrative activities. Our administrative offices in Phoenix, Arizona, consist of 2,976 square feet under a lease expires on December 31, 2021. The facility accommodates our finance and other administrative activities. We lease greenhouse space and farmland for agricultural use in Northern California, as well as farmland in Southern California, Idaho and Hawaii. We also lease office and warehouse space in Idaho under a lease that expires on December 31, 2023.

We believe that our leased facilities are adequate to meet our current needs and that, if needed, suitable additional or alternative space will be available to accommodate our operations.

Item 3. Legal Proceedings.

We currently are not a party to any material litigation or other material legal proceedings. From time to time, we may be subject to legal proceedings and claims in the ordinary course of business.

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.

Our common stock has been listed on the NASDAQ Stock Market under the symbol "RKDA" since May 15, 2015. Prior to May 15, 2015, there was no public trading for our common stock.

Holders of Record

As of March 19, 2021, we had 40 holders of record of our common stock. Because many of our shares of common stock are held by brokers and other institutions on behalf of stockholders, we are unable to estimate the total number of beneficial stockholders represented by these record holders.

Dividend Policy

We have never declared or paid cash dividends on our capital stock. We currently intend to retain all available funds and any future earnings for use in the operation of our business and do not anticipate paying any cash dividends in the foreseeable future. Any decision to declare and pay cash dividends in the future will be made at the discretion of our board of directors and will depend on, among other things, our results of operations, cash requirements, financial condition, contractual restrictions, and other factors that our board of directors may deem relevant.

Securities Authorized for Issuance under Equity Compensation Plans

See Part III, Item 12, for a description of securities authorized for issuance under equity compensation plans.

Recent Sales of Unregistered Securities

Information concerning our sales of unregistered securities during the year ended December 31, 2020, has previously been reported in reports on Form 10-Q and reports on Form 8-K that we filed during that fiscal year.

Purchases of Equity Securities by the Issuer and Affiliated Purchasers

We did not repurchase any of our equity securities during the year ended December 31, 2020.

Item 6. Selected Financial Data.

Not applicable.

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations.

Special Note Regarding Forward-Looking Statements

The following discussion and analysis of our financial condition and results of operations should be read in conjunction with our audited consolidated financial statements and the related notes to those statements included herein. In addition to historical financial information, this report contains forward-looking statements that involve risks and uncertainties. Our actual results could differ materially from those discussed in the forward-looking statements. The statements contained in this report that are not purely historical are forward-looking statements within the meaning of Section 27A of the Securities Act and Section 21E of the Securities Exchange Act of 1934, as amended, or the Exchange Act. Forward-looking statements are often identified by the use of words such as, but not limited to, "anticipate," "believe," "can," "continue," "could," "estimate," "expect," "intend," "may," "plan," "project," "seek," "should," "strategy," "target," "will," "would" and similar expressions or variations intended to identify forward-looking statements. These statements are based on the beliefs and assumptions of our management based on information currently available to management. Such forward-looking statements are subject to risks, uncertainties and other important factors that could cause actual results and the timing of certain events to differ materially from future results expressed or implied by such forward-looking statements. Factors that could cause or contribute to such differences include, but are not limited to, those identified below. Furthermore, such forward-looking statements speak only as of the date of this report. Except as required by law, we undertake no obligation to update any forward-looking statements to reflect events or circumstances after the date of such statements.

"Arcadia Biosciences," "Sonova," "Sonova GLA Safflower Oil and design," "GoodHemp" and "GoodWheat" are our registered trademarks in the United States and, in some cases, in certain other countries. This report may also contain trademarks, service marks, and trade names of other companies. Solely for convenience, the trademarks, service marks and trade names referred to in this report may appear without the ®, TM, or SM symbols, but such references do not constitute a waiver of any rights that might be associated with the respective trademarks, service marks, or trade names.

Overview

We are a leader in science-based approaches to developing high value crop productivity traits primarily in hemp and wheat, designed to enhance farm economics by improving the performance of crops in the field, as well as their value as food ingredients, health and wellness products, and their viability for industrial applications. We use advanced breeding techniques to develop these proprietary innovations which we are beginning to monetize through a number of methods including seed and grain sales, product extract sales, sales of products using our patented non-GMO GoodWheat technology, trait licensing and royalty agreements.

Our commercial strategy is to link consumer's nutrition, health and wellness demands with the superior functional benefits our crops deliver directly from the farm, enabling us to share premium economics throughout the ag-food supply chain and to build a world-class estate of high value traits and varieties. In particular, we believe the recent legalization of hemp in the U.S. and many other areas of the world has created a significant agricultural and financial opportunity. The demonstrated broad demand for industrial, nutritional, health and wellness products from hemp, coupled with its poor genetics represent a vast, new opportunity for Arcadia to add substantial value to its existing high value trait and seed estate.

The passage of the U.S. Agriculture Improvement Act of 2018 – also known as the Farm Bill – confirmed the federal legalization of hemp, the term given to non-psychoactive cannabis containing less than 0.3% tetrahydrocannabinol (THC). It also included provisions for legalizing on a federal level hemp's cultivation, transport and sale for the first time in more than 75 years. Hemp, not previously distinguished by the federal government from cannabis, a Schedule 1 drug and banned as an agricultural crop, lacks substantive plant biology research and suffers from suboptimal genetics, highly fragmented germplasm and rampant inconsistencies. We are targeting hemp-based solutions that allow farmers to reliably and consistently achieve compliance with USDA regulations, through varieties with improved functionality and application of specific attributes such as select cannabinoid contents for health and wellness, enhanced proteins profiles for plant-based dietary applications and industrial applications such as clothing and hempcrete. Arcadia conducts its business in only federal and state markets in which its activities are legal.

On October 31, 2019, the USDA published the interim final rule as authorized by the Agriculture Improvement Act of 2018 for hemp cultivation, which mandates that states test hemp crops and dispose of "hot" crops that exceed 0.3% THC. While hemp farmers will have access to crop protection options, the destruction of hot crops that fail these stringent inspections will not be a covered loss under crop insurance programs. In 2019 alone, more than 20% of U.S. hemp crops were non-compliant, representing over $2 billion in losses for growers.

Arcadia GoodHemp

In December 2019, we announced the launch of a new product line, GoodHemp, as the company's new commercial brand for delivering genetically superior hemp seeds, transplants, flower and extracts. On August 21, 2020, the Company acquired by merger Industrial Seed Innovations (ISI), an Oregon-based industrial hemp breeding and seed company. As a result of the acquisition, the Company acquired ISI's commercial and genetic assets, including seed varieties, germplasm library and intellectual property. ISI's Rogue and Umpqua seed varieties are now part of Arcadia's portfolio, alongside the Company's GoodHemp line of genetically superior hemp seeds, transplants, and extracts. The acquisition has significantly broadened and accelerated commercialization of Arcadia's hemp-related breeding platform, as well as established a breeding research and development facility in the Pacific Northwest, a key production area in the hemp industry.

The Hemp Business Journal estimates the hemp CBD market – the primary non-psychoactive compound in hemp – totaled $190 million in U.S. sales in 2018. By 2025, the Brightfield Group, a hemp and CBD market research firm, projects U.S. sales of hemp-based CBD to reach $16.8 billion. Additionally, Markets and Markets estimates the non-cannabinoid, industrial hemp global market will exceed $26 billion by 2025.

Archipelago Ventures Hawaii, LLC

In August 2019, we formed a new joint venture to serve the Hawaiian, North American and Asian hemp markets, Archipelago Ventures Hawaii, LLC ("Archipelago"). This new venture between Arcadia and Legacy Ventures Hawaii ("Legacy") combines Arcadia's extensive genetic expertise and seed innovation history with Legacy's growth capital and strategic advisory expertise in the Hawaiian markets. Additionally, Legacy brings to the partnership years of proven success in extraction, product formulation and sales of cannabinol oil and distillate products through its equity partner, Vapen CBD. Legacy was originally formed to be a vehicle for its partners to pursue hemp opportunities within the Hawaiian Islands.

Archipelago creates a vertically integrated supply chain, from seed to sale, we believe the first of its kind in Hawaii, and has three important strategic imperatives: (1) ensure a reliable supply chain during critical scale up of the global hemp market, a major risk mitigation for success, (2) ensure high quality throughout the supply chain, from genetics to the field and field to the customer and (3) ensure being well-positioned to address the unique needs and opportunities of the Hawaiian market.

Arcadia GoodWheat

In 2018, we launched our GoodWheat brand, a non-genetically modified (non-GM) portfolio of wheat products that enables food manufacturers to differentiate their consumer-facing brands. Consumer food companies are looking to simplify their food ingredient formulations and consumers are demanding "clean labeling" in their foods, paying more for foods having fewer artificial ingredients and more natural, recognizable and healthy ingredients. A 2017 survey by PR agency Ingredient Communications found that 73% of consumers are happy to pay a higher retail price for a food or drink product made with ingredients they recognize. Because GoodWheat increases the nutrient density directly in the primary grains and oils, it provides the mechanism for food formulation simplification naturally, cost effectively and in a timeframe to meet evolving consumer demands.

The brand launch is a key element of the company's go-to-market strategy to achieve greater value for its innovations by participating in downstream consumer revenue opportunities. We designed the brand to make an immediate connection with consumers that products made with GoodWheat meet their demands for healthier wheat options that also taste great. The GoodWheat brand encompasses our current and future non-GM wheat portfolio of high fiber Resistant Starch (RS) and Reduced Gluten wheat varieties, as well as future wheat innovations. In October 2019, the U.S. Patent and Trademark Office granted us the latest patents for extended shelf life wheat, the newest trait in our non-genetically modified wheat portfolio. This new trait was designed to promote whole wheat consumption by improving the shelf life and taste of whole grain wheat products.

We now hold more than 15 global patents on our high fiber Resistant Starch wheat, protecting both bread wheat and durum (pasta) wheat. Claims granted in 2020 strengthen our intellectual property for our Resistant Starch portfolio of products.

We announced in August 2020 an agreement with Bay State Milling Company and Arista Cereal Technologies to bring to market our resistant starch GoodWheat in North America and other key markets, beginning in early 2021. In the daily American diet approximately 500 calories come from wheat products, 25% of the FDA's recommended daily caloric intake for a woman and 20% for a man. The GoodWheat portfolio of specialty wheat varieties delivers new functional value through an ingredient already an important component of the human diet.

In years to come, we expect to achieve enhanced nutritional characteristics within a number of other broad acre crops using advanced breeding and gene-editing techniques. Targets include but are not limited to higher fiber, longer shelf life and enhanced protein in crops other than wheat.

Verdeca HB4® Soybean

In 2012, we partnered with Bioceres to form Verdeca, a U.S.-based joint venture company to deploy next-generation soybean traits developed to benefit soybean producers through quality improvement, stress mitigation and management practices. The HB4® soybean varieties deliver two layers of value for growers: drought and herbicide tolerance, offering resistance to a broad-spectrum herbicide utilized to prevent growth of a wide range of annual and perennial broadleaf weeds and grasses. HB4® is the first trait offering tolerance to drought and salinity in soybeans, with 30 international patents. HB4® is currently approved in the four main countries producing this strategic crop – the U.S., Brazil, Argentina and Paraguay - representing 80% of the global soybean market. Regulatory submissions are under consideration by China, Canada, Bolivia and Uruguay.

In November 2020, the Company entered into a Master Transaction Agreement with Bioceres pursuant to which the Company sold all of its memberships interests it owned in Verdeca to Bioceres, and the Company and Bioceres entered into a license agreement for intellectual property rights related to HB4® soybean trait. Such license agreement includes milestone payments due to Arcadia commencing within thirty days of either Bioceres reaching commercial plantings of at least 200,000 hectares of HB4 or if China approves the HB4 soybean trait for "food and feed". Import approval by China is required for commercial launch and the expectation to obtain such approval in late 2021 is under review in light of the coronavirus outbreak.

Impact of COVID-19

In early 2020, the World Health Organization ("WHO") determined the coronavirus ("COVID-19") was a worldwide pandemic. We are closely monitoring how the spread of the new strains of coronavirus are affecting our employees and business operations. We have developed preparedness plans to help protect the safety of our employees while safely continuing business operations. While management currently expects the impact of COVID-19 to be temporary, there is uncertainty around the duration and its broader impact on the economy and therefore the effects it will have on the Company's financial condition, liquidity, operations, suppliers, industry, and workforce.

Components of Our Statements of Operations Data

Revenues

We derive our revenues primarily from product revenues, licensing agreements, royalties and contract research agreements. Given our acute focus on selling our GoodWheat and GoodHemp products, we do not intend to continue pursuing contract research agreements and government grant projects.

Product Revenues

Our product revenues to date have consisted primarily of sales of our SONOVA products, with initial GoodWheat seed sale revenues recognized in the fourth quarter of 2019. We recognize revenue from product sales when control of the product is transferred to third-party distributors and manufacturers, collectively "our

customers," which generally occurs upon shipment. Our revenues fluctuate depending on the timing of shipments of product to our customers.

License Revenues

Our license revenues to date consist of up-front, nonrefundable license fees, annual license fees, and subsequent milestone payments that we receive under our research and license agreements.

Milestone fees are variable consideration that is initially constrained and recognized only when it is probable that such amounts would not be reversed. Given the seasonality of agriculture and time required to progress from one milestone to the next, achievement of milestones is inherently uneven, and our license revenues are likely to fluctuate significantly from period to period.

Royalty Revenues

Royalty revenues from the Company's agreements with third parties related to GoodWheat products and traits are recognized when the Company can reasonably determine the amounts earned. In most cases, this will be upon notification from the third-party licensee, which is typically during the quarter following the quarter in which the sales occurred.

Contract Research and Government Grant Revenues

Contract research and government grant revenues consist of amounts earned from performing contracted research primarily related to breeding programs or the genetic engineering of plants for third parties. Contract research revenue is accounted for as a single performance obligation for which revenues are recognized over time using the input method (e.g. costs incurred to date relative to the total estimated costs at completion).

We have received payments from government entities in the form of government grants. Government grant revenue is accounted for as a single performance obligation for which revenues are recognized over time using the input method (e.g. costs incurred to date relative to the total estimated costs at completion). Our obligation with respect to these agreements is to perform the research on a best-efforts basis.

Operating Expenses

Cost of Product Revenues

Cost of product revenues relates to the sale of our SONOVA and GoodWheat products and consists of in-licensing and royalty fees, any adjustments or write-downs to inventory, as well as the cost of raw materials, including inventory and third-party services costs related to procuring, processing, formulating, packaging and shipping our products.

Research and Development Expenses

Research and development expenses consist of costs incurred in the discovery, development and testing of our products and products in development incorporating our traits. These expenses consist primarily of employee salaries and benefits, fees paid to subcontracted research providers, fees associated with in-licensing technology, land leased for field trials, chemicals and supplies, and other external expenses. These costs are expensed as incurred. Additionally, we are required from time to time to make certain milestone payments in connection with the development of technologies in-licensed from third parties. Our research and development expenses may fluctuate from period to period.

Gain on sale of Verdeca

The gain on sale of Verdeca is the gain recognized for the sale our membership interests in the Verdeca joint venture to our partner Bioceres.

Change in Fair Value of Contingent Consideration

Change in the fair value of contingent consideration is comprised of the gain associated with the reduction of our contingent liability as the result of a decision to abandon a program that was previously accrued.

Selling, General and Administrative Expenses

Selling, general and administrative expenses consist primarily of employee costs, professional service fees, and overhead costs. Our selling, general, and administrative expenses may fluctuate from period to period. In connection with our commercialization activities for our consumer ingredient products, we expect to increase our investments in sales and marketing and business development.

Interest Expense

Interest expense consists primarily of contractual interest on notes payable to finance the purchase of company vehicles.

Other Income, Net

Other income, net, consists of interest income and the amortization of investment premium and discount on our cash and cash equivalents and investments.

Change in the Estimated Fair Value of Common Stock Warrant Liabilities

Change in the estimated fair value of common stock warrant liabilities is comprised of the fair value remeasurement of liability classified common stock warrants.

Loss on Extinguishment of Warrant Liabilities

Loss on extinguishment of warrant liability is comprised of the difference between the reacquisition price and the carrying amount of the portion of the Warrants associated with the Warrant Exercise Transactions.

Offering Costs

Offering costs generally include placement agent, legal, advisory, accounting and filing fees.

Income Tax Benefit (Provision)

Our income tax provision has not been historically significant, as we have incurred losses since our inception. The provision for income taxes consists of state and foreign income taxes. Due to cumulative losses, we maintain a valuation allowance against our U.S. deferred tax assets as of the years ended December 31, 2020 and 2019. We consider all available evidence, both positive and negative, including but not limited to, cumulative losses, projected future outcomes, industry and market trends and the nature of each of the deferred tax assets in assessing the extent to which a valuation allowance should be applied against our U.S. deferred tax assets.

Results of Operations

Comparison of the Years ended December 31, 2020 and 2019

	Year Ended December 31,	
	2020	2019
	(in thousands)	
Revenues:		
Product	$ 1,044	$ 814
License	6,801	67
Royalty	83	—
Contract research and government grants	106	288
Total revenues	8,034	1,169
Operating expenses (income):		
Cost of product revenues	5,199	885
Research and development	7,960	7,098
Gain on sale of Verdeca	(8,814)	—
Change in fair value of contingent consideration	—	(1,000)
Selling, general and administrative	16,467	13,567
Total operating expenses	20,812	20,550
Loss from operations	(12,778)	(19,381)
Interest expense	(47)	(5)
Other income, net	740	466
Change in fair value of common stock warrant liabilities	6,570	(9,243)
Loss on extinguishment of warrant liability	(635)	—
Offering costs	—	(708)
Loss before income taxes	(6,150)	(28,871)
Income tax benefit (provision)	124	(2)
Net loss	(6,026)	(28,873)
Net loss attributable to non-controlling interests	(1,371)	(68)
Net loss attributable to common stockholders	$ (4,655)	$ (28,805)

Revenues

Product revenues accounted for 13% and 70% of our total revenues for the years ended December 31, 2020 and 2019, respectively. The $230,000, or 28%, increase in product revenues from sales of our SONOVA products was primarily driven by additional pet food orders.

License revenues accounted for 85% and 6% of our total revenues for the years ended years ended December 31, 2020 and 2019, respectively. The $6,734,000 increase in license revenues consists primarily of the amounts allocated to the licenses granted to Bioceres for certain intellectual property rights in connection with the November 2020 transaction. See Note 9. There were no license agreements executed in 2019.

Royalty revenues accounted for 1% and 0% of our total revenues for the years ended December 31, 2020 and 2019, respectively. The $83,000 increase of royalty revenues represents minimum annual royalty fees earned.

Contract research and government grant revenues accounted for 1% and 25% of our total revenues for the years ended December 31, 2020 and 2019, respectively. The $182,000, or 63%, decrease in contract research and government grant revenues was driven by the completion of agreements and grants. Given our acute focus on selling our GoodWheat and GoodHemp products, we do not intend to continue pursuing contract research agreements and government grant projects.

Cost of Product Revenues

Cost of product revenues increased by $4,314,000, or 487%, for the year ended December 31, 2020 compared to the year ended December 31, 2019. The increase is mainly due to write-downs in the amounts of $1,600,000 for contracted hemp seed production which did not meet quality specifications, $1,300,000 for Archipelago inventory due to regulatory changes, $850,000 for a net realizable value adjustment on seeds purchased from a third-party grower, and $397,000 for a net realizable value adjustment on wheat inventory.

Research and Development

Research and development expenses increased by $900,000, or 12%, for the year ended December 31, 2020 compared to the year ended December 31, 2019. The increase was primarily driven by higher employee-related expenses as we expanded our research teams, as well as external hemp-related costs. The increase was partially offset by the less pre-commercial soybean activity, partially attributed to the sale of our share of Verdeca in November 2020.

Gain on sale of Verdeca

The gain on sale of Verdeca is the gain recognized as part of the transaction executed in November 2020 in which we sold our membership interests in the Verdeca joint venture to our partner Bioceres. See Note 9.

Change in fair value of contingent consideration

There was no change in fair value of contingent consideration during the year ended December 31, 2020. During the year ended December 31, 2019, the change in the fair value of contingent consideration was due to the gain of $1.0 million associated with the reduction of our contingent liability as the result of a decision to abandon a program that was previously accrued. See Note 15.

Selling, General, and Administrative

Selling, general, and administrative expenses increased by $2.9 million, or 21%, for the year ended December 31, 2020 compared to the year ended December 31, 2019. The increase was primarily driven by higher consulting activity and fees and consultants' stock compensation expense, higher employee-related expenses including severance, higher insurance premiums, increased rent expense associated with additional leased space and increased marketing and public relations activities.

Interest Expense

Interest expense was $47,000 for the year ended December 31, 2020, due to new notes payable agreements entered into during 2020. There was $5,000 of interest expense for the year ended December 31, 2019.

Other Income, Net

Other income, net, increased $274,000, or 59%, for the year ended December 31, 2020 compared to the year ended December 31, 2019. This was primarily due to the unrealized gain of corporate securities.

Change in the Estimated Fair Value of Common Stock Warrant Liabilities

Change in the estimated fair value of common stock warrant liabilities resulted in income of $6.6 million for the year ended December 31, 2020 due to the fair value remeasurement of the common stock warrant liabilities driven by a decrease in the stock price and risk-free rates, as well as a fewer number of warrants classified as liabilities outstanding at December 31, 2020 compared to December 31, 2019.

Loss on Extinguishment of Warrant Liability

In connection with the May and July 2020 Warrant Exercise Transactions, the Company recognized a loss on extinguishment of warrant liabilities of approximately $635,000 for the year ended December 31, 2020. There were no such transactions during the year ended December 31, 2019.

Offering costs

Offering costs decreased by $708,000 for the year ended December 31, 2020 as all financing transactions completed during the year qualified for equity treatment and the offering costs were accounted for as a reduction to equity. Offering costs for the year ended December 31, 2019 of $708,000 were comprised of the placement agent fees, placement agent warrants, advisory fees, and legal and accounting fees related to the financing transactions that qualified for liability treatment.

Income Tax Provision

The income tax provision resulted in a $124,000 benefit for the year ended December 31, 2020, compared to an income tax expense of $2,000 for the year ended December 31, 2019. A deferred tax liability arising from the difference between book purchase price allocation and tax basis has been assessed upon closing of the Industrial Seed Innovations acquisition completed in August 2020. See Note 7. The purchase accounting deferred tax liabilities enabled the realization of a portion of the existing deferred tax assets, thus allowing for a reduction in the valuation allowance in the amount of $107,000.

Seasonality

We and our commercial partners operate in different geographies around the world and conduct field trials used for data generation, which must be conducted during the appropriate growing seasons for particular crops and markets. Often, there is only one crop-growing season per year for certain crops and markets. Similarly, climate conditions and other factors that may influence the sales of our products may vary from season to season and year to year. In particular, weather conditions, including natural disasters such as heavy rains, hurricanes, hail, floods, tornadoes, freezing conditions, drought or fire, may affect the timing and outcome of field trials, which may delay milestone payments and the commercialization of products incorporating our seed traits. In the future, sales of commercial products that incorporate our seed traits will vary based on crop growing seasons and weather patterns within particular regions.

The level of seasonality in our business overall is difficult to evaluate at this time due to our relatively early stage of development, our relatively limited number of commercialized products, our expansion into new geographical markets and our introduction of new products and traits.

Liquidity, Capital Resources and Going Concern

We have funded our operations primarily with the net proceeds from our initial public offering, private placements of equity securities and debt, as well as proceeds from the sale of our SONOVA products and payments under license agreements, contract research agreements and government grants. Our principal use of cash is to fund our operations, which are primarily focused on completing development and commercializing our quality seed traits. This includes replicating field trials, coordinating with our partners on their development programs and scaling harvest production of wheat and hemp. As of December 31, 2020, we had cash and cash equivalents of $14.0 million, restricted cash of $2.0 million and short-term investments of $11.6 million. For the years ended December 31, 2020 and 2019, the Company had net losses of $6.0 million and $28.9 million, respectively, and net cash used in operations of $30.2 million and $17.2 million, respectively.

As is disclosed in Note 23, on January 25, 2021, the Company entered into a securities purchase agreement with certain institutional and accredited investors relating to the issuance and sale in a private placement of shares of Company common stock and warrants for an aggregate of $25.1 million, exclusive of any related transaction fees.

As is disclosed in Note 12 and 13, the Company obtained funding through one common stock and warrant financing and two warrant exercise financings during 2020, and two common stock and warrant financings and two

warrant exercise financings during 2019. On December 22, 2020, the Company entered into agreements with institutional investors through a registered direct offering in the amount of $8 million, exclusive of any related transaction fees. In May and July 2020, investors exercised warrants in the amount of $9.4 million, exclusive of transactions costs.

We believe that our existing cash, restricted cash, cash equivalents and short-term investments will be sufficient to meet our anticipated cash requirements for at least the next 12 months.

We may seek to raise additional funds through debt or equity financings, if necessary. We may also consider entering into additional partner arrangements. Our sale of additional equity would result in dilution to our stockholders. Our incurrence of debt would result in debt service obligations, and the instruments governing our debt could provide for additional operating and financing covenants that would restrict our operations. If we do require additional funds and are not able to secure adequate additional funding, we may be forced to reduce our spending, extend payment terms with our suppliers, liquidate assets, or suspend or curtail planned development programs. Any of these actions could materially harm our business, results of operations and financial condition.

Cash Flows

The following table summarizes our cash flows for the periods indicated (in thousands):

	Year Ended December 31,	
	2020	2019
Net cash (used in) provided by:		
Operating activities	$ (30,218)	$ (17,198)
Investing activities	17,284	(8,369)
Financing activities	20,560	21,986
Net (decrease) increase in cash and cash equivalents	$ 7,626	$ (3,581)

Cash Flows from Operating Activities

Cash used in operating activities for the year ended December 31, 2020 was $30.2 million. Our net loss of $6.0 million, adjustments in our working capital accounts of $11.5 million, gain on sale of Verdeca of $8.8 million, corporate securities received in exchange for license agreement of $4.3 million, change in fair value of common stock warrant liabilities of $6.6 million, operating lease payments of $910,000, unrealized gain on corporate securities of $656,000 and net amortization of investment premium of $44,000 were partially offset by non-cash charges of $2.0 million for stock-based compensation, depreciation and amortization of $662,000, lease amortization of $1.0 million, loss on extinguishment of warrant liability of $635,000, as well as $4.3 million of inventory write-downs.

Cash used in operating activities for the year ended December 31, 2019 was $17.2 million. Our net loss of $28.9 million, change in fair value of contingent consideration of $1.0 million, operating lease payments of $715,000, and net amortization of investment premium and discount of $180,000 were partially offset by the change in fair value of common stock warrant liabilities and common stock adjustment feature liability of $9.2 million, non-cash charges of $2.3 million for stock-based compensation, depreciation and amortization of $194,000, lease amortization of $708,000, as well as $0.7 million of offering costs incurred in connection with financing activities and adjustments in our working capital accounts of $0.1 million.

Cash Flows from Investing Activities

Cash provided by investing activities for the year ended December 31, 2020 of $17.3 million primarily consisted of $18.3 million of proceeds from sales and maturities of investments and $3.2 million of proceeds from the sale of Verdeca, partially offset by $2.3 million in purchases of property and equipment, $1.3 million of purchases of investments and $0.5 million of acquisitions, net of cash acquired.

Cash used in investing activities for the year ended December 31, 2019 of $8.4 million primarily consisted of $28.4 million in purchases of short term investments and $1.5 million in purchases of property and equipment, partially offset by $21.5 million in proceeds from sales and maturities of investments.

Cash Flows from Financing Activities

Cash provided by financing activities for the year ended December 31, 2020 of $20.6 million consisted of proceeds from the exercise of warrants of $9.4 million, proceeds from the issuance of stock and warrants relating to the December 2020 Offering of $8.0 million, proceeds from borrowings of $3.1 million, capital contributions from the non-controlling interest in our joint venture of $1.6 million and proceeds from the purchase of ESPP shares of $51,000. Partially offsetting these proceeds were payments of offering costs totaling $652,000 for the December 2020 Offering, as well payments of transaction costs relating to extinguishment of warrant liability of $863,000.

Cash provided by financing activities for the year ended December 31, 2019 of $21.9 million consisted of proceeds from the issuance of stock and warrants relating to the June 2019 Offering of $7.5 million and from the September 2019 Offering of $10.0 million, proceeds from the exercise of some of the June 2019 warrants of $5.3 million, capital contributions from the non-controlling interest in our joint venture of $689,000 and proceeds from the purchase of ESPP shares of $21,000. Partially offsetting these proceeds were payments of offering costs totaling $798,000 and $663,000 for the September 2019 and June 2019 Offerings, respectively, as well as $24,000 in payments of offering costs for the June 2018 Offering.

Off-Balance Sheet Arrangements

Since our inception, we have not engaged in any off-balance sheet arrangements, including the use of structured finance, special purpose entities or variable interest entities, other than Verdeca. See Note 9 for further detail.

Critical Accounting Polices and Estimates

Our management's discussion and analysis of our financial condition and results of operations is based on our financial statements, which have been prepared in accordance with GAAP. The preparation of these financial statements requires us 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, as well as the reported revenue generated, and expenses incurred during the reporting periods. Our estimates are based on our historical experience and on various other factors that we believe are reasonable under the circumstances, the results of which form the basis for making judgments about the carrying value of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates under different assumptions or conditions.

We consider our critical accounting policies and estimates to be revenue recognition, determination of the provision for income taxes, stock-based compensation, fair value of certain equity instruments, and net realizable value of inventory.

Revenue Recognition

We recognize revenue when control of the promised goods or services is transferred to customers at an amount that reflects the consideration to which the entity expects to be entitled to in exchange for those goods or services. See Note 2 for further detail.

We generally recognize product revenues once passage of title has occurred, which is generally upon shipment. Shipping and handling costs charged to customers are recorded as revenues and included in cost of product revenues at the time the sale is recognized.

We have determined that, at the inception of each license agreement, there is only one deliverable for the license for, access to and assistance with the development of the specified intellectual property. We recognize revenue up-front and annual license fees in full when it is deemed probable to be earned. See Note 2 for further detail.

We recognize royalty revenue when the Company can reasonably determine the amounts earned.

We recognize revenue related to milestone payments when it is probable that such amounts would not be reversed. See Note 2 for further detail.

Up-front license fees for newly executed agreements are recognized upon execution. Annual license fees and milestone fees are variable consideration that is initially constrained and recognized only when it is probable that such amounts would not be reversed. The evaluation and analysis of such fees is performed and once the annual license or milestone fee is deemed probable to have been earned, it is recognized in full in that period. See Note 2 for further detail.

Contract research revenue consists of amounts earned from performing contracted research activities for third parties. Activities performed are related to breeding programs or the genetic engineering of plants and are subject to an executed agreement. We generally recognize fees for research activities ratably over the contractually specified performance period.

Grant revenues are recognized as eligible research and development expenses are incurred using a proportional performance recognition methodology.

Inventories

Inventory costs are tracked on a lot-identified basis, valued at the lower of cost or net realizable value and are included as cost of product revenues when sold. We compare the cost of inventories with market value and write down inventories to net realizable value, if lower. We write down inventory when conditions indicate that the net realizable value may be less than cost due to physical deterioration, obsolescence, changes in price levels or other factors. Additionally, we provide reserves for excess and slow-moving inventory to its estimated net realizable value. The inventory write-downs are based upon estimates about future demand from our customers and distributors and market conditions. Future events that could significantly influence our judgment and related estimates include conditions in target markets, introduction of new products or changes to current or future competitor products.

Stock-Based Compensation

We recognize compensation expense related to the employee stock purchase plan and stock options based on the estimated fair value of the awards on the date of grant, net of estimated forfeitures. We estimate the grant date fair value, and the resulting stock-based compensation expense, using the Black-Scholes option-pricing model. The grant date fair value of the stock-based awards is generally recognized on a straight-line basis over the requisite service period, which is generally the vesting period of the respective awards.

We recorded stock-based compensation expense related to equity awards of $2.0 million and $2.3 million for the years ended December 31, 2020 and 2019, respectively.

In determining the fair value of stock-based awards, we use the Black-Scholes option-pricing model and assumptions discussed below. Each of these inputs is subjective and generally requires significant judgment to determine.

Expected Term—The expected term represents the period that stock-based awards are expected to be outstanding and was estimated based on a simplified method allowed by the SEC due to insufficient historical data, and defines the term as the average of the contractual term of the options and the weighted-average vesting period for all open employee awards.

Expected Volatility—Since we were privately held and do not have sufficient trading history for our common stock, the expected volatility was estimated based on the average historical volatilities of common stock of comparable publicly traded entities over a period equal to the expected term of the stock option grants. The comparable companies were chosen based on their similar size, stage in the life cycle, or area of specialty. We will continue to apply this process until a sufficient amount of historical information regarding the volatility of our own stock price becomes available.

Risk-Free Interest Rate—The risk-free interest rate is based on the U.S. Treasury zero coupon issues in effect at the time of grant for periods corresponding with the expected term of option.

Expected Dividend—We have never paid dividends on our common stock and have no plans to pay dividends on our common stock. Therefore, we used an expected dividend yield of zero.

For stock options and other equity awards, our board of directors determine the fair value of each share of underlying common stock based on the closing price of our common stock as reported on the NASDAQ Stock Market on the date of grant.

In addition to the Black-Scholes assumptions, we estimate our forfeiture rate based on an analysis of our actual forfeitures and will continue to evaluate the adequacy of the forfeiture rate based on actual forfeiture experience, analysis of employee turnover behavior, and other factors. The impact from any forfeiture rate adjustment would be recognized in full in the period of adjustment and if the actual number of future forfeitures differs from our estimates, we might be required to record adjustments to stock-based compensation in future periods.

Income Taxes

We use the asset and liability method of accounting for income taxes. Under this method, deferred tax assets and liabilities are determined based on the differences between the financial reporting and the tax bases of assets and liabilities and are measured using the enacted tax rates and laws that will be in effect when the differences are expected to reverse. A valuation allowance is provided when it is more likely than not that some portion or all of a deferred tax asset will not be realized.

Recent Accounting Pronouncements

For discussions of the adoption and potential impacts of recently issued accounting standards, refer to Note 3 – Recent Accounting Pronouncements.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk.

Not applicable.

Item 8. Financial Statements and Supplementary Data.

INDEX TO CONSOLIDATED FINANCIAL STATEMENTS

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the stockholders and the Board of Directors of Arcadia Biosciences, Inc.

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Arcadia Biosciences, Inc. and subsidiaries (the "Company") as of December 31, 2020 and 2019, the related consolidated statements of operations and comprehensive loss, stockholders' equity, and cash flows, for each of the two years in the period ended December 31, 2020, and the related notes (collectively referred to as the "consolidated financial statements"). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2020 and 2019, and the results of its operations and its cash flows for each of the two years in the period ended December 31, 2020, in conformity with accounting principles generally accepted in the United States of America.

Basis for Opinion

These consolidated financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's consolidated 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 the 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 consolidated 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 consolidated 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 consolidated 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 consolidated financial statements. We believe that our audits provide a reasonable basis for our opinion.

Critical Audit Matter

The critical audit matter communicated below is a matter arising from the current-period audit of the consolidated financial statements that was communicated or required to be communicated to the audit committee and that (1) relates to accounts or disclosures that are material to the consolidated financial statements and (2) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matter below, providing a separate opinion on the critical audit matter or on the accounts or disclosures to which it relates.

GoodWheat and GoodHemp Inventory Valuation – Refer to Note 4 to the Consolidated Financial Statements

Critical Audit Matter Description

GoodWheat and GoodHemp inventories are recorded at the lower of cost or net realizable value. Management periodically evaluates the carrying value of inventories in relation to the forecasts of product demand, which takes into consideration the estimated marketability and salability of products. When quantities on hand exceed forecasted demand, regulatory changes occur, or quality specifications are not met, a write-down is recorded for such inventories. Changes in assumptions of forecasted product demand could have a significant impact on the amount of inventory valuation, and any related write-downs.

Given the significant judgments made by management in forecasting product demand, including the impact of product marketability and salability, auditing the reasonableness of management’s estimates and assumptions required a high degree of auditor judgment and an increased extent of effort.

How the Critical Audit Matter Was Addressed in the Audit

Our audit procedures over GoodWheat and GoodHemp inventory valuation included the following, among others:

- We tested the demand forecasts by obtaining documentation to support customer orders, contracts, historical and future sales that corroborate the reasonableness of amount stated for demand.
- We evaluated management’s ability to accurately forecast product demand by comparing actual results to management’s historical estimates.
- We performed corroborative inquiries with the personnel responsible for sales forecasting to evaluate the reasonableness of the product salability and demand forecasts.
- We evaluated whether write-downs of inventory may be understated by evaluating write-down activity subsequent to December 31, 2020.

/s/ Deloitte & Touche LLP

Phoenix, Arizona

March 31, 2021

We have served as the Company's auditor since 2007.

Arcadia Biosciences, Inc.
Consolidated Balance Sheets
(In thousands, except share data)

	As of December 31,	
	2020	**2019**
Assets		
Current assets:		
Cash and cash equivalents	$ 14,042	$ 8,417
Short-term investments	11,625	16,915
Accounts receivable	1,406	602
Inventories, net — current	3,812	1,794
Prepaid expenses and other current assets	811	712
Total current assets	31,696	28,440
Restricted cash	2,001	—
Property and equipment, net	3,539	1,799
Right of use assets	5,826	1,963
Inventories, net — noncurrent	3,485	364
Goodwill	408	—
Intangible assets, net	370	—
Other noncurrent assets	23	8
Total assets	$ 47,348	$ 32,574
Liabilities and stockholders' equity		
Current liabilities:		
Accounts payable and accrued expenses	$ 4,105	$ 4,685
Amounts due to related parties	80	40
Debt - current	1,141	24
Unearned revenue — current	8	42
Operating lease liability - current	717	611
Other current liabilities	263	306
Total current liabilities	6,314	5,708
Debt - noncurrent	2,105	107
Operating lease liability - noncurrent	5,389	1,497
Common stock warrant liabilities	2,708	14,936
Other noncurrent liabilities	2,280	2,000
Total liabilities	18,796	24,248
Commitments and contingencies (Note 15)		
Stockholders' equity:		
Common stock, $0.001 par value—150,000,000 shares authorized as of December 31, 2020 and December 31, 2019; 13,450,861 and 8,646,149 shares issued and outstanding as of December 31, 2020 and December 31, 2019, respectively.	54	49
Additional paid-in capital	239,496	214,826
Accumulated other comprehensive income	-	1
Accumulated deficit	(211,825)	(207,171)
Total Arcadia Biosciences stockholders' equity	27,725	7,705
Non-controlling interest	827	621
Total stockholders' equity	28,552	8,326
Total liabilities and stockholders' equity	$ 47,348	$ 32,574

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

Arcadia Biosciences, Inc.
Consolidated Statements of Operations and Comprehensive Loss
(In thousands, except share and share data)

	Year Ended December 31,	
	2020	2019
Revenues:		
Product	$ 1,044	$ 814
License	6,801	67
Royalty	83	—
Contract research and government grants	106	288
Total revenues	8,034	1,169
Operating expenses (income):		
Cost of product revenues	5,199	885
Research and development	7,960	7,098
Gain on sale of Verdeca	(8,814)	—
Change in fair value of contingent consideration	—	(1,000)
Selling, general and administrative	16,467	13,567
Total operating expenses	20,812	20,550
Loss from operations	(12,778)	(19,381)
Interest expense	(47)	(5)
Other income, net	740	466
Change in fair value of common stock warrant liabilities	6,570	(9,243)
Loss on extinguishment of warrant liability	(635)	—
Offering costs	—	(708)
Net loss before income taxes	(6,150)	(28,871)
Income tax benefit (provision)	124	(2)
Net loss	(6,026)	(28,873)
Net loss attributable to non-controlling interest	(1,371)	(68)
Net loss attributable to common stockholders	$ (4,655)	$ (28,805)
Net loss per share attributable to common stockholders:		
Basic and diluted	$ (0.47)	$ (4.53)
Weighted-average number of shares used in per share calculations:		
Basic and diluted	9,959,018	6,363,112
Other comprehensive (loss) income, net of tax		
Unrealized (losses) gains on investment securities	(1)	1
Other comprehensive (loss) income	(1)	1
Comprehensive loss attributable to common stockholders	$ (4,656)	$ (28,804)

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

Arcadia Biosciences, Inc.
Consolidated Statements of Stockholders' Equity

(In thousands, except share data)

	Common Stock		Additional Paid-In Capital	Accumulated Deficit	Accumulated Other Comprehensive (Loss) Income	Non-controlling Interest	Total Stockholders' Equity
	Shares	Amount					
Balance at December 31, 2019	8,646,149	$ 49	$ 214,826	$ (207,171)	$ 1	$ 621	$ 8,326
Issuance of shares related to employee stock purchase plan	19,667	—	51	—	—	—	51
Issuance of shares related to exercise of June 2018 Warrants	1,392,345	1	5,568	—	—	—	5,569
Issuance of investor warrants related to May 2020 Warrant Transaction	—	—	4,415	—	—	—	4,415
Issuance of placement agent warrants related to issuance of May 2020 Warrants	—	—	215	—	—	—	215
Issuance of shares related to the exercise of March 2018 PIPE	641,416	1	2,443	—	—	—	2,444
Issuance of investor warrants related to July 2020 Warrant Transaction	—	—	2,059	—	—	—	2,059
Issuance of placement agent warrants related to issuance of July 2020 Warrants	—	—	101	—	—	—	101
Shares of common stock issued at closing of ISI transaction	132,626	—	432	—	—	—	432
Issuance of shares and warrants related to December 2020 Offering	2,618,658	3	7,997	—	—	—	8,000
Offering costs related to December 2020 Offering	—		(939)				(939)
Issuance of placement agent warrants related to December 2020 Offering	—	—	287	—	—	—	287
Stock-based compensation	—	—	2,042	—	—	—	2,042
Non-controlling interest contributions	—	—	—	—	—	1,578	1,578
Unrealized losses on investment securities	—	—	—	—	(1)	—	(1)
Net loss	—	—	—	(4,655)	—	(1,371)	(6,026)
Balance at December 31, 2020	13,450,861	$ 54	$ 239,496	$ (211,825)	$ —	$ 827	$ 28,552

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

	Common Stock		Additional Paid-In Capital	Accumulated Deficit	Accumulated Other Comprehensive (Loss) Income	Non-controlling Interest	Total Stockholders' Equity
	Shares	Amount					
Balance at December 31, 2018	4,774,919	$ 45	$ 191,136	$ (178,366)	$ —	$ —	$ 12,815
Issuance of shares related to employee stock purchase plan	8,536	—	18	—	—	—	18
Issuance of shares related to employee stock option exercises	546	—	3	—	—	—	3
Issuance of shares and warrants related to June 2019 Offering	1,489,575	2	3,301	—	—	—	3,303
Offering costs related to June 2019 Offering	—	—	(489)	—	—	—	(489)
Issuance of placement agent warrants related to June 2019 Offering	—	—	198	—	—	—	198
Issuance of shares related to the exercise of warrants issued with the June 2019 offering	1,053,745	1	5,268	—	—	—	5,269
Reclassification of common stock warrant liability balance with exercise	—	—	7,016	—	—	—	7,016
Issuance of shares and warrants related to September 2019 Offering	1,318,828	1	6,570	—	—	—	6,571
Offering costs related to September 2019 Offering	—	—	(808)	—	—	—	(808)
Issuance of placement agent warrants related to September 2019 Offering	—	—	326	—	—	—	326
Stock-based compensation	—	—	2,287	—	—	—	2,287
Non-controlling interest contributions	—	—	—	—	—	689	689
Unrealized gains on investment securities	—	—	—	—	1	—	1
Net loss	—	—	—	(28,805)	—	(68)	(28,873)
Balance at December 31, 2019	8,646,149	$ 49	$ 214,826	$ (207,171)	$ 1	$ 621	$ 8,326

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

Arcadia Biosciences, Inc.
Consolidated Statements of Cash Flows
(In thousands)

	Year Ended December 31,	
	2020	**2019**
CASH FLOWS FROM OPERATING ACTIVITIES:		
Net loss	$ (6,026)	$ (28,873)
Adjustments to reconcile net loss to cash used in operating activities:		
Change in fair value of common stock warrant liabilities	(6,570)	9,243
Change in fair value of contingent consideration	—	(1,000)
Offering costs	—	708
Depreciation	632	194
Amortization of intangible assets	30	—
Lease amortization	1,048	708
(Gain) Loss on disposal of equipment	(8)	3
Net amortization of investment premium	(44)	(180)
Stock-based compensation	2,042	2,287
Gain on sale of Verdeca	(8,814)	—
Corporate securities received in exchange for license agreement	(4,318)	—
Unrealized gain on corporate securities	(656)	—
Write down of inventory	4,311	304
Loss on extinguishment of warrant liability	635	—
Deferred income taxes	(107)	—
Changes in operating assets and liabilities:		
Accounts receivable	(1,119)	(437)
Unbilled revenue	—	3
Inventories	(9,751)	(1,535)
Prepaid expenses and other current assets	39	(8)
Other noncurrent assets	(15)	(1)
Accounts payable and accrued expenses	(580)	2,102
Amounts due to related parties	40	11
Unearned revenue	(34)	(54)
Other current liabilities	(43)	42
Operating lease payments	(910)	(715)
Net cash used in operating activities	(30,218)	(17,198)
CASH FLOWS FROM INVESTING ACTIVITIES:		
Proceeds from sale of property and equipment	8	16
Purchases of property and equipment	(2,335)	(1,477)
Proceeds from sale of Verdeca	3,153	—
Acquisitions, net of cash acquired	(500)	—
Purchases of investments	(1,292)	(28,358)
Proceeds from sales and maturities of investments	18,250	21,450
Net cash provided by (used in) investing activities	17,284	(8,369)
CASH FLOWS FROM FINANCING ACTIVITIES:		
Payments of offering costs relating to June 2018 Offering	—	(24)
Proceeds from issuance of common stock and warrants from June 2019 Offering	—	7,500
Payments of offering costs relating to June 2019 Offering	—	(663)
Proceeds from issuance of common stock and warrants from September 2019 Offering	—	10,000
Payments of offering costs relating to September 2019 Offering	—	(798)
Proceeds from issuance of common stock and warrants from December 2020 Offering	8,000	—
Payments of offering costs relating to December 2020 Offering	(652)	—
Proceeds from borrowings	3,108	—
Payments of transaction costs relating to extinguishment of warrant liability	(863)	—
Principal payments on notes payable	(34)	(8)
Proceeds from exercise of warrants	9,372	5,269
Proceeds from exercise of stock options and purchases through ESPP	51	21
Capital contributions received from non-controlling interest	1,578	689
Net cash provided by financing activities	20,560	21,986
Net increase (decrease) in cash, cash equivalents and restricted cash	7,626	(3,581)
Cash, cash equivalents and restricted cash — beginning of period	8,417	11,998
Cash, cash equivalents and restricted cash — end of period	$ 16,043	$ 8,417

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

SUPPLEMENTAL DISCLOSURES OF CASH FLOW INFORMATION:		
Cash paid for interest	$ 10	$ 4
Cash paid for taxes	$ 1	$ 2
NONCASH TRANSACTIONS:		
Offering costs in accounts payable and accrued expenses at end of period	$ —	$ 20
Shares of common stock issued at closing of ISI transaction	$ 432	$ —
Common stock warrants issued to placement agent and included in offering costs related to December 2020 Purchase Agreement	$ 287	$ —
Common stock warrants issued to placement agent and included in offering costs related to May 2020 Warrant Transaction	$ 215	$ —
Common stock warrants issued to placement agent and included in offering costs related to July 2020 Warrant Transaction	$ 101	$ —
Common stock warrants issued to placement agent and included in offering costs related to June 2019 Offering	$ —	$ 86
Common stock warrants issued to placement agent and included in offering costs related to September 2019 Offering	$ —	$ 95
Reclassification of common stock warrant liability balance with warrant exercises	$ —	$ 7,016
Right of use assets obtained in exchange for new operating lease liabilities	$ 331	$ 2,328
Right of use assets obtained through modification of existing lease agreement	$ 4,207	$ 194
Fixed assets acquired with notes payable	$ 37	$ 139
Purchases of fixed assets included in accounts payable and accrued expenses	$ 71	$ 1

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

Arcadia Biosciences, Inc.
Notes to Consolidated Financial Statements

Note 1. Description of Business

Organization

Arcadia Biosciences, Inc. (the "Company"), was incorporated in Arizona in 2002 and maintains its headquarters in Davis, California, with additional facilities in Phoenix, Arizona, American Falls, Idaho, Molokai, Hawaii, and Albany, Oregon. The Company was reincorporated in Delaware in March 2015.

The Company is a leader in science-based approaches to developing high value crop productivity traits primarily in hemp, wheat, and soybean, designed to enhance farm economics by improving the performance of crops in the field, as well as their value as food ingredients, health and wellness products, and their viability for industrial applications. The Company uses state of the art gene-editing technology and advanced breeding techniques to develop these proprietary innovations which the Company is beginning to monetize through a number of methods including seed and grain sales, product extract sales, trait licensing and royalty agreements.

In February 2012, the Company formed Verdeca LLC (“Verdeca,” see Note 9), a limited liability company jointly owned with Bioceres, Inc. (“Bioceres”), a U.S. wholly owned subsidiary of Bioceres, S.A., an Argentine corporation. Bioceres, S.A. is an agricultural investment and development cooperative. On November 12, 2020, the Company entered into a Master Transaction Agreement (“Transaction”) with Bioceres Crop Solutions Corp pursuant to which the Company sold all of its memberships interests it owned in Verdeca to Bioceres, Inc. Verdeca was consolidated by the Company through the date of the Transaction.

On August 9, 2019, the Company entered into a joint venture agreement with Legacy Ventures Hawaii, LLC (“Legacy,” see Note 8) to grow, extract, and sell hemp products. The new partnership, Archipelago Ventures Hawaii, LLC (“Archipelago”), combines the Company’s extensive genetic expertise and resources with Legacy’s experience in hemp extraction and sales.

Liquidity, Capital Resources, and Going Concern

The accompanying consolidated financial statements have been prepared on a going concern basis, which contemplates the realization of assets and the satisfaction of liabilities during the normal course of business. Since inception, the Company has financed its operations primarily through equity and debt financings. As of December 31, 2020, the Company had an accumulated deficit of $211.8 million, cash and cash equivalents of $14.0 million, restricted cash of $2.0 million, and short-term investments of $11.6 million. For the years ended December 31, 2020 and 2019, the Company had net losses of $6.0 million and $28.9 million, respectively, and net cash used in operations of $30.2 million and $17.2 million, respectively. The Company believes that its existing cash, cash equivalents and investments will be sufficient to meet its anticipated cash requirements for at least through March 2022.

The Company may seek to raise additional funds through debt or equity financings. The Company may also consider entering into additional partner arrangements. The sale of additional equity would result in dilution to the Company’s stockholders. The incurrence of debt would result in debt service obligations, and the instruments governing such debt could provide for additional operating and financing covenants that would restrict operations. If the Company does require additional funds and is unable to secure adequate additional funding at terms agreeable to the Company, the Company may be forced to reduce spending, extend payment terms with suppliers, liquidate assets, or suspend or curtail planned development programs. Any of these actions could materially harm the business, results of operations and financial condition.

Arcadia Biosciences, Inc.
Notes to Consolidated Financial Statements. (Continued)

The Company is closely monitoring how the spread of the novel coronavirus (“COVID-19”) is affecting its business operations and employees. The Company’s targeted revenues have been adversely impacted as hemp growers have been slower to make decisions to purchase hemp seeds due to economic uncertainty and wheat consumer packaged goods companies have been heavily focused on production over R&D evaluation as demand for staples like pasta and flour have increased. The continued spread of the outbreak may further impact the Company’s business, results of operations, and financial condition.

Note 2. Summary of Significant Accounting Policies

Basis of Presentation and Principles of Consolidation

The consolidated financial statements include the accounts of the Company, Verdeca and Archipelago. All intercompany balances and transactions have been eliminated in consolidation. The Company prepares its consolidated financial statements in conformity with accounting principles generally accepted in the United States of America, or U.S. GAAP (“GAAP”), and with the rules of the Securities and Exchange Commission.

The Company uses a qualitative approach in assessing the consolidation requirement for variable interest entities ("VIEs"). This approach focuses on determining whether the Company has the power to direct the activities of the VIE that most significantly affect the VIE’s economic performance and whether the Company has the obligation to absorb losses, or the right to receive benefits, that could potentially be significant to the VIE.

Up to the date of the sale transaction described in Note 1, the Company has determined that it is the primary beneficiary of Verdeca, which was a VIE. Accordingly, the Company consolidates Verdeca in the consolidated financial statements after eliminating intercompany transactions. The Company evaluates its relationships with its VIEs upon the occurrence of certain significant events that affect the design, structure or other factors pertinent to the primary beneficiary determination. Verdeca had no operations, assets or liabilities as of and for the period ended November 12, 2020 and for the year ended December 31, 2019.

For all periods presented, the Company has determined that it is the primary beneficiary of Archipelago, a joint venture, as it has a controlling interest in Archipelago. Accordingly, the Company consolidates Archipelago in the consolidated financial statements after eliminating intercompany transactions. For consolidated joint ventures, the non-controlling partner’s share of the assets, liabilities and operations of the joint venture is included in non-controlling interests as equity of the Company. The non-controlling partner’s interest is generally computed as the joint venture partner’s ownership percentage of Archipelago. Net loss attributable to non-controlling interest of $1,371,000 and $68,000 is recorded as an adjustment to net loss to arrive at net loss attributable to common stockholders for the years ended December 31, 2020 and 2019, respectively. The non-controlling partner’s equity interests are presented as non-controlling interests on the consolidated balance sheets as of December 31, 2020 and 2019.

Use of Estimates

The preparation of consolidated financial statements in conformity with GAAP requires management to make estimates and assumptions in the Company’s consolidated financial statements and notes thereto. Significant estimates and assumptions made by management included the determination of the provision for income taxes, stock-based compensation, fair value of certain equity instruments, and net realizable value of inventory. Management bases its estimates on historical experience and on various other market-specific and relevant assumptions that management believes to be reasonable under the circumstances. Actual results could differ from those estimates.

COVID-19 continues to create significant uncertainty and disruption in the global economy and financial markets and could impact estimates.

Cash and Cash Equivalents

The Company considers any liquid investments with a stated maturity of three months or less at the date of purchase to be cash equivalents. Cash and cash equivalents consist of cash on deposit with banks. The Company limits cash investments to financial institutions with high credit standings; therefore, management believes that there is no significant exposure to any credit risk in the Company's cash and cash equivalents. However, as of December 31, 2020 and 2019, a substantial portion of the Company's cash in depository accounts is in excess of the federal deposit insurance limits.

Restricted Cash

Restricted cash consists of funds that are contractually or legally restricted as to usage or withdrawal and have been presented separately from cash and cash equivalents on the consolidated balance sheets.

Investments in Debt and Equity Securities

Investments in debt and equity securities are carried at fair value and classified as short-term investments. The 1,875,000 shares of common stock of Bioceres Crop Solutions Corp. ("BIOX") added during the fourth quarter ended December 31, 2020, have a six-months' trading restriction, expiring on May 12, 2021. Realized and unrealized gains and losses on investment securities are included in other income, net, in the consolidated statements of operations and comprehensive loss. Investment securities are reported as cash and cash equivalent, short-term investments or long-term investments in the consolidated balance sheets based on the nature of the investments and maturity period. Short-term investments have maturities of less than a year and long-term investments have maturities of a year and greater from the balance sheet date. The Company's equity securities are primarily comprised of shares of BIOX listed on the New York Stock Exchange ("NYSE"). These investments are held in the custody of a major financial institution. Other debt securities consist of U.S. government securities, treasury bills, commercial paper, corporate securities, and money markets.

Other-than-Temporary Impairments on Investment

The Company regularly reviews each of its investments for impairment by determining if the investment has sustained an other-than-temporary decline in its value, in which case the investment is written down to its fair value by a charge to earnings. Factors that are considered by the Company in determining whether an other-than-temporary decline in value has occurred include (i) the market value of the investment in relation to its cost basis, (ii) the financial condition of the investment, and (iii) the Company's intent and ability to retain the investment for a sufficient period of time to allow for recovery of the market value of the investment. As of December 31, 2020 and 2019, there was no impairment of the Company's investments.

Accounts Receivable

Accounts receivable represents amounts owed to the Company from product sales, licenses, royalties and contract research and government grants. The carrying value of the Company's receivables represents estimated net realizable values. The Company generally does not require collateral and estimates any required allowance for doubtful accounts based on historical collection trends, the age of outstanding receivables, and existing economic conditions. If events or changes in circumstances indicate that specific receivable balances may be impaired, further consideration is given to the collectability of those balances and the allowance is recorded accordingly. Past-due receivable balances are written off when the Company's internal collection efforts have been unsuccessful in collecting the amounts due. The Company had no amounts reserved for doubtful accounts at December 31, 2020 and 2019 as the Company expected full collections of all accounts receivable balances as of each of these dates.

Inventory

GoodWheat: Propriety wheat plants are grown, producing seed with a variety of improved nutritional qualities, including high levels of amylose, improved shelf-life, and reduced gluten. The seed is used for subsequent

plantings or processed, and sold as GoodWheat seeds, grain, and flour, which the Company refers to collectively as GoodWheat products. Amounts inventoried consist primarily of fees paid to contracted cooperators to grow the crops, costs to process and store harvested seed and grain, and costs to mill the grain into flour.

SONOVA® Gamma Linolenic Acid ("GLA") Safflower Oil: Proprietary safflower plants were grown, producing seed with a high-GLA content. This seed was processed, and is sold as GLA oil, including SONOVA 400 GLA safflower oil and SONOVA Ultra GLA safflower oil, which the Company refers to collectively as SONOVA products. Amounts inventoried consist primarily of fees paid to contracted cooperators to grow the crops and costs to process and store the oil.

GoodHemp: Proprietary seeds are grown and used for subsequent plantings and sold as final product to other growers. Amounts in inventory for internally produced hemp seeds consist primarily of labor, supplies and facility costs. The costs to procure seeds from external growers and suppliers are included in inventory, as well.

Archipelago: Hemp seeds are purchased from external sources and planted on land leased in Molokai. The costs of purchasing, planting and growing the seed, and harvesting the resulting biomass are captured as inventory, along with the costs to process the biomass into CBD oil. Amounts in inventory for growing biomass primarily consist of labor, supplies and facility costs.

The inventories—current line item on the balance sheet represents inventory forecasted to be sold or used in production in the next 12 months, as of the balance sheet date, and consists primarily of the cost of GoodWheat seed, grain, and flour, GLA oil, and hemp seed. The inventories—noncurrent line item on the balance sheet represents inventory expected to be used in production or sold beyond the next 12 months, as of the balance sheet date, and consists primarily of GoodWheat seed and grain, and GLA oil.

Raw materials inventories consist primarily of the costs to produce GoodWheat seeds. Goods in process inventories consist of costs to produce GoodHemp seed, hemp seed production costs incurred by Archipelago, grower fees and related costs for soybeans to be transferred to Verdeca, and GoodWheat seed and grain. Finished goods inventories consist of GoodWheat products, GoodHemp seed and GLA oil that are available for sale.

Property and Equipment

Property and equipment acquisitions are recorded at cost. Provisions for depreciation are calculated using the straight-line method over the following average estimated useful lives of the assets:

	Years
Laboratory equipment	5
Software and computer equipment	3
Machinery and equipment	2-20
Furniture and fixtures	7
Vehicles	5
Leasehold improvements	2-10*

* *Leasehold improvements are depreciated over the shorter of the estimated life of the asset or the remaining life of the lease.*

Impairment of Long-Lived Assets

The Company evaluates if events and circumstances have occurred that indicate the remaining estimated useful life of long-lived assets and identifiable intangible assets may warrant revision or that the remaining balance of these assets may not be recoverable. In evaluating for recoverability, the Company estimates the future undiscounted cash flows expected to result from the use of the assets and their eventual disposition. In the event that the balance of any asset exceeds the future undiscounted cash flow estimate, impairment is recognized based on the excess of the carrying amounts of the asset above its estimated fair value. As of December 31, 2020 and 2019, there was no impairment of the Company's long-lived assets.

Fair Value of Financial Instruments

Fair value accounting is applied for all financial assets and liabilities and non-financial assets and liabilities that are recognized or disclosed at fair value in the consolidated financial statements on a recurring basis. Assets and liabilities recorded at fair value in the consolidated financial statements are categorized based upon the level of judgment associated with the inputs used to measure their fair value. Hierarchical levels, which are directly related to the amount of subjectivity associated with the inputs to the valuation of these assets or liabilities, are as follows:

- Level 1 inputs are quoted prices (unadjusted) in active markets for identical assets or liabilities that the Company can access at the measurement date.
- Level 2 inputs are observable inputs other than quoted prices in active markets for identical assets and liabilities, quoted prices for identical or similar assets or liabilities in inactive markets, or other inputs that are observable or can be corroborated by observable market data for substantially the full term of the assets or liabilities.
- Level 3 inputs are unobservable inputs for the asset or liability.

The carrying values of the Company's financial instruments, including cash equivalents, accounts receivable, and accounts payable approximated their fair values due to the short period of time to maturity or repayment.

Concentration of Risk

Cash and cash equivalents are maintained with several financial institutions. Deposits held with banks may exceed the amount of insurance provided on such deposits. Generally, these deposits may be redeemed upon demand and are maintained with financial institutions with reputable credit and therefore bear minimal credit risk. The Company seeks to mitigate its credit risks by spreading such risks across multiple counterparties and monitoring the risk profiles of these counterparties.

Customer Concentration

Significant customers are those that represent greater than 10% of the Company's total revenues or gross accounts receivable balance at each respective balance sheet date.

The Company had three customers that represented 57%, 21% and 12% of accounts receivable, and three customers that represented 47%, 17%, and 15% of accounts receivable, as of December 31, 2020 and 2019, respectively. The Company had one customer that represented 83% of total revenues, and two customers that represented 40% and 15% of total revenues, for the years ended December 31, 2020 and 2019, respectively.

Stock-Based Compensation

The Company recognizes compensation expense related to its employee stock purchase plan and the cost of stock-based compensation awards on a straight-line basis over the requisite service period, net of estimated forfeitures. Judgment is required in estimating the amount of stock-based awards that will be forfeited prior to vesting. Compensation expense could be revised in subsequent periods if actual forfeitures differ from those estimates. The Company has selected the Black-Scholes option-pricing model and various inputs to estimate the fair value of its stock-based awards. See Note 14 for additional information. Amounts recognized in the consolidated statements of operations and comprehensive loss were as follows (in thousands):

	Year Ended December 31,	
	2020	2019
	(in thousands)	
Research and development	$ 341	$ 321
Selling, general and administrative	1,701	1,966
Total stock-based compensation	$ 2,042	$ 2,287

Income Taxes

The Company uses the asset and liability method of accounting for income taxes. Under this method, deferred tax assets and liabilities are determined based on the differences between the financial reporting and the tax basis of assets and liabilities and are measured using the enacted tax rates and laws that will be in effect when the differences are expected to reverse. A valuation allowance is provided when it is more likely than not that some portion or all of a deferred tax asset will not be realized.

Net Loss per Share

Basic net loss per share, which excludes dilution, is computed by dividing the net loss attributable to common stockholders by the weighted-average number of shares of common stock outstanding during the period. Diluted net loss per share reflects the potential dilution that could occur if securities or other contracts to issue common stock, such as stock options, convertible promissory notes, convertible preferred stock, redeemable convertible preferred stock and warrants, result in the issuance of common stock which share in the losses of the Company. Certain potential shares of common stock have been excluded from the computation of diluted net loss per share as their effect would be anti-dilutive. Such potentially dilutive shares are excluded when the effect would be to reduce the loss per share. Due to net losses, there is no impact on earnings per share calculation in applying the two-class method since the participating securities have no legal requirement to share in any losses.

Revenue Recognition

The Company derives its revenues from product revenues, licensing agreements, royalties, contract research agreements, and government grants.

Product Revenues

Product revenues to date have consisted primarily of sales of SONOVA products, with initial GoodWheat seed sale revenues recognized in the fourth quarter of 2019 and initial GoodHemp seed sale revenues recognized in the fourth quarter of 2020. The Company recognizes revenue from product sales when control of the product is transferred to third-party distributors and manufacturers, collectively “our customers”, which generally occurs upon shipment. Revenues fluctuate depending on the timing of shipments of product to our customers.

License Revenues

License revenues to date consist of up-front, nonrefundable license fees, annual license fees, and subsequent milestone payments that the Company receives under the Company’s research and license agreements. The Company recognizes revenue generated from up-front, nonrefundable license fees upon execution of the agreement and recognizes annual license fees when it is probable that a material reversal will not occur.

Milestone fees are variable consideration that is initially constrained and recognized only when it is probable that such amounts would not be reversed. The Company assesses when achievement of milestones is probable to determine the timing of revenue recognition for milestone fees. Milestones typically consist of significant stages of development for the Company’s traits in a potential commercial product, such as achievement of specific technological targets, completion of field trials, filing with regulatory agencies, completion of the regulatory process, and commercial launch of a product containing the Company’s traits. Given the seasonality of agriculture and time required to progress from one milestone to the next, achievement of milestones is inherently uneven, and the Company’s license revenues are likely to fluctuate significantly from period to period.

Royalty Revenues

Royalty revenues from the Company’s agreements with third parties related to GoodWheat products are recognized when the Company can reasonably determine the amounts earned. In most cases, this will be upon notification from the third-party licensee.

Contract Research Revenues

Contract research and government grant revenues consist of amounts earned from performing contracted research primarily related to breeding programs or the genetic engineering of plants for third parties. Contract research revenue is accounted for as a single performance obligation for which revenues are recognized over time using the input method (e.g., costs incurred to date relative to the total estimated costs at completion).

Government Grant Revenues

The Company receives payments from government entities in the form of government grants. Government grant revenue is accounted for as a single performance obligation for which revenues are recognized over time using the input method (e.g., costs incurred to date relative to the total estimated costs at completion). The Company's obligation with respect to these agreements is to perform the research on a best-efforts basis.

Unearned Revenue

The Company defers revenue to the extent that cash received in conjunction with a license agreement, contract or grant exceeds the revenue recognized in accordance with Company policies. During the year ended December 31, 2020, the Company recognized revenue of $54,000 that was included in unearned revenue on the consolidated balance sheet as of December 31, 2019.

Cost of Product Revenues

Cost of product revenues relates to the sale of SONOVA and GoodWheat products and consists of in-licensing and royalty fees, any adjustments or write-downs to inventory, as well as the cost of raw materials, including inventory and third-party services costs related to procuring, processing, formulating, packaging, and shipping the Company's products.

Research and Development Expenses

Research and development expenses consist of costs incurred in the discovery, development, and testing of the Company's products and products in development incorporating the Company's traits. These expenses consist primarily of employee salaries and benefits, fees paid to subcontracted research providers, fees associated with in-licensing technology, land leased for field trials, chemicals and supplies, and other external expenses. These costs are expensed as incurred.

Change in Fair Value of Contingent Consideration

Change in the fair value of contingent consideration is comprised of the gain associated with the reduction of the contingent liability. See Note 15.

Change in the Estimated Fair Value of Common Stock Warrant Liabilities

Change in the estimated fair value of common stock warrant liabilities is comprised of the fair value remeasurement of liability classified common stock warrants. See Note 13.

Note 3. Recent Accounting Pronouncements

In February 2016, the Financial Accounting Standards Board ("FASB") issued ASU No. 2016-02, *Leases (Topic 842)*. Based on the new standard, lessees recognize lease assets and lease liabilities for leases classified as operating leases under previous GAAP and disclose qualitative and quantitative information about leasing arrangements with terms longer than 12 months. The adoption required recording right-of-use assets and corresponding lease obligation liabilities for the operating leases. The Company adopted ASU No. 2016-02 on January 1, 2019. See Note 16.

In June 2016, the FASB issued ASU No. 2016-13, *Financial Instruments - Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments*. Additionally, the FASB issued ASU No. 2019-04, *Codification Improvements to Topic 326*, in April 2019 and ASU 2019-05, *Financial Instruments — Credit Losses (Topic 326) — Targeted Transition Relief*, in May 2019. The amendments affect loans, debt securities, trade receivables, net investments in leases, off-balance-sheet credit exposures, reinsurance receivables, and any other financial assets not excluded from the scope that have the contractual right to receive cash. In November 2019, the FASB issued ASU No. 2019-10, which defers the effective date of ASU No. 2016-13 for smaller reporting companies to fiscal years beginning after December 15, 2022, including interim periods within those fiscal years. The Company is currently evaluating the impact of the adoption of ASU No. 2016-13 on the consolidated financial statements.

In August 2016, the FASB issued ASU No. 2016-15, *Statement of Cash Flows (Topic 230): Classification of Certain Cash Receipts and Cash Payments*. The amendments address cash flow issues such as debt prepayment or debt extinguishment costs and zero-coupon debt instruments. The amendments in this update are effective for fiscal years beginning after December 15, 2018, and interim periods within fiscal years beginning after December 15, 2019. Early adoption is permitted, including adoption in an interim period. The amendments are to be applied using a retrospective transition method to each period presented. If it is impractical to retrospectively apply, it can be applied prospectively as of the earliest date practicable. The Company adopted ASU No. 2016-15 on January 1, 2019 with no material impact to the consolidated financial statements.

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*. The amendments affect any entity required to make disclosures about recurring or nonrecurring fair value measurements. The amendments were effective for all entities for fiscal years beginning after December 15, 2019. The Company adopted ASU No. 2018-13 on January 1, 2020 and expanded its disclosures for significant unobservable inputs used to develop Level 3 fair value measurements. See Note 6.

In June 2018, the FASB issued ASU No. 2018-07, *Compensation—Stock Compensation (Topic 718): Improvements to Nonemployee Share-Based Payment Accounting*. The standard expands the scope of ASC Topic 718 to include share-based payment transactions for acquiring goods and services from nonemployees, and supersedes ASC Topic 505-50, *Equity – Equity Based Payments to Non-Employees*. The Company adopted ASU 2018-07 on January 1, 2019 with no material impact to the consolidated financial statements.

In December 2019, the FASB issued ASU No. 2019-12, *Income Taxes (Topic 740): Simplifying the Accounting for Income Taxes.* The amendments simplify the accounting for income taxes by removing certain exceptions to the general principles in Topic 740 and clarifying other areas of existing guidance. The amendments are effective for all entities for fiscal years beginning after December 15, 2020. The Company is currently evaluating the impact of the adoption of ASU No. 2019-12 on the consolidated financial statements.

In April 2020, the FASB issued a staff question-and-answer ("Q&A") document to respond to frequently asked questions about the accounting for lease concessions related to the effects of the COVID-19 pandemic. Under current GAAP, subsequent changes to lease payments that are not stipulated in the original lease contract are generally accounted for as lease modifications under Topic 842. The Q&A allows companies to make an accounting policy election to not evaluate lease concessions related to the effects of the COVID-19 pandemic as lease modifications. Entities that make this election then need to decide whether to apply the lease modification guidance in ASC 842 to the concession or account for the concession as if it were contemplated as part of the existing contract. The Company has not entered into any lease modifications that provide concessions related to the effects of the COVID-19 pandemic, and therefore has not evaluated its option to make this accounting policy election.

Note 4. Inventory

Inventory costs are tracked on a lot-identified basis and are included as cost of product revenues when sold. Inventories are stated at the lower of cost or net realizable value. The Company makes adjustments to inventory when conditions indicate that the net realizable value may be less than cost due to physical deterioration, obsolescence, changes in price levels, or other factors. Additional adjustments to inventory are made for excess and slow-moving inventory on hand that is not expected to be sold within a reasonable timeframe to reduce the carrying amount to its estimated net realizable value. The write-downs to inventory are included in cost of product revenues and are based upon estimates about future demand from the Company's customers and distributors and market conditions. Therefore, if there are significant changes in demand and market conditions, substantial future write-downs of inventory may be required, which would materially increase our expenses in the period the write down is taken and materially affect our operating results. The Company recorded write-downs of wheat inventories, hemp seed inventories, and prepaid production costs of $4.3 million for the year ended December 31, 2020. The Company recorded $304,000 of inventory write-downs for the year ended December 31, 2019.

Inventories, net consist of the following (in thousands):

	December 31, 2020	December 31, 2019
Raw materials	$ 966	$ 67
Goods in process	1,921	188
Finished goods	4,410	1,903
Inventories	$ 7,297	$ 2,158

Note 5. Property and Equipment, Net

Property and equipment, net consisted of the following (in thousands):

	As of December 31,	
	2020	2019
Laboratory equipment	$ 2,951	$ 2,443
Software and computer equipment	591	502
Machinery and equipment	2,046	989
Furniture and fixtures	181	90
Vehicles	428	395
Leasehold improvements	2,229	2,023
Property and equipment, gross	8,426	6,442
Less accumulated depreciation and amortization	(4,887)	(4,643)
Property and equipment, net	$ 3,539	$ 1,799

Depreciation expense was $632,000 and $194,000 for the years ended December 31, 2020 and 2019, respectively.

As of December 31, 2020 and 2019, respectively, there was $239,000 and $1,014,000 of construction in progress included in property and equipment that had not been placed into service and was not subject to depreciation.

Arcadia Biosciences, Inc.
Notes to Consolidated Financial Statements. (Continued)

Note 6. Investments and Fair Value Instruments

Investments

The Company classified its investments in corporate securities of BIOX as short-term investments. The investments are carried at fair value, based on quoted market prices or other readily available market information. Unrealized and realized gains and losses are recognized as Other income in the consolidated statements of operations and comprehensive loss.

The following tables summarize the amortized cost and fair value of the investment securities portfolio at December 31, 2020 and December 31, 2019, and the corresponding amounts of unrealized gains and losses recognized in other income, net, in the consolidated statements of operations and comprehensive loss:

(Dollars in thousands)	Amortized Cost	Unrealized Gains	Unrealized Losses	Estimated Fair Value
December 31, 2020				
Cash equivalents:				
Money market funds	$ 12,082	$ —	$ —	$ 12,082
Short-term investments:				
Corporate securities	10,969	656	—	11,625
Total Assets at Fair Value	$ 23,051	$ 656	$ —	$ 23,707

(Dollars in thousands)	Amortized Cost	Unrealized Gains	Unrealized Losses	Estimated Fair Value
December 31, 2019				
Cash equivalents:				
Money market funds	$ 6,864	$ —	$ —	$ 6,864
Commercial paper	900	—	—	900
Short-term investments:				
Corporate securities	3,300	—	—	3,300
Treasury bills	1,495	1	—	1,496
Commercial paper	12,119	—	—	12,119
Total Assets at Fair Value	$ 24,678	$ 1	$ —	$ 24,679

The Company did not have any investment categories that were in a continuous unrealized loss position for more than twelve months as of December 31, 2020.

Fair Value Measurement

The fair value of the investment securities at December 31, 2020 were as follows:

	Fair Value Measurements at December 31, 2020			
(Dollars in thousands)	Level 1	Level 2	Level 3	Total
Assets at Fair Value				
Cash equivalents:				
Money market funds	$ 12,082	$ —	$ —	$ 12,082
Short-term investments:				
Corporate securities	11,625	—	—	11,625
Total Assets at Fair Value	$ 23,707	$ —	$ —	$ 23,707

Arcadia Biosciences, Inc.
Notes to Consolidated Financial Statements. (Continued)

The fair value of the investment securities at December 31, 2019 were as follows:

	Fair Value Measurements at December 31, 2019			
(Dollars in thousands)	**Level 1**	**Level 2**	**Level 3**	**Total**
Assets at Fair Value				
Cash equivalents:				
Money market funds	$ 6,864	$ —	$ —	$ 6,864
Commercial paper	—	900	—	900
Short-term investments:				
Corporate securities	—	3,300	—	3,300
Treasury bills	1,496	—	—	1,496
Commercial paper	—	12,119	—	12,119
Total Assets at Fair Value	$ 8,360	$ 16,319	$ —	$ 24,679

The Company uses the market approach technique to value its financial instruments and there were no changes in valuation techniques during 2020 or 2019. The Company's financial instruments consist primarily of cash and cash equivalents, accounts receivable, accounts payable, accrued liabilities, and notes payable. For accounts receivable, accounts payable, accrued liabilities, and notes payable the carrying amounts of these financial instruments as of December 31, 2020 and 2019 were considered representative of their fair values due to their short term to maturity or repayment. Cash equivalents are carried at cost, which approximates their fair value.

The Company's Level 3 liabilities consist of a contingent liability resulting from the Anawah acquisition, as described in Note 15, a contingent liability resulting from the Industrial Seed Innovations acquisition, as described in Note 7, and liabilities related to the March 2018, the June 2019 and the September 2019 Offerings described in Note 13.

The contingent liability was measured and recorded on a recurring basis as of December 31, 2020 and 2019 using unobservable inputs, namely the Company's ability and intent to pursue certain specific products developed using technology acquired in the purchase. A significant deviation in the Company's ability and/or intent to pursue the technology acquired in the purchase could result in a significantly lower (higher) fair value measurement.

The warrant liabilities were measured and recorded on a recurring basis using the Black-Scholes Model with the following assumptions at December 31, 2020 and 2019:

	September 2019 Warrants		June 2019 Warrants		June 2018 Warrants		March 2018 Warrants	
	December 31, 2020	**December 31, 2019**	**December 31, 2020**	**December 31, 2019**	**December 31, 2020**	**December 31, 2019**	**December 31, 2020**	**December 31, 2019**
Expected term (in years)	4.20	5.20	3.96	4.96	—	3.96	2.22	3.22
Expected volatility	135.0%	120.0%	135.0%	120.0%	—	123.0%	130.0%	125.0%
Risk-free interest rate	0.3%	1.7%	0.3%	1.7%	—	1.7%	0.1%	1.6%
Expected dividend yield	0%	0%	0%	0%	—	0%	0%	0%

The significant unobservable input used in the fair value measurement of the Company's Level 3 warrant liabilities is volatility. A significant increase (decrease) in volatility could result in a significantly higher (lower) fair value measurement.

Arcadia Biosciences, Inc.
Notes to Consolidated Financial Statements. (Continued)

The following table sets forth the establishment of the Company's Level 3 liabilities, as well as a summary of the changes in the fair value and other adjustments (in thousands):

	(Level 3)					
(Dollars in thousands)	Common Stock Warrant Liability - March 2018 Purchase Agreement	Common Stock Warrant Liability - June 2018 Offering	Common Stock Warrant Liability - June 2019 Offering	Common Stock Warrant Liability - September 2019 Offering	Contingent Liabilities	Total
Balance as of December 31, 2018	$ 2,354	$ 2,729	$ —	$ —	$ 3,000	$ 8,083
Common stock and warrants issued in conjunction with June 2019 Offering	—	—	4,198	—	—	$ 4,198
Common stock and warrants issued in conjunction with September 2019 Offering	—	—	—	3,428	—	$ 3,428
Change in fair value and other adjustments	2,225	2,715	4,811	(508)	(1,000)	$ 8,243
Exercise of warrants	-	-	(7,016)	-	-	$ (7,016)
Balance as of December 31, 2019	$ 4,579	$ 5,444	$ 1,993	$ 2,920	$ 2,000	$ 16,936
Change in fair value and other adjustments	(2,277)	(1,426)	(1,161)	(1,706)	—	$ (6,570)
Exercise of warrants	(1,641)	(4,018)	—	—	—	$ (5,659)
ISI acquisition contingent consideration	—	—	—	—	280	$ 280
Balance as of December 31, 2020	$ 662	$ —	$ 832	$ 1,214	$ 2,280	$ 4,987

Note 7. Industrial Seed Innovations Acquisition

On August 21, 2020, the Company acquired by merger Industrial Seed Innovations (ISI), an Oregon-based industrial hemp breeding and seed company. As a result of the acquisition, the Company acquired ISI's commercial and genetic assets, including seed varieties, germplasm library and intellectual property. ISI's Rogue and Umpqua seed varieties are now part of Arcadia's portfolio, alongside the Company's GoodHemp line of genetically superior hemp seeds, transplants, and extracts. The acquisition has significantly broadened and accelerated commercialization of Arcadia's hemp-related breeding platform, as well as established a breeding research and development facility in the Pacific Northwest, a key production area in the hemp industry.

The purchase price consideration for the acquisition totaled an estimated $1,212,000, of which $500,000 in cash and $432,000 in the form of 132,626 shares of the Company's common stock, was paid during the month of August 2020. The remaining amount of $280,000 will be recognized in two annual installments, each of up to 132,626 shares of the Company's common stock, subject to the achievement of revenue milestones in 2021 and 2022, and is recorded as a contingent liability in the consolidated balance sheets as of December 31, 2020. The cash consideration paid for the acquisition was funded by cash on hand.

For the year ended December 31, 2020, no revenues from ISI were recorded, and expenses were immaterial. The pro forma impact of the acquisition to the historical financial results was determined not to be significant.

Acquisition costs are not included as components of consideration transferred and instead are accounted for as expenses in the period in which the costs are incurred. The Company incurred costs related to the ISI acquisition of approximately $67,000 included in selling, general and administrative expenses in the Company's consolidated statements of operations and comprehensive loss.

The following table presents the allocation of the purchase price of ISI assets acquired, based on their relative fair values, which have been assessed during the year ended December 31, 2020. Intangible assets will be amortized based on their useful life of five years, and their balance as of December 31, 2020 was $370,000. A deferred tax liability arising from the difference between book purchase price allocation and tax basis has been assessed in the amount of $107,000. Deferred tax liabilities are required to be recorded in purchase accounting independently of

whether the acquiror has a valuation allowance on its own net deferred tax assets. As a result, the combined entity now has additional deferred tax liabilities available to reduce the amount of valuation allowance necessary. Future reversals of existing taxable temporary differences are an objective source of future taxable income. Accordingly, the purchase accounting deferred tax liabilities enabled the realization of a portion of the existing deferred tax assets, thus allowing for a reduction in the valuation allowance. The reduction in the valuation allowance is not accounted for as part of the purchase accounting but is recognized in the consolidated statements of operations and comprehensive loss as a discrete tax benefit in the income tax provision.

	Purchase Price Allocation
Inventory	$ 511
Intangible assets, net	400
Goodwill	408
Deferred tax liability	(107)
Total consideration allocated	$ 1,212

The former shareholders of ISI remain responsible for ISI's pre-acquisition liabilities. Pursuant to the definitive acquisition agreement, the Company entered into a lease agreement with ISI for the use of land, equipment, greenhouses and buildings. The lease was effective upon the execution of the definitive acquisition agreement and has a term of 3 years with the option to renew for three additional 3-year terms.

Note 8. Consolidated Joint Venture

On August 9, 2019, the Company and Legacy Ventures Hawaii, LLC, a Nevada limited liability company ("Legacy"), formed Archipelago Ventures Hawaii, LLC, a Delaware limited liability company and entered into a Limited Liability Company Operating Agreement (the "Operating Agreement"). The Company and Legacy formed Archipelago to develop, extract and commercialize hemp-derived products from industrial hemp grown in Hawaii.

Pursuant to the Operating Agreement, a joint operating committee consisting of two individuals appointed by the Company and two individuals appointed by Legacy will manage Archipelago. As of December 31, 2020, the Company and Legacy hold 50.75% and 49.25% interests in Archipelago, respectively, and have made capital contributions to Archipelago of $2,336,000 and $2,267,000, respectively, as determined by the joint operating committee. The Operating Agreement includes indemnification rights, non-competition obligations, and certain rights and obligations in connection with the transfer of membership interests, including rights of first refusal.

The Company consolidates Archipelago in the consolidated financial statements after eliminating intercompany transactions. Net loss attributable to non-controlling interest of $1,371,000 and $68,000 is recorded as an adjustment to net loss to arrive at net loss attributable to common stockholders for the years ended December 31, 2020 and 2019, respectively. Legacy's equity interests are presented as non-controlling interests on the consolidated balance sheets. Refer to Note 2 for basis of presentation.

Note 9. Verdeca-BIOX Transactions

In February 2012, the Company formed Verdeca, which was equally owned with Bioceres. Verdeca was formed to develop and deregulate soybean varieties using both partners' agricultural technologies.

On November 12, 2020, the Company entered into a Master Transaction Agreement with Bioceres Crop Solutions Corp. ("BIOX") pursuant to which (i) the Company sold all of its memberships interests it owned in Verdeca to BIOX, and (ii) the Company and BIOX entered into a license agreement for certain intellectual property rights, including rights to the Company's HB4 soybean trait and its GoodWheat portfolio of specialty wheat products in South and Central America. Prior to the transaction, Verdeca was equally owned by the Company and a wholly-owned subsidiary of BIOX.

In consideration for the sale of the membership interests in Verdeca and entering into the license agreement, on November 12, 2020, BIOX paid the Company $5,000,000 in cash and issued the Company 1,875,000 shares of BIOX common stock. BIOX will also pay the Company an additional (i) $1,000,000 payable in five equal monthly payments beginning on December 12, 2020 for transaction expenses and fees and (ii) $2,000,000 payable in four equal quarterly payments with the first payment commencing within thirty days of either BIOX reaching commercial plantings of at least 200,000 hectares of Haab 4 soybeans ("HB4") or if China approves the HB4 soybean trait for "food and feed". In addition to the above payments, BIOX will also pay the Company quarterly royalty payments equal to six percent (6%) of the net revenues BIOX or its affiliates receive from HB4 soybean sales and twenty five percent (25%) of the net revenues BIOX or its affiliates receive from sales of licensed wheat products; provided that royalty payments for HB4 soybeans shall not exceed $10,000,000. The total amount of fixed consideration agreed upon as of the date of the transaction was $16,968,750. The fixed consideration was allocated based on estimates of the stand-alone selling prices. A fixed consideration in the amount of $10,288,000, including $6,650,000 of corporate securities received, has been allocated to the sale of the membership interest in Verdeca and resulted in a gain of $8,814,000 recorded on the consolidated statements of operations and comprehensive loss for the year ended December 31, 2020. Inventory with a carrying value of $1,474,000 was derecognized in connection with the sale of the membership interest in Verdeca. A fixed consideration in the amount of $6,680,000, including $4,318,000 of corporate securities received, has been allocated to the sale of intellectual property rights and has been recorded as license revenues on the consolidated statements of operations and comprehensive loss for the year ended December 31, 2020. As of December 31, 2020, the Company has $800,000 recorded within accounts receivable on its consolidated balance sheets related to this transaction. Any future proceeds from the agreement will be allocated in the same proportion.

The Company agreed not to sell or transfer any shares of BIOX common stock it received in this transaction for a period of 180 days without the prior written consent of BIOX, subject to certain exceptions allowing the Company to pledge shares to a lender as collateral.

Note 10. Accounts Payable and Accrued Expenses

Accounts payable and accrued expenses consisted of the following (in thousands):

	As of December 31,	
	2020	2019
Accounts payable - trade	$ 726	$ 492
Payroll and benefits	1,489	1,290
Inventory	965	1,143
Research and development	45	629
Royalty fees due to unrelated parties	276	226
Consulting	153	397
Rent and utilities	78	23
Audit and tax fees	57	113
Legal	152	138
Other	164	234
Total accounts payable and accrued expenses	$ 4,105	$ 4,685

Note 11. Collaborative Arrangements

In August 2017, the Company entered into a collaborative arrangement for the research, development and commercialization of an improved wheat quality trait in North America. This collaborative arrangement is a contractual agreement with Corteva Agriscience ("Corteva") involves a joint operating activity where both Arcadia and Corteva are active participants in the activities of the collaboration. Arcadia and Corteva participate in the research and development, and Arcadia has the primary responsibility for the intellectual property strategy while Corteva will generally lead the marketing and commercialization efforts. Both parties are exposed to significant risks and rewards of the collaboration and the agreement includes both cost sharing and profit sharing. The activities are performed with no guarantee of either technological or commercial success.

The Company accounts for research and development ("R&D") costs in accordance ASC 730, *Research and Development*, which states R&D costs must be charged to expense as incurred. Accordingly, internal R&D costs are expensed as incurred. Third-party R&D costs are expensed when the contracted work has been performed or as milestone results are achieved.

Note 12. Equity Financing

Private Placements

In March 2018, the Company issued in a private placement offering (the "March 2018 Private Placement") pursuant to a securities purchase agreement ("March 2018 Purchase Agreement") (i) 300,752 shares of its common stock and (ii) warrants to purchase up to 300,752 shares of common stock at an initial exercise price equal to $45.75 (the "March 2018 Warrants") and raised total gross proceeds of $10.0 million. The March 2018 Warrants are exercisable at any time at the option of the holder and expire five years from the date of issuance. In connection with the March 2018 Private Placement, the Company granted to a placement agent warrants to purchase a total of 15,038 shares of Common Stock (the "March 2018 Placement Agent Warrants") that have an exercise price per share equal to $41.5625 and a term of five years from the date of issuance.

The number of shares of common stock and the number and exercise price of the March 2018 Warrants issued in the March 2018 Private Placement were subject to adjustments as provided in the March 2018 Purchase Agreement. Following the adjustments as provided in the March 2018 Purchase Agreement, the number of shares issued to the purchasers was 1,201,634, the total number of shares issuable upon exercise of the March 2018 Warrants was 1,282,832 and the per share exercise price of the March 2018 Warrants was $10.7258.

Registered Direct Offerings

On May 11, 2018, the Company filed a shelf Registration Statement on Form S-3 with the SEC which was declared effective on June 8, 2018 ("Shelf Registration Statement"). This shelf registration process allows the Company to sell any combination of common stock, preferred stock, warrants and units consisting of such securities in one or more offerings from time to time having aggregate offering prices of up to $50 million.

In June 2018, the Company entered into a securities purchase agreement (the "June 2018 Purchase Agreement") pursuant to which it sold (i) 1,392,345 registered shares of its common stock pursuant to the Shelf Registration Statement and (ii) unregistered warrants to purchase 1,392,345 shares of its common stock (the "June 2018 Warrants") in a private placement, for total gross proceeds of $14.0 million (the "June 2018 Registered Direct Offering"). The June 2018 Registered Direct Offering closed on June 14, 2018. The June 2018 Warrants have an exercise price of $9.94 per share, became exercisable upon issuance and expire 5.5 years after the date of issuance. In connection with the June 2018 Registered Direct Offering, the Company granted to a placement agent warrants to purchase a total of 69,617 shares of common stock ("June 2018 Placement Agent Warrants") that have an exercise price per share equal to $12.568 and a term of five years.

In June 2019, the Company entered into a securities purchase agreement (the "June 2019 Purchase Agreement") pursuant to which it sold (i) 1,489,575 registered shares of its common stock pursuant to the Shelf Registration Statement and (ii) unregistered warrants to purchase 1,489,575 shares of its common stock (the "June 2019 Warrants") in a private placement, for total gross proceeds of $7.5 million (the "June 2019 Registered Direct Offering"). The June 2019 Registered Direct Offering closed on June 14, 2019. The June 2019 Warrants have an exercise price of $5.00 per share, became exercisable upon issuance and expire 5.5 years after the date of issuance.

In connection with the June 2019 Registered Direct Offering, the Company granted to a placement agent warrants to purchase a total of 74,479 shares of common stock ("June 2019 Placement Agent Warrants") that have an exercise price per share equal to $6.2938 and a term of five years.

In September 2019, the Company entered into a securities purchase agreement (the "September 2019 Purchase Agreement") pursuant to which it sold (i) 1,318,828 registered shares of its common stock pursuant to the Shelf Registration Statement and (ii) unregistered warrants to purchase 659,414 shares of its common stock (the "September 2019 Warrants") in a private placement, for total gross proceeds of $10.0 million (the "September 2019 Registered Direct Offering"). The September 2019 Registered Direct Offering closed on September 5, 2019. The September 2019 Warrants have an exercise price of $7.52 per share, became exercisable upon issuance and expire 5.5 years after the date of issuance. In connection with the September 2019 Registered Direct Offering, the Company granted to a placement agent warrants to purchase a total of 65,942 shares of common stock ("September 2019 Placement Agent Warrants") that have an exercise price per share equal to $9.4781 and a term of five years.

In December 2020, the Company entered into a securities purchase agreement (the "December 2020 Purchase Agreement") pursuant to which it sold (i) 2,618,658 registered shares of its common stock pursuant to the Shelf Registration Statement and (ii) unregistered warrants to purchase 2,618,658 shares of its common stock (the "December 2020 Warrants") in a private placement, for total gross proceeds of $8.0 million (the "December 2020 Registered Direct Offering"). The December 2020 Registered Direct Offering closed on December 22, 2020. The December 2020 Warrants have an exercise price of $3.00 per share, became exercisable upon issuance and expire 5.5 years after the date of issuance. In connection with the December 2020 Registered Direct Offering, the Company granted to a placement agent warrants to purchase a total of 130,933 shares of common stock ("December 2020 Placement Agent Warrants") that have an exercise price per share equal to $3.8188 and a term of five years. See Note 13.

Note 13. Warrants

Common Stock Warrant transactions

In May 2020, several existing accredited investors exercised the June 2018 Warrants (the "May 2020 Warrant Exercise Transaction") to purchase up to an aggregate of 1,392,345 shares of the Company's common stock at a reduced exercise price of $4.90 per share for gross proceeds of $6.8 million. As consideration for the exercise of the June 2018 Warrants, the Company issued new unregistered warrants to purchase up to 1,392,345 shares of common stock (the "May 2020 Warrants") at an exercise price of $4.775 per share with an exercise period of five years from the date of issuance. The May 2020 Warrants were valued at $4.4 million, which was calculated using the Black-Scholes Model with the following assumptions: volatility of 128 percent, stock price of $3.81, and risk-free rate of 0.38%. In connection with the May 2020 Warrant Exercise Transaction, the Company granted to a placement agent warrants to purchase a total of 69,617 shares of common stock (the "May 2020 Placement Agent Warrants") that have an exercise price per share equal to $6.125 and a term of five years. The value of the May 2020 Placement Agent Warrants was determined to be $215,000 using the Black-Scholes Model. The Company recognized a gain on extinguishment of warrant liability in the amount of $47,000 associated with this transaction, during the quarter ended June 30, 2020.

In July 2020, an existing accredited investor exercised its March 2018 Warrants (the "July 2020 Warrant Exercise Transaction") to purchase up to an aggregate of 641,416 shares of the Company's common stock at a reduced exercise price of $3.975 per share for gross proceeds of $2.6 million. As consideration for the exercise of these March 2018 Warrants, the Company issued new unregistered warrants to purchase up to 641,416 shares of common stock (the "July 2020 Warrants") at an exercise price of $3.85 per share with an exercise period of 5.5 years from the date of issuance. The July 2020 Warrants were valued at $2.1 million, which was calculated using the Black-Scholes Model with the following assumptions: volatility of 126 percent, stock price of $3.73, and risk-free rate of 0.35%. In connection with the July 2020 Warrant Exercise Transaction, the Company granted to a placement agent warrants to purchase a total of 32,071 shares of common stock (the "July 2020 Placement Agent Warrants") that have an exercise price per share equal to $4.969 and a term of 5.5 years. The value of the July 2020 Placement Agent Warrants was determined to be $101,000 using the Black-Scholes Model. The Company recognized a loss on extinguishment of warrant liability in the amount of $682,000 associated with this transaction, during the quarter ended September 30, 2020.

Equity Classified Common Stock Warrants

In connection with professional services agreements with non-affiliated third parties, during the years ended December 31, 2020 and 2019, the Company issued service and performance warrants (“Service and Performance Warrants”).

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Notes to Consolidated Financial Statements. (Continued)

As of December 31, 2020, the Company issued the following warrants to purchase shares of its common stock. These warrants are exercisable any time at the option of the holder until their expiration date.

	Issuance Date	Term	Exercise Price Per Share	Warrants Exercised during the Year Ended December 31, 2019	Warrants Outstanding at December 31, 2019	Warrants Exercised during the Year Ended December 31, 2020	Warrants Outstanding at December 31, 2020
December 2020 Warrants	December 2020	5.5 years	$ 3.00	—	—	—	2,618,658
December 2020 Placement Agent Warrants	December 2020	5 years	$ 3.82	—	—	—	130,933
July 2020 Warrants	July 2020	5.5 years	$ 3.85	—	—	—	641,416
July 2020 Placement Agent Warrants	July 2020	5.5 years	$ 4.97	—	—	—	32,071
May 2020 Warrants	May 2020	5 years	$ 4.78	—	—	—	1,392,345
May 2020 Placement Agent Warrants	May 2020	5 years	$ 6.13	—	—	—	69,617
March 2020 Service and Performance Warrants	March 2020	3 years	$ 2.50	—	—	—	18,350
February 12, 2020 Service and Performance Warrants	February 2020	2 years	$ 4.71	—	—	—	150,000
February 3, 2020 Service and Performance Warrants	February 2020	2 years	$ 4.91	—	—	—	10,000
September 2019 Placement Agent Warrants	September 2019	5 years	$ 9.48	—	65,942	—	65,942
August 2019 Service and Performance Warrants	August 2019	2 years	$ 1.92	—	20,000	—	20,000
July 2019 Service and Performance Warrants	July 2019	2 years	$ 2.19	—	10,000	—	10,000
June 2019 Placement Agent Warrants	June 2019	5 years	$ 6.29	—	74,479	—	74,479
April 2019 Service and Performance Warrants	April 2019	5 years	$ 6.18	—	145,154	—	145,154
June 2018 Placement Agent Warrants	June 2018	5 years	$ 12.57	—	69,617	—	69,617
March 2018 Placement Agent Warrants	March 2018	5 years	$ 41.56	—	15,038	—	15,038
Total				—	400,230	—	5,463,620

Liability Classified Common Stock Warrants

Certain warrants contain a contingent cash payment feature and therefore were accounted for as a liability at the date of issuance and are adjusted to fair value at each balance sheet date. The change in fair value of the warrant liability is recorded as change in fair value of common stock warrant liabilities in the consolidated statements of operations and comprehensive loss. The key terms and activity of the liability classified common stock warrants are summarized as follows:

	Issuance Date	Term	Exercise Price Per Share	Warrants Exercised during the Year Ended December 31, 2019	Warrants Outstanding at December 31, 2019	Warrants Exercised during the Year Ended December 31, 2020	Warrants Outstanding at December 31, 2020
September 2019 Warrants	September 2019	5.5 years	$ 7.52	—	659,414	—	659,414
June 2019 Warrants	June 2019	5.5 years	$ 5.00	1,053,745	435,830	—	435,830
June 2018 Warrants	June 2018	5.5 years	$ 9.94	—	1,392,345	1,392,345	—
March 2018 Warrants	March 2018	5 years	$ 10.73	—	1,282,832	641,416	641,416
Total				1,053,745	3,770,421	2,033,761	1,736,660

See Note 6 for the Black-Scholes option-pricing model and weighted-average assumptions used to estimate the fair value of the warrant liabilities.

Note 14. Stock-Based Compensation and Employee Stock Purchase Program

Stock Incentive Plans

The Company has two equity incentive plans: the 2006 Stock Plan (“2006 Plan”) and the 2015 Omnibus Equity Incentive Plan (“2015 Plan”).

In 2006, the Company adopted the 2006 Plan, which provided for the granting of stock options to executives, employees, and other service providers under terms and provisions established by the Board of Directors. The Company granted non-statutory stock options (“NSOs”) under the 2006 Plan until May 2015, when it was terminated as to future awards, although it continues to govern the terms of options that remain outstanding and were issued under the 2006 Plan. The 2015 Plan became effective upon the Company’s IPO in May 2015 and all shares that were reserved, but not issued, under the 2006 Plan were assumed by the 2015 Plan. Upon effectiveness, the 2015 Plan had 154,387 shares of common stock reserved for future issuance, which included 10,637 that were transferred to and assumed by the 2015 Plan. The 2015 Plan provides for automatic annual increases in shares available for grant. In addition, shares subject to awards under the 2006 Plan that are forfeited or canceled will be added to the 2015 Plan. The 2015 Plan provides for the grant of incentive stock options (“ISOs”), NSOs, restricted stock awards, stock units, stock appreciation rights, and other forms of equity compensation, all of which may be granted to employees, officers, non-employee directors, and consultants. The ISOs and NSOs will be granted at a price per share not less than the fair value at the date of grant. Options granted generally vest over a four-year period; however, the options granted in the third quarter of 2018 vest over two-year period, vesting monthly on a pro-rated basis. Options granted, once vested, are generally exercisable for up to 10 years, after grant.

In June 2019, the shareholders approved an amendment to the Company’s 2015 Plan for a one-time increase to the number of shares of common stock that may be issued under the 2015 Plan by 120,000 shares. As of December 31, 2020, a total of 1,047,243 shares of common stock were reserved for issuance under the 2015 Plan, of which 157,484 shares of common stock are available for future grant. As of December 31, 2020, a total of 19,172 and 870,587 options are outstanding under the 2006 and 2015 Plans, respectively. As of December 31, 2019, a total of 45,229 and 616,472 options are outstanding under the 2006 and 2015 Plans, respectively.

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Notes to Consolidated Financial Statements. (Continued)

The following is a summary of stock option information and weighted average exercise prices under the Company's stock incentive plans (in thousands, except share data and price per share):

	Shares Subject to Outstanding Options	Weighted-Average Exercise Price Per Share	Aggregate Intrinsic Value
Outstanding — Balance at December 31, 2018	530,044	$ 35.53	$ —
Options granted	208,571	5.13	
Options exercised	(546)	4.63	
Options forfeited	(30,132)	33.95	
Options expired	(46,236)	98.69	
Outstanding — Balance at December 31, 2019	661,701	21.60	$ 305
Options granted	502,494	4.28	
Options exercised	—	—	
Options forfeited	(174,508)	5.91	
Options expired	(99,928)	25.56	
Outstanding — Balance at December 31, 2020	889,759	14.46	$ 240
Vested and expected to vest — December 31, 2020	841,991	15.03	$ 240
Exercisable —December 31, 2020	502,973	$ 22.20	$ —

Aggregate intrinsic value represents the difference between the exercise price of the options and the estimated fair value of the Company's common stock determined by our Board of Directors for each of the respective periods. The intrinsic value of options exercised was $0 for both years ended December 31, 2020 and 2019.

As of December 31, 2020, there was $0.7 million of unrecognized compensation cost related to unvested stock-based compensation grants that will be recognized over the weighted-average remaining recognition period of 2.77 years.

On August 22, 2019, Rajendra Ketkar provided notice to the Company of his retirement as Arcadia's president, chief executive officer and director, effective as of September 1, 2019. On August 23, 2019, Arcadia and Mr. Ketkar entered into a Separation and Release Agreement (the "Separation Agreement") which provides that the vesting of certain options previously issued to Mr. Ketkar will be accelerated pursuant to the terms of the Separation Agreement. In addition, the Separation Agreement extends the post-termination exercise period of the accelerated options from 90 days to up to two years. The stock compensation expense related to the modification of Mr. Ketkar's stock options was $438,000 and recognized in selling, general and administrative expenses during the year ended December 31, 2019.

In determining the fair value of the stock-based awards, the Company uses the Black-Scholes option-pricing model and assumptions discussed below. Each of these inputs is subjective and generally requires significant judgment to determine.

Expected Term—The expected term is the estimated period of time outstanding for stock options granted and was estimated based on a simplified method allowed by the SEC due to insufficient historical data, and defines the term as the average of the contractual term of the options and the weighted-average vesting period for all open employee awards.

Expected Volatility—Since the Company was privately held and does not have a long trading history for its common stock, the expected volatility was estimated based on the average volatility for comparable publicly traded biotechnology companies over a period equal to the expected term of the stock option grants. When selecting comparable publicly traded biotechnology companies on which it has based its expected stock price volatility, the Company selected companies with comparable characteristics to it, including enterprise

value, risk profiles, position within the industry, and with historical share price information sufficient to meet the expected life of the stock-based awards. The historical volatility data was computed using the daily closing prices for the selected companies' shares during the equivalent period of the calculated expected term of the stock-based awards. The Company will continue to apply this process until a sufficient amount of historical information regarding the volatility of its own stock price becomes available.

Risk-Free Interest Rate—The risk-free interest rate is based on the interest rate of U.S. Treasuries of comparable maturities on the date the options were granted.

Expected Dividend—The expected dividend yield is based on the Company's expectation of future dividend payouts to common stockholders.

The fair value of stock option awards was estimated at the date of grant using a Black-Scholes option-pricing model with the following weighted-average assumption:

	Year Ended December 31,	
Assumptions	**2020**	**2019**
Expected term (years)	6.48	7.04
Expected volatility	134%	99%
Risk-free interest rate	1.01%	2.01%
Expected dividend yield	—	—

The weighted- average, estimated grant date fair value of employee stock options granted during the years ended December 31, 2020 and 2019 was $3.80 and $5.13, respectively. The Company recognized $2.0 million and $2.3 million of compensation expense for stock options awards for the years ended December 31, 2020 and 2019, respectively.

Employee Stock Purchase Plan

The Company's 2015 Employee Stock Purchase Plan ("ESPP") became effective on May 14, 2015. The ESPP allows eligible employees to purchase shares of the Company's common stock at a discount of up to 15% of their eligible compensation through payroll deductions, subject to any plan limitations. After the first offering period, which began on May 14, 2015 and ended on February 1, 2016, the ESPP provides for six-month offering periods, and at the end of each offering period, employees are able to purchase shares at 85% of the lower of the fair market value of the Company's common stock on the first trading day of the offering period or on the last day of the offering period. As of December 31, 2020, the number of shares of common stock reserved for future issuance under the ESPP is 105,036. The ESPP provides for automatic annual increases in the shares available for purchase beginning on January 1, 2016. As of December 31, 2020, 35,056 shares had been issued under the ESPP. The Company recorded $47,000 and $16,000 of ESPP related compensation expense for the years ended December 31, 2020 and 2019, respectively.

Note 15. Commitments and Contingencies

Leases

The Company leases office and laboratory space, greenhouse space, grain storage bins, warehouse space, farmland, and equipment under operating lease agreements having initial lease terms ranging from one to five years, including certain renewal options available to the Company at market rates. The Company also leases land for field trials on a short-term basis. See Note 16.

Legal Matters

From time to time, in the ordinary course of business, the Company may become involved in certain legal proceedings. The Company currently is not a party to any material litigation or other material legal proceedings.

Contingent Liability Related to the Anawah Acquisition

On June 15, 2005, the Company completed its agreement and plan of merger and reorganization with Anawah, Inc. (“Anawah”), to purchase the Anawah’s food and agricultural research company through a non-cash stock purchase. Pursuant to the merger with Anawah, and in accordance with the ASC 805 - Business Combinations, the Company incurred a contingent liability not to exceed $5.0 million. This liability represents amounts to be paid to Anawah’s previous stockholders for cash collected on revenue recognized by the Company upon commercial sale of certain specific products developed using technology acquired in the purchase. As of December 31, 2010, the Company ceased activities relating to three of the six Anawah product programs thus, the contingent liability was reduced to $3.0 million. During the third quarter of 2016, one of the programs previously accrued for was abandoned and another program previously abandoned was reactivated. During the fourth quarter of 2019, the Company determined that one of the technologies was no longer active and decided to abandon the previously accrued program. As a result, the Company recognized a gain of $1.0 million in the consolidated statements of operations and comprehensive loss for the year ended December 31, 2019. As of December 31, 2020, the Company continues to pursue a total of two development programs using this technology and believes that the contingent liability is probable. As a result, $2.0 million remains on the consolidated balance sheet as an other noncurrent liability.

Contingent Liability Related to the ISI Acquisition

On August 21, 2020, the Company acquired by merger Industrial Seed Innovations (ISI). A portion of the purchase price consideration for the acquisition in the amount of $280,000 will be recognized in two annual installments, each of up to 132,626 shares of the Company’s common stock, subject to the achievement of revenue milestones in 2021 and 2022. The contingent consideration of $280,000 was measured and recorded at fair value as of the acquisition date using a third-party valuation specialist. As of December 31, 2020, the full amount of the contingent consideration is included in other noncurrent liabilities as no installments will become due within 12 months from the consolidated balance sheets date. As of December 31, 2020, no material changes in its fair value have been observed since the acquisition date in August 2020.

Contracts

The Company has entered into contract research agreements with unrelated parties that require the Company to pay certain funding commitments. The initial terms of these agreements range from one to three years in duration and in certain cases are cancelable.

The Company licenses certain technologies via executed agreements (“In-Licensing Agreements”) that are used to develop and advance the Company’s own technologies. The Company has entered into various In-Licensing Agreements with related and unrelated parties that require the Company to pay certain license fees, royalties, and/or milestone fees. In addition, certain royalty payments ranging from 2% to 15% of net revenue amounts as defined in the In-Licensing Agreements are or will be due.

Royalties due to both related and unrelated parties on license revenue accrued as of December 31, 2020 and 2019 were $356,000 and $266,000, respectively. Accrued royalties are included within accounts payable and accrued expenses on the consolidated balance sheets, and within research and development on the consolidated statements of operations and comprehensive loss.

Milestone payments are contingent upon the successful development or implementation of various technologies. Payments for milestones yet to be achieved totaled $2.0 million for both the years ended December 31, 2020 and 2019, respectively. The timing of the payments is not determinable at this time pending research and development currently in progress; however, no payments were made during the years ended December 31, 2020 and 2019.

The Company could be adversely affected by certain actions by the government as it relates to government contract revenue received in prior years. Government agencies, such as the Defense Contract Audit Agency routinely audit and investigate government contractors. These agencies review a contractor's performance under its agreements; cost structure; and compliance with applicable laws, regulations and standards. The agencies also review the adequacy of, and a contractor's compliance with, its internal control systems and policies, including the contractor's purchasing, property, estimating, compensation and management information systems. While the Company's management anticipates no adverse result from an audit, should any costs be found to be improperly allocated to a government agreement, such costs will not be reimbursed, or if already reimbursed, may need to be refunded. If an audit uncovers improper or illegal activities, civil and criminal penalties and administrative sanctions, including termination of contracts, forfeiture of profits, suspension of payments or fines, and suspension or prohibition from doing business with the government could occur. In addition, serious reputational harm or significant adverse financial effects could occur if allegations of impropriety were made against the Company. There currently are routine audits in process relating to government grant revenues.

Note 16. Leases

Operating Leases

As of December 31, 2020, the Company leases office space in Davis, CA, Phoenix, AZ, and Molokai, HI, as well as additional buildings, land and equipment. Leases with an initial term of 12 months or less are not recorded on the balance sheet; the Company recognizes lease expense for these short-term leases on a straight-line basis. The Company subleases a portion of the Davis office lease to third parties. During the year ended December 31, 2020, the Company entered into four lease amendments, including one that provides for additional office space in Davis, CA, and extends the term through April 2025, with one option to renew for an additional five-year term. The Company expects to exercise its options to renew, and in accordance with ASC 842, accounted for the amendment and expected renewal as a lease modification and remeasured the operating lease liability, resulting in an additional $3.8 million operating lease liability and right of use asset. The Company also entered into a lease amendment for additional parcels of land in Molokai, HI, modified the Molokai office space lease to extend the term by 12 months, and entered into new lease agreements for office equipment, collectively resulting in an additional $0.1 million of operating lease liabilities and right of use assets. The Company also entered into a lease amendment for the land and greenhouses in Woodland, CA, extending the term by four years collectively, and resulting in an additional $0.3 million of operating lease liabilities and right of use assets. In connection with the ISI Acquisition, the Company entered into a new lease for the premises and equipment in Oregon with a three-year term, resulting in an additional $0.2 million of operating lease liabilities and right of use assets. There are no finance leases or material leases that have not yet commenced as of December 31, 2020.

Some leases (the Davis office, warehouse, greenhouses and a copy machine) include one or more options to renew, with renewal terms that can extend the lease term from one to six years. The exercise of lease renewal options is at the Company's sole discretion.

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Notes to Consolidated Financial Statements. (Continued)

The Company's lease agreements do not contain any material variable lease payments, material residual value guarantees or material restrictive covenants. Leases consisted of the following (in thousands):

Leases	Classification	December 31, 2020	December 31, 2019
Assets			
Operating lease assets	Right of use asset	$ 5,826	$ 1,963
Total leased assets		$ 5,826	$ 1,963
Liabilities			
Current - Operating	Operating lease liability - current	$ 717	$ 611
Noncurrent - Operating	Operating lease liability - noncurrent	5,389	1,497
Total leased liabilities		$ 6,106	$ 2,108

Lease Cost	Classification	For the Year Ended December 31, 2020	For the Year Ended December 31, 2019
Operating lease cost	SG&A and R&D Expenses	$ 1,042	$ 708
Short term lease cost (1)	R&D Expenses	305	205
Sublease income (2)	SG&A and R&D Expenses	(45)	(55)
Net lease cost		$ 1,302	$ 858

(1) Short term lease cost consists of field trial lease agreements with a lease term of 12 months or less.
(2) Sublease income is recorded as a reduction to lease expense.

Lease Term and Discount Rate	December 31, 2020	December 31, 2019
Weighted-average remaining lease term (years)	5.0	2.6
Weighted-average discount rate	6%	7%

The maturities of the operating lease liabilities as of December 31, 2020 are as follows (in thousands):

Years Ending December 31,	Amounts
2021	$ 1,089
2022	962
2023	927
2024	817
2025	782
Thereafter	3,396
Total operating lease payments	$ 7,973
Less: imputed interest	$ 1,867
Total current and noncurrent operating lease liabilities	$ 6,106

In March 2021, the Company entered into a lease for office space in Chesterfield, MO, with a lease term of 38 months following the commencement date and no renewal option. The lease is expected to commence in the first quarter of 2021.

Note 17. Debt

Vehicle Loans

During the year ended December 31, 2019, the Company entered into notes payable agreements to finance the purchase of company vehicles. The Company has various vehicle loans that mature in 2024 and have interest rates that range from 7.64% to 8.00%. As of December 31, 2020, the outstanding balance of vehicle loans was $138,000.

Paycheck Protection Program Note

On April 16, 2020, the Company borrowed $1.1 million and entered into a promissory note for the same amount (the “PPP Note”) under the Paycheck Protection Program (“PPP”) that was established under the Coronavirus Aid Relief, and Economic Security Act (“CARES Act”) of 2020. The PPP Note matures on April 16, 2022, bears an interest rate of 1.00% per year, with interest accruing monthly beginning on November 2, 2020. The Company may prepay the PPP Note at any time prior to maturity with no prepayment penalties. The principal amount of the PPP Note and accrued interest are eligible for forgiveness if the proceeds are used for qualifying expenses, including payroll, rent, and utilities during the eight week period commencing on April 16, 2020. The Company will be obligated to repay any portion of the principal amount of the PPP Note that is not forgiven, together with accrued interest thereon, until such unforgiven portion is paid in full. The Company intends to apply for loan forgiveness within the required timeframe. No assurance is provided that the Company will obtain forgiveness of the PPP Note in whole or in part. As of December 31, 2020, the outstanding balance of the PPP Note was $1.1 million.

Promissory Note

On June 26, 2020, the Company executed a promissory note (the “Note") in the amount of $2.0 million, payable to MidFirst Bank, a federally chartered savings association (the "Lender"). The Note was issued in accordance with the terms of a Loan Agreement dated as of May 18, 2020 entered into by the Company and the Lender (the “Loan Agreement”) in which the Lender agreed to make advances to the Company from time to time, at any amount up to but not to exceed $2.0 million. Pursuant to the Loan Agreement, the Note accrues interest, adjusted monthly, at a rate equal to the greater of (i) 3.25% and (ii) the sum of (a) the quotient of the LIBOR Index divided by (one minus the reserve requirement set by the Federal Reserve), and (b) 2.50%. The Company is required to make monthly interest payments on the Note to the Lender and pay the full principal amount plus any accrued but unpaid interest outstanding under the Note no later than May 18, 2023. The Company and the Lender also entered into a Pledge and Security Agreement dated as of May 18, 2020 whereby the Company agreed to secure the Note by granting a security interest to the Lender for the Company’s deposit account held with and controlled by the Lender. Due to the lender’s control of the deposit account, the balance of $2.0 million is included in restricted cash on the consolidated balance sheets as of December 31, 2020. As of December 31, 2020, the outstanding balance of the Note was $2.0 million. On February 26, 2021, the Company repaid the full balance of $2.0 million, and expects to close the line of credit on or around March 31, 2021.

Maturities of current and noncurrent debt as of December 31, 2020 are as follows (in thousands):

Years ending December 31,	Amounts
2021	$ 1,141
2022	32
2023	2,035
2024	38
2025	—
Thereafter	—
Total	$ 3,246

Note 18. Income Taxes

The components of loss before income taxes are as follows (in thousands):

	Year Ended December 31,	
	2020	2019
Domestic	$ (6,150)	$ (28,871)
Foreign	—	—
Loss before income taxes	$ (6,150)	$ (28,871)

The total income tax (benefit) expense for the years ended December 31, 2020 and 2019 was $(124,000) and $2,000, respectively, and is comprised of current state taxes and foreign taxes withheld by governmental agencies outside of the United States, as follows (in thousands):

	Year Ended December 31,	
	2020	2019
Current:		
Federal	$ —	$ —
State	(28)	2
Foreign	10	—
Total current tax (benefit) expense	(18)	2
Deferred:		
Federal	(84)	—
State	(22)	—
Foreign	—	—
Total deferred tax (benefit) expense	(106)	—
Total tax (benefit) expense	$ (124)	$ 2

The Company operates in only one federal jurisdiction, the United States. The following is a reconciliation of the statutory federal income tax rate to the Company's effective tax rate is as follows:

	Year Ended December 31,	
	2020	2019
Expected income tax provision at the federal statutory rate	21.0%	21.0%
State taxes, net of federal benefits	9.4%	5.3%
Change in valuation allowance	(43.8)%	(26.4)%
Transaction costs	(2.2)%	—
Related offering costs	—	(0.5)%
Derivative liabilities	22.4%	—
Non-Controlling Interest	(4.7)%	—
Withholding taxes	(0.2)%	—
Other	—	0.6%
Income tax provision	1.9%	—

Deferred income taxes reflect the net tax effects of temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for income tax purposes, net operating loss carryforwards ("NOLs") and other tax credits. Significant components of the Company's deferred tax assets and liabilities are as follows (in thousands):

	As of December 31,	
	2020	2019
Deferred tax assets:		
Net operating loss carryforwards	$ 15,478	$ 13,267
Unearned revenue	2	11
Stock-based compensation	3,881	3,384
Accrued payroll and benefits	236	224
Research and development credits	16	—
Fixed asset basis difference	84	90
Inventory reserve	491	568
Lease liability	1,622	565
Common stock warrant assets	—	988
Contingent Consideration	531	—
Charitable contributions	3	2
Total deferred tax assets	22,344	19,099
Deferred tax liabilities:		
Right of use asset	(1,548)	(526)
Amortizable intangibles	(98)	—
Income from Partnerships	(13)	—
Other	(174)	—
Total deferred tax liabilities	(1,833)	(526)
Less valuation allowance	(20,511)	(18,573)
Net deferred tax assets	$ —	$ —

Realization of the deferred tax assets is dependent upon future taxable income, if any, the amount and timing of which are uncertain. Accordingly, the net deferred tax assets have been offset by a valuation allowance. The net valuation allowance increased by $1.9 million during the year ended December 31, 2020 and decreased by $25.9 million during the year ended December 31, 2019.

At December 31, 2020, the Company had federal and state NOLs aggregating approximately $55.8 million and $57.2 million, respectively. At December 31, 2020, the utilization of a portion of the federal NOLs is subject to an annual limitation under Section 382 of the Internal Revenue Code (IRC). Of the $193.1 million of federal NOLs generated, $7.2 million was previously determined as unavailable to be utilized within the carryforward period, and $130.5 million is expected to be unavailable due to an ownership change under IRC Section 382 that the Company experienced as a result of the common shares issued in connection with the June 2018 Offering. The Company is currently conducting additional analysis regarding the valuation of the Company at the time of the ownership change to assess what, if any, portion of the limitation may be reversed. The Company's ownership shift analysis was performed through December 31, 2019, and no significant ownership changes were noted during the year ended December 31, 2019. Further, the Company may have experienced an ownership change under IRC Section 382 as a result of the common shares issued in connection with the December 2020 Purchase Agreement or in the January 2021 Purchase Agreement. See subsequent events in Note 23. Such an ownership change could limit the Company's ability to utilize its NOL carryforwards prior to expiration but would not impact the net deferred tax asset recorded given the full valuation allowance. If not utilized, these federal NOLs will begin to expire in 2021 and state NOLs will begin to expire in 2024. IRC Section 382 may also limit NOLs generated in future years.

The Company evaluates deferred tax assets, including the benefit from NOLs, to determine if a valuation allowance is required. Such evaluation is based on consideration of all available evidence using a "more likely than

not" standard with significant weight being given to evidence that can be objectively verified. This assessment considers, among other matters, the nature, frequency, and severity of current and cumulative losses; forecasts of future profitability; the length of statutory carryforward periods; the Company's experience with operating losses; and tax-planning alternatives. The significant piece of objective negative evidence evaluated was the cumulative loss incurred through the year ended December 31, 2020. Given this evidence and the expectation to incur operating losses in the foreseeable future, a full valuation allowance has been recorded against the net deferred tax asset. The Company will continue to maintain a full valuation allowance against the entire amount of its net deferred tax asset, until such time as the Company has determined that the weight of the objectively verifiable positive evidence exceeds that of the negative evidence and it is likely that the Company will be able to utilize all of its net deferred tax asset relating to its federal and state NOL carryforwards. Although the Company has established a full valuation allowance on its net deferred tax asset, for Federal tax losses before 2018 and for all state tax losses, it has not forfeited the right to carryforward tax losses up to 20 years and apply such tax losses against taxable income in such years, thereby reducing its future tax obligations. Federal tax losses generated in 2018 and later do not expire. The Company is subject to taxation in the United States and various state jurisdictions. As of December 31, 2020, the Company's tax years for 2001 through 2020 are generally subject to examination by the tax authorities. The years are open back to 2001 to the extent the NOLs being carried forward were generated then.

As of December 31, 2020, the Company had the following unrecognized tax benefits (in thousands):

	Year Ended December 31,	
	2020	2019
Unrecognized tax benefit beginning balance	$ —	$ —
Increases for tax positions taken in prior years	2	—
Decreases for tax positions taken in prior years	—	—
Increases for tax positions taken in current years	15	—
Settlements	—	—
Unrecognized tax benefit ending balance	$ 17	$ —

The Company is currently not under audit for federal or state purposes. The Company does not anticipate its total unrecognized tax benefits as of December 31, 2020 will significantly change due to settlement of examination or the expiration of statute of limitations during the next 12 months. The Company is currently unaware of any uncertain tax positions that could result in significant additional payments, accruals or other material deviation in this estimate over the next 12 months.

Note 19. Retirement Benefits

The Company has a 401(k) retirement plan (the "Plan") available for participation by all regular full-time employees who have completed three months of service with the Company. The Company established the Plan in 2008. The Plan provides for a discretionary matching contribution equal to 50% of the amount of the employee's salary deduction, not to exceed 3% of the salary per employee. Highly compensated employees are excluded from receiving any discretionary matching contribution. Employees' rights to employer contributions vest on the one-year anniversary of their date of employment. The Company has the option to make discretionary matching contributions. The Company did not make discretionary matching contributions during the years ended December 31, 2020 and 2019.

Note 20. Segment and Geographic Information

Management has determined that it has one business activity and operates in one segment as it only reports financial information on an aggregate and consolidated basis to its Chief Executive Officer, who is the Company's chief operating decision maker.

Revenues based on the location of the customers, are as follows (in thousands):

	Year Ended December 31,	
	2020	2019
United States	$ 761	$ 722
Argentina	6,681	-
India	100	7
Africa	106	182
Canada	354	258
Austria	32	-
Total	$ 8,034	$ 1,169

Note 21. Net Loss per Share

Basic net loss per share is calculated by dividing net loss attributable to common stockholders by the weighted-average number of common shares outstanding during the period and excludes any dilutive effects of stock-based awards and warrants. Diluted net loss per share attributable to common stockholders is computed giving effect to all potentially dilutive common shares, including common stock issuable upon exercise of stock options and warrants. As the Company had net losses for the years ended December 31, 2020 and 2019, all potentially dilutive common shares were determined to be anti-dilutive.

Securities that were not included in the diluted per share calculations because they would be anti-dilutive were as follows (in shares):

	Year Ended December 31,	
	2020	2019
Options to purchase common stock	889,759	661,701
Warrants to purchase common stock	7,200,280	4,170,651
Total	8,090,039	4,832,352

Note 22. Related Party Transactions

The Company's related parties include Moral Compass Corporation ("MCC") and the John Sperling Foundation ("JSF"). The rights to the intellectual property owned by Blue Horse Labs, Inc. ("BHL") were assigned to its sole shareholder, the John Sperling Revocable Trust ("JSRT") due to BHL's dissolution and then subsequently to the JSF. The JSF is deemed a related party of the Company because MCC, the Company's largest stockholder, and the JSF share common officers and directors.

Transactions with related parties are reflected in the consolidated financial statements under amounts due to related parties. Outlined below are details of agreements between the Company and its related parties:

JSF receives a single digit royalty from the Company when revenue has been collected on product sales or for license payments from third parties that involve certain intellectual property developed under research funding originally from BHL. Royalty fees due to JSF were $80,000 and $40,000 as of December 31, 2020 and December 31, 2019, respectively, and are included in the consolidated balance sheets as amounts due to related parties.

The Company currently leases land on the island of Molokai, Hawaii from an entity owned by Kevin Comcowich, the Chair of the Company's Board of Directors, and his wife. The Company grows hemp on this land to support the operations of its joint venture Archipelago Ventures Hawaii. The original lease was executed in February 2019, covers 10 acres of land, has a term of two years and provides for rent payments of $1,200 per acre per year. In March and April 2020, the Company entered into two lease amendments for two additional 10-acre parcels and two additional 15-acre parcels, at the same lease rate of $1,200 per acre per year, and with a term of two years. The term for all five parcels of leased land ends February 28, 2022. In 2019, the Company engaged a third-party contractor to construct a fence on the property to adhere to the rules of the hemp pilot program. Out of pocket costs to build this fence were approximately $126,400. Mr. Comcowich supplied materials to the contractor and received payments from the contractor totaling approximately $44,000. The Company made lease payments in the amount of $84,000 and $84,000 for the years ended December 31, 2020 and 2019, respectively. For the advisory services provided by Mr. Comcowich to support the operations of the Archipelago joint venture, he was issued 5,273 options to purchase Arcadia common stock for which $9,000 of stock compensation expense was recognized during the year ended December 31, 2020.

Note 23. Subsequent Events

The Company has reviewed and evaluated subsequent events through March 31, 2021, the date the consolidated financial statements were available to be issued.

January 2021 PIPE transaction

On January 25, 2021, the Company entered into a securities purchase agreement with certain institutional and accredited investors relating to the issuance and sale in a private placement of 7,876,784 shares of Company common stock at a purchase price of $3.1925 per share and warrants exercisable for an aggregate of 3,938,392 shares of Common Stock with an exercise price of $3.13 per Warrant Share. Subject to certain ownership limitations, the Warrants are exercisable upon issuance and will expire on the 5.5-year anniversary of the date of issuance. The Company received cash proceeds of $23.3 million, net of transaction fees. The Company also agreed to grant to Wainwright, or its designees, warrants to purchase up to 5.0% of the aggregate number of shares sold in the Private Placement (393,839 shares) for the services provided as Placement Agent in the transaction. Pursuant to the January 2021 Registration Rights Agreement, the Company filed the January 2021 Registration Statement with the SEC on February 2, 2021 for purposes of registering the sale of the shares of Common Stock issued pursuant to the January 2021 Purchase Agreement and the shares of Common Stock issuable upon exercise of the January 2021 Warrants. The SEC declared the registration statement effective on February 11, 2021.

Item 9. Changes in and Disagreements With Accountants on Accounting and Financial Disclosure.

None.

Item 9A. Controls and Procedures.

Evaluation of Disclosure Controls and Procedures

As of December 31, 2020, Arcadia's disclosure controls and procedures (as defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, or the Exchange Act) were evaluated, with the participation of Arcadia's principal executive officer and principal financial officer, to assess whether they are effective in providing reasonable assurance that information required to be disclosed by Arcadia in the reports that it files or submits under the Exchange Act is accumulated and communicated to management, including its principal executive officer and principal financial officer, as appropriate, to allow timely decisions regarding required disclosure and to provide reasonable assurance that such information is recorded, processed, summarized and reported within the time periods specified in Securities and Exchange Commission rules and forms. Based on this evaluation, Matthew T. Plavan, Arcadia's principal executive officer, and Pamela Haley, Arcadia's principal financial officer, concluded that these disclosure controls and procedures were effective as of December 31, 2020.

Management's Report on Internal Control Over Financial Reporting

Management is responsible for establishing and maintaining adequate internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)). Arcadia's management, including Matthew T. Plavan, its principal executive officer, and Pamela Haley, its principal financial officer, evaluated the effectiveness of Arcadia's internal control over financial reporting using the framework in Internal Control—Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). Based on this evaluation, management concluded that Arcadia's internal control over financial reporting was effective as of December 31, 2020.

Changes in Internal Control over Financial Reporting

Under the supervision and with the participation of our management, including our Principal Executive Officer and Principal Financial Officer, we conducted an evaluation of any changes in our internal control over financial reporting (as such term is defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) that occurred during our most recently completed fiscal quarter. Based on that evaluation, our Principal Executive Officer and Principal Financial Officer concluded that there has not been any change in our internal control over financial reporting during that quarter that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

Item 9B. Other Information.

None.

PART III

Item 10. Directors, Executive Officers and Corporate Governance.

The information required by this item will be contained in our definitive proxy statement to be filed with the Securities and Exchange Commission on Schedule 14A in connection with our 2021 Annual Meeting of Stockholders (the "Proxy Statement"), which is expected to be filed no later than 120 days after the end of our fiscal year ended December 31, 2020, under the headings "Executive Officers," "Election of Directors," "Corporate Governance," and "Section 16(a) Beneficial Ownership Reporting Compliance," and is incorporated herein by reference.

The Company has adopted a written code of business conduct and ethics that applies to our directors, officers, and employees, including our principal executive officer, principal financial officer, principal accounting officer or controller, or persons performing similar functions. A current copy of the code is posted on the Corporate Governance section of our website, which is located at www.arcadiabio.com. If Arcadia makes any substantive amendments to, or grant any waivers from, the code of business conduct and ethics for our principal executive officer, principal financial officer, principal accounting officer, controller or persons performing similar functions, or any officer or director, the Company will disclose the nature of such amendment or waiver on our website or in a current report on Form 8-K.

Item 11. Executive Compensation.

The information required by this item will be contained in Proxy Statement under the headings "Executive Compensation" and "Director Compensation," and is incorporated herein by reference.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters.

The information required by this item will be contained in Proxy Statement under the headings "Security Ownership of Certain Beneficial Owners and Management" and "Equity Compensation Plan Information," and is incorporated herein by reference.

Item 13. Certain Relationships and Related Transactions, and Director Independence.

The information required by this item will be contained in Proxy Statement under the headings "Certain Relationships and Related Party Transactions" and "Corporate Governance," and is incorporated herein by reference.

Item 14. Principal Accounting Fees and Services.

The information required by this item will be contained in Proxy Statement under the heading "Ratification of Independent Registered Public Accounting Firm-Principal Accounting Fees and Services," and is incorporated herein by reference.

PART IV

Item 15. Exhibits, Financial Statement Schedules.

The financial statements schedules and exhibits filed as part of this Annual Report on Form 10-K are as follows:

(a)(1) Financial Statements

Reference is made to the financial statements included in Item 8 of Part II hereof.

(a)(2) Financial Statement Schedules

All other schedules are omitted because they are not required or the required information is included in the statements or notes thereto.

(a)(3) Exhibits

Reference is made to the Exhibit Index accompanying this Annual Report on Form 10-K.

Item 16. Form 10-K Summary.

Not applicable.

Exhibit Index

Exhibit Number	Exhibit Description	Incorporated by Reference				Filed Herewith
		Form	File No.	Exhibit	Filing Date	
3.1	Amended and Restated Certificate of Incorporation of Registrant.	8-K	001-37383	3.1	5/26/2015	
3.2	Certificate of Amendment to the Amended and Restated Certificate of Incorporation of Registrant.	10-Q	001-37383	3.1	8/10/2017	
3.3	Amendment to the Amended and Restated Certificate of Incorporation of Registrant.	8-K	001-37383	3.1	1/23/2018	
3.4	Amended and Restated Bylaws of Registrant.	8-K	001-37383	3.2	5/26/2015	
4.1	Form of Registrant’s common stock certificate	S-3	333-224061	4.1	3/30/2018	
4.2	Form of Common Stock Purchase Warrant	8-K	001-37383	4.1	3/23/2018	
4.3	Form of Common Stock Purchase Warrant	8-K	001-37383	4.1	6/14/2019	
4.4	Form of Placement Agent Warrant	8-K	001-37383	4.2	6/14/2019	
4.5	Form of Common Stock Purchase Warrant	8-K	001-37383	4.1	9/9/2019	
4.6	Form of Placement Agent Warrant	8-K	001-37383	4.2	9/9/2019	
4.7	Description of Registrant's Securities Pursuant to Section 12 of the Securities Exchange Act of 1934, as amended.	10-K	001-37383	4.7	3/25/2020	
4.8	Form of Common Stock Purchase Warrant	8-K	001-37383	4.1	5/18/2020	
4.9	Form of Placement Agent Warrant	8-K	001-37383	4.2	5/18/2020	
4.10	Form of Common Stock Purchase Warrant	8-K	001-37383	4.1	7/8/2020	
4.11	Form of Placement Agent Warrant	8-K	001-37383	4.2	7/8/2020	
4.12	Form of Investor Warrant	8-K	001-37383	4.1	12/22/2020	
4.13	Form of Placement Agent Warrant	8-K	001-37383	4.2	12/22/2020	
10.1*	Form of Indemnification Agreement between the Registrant and each of its Officers and Directors.	S-1	333-202124	10.7	2/17/2015	
10.2*	2006 Stock Plan, as amended and restated, and form of agreement thereunder.	S-1	333-202124	10.8	2/17/2015	
10.3*	2015 Omnibus Equity Incentive Plan and forms of agreement thereunder.	S-1	333-232858	10.9	7/26/2019	
10.4*	2015 Employee Stock Purchase Plan and form of agreement thereunder.	S-1/A	333-202124	10.10	5/11/2015	
10.5*	Executive Incentive Bonus Plan.	S-1/A	333-202124	10.15	5/11/2015	
10.6*	Amended and Restated Director Compensation Policy.	10-Q	001-37383	10.14	5/10/2016	
10.7*	Form of Severance and Change in Control Agreement.	S-1/A	333-202124	10.18	4/6/2015	

10.8	Base Office Lease dated March 17, 2003 between the Registrant and Pac West Office Equities, LP, including Amendments 1-7.	S-1	333-229047	10.16	12/27/2018
10.9*	Separation and Release Agreement between the Registrant and Rajendra Ketkar, dated August 23, 2019.	8-K	001-37383	10.1	8/28/2019
10.10*	Employment Letter and appended form of Severance and Change In Control Agreement between the Registrant and Matthew Plavan, dated October 1, 2019.	8-K/A	001-37383	10.1	10/7/2019
10.11*	Offer Letter and appended form of Severance and Change In Control Agreement between the Registrant and Sarah Reiter, dated February 16, 2018.	S-1	333-232858	10.17	7/26/2019
10.12*	Employment Letter and appended form of Severance and Change In Control Agreement between the Registrant and Pam Haley, dated October 1, 2019.	8-K/A	001-37383	10.2	10/7/2019
10.13+	Limited Liability Company Operating Agreement for Archipelago Ventures Hawaii, LLC, dated as of August 9, 2019.	8-K	001-37383	10.1	8/9/2019
10.14	Securities Purchase Agreement dated as of March 19, 2018, between Arcadia Biosciences, Inc. and each purchaser named in the signature pages thereto.	8-K	001-37383	10.1	3/23/2018
10.15	Form of Registration Rights Agreement.	8-K	001-37383	10.2	3/23/2018
10.16	Form of Securities Purchase Agreement dated as of June 11, 2018, between Arcadia Biosciences, Inc. and each purchaser named in the signature pages thereto.	8-K	001-37383	10.1	6/14/2018
10.17	Form of Securities Purchase Agreement dated as of June 12, 2019, between Arcadia Biosciences, Inc. and each purchaser named in the signature pages thereto.	8-K	001-37383	10.1	6/14/2019
10.18	Form of Securities Purchase Agreement dated as of September 5, 2019, between Arcadia Biosciences, Inc. and each purchaser named in the signature pages thereto.	8-K	001-37383	10.1	9/9/2019
10.19	Promissory Note, dated April 16, 2020, by and between MidFirst Bank and Arcadia Biosciences, Inc.	8-K	001-37383	10.1	4/21/2020
10.20	Amendment No. 8 to the Office Lease dated March 17, 2003 between the Registrant and Pac West Office Equities, LP.	10-K	001-37383	10.8	5/12/2020
10.21	Amendment No. 9 to the Office Lease dated March 17, 2003 between the Registrant and Pac West Office Equities, LP.	10-Q	001-37383	10.2	8/13/2020

10.22	Form of Letter Agreement, dated as of May 14, 2020.	8-K	001-37383	10.1	5/18/2020	
10.23	Loan Agreement, dated May 18, 2020, by and between MidFirst Bank and Arcadia Biosciences, Inc.	8-K	001-37383	10.1	7/2/2020	
10.24	Pledge and Security Agreement dated May 18, 2020, by and between MidFirst Bank and Arcadia Biosciences, Inc.	8-K	001-37383	10.2	7/2/2020	
10.25	Promissory Note, dated June 26, 2020, by and between MidFirst Bank and Arcadia Biosciences, Inc.	8-K	001-37383	10.3	7/2/2020	
10.26	Form of Letter Agreement, dated as of July 6, 2020.	8-K	001-37383	10.1	7/8/2020	
10.27	Form of Securities Purchase Agreement dated as of December 18, 2020, between Arcadia Biosciences, Inc. and each purchaser named on the signature pages thereto.	8-K	001-37383	10.1	12/22/2020	
10.28	Master Transaction Agreement*+.	8-K	001-37383	10.2	12/22/2020	
21.1	List of subsidiaries of the Registrant.	S-1	333-202124	21.1	2/17/2015	
23.1	Consent of Deloitte & Touche LLP, independent registered public accounting firm.					X
24.1	Power of attorney (included in the signature page to this filing).					X
31.1	Certification of Principal Executive Officer Pursuant to Rules 13a-14(a) and 15d-14(a) under the Securities Exchange Act of 1934, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.					X
31.2	Certification of Principal Financial Officer Pursuant to Rules 13a-14(a) and 15d-14(a) under the Securities Exchange Act of 1934, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.					X
32.1	Certification of Principal Executive Officer Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.					X
32.2	Certification of Principal Financial Officer Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.					X
101.INS	XBRL Instance Document.					X
101.SCH	XBRL Taxonomy Extension Schema Document.					X

101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document.	X
101.DEF	XBRL Taxonomy Extension Definition Linkbase Document.	X
101.LAB	XBRL Taxonomy Extension Label Linkbase Document.	X
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document	X

* Indicates a management contract or compensatory plan or arrangement.

\+ Certain information has been excluded from this exhibit because it is not material and would likely cause competitive harm to the registrant if publicly disclosed.

SIGNATURES

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

ARCADIA BIOSCIENCES, INC.

Date: March 31, 2021

By: /s/ MATTHEW T. PLAVAN
Matthew T. Plavan
President and Chief Executive Officer
(Principal Executive Officer)

Date: March 31, 2021

By: /s/ PAMELA HALEY
Pamela Haley
Chief Financial Officer
(Principal Financial and Accounting Officer)

Each person whose individual signature appears below hereby authorizes and appoints Matthew T. Plavan with full power of substitution and resubstitution and full power to act without the other, as his or her true and lawful attorney-in-fact and agent to act in his or her name, place and stead and to execute in the name and on behalf of each person, individually and in each capacity stated below, and to file any and all amendments to this Annual Report on Form 10-K, and to file the same, with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing, ratifying and confirming all that said attorneys-in-fact and agents or any of them or their or his substitute or substitutes may lawfully do or cause to be done by virtue thereof.

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

Name	Title	Date
/s/ MATTHEW T. PLAVAN **Matthew T. Plavan**	**Director**	March 31, 2021
/s/ ALBERT B. BOLLES **Albert D. Bolles**	**Director**	March 31, 2021
/s/ KEVIN COMCOWICH **Kevin Comcowich**	**Director**	March 31, 2021
/s/ LILIAN SHACKELFORD MURRAY **Lilian Shackelford Murray**	**Director**	March 31, 2021
/s/ GREGORY D. WALLER **Gregory D. Waller**	**Director**	March 31, 2021
/s/ AMY YODER **Amy Yoder**	**Director**	March 31, 2021
/s/ DEBORAH D. CAROSELLA **Deborah D. Carosella**	**Director**	March 31, 2021

EXHIBIT 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We consent to the incorporation by reference in Registration Statements Nos. 333-229047, 333-232858, and 333-235446 on Form S-1, Registration Statements Nos. 333-224061, 333-224893, 333-239641 and 333-252659 on Form S-3, and Registration Statement Nos. 333-204215, 333-210023, 333-216545, 333-223805, 333-232072 and 333-237438 on Form S-8 of our report dated March 31, 2021, relating to the financial statements of Arcadia Biosciences, Inc., appearing in this Annual Report on Form 10-K of Arcadia Biosciences, Inc. for the year ended December 31, 2020.

/s/ Deloitte & Touche LLP

Phoenix, Arizona
March 31, 2021

Exhibit 31.1

CERTIFICATION PURSUANT TO
RULES 13a-14(a) AND 15d-14(a) UNDER THE SECURITIES EXCHANGE ACT OF 1934,
AS ADOPTED PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Matthew T. Plavan, certify that:

1. I have reviewed this Annual Report on Form 10-K of Arcadia Biosciences, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 31, 2021

By: /s/ MATTHEW T. PLAVAN
Matthew T. Plavan
President and Chief Executive Officer
(Principal Executive Officer)

Exhibit 31.2

CERTIFICATION PURSUANT TO
RULES 13a-14(a) AND 15d-14(a) UNDER THE SECURITIES EXCHANGE ACT OF 1934,
AS ADOPTED PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Pamela Haley, certify that:

1. I have reviewed this Annual Report on Form 10-K of Arcadia Biosciences, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 31, 2021

By: /s/ PAMELA HALEY
Pamela Haley
Chief Financial Officer
(Principal Financial Officer)

Exhibit 32.1

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350, AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Annual Report of Arcadia Biosciences, Inc. (the "Company") on Form 10-K for the year ended December 31, 2020 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I certify, pursuant to 18 U.S.C. § 1350, as adopted pursuant to § 906 of the Sarbanes-Oxley Act of 2002, that:

(1) the Report fully complies with the requirements of section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: March 31, 2021

By: /s/ MATTHEW T. PLAVAN
Matthew T. Plavan
President and Chief Executive Officer
(Principal Executive Officer)

Exhibit 32.2

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350, AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Annual Report of Arcadia Biosciences, Inc. (the "Company") on Form 10-K for the year ended December 31, 2020 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I certify, pursuant to 18 U.S.C. § 1350, as adopted pursuant to § 906 of the Sarbanes-Oxley Act of 2002, that:

(1) the Report fully complies with the requirements of section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: March 31, 2021

By: /s/ PAMELA HALEY
Pamela Haley
Chief Financial Officer
(Principal Financial Officer)