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, 2022

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.)**
5950 Sherry Lane, Suite 215 **Dallas, TX** **(Address of principal executive offices)**	**75225** **(Zip Code)**

(214) 974-8921
(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.
If securities are registered pursuant to Section 12(b) of the Act, indicate by check mark whether the financial statements of the registrant included in the filing reflect the correction of an error to previously issued financial statements. ☐
Indicate by check mark whether any of those error corrections are restatements that required a recovery analysis of incentive-based compensation received by any of the registrant's executive officers during the relevant recovery period pursuant to §240.10D-1(b). ☐

Indicate by check mark whether the Registrant is a shell company (as defined in Rule 12b-2 of the 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, 2022, the last business day of the Registrant's most recently completed second fiscal quarter, was approximately $21,027,600 (based on the closing price of $40.00 on June 30, 2022 on the NASDAQ Capital Market).

As of March 23, 2023, the registrant had 857,572 shares of common stock outstanding, $0.001 par value per share.

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 2022 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,” "management," “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, 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 producer and marketer of innovative, plant-based food and beverage products. Our history as a leader in science-based approaches to developing high value crop improvements, primarily in wheat, designed to enhance farm economics by improving the performance of crops in the field, as well as their value as food ingredients, has laid the foundation for our path forward. We have used non-genetically modified ("non-GMO") advanced breeding techniques to develop these proprietary innovations which we are now commercializing through the sales of seed and grain, food ingredients and products, trait licensing and royalty agreements. The acquisition of the assets of Live Zola, LLC ("Zola") added coconut water to our portfolio of products.

Our commercial strategy is to satisfy consumer nutrition 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. The acquisition of the Zola brand allows us to broaden our reach within the beverage sector.

Our Growth Strategy

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

- ***Accelerate the monetization of our GoodWheat™ wheat trait portfolio.*** Our proprietary intellectual property ("IP") with multiple non-GMO wheat traits have clear functional benefits, and we will continue to build partnerships across the wheat value chain. This will include launching GoodWheat™ into multiple categories where our wheat can provide a compelling point-of-difference at attractive margins. We will continue to acquire, develop and retain the requisite management and industry experience to fully participate in, and control, the route to market for our high value food ingredients.
- ***Evaluate acquisitive growth opportunities.*** We intend to evaluate potential acquisitions that will allow us to bring the GoodWheat value proposition to an existing business. We believe there is a significant opportunity to scale our business faster by purchasing an existing business in a new wheat-based category outside of pasta.
- ***Scale Zola through retail expansion.*** We plan to expand distribution of our Zola coconut water brand through mass market retailers and grocery store chains. Based on our research, consumers prefer the clean, crisp taste of Zola to that of other leading coconut water brands. As a result, we plan to refresh our packaging, launch new innovation and continue to invest in effective brand-building activities.

Arcadia Wellness, LLC

In May 2021, our wholly owned subsidiary Arcadia Wellness, LLC ("Arcadia Wellness" or "AW"), acquired the businesses of Eko, Lief, and Zola. The acquisition included consumer CBD brands like Soul Spring™, a CBD-infused botanical therapy brand in the natural category, Saavy Naturals™, a line of natural body care products and ProVault™, a CBD-infused sports performance formula made with natural ingredients, providing effective support and recovery for athletes. Also included in the purchase is Zola, a coconut water sourced exclusively with sustainably grown coconuts from Thailand. On July 8, 2022, the Company entered into an agreement to license Saavy Naturals™ to Radiance Beauty and Wellness, Inc. ("Radiance Beauty").

Our Product Portfolio

GoodWheat™ Consumer Products

In June 2022, we launched our GoodWheat pasta in five varieties – penne, spaghetti, fettuccine, elbows and rotini – in select retailers nationwide and on Amazon. Our pasta delivers 4 times the fiber of traditional wheat pasta with 9g of protein per serving and no sacrifice on taste. In fact, our research shows that GoodWheat pasta scores at parity on taste with leading wheat pasta competitors and significantly outscores market leading vegetable-based pastas. Made with only our USA farm grown wheat, GoodWheat pasta meets consumers' preference for clean labels and transparent sourcing. And, in December of 2022, GoodWheat received the American Heart Association's Heart-Check mark on all of our pasta products. With its high fiber, lower sodium and zero saturated fat, GoodWheat meets the criteria for a heart-healthy pasta and provides consumers with a better-for-you option that delivers superior nutrition with the taste and texture of traditional pasta.

Most Americans suffer from a significant fiber deficiency. Less than 10 percent of women and less than 3 percent of men get enough fiber in their daily diets. The recommended daily value of fiber is 25g for women and children, and 38g for men according to the May 2021 Food and Health Survey by the International Food Information Council. One serving of GoodWheat Pasta gets your fiber closer to your daily need, delivering 8g of fiber, which accounts for 32 percent of the daily value of fiber needs for women and children, and 20 percent for men.

In 2023, we plan to expand the GoodWheat portfolio with the launch of innovative, new wheat-based products in additional categories, offering consumers more options to improve their fiber intake at multiple mealtimes throughout the day.

Zola Coconut Water

Zola is a pure, natural, 100% coconut water with a crisp, clean taste that's lightly sweet and refreshing. Naturally hydrating and never from concentrate, Zola is Non-GMO Project Verified and only contains 60 calories per serving. In taste tests, Zola beats competitors 2 to 1 and is the best-tasting way to rehydrate, reset and reenergize.

CBD Body Care ProVault Topical Pain Relief

Our portfolio currently consists of two body care brands that both contain CBD. The first brand is ProVault, a muscle and joint pain relief product that is formulated with THC-free CBD isolate along with a proprietary blend of natural ingredients and fast-acting cooling agents. The second brand is SoulSpring, a CBD-infused line of bath and body products that includes nourishing botanicals and minerals.

The market for CBD products has been under pressure primarily due to regulatory uncertainty. Given our strategic focus on food and beverage products, we are currently in the process of exploring strategic alternatives for our body care brands.

GoodWheat™ Wheat Traits

Enhanced Quality Grains

The GoodWheat brand also encompasses our current and future non-GMO wheat portfolio of high fiber Resistant Starch ("RS"), Reduced Gluten ("RG") wheat varieties, and extended shelf life wheat, as well as future wheat innovations. We now hold more than 15 global patents on our high fiber RS wheat, protecting both bread wheat and durum (pasta) wheat. Claims granted recently strengthen our IP for our RS portfolio of products.

Our GoodWheat™ wheat traits redesign wheat as a functional food adding value to the wheat supply chain by enabling a wider range of choices to meet consumer demands. 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. We believe improving the fiber content of wheat can deliver improved health benefits to a wide population.

High Fiber RS Wheat

Our high fiber 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. 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 bread flour is currently being introduced to North American bakery and consumer packaged goods ("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.

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.

Arcadia is continuing to advance a new wheat variety with reduced gluten levels. Our proprietary, non-GMO 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.

Improved Shelf Life of Whole Grain Flour

The United States Department of Agriculture 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.

Product Development

With our food, beverage and wellness products now entering the market, we are firmly in the commercialization phase of our corporate lifecycle. We are de-emphasizing new trait discovery research and development (“R&D”) and are increasing our focus on food-science innovation to fully leverage the value in our existing superior wheat genetics. We are evolving our organizational capabilities to match this strategy progression to include in-house food formulation and CPG supply chain expertise.

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 directly from our own well-established plant technology traits, we expect this extension of our involvement will provide more meaningful improvements.

Field Trials and Breeder & Foundation Seed Production. Our trait evaluation and development staff conducts field operations for both trials and production in American Falls, Idaho, and oversee production in other areas of the country, as needed. Similarly, regulatory trials may be needed to 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.

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. 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. We ensure all of our plant materials are accounted for, tracked and inventoried, which enables us to maintain direct control and proper documentation.

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, 2022, we owned or exclusively controlled 70 issued patents, 38 pending patent applications worldwide, and 6 plant variety protection certificates. These totals reflect the following: (i) with respect to the U.S. territory, we owned 23 and exclusively in-licensed 2 U.S. issued patents, and we owned 6 U.S. patent applications and 6 plant variety protection certificates relating to our plants, trait technologies, and business methods; and (ii) in connection with foreign territories, we owned 26 and exclusively in-licensed 19 foreign issued patents, and owned 32 pending foreign patent applications. As of December 31, 2022, our GoodWheat® portfolio included 12 U.S. issued patents, 6 U.S. patent applications, 1 plant variety certificate, 23 foreign issued patents and 25 foreign patent applications. With respect to all of the foregoing patent and plant protection 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, 2022, Arcadia Biosciences, Inc. and Arcadia Wellness, LLC had nine and eight registered trademarks in the United States, respectively. We also have eleven 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.

Corteva Agriscience

In 2017, we entered into a 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 2019, we entered into an agreement with Arista and Bay State Milling ("BSM"). Under the agreement, BSM is the exclusive commercial partner for our high fiber resistant starch bread wheat in North America under its HealthSense™ brand portfolio, while Arista has exclusive rights under our high fiber resistant starch bread 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.

Competition

The markets for consumer goods are highly competitive, and we face significant direct and indirect competition in several aspects of our business. We compete with both large, established manufacturers, as well as small, innovative producers of pasta and beverage products. There are several companies working to improve genetics in crops, such as wheat, that may compete with the trait used in our GoodWheat products.

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

- *Companies Selling Pasta 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.
- *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 is an agriculture biotechnology company that has a similar strategy to ours to create healthier specialty food ingredients and agriculturally advantageous food crops.

- *Coconut water:* The beverage industry is competitive. Competitors in this market compete for brand recognition, ingredient sourcing, product shelf space, and e-commerce page rankings. Our competitors have similar distribution channels and retailers to deliver and sell their products. Competitors in this space include Vita Coco, ZICO, C20 and Harmless Harvest.

Employees

As of December 31, 2022, we had 30 employees with 17 in management, operations, commercial production, 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.

Diversity and Inclusion

At Arcadia, we recognize the immense benefits that a diverse team brings to our organization, including delivering better business outcomes. Our talented people leverage their diverse backgrounds and skills toward a common goal: meeting the needs of the present without compromising the ability of future generations to do the same. This spirit of inclusive collaboration can be felt throughout our Company. Our commitment to diversity begins at the highest levels of our organization, as evidenced by the fact that 43% of our Board of Directors are women. From a management perspective, 63% of our CEO's direct reports are women, racially or ethnically diverse, which we believe sets the right tone and expectation for diversity and inclusion within the Company. More broadly, 59% of our employees are women.

Facilities

Our corporate headquarters are located in Dallas, Texas with additional office space in Davis, California and additional facilities in American Falls, Idaho. 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.

Available Information

Our website address is www.arcadiabio.com. Our Annual Report on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K, any amendments to those reports, proxy and registration statements filed or furnished with the Securities and Exchange Commission, or SEC, are available free of charge through our website. We make these materials available through our website as soon as reasonably practicable after we electronically file such materials with, or furnish such materials to, the SEC. The information contained in, or that can be accessed through, our website is not part of this Report.

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 Business

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 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 signs of improvement, 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 US financial markets have been negatively impacted by the rise of inflation and interest rates, and in March 2023, the government closure of Silicon Valley Bank, increasing the potential for a local and/or global economic recession that could disrupt our business. A 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 $15.6 million and $16.1 million for the years ended December 31, 2022 and 2021, respectively. As of December 31, 2022, we had an accumulated deficit of $257.9 million. Net cash used in operations was $14.0 million and $25.9 million for the years ended December 31, 2022 and 2021, respectively. We expect to continue to incur losses. Because we have incurred and expect to continue to incur significant costs and expenses for these efforts before we obtain any incremental revenues from the sale of 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 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 pasta and coconut water 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 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 and consumer 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.

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 United States Department of Agriculture, Food and Drug Administration ("FDA"), the U.S. Environmental Protection Agency 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.

We depend on our key personnel and, if we are not able to attract and retain qualified technical 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 technical 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 food innovation, supply chain management, 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.

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.

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. We may be subject to many different state-based regulations for hemp, all of which could require us to incur substantial costs associated with compliance requirements.

The Drug Enforcement Administration ("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 FDA 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.

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 seed and grain 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. 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.

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. This 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.

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 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.

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.

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 January 2021 and December 2020 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, 2022, there were 616,079 shares of our common stock outstanding, of which approximately 587,028 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 22,456 options exercisable as of December 31, 2022 at a weighted-average exercise price of $215.20.

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 $6,400.00 per share, our stock price has ranged from $10.48 to $6,984.00, through December 31, 2022. 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.

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.

Our failure to meet the continued listing requirements of Nasdaq could result in a delisting of our common stock, which could negatively impact the market price and liquidity of our common shares and our ability to access the capital markets.

Our common stock is listed on The Nasdaq Capital Market. If we fail to satisfy the continued listing requirements of the Nasdaq Stock Market ("Nasdaq"), such as the corporate governance requirements or the minimum closing bid price requirement, Nasdaq may take steps to delist our common stock. Such a delisting would have a negative effect on the price of our common stock, impair the ability to sell or purchase our common stock when persons wish to do so, and any delisting materially adversely affect our ability to raise capital or pursue strategic restructuring, refinancing or other transactions on acceptable terms, or at all. Delisting from The Nasdaq Capital Market could also have other negative results, including the potential loss of institutional investor interest and fewer business development opportunities.

On September 27, 2022, we received a notice from the Nasdaq Listing Qualifications Department of Nasdaq informing us that because the closing bid price of our common stock had been below $1.00 per share for 30 consecutive business days, we no longer complied with the minimum bid price requirement for continued listing on The Nasdaq Capital Market. Nasdaq Listing Rule 5550(a)(2) requires listed securities to maintain a minimum bid price of $1.00 per share, and Nasdaq Listing Rule 5810(c)(3)(A) provides that a failure to meet the minimum bid price requirement exists if the deficiency continues for a period of 30 consecutive business days. The notice had no immediate effect on the listing or the trading of our common stock on The Nasdaq Capital Market. Pursuant to Nasdaq Listing Rule 5810(c)(3)(A), the notice letter stated that we had an initial compliance period of 180 calendar days, or until March 27, 2023, to regain compliance with the minimum bid price requirement. To regain compliance, the closing bid price of our common stock must meet or exceed $1.00 per share for a minimum of 10 consecutive business days during the 180 calendar day grace period.

On March 15, 2023, we received a letter from the Listing Qualifications Department of Nasdaq notifying us that as a result of the closing bid price of our common stock having been at $1.00 per share or greater for at least ten consecutive business days, we had regained compliance with Nasdaq’s minimum bid price requirement under Nasdaq’s Marketplace Rule 5550(a)(2) for continued listing on The NASDAQ Capital Market, and the matter was now closed.

Item 1B. Unresolved Staff Comments.

Not applicable.

Item 2. Properties.

Our corporate headquarters are located in Dallas, Texas with additional office space in Davis, California and additional facilities in American Falls, Idaho. 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 23, 2023, 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, 2022, has previously been reported in Current Reports on Form 8-K that we filed during that 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, 2022.

Item 6. [Reserved]

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," "GoodWheat," "GoodHemp," "Zola coconut water," "Soul Spring," "ProVault" and "Saavy Naturals" 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 producer and marketer of innovative, plant-based food and beverage products. Our history as a leader in science-based approaches to developing high value crop improvements, primarily in wheat, designed to enhance farm economics by improving the performance of crops in the field, as well as their value as food ingredients, has laid the foundation for our path forward. We have used non-genetically modified advanced breeding techniques to develop these proprietary innovations which we are now commercializing through the sales of seed and grain, food ingredients and products, trait licensing and royalty agreements. The acquisition of the assets of Live Zola, LLC ("Zola") added coconut water to our portfolio of products.

Our commercial strategy is to satisfy consumer nutrition 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. The acquisition of the Zola brand allows us to broaden our reach within the beverage sector.

Components of Our Statements of Operations Data

Revenues

The Company derives its revenues from product sales, licensing agreements and royalty fees.

Product revenues

Product revenues consist primarily of sales of Arcadia Wellness products, GoodWheat grain and pasta, and GLA products. 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 delivery. Revenues fluctuate depending on the timing of shipments of product to our customers and are reported net of estimated chargebacks, returns and losses.

License revenues

License revenues consist of up-front, nonrefundable license fees, annual license fees, and subsequent milestone payments that we receive under our license agreements. Revenue generated from up-front license fees are recognized upon execution of the agreement. We recognize 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 are probable in order to determine the timing of revenue recognition for milestone fees. Milestones typically represent significant stages of development for our 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 our traits. Given the seasonality of agriculture and time required to progress from one milestone to the next, achievement of milestones is inherently uneven, and license revenues are likely to fluctuate significantly from period to period.

Royalty revenues

Royalty revenues consist of amounts earned from the sale of commercial products that incorporate the Company's traits by third parties. Royalty revenues consist of a minimum annual royalty, offset by amounts earned from the sale of products. The Company recognizes the minimum annual royalty on a straight-line basis over the year, and the Company recognizes royalty revenue resulting from the sale of products when the third parties transfer control of the product to their customers, which generally occurs upon shipment. Royalty revenues can fluctuate depending on the timing of shipments of product by the third parties to their customers.

Operating Expenses

Cost of revenues

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

Research and development expenses ("R&D")

Research and development expenses consist of costs incurred in the development and testing of the Company's products and other products in development incorporating the Company's traits. These expenses currently consist primarily of fees paid to product formulation consultants and are expensed as incurred. Additionally, the Company is required from time to time to make certain milestone payments in connection with the development of technologies in-licensed from third parties. The Company's 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 in November 2020.

Loss on sale of Arcadia Spain

The loss on sale of Arcadia Spain is the loss recognized for the sale of the assets of our subsidiary Arcadia Spain. See Note 1 to the consolidated financial statements.

Impairment of intangible assets

Impairments of intangible assets are recorded when the fair value of intangible assets drops below its carrying amount. See Note 2 and 8 to the consolidated financial statements.

Impairment of goodwill

Impairments of goodwill are recorded when the fair value of the reporting unit drops below its carrying amount. See Note 2 to the consolidated financial statements.

Change in fair value of contingent consideration

Change in the fair value of contingent consideration is comprised of the fair value remeasurement of the liabilities associated with our contingent consideration.

Gain on sale of property and equipment, net

Gain on sale of fixed assets includes gains from the sale of tangible assets sold above their net book value.

Impairment of property and equipment, net

Impairment of property and equipment, net includes losses from tangible assets due to impairment or recoverability test charges to write down fixed assets to their fair value or recoverability value.

Selling, general and administrative expenses

Selling, general and administrative expenses consist primarily of employee costs, professional service fees, broker and sales commission 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 products, we expect to increase our investments in sales and marketing, including additional consulting fees.

Interest income (expense)

Interest income consists primarily of interest earned on investments. Interest expense consists primarily of contractual interest on notes payable relating to the purchase of company vehicles.

Other income, net

Other income, net, consists of realized gains on corporate securities, 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 and option liabilities

Change in the estimated fair value of common stock warrant and option liabilities is comprised of the fair value remeasurement of the liabilities associated with our financing transactions.

Gain on extinguishment of Paycheck Protection Program ("PPP") loan

The PPP loan amount forgiven has been recorded as gain on extinguishment of PPP loan, as the Company has been legally released from being the primary obligor.

Issuance and offering costs

Issuance and offering costs generally include placement agent, legal, advisory, accounting and filing fees related to financing transactions.

Income tax 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 December 31, 2022 and 2021. We consider all available evidence, both positive and negative, including but not limited to: earnings history, 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, 2022 and 2021

	Year Ended December 31, 2022	Year Ended December 31, 2021	$ Change	% Change
	(in thousands)			
Revenues:				
Product	$ 8,960	$ 6,587	$ 2,373	36 %
License	879	17	862	5071 %
Royalty	117	176	(59)	-34 %
Total revenues	9,956	6,780	3,176	47 %
Operating expenses (income):				
Cost of revenues	9,802	8,708	1,094	13 %
Research and development	1,509	3,889	(2,380)	-61 %
(Gain) on sale of Verdeca	(1,138)	—	(1,138)	100 %
Loss on sale of Arcadia Spain	—	497	(497)	-100 %
Impairment of intangible assets	404	3,302	(2,898)	-88 %
Impairment of goodwill	—	1,648	(1,648)	-100 %
Change in fair value of contingent consideration	(70)	(210)	140	-67 %
(Gain) on sale of property and equipment	(314)	—	(314)	100 %
Impairment of property and equipment, net	530	1,534	(1,004)	-65 %
Selling, general and administrative	18,048	22,938	(4,890)	-21 %
Total operating expenses	28,771	42,306	(13,535)	-32 %
Loss from operations	(18,815)	(35,526)	16,711	-47 %
Interest income (expense)	289	(20)	309	-1545 %
Other income, net	33	10,114	(10,081)	-100 %
Change in fair value of common stock warrant and option liabilities	3,209	8,946	(5,737)	-64 %
Gain on extinguishment of PPP loan	—	1,123	(1,123)	-100 %
Issuance and offering costs	(314)	(769)	455	-59 %
Net loss before income taxes	(15,598)	(16,132)	534	-3 %
Income tax (provision)	(14)	(2)	(12)	600 %
Net loss	(15,612)	(16,134)	522	-3 %
Net loss attributable to non-controlling interest	(236)	(1,474)	1,238	-84 %
Net loss attributable to common stockholders	$ (15,376)	$ (14,660)	$ (716)	5 %

Revenues

Product revenues accounted for 90% and 97% of our total revenues in 2022 and 2021, respectively. The $2.4 million, or 36%, increase in product revenues in 2022 compared to 2021 was primarily driven by higher sales of Zola coconut water and body care products, the brands acquired in May 2021.

License revenues accounted for 9% and 0% of our total revenues in 2022 and 2021, respectively. The $0.9 million increase in license revenues in 2022 compared to 2021 is related to the Verdeca-Bioceres licensing agreement discussed in Note 10 to the consolidated financial statements.

Royalty revenues accounted for 1% and 3% of our total revenues in 2022 and 2021, respectively. The $59,000 decrease in royalty revenues in 2022 compared to 2021 represents fewer annual royalty fees earned.

Operating expenses (income)

Cost of revenues

Cost of revenues increased by $1.1 million, or 13%, in 2022 compared to 2021. The increase in cost of revenues is the result of the increase in revenues as well as inventory write-downs of $2.3 million during 2022. Gross profit, calculated as total revenues less cost of revenues, was $154,000 in 2022 compared to gross loss of $1.9 million in 2021. The decrease in gross loss was primarily driven by the increase in product revenues as well as the increase in license revenue related to the Verdeca-Bioceres licensing agreement in 2022.

Research and development

Research and development expenses decreased by $2.4 million, or 61%, in 2022 compared to 2021. The decrease was primarily driven by the Company's recent focus on commercialization, which has led to lower employee-related expenses, and related activity costs as we right-sized our research teams.

Gain on sale of Verdeca

In 2022, we recognized a gain on sale of Verdeca of $1.1 million related to the regulatory approval of the Haab 4 soybeans. See Note 10 to the consolidated financial statements.

Loss on sale of Arcadia Spain

In 2021, we recognized a loss of $497,000 on the sale of Arcadia Spain, our wholly owned subsidiary, which we sold to a European partner. See Note 1 to the consolidated financial statements.

Impairment of intangible assets

Impairment of intangible assets decreased by $2.9 million in 2022 compared to 2021. We recognized impairments of intangible assets of $404,000 and $3.3 million in 2022 and 2021, respectively, primarily as a result of lower margins in our wellness products due to unfavorable product mix and higher freight costs that have a significant impact in the near-term. A volatile economic climate and higher than normal inflation were also contributing factors, in addition to a decline in the hemp seed market forecasted sales. See Note 2 and 8 to the consolidated financial statements.

Impairment of goodwill

We did not recognize any impairment of goodwill in 2022. We recognized an impairment of goodwill in the amount of $1.6 million in 2021 primarily as a result of weakness in the acquired consumer product margins, combined with a volatile economic climate and higher than normal inflation.

Change in fair value of contingent consideration

Change in fair value of contingent consideration in 2022 was a decrease of $70,000 compared to a decrease of $210,000 in 2021 both due to the remeasurement of the Anawah and Industrial Seed Innovations contingent consideration liabilities. See Note 6 and 16 to the consolidated financial statements.

Gain on sale of property and equipment

In 2022, we sold property and equipment related to the Davis laboratory, Archipelago and Body Care for net proceeds exceeding book value by $314,000.

Impairment of property and equipment, net

In 2022, we recognized $530,000 of impairments of property and equipment, of which $320,000 is related to the Radiance Beauty licensing agreement. In 2021, we recognized $1.5 million of impairments of Archipelago property and equipment related to CBD processing.

Selling, General, and Administrative

Selling, general, and administrative expenses decreased by $4.9 million, or 21%, in 2022 compared to 2021. The decrease was primarily driven by lower salaries, lease expense and consulting fees in 2022.

Interest income (expense)

In 2022, the Company had interest income of $289,000 from investments as compared to interest expense of $20,000 in 2021.

Other income, net

Other income, net, decreased by $10.1 million, or 100%, in 2022 compared to 2021 due to $10.2 million of realized gain from the sale of corporate securities of Bioceres in June 2021. See Note 6 and Note 10 to the consolidated financial statements.

Change in the estimated fair value of common stock warrant and option liabilities

Change in the estimated fair value of common stock warrant and option liabilities decreased by $5.7 million in 2022 compared to 2021. The decrease was driven by the adoption of ASU 2020-06 in January 2022, which resulted in the reclassification of common stock warrants from liability to equity, partially offset by the change in the estimated fair value of the liability classified preferred investment options issued in connection with the August 2022 RDO financing transaction.

Gain on extinguishment of PPP loan

In 2021, we were notified by our lender that the Small Business Administration had forgiven the original PPP loan amount in full, resulting in a $1.1 million gain on the extinguishment of the PPP loan. See Note 18 to the consolidated financial statements.

Issuance and offering costs

In 2022, we recognized $314,000 in issuance and offering costs related to the August 2022 RDO financing transaction. In 2021, we recognized $769,000 in issuance and offering costs related to the January 2021 PIPE financing transaction.

Income tax (provision)

The income tax provision resulted in expense of $14,000 in 2022 as compared to expense of $2,000 in 2021.

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. Demand for our consumer body care products tends to vary with major holidays and demand for coconut water products is generally higher in the summer months.

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

Liquidity and Capital Resources

We have funded our operations primarily with the net proceeds from our private and public offerings of our equity securities and debt, as well as proceeds from the sale of our products and payments under license agreements. Our principal use of cash is to fund our operations, which are primarily focused on commercializing our products. Our contractual obligations are primarily related to our operating leases for facilities, land and equipment. Refer to Note 17 to the consolidated financial statements for details of our leasing arrangements. As of December 31, 2022, we had cash and cash equivalents of $20.6 million. For the years ended December 31, 2022 and 2021, the Company had net losses of $15.6 million and $16.1 million, respectively, and net cash used in operations of $14.0 million and $25.9 million, respectively.

Going Concern

We believe that our existing cash and cash equivalents will not be sufficient to meet our anticipated cash requirements for at least the next 12-18 months from the issuance date of our 2022 financial statements, and thus raises substantial doubt about the Company’s ability to continue as a going concern. The financial statements do not include any adjustments that might result from the outcome of this uncertainty.

We may seek to raise additional funds through debt or equity financings, if necessary. We may also consider entering into additional partner arrangements. Any 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 product launches. Any of these actions could materially harm our business, results of operations and financial condition.

Liquidity

The following table summarizes total current assets, current liabilities and working capital for the dates indicated:

	As of December 31,	
	2022	2021
Current assets	$ 25,398	$ 35,388
Current liabilities	4,209	5,040
Working capital surplus	21,189	30,348

Cash Flows

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

	Year Ended December 31,	
	2022	2021
Net cash (used in) provided by:		
Operating activities	$ (13,977)	$ (25,868)
Investing activities	1,417	16,608
Financing activities	4,519	21,900
Effects of foreign currency translation on cash and cash equivalents	—	2
Net decrease in cash and cash equivalents	$ (8,041)	$ 12,642

Cash flows from operating activities

Cash used in operating activities for the year ended December 31, 2022 was $14.0 million. With respect to our net loss of $15.6 million, non-cash charges including $1.1 million of stock-based compensation, $884,000 of lease amortization, $2.5 million of write-downs of inventory, $530,000 of impairment of property and equipment, $314,000 of issuance and offering costs, $404,000 of impairment of intangible assets, $439,000 of depreciation, and $1.0 million adjustments in our working capital accounts were offset by $3.2 million for the change in fair value of common stock warrant and option liabilities, gain on sale of Verdeca of $1.1 million, $314,000 of net gain on disposal of property and equipment, and operating lease payments of $932,000.

Cash used in operating activities for the year ended December 31, 2021 was $25.9 million. With respect to our net loss of $16.1 million, non-cash charges including $1.5 million of stock-based compensation, $1.3 million of lease amortization, $3.6 million of write-downs of inventory, $1.5 million of impairment of property and equipment, $769,000 of issuance and offering costs, $1.6 million of impairment of goodwill, $3.3 million of impairment of intangible assets, and $929,000 of depreciation were offset by $1.7 million adjustments in our working capital accounts, $10.2 million of realized gain on corporate securities, $8.9 million for the change in fair value of common stock warrant liabilities, $210,000 of other non-cash income from the change in fair value of contingent consideration, and $1.3 million of operating lease payments.

Cash flows from investing activities

Cash provided by investing activities for the year ended December 31, 2022 of $1.4 million primarily consisted of $920,000 of proceeds from sales of property and equipment, $569,000 proceeds from sale of Verdeca, partially offset by $72,000 of purchases of property and equipment.

Cash provided by investing activities for the year ended December 31, 2021 of $16.6 million primarily consisted of $21.8 million of proceeds from sales of investments, partially offset by $4.3 million of acquisitions, and $1.0 million in purchases of property and equipment.

Cash flows from financing activities

Cash provided by financing activities for the year ended December 31, 2022 of $4.5 million consisted of proceeds from the issuance of common stock relating to the August 2022 RDO financing transaction of $5.0 million gross proceeds and proceeds from the purchase of ESPP shares of $7,000, which were offset by payments of transaction costs related to the August 2022 RDO financing transaction of $488,000.

Cash provided by financing activities for the year ended December 31, 2021 of $21.9 million consisted of proceeds from the issuance of common stock relating to the January 2021 private placement financing transaction of $25.1 million of gross proceeds, capital contributions from the non-controlling interest in our joint venture of $750,000, and proceeds from the purchase of ESPP shares of $39,000, which were offset by payments of transaction costs related to the January 2021 private placement of $1.9 million and principal payments on debt of $2.1 million.

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, a joint venture sold in November 2020.

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, impairments of property and equipment, 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 on each of the below revenue streams.

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

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.

Determination of the provision for 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.

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 $1.1 million and $1.5 million for the years ended December 31, 2022 and 2021, 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 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—The historical volatility data was computed using the daily closing prices for the Company's shares during the equivalent period of the calculated expected term of the stock-based awards.

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—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.

Impairments of property and equipment

The Company evaluates if events and circumstances have occurred that indicate the remaining estimated useful life of property and equipment 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.

Net realizable value of 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 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.

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, 2022 and 2021, 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, 2022, 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, 2022 and 2021, and the results of its operations and its cash flows for each of the two years in the period ended December 31, 2022, in conformity with accounting principles generally accepted in the United States of America.

Going Concern

The accompanying consolidated financial statements have been prepared assuming that the Company will continue as a going concern. As discussed in Note 1 to the consolidated financial statements, the Company has an accumulated deficit, recurring net losses and net cash used in operations, and resources that will not be sufficient to meet its anticipated cash requirements, which raises substantial doubt about its ability to continue as a going concern. Management's plans in regard to these matters are also described in Note 1. The consolidated financial statements do not include any adjustments that might result from the outcome of this uncertainty.

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 Inventory Valuation – Refer to Note 4 to the consolidated financial statements

Critical Audit Matter Description

GoodWheat 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 inventory valuation included the following, among others:

- We evaluated the demand forecasts by obtaining documentation to support customer orders, contracts, historical and future sales that corroborate the reasonableness of amount estimated 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 assessed whether write-downs of inventory may be understated by examining GoodWheat write-down activity subsequent to December 31, 2022.

/s/ Deloitte & Touche LLP

Tempe, Arizona

March 30, 2023

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,	
	2022	2021
Assets		
Current assets:		
Cash and cash equivalents	$ 20,644	$ 28,685
Accounts receivable and other receivables, net of allowance for doubtful accounts of $3 and $76 as of December 31, 2022 and 2021, respectively	1,287	1,370
Inventories, net — current	2,571	4,433
Assets held for sale	87	—
Prepaid expenses and other current assets	809	900
Total current assets	25,398	35,388
Property and equipment, net	704	2,291
Right of use assets	1,848	3,081
Inventories, net — noncurrent	767	2,494
Intangible assets, net	40	484
Other noncurrent assets	165	180
Total assets	$ 28,922	$ 43,918
Liabilities and stockholders’ equity		
Current liabilities:		
Accounts payable and accrued expenses	$ 2,881	$ 3,638
Amounts due to related parties	48	64
Operating lease liability — current	1,010	1,074
Other current liabilities	270	264
Total current liabilities	4,209	5,040
Operating lease liability — noncurrent	1,007	2,220
Common stock warrant and option liabilities	806	3,392
Other noncurrent liabilities	2,000	2,070
Total liabilities	8,022	12,722
Commitments and contingencies (Note 16)		
Stockholders’ equity:		
Common stock, $0.001 par value—150,000,000 shares authorized as of December 31, 2022 and December 31, 2021; 616,079 and 554,609 shares issued and outstanding as of December 31, 2022 and December 31, 2021, respectively.	65	63
Additional paid-in capital	278,827	257,515
Accumulated deficit	(257,859)	(226,485)
Total Arcadia Biosciences stockholders’ equity	21,033	31,093
Non-controlling interest	(133)	103
Total stockholders' equity	20,900	31,196
Total liabilities and stockholders’ equity	$ 28,922	$ 43,918

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, 2022	Year Ended December 31, 2021
Revenues:		
Product	$ 8,960	$ 6,587
License	879	17
Royalty	117	176
Total revenues	9,956	6,780
Operating expenses (income):		
Cost of revenues	9,802	8,708
Research and development	1,509	3,889
(Gain) on sale of Verdeca	(1,138)	—
Loss on sale of Arcadia Spain	—	497
Impairment of intangible assets	404	3,302
Impairment of goodwill	—	1,648
Change in fair value of contingent consideration	(70)	(210)
(Gain) on sale of property and equipment	(314)	—
Impairment of property and equipment, net	530	1,534
Selling, general and administrative	18,048	22,938
Total operating expenses	28,771	42,306
Loss from operations	(18,815)	(35,526)
Interest income (expense)	289	(20)
Other income, net	33	10,114
Change in fair value of common stock warrant and option liabilities	3,209	8,946
Gain on extinguishment of PPP loan	—	1,123
Issuance and offering costs	(314)	(769)
Net loss before income taxes	(15,598)	(16,132)
Income tax (provision)	(14)	(2)
Net loss	(15,612)	(16,134)
Net loss attributable to non-controlling interest	(236)	(1,474)
Net loss attributable to common stockholders	$ (15,376)	$ (14,660)
Net loss per share attributable to common stockholders:		
Basic and diluted	$ (25.65)	$ (27.56)
Weighted-average number of shares used in per share calculations:		
Basic and diluted	599,389	532,016
Other comprehensive loss	—	—
Comprehensive loss attributable to common stockholders	$ (15,376)	$ (14,660)

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	Non-controlling Interest	Total Stockholders' Equity
	Shares	Amount				
Balance at December 31, 2020	336,272	$ 54	$ 239,496	$ (211,825)	$ 827	28,552
Issuance of shares related to the January 2021 PIPE	196,920	8	15,508	—	—	15,516
Offering costs related to the January 2021 PIPE	—	—	(2,084)	—	—	(2,084)
Issuance of placement agent warrants related to issuance of January 2021 PIPE	—	—	942	—	—	942
Issuance of shares at closing of Arcadia Wellness acquisition	20,686	1	2,052	—	—	2,053
Issuance of shares related to exercise of Service and Performance Warrants	350	—	22	—	—	22
Issuance of shares related to employee stock purchase plan	381	—	38	—	—	38
Stock-based compensation	—	—	1,541	—	—	1,541
Non-controlling interest contributions	—	—	—	—	750	750
Net loss	—	—	—	(14,660)	(1,474)	(16,134)
Balance at December 31, 2021	554,609	$ 63	$ 257,515	$ (226,485) $ —	$ 103	$ 31,196
Reclassification upon adoption of ASU 2020-06	—	—	19,390	(15,998)	—	3,392
Issuance of shares related to August 2022 Offering	61,250	2	1,174	—	—	1,176
Offering costs related to August 2022 Offering	—	—	(365)	—	—	(365)
Issuance of shares related to employee stock purchase plan	220	—	7	—	—	7
Stock-based compensation	—	—	1,106	—	—	1,106
Net loss	—	—	—	(15,376)	(236)	(15,612)
Balance at December 31, 2022	616,079	$ 65	$ 278,827	$ (257,859)	$ (133)	$ 20,900

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

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

	Year Ended December 31, 2022	2021
CASH FLOWS FROM OPERATING ACTIVITIES:		
Net loss	$ (15,612)	$ (16,134)
Adjustments to reconcile net loss to cash used in operating activities:		
Change in fair value of common stock warrant and option liabilities	(3,209)	(8,946)
Change in fair value of contingent consideration	(70)	(210)
Issuance and offering costs	314	769
Depreciation	439	929
Amortization of intangible assets	40	116
Lease amortization	884	1,276
Impairment of intangible assets	404	3,302
Impairment of goodwill	—	1,648
(Gain) Loss on disposal of equipment	(314)	23
Loss on disposal of intangible assets	—	222
Stock-based compensation	1,106	1,541
Bad debt expense	60	76
Gain on sale of Verdeca	(1,138)	—
Realized gain on corporate securities	—	(10,221)
Write-down of inventories	2,471	3,593
Gain on extinguishment of PPP loan	—	(1,123)
Impairment of property and equipment	530	1,534
Changes in operating assets and liabilities:		
Accounts receivable and other receivables	592	(40)
Inventories	1,118	(2,383)
Prepaid expenses and other current assets	91	56
Other noncurrent assets	16	(158)
Accounts payable and accrued expenses	(757)	(372)
Amounts due to related parties	(16)	(16)
Unearned revenue	0	(8)
Other current liabilities	6	1
Operating lease payments	(932)	(1,343)
Net cash used in operating activities	(13,977)	(25,868)
CASH FLOWS FROM INVESTING ACTIVITIES:		
Proceeds from sale of property and equipment	920	19
Proceeds from sale of Verdeca — earn-out received	569	—
Purchases of property and equipment	(72)	(1,007)
Acquisitions, net of cash acquired	—	(4,250)
Proceeds from sales and maturities of investments	—	21,846
Net cash provided by investing activities	1,417	16,608
CASH FLOWS FROM FINANCING ACTIVITIES:		
Proceeds from issuance of common stock, pre-funded warrants and preferred investment options from August 2022 Offering	5,000	—
Payments of offering costs relating to August 2022 Offering	(488)	—
Proceeds from issuance of common stock and warrants from January 2021 PIPE securities purchase agreement	—	25,147
Payments of offering costs relating to January 2021 PIPE securities purchase agreement	—	(1,912)
Principal payments on notes payable	—	(2,146)
Proceeds from exercise of warrants	—	22
Proceeds from exercise of stock options and purchases through ESPP	7	39
Capital contributions received from non-controlling interest	—	750
Net cash provided by financing activities	4,519	21,900
Effects of foreign currency translation on cash and cash equivalents	—	2
Net increase (decrease) in cash and cash equivalents	(8,041)	12,642
Cash and cash equivalents — beginning of period	28,685	16,043
Cash and cash equivalents — end of period	$ 20,644	$ 28,685

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

SUPPLEMENTAL DISCLOSURES OF CASH FLOW INFORMATION:		
Cash paid for interest	$ 1	$ 25
Cash paid for taxes	$ —	$ 1
NONCASH TRANSACTIONS:		
Fair value of shares of common stock issued at closing of Arcadia Wellness transaction	$ —	$ 2,053
Common stock warrant liabilities reclassified to equity upon adoption of ASU 2020-06	$ 3,392	$ —
Common stock options issued to placement agent and included in offering costs related to August 2022 RDO securities purchase agreement	$ 191	$ —
Common stock warrants issued to placement agent and included in offering costs related to January 2021 PIPE securities purchase agreement	$ —	$ 942
Right of use assets obtained in exchange for new operating lease liabilities	$ 114	$ 1,664
Proceeds from sale of property and equipment in accounts receivable and other receivables	$ 19	$ —
Proceeds from sale of Verdeca in accounts receivable and other receivables	$ 569	$ —

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," "Arcadia" or "management"), was incorporated in Arizona in 2002 and maintains its headquarters in Dallas, Texas, with additional office space in Davis, California, and additional facilities in American Falls, Idaho. The Company was reincorporated in Delaware in March 2015.

The Company is a producer and marketer of innovative, plant-based food and beverage products. Its history as a leader in science-based approaches to developing high-value crop improvements, as well as nutritionally enhanced food ingredients, has laid the foundation for its path forward. The Company used advanced breeding techniques to develop these proprietary innovations which are now being commercialized through the sales of seed and grain, as well as food ingredients and products. The acquisition of the assets of Live Zola, LLC (“Zola”) added coconut water to the Company's portfolio of products.

In May 2021, the Company’s wholly owned subsidiary Arcadia Wellness, LLC (“Arcadia Wellness” or “AW”, see Note 7), acquired the businesses of Eko, Lief, and Zola. The acquisition included consumer CBD brands like Soul Spring™, a CBD-infused botanical therapy brand in the natural category, Saavy Naturals™, a line of natural body care products and ProVault™, a CBD-infused sports performance formula made with natural ingredients, providing effective support and recovery for athletes. Also included in the purchase was Zola, a coconut water sourced exclusively with sustainably grown coconuts from Thailand. On July 8, 2022, the Company entered into an agreement to license Saavy Naturals™ to Radiance Beauty and Wellness, Inc. ("Radiance Beauty"). See Note 7 for a discussion of the licensing agreement.

In April 2021, the newly formed Company’s wholly owned subsidiary Arcadia SPA, S.L. (“Arcadia Spain” or “ASPA”) acquired the physical and intellectual property assets of Agrasys S.A. (“Agrasys”), a food ingredients company based in Barcelona, Spain. The Company sold all of the assets and liabilities related to the subsidiary Arcadia Spain in November 2021 to a European buyer (the "buyer"), to focus on the US domestic market. The loss on sale of Arcadia Spain recorded on the consolidated statements of operations and comprehensive loss was $497,000. The buyer assumed all present and future liabilities, including the initial commitments related to the 2022 planting season.

In August 2019, the Company entered into a joint venture agreement with Legacy Ventures Hawaii, LLC (“Legacy,” see Note 9) to grow, extract, and sell hemp products. The partnership Archipelago Ventures Hawaii, LLC (“Archipelago”), combines the Company’s extensive genetic expertise and resources with Legacy’s experience in hemp extraction and sales. In October 2021, Arcadia and Legacy mutually agreed to wind down the cultivation activities of Archipelago, due to regulatory challenges and a saturated hemp market. As a result, the Company recorded impairments of property and equipment in the amount of $160,000 and $1.4 million for the years ended December 31, 2022, and 2021, respectively. The Company assessed Archipelago’s fixed assets for impairment through an asset recoverability test, using prices for similar assets. See Note 5.

Reverse Stock Split

In February 2023, the Company’s board of directors approved a reverse split of 40:1 on the Company’s issued and outstanding common stock. On February 15, 2023, the Company’s stockholders approved the certificate of amendment, which the Company filed on February 27, 2023 with the Secretary of State of Delaware to effect the reverse split on March 1, 2023. All issued and outstanding common stock, options to purchase common stock and per share amounts contained in the consolidated financial statement have been retroactively adjusted to reflect the reverse stock split for all periods presented.

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, 2022, the Company had an accumulated deficit of $257.9 million, and cash and cash equivalents of $20.6 million. For the years ended December 31, 2022 and 2021, the Company had net losses of $15.6 million and $16.1 million, respectively, and net cash used in operations of $14.0 million and $25.9 million, respectively. The Company believes that its existing cash and cash equivalents will not be sufficient to meet its anticipated cash requirements for at least the next 12-18 months from the issuance date of these financial statements, and thus raises substantial doubt about the Company's ability to continue as a going concern. The financial statements do not include any adjustments that might result from the outcome of this uncertainty.

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.

Note 2. Summary of Significant Accounting Policies

Basis of Presentation and Principles of Consolidation

The consolidated financial statements include the accounts of the Company, Arcadia Wellness 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.

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 $236,000 and $1.5 million is recorded as an adjustment to net loss to arrive at net loss attributable to common stockholders for the years ended December 31, 2022 and 2021, respectively. The non-controlling partner's equity interests are presented as non-controlling interests on the consolidated balance sheets as of December 31, 2022 and 2021.

The functional currency of the foreign subsidiary Arcadia Spain during the year ended December 31, 2021, was its local currency (i.e., the Euro). Accordingly, period-end exchange rates were applied to translate its assets and liabilities and average transaction exchange rates to translate its revenues, expenses, gains, and losses into U.S. dollars. Upon disposal of all of the assets and liabilities related to Arcadia Spain, the Company deconsolidated the accounts of the subsidiary as of November 30, 2021, and recorded a loss on the sale in the amount of $497,000 during the year ended December 31, 2021.

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, impairments of long-lived assets such as intangible assets and goodwill, impairment of property and equipment, net realizable value of inventory, and contingent liabilities. 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.

Cash and cash equivalents

The Company considers any liquid investment with a stated maturity of three months or less at the date of purchase to be a cash equivalent. Cash and cash equivalents consist of cash on deposit with banks and money-market funds. 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, 2022 and 2021, a portion of the Company's cash in depository accounts is in excess of the federal deposit insurance limits.

Investments in debt and equity securities

Investments in debt and equity securities are carried at fair value and classified as short-term investments. 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.

Other-than-temporary impairments on investments

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, 2022 and 2021, there was no impairment of the Company's investments.

Accounts receivable and other receivables

Accounts receivable represents amounts owed to the Company from product sales, licenses, and royalties. Other receivables represent amounts owed to the Company for miscellaneous non-trade activities including the sale of property and equipment. 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 $3,000 and $76,000 amounts reserved for doubtful accounts at December 31, 2022 and 2021, respectively, and the allowance activity during the year ended December 31, 2022, was immaterial.

Inventory

Inventory costs are tracked on a lot-identified basis and are included as cost of 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.

GoodWheat: Proprietary wheat plants are grown, producing seed and grain 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 and the grain is either sold or used as an ingredient in the production of food products, 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 harvested seed and grain, and costs to mill the grain into flour.

Body care: A portfolio of CBD-infused and CBD-free consumer bath and body care products such as body lotions, bath-bombs and topical pain relievers, that are produced in the US. Amounts inventoried consist primarily of purchased raw materials, components, labor, and manufacturing facility costs.

Zola Coconut water: Inventories mainly consist of coconut water imported from Thailand, freight-in, supplies, and labor.

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. In addition, hemp seeds were planted on land leased in Hawaii. 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 grain, Zola Coconut water, and GoodHemp seeds. 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.

Raw materials inventories consist primarily of GoodWheat seeds and in-transit Zola Coconut Water. Finished goods inventories consist primarily of GoodWheat grain, Zola Coconut Water, and GoodHemp seeds 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.*

The Company evaluates if events and circumstances have occurred that indicate the remaining estimated useful life of fixed 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.

Impairment of long-lived intangible assets and goodwill

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.

Intangible assets, net

During the years ended December 31, 2022 and 2021, there were $404,000 and $3.3 million, respectively of impairment of intangible assets, recorded on the consolidated statements of operations and comprehensive loss. See Note 8 for more information.

Goodwill

No goodwill impairment charges were recorded during the year ended December 31, 2022. During the year ended December 31, 2021, the Company recorded an impairment charge of $1.6 million, which was included as impairment of goodwill on our consolidated statements of operations and comprehensive loss. The impairment charge was primarily the result of weakness in our newly acquired consumer product margins combined with a volatile economic climate and higher than normal inflation. The decline in the stock price observed during the fourth quarter of 2021, pushed our market capitalization significantly below the recorded value of our stockholders' equity.

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.

Customers representing greater than 10% of accounts receivable were as follows (in percentages):

	As of December 31,	
	2022	2021
Customer B	—	11
Customer D	—	15
Customer E	—	11
Customer A	57	—

Customers representing greater than 10% of total revenues were as follows (in percentages):

	For Year Ended December 31,	
	2022	2021
Customer D	—	11
Customer B	—	10
Customer F	13	—

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 15 for additional information. Amounts recognized in the consolidated statements of operations and comprehensive loss were as follows (in thousands):

	Year Ended December 31,	
	2022	2021
Research and development	$ 75	$ 98
Selling, general and administrative	1,031	1,443
Total stock-based compensation	$ 1,106	$ 1,541

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 sales, licensing agreements and royalty fees.

Product revenues

Product revenues consist primarily of sales of Arcadia Wellness products, GoodWheat grain and pasta, and GLA products. 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 delivery. The Company's revenues fluctuate depending on the timing of shipments of product to our customers and are reported net of estimated chargebacks, returns and losses.

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 consist of amounts earned from the sale of commercial products that incorporate the Company's traits by third parties. Royalty revenues consist of a minimum annual royalty, offset by amounts earned from the sale of products. The Company recognizes the minimum annual royalty on a straight-line basis over the year, and the Company recognizes royalty revenue resulting from the sale of products when the third parties transfer control of the product to their customers, which generally occurs upon shipment. Royalty revenues can fluctuate depending on the timing of shipments of product by the third parties to their customers.

Unearned revenue

The Company defers revenue to the extent that cash received in conjunction with a license agreement is not yet earned in accordance with the Company policies.

Cost of revenues

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

Research and development expenses

Research and development expenses consist of costs incurred in the development and testing of the Company's products and other products in development incorporating the Company's traits. These expenses currently consist primarily of fees paid to product formulation consultants and are expensed as incurred. Additionally, the Company is required from time to time to make certain milestone payments in connection with the development of technologies in-licensed from third parties. The Company's research and development expenses may fluctuate from period to period.

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 6 and Note 16.

Change in the estimated fair value of common stock warrant and option liabilities

Change in the estimated fair value of common stock warrant and option liabilities is comprised of the fair value remeasurement of liability classified common stock warrants and options. See Note 14.

Note 3. Recent Accounting Pronouncements

In June 2016, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("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 adopted ASU No. 2016-13 on January 1, 2023 with an immaterial impact on the Company’s disclosures.

In August 2020, the FASB issued ASU No. 2020-06, Debt—Debt with Conversion and Other Options (Subtopic 470-20) and Derivatives and Hedging—Contracts in Entity’s Own Equity (Subtopic 815-40). The FASB Board is issuing this Update to address issues identified as a result of the complexity associated with applying GAAP for certain financial instruments with characteristics of liabilities and equity. In addressing the complexity, the FASB Board focused on amending the guidance on convertible instruments and the guidance on the derivatives scope exception for contracts in an entity’s own equity. ASU 2020-06 is effective for public business entities that meet the definition of a Securities and Exchange Commission (SEC) filer, excluding entities eligible to be smaller reporting companies as defined by the SEC, for fiscal years beginning after December 15, 2021, including interim periods within those fiscal years. The amendments in this Update are effective for public business entities that meet the definition of a smaller reporting company, as defined by the SEC, for fiscal years beginning after December 15, 2023, including interim periods within those fiscal years. The Company early adopted ASU No. 2020-06 on January 1, 2022, using the modified retrospective method. Prior to the adoption of ASU No. 2020-06, the Company had liability classified awards due to the existence of certain contingent cash payment feature. Upon adoption, these clauses no longer preclude equity classification. Under the modified retrospective method, the historical mark-to-market adjustments related to outstanding awards were reversed through retained earnings and the original carrying value of the awards were reclassified to additional paid-in capital. Adoption of the new standard resulted in an increase to accumulated deficit of $16.0 million, an increase to additional paid-in capital of $19.4 million, and a decrease to common stock warrant liabilities of $3.4 million, on the consolidated balance sheets.

In May 2021, the FASB issued ASU No. 2021-04, Earnings Per Share (Topic 260), Debt—Modifications and Extinguishments (Subtopic 470-50), Compensation—Stock Compensation (Topic 718), and Derivatives and Hedging—Contracts in Entity's Own Equity (Subtopic 815-40): Issuer's Accounting for Certain Modifications or Exchanges of Freestanding Equity-Classified Written Call Options. The amendments in this Update clarify and reduce diversity in an issuer's accounting for modifications or exchanges of freestanding equity-classified written call options (for example, warrants) that remain equity classified after modification or exchange. The amendments in this Update affect all entities that issue freestanding written call options that are classified in equity. The amendments in this Update are effective for all entities for fiscal years beginning after December 15, 2021, including interim periods within those fiscal years. The Company adopted ASU No. 2021-04 on January 1, 2022 with an immaterial impact on the Company's disclosures.

Note 4. Inventory

Inventory costs are tracked on a lot-identified basis and are included as cost of 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 revenues and are based upon estimates about future demand from the Company's customers and distributors and market conditions. The Company recorded write-downs of wheat, hemp seed and CBD oil inventories, as well as body care products of $2.5 million for the year ended December 31, 2022. Of inventory write-downs during the year ended December 31, 2022, $394,000 was related to the Radiance Beauty licensing agreement discussed in Note 7. The Company recorded write-downs of wheat inventories, hemp seed inventories, and body care products of $3.6 million for the year ended December 31, 2021. If there are significant changes in demand and market conditions, substantial future write-downs of inventory may be required, which would materially increase the Company's expenses in the period the write down is taken and materially affect the Company's operating results.

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

	December 31, 2022	December 31, 2021
Raw materials	$ 610	$ 1,851
Goods in process	—	842
Finished goods	2,728	4,234
Inventories	$ 3,338	$ 6,927

Note 5. Property and Equipment, Net

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

	As of December 31, 2022	As of December 31, 2021
Laboratory equipment	$ 679	$ 2,659
Software and computer equipment	407	548
Machinery and equipment	450	1,809
Furniture and fixtures	83	211
Vehicles	306	417
Leasehold improvements	1,590	2,306
Property and equipment, gross	3,515	7,950
Less accumulated depreciation and amortization	(2,811)	(5,659)
Property and equipment, net	$ 704	$ 2,291

Depreciation expense was $439,000 and $929,000 for the years ended December 31, 2022 and 2021, respectively.

As of December 31, 2022 and 2021, there was $10,000 and $267,000 of construction in progress, respectively, included in property and equipment that had not been placed into service and was not subject to depreciation.

Property and equipment are considered assets held for sale when management approves and commits to a plan to dispose of a property or group of properties. The property and equipment held for sale prior to the sale date is separately presented, within current assets, on the consolidated balance sheet as assets held for sale.

During the year ended December 31, 2022, management initiated the sale of property and equipment related to the Davis laboratory, Archipelago and Body Care. The Company completed the sale of such property and equipment with a net gain on sale of property and equipment in the amount of $314,000 recorded on the consolidated statements of operations and comprehensive loss during the year ended December 31, 2022. The proceeds related to the sale of property and equipment during the year ended December 31, 2022 were $920,000. The Company had no sales of assets held for sale as of December 31, 2021. Property and equipment related to Archipelago, in the amount of $87,000, have been classified as assets held for sale, and are recorded at fair value as of December 31, 2022.

During the year ended December 31, 2022, the Company recorded write-downs of property and equipment of $530,000, of which $320,000 was related to the Radiance Beauty licensing agreement. See Note 7 for further discussion of the licensing agreement. The Company recorded impairments of property and equipment in the amount of $1.5 million for the year ended December 31, 2021 primarily related to the unwinding of Archipelago. The Company assessed Archipelago's fixed assets for impairment through an asset recoverability test, calculating the fair value using prices for similar assets.

Note 6. Investments and Fair Value Instruments

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.

During the year ended December 31, 2021, the Company recorded realized gains of $10.2 million associated with the sale of corporate securities in other income, net, 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, 2022 and 2021:

(Dollars in thousands)	Amortized Cost	Unrealized Gains	Unrealized Losses	Estimated Fair Value
December 31, 2022				
Cash equivalents:				
Money market funds	$ 18,620	$ —	$ —	$ 18,620
Total Assets at Fair Value	$ 18,620	$ —	$ —	$ 18,620

(Dollars in thousands)	Amortized Cost	Unrealized Gains	Unrealized Losses	Estimated Fair Value
December 31, 2021				
Cash equivalents:				
Money market funds	$ 26,842	$ —	$ —	$ 26,842
Total Assets at Fair Value	$ 26,842	$ —	$ —	$ 26,842

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, 2022.

Fair Value Measurement

The fair value of the investment securities at December 31, 2022 were as follows:

	Fair Value Measurements at December 31, 2022			
(Dollars in thousands)	Level 1	Level 2	Level 3	Total
Assets at Fair Value				
Cash equivalents:				
Money market funds	$ 18,620	$ —	$ —	$ 18,620
Total Assets at Fair Value	$ 18,620	$ —	$ —	$ 18,620

The fair value of the investment securities at December 31, 2021 were as follows:

	Fair Value Measurements at December 31, 2021			
(Dollars in thousands)	Level 1	Level 2	Level 3	Total
Assets at Fair Value				
Cash equivalents:				
Money market funds	$ 26,842	$ —	$ —	$ 26,842
Total Assets at Fair Value	$ 26,842	$ —	$ —	$ 26,842

The Company uses the market approach technique to value its financial instruments and there were no changes in valuation techniques during 2022 or 2021. The Company's financial instruments consist primarily of cash and cash equivalents, accounts receivable and other receivables, accounts payable and accrued liabilities. For accounts receivable and other receivables, accounts payable and accrued liabilities, the carrying amounts of these financial instruments as of December 31, 2022 and December 31, 2021 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, Inc. ("Anawah") acquisition as described in Note 16, as well as preferred investment options related to the August 2022 Registered Direct Offering described in Note 14. As of December 31, 2021, the Company also had common stock warrant liabilities related to the March 2018, the June 2019, the September 2019, and the January 2021 Offerings, described in Note 14, which were reclassified to additional paid-in capital upon adoption of ASU 2020-06, as of January 1, 2022. See Note 3 for details of the adoption of ASU 2020-06.

The contingent liability related to the Anawah acquisition was measured and recorded on a recurring basis as of December 31, 2022 and 2021, 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 preferred investment option liabilities were measured and recorded on a recurring basis using the Black-Scholes Model with the following assumptions at December 31, 2022:

	August 2022 Options	August 2022 Placement Agent Options
	December 31, 2022	December 31, 2022
Expected term (in years)	4.67	4.67
Expected volatility	106.2 %	106.2 %
Risk-free interest rate	4.0 %	4.0 %
Expected dividend yield	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.

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):

(Dollars in thousands)	Common Stock Warrant Liability - March 2018 Purchase Agreement	Common Stock Warrant Liability - June 2019 Offering	Common Stock Warrant Liability - September 2019 Offering	Common Stock Warrant Liability - January 2021 Offering	August 2022 Options	August 2022 Placement Agent Options	Contingent Liabilities	Total
Balance as of December 31, 2021	$ 7	$ 170	$ 223	$ 2,993	$ —	$ —	$ 2,070	$ 5,463
Reclassification upon adoption of ASU 2020-06	(7)	(170)	(223)	(2,993)	—	—	—	(3,393)
Initial recognition	—	—	—	—	3,824	191	—	4,015
Change in fair value and other adjustments	—	—	—	—	(3,057)	(152)	(70)	(3,279)
Balance as of December 31, 2022	$ —	$ —	$ —	$ —	$ 767	$ 39	$ 2,000	$ 2,806

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

The Company recorded aggregate impairment charges of $404,000 and $3.3 million during the years ended December 31, 2022 and 2021, respectively, related to intangible assets and other long-lived assets. The Company has classified the fair value measurements as a Level 3 measurement in the fair value hierarchy because they involve significant unobservable inputs such as cash flow projections, discount rates and management assumptions.

Assets classified as held for sale are recorded at fair value as of December 31, 2022. The Company has classified the fair value measurements as a Level 3 measurement in the fair value hierarchy as the fair value has been estimated using publicly available prices for some of the assets, and business partners' estimates for assets with prices not readily available, due to the relatively small size of the industry in which they can be used.

Note 7. Arcadia Wellness Acquisition

On May 17, 2021, the Company's wholly owned subsidiary Arcadia Wellness, acquired the assets of Eko, Lief, and Zola. The acquisition included consumer brands of bath and body care products such as Soul Spring, the CBD-infused botanical therapy brand, Saavy Naturals, a line of natural body care products and Provault, a CBD-infused sports performance formula. Also included in the purchase was Zola, a coconut water sourced from Thailand.

The acquisition was recorded as a business combination, in accordance with ASC Topic 805. The purchase price consideration for the acquisition totaled an estimated $6.1 million, of which $4.0 million in cash and $2.1 million in the form of 20,686 shares of the Company's common stock, was paid during the month of May 2021. The cash consideration paid for the acquisition was funded by cash on hand.

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 Arcadia Wellness acquisition of approximately $850,000 included in selling, general and administrative expenses in the Company's consolidated statements of operations and comprehensive loss for the year ended December 31, 2021.

The following table presents the allocation of the purchase price of the assets acquired, based on their fair values at the acquisition date (in thousands):

	Purchase Price Allocation
Inventory	$ 840
Prepaid and other current assets	62
Fixed assets	308
Deposits	82
Customer list	360
Trade names and trademarks	2,900
Formulations	260
Goodwill	1,240
Total consideration allocated	$ 6,052

The former shareholders of Eko, Lief, and Zola remain responsible for their pre-acquisition liabilities. In connection with the acquisition, the Company entered into a lease agreement for the use of offices, production equipment acquired, and storage warehouses. The lease was effective on May 17, 2021 and has a term of 3 years.

For the period from January 1, 2022 to December 31, 2022, the Company recognized approximately $6.5 million of revenue and $2.1 million of net loss relating to Arcadia Wellness, which included charges related to the Radiance Beauty licensing agreement discussed below, as well as the amortization of acquired intangible assets. For the period from May 17 to December 31, 2021, the Company recognized approximately $4.3 million of revenue and $7.5 million of net loss relating to Arcadia Wellness, which included charges for the amortization and impairment of acquired intangible assets and goodwill.

Acquired intangible assets of $3.5 million include trade names and trademarks of $2.9 million (indefinite useful life), customer list of $360,000 (fifteen-year useful life) and formulations of $260,000 (ten-year useful life).

The total weighted average amortization period for the acquired intangibles is 12.9 years.

The acquisition produced $1.2 million of goodwill. The goodwill is attributable to a combination of Arcadia Wellness's expectation regarding a more meaningful engagement by the customers due to the scale of the combined Company, and other synergies. Goodwill will be tested for impairment at least annually (more frequently if certain indicators are present). Goodwill arising from the Arcadia Wellness acquisition is deductible for tax purposes.

On July 8, 2022, the Company entered into a licensing agreement with Radiance Beauty. Under the terms of the licensing agreement, Radiance Beauty was granted an exclusive, transferable, sublicensable, perpetual, worldwide license to use the Saavy Naturals™ mark and to modify, manufacture, distribute, market and sell related products. In addition, as part of the licensing agreement, Radiance Beauty received the remaining accounts receivables and inventory balances after July 31, 2022, certain equipment, as well as three months of salaries in the amount of $355,000 and rent, maintenance and utilities in the amount of $19,000. Radiance Beauty is subleasing space from the Company and will pay the Company a 4% royalty of gross sales of products beginning January 1, 2023. During the year ended December 31, 2022, accounts receivables and inventories of $21,000 and $394,000, respectively, were written down. In addition, property and equipment and intangible assets were written down by $320,000 and $72,000, respectively, during the year ended December 31, 2022.

Supplemental Pro-Forma Results of Operations (Unaudited)

The following unaudited pro-forma consolidated results of operations for the years ended December 31, 2022 and 2021, have been prepared as if the acquisition of Arcadia Wellness had occurred on January 1, 2021 and includes adjustments for amortization of intangibles, and the addition to basic and diluted weighted average number of shares outstanding.

	For the year ended December 31,	
	2022 (Pro forma)	2021 (Pro forma)
Total revenues	$ 9,956	$ 9,062
Net loss	(15,605)	(17,854)
Net loss attributable to common stockholders	$ (15,376)	$ (16,380)
Weighted average shares - Basic and diluted	599,389	539,773
Net loss per share attributable to common stockholders:		
Basic and diluted	$ (25.65)	$ (30.35)

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

Note 8. Intangible assets, net

The Company’s intangible assets, net as of December 31, 2022 and 2021, consist of the following (in thousands):

	December 31, 2022			December 31, 2021		
	Gross Carrying Amount (1)	Accumulated Amortization	Net Carrying Amount	Gross Carrying Amount (1)	Accumulated Amortization	Net Carrying Amount
Amortized intangible assets						
Intellectual property	$ 144	$ 141	$ 3	$ 570	$ 419	$ 151
Customer lists	33	31	2	400	355	45
Total amortizable intangible assets	$ 177	$ 172	$ 5	$ 970	$ 774	$ 196
Indefinite-lived intangible assets						
Brands and trademarks	$ 35	$ —	$ 35	$ 2,950	$ 2,662	$ 288
Total intangible asset, net	$ 212	$ 172	$ 40	$ 3,920	$ 3,436	$ 484

(1) During the years ended December 31, 2022 and 2021, the Company estimated an overall decrease in the sales forecast for AW products, due to an inventory item rationalization, in addition to a decrease in the sales forecast of ISI seeds, related to the saturated hemp seed market. As a result, Arcadia performed a quantitative intangible assets impairment test. The Company used a discounted cash flow approach to develop the fair value of our acquired intellectual property, customer lists, brands and trademarks. As a result of this assessment, Arcadia recorded an impairment of intangible assets in the amount of $404,000 and $3.3 million in the consolidated statements of operations and comprehensive loss for the years ended December 31, 2022 and 2021, respectively. Of the impairment recognized during the year ended December 31, 2022, $72,000 was related to the Radiance Beauty licensing agreement.

Note 9. 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, 2022, the Company and Legacy hold 50.75% and 49.25% interests in Archipelago, respectively, and have made capital contributions to Archipelago of $3.1 million and $3.0 million, 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 $236,000 and $1.5 million was recorded as an adjustment to net loss to arrive at net loss attributable to common stockholders for the years ended December 31, 2022 and 2021, respectively. Legacy’s equity interests are presented as non-controlling interests on the consolidated balance sheets. Refer to Note 2 for basis of presentation.

In October 2021, Arcadia and Legacy mutually agreed to wind down the cultivation activities of Archipelago, due to regulatory challenges and a saturated hemp market.

Note 10. 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 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 Haab 4 ("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 also paid the Company an additional $1,000,000 for transaction expenses and fees and is obligated to pay $2,000,000 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 HB4 soybeans or China approving the HB4 soybean trait for “food and feed”. In addition to the above payments, BIOX is also obligated to 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 total 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, was allocated to the sale of the membership interest in Verdeca and resulted in a gain of $8,814,000 in 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 was recorded as license revenues in 2020. Any future proceeds from the agreement will be allocated in the same proportion.

All of the shares of BIOX were sold in June 2021 and generated a one-time impact on liquidity in the amount of $22.2 million of gross proceeds. See Note 6.

During the second quarter of 2022, Bioceres received China's approval of the HB4 soybean trait and as a result, Arcadia recorded license revenue of $862,000 and a gain on sale of Verdeca of $1.1 million on the consolidated statements of operations and comprehensive loss. As of December 31, 2022, the Company received payment of $1.0 million with the remaining $1.0 million in accounts receivable and other receivables, which the Company anticipates to receive over the next three months pursuant to the agreement.

Note 11. Accounts Payable and Accrued Expenses

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

	As of December 31,	
	2022	2021
Accounts payable - trade	$ 931	$ 1,411
Payroll and benefits	1,373	1,606
Inventory	69	72
Royalty fees due to unrelated parties	6	51
Consulting	8	79
Rent and utilities	28	127
Audit and tax fees	99	72
Legal	69	58
Other	298	162
Total accounts payable and accrued expenses	$ 2,881	$ 3,638

Note 12. 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”) and 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 13. Equity Financing

Private Placements

In January 2021, the Company issued in a private placement offering (the “January 2021 Private Placement”) pursuant to a securities purchase agreement (“January 2021 Purchase Agreement”) (i) 196,920 shares of its common stock, and (ii) warrants to purchase up to 98,460 shares of common stock at an exercise price of $125.20 per share (the “January 2021 Warrants”) and raised total gross proceeds of $25.1 million. The January 2021 Warrants are exercisable at any time at the option of the holder and expire 5.5 years from the date of issuance. In connection with the January 2021 Private Placement, the Company granted to a placement agent warrants to purchase a total of 9,846 shares of Common Stock (the “January 2021 Placement Agent Warrants”) that have an exercise price per share equal to $159.60 and a term of 5.5 years from the date of issuance.

The common stock warrants are classified as a liability within Level 3 due to a contingent cash payment feature. The Company utilized the Black Scholes Merton model on January 28, 2021 with the following assumptions: volatility of 123.8%, stock price of $115.20 and risk-free rate of 0.5%. The estimated fair value of the common stock warrant liability was subsequently remeasured at December 31, 2021 with the changes recorded on the Company's consolidated statements of operations and comprehensive loss.

The January 2021 Placement Agent Warrants were issued for services performed by the placement agent as part of the January 2021 Private Placement and were treated as offering costs. The value of the January 2021 Placement Agent Warrants was determined to be $942,000, calculated using the Black-Scholes Model. The Company incurred additional offering costs totaling $1.9 million that consist of direct incremental legal, advisory, accounting and filing fees relating to the January 2021 Private Placement. The offering costs, inclusive of the January 2021 Placement Agent Warrants, totaled $2.8 million and allocated to the common stock warrant liability and the common stock using their relative fair values. A total of $769,000 was allocated to the common stock warrant liability and expensed and the remaining $2.0 million was allocated to the common stock and offset to additional paid in capital.

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) 7,519 shares of its common stock and (ii) warrants to purchase up to 7,519 shares of common stock at an initial exercise price equal to $1,830.00 (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 376 shares of Common Stock (the "March 2018 Placement Agent Warrants") that have an exercise price per share equal to $1,662.50 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 30,041, the total number of shares issuable upon exercise of the March 2018 Warrants was 32,071 and the per share exercise price of the March 2018 Warrants was $429.03.

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 ("2018 Shelf Registration Statement"). On April 21, 2022, the Company filed a shelf Registration Statement on Form S-3 with the SEC which was declared effective on May 12, 2022 ("2022 Shelf Registration Statement"). Each of the 2018 Shelf Registration Statement and the 2022 Shelf Registration Statement 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 $50.0 million. The Company ceased being able to use the 2018 Shelf Registration Statement to register the issuance of securities after June 8, 2021, the three-year anniversary of its effective date. The 2022 Shelf Registration Statement may no longer be used to register the issuance of securities after May 12, 2025, the three-year anniversary of its effective date.

In August 2022, the Company entered into a securities purchase agreement (the "August 2022 Purchase Agreement") pursuant to which it sold (i) 61,250 registered shares of its common stock, pursuant to the 2022 Shelf Registration Statement, (ii) pre-funded common stock purchase warrants (the "Pre-Funded Warrants") to purchase up to 56,813 shares of common stock, at an exercise price of $0.004 per share, which Pre-Funded Warrants were registered under the 2022 Shelf Registration Statement, and (iii) unregistered preferred investment options (the "August 2022 Options") to purchase up to 118,063 shares of common stock, at an exercise price of $37.35 per share, in a private placement, for total gross proceeds of $5.0 million (the "August 2022 Registered Direct Offering"). The August 2022 Registered Direct Offering closed on August 16, 2022. The August 2022 Pre-Funded Warrants became exercisable upon issuance and are exercisable until exercised in full. The August 2022 Options became exercisable upon issuance and expire 5 years after the date of issuance. In connection with the August 2022 Registered Direct Offering, the Company granted to a placement agent preferred investment options ("August 2022 Placement Agent

Options") to purchase a total of 5,904 shares of common stock that have an exercise price per share equal to $52.80 and a term of five years.

The August 2022 Options and August 2022 Placement Agent Options are classified as liabilities within Level 3 due to a certain early settlement provisions that preclude them from equity classification. The Company utilized the Black-Scholes Merton model on August 16, 2022 with the following assumptions: volatility of 128.46%, stock price of $37.60, risk-free rate of 2.97% and a term of 5 years. The estimated fair value of the common stock option liabilities was subsequently remeasured at December 31, 2022 with the changes recorded on the Company's consolidated statements of operations and comprehensive loss.

The August 2022 Placement Agent Options were issued for services performed by the placement agent as part of the August 2022 Registered Direct Offering and were treated as offering costs. The value of the August 2022 Placement Agent Options was determined to be $191,000, calculated using the Black-Scholes Model. The Company incurred additional offering costs totaling $488,000 that consist of direct incremental legal, advisory, accounting and filing fees relating to the August 2022 Registered Direct Offering. The offering costs, inclusive of the August 2022 Placement Agent Options, totaled $679,000 and were allocated to the common stock option liabilities, the common stock and Pre-Funded Warrants using their relative fair values. A total of $314,000 was allocated to the common stock option liabilities and expensed while the remaining $365,000 was allocated to the common stock and Pre-Funded Warrants and offset to additional paid in capital.

In December 2020, the Company entered into a securities purchase agreement (the "December 2020 Purchase Agreement") pursuant to which it sold (i) 65,467 registered shares of its common stock pursuant to the 2018 Shelf Registration Statement and (ii) unregistered warrants to purchase 65,467 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 $120.00 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 3,274 shares of common stock ("December 2020 Placement Agent Warrants") that have an exercise price per share equal to $152.75 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) 32,971 registered shares of its common stock pursuant to the 2018 Shelf Registration Statement and (ii) unregistered warrants to purchase 16,486 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 $300.80 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 1,649 shares of common stock ("September 2019 Placement Agent Warrants") that have an exercise price per share equal to $379.12 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) 37,240 registered shares of its common stock pursuant to the 2018 Shelf Registration Statement and (ii) unregistered warrants to purchase 37,240 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 $200.00 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 1,862 shares of common stock ("June 2019 Placement Agent Warrants") that have an exercise price per share equal to $251.75 and a term of five years.

In June 2018, the Company entered into a securities purchase agreement (the "June 2018 Purchase Agreement") pursuant to which it sold (i) 34,809 registered shares of its common stock pursuant to the 2018 Shelf Registration Statement and (ii) unregistered warrants to purchase 34,809 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 $397.60 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 1,741 shares of common stock ("June 2018 Placement Agent Warrants") that have an exercise price per share equal to $502.72 and a term of five years.

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Notes to Consolidated Financial Statements. (Continued)

Note 14. Warrants and Options

Equity Classified Common Stock Warrants

In connection with professional services agreements with non-affiliated third parties, during the year ended December 31, 2022, the Company issued service and performance warrants ("Service and Performance Warrants").

The Company issued the following warrants to purchase shares of its common stock, which are outstanding as of December 31, 2022 and 2021, respectively. 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, 2021	Warrants Outstanding at December 31, 2021	Warrants Exercised during the Year Ended December 31, 2022	Warrants Outstanding at December 31, 2022
December 2022 Service and Performance Warrants (1)	December 2022	5 years	$ 11.20	—	—	—	1,000
October 2022 Service and Performance Warrants (1)	October 2022	5 years	$ 16.00	—	—	—	1,000
August 2022 Pre-Funded Warrants	August 2022	perpetual	$ —	—	—	—	56,813
January 2021 Placement Agent Warrants	January 2021	5.5 years	$ 159.60	—	9,846	—	9,846
January 2021 Service and Performance Warrants (1)	January 2021	2 years	$ 123.20	—	188	—	188
December 2020 Warrants	December 2020	5.5 years	$ 120.00	—	65,467	—	65,467
December 2020 Placement Agent Warrants	December 2020	5 years	$ 152.80	—	3,274	—	3,274
July 2020 Warrants	July 2020	5.5 years	$ 154.00	—	16,036	—	16,036
July 2020 Placement Agent Warrants	July 2020	5.5 years	$ 198.80	—	802	—	802
May 2020 Warrants	May 2020	5 years	$ 191.20	—	34,809	—	34,809
May 2020 Placement Agent Warrants	May 2020	5 years	$ 245.20	—	1,741	—	1,741
March 2020 Service and Performance Warrants (1)	March 2020	3 years	$ 100.00	—	459	—	459
February 12, 2020 Service and Performance Warrants (1)(3)	February 2020	2 years	$ 188.40	—	3,750	—	—
February 3, 2020 Service and Performance Warrants (1)(3)	February 2020	2 years	$ 196.40	—	250	—	—
September 2019 Placement Agent Warrants	September 2019	5 years	$ 379.20	—	1,649	—	1,649
June 2019 Placement Agent Warrants	June 2019	5 years	$ 251.60	—	1,862	—	1,862
April 2019 Service and Performance Warrants (1)	April 2019	5 years	$ 247.20	—	3,629	—	3,629
June 2018 Placement Agent Warrants	June 2018	5 years	$ 502.80	—	1,741	—	1,741
March 2018 Placement Agent Warrants	March 2018	5 years	$ 1,662.40	—	376	—	376
January 2021 Warrants (2)	January 2021	5.5 years	$ 125.20	—	98,460	—	98,460
September 2019 Warrants (2)	September 2019	5.5 years	$ 300.80	—	16,486	—	16,486
June 2019 Warrants (2)	June 2019	5.5 years	$ 200.00	—	10,896	—	10,896
June 2018 Warrants (2)	June 2018	5.5 years	$ 397.60	—	—	—	—
March 2018 Warrants (2)	March 2018	5 years	$ 429.20	—	16,036	—	16,036
Total				—	287,757	—	342,570

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Notes to Consolidated Financial Statements. (Continued)

(1) The Company issued service and performance warrants ("Service and Performance Warrants") in connection with professional services agreements with non-affiliated third party entities.

(2) Certain warrants contain a contingent cash payment feature and therefore were accounted for as a liability at the date of issuance and were adjusted to fair value at each balance sheet date. Upon adoption of ASU No. 2020-06 on January 1, 2022, all of the common stock warrant liabilities have been reclassified to equity classified common stock warrants, due to the elimination of the contingent cash payments as criteria for liability classification.

(3) These warrants expired in February 2022.

Liability Classified Preferred Investment Options

The preferred investment options issued in connection with the August 2022 Registered Direct Offering contain certain early settlement provisions that preclude them from equity classification and therefore were accounted for as liabilities at the date of issuance and are adjusted to fair value at each balance sheet date. The change in fair value of the options liabilities is recorded as change in fair value of common stock warrant and option liabilities in the consolidated statements of operations and comprehensive loss. The key terms and activity of the liability classified preferred investment options are summarized as follows:

	Issuance Date	Term	Exercise Price Per Share	Exercised during the Year Ended December 31, 2021	Outstanding at December 31, 2021	Exercised during the Year Ended December 31, 2022	Outstanding at December 31, 2022
August 2022 Options	August 2022	5 years	$ 37.20	—	—	—	118,063
August 2022 Placement Agent Options	August 2022	5 years	$ 52.80	—	—	—	5,904
Total				—	—	—	123,967

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

Note 15. 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 3,860 shares of common stock reserved for future issuance, which included 259 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 exercise price for ISOs and NSOs will be granted at a price per share not less than the fair value of our common stock at the date of grant. Options granted generally vest over a four-year period; however, there might be alternative vesting schedules, as approved by the Board. Options granted, once vested, are generally exercisable for up to 10 years, after grant to the extent vested.

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 3,000 shares. On May 17, 2021, upon completion of the Arcadia Wellness transaction, the Company granted 6,200 inducement stock option pursuant to Rule 5635(c)(4) of the Nasdaq Listing Rules. On May 28, 2021, the Company filed a registration statement on Form S-8 to register the issuance of shares upon exercise of these inducement stock options. On February 2, 2022, Stanley Jacot, Jr. was hired as the new president and chief executive officer of the Company. The Company granted Mr. Jacot an inducement stock option to purchase 7,902 shares of the Company's common stock pursuant to Rule 5635(c)(4) of the Nasdaq Listing Rules. The Company has filed a registration statement on Form S-8 to register the issuance of shares upon exercise of this inducement stock option. The inducement options grants have been issued outside of the 2015 Plan, but are subject to the terms and conditions of the 2015 Plan. As of December 31, 2022, a total of 62,192 shares of common stock were reserved for issuance under the 2015 Plan, of which 10,771 shares of common stock are available for future grant. As of December 31, 2022, a total of 103 and 51,421 options are outstanding under the 2006 and 2015 Plans, respectively. As of December 31, 2021, a total of 206 and 33,648 options were outstanding under the 2006 and 2015 Plans, respectively. As of December 31, 2022 a total of 8,477 inducement options are outstanding.

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, 2020	22,243	$ 578.40	$ 9,600
Options granted	30,676	110.40	—
Options exercised	—	—	—
Options forfeited	(11,004)	123.60	43,440
Options expired	(6,361)	1,160.80	—
Outstanding — Balance at December 31, 2021	35,554	211.20	—
Options granted	33,408	44.00	11,880
Options exercised	—	—	—
Options forfeited	(6,658)	91.60	—
Options expired	(2,302)	644.80	—
Outstanding — Balance at December 31, 2022	60,002	114.80	—
Vested and expected to vest — December 31, 2022	54,018	121.60	—
Exercisable —December 31, 2022	22,456	$ 215.20	$ —

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 exercisable was $0 for both years ended December 31, 2022 and 2021.

As of December 31, 2022, there was $1.1 million of unrecognized compensation cost related to unvested stock-based compensation grants that will be recognized over the weighted-average remaining recognition period of 2.4 years.

On December 14, 2021, Matt Plavan provided notice to the Company of his resignation as Arcadia's president, chief executive officer and director, effective as of December 31, 2021. On December 19, 2021, Arcadia and Mr. Plavan entered into a Separation and Release Agreement (the "Separation Agreement") which provided that the vesting of all unvested options previously issued to Mr. Plavan 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 and one-half years. The stock compensation expense related to the modification of Mr. Plavan's stock options was $154,000 and recognized in selling, general and administrative expenses during the year ended December 31, 2021.

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, 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—The historical volatility data was computed using the daily closing prices for the Company's shares during the equivalent period of the calculated expected term of the stock-based awards.

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 the Black-Scholes option-pricing model with the following weighted-average assumption:

	Year Ended December 31,	
Assumptions	**2022**	**2021**
Expected term (years)	6.40	6.31
Expected volatility	122 %	121 %
Risk-free interest rate	2.61 %	0.86 %
Expected dividend yield	—	—

The weighted-average, estimated grant date fair value of employee stock options granted during the years ended December 31, 2022 and 2021 was $38.50 and $96.40, respectively. The Company recognized $1.1 million and $1.5 million of compensation expense for stock options awards for the years ended December 31, 2022 and 2021, 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, 2022, the number of shares of common stock reserved for future issuance under the ESPP is 3,122. The ESPP provides for automatic annual increases in the shares available for purchase beginning on January 1, 2016. As of December 31, 2022, 1,475 shares had been issued under the ESPP. The Company recorded $4,000 and $14,000 of ESPP related compensation expense for the years ended December 31, 2022 and 2021, respectively.

Note 16. Commitments and Contingencies

Leases

The Company leases office and facility space having initial lease terms ranging from one to five years, including certain renewal options available to the Company at market rates. See Note 17.

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. In 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 of December 31, 2022, the Company continues to pursue or are otherwise liable for 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

In August 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 was to be recognized in two annual installments, each of up to 3,316 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. During the years ended December 31, 2022 and 2021, a decrease in the liability of $70,000 and $210,000 was recorded, respectively, as a result of a remeasurement of the contingent consideration and reflected in changes in fair value of the contingent consideration on the consolidated statements of operations and comprehensive loss.

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 accrued as of December 31, 2022 and 2021 were $54,000 and $115,000, respectively. Accrued royalties are included within accounts payable and accrued expenses on the consolidated balance sheets.

Milestone payments are contingent upon the successful development or implementation of various technologies. During the year ended December 31, 2022, we recognized a milestone achievement of $2.0 million related to the regulatory approval of the HB4 soybean trait licensed to Biocere's. See Note 10 for more information.

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 17. Leases

Operating Leases

As of December 31, 2022, the Company leases office space in Dallas, Texas and Davis, California, 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. In May 2022, the Company terminated its lease for office space in Chesterfield, MO effective September 30, 2022. The original lease term was scheduled to expire in May 2024. As a result, the Company paid $47,000 in early termination fees to exit the lease. In addition, the Company subleased the facility in Chatsworth, CA to Radiance Beauty as part of the licensing agreement beginning November 1, 2022 for the remainder of the lease term. During the year ended December 31, 2022, the Company entered into an agreement to lease office space in Dallas, Texas. The new lease commenced in July 2022.

Some leases (the Davis and Dallas offices, a warehouse, 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.

During 2020, the Company entered into a lease amendment that provided for additional office space in Davis, CA, and extended the term through April 2025, with one option to renew for an additional five-year term. The Company initially expected to exercise its options to renew, and in accordance with ASC 842, *Leases*, accounted for the amendment and expected renewal as a lease modification and remeasured the operating lease liability. During the year ended December 31, 2021, the Company re-assessed its long-term strategy regarding office spaces, and determined that the expectation to exercise its option to renew for an additional five-year term after April 2025 is no longer reasonable. In accordance with ASC 842, the Company accounted for the change that resulted in a decrease of $2.8 million for the operating lease liability and of $2.6 million for the right of use asset.

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, 2022	December 31, 2021
Assets			
Operating lease assets	Right of use asset	$ 1,848	$ 3,081
Total leased assets		$ 1,848	$ 3,081
Liabilities			
Current - Operating	Operating lease liability - current	$ 1,010	$ 1,074
Noncurrent - Operating	Operating lease liability - noncurrent	1,007	2,220
Total leased liabilities		$ 2,017	$ 3,294

Lease Cost	Classification	For the Year Ended December 31, 2022	For the Year Ended December 31, 2021
Operating lease cost	SG&A and R&D Expenses	$ 1,028	$ 1,352
Short term lease cost [1]	SG&A and R&D Expenses	6	133
Sublease income [2]	SG&A and R&D Expenses	(384)	(63)
Net lease cost		$ 650	$ 1,422

[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, 2022	December 31, 2021
Weighted-average remaining lease term (years)	2.4	2.7
Weighted-average discount rate	6%	6%

The maturities of the operating lease liabilities as of December 31, 2022 are as follows (in thousands):

Years Ending December 31,	Amounts
2023	$ 1,104
2024	886
2025	156
2026 and thereafter	—
Total operating lease payments	$ 2,146
Less: imputed interest	129
Total current and noncurrent operating lease liabilities	$ 2,017

Note 18. Debt

Paycheck Protection Program Note

On April 16, 2020, the Company borrowed $1.1 million through MidFirst Bank, a federally chartered savings association (the "Lender"), and entered into a promissory note for the same amount under the Paycheck Protection Program (“PPP”) that was established under the Coronavirus Aid Relief, and Economic Security Act (“CARES Act”) of 2020. During 2021, the Company applied for full PPP loan forgiveness, and in August 2021, the lender notified Arcadia that the Small Business Administration had forgiven the original loan in full. During the year ended December 31, 2021, the amount forgiven has been recorded as gain on extinguishment of PPP loan on the consolidated statements of operations and comprehensive loss, as the Company has been legally released from being the primary obligor in accordance with ASC 405-20, *Liabilities – Extinguishment of Liabilities*.

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 accrued 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 was 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. On February 26, 2021, the Company repaid the full balance of $2.0 million, and on March 31, 2021, the line of credit was closed. As of December 31, 2021, there was no outstanding balance of the Note.

Note 19. Income Taxes

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

	Year Ended December 31,	
	2022	2021
Domestic	$ (15,598)	$ (16,006)
Foreign	—	(126)
Loss before income taxes	$ (15,598)	$ (16,132)

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Notes to Consolidated Financial Statements. (Continued)

The total income tax expense for the years ended December 31, 2022 and 2021 was $14,000 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,	
	2022	2021
Current:		
Federal	$ —	$ —
State	(13)	(2)
Foreign	(1)	—
Total current tax (expense)	(14)	(2)
Deferred:		
Federal	—	—
State	—	—
Foreign	—	—
Total deferred tax (expense)	—	—
Total tax (expense)	$ (14)	$ (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,	
	2022	2021
Expected income tax provision at the federal statutory rate	21.0 %	21.0 %
State taxes, net of federal benefits	16.0 %	(20.1)%
Impact of Section 382 Study	—	(10.4)%
Change in valuation allowance	(40.9)%	(0.4)%
Transaction costs	—	(1.0)%
Derivative liability	4.1 %	11.7 %
Contingent Consideration Release	0.1 %	—
Non-controlling interest	(0.3)%	(1.9)%
Gain on debt extinguishment	—	1.5 %
Other	(0.1)%	(0.4)%
Income tax provision	(0.1)%	—

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Notes to Consolidated Financial Statements. (Continued)

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,	
	2022	2021
Deferred tax assets:		
Net operating loss carryforwards	$ 19,654	$ 14,586
Unearned revenue	—	1
Stock-based compensation	4,541	3,677
Accrued payroll and benefits	296	3
Research and development credits	16	16
Fixed asset basis difference	54	73
Inventory reserve	445	422
Charitable contributions	2	2
Income from partnerships	97	163
Lease liability	531	752
Contingent consideration	—	456
Allowance for bad debt	65	27
Amortized intangibles	819	660
Goodwill	393	366
Section 174 Capitalization	340	—
Total deferred tax assets	27,253	21,204
Deferred tax liabilities:		
Right of use asset	(486)	(699)
Amortizable intangibles	—	—
Income from partnerships	—	—
Other	—	—
Total deferred tax liabilities	(486)	(699)
Less valuation allowance	(26,767)	(20,505)
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 $6.3 million during the year ended December 31, 2022 and decreased by $6,000 during the year ended December 31, 2021.

At December 31, 2022, the Company had federal and state NOLs aggregating approximately $81.1 million and $47.5 million, respectively. At December 31, 2022, 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 $222.3 million of federal NOLs available, approximately $141.2 million are expected to expire unutilized due to ownership changes as defined in IRC Section 382. If not utilized, the federal and state NOLs will begin to expire in 2023 and 2024, respectively. 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, 2022. 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, 2022, the Company's tax years for 2003 through 2022 are generally subject to examination by the tax authorities. The years are open back to 2003 to the extent the NOLs being carried forward were generated then.

As of December 31, 2022, the Company had the following unrecognized tax benefits (in thousands):

	Year Ended December 31,	
	2022	2021
Unrecognized tax benefit beginning balance	$ 17	$ 17
Increases for tax positions taken in prior years	—	—
Decreases for tax positions taken in prior years	(1)	—
Increases for tax positions taken in current years	—	—
Settlements	—	—
Unrecognized tax benefit ending balance	$ 16	$ 17

In February 2023, the Company received notification from the Internal Revenue Service that our Archipelago joint venture was selected for audit for the 2021 tax year. The Opening Conference is scheduled for April 24, 2023, and Management has not yet received the IRS agent's Initial Document Request.

The Company is currently not under audit for state purposes. The Company does not anticipate its total unrecognized tax benefits as of December 31, 2022 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 20. 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, 2022 and 2021.

Note 21. 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,	
	2022	2021
United States	$ 8,836	$ 6,003
Argentina	862	26
India	7	7
Canada	194	503
Spain	—	225
United Kingdom	—	16
Germany	57	—
Total	$ 9,956	$ 6,780

Note 22. 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, warrants and options. 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, 2022 and 2021, 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,	
	2022	2021
Options to purchase common stock	60,002	35,554
Warrants to purchase common stock	285,757	287,750
Preferred investment options	123,967	—
Total	469,726	323,304

Note 23. 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 $48,000 and $64,000 as of December 31, 2022 and December 31, 2021, respectively, and are included in the consolidated balance sheets as amounts due to related parties.

During the year ended December 31, 2021, the Company leased 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 used to grow hemp on this land to support the operations of its joint venture Archipelago Ventures Hawaii, until the expiration of the lease in February 2022. 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 Company made lease payments in the amount of $0 and $84,000 during the years ended December 31, 2022 and 2021, respectively. Mr. Comcowich served as the Company's interim chief executive officer from January 1, 2022 to February 1, 2022, and received $34,000 in total compensation for his services in this role.

During the year ended December 31, 2022, the Company sold Archipelago equipment to Mr. Comcowich at fair value. The impact of the transaction on the consolidated financial statements was not material.

Note 24. Subsequent Events

On March 2, 2023, the Company entered into a securities purchase agreement pursuant to which it sold in a private placement (i) 165,500 shares of common stock ("March 2023 PIPE Shares"), (ii) pre-funded common stock purchase warrants ("March 2023 Pre-Funded Warrants") to purchase up to 500,834 shares of common stock, at an exercise price of $0.0001 per share, and (iii) preferred investment options ("March 2023 Options") to purchase up to 1,332,668 shares of common stock, at an exercise price of $9.00 per share, for gross proceeds of $6.0 million (the "March 2023 PIPE"). The March 2023 PIPE closed on March 6, 2023. At the closing of the March 2023 PIPE, the Company also reduced the exercise price of outstanding warrants to purchase a total of 178,132 shares of common stock that were previously issued to the investors in the March 2023 PIPE. The March 2023 Pre-Funded Warrants became exercisable upon issuance and are exercisable until exercised in full. The March 2023 Options became exercisable upon issuance with 666,334 options expiring 18 months after the date of issuance and the remaining 666,334 options expiring 5 years after the date of issuance. The Company agreed to register the resale of the March 2023 PIPE Shares and the shares issuable upon exercise of the March 2023 Pre-Funded Warrants and March 2023 Options. In connection with the March 2023 PIPE, the Company granted to a placement agent preferred investment options ("March 2023 Placement Agent Options") to purchase a total of 33,317 shares of common stock that have an exercise price per share equal to $11.25 and a term of five years.

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, 2022, 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, Stanley E. Jacot Jr., Arcadia's principal executive officer, and Thomas J. Schaefer, Arcadia's principal financial officer, concluded that these disclosure controls and procedures were effective as of December 31, 2022.

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 Stanley E. Jacot Jr., its principal executive officer, and Thomas J. Schaefer, 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, 2022.

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.

Item 9C. Disclosure Regarding Foreign Jurisdictions that Prevent Inspections.

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 2022 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, 2022, 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.

Auditor Firm Id:	34	Auditor Name:	Deloitte & Touche LLP	Auditor Location:	Tempe, AZ, United States

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

		Incorporated by Reference				
Exhibit Number	Exhibit Description	Form	File No.	Exhibit	Filing Date	Filed Herewith
3.1	Amended and Restated Certificate of Incorporation of Registrant.	8-K	001-37383	3.1	5/26/2015	
3.2	Amendment to the Amended and Restated Certificate of Incorporation of Registrant.	8-K	001-37383	3.1	2/28/2023	
3.3	Certificate of Designation of Series A Preferred Stock.	8-K	001-37383	3.1	12/8/2022	
3.4	Amended and Restated Bylaws of Registrant.	8-K	001-37383	3.2	5/26/2015	
3.5	Amendment to the Amended and Restated Bylaws of Registrant.	8-K	001-37383	3.2	12/8/2022	
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					X
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	
4.14	Form of Investor Warrant.	8-K	001-37383	4.1	1/29/2021	
4.15	Form of Placement Agent Warrant.	8-K	001-37383	4.2	1/29/2021	
4.16	Form of Investor Pre-Funded Warrant.	8-K	001-37383	4.1	8/16/2022	
4.17	Form of Investor Preferred Investment Option.	8-K	001-37383	4.2	8/16/2022	
4.18	Form of Placement Agent Preferred Investment Option.	8-K	001-37383	4.3	8/16/2022	
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	Amendment No. 8 to the Office Lease dated March 17, 2003 between the Registrant and Pac West Office Equities, LP.	10-Q	001-37383	10.8	5/13/2020	
10.10	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	
10.11*	Employment letter for Laura Pitlik, Chief Marketing Officer.	10-Q	001-37383	10.1	11/15/2021	

10.12*	Severance and Change In Control Agreement for Laura Pitlik.	10-Q	001-37383	10.2	11/15/2021
10.13*	Employment Letter for Stanley E. Jacot Jr., Chief Executive Officer	10-Q	001-37383	10.1	5/12/2022
10.14*	Severance and Change in Control Agreement for Stanley E. Jacot, Jr.	10-Q	001-37383	10.1	5/12/2022
10.15*	Inducement Option Grant for Stanley E. Jacot, Jr.	10-Q	001-37383	10.2	5/12/2022
10.16*	Employment Letter and Severance and Change in Control Agreement for Thomas J. Schaefer.	8-K/A	001-37383	10.1	1/5/2023
10.17+	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
10.18	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
10.19	Form of Registration Rights Agreement.	8-K	001-37383	10.2	3/23/2018
10.20	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
10.21	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
10.22	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
10.23	Form of Letter Agreement, dated as of May 14, 2020.	8-K	001-37383	10.1	5/18/2020
10.24	Form of Letter Agreement, dated as of July 6, 2020.	8-K	001-37383	10.1	7/8/2020
10.25	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
10.26	Form of Securities Purchase Agreement dated as of January 25, 2021, between Arcadia Biosciences, Inc. and each purchaser named on the signature pages thereto.	8-K	001-37383	10.1	1/29/2021
10.27	Form of Registration Rights Agreement dated as of January 25, 2021, between Arcadia Biosciences, Inc. and each purchaser named on the signature pages thereto.	8-K	001-37383	10.2	1/29/2021

10.28	Form of Securities Purchase Agreement, dated as of August 12, 2022, between Arcadia Biosciences, Inc. and each purchaser named on the signature pages thereto.	8-K	001-37383	10.1	8/16/2022	
10.29+	Master Transaction Agreement.	8-K	001-37383	10.2	12/22/2020	
10.30+	Asset Purchase Agreement dated May 17, 2021, by and among Arcadia, Buyer, Seller, Eko, Lief, Zola and Parent.	8-K	001-37383	10.1	5/21/2021	
21.1	List of subsidiaries of the Registrant.	S-1	333-262407	21.1	1/28/2022	
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	Inline XBRL Instance Document.					X
101.SCH	Inline XBRL Taxonomy Extension Schema Document.					X
101.CAL	Inline XBRL Taxonomy Extension Calculation Linkbase Document.					X
101.DEF	Inline XBRL Taxonomy Extension Definition Linkbase Document.					X
101.LAB	Inline XBRL Taxonomy Extension Label Linkbase Document.					X

101.PRE	Inline XBRL Taxonomy Extension Presentation Linkbase Document.	X
104	Cover Page Interactive Data File (embedded within the Inline XBRL 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 30, 2023	By:	/s/ STANLEY E. JACOT JR.
		Stanley E. Jacot Jr. **President and Chief Executive Officer** **(Principal Executive Officer)**
Date: March 30, 2023	By:	/s/ THOMAS J. SCHAEFER
		Thomas J. Schaefer **Chief Financial Officer** **(Principal Financial and Accounting Officer)**

Each person whose individual signature appears below hereby authorizes and appoints Stanley Jacot Jr. 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/ STANLEY E. JACOT JR. **Stanley E. Jacot Jr.**	**Director**	March 30, 2023
/s/ ALBERT B. BOLLES **Albert D. Bolles**	**Director**	March 30, 2023
/s/ KEVIN COMCOWICH **Kevin Comcowich**	**Director**	March 30, 2023
/s/ LILIAN SHACKELFORD MURRAY **Lilian Shackelford Murray**	**Director**	March 30, 2023
/s/ GREGORY D. WALLER **Gregory D. Waller**	**Director**	March 30, 2023
/s/ AMY YODER **Amy Yoder**	**Director**	March 30, 2023
/s/ DEBORAH D. CAROSELLA **Deborah D. Carosella**	**Director**	March 30, 2023

EXHIBIT 4.7

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

The following description of registered securities of Arcadia Biosciences, Inc. ("Arcadia," "we," "us," "our") is based upon our certificate of incorporation, as amended ("Certificate of Incorporation") and bylaws, as amended ("Bylaws") and does not purport to be complete. This summary is subject to, and is qualified in its entirety by, or Certificate of Incorporation and Bylaws, each of which is incorporated by reference as exhibits to the Annual Report on Form 10-K of which this Exhibit is a part, and the applicable provisions of the Delaware General Corporation Law ("DGCL"). We encourage you to read our Certificate of Incorporation and Bylaws for additional information.

General

Our authorized capital stock consists of 150,000,000 shares of common stock, $0.001 par value, and 20,000,000 shares of preferred stock, $0.001 par value. 40,000 shares of our preferred stock was designated as "Series A Preferred Stock" as of December 31, 2022. Our common stock and Series A Preferred Stock have been registered under Section 12 of the Securities Exchange Act of 1934, as amended. As of the date of this Annual Report on Form 10-K, there are no outstanding shares of Series A Preferred Stock

Common Stock

Holders of our common stock are entitled to one vote per share for each share held of record on all matters submitted to a vote of stockholders and do not have cumulative voting rights. Our Certificate of Incorporation does not provide for cumulative voting. Subject to preferences that may be applicable to any outstanding preferred stock, the holders of our common stock are entitled to receive ratably such dividends, if any, as may be declared by our board of directors out of legally available funds. Upon liquidation, dissolution or winding-up, the holders of our common stock are entitled to share ratably in all of our assets which are legally available for distribution, after payment of or provision for all liabilities and the liquidation preference of any outstanding preferred stock. The holders of our common stock have no preemptive, subscription, redemption or conversion rights.

Preferred Stock

The board of directors has the authority, without further action by the stockholders, to issue up to 20,000,000 shares of preferred stock, $0.001 par value per share, in one or more series. The board of directors also has the authority to designate the rights, preferences, privileges and restrictions of each such series, including dividend rights, dividend rates, conversion rights, voting rights, terms of redemption, redemption prices, liquidation preferences, and the number of shares constituting any series.

The issuance of preferred stock may have the effect of delaying, deferring or preventing a change in control of the company without further action by the stockholders. The issuance of preferred stock with voting and conversion rights may also adversely affect the voting power of the holders of common stock. In certain circumstances, an issuance of preferred stock could have the effect of decreasing the market price of the common stock.

Series A Preferred Stock

Our board of directors declared a dividend of one one-thousandth of a share of Series A Preferred Stock for each share of our common stock outstanding as of 5:00 p.m. Eastern Time on December 28, 2022.

Transferability. Shares of Series A Preferred Stock are uncertificated and represented in book-entry form. No shares of Series A Preferred Stock may be transferred by the holder thereof except in connection with a transfer by such holder of any shares of our common stock by such holder, in which case a number of one one-thousandths

(1/1,000ths) of a share of Series A Preferred Stock equal to the number of shares of our common stock to be transferred by such holder will be automatically transferred to the transferee of such shares of common stock.

Voting Rights. Each share of Series A Preferred Stock will entitle the holder thereof to 1,000,000 votes per share. Thus, each one-thousandth of a share of Series A Preferred Stock entitles the holder thereof to 1,000 votes. The outstanding shares of Series A Preferred Stock will vote together with the outstanding shares of our common stock as a single class exclusively with respect to any proposal to adopt an amendment to our Certificate of Incorporation to reclassify the outstanding shares of our common stock into a smaller number of shares of Common Stock at a ratio specified in or determined in accordance with the terms of such amendment (the "**Reverse Stock Split**") and any proposal to adjourn any meeting of stockholders called for the purpose of voting on Reverse Stock Split (the "**Adjournment Proposal**"). The Series A Preferred Stock will not be entitled to vote on any other matter, except to the extent required under the DGCL. Unless otherwise provided on any applicable proxy or ballot with respect to the voting on the Reverse Stock Split or the Adjournment Proposal, the vote of each share of Series A Preferred Stock (or fraction thereof) entitled to vote on the Reverse Stock Split, the Adjournment Proposal or any other matter brought before any meeting of stockholders held to vote on the Reverse Stock Split and the Adjournment Proposal will be cast in the same manner as the vote, if any, of the share of common stock (or fraction thereof) in respect of which such share of Series A Preferred Stock (or fraction thereof) was issued as a dividend is cast on the Reverse Stock Split, the Adjournment Proposal or such other matter, as applicable, and the proxy or ballot with respect to shares of common stock held by any holder on whose behalf such proxy or ballot is submitted will be deemed to include all shares of Series A Preferred Stock (or fraction thereof) held by such holder. Holders of Series A Preferred Stock will not receive a separate ballot or proxy to cast votes with respect to the Series A Preferred Stock on the Reverse Stock Split, the Adjournment Proposal or any other matter brought before any meeting of stockholders held to vote on the Reverse Stock Split.

Dividend Rights. The holders of Series A Preferred Stock, as such, will not be entitled to receive dividends of any kind.

Liquidation Preference. The Series A Preferred Stock will rank senior to the Common Stock as to any distribution of assets in the event of our liquidation, dissolution or winding up, whether voluntarily or involuntarily. Upon our liquidation, dissolution or winding up, whether voluntarily or involuntarily, any Dissolution, each holder of outstanding shares of Series A Preferred Stock will be entitled to be paid out of our assets that are available for distribution to stockholders, prior and in preference to any distribution to the holders of Common Stock, an amount in cash equal to $0.001 per outstanding share of Series A Preferred Stock.

Redemption. All shares of Series A Preferred Stock that are not present in person or by proxy at any meeting of stockholders held to vote on the Reverse Stock Split and the Adjournment Proposal as of immediately prior to the opening of the polls at such meeting (the "Initial Redemption Time") will automatically be redeemed in whole, but not in part, by us at the Initial Redemption Time without further action on the part of us or the holder of shares of Series A Preferred Stock (the "Initial Redemption"). Any outstanding shares of Series A Preferred Stock that have not been redeemed pursuant to an Initial Redemption will be redeemed in whole, but not in part, (i) if such redemption is ordered by the Board in its sole discretion, automatically and effective on such time and date specified by the Board in its sole discretion or (ii) automatically upon the approval by our stockholders of the Reverse Stock Split at any meeting of the stockholders held for the purpose of voting on such proposal. Each share of Series A Preferred Stock redeemed in any redemption described above will be redeemed in consideration for the right to receive an amount equal to $0.10 in cash for each one hundred whole shares of Series A Preferred Stock that are "beneficially owned" by the "beneficial owner" (as such terms are defined in the certificate of designation with respect to the Series A Preferred Stock) thereof as of the applicable redemption time and redeemed pursuant to such redemption, payable upon receipt by us of a written request submitted by the applicable holder to our corporate secretary (each a "Redemption Payment Request") following the applicable redemption time. Such Redemption Payment Request shall (i) be in a form reasonably acceptable to us (ii) set forth in reasonable detail the number of shares of Series A Preferred Stock beneficially owned by the holder at the applicable redemption time and include evidence reasonably satisfactory to us regarding the same, and (iii) set forth a calculation specifying the amount in cash owed to such holder by us with respect to the shares of Series A Preferred Stock that were redeemed at the applicable redemption time. However, the redemption consideration in respect of the shares of Series A Preferred Stock (or fractions thereof) redeemed in any redemption described above: (i) will entitle the former beneficial owners of less than one hundred whole shares of Series A Preferred Stock redeemed in any redemption to no cash payment in respect thereof and (y) will, in the case of a former beneficial owner of a number of shares of Series A Preferred Stock (or fractions thereof) redeemed pursuant to any redemption that is not equal to a whole number that is a multiple of one hundred, entitle such beneficial owner to the same cash payment, if any, in respect of such redemption as would have been payable in such redemption to such beneficial owner if the number of shares (or fractions thereof) beneficially owned by such beneficial owner and redeemed pursuant to such redemption were rounded down to the nearest whole number that is a multiple of one hundred (such, that for example, the former beneficial owner of 150 shares of Series A Preferred Stock redeemed pursuant to any redemption will be entitled to receive the same cash payment in respect of such redemption as would have been payable to the former beneficial owner of 100 shares of Series A Preferred Stock redeemed pursuant to such redemption). The Series A Preferred Stock has no stated maturity and is not subject to any sinking fund. The Series A Preferred Stock is not subject to any restriction on the redemption or repurchase of shares by us while there is any arrearage in the payment of dividends or sinking fund installments.

At a meeting of our stockholders held on February 15, 2023, our stockholders approved a 40-1 reverse stock split of our outstanding common stock. As a result of that stockholder approval, all outstanding shares of Series A Preferred Stock were then redeemed by the Company. All redeemed shares of Series A Preferred Stock automatically were retired and restored to the status of authorized but unissued shares of preferred stock. There are no outstanding shares of preferred stock as of the date of this Annual Report on Form 10-K.

Anti-Takeover Effects of Provisions of our Certificate of Incorporation and Bylaws

Our Certificate of Incorporation and Bylaws contain certain provisions that could have the effect of delaying, deterring or preventing another party from acquiring control of us. These provisions and certain provisions of the DGCL, which are summarized below, are expected to discourage coercive takeover practices and inadequate takeover bids. These provisions are also designed, in part, to encourage persons seeking to acquire control of us to negotiate first with our board of directors. We believe that the benefits of increased protection of our potential ability to negotiate more favorable terms with an unfriendly or unsolicited acquirer outweigh the disadvantages of discouraging a proposal to acquire us.

Undesignated Preferred Stock

As discussed above, our board of directors will have the ability to issue preferred stock with voting or other rights or preferences that could impede the success of any attempt to change control of us. These and other provisions may have the effect of deterring hostile takeovers or delaying changes in control or management of our company.

Limits on Ability of Stockholders to Act by Written Consent or Call a Special Meeting

Our Certificate of Incorporation provides that our stockholders may not act by written consent, which may lengthen the amount of time required to take stockholder actions. As a result, a holder controlling a majority of our capital stock would not be able to amend our Bylaws or remove directors without holding a meeting of our stockholders called in accordance with our Bylaws.

In addition, our Bylaws provide that special meetings of the stockholders may be called only by the majority of our board of directors. Stockholders may not call a special meeting, which may delay the ability of our stockholders to force consideration of a proposal or for holders controlling a majority of our capital stock to take any action, including the removal of directors.

Requirements for Advance Notification of Stockholder Nominations and Proposals

Our Bylaws require advance notice procedures with respect to stockholder proposals and the nomination of candidates for election as directors, other than nominations made by or at the direction of our board of directors or a committee of our board of directors. These provisions may have the effect of precluding the conduct of certain business at a meeting if the proper procedures are not followed. These provisions may also discourage or deter a potential acquirer from conducting a solicitation of proxies to elect the acquirer's own slate of directors or otherwise attempting to obtain control of our company.

Board Classification

Our board of directors is divided into three classes, one class of which is elected each year by our stockholders. The directors in each class will serve three-year terms. A third party may be discouraged from making a tender offer or otherwise attempting to obtain control of us as it is more difficult and time consuming for stockholders to replace a majority of the directors on a classified board.

No Cumulative Voting

Our Certificate of Incorporation and Bylaws do not permit cumulative voting in the election of directors. Cumulative voting allows a stockholder to vote a portion or all of its shares for one or more candidates for seats on the board of directors. Without cumulative voting, a minority stockholder may not be able to gain as many seats on our board of directors as the stockholder would be able to gain if cumulative voting were permitted. The absence of cumulative voting makes it more difficult for a minority stockholder to gain a seat on our board of directors to influence our board's decision regarding a takeover.

Amendment of Charter and Bylaws Provisions

The amendment of the above provisions of our Certificate of Incorporation requires approval by holders of at least two-thirds of our outstanding capital stock entitled to vote generally in the election of directors. The amendment of our Bylaws requires approval by the holders of at least two-thirds of our outstanding capital stock entitled to vote generally in the election of directors.

Delaware Anti-Takeover Statute

We are subject to the provisions of Section 203 of the DGCL, regulating corporate takeovers. In general, Section 203 prohibits a publicly-held Delaware corporation from engaging, under certain circumstances, in a business combination with an interested stockholder for a period of three years following the date the person became an interested stockholder unless:

- prior to the date of the transaction, our board of directors approved either the business combination or the transaction which resulted in the stockholder becoming an interested stockholder;

- upon completion of the transaction that resulted in the stockholder becoming an interested stockholder, the interested stockholder owned at least 85% of the voting stock of the corporation outstanding at the time the transaction commenced, calculated as provided under Section 203; or

- at or subsequent to the date of the transaction, the business combination is approved by our board of directors and authorized at an annual or special meeting of stockholders, and not by written consent, by the affirmative vote of at least two-thirds of the outstanding voting stock which is not owned by the interested stockholder.

Generally, a business combination includes a merger, asset or stock sale, or other transaction resulting in a financial benefit to the interested stockholder. An interested stockholder is a person who, together with affiliates and associates, owns or, within three years prior to the determination of interested stockholder status, did own 15% or more of a corporation's outstanding voting stock. We expect the existence of this provision to have an anti-takeover effect with respect to transactions our board of directors does not approve in advance. We anticipate that Section 203 may also discourage attempts that might result in a premium over the market price for the shares of common stock held by stockholders.

The provisions of the DGCL and the provisions of our Certificate of Incorporation and Bylaws, as amended upon the completion of this offering, could have the effect of discouraging others from attempting hostile takeovers and, as a consequence, they might also inhibit temporary fluctuations in the market price of our common stock that often result from actual or rumored hostile takeover attempts. These provisions might also have the effect of preventing changes in our management. It is possible that these provisions could make it more difficult to accomplish transactions that stockholders might otherwise deem to be in their best interests.

Forum Selection

Our Certificate of Incorporation provides that unless we consent in writing to the selection of an alternative forum, the Court of Chancery of the State of Delaware is the sole and exclusive forum for:

- any derivative action or proceeding brought on our behalf;
- any action asserting a breach of fiduciary duty owed by any of our directors, officers or other employees to us or our stockholders;
- any action asserting a claim against us arising pursuant to any provisions of the DGCL, our Certificate of Incorporation or our Bylaws; or
- any action asserting a claim against us that is governed by the internal affairs doctrine.

These exclusive-forum provisions may limit a stockholder's ability to bring a claim in a judicial forum that it finds favorable for disputes with us or our directors, officers or other employees, which may discourage lawsuits against us and our directors, officers and other employees. Furthermore, the enforceability of similar choice of forum provisions in other companies' charter documents has been challenged in legal proceedings, and it is possible that a court could find these types of provisions to be inapplicable or unenforceable. If a court were to find either exclusive-forum provision in our Certificate of Incorporation to be inapplicable or unenforceable in an action, we may incur additional costs associated with resolving the dispute in other jurisdictions, which could harm our business.

These exclusive-forum provisions are not intended to apply to any causes of action arising under the Securities Act of 1933 or the Exchange Act of 1934 or any other claim for which the federal courts have exclusive jurisdiction.

Listing

Our common stock is listed on the NASDAQ Capital Market under the symbol "RKDA". Our Series A Preferred Stock is not listed on any securities exchange.

EXHIBIT 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We consent to the incorporation by reference in Registration Statement Nos. 333-229047, 333-232858, 333-235446, 333-262407 and 333-267637 on Form S-1, Registration Statement Nos. 333-224061, 333-224893, 333-239641, 333-252659 and 333-264425 on Form S-3, and Registration Statement Nos. 333-204215, 333-210023, 333-216545, 333-223805, 333-232072, 333-237438, 333-256599 and 333-265322 on Form S-8 of our report dated March 30, 2023, relating to the financial statements of Arcadia Biosciences, Inc. appearing in this Annual Report on Form 10-K for the year ended December 31, 2022.

/s/ Deloitte & Touche LLP

Tempe, Arizona

March 30, 2023

Exhibit 31.1

CERTIFICATION OF CHIEF EXECUTIVE OFFICER
PURSUANT TO EXCHANGE ACT RULE 13a-14(a)/15d-14(a)
AS ADOPTED PURSUANT TO SECTION 302
OF THE SARBANES-OXLEY ACT OF 2002

I, Stanley E. Jacot Jr., 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(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

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

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

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

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

5. The registrant's other certifying officer 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 30, 2023

By: /s/ STANLEY E. JACOT Jr.
Stanley E. Jacot Jr.
President and Chief Executive Officer
(Principal Executive Officer)

Exhibit 31.2

**CERTIFICATION OF CHIEF FINANCIAL OFFICER
PURSUANT TO EXCHANGE ACT RULE 13a-14(a)/15d-14(a)
AS ADOPTED PURSUANT TO SECTION 302
OF THE SARBANES-OXLEY ACT OF 2002**

I, Thomas J. Schaefer, 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(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

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

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

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

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

5. The registrant's other certifying officer 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 30, 2023	By:	/s/ THOMAS J. SCHAEFER
		Thomas J. Schaefer
		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, 2022 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 30, 2023

By: /s/ STANLEY E. JACOT Jr.
Stanley E. Jacot Jr.
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, 2022 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 30, 2023

By: /s/ THOMAS J. SCHAEFER
Thomas J. Schaefer
Chief Financial Officer
(Principal Financial Officer)