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Zacks Small-Cap Research

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Arcadia Biosciences, Inc. (RKDA-NASDAQ)

HB4 soybean & GoodWheat product lines expected to advance under licensing agreements with Bioceres. Industrial Seed Innovations (ISI) acquired. GoodHemp inventories ready for 2021.

A discounted cash flow (DCF) model that applies a 12.5% discount rate and a terminal price-to-sales ratio (P/S) of only 0.35 (which is the average P/S ratio of a large agricultural products company) indicates a NAV share price target of $10.00.

Current Price (11/13/20)	$2.81
Valuation	**$10.00**

OUTLOOK

Arcadia Biosciences (NASDAQ: RKDA) is an **innovative agricultural biotechnology company** with a broad and growing agricultural product portfolio focused predominately on improving crop traits and nutritional value. Management's current focus is on **wheat, soybeans** and **hemp,** under the trademarked names of GoodWheat, Verdeca HB4 and GoodHemp. **GoodWheat** is being rolled out in the U.S. via collaboration with Three Farm Daughters. Bioceres spearheading **HB4** soybean and GoodWheat efforts in Latin America under licensing agreements with Arcadia. **GoodHemp** is prepared for 2021 planting seasons.

SUMMARY DATA

52-Week High	**$6.63**
52-Week Low	**$2.30**
One-Year Return (%)	**-31.30**
Beta	**-0.82**
Average Daily Volume (shrs.)	**202,535**
Shares Outstanding (million)	**10.70**
Market Capitalization ($ mil.)	**$30.07**
Short Interest Ratio (days)	**0.18**
Institutional Ownership (%)	**11.91**
Insider Ownership (%)	**15.33**
Annual Cash Dividend	**$0.00**
Dividend Yield (%)	**0.00**
5-Yr. Historical Growth Rates	
Sales (%)	**N/M**
Earnings Per Share (%)	**N/A**
Dividend (%)	**N/A**
P/E using TTM EPS	**N/M**
P/E using 2019 Estimate	**N/M**
P/E using 2020 Estimate	**N/M**

Risk Level	**Above Average**
Type of Stock	**Small-Growth**
Industry	**Agricultural Products**

ZACKS ESTIMATES

Revenue
(in millions of $)

	Q1 (Mar)	Q2 (Jun)	Q3 (Sep)	Q4 (Dec)	Year (Dec)
2018	0.2 A	0.4 A	0.4 A	0.5 A	1.5 A
2019	0.2 A	0.2 A	0.4 A	0.4 A	1.2 A
2020	0.3 A	0.3 A	0.3 A	0.5 E	1.4 E
2021	0.4 E	1.0 E	1.0 E	1.4 E	3.8 E

Earnings per Share
(EPS is operating earnings before non-recurring items)

	Q1 (Mar)	Q2 (Jun)	Q3 (Sep)	Q4 (Dec)	Year (Dec)
2018	-$4.86 A	-$2.02 A	-$0.46 A	-$0.14 A	-$6.12 A
2019	-$0.86 A	-$1.04 A	-$0.92 A	-$0.44 A	-$3.07 A
2020	-$0.65 A	-$0.71 A	-$0.70 E	-$0.39 E	-$2.43 E
2021	-$0.63 E	-$0.53 E	-$0.50 E	-$0.41 E	-$2.05 E

Quarterly revenues & EPS estimates may not equal annual numbers due to rounding. Operating EPS do not include change in fair value of common stock warrant liabilities.

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EXECUTIVE SUMMARY

Arcadia Biosciences (NASDAQ: RKDA) is on the cusp of meaningful revenue growth, primarily from management's initiative into the hemp space, but also from the restructured strategic relationship with Bioceres Crop Solutions for the commercialization of HB4 soybean technology in the Central and South America. Furthermore, the GoodWheat franchise should be bolstered by the recent relationships established with Three Farm Daughters (U.S.), Bioceres (Latin America), GoodMills (Europe) and Corner Foods (China and Israel). In addition, the company's legacy SONOVA GLA product line is anticipated to be sustained through the introduction of GLA supplemental capsules into the China market, which could generate an incremental $1.8 million in sales during 2021.

Highlights of Third Quarter Events

- Commercialization of the **HB4® soybean seed** business
  - Arcadia **sold its 50% interest in Verdeca JV** to Bioceres Crop Solutions (NYSE: BIOX)
    - In exchange for
      - $6.0 million in cash
      - 1.875 million shares of BIOX stock (valued at $15 million)
      - $2.0 million upon China granting import clearance for HB4 soybeans
      - 6% royalty payments of HB4 soybean revenues up to $10 million
  - Bioceres acquired license rights to GoodWheat technologies in Latin America (see below)
- **GoodWheat** updates
  - **Bioceres Crop Solutions** acquired **distribution rights of GoodWheat** product portfolio into **South and Central America**
    - Arcadia will receive **future royalties of 25%** on GoodWheat revenues
  - **Three Farm Daughters** milestones
    - **E-commerce site** (www.threefarmdaughters.com) operative with four branded food products (flour and three pastas) powered by Shopify.
    - Three Farm Daughters GoodWheat products will be soon sold by **Hugo's Family Marketplace** (a regional, family-owned supermarket grocery chain serving North Dakota and Minnesota)
  - **GoodMills Innovation i**s in the R&D development stage of bringing GoodWheat products to market across seven European countries
  - **Corner Foods** expected to distribute GoodWheat products to Asia via TMall e-commerce portal, supported by demand driven by Tastemade China cooking and lifestyle network
- Arcadia closed the **acquisition of Industrial Seed Innovations** (ISI) on August 21st.
  - As a result, Arcadia now owns ISI's commercial and genetic assets, including the popular **Rogue and Umpqua seed varieties**, along with ISI's germplasm library and IP
  - Arcadia's hemp-related breeding platform has been significantly broadened
  - The acquisition includes a breeding **research and development facility** in the Pacific Northwest
  - Hawaiian Hemp Regulatory update
    - Drug Enforcement Agency (DEA) issued an interim final ruling (IFR)
      - The IFR classified any hemp derivative with more than 0.3% THC as marijuana (a
    - Hawaiian Industrial Hemp Pilot Program expired on October 31st
    - As a result, in order to remain in compliance with this new regulatory framework, Arcadia was required to destroy the hemp plants in the ground and in inventory prior to October 31, 2020, necessitating an inventory write-off of $1.3 million
  - The domestic hemp seed market is expected to re-accelerate in 2021 after growers hesitated to make purchasing decisions during the pandemic
    - Arcadia has significant seed inventories and expects to have over 10 million seeds available for shipment at the beginning of 2021, with potentially up to 20-30 million seeds available for sale during the entire 2021 season

RECENT NEWS

Third Quarter 2020 Financial Results

On November 12, 2020, Arcadia Biosciences reported financial results for the third quarter ending September 30, 2020. Total revenues declined 19.9% YOY to approximately $314,000. Product revenues increased 13.4% to approximately $245,000, primarily driven by an intentional $116,000 decrease in contract research & government grants revenue, which was partially offset by $45,000 incremental increase in SONOVA® GLA product sales and GoodWheat royalty revenues. Royalty revenues were $16,000. Contract research and government grant revenues decreased 73.0% to $43,000 since contract research agreements and government, grant projects are no longer being pursued as management is pursuing sales opportunities of GoodWheat and GoodHemp products.

Total operating expenses were relatively flat versus the comparable quarter last year, though the components varied; the large percentage increase in cost of product revenues was counterbalanced by single-digit declines in R&D and SG&A expenses. Cost of product revenues increased 940% to approximately $1.84 million due a $1.3 million hemp-related write-down for the Archipelago JV due to a recently issued regulatory ruling. Adjusting for this write down, cost of product revenues would have increased by only $364,000. R&D expenses decreased 8.8% to approximately $1.76 million, primarily due to lower soy-related costs. SG&A expenses decreased 4.1% to approximately $4.29 million, primarily driven by lower employee-related expenses, which was somewhat offset by higher consulting fees.

For the third quarter, Arcadia Biosciences reported a **net loss** attributable to shareholders of $6.39 million (or **$0.60 per diluted share**), of which $1.13 million was related to the change in fair value of stock warrants, a non-cash item. **Without this non-operating item**, Arcadia's operating loss was $6.610 million (or **$0.70 per diluted share**).

As of September 30, 2020, working capital was approximately $12.8 million, a $4.9 million decline from the second quarter ending on June 30, 2020. Thus far in 2020, **shares outstanding have increased by 25.3%** to 10,832,203 shares **since December 31, 2019**.

Recent Developments – HB4 Soybeans

On November 12, 2020, Bioceres Crop Solutions agreed to acquire the remaining 50% ownership interest in the Verdeca joint venture from Arcadia Biosciences, as well as the Intellectual Property assets related to soybean for Latin America, for **$20.0 million** consisting of $6.0 million in cash and 1,875,000 shares of Bioceres (NYSE: BIOX). In addition, Arcadia will receive **$2.0 million** upon Verdeca obtaining regulatory import clearance for HB4 soybeans from China. In addition, Bioceres will pay 6% royalty payments of the net HB4® soybean technology revenues realized by Verdeca up to a maximum of $10 million.

Bioceres Crop Solutions Corp is a NYSE-listed agricultural crop productivity solutions company with a multi-product platform that provides ag-related products throughout the crop cycle, including seeds, seed treatments, biologicals, adjuvants, chemicals and fertilizers. Its EcoSeed business is **heavily dependent** on seed products the incorporate **HB4 yield improvement technology**. The management of Bioceres expects that the commercialization of HB4 technology will drive "an increasingly significant portion" of that company's future revenues. Therefore, in the words of Arcadia's CEO, Matthew Plavan, "**Bioceres is the perfect commercial steward to advance the HB4 soybean into global markets**." Bioceres plans to further accelerate the commercialization of this technology by increasing the number of related breeding collaborations and go-to-market partnerships in current as well as new geographies.

Recent Developments - GoodHemp™

On August 21, 2020, Arcadia Biosciences **acquired Industrial Seed Innovations**, an Oregon-based industrial hemp breeding and seed company. The acquisition included Industrial Seed's intellectual property, genetics portfolio and customer base. The **purchase price** was **$1,212,000**: $500,000 in cash, $432,000 in RKDA stock (132,626 shares) and $280,000 in RKDA stock to be paid in two annual installments (each to be up to 132,626 shares, subject to revenue milestones in 2021 and 2022). The administrative acquisition costs of approximately $67,000 were expensed during the third quarter as SG&A expenses. Going forward, Arcadia will lease the land, equipment, greenhouses and buildings, which are being utilized by Industrial Seed Innovations.

From the third quarter conference call, management provided the following information:

- The company has significant seed inventories. Management expects to have over 10 million seeds available for shipment at the beginning of 2021, with potentially up to 20-30 million seeds available for sale during the entire 2021 season.
- A hemp association has estimated that 130,000 acres will be cultivated with hemp in 2021
- Market intelligence indicates that growers purchase between $1,500 to $2,200 worth of seeds per acre. For CBD production, seed densities range between 2,500 and 8,500 seeds per acre

Utilizing these statistics, management provided an estimated value of the company's hemp seed inventory in the conference call. Alternatively, www.kush.com provides the wholesale pricing of hemp seeds. Though seed prices have varied both overtime and by quality, the average cost per hemp seed with quality genetics was about $0.50 in mid-2020. Therefore, we estimate the revenue potential of Arcadia's hemp seed inventory will be $5.0 million at the end of 2020, and $12.5 million if the mid-range of 20-30 million of potential production is achieved in 2021. Due to an over-abundance of cation, we are conservatively not incorporating this **huge revenue potential** into our earnings model until we discern traction in the buying decisions of hemp farmers in 2021.

Recent Developments - GoodWheat™

In early November 2020, Bioceres acquired the license rights to Arcadia's GoodWheat technologies in South and Central America, under which Arcadia Biosciences will receive **future royalties of 25% on the net wheat technology revenues**.

In August 2020, three new collaborative partnerships were announced by Arcadia Biosciences in rapid succession in early August. Each addresses a totally distinct market. **GoodMills Innovation** provides could be a major distribution channel into the central European market while **Three Farm Daughters** is a fledgling, emerging company that will specialize in the use of GoodWheat products in the U.S. with the support of Arcadia Biosciences, while a **collaboration with Corner Foods** will develop a growth direct- to-consumer initiative in China, initially with an e-commerce website and a social media platform.

Recent Patents

In May 2020, Arcadia Biosciences was granted **two patents** for **extending the shelf life** of the company's GoodWheat wheat varieties of extended shelf life and reduced gluten by minimizing hydrolytic and oxidative rancidity (U.S. Patent 10,463,051 and 10,457,951). Also, Arcadia received **notices of allowance for two additional patents** that extend earlier claims on extended shelf life and reduced gluten wheat GoodWheat product lines. Arcadia's patented trait technology **improves the shelf life and taste of whole wheat flour** by slowing enzymatic processes that cause bitterness as it ages. By this means, the storage life of whole wheat flour made with GoodWheat is extended to more than 10 months versus 10 to 30 days for standard whole wheat flour.

On June 18, 2020, the company announced that the **Australia Patent Office granted a foundational patent** to Arcadia Biosciences. Patent Number 2016288257 covers certain mutations

to the wheat genome that make it herbicide tolerant. Arcadia also announced that the **U.S. Patent** and Trademark Office granted a **Notice of Allowance** (15/740,876) **for the same herbicide tolerant wheat technology**. Australia and the U.S. are the first major wheat-producing countries to approve these wheat technology patents. Additional company wheat patents are pending in other key wheat markets.

These new patents (described) above have increased the total number of non-GMO GoodWheat patents to 23.

Arcadia Biosciences Added Russell Microcap ® Index

Arcadia Biosciences was added to the **Russell Microcap Index** effective on the close of June 26, 2020. The Russell indexes are reconstituted annually and many mutual funds benchmark to these indices. Consequently, the **shareholder base** of Arcadia **should broaden**, and the stock should experience **greater liquidity**. In addition, the inclusion of the company's stock into this Russell index should **expand awareness** of Arcadia Biosciences among investors, both retail and institutional.

OVERVIEW

Arcadia Biosciences is an **innovative, agricultural biotechnology company** with a broad and growing agricultural product portfolio focused predominately on improving crop traits and nutritional value. Targeted traits include improvements that optimize nutritional and wellness value (like increased fiber and reduced allergenicity), particularly for wheat and soybeans, as well as an optimized cannabinoid profile for hemp. The company **develops seeds for crops**, with the current focus on **hemp, wheat and soybeans** under the trademarked names of **GoodHemp**™, **GoodWheat**™ and **HB4**® soybeans, respectively. Arcadia Biosciences owns or exclusively controls 153 issued patents and 63 pending patent applications worldwide across 30 patent families.



Product logos from Arcadia Biosciences' website

In 2017, management began transitioning the company from a predominantly agricultural research and licensing company (which targeted revenue from government grants and research contracts) to **branded, agricultural ingredient company** that is striving to **capture a position in the higher margin, branded, plant-based ingredients business** that targets markets higher in the value chain where consumers are willing to pay premium prices, namely in the nutritional, food & beverage, cosmetics, personal care and pet nutrition industries. These markets target the burgeoning growth in demand for differentiated health & wellness products, such as healthy high-fiber food options, specialty low gluten choices and quality CBD products.

The foundation for developing a portfolio of quality ingredients for the consumer market is the company's core competencies in plant genomics and **ArcaTech platform**. Arcadia has a robust and growing library of unique and high-value traits for multiple crops, including wheat, soybeans and most recently hemp.

MANAGEMENT'S GROWTH STRATEGY

Since 2017, management has strived to develop healthy food options and value-added, differentiated agricultural products that **target the demand from consumer food and health/wellness companies**. In addition, management has placed a greater importance on time-to-market to satisfy current consumer demand. As a result, **the bulk of Arcadia's revenue has transitioned** from contract research agreements and government grants **to product sales** as a result of management's strategy to **emphasize the commercialization of the ingredient traits** of the company's agricultural products, particularly in the company's three strategic crop categories: **wheat, soybeans and, most recently, hemp**. By moving to the value-added end of the food chain, Arcadia is positioned to address the lucrative, less price-sensitive and higher margin portion of the agricultural value food chain.

Arcadia Biosciences, Inc.	Percentage of Revenues		
Segments	Year ending 12/31/2017	Year ending 12/31/2018	Year ending 12/31/2019
Product	12.8%	44.9%	69.6%
License	36.5%	10.2%	5.7%
Contract research & gov't grants	50.7%	44.9%	24.6%

Historically, Arcadia was dedicated to the development of abiotic stress traits with a focus on enhancing crop robustness (quality, resiliency and yield) and on improving yields. The effort was focused primarily on farmers (growers). Through 2017, licensing and contract research & government grants accounted for the vast majority of revenue (over 80%). While the company had some success, the shift in regulatory and consumer attitudes **away from genetically modified (GM) foods** provided an opportunity for management to leverage Arcadia's technologies and industry relationships **towards the non-GM space** and shift the company's focus on branded consumer food companies.

The shift in strategy was facilitated by the adoption of additional technology, which was bolstered in 2017 with the in-licensing (from MIT and Harvard University) of **CRISPR-Cas9** gene-editing technology. CRISPR-Cas9 complements Arcadia's **TILLING platform**. Used in combination, the two technologies are expected to significantly reduce the time to bring novel discoveries to market. TILLING functions as a way to create seed and DNA libraries by identifying certain attractive mutations in specific genes while CRISPR-Cas9 allows for direct gene-editing of a crop's DNA with the goal of enhancing attractive traits. The combination of TILLING and CRISPR-Cas9 is estimated to reduce time-to-market of a novel discovery by approximately two years to three-to-five years versus TILLING alone, which generally was five-to-seven years.

Management is in the process of **migrating the company's commercial strategy** in the agricultural food supply chain from farmers **to consumer food companies**. Arcadia is transforming into an agricultural ingredient company that **targets the demands of consumer food and health & wellness product markets**. Current consumer demand is shifting towards **natural, healthier and more nutritional food** options.

An increasing amount of future sales should be derived from food and other products (such as hemp) that incorporate proprietary traits that Arcadia Biosciences has developed. The needs of farmers will continue to be addressed through superior crop attributes while Arcadia is targeting the premium economics in the end-markets of the agricultural food supply chain.

Also, management is refining the company's **go-to-market strategy** that entails aligning with the branding strategy of food companies by providing high-value food ingredients that enable branded packaged food companies to differentiate their products in the marketplace.

Arcadia's **high-visibility development initiatives** include:

1) **GoodHemp™**
   - The 2018 Farm Bill creating a burgeoning market by essentially de-scheduling hemp and hemp-derived products from the Controlled Substance Act
   - Formed **Arcadia Specialty Genomics** unit in February 2019 with growth chamber facilities and greenhouses located in Central California
   - Formed **Archipelago Ventures Hawaii, LLC joint venture** with **Legacy Ventures Hawaii** in August 2019 with plans to build world class cGMP extraction facilities in Hawaii
   - Launched GoodHemp seed in December 2019

2) **GoodWheat™** - portfolio of specialty wheat varieties
   - In 2019, introduced **resistant starch GoodWheat** and **high fiber GoodWheat**
   - In 2020, launched **reduced gluten GoodWheat**
   - Introduction of **high fiber durum** expected later in 2020
   - Collaboration with millers/trait/direct-to-consumer companies:
     - **Ardent Mills LLC** in November 2018 for improving the flavor profile and shelf-life
     - **Bay State Milling** in August 2019 for high fiber GoodWheat in North America
     - **Arista Cereal Technologies** in December 2019 for high fiber GoodWheat in Asia, Australia and Europe
     - **Corner Foods** in August 2020 for e-commerce portal in China & later Israel
     - **Three Farm Daughters** in August 2020 as a direct-to-consumer effort in U.S.
     - **GoodMills Innovation in** August 2020 to trigger distribution across Europe



Product logos from Arcadia's Biosciences presentations & press releases

3) **HB4®** drought tolerant and herbicide tolerant soybeans
   - Arcadia has **licensed its HB4 soybean technology to Bioceres**, a major Argentinian agricultural bio-technologies (crop and seed trait) company under a royalty arrangement
   - **HB4** and herbicide tolerant trait stack have received regulatory approvals in the U.S., Brazil, Argentina and Paraguay
   - Now in the pre-commercial evaluation phase, drought resistant soybeans are expected commercially launched within the next six months



Product logos from Arcadia's Biosciences presentations

Arcadia Biosciences strives to improve the quality and nutritional value of plant-based ingredients by directing the company's **core competencies in plant genomics** (through its ArcaTech platform) to rapidly develop innovative new varieties of crops, particularly for the species of wheat, soybeans and now hemp. **In 2019, hemp became a new strategic crop for Arcadia**. A pipeline for

commercialization has been developed, including a catalog of multiple varieties and the development of six novel varieties that are expected to be evaluated in on-farm trials during 2020.

GoodHemp™

In February 2019, management announced that the company would be pursuing the genetic improvement, development and commercialization of a new crop: **hemp**. A new strategic business unit, **Arcadia Specialty Genomics** (ASG), was established to spearhead the effort. Since ASG intends only to conduct business in markets where the agricultural product is legal on a federal and state basis, initially the unit is **focused on hemp** (a non-psychoactive strain of the cannabis plant), which was federally legalized through the U.S. Agriculture Improvement Act of 2018. The company's first commercial hemp product, **GoodHemp**™ (an ultra-low THC, disease resistant hemp seed) **debuted within 11 months**, demonstrating Arcadia's prowess for innovation (via the ArcaTech platform) and speed-to-market capabilities, particularly though adept partnering abilities.

GoodHemp™ Milestones

- February 2019 – announced formation of **Arcadia Specialty Genomics** business unit
- March 2019 - granted an **Industrial Hemp Pilot Program License** in Hawaii
- April 2019 - opened sun-grown **cultivation** facility in Hawaii
- August 2019 – formed **Archipelago Ventures Hawaii**, LLC JV with Archipelago™ Ventures
- September 2019 - granted a **Hemp License** in California
- December 2019 – launched **GoodHemp™** and produced first **seed catalog**
- January 2020 - formed **GoodHemp Innovation Partners platform**
- March 2020 - partnered with **Grow West**® and **Buttonwillow Warehouse** Company
- March 2020 - partnered with **Vivion Specialties** to distribute Hawaiian hemp-derived products in North America

Management's Hemp Strategy

Due to the Federal legal restrictions on hemp as a controlled substance prior to 2019, very little genetic research was conducted on hemp. Consequently, the quality of CBD hemp seed was uneven, resulting in unpredictable crop outcomes. Given the lack of advancements in genetics of the hemp plant, vast agricultural and financial opportunities lie before Arcadia. **Management's goal in the hemp space is to develop proprietary, genetically-improved hemp seeds and hemp-derived CBD products for the commercial market** and position the company as a premier provider to meet the upcoming wave of demand for hemp seeds, transplants, flower and extracts for the nutraceutical, personal care and food industries.

As part of an aggressive germplasm acquisition strategy, Arcadia acquired strains of hemp germplasm in early 2019, and by July 2019, Arcadia's hemp breeding program internally created the company's first proprietary hemp variety. In December 2019, Arcadia introduced **Complia™ Bot+**, the company's first hemp strain that provides a high 10%+ CBD content with an ultra-low THC content. These milestones demonstrate Arcadia's expertise in **plant genetics** and **competencies in varietal development**. By May 2020, **10 varieties** of the Complia hemp product line had been developed and were available for plantings.

Arcadia is leveraging **ArcaTech** to help rapidly develop varieties of hemp. The company acquired strains of hemp germplasm to **quickly go-to-market** with the Complia Bot portfolio of seeds. Through the acquisition, Arcadia's scientists were also able to rapidly **develop a library of germplasm** that contain genetic variations which can **fuel a robust breeding pipeline via the proprietary ArcaTech prototyping technology platform**. Longer-term, management expects to develop varieties designed for industrial hemp fiber and nutritional hemp protein markets.

Cultivation Facilities

Management expects the number of varietal offerings in the company's seed portfolio to significantly expand as the company's technology platform develops improved hemp traits through genetic optimization and the company's breeding operations verify the expected improved performance claims.

In March 2019, Department of Agriculture of Hawaii granted an **Industrial Hemp Pilot Program License**, which allowed for the cultivation of industrial hemp in **Hawaii** for the purposes of agricultural and academic research. In April, Arcadia opened a 10-acre sun-grown **cultivation facility** on leased land in Molokai and began its research program, which is focused on the development of novel varieties and crop quality traits that will enhance pest resistance and possessing productivity. Management's plans are to produce proprietary seed lines and flower for cannabidiol (CBD) oil extraction.

Within five months, the cultivation footprint was expanded to 30 acres and in May 2020, an additional 20 acres are coming on line, bringing the total to **50 acres**. Initial harvests demonstrated that several hemp varieties can be successfully grown and harvested over multiple production seasons for CBD production. The next phases of development are the ramp-up of acreage for flower production and the construction of extraction and processing facilities.

In addition, the Hawaiian Industrial Pilot Program expired on October 31, 2020. As a result, in order to remain in compliance with this new regulatory framework, Arcadia was required to destroy the hemp plants in the ground and in inventory prior to October 31, 2020, necessitating an inventory write-off of $1.3 million.

Regulatory Background on Hemp

The U.S. Agriculture Improvement Act of 2018 (aka the Farm Bill) redefined hemp as an agricultural product, thereby opening a potentially enormous new agricultural commodity market in the U.S. Previously, the Farm Bill of 2014 legalized hemp for state-sanctioned research programs; however, the **Farm Bill 2018 completely removed hemp from regulation under the Controlled Substance Act** thereby declassifying hemp as a Schedule 1 drug. Specifically, the Farm Bill (which went into effect on January 1, 2019) separated the definition of hemp from that of marijuana and defined hemp as the plant Cannabis sativa L. and any part of that plant, including the seeds thereof and all derivatives, extracts, cannabinoids, isomers, acids, salts, and salts of isomers, whether growing or not with a delta-9 tetrahydrocannabinol concentration of not more than 0.3% on a dry weight basis. As a result, the cultivation of the hemp plant was no longer considered illegal under U.S. federal statutes, though individual states are still able to regulate hemp.

However, on August 20, 2020, the **Drug Enforcement Agency** (DEA) issued an **interim final ruling** (IFR), which implemented the conforming changes to DEA's regulations as a result of the Agricultural Improvement Act of 2018 (aka the 2018 Farm Bill). **The IFR classified any hemp derivative or hemp oil that contains more than 0.3% THC as marijuana**, that is, an illegal schedule I substance under the Controlled Substances Act. In early October, a hemp trade association and a hemp company challenged the U.S. DEA IFR by filing a petition in the U.S. Court of Appeals in the District of Columbia, citing that the 2018 Farm Bill created a legal distinction between hemp and marijuana.

Hemp Initiative - 2020

After the branded product's debut at the American Seed Trade Association CSS & Seed Expo in mid-December, the company received over $3.7 million worth of orders for early adopter farmer trials in the spring planting season (April/May). Demand was aided the regulatory mandate from the USDA requiring "hot" crops (those that exceed 0.3% THC) be destroyed. In 2019, approximately 20% of U.S. hemp crops (50,000 acres of 230,000 acres planted worth roughly $2 billion)[i] were deemed non-compliant.

However, the COVID-19 pandemic delayed the conversion of $3.7 million GoodHemp backlog. Though the Farm Bill of 2018 legalized hemp, the **FDA was given regulatory oversight** over the use of hemp and its extracts, to be exact CBD. As the CBD market furiously ramps up, many companies made clinically unsubstantiated claims and grossly mislabeled their CBD products. In response, **the FDA issued warning letters**, and subsequently, the demand for hemp and hemp-derived CBD diminished significantly.

Currently, with the DEA having classified any hemp derivative or hemp oil with more than 0.3% THC in any part of the growing, harvesting or processing stages as marijuana, growers are hesitant. **The industry awaits regulatory clarification**, most likely through the verdict in the court challenge of the DEA's IFR.

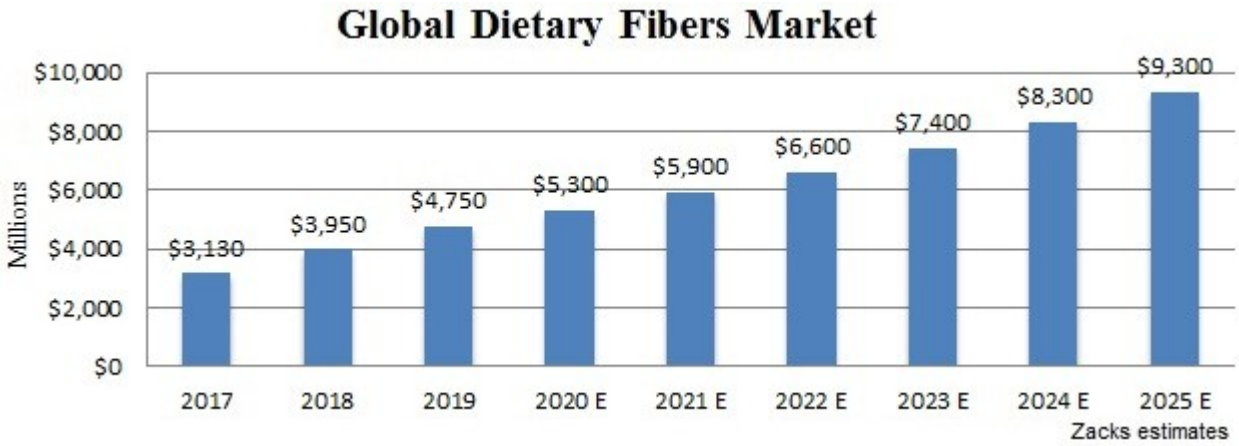
GOODWHEAT™

One of the company's flagship proprietary product programs is the **GoodWheat brand**, which is comprised of non-genetically modified (non-GM) varieties of wheat with enhanced attributes. Management is committed to expanding the GoodWheat platform and accelerating its commercialization. Over the last few years, Arcadia Biosciences has introduced several varieties of GoodWheat and entered into strategic collaborations with millers to advance the distribution of consumer products made with GoodWheat.

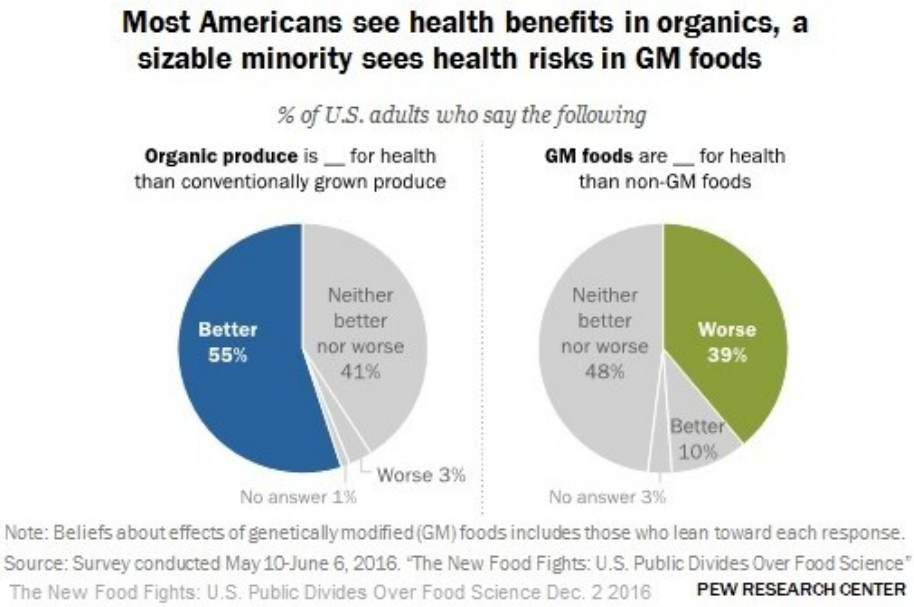
GoodWheat resistant starch contains very high levels (up to 94%) of amylose. This significant value-added trait **delivers high dietary fiber content**, which can promote gastrointestinal health and relieve obesity-related health conditions. Concurrently, Arcadia reported that GoodWheat resistant starch delivers the high levels of dietary fiber which meet the U.S. Food and Drug Administration's (FDA) threshold for the designations of "**good source of fiber**" and "**high in fiber**" on consumer packaging, increasingly important attributes desired by both consumers and food companies.

The average American's daily diet includes approximately 500 calories from wheat products, which is equal to roughly 25% of the FDA's total recommended caloric intake for women and 20% for men. Consumers are placing increased importance on fiber-rich grain foods as they are becoming increasingly aware of the overall health benefits of resistant starch, including weight loss. These consumer preferences are helping to accelerate demand growth of resistant starch products in general and to expand the size of the potential market for the GoodWheat brand in particular. According to Mordor Intelligence, the global food fiber market is estimated to expand at a 9% CAGR over the forecast period (2019 - 2024) to nearly $88 billion in 2024.[ii] The addressable U.S. market for GoodWheat is estimated to be as much as $9.7 billion.

High fiber GoodWheat resistant starch, with its high levels of amylose resistant starch, increases the total dietary fiber content without the need for the addition of fiber additives. According to MarketsandMarkets, the **global dietary fibers market** is projected to reach $9.6 billion by 2025, up from an estimated $5.3 billion in 2020[iii] (12.5% CAGR) due to increased demand for plant-sourced fiber products and supplements that stems from the growth in health concerns and gastrointestinal disorders, along with an increasing vegan population.[iv] Our estimate growth rate is slightly more conservative at an 11.3% CAGR.



In addition, non-genetically modified (non-GM) foods have other inherent advantages over their genetically modified counterparts. According to the Pew Research Center, GM foods are being viewed negatively by a sizable minority with 39% of Americans believing that GM foods are less healthy than regular foods.[v]



The same study indicates that a majority of U.S. consumers believe that organic foods are more health than conventionally grown produce. As a result, the growth of organic foods is significantly outpacing that of non-organic foods. According to the Organic Trade Association's 2020 Organic Industry Survey (released in June 202-), organic food sales continue to outpace the general market, with sales increasing 4.6% in 2019 compared to only 2.3% for total food sales.[vi] Foods labeled as organic cannot contain GM products. This mega-trend of increasing demand for organic foods is another catalyst for the GoodWheat portfolio.

U.S. Organic Food vs. Total Food Sales, Growth & Penetration, 2010–2019

CATEGORY	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Organic Food	22,961	25,148	27,965	31,378	35,099	39,006	42,507	45,209	47,862	50,065
Growth (%)	8.0%	9.5%	11.2%	12.2%	11.9%	11.1%	9.0%	6.4%	5.9%	4.6%
Total Food	677,354	713,985	740,450	760,486	787,575	807,998	812,907	822,160	840,972	860,583
Growth (%)	1.2%	5.4%	3.7%	2.7%	3.6%	2.6%	0.6%	1.1%	2.3%	2.3%
Organic (as % Total)	**3.4%**	**3.5%**	**3.8%**	**4.1%**	**4.5%**	**4.8%**	**5.2%**	**5.5%**	**5.7%**	**5.8%**

Source: Organic Trade Association's 2020 Organic Industry Survey conducted 2/7/2020–3/27/2020 ($mil, consumer sales).

Furthermore, non-GM foods are, in general, less costly to prepare and, in the U.S., require less time-consuming regulatory oversight. Some markets in Europe and Asia have banned GMO foods.

Arcadia Biosciences markets its GoodWheat line of products through demonstrations and sampling of pasta, waffles and desserts, such as at the International Baking Industry Exposition that was held from September 7 to 11, 2019 in Las Vegas.

GoodWheat variety milestones

- March 2018 - GoodWheat **resistant starch** achieves up to 94% of amylose
- April 2018 - introduced GoodWheat **reduced gluten** (overall gluten content reduced of 60%)
- October 2018 - GoodWheat **extended shelf life** wheat granted U.S. Patent No. 10,087,455
- November 2018 - harvest on almost 230 acres of GoodWheat **resistant starch** & 1st field production **reduced gluten**
- 2019 - GoodWheat **resistant starch** introduced
- 2019 - GoodWheat **reduced gluten** introduced
- November 2019 - harvest of GoodWheat varieties on 2,300 acres in ID, MT, ND, OR & AZ
- December 2019 - limited release of **reduced gluten** GoodWheat flour
- May 2020 - GoodWheat **extended shelf life** & **and reduced gluten** granted additional two U.S. patents for extending the shelf life of whole wheat to more than 10 months
- June 2020 - **foundational patent** covering Arcadia's herbicide tolerant wheat technology granted in both the U.S. and Australia



GoodWheat website: eatgoodwheat.com



Photo: Arcadia Biosciences, Inc.

During 2019, Arcadia scaled up production of GoodWheat wheat varieties, harvesting winter and summer **trials planted on more than 2,300 acres** in key wheat growing areas. The crops supplied Arcadia with a sufficient material to meet the company's grain and seed supply needs to attain management's targets for 2020 sales. **In the fourth quarter of 2019, Arcadia delivered its first seed sales to Bay State Milling** for the counter-season planting. However, harsh weather and an increase in disease across the upper Midwest reduced the initial sale by approximately $250,000. Nevertheless, on February 18, 2020, **Bay State Milling announced the construction of a new 1 million bushel, grain storage elevator** at its Tolleson Arizona location in order to support the go-to-market plan for the rollout of Arcadia's high fiber GoodWheat under the HealthSense brand.

In December, Arcadia rolled out a **limited release of reduced gluten GoodWheat flour**; the limited supply sold out by the end of January. Since early December, five new consumer packaged goods (CPG) companies have begun evaluating GoodWheat in beer, pasta and bread products. Announcements concerning of the use of GoodWheat varieties by specific consumer food companies in 2020 would give confidence that management's revenue expectations would be achieved this year.

During 2020, management expects commercial sales of high fiber GoodWheat (both resistant starch and reduced gluten) to scale up as the company continues to build partnerships across the wheat value chain and work with multiple public breeding platforms. This effort has been bolstered by GoodWheat resistant starch having met the FDA's requirement for the designations of "high in fiber" and "good source of fiber."

According to the company's newsletter, The Messenger, growing conditions for GoodWheat varieties in the field are very good with the harvest in the southern U.S. expected in the May-June range. The spring planting in the northern U.S. is on schedule. As of April, 70% of the contracted acres planted.

GoodWheat Strategic Collaborations

A global commercial agreement among Arcadia Biosciences, Arista Cereal Technologies and Bay State Milling was formalized in December 2019. The milestone event provided the infrastructure basis towards commercializing high fiber GoodWheat resistant starch in North America, Europe and Australia. The agreement secures go-to-market pathway for high fiber GoodWheat to enter the North American market under Bay State's HealthSense™ branded flour. An initial purchase commitment was secured from Bay State Milling for bread wheat for delivery in 2020.

- November 2018 - collaboration with **Ardent Mills** to develop and commercialize GoodWheat varieties
- August 2019 - binding term sheet agreement with **Arista Cereal Technologies** resolved patent dispute
- December 2019 - **Bay State Milling** becomes exclusive North American commercial partner for high-fiber bread GoodWheat under Bay State Milling's HealthSense™ flour brand
- August 2020 - term sheet to collaborate with **Corner Foods** to bring GoodWheat to Asia via e-commerce portal and later to Israel
- August 2020 - term sheet to form a strategic business venture with **Three Farm Daughters**, an emerging company, planning to develop and market GoodWheat products in the U.S.
- August 2020 - collaboration with **GoodMills Innovation** with the capabilities to spark distribution across seven European countries



Product logos from Arcadia's Biosciences presentations & press releases

Collaboration with Ardent Mills - 2018

On November 6, 2018, Arcadia Biosciences announced a **collaboration with Ardent Mills** LLC, a leading North American flour-milling and grain-based ingredient company with over 35 community flour mills and mixing facilities in the U.S., Canada and Puerto Rico. The relationship is focused on advancing the development and commercialization of innovative wheat varieties, initially on Arcadia's extended shelf life and flavor improvement programs that utilize the company's proprietary non-GM wheat genetic diversity TILLING library. Arcadia's trait technology can **extend the storage life of whole wheat flour** by slowing enzymatic processes; the slower oxidation concurrently **diminishes the bitterness** associated with many whole wheat products, thereby improving the taste of the resultant consumer products.

Collaboration between Arcadia, Arista Cereal Technologies and Bay State Milling - 2019

In August 2019, Arcadia entered into a binding term sheet with Bay State Milling Company and Arista Cereal Technologies in order to resolve a patent dispute. Later, the relationship was formalized in December 2019, when a global collaboration agreement was signed. Arista Cereal Technologies (a joint venture company formed by the French farmer cooperative Limagrain and Australia's Commonwealth Scientific and Industrial Research Organization), received the exclusive rights of Arcadia's high fiber wheat IP (intellectual property) in Australia and Europe, while **Bay State Milling Company** became Arcadia's **exclusive commercial partner for high fiber GoodWheat in North America**. Bay State, which strategically is emphasizing distinctive plant-based ingredients for the next generation of sustainable and healthful foods, will utilize high-amylose GoodWheat under in its branded **HealthSense™ flour**.

GoodMills Innovation GmbH - 2020

On August 12, 2020, Arcadia Biosciences entered into a collaborative effort with **GoodMills Innovation GmbH**. The relationship has the potential for Arcadia's portfolio of specialty wheats to address a large swath of Europe's flour market for higher fiber, less calorie, reduced allergenicity and extended shelf life wheat products. GoodMills has innovation skills in the realms of functional and nutritional specialty flours and the logistical pathway for commercialization of wheat products across seven European nations.

GoodMills Innovation is an affiliate of Palsgaard, an ingredients manufacturer, and GoodMills Group GmbH, Europe's largest flour producer which processes approximately 2.9 million tonnes of grain annually. With 25 flour mills, GoodMills Group serves the industrial flour needs for major leading brands in Austria, Germany, the Czech Republic, Poland, Hungary, Romania and Bulgaria.

Three Farm Daughters

On August 9, 2020, the company formed a strategic business venture with Three Farm Daughters, LLLP. Based in North Dakota, Three Farm Daughters is an emerging company focused on developing and marketing food products that utilize Arcadia's non-GMO GoodWheat. Arcadia Biosciences and Three Farm Daughters ultimately will develop a branded line of food products based on GoodWheat ingredients, e.g. flours, pastas, noodles, crackers etc.



Arcadia Biosciences Presentation September 2020

The sisters' parents have grown GoodWheat over the last two years on the family farm. In their diets, they have experienced first-hand the quality and taste of nutritional food made with healthier GoodWheat ingredients. Varieties of GoodWheat can "contain up to 10 times the dietary fiber of traditional wheat, up to 65 percent less allergenic gluten, and nearly 30 percent fewer calories per serving than traditional wheat."[vii]

The sisters developed their first healthy food products. Three Farm Daughters launch its initial products, **refined, non-enriched wheat flour**, **linguine**, **fusilli** and **fettuccine** in October 2020 and markets them online on their website: www.threefarmdaughters.com. The products are also slated to be sold through **Hugo's Family Marketplace** (a regional, family-owned supermarket grocery chain serving North Dakota and Minnesota). Eventually, Farm Daughters products are expected to be sold on Amazon.

Corner Foods

On August 6, 2020, Arcadia Biosciences announced a collaborative effort with Corner Foods to develop a growth direct- to-consumer initiative **via two digital platforms in Asia**: TMall (tmall.com) and Tastemade China (tastemade.com). Corner Foods is an affiliate of Corner Capital Group, which has offices in Tokyo, Taipei, San Francisco, New York and Tel Aviv.

Once a definitive agreement is signed, **Tastemade China**, a cooking and lifestyle network, plans to post food video content that will introduce its viewers to GoodWheat flours, pastas and specialty baking mixes. **TMall** is a Beijing-registered e-commerce website, which provides many consumer items, from clothing to wheat flour. Combined, TMall and Tastemade China have an estimated eight million viewers per month. Corner Foods also has a presence in Israel; therefore, Arcadia Biosciences and Corner Foods have plans to introduce GoodWheat products into the food retail and foodservice markets in Israel.

SONOVA® GLA SAFFLOWER OIL

SONOVA GLA safflower oil was developed under a licensing agreement with Abbott Laboratories (NYSE: ABT). The primary active component of SONOVA GLA is gamma-linolenic acid (GLA), which is an omega-6 fatty acid found in a very few plant-based oils (e.g. borage, evening primrose, black currant, and safflower). **SONOVA GLA contains the highest concentration of GLA (65%)** compared to other conventional plant oils that only contain between 10% and 22%. Clinical evidence indicates that **GLA has proven anti-inflammatory, skin health and anti-aging benefits** in humans[viii] and also in dogs and cats.

Acadia contracts farmers in Idaho to produce GLA safflower and then contracts a manufacturer in California to process the seed into refined oil. Acadia sells its branded SONOVA GLA safflower oil in the United States in multiple concentrations (40%-65%) and formulations, primarily to manufacturers of dietary supplements, nutritional supplements, medical foods and dog food. Acadia Biosciences continues to receive interest from additional potential customers that are looking to incorporate SONOVA GLA safflower oil into their products.

Over the long term, sales of SONOVA GLA are expected to increase in the mid-to-single digit range. However, management does not view SONOVA GLA oil as a large growth opportunity, but rather sees blue sky growth potential in hemp, non-GM wheat and drought tolerant soybeans. Yet, **the company's innovation and development processes that brought SONOVA GLA safflower to market demonstrates that Arcadia has the technological, regulatory and commercialization abilities to advance GoodHemp, GoodWheat and HB4 soybeans**. Acadia Biosciences developed and commercialized SONOVA GLA safflower oil in less than six years.

Development & Commercialization Timeline of SONOVA GLA Safflower Oil

2003	began development of trait under a research & commercial agreement with Abbott Labs
Nov. 2005	research achieved 35% GLA in the oil from safflower seeds
April 2006	research achieved 65% GLA in the oil from safflower seeds
Dec. 2009	received FDA approval of SONOVA 400 GLA for use as a human dietary supplement

Oct. 2010	commercially introduced SONOVA 400 GLA safflower oil (40% GLA)
June 2014	commercially introduced Sonova Ultra GLA safflower oil (55% GLA)
Jan. 2017	FDA grants GRAS petition (generally recognized as safe) for use of SONOVA GLA in medical foods and nutritional beverages
Aug. 2017	FDA approved the use (safe and nutritious) of SONOVA GLA in dog diets
Feb. 2019	FDA approved the use of SONOVA GLA in cat food

HB4® SOYBEANS

In February 2012, Arcadia Biosciences partnered with Bioceres Crop Solutions Corp. (NYSE: BIOX) to form **Verdeca LLC**, a U.S.-based 50/50 joint venture company. On November 12, 2020, Bioceres Crop Solutions agreed to acquire the remaining 50% ownership interest in the Verdeca joint venture from Arcadia Biosciences, as well as the Intellectual Property assets related to soybean for Latin America, for **$20.0 million** consisting of $6.0 million in cash and 1,875,000 shares of Bioceres (NYSE: BIOX). In addition, Arcadia will receive **$2.0 million** upon Verdeca obtaining regulatory import clearance for HB4 soybeans from China. In addition, Bioceres will pay 6% royalty payments of the net HB4® soybean technology revenues realized by Verdeca up to a maximum of $10 million.

Bioceres/Verdeca is focused on the development and deregulation of **genetically modified (GM) drought tolerant soybeans**. The JV's flagship product is HB4 drought tolerant soybeans stacked with herbicide tolerant traits, which provide a yield advantage over conventional soybeans when grown under the same suboptimal conditions. These proprietary, genetically modified soybeans have successfully **undergone extensive validation and regulatory field trials**, which were completed at multiple locations in Argentina and the United States. Importantly, field trials in 2018 were conducted during drought conditions, which especially demonstrated the benefits of the HB4 drought tolerant trait, validating HB4's value proposition.

HB4 Stress Tolerant Soybean Field Trial



Arcadia Biosciences Investor Presentation December 2016

Bioceres Crop Solutions is an Argentinian-based, fully-integrated provider of crop productivity solutions, including seeds, seed traits, seed treatments, high-value adjuvants and fertilizers. Not only does Bioceres hold a desirable trait portfolio, but also Bioceres is **headquartered in Argentina**. The demand for HB4 soybeans may be the greatest in certain places of the world that are prone to arid growing seasons, such as specific regions of South America, particularly Argentina, the third largest soybean exporter in the world. Together, Argentina and Brazil produce over 45% of the world's

soybeans; Verdeca has received regulatory approvals for HB4 in both of these South American countries.

The Verdeca JV advanced the HB4 drought tolerant trait stacked with herbicide tolerant traits, having **received regulatory approvals for the traits and for commercialization (planting and harvesting) in Argentina, the United States, Brazil and Paraguay**, which together account for over 80% of global soybean production.

China would be a meaningful market for South American soybean producers if import approval is granted. The growing middle class population in China has increased demand for soybeans as an affordable protein source. In addition, the recent trade was between the U.S. and China has prompted China to seek alternative sources in order to reduce its dependence on U.S. soybean exports. Import approval was sought from China in 2017. The application continues to be under review, and management is hopeful that the approval may be obtained in late 2020. If import approval is received from China, Arcadia Biosciences would receive **$2.0 million** upon the regulatory import clearance, and **potentially up to $10 million in royalties**.

HB4® Soybean Regulatory Approvals

In order to plant, harvest and sell HB4 soybean products, regulatory approvals are required for food safety and commercialization. In addition, for international commerce, an import approval is required in the country to which the soybean product will be consumed. **The Verdeca JV has advanced the HB4 drought tolerant trait stacked with herbicide tolerant traits through the regulatory submission and approval in Argentina, the United States, Brazil and Paraguay**. The HB4 drought tolerant and herbicide tolerant traits now has **regulatory approval in over 80% of the soybean market worldwide**. Regulatory studies are under way in Europe.

Argentina

- October 2015 – received regulatory approval from Argentina's Ministry of Agriculture, Livestock and Fisheries for HB4 stress tolerance trait
- October 2018 - received approval from Argentina's Secretariat of Food and Bioeconomy for HB4 soybeans with drought tolerant trait stacked with herbicide tolerant traits

United States

- August 2015 – U.S. Food and Drug Administration (FDA) completes the Early Food Safety Evaluation process for HB4 stress tolerance trait
- August 2017 - received U.S. Food and Drug Administration (FDA) approval of HB4 drought tolerant soybeans for commercial use in human food and animal feed
- August 2019 - received U.S. Department of Agriculture (USDA) approval for commercialization (planting and harvesting) of HB4 soybeans (for both tolerant and herbicide tolerant traits)
    - Verdeca may now begin evaluating potential U.S. germplasm partners for the HB4 trait

Brazil

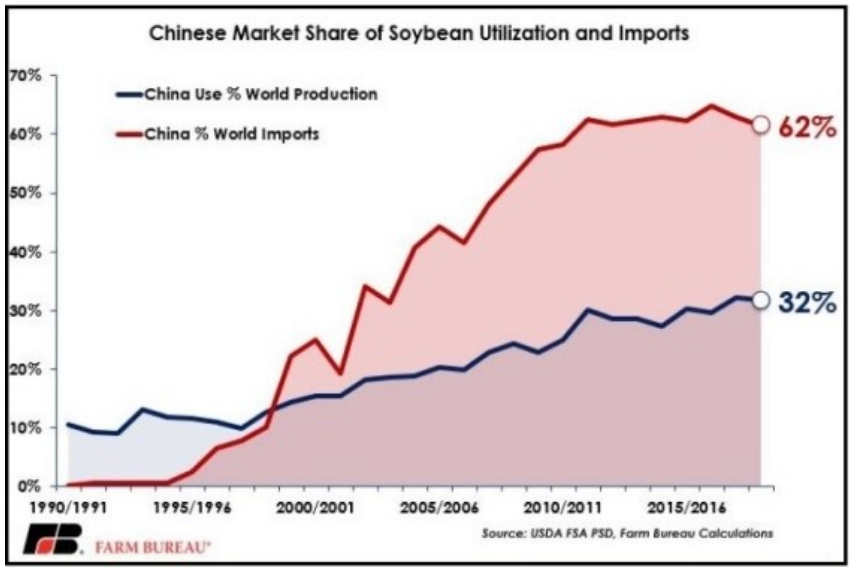
- July 2015 - announced a collaboration with Tropical Melhoramento e Genética Ltda. (TMG), a Brazilian soybean and cotton breeding company, to help develop and commercialize HB4 soybeans with stress tolerance trait in Brazil
- May 2019 - received approval from Brazil's National Technical Commission of Biosafety for commercialization (planting and harvesting) of HB4 soybeans (for both drought tolerant and herbicide tolerant traits)

Paraguay – soybean crop grown on over 3.5 million hectares

- November 2019 - received approval from the Paraguayan Minister of Agriculture (via the National Commission for Agricultural and Forestry Biosafety) for commercialization (planting and harvesting) of HB4 soybeans (for both drought tolerant and herbicide tolerant traits)

The **most recent HB4 soybean crop** (harvested in May 2020) was **planted on 3,000 hectares** to build an inventory of seed for the next cycle. After the harvest of the HB4 soybean seed crop, Arcadia Biosciences has a sufficient to seed supply for 90,000 acres of soybean production.

Regulatory applications have also been submitted and are under consideration in Bolivia and Uruguay. **Import applications are under review in China**, Canada, Bolivia and Uruguay. Management expects that an application for regulatory approval in the European Union will be submitted later in 2020.



China is both the leading consumer and importer of soybeans, accounting for roughly one-third of global consumption and 62% of world imports in 2017.[ix] Once import approval is secured in China, Arcadia's management anticipates commercial production in Argentina will scale-up rapidly in order to launch an export program of HB4 soybeans to China.



Expoagro

Source: Expoagro Commercial Brochure

Argentinian Trade Show - Expoagro

In March of the last two years (2019 and 2020), Verdeca has showcased HB4 drought tolerant soybeans at **Expoagro**, Argentina's largest farm show, which is attended by over 150,000 attendees. During the exposition, Verdeca recruited South American growers to adopt HB4 soybean varieties for the upcoming growing season.



Verdeca

Pavilion at Expoagro

March 2019

Arcadia Biosciences Presentation May 2019

FINANCINGS

Initial Public Offering in 2015

Arcadia Biosciences completed its Initial Public Offering (IPO) on May 14, 2015. 8,200,000 common shares were offered at $8.00 per share, which provided **net proceeds of $61,008,000**. Credit Suisse, J.P. Morgan and Piper Jaffray were the underwriters of the offering. Since the IPO, a reverse 1-20 stock split occurred on January 23, 2018.

Financings in 2016 and 2017

No financings were necessary in 2016 and 2017.

Financings in 2018

During 2018, Arcadia closed a private placement of 1,201,634 shares of common stock and 1,282,832 warrants in May and a direct offering of 1,392,345 common stock at a purchase price of $9.93 and warrants in June for **net proceeds of approximately $21.3 million**. On May 11, 2018, Arcadia filed a shelf Registration Statement (Form S-3), which allows for the sale of $50 million worth of common stock, preferred stock, warrants and/o units from time to time up.

Financings in 2019

On June 12, 2019, Arcadia closed a registered direct offering (through a shelf registration) of 1,489,575 shares of common stock at $4.91 per share for gross proceeds of approximately $7.31 million. In a concurrent private placement, Arcadia issued 1,489,575 unregistered 5 ½-year warrants (exercisable into 1,489,575 common shares at a price of $5.00 per share) at a price of $0.125 per warrant for gross proceeds of approximately $186,000. **Net proceeds from issuance of common stock and warrants were approximately $6.88 million.** H.C. Wainwright & Co. was the exclusive placement agent for the offering. The net proceeds are intended for general corporate purposes and to pursue growth opportunities, which may include hemp germplasm acquisition, breeding and research activities and the scale-up of GoodWheat as well as for general and administrative expenses.

Around the first week in September 2019, the company **received approximately $5.269 million from the exercise of warrants** from prior financings.

On September 5, 2019**,** Arcadia Biosciences closed a registered direct offering (through a shelf registration) of 1,318,828 common shares $7.52 per share for gross proceeds of approximately $9.92 million. In a concurrent private placement, Arcadia issued 5 ½-year unregistered warrants (exercisable into 659,414 common shares at a price of $7.52 per share) at a price of $0.125 per warrant for gross proceeds of approximately $82,000. **Net proceeds from issuance of common stock and warrants were approximately $9.22 million.** H.C. Wainwright & Co. was the exclusive placement agent for the offering.

Financings in 2020

On April 16, 2020, Arcadia Biosciences entered into a 2-year, 1% unsecured note in the amount of $1,107,700 under the **Paycheck Protection Program** (PPP), which was established under the Coronavirus Aid, Relief, and Economic Security Act (CARES Act). Since the proceeds of the note will be used for payroll costs, mortgage interest, rent and utilities, management anticipates applying for forgiveness of the loan granted under the PPP. The lender is MidFirst Bank.

On May 18, 2020, several accredited investors exercised June 2018 warrants, purchasing 1,392,345 shares at a reduced exercise price of $4.90 per share. In consideration for the exercise of the June 2018 warrants, Arcadia Biosciences issued 1,392,345 new unregistered 5-year warrants (May 2020 warrants) exercisable at $4.775 per share. **Net proceeds were approximately $6.23 million**, which management intends to direct **toward acquisitions within the hemp industry**.

On June 26, 2020, Arcadia Biosciences executed a 3-year **$2,000,000 secured promissory note** with the MidFirst Bank at a floating rate of either 3.25% or at rate based off of LIBOR, whichever is higher.

On July 8, 2020**,** an institutional investor exercised 641,416 existing warrants at a reduced exercise price of $3.975 per share. In consideration for the exercise of the warrants, Arcadia issued 641,416 new unregistered 5½ -year warrants exercisable at 3.85 per share. **Gross proceeds were approximately $2.55 million**. **Net proceeds are intended for the scale up of HB4® soybean inventories** by providing funding to expand the amount of acreage for the next crop cycle. H.C. Wainwright & Co. acted as exclusive placement agent for the offering.

VALUATION

For Arcadia Biosciences, a reasonable methodology is a discounted cash flow (DCF) model that estimates future cash flows and discounts them by using the cost of capital in order to attain a net present value. Arcadia's revenues for 2020 are being estimated using management's guidance while revenues in the out-years are being projected by industry forecasts and our estimates of the company's market share. The model is arranged by products lines, namely GoodHemp, GoodWheat, HB4 soybeans and SONOVA GLA.

Other assumptions relate to the cash costs, R&D expenses and the tax rate. To account for economies of scale, the company's gross margin increases as the top-line grows; therefore, cash costs as a percentage of sales are assumed to decline over time. R&D expenses are expected to increase at an 8% annual rate as the company continues to invest in new and ongoing genetic programs. The tax rate is anticipated to rise slowly until the current full corporate tax rate of 21% is attained.

The discount rate for large cap publicly-traded equities is usually in the 5%-to-10% range; however, for small cap companies, the discount rate is generally in the 12%-to-15% range due to a higher level of business risk. Since the outlook for Arcadia Biosciences is very positive with the company expected to generate meaningful sales over the next few quarters, we are using a discount rate of 12.5% in the DCF model.

The terminal value is calculated by multiplying the projected sales level in year ten by the estimated terminal price-to-sales ratio (P/S) of 0.35, which is the average P/S ratio of a large agricultural products company.

It is well known that the results of DCF models are highly sensitive to the input assumptions. As the company reports subsequent quarters, the DCF model will be updated so that it accurately dovetails with reported financial results.

Our **DCF model values Arcadia Biosciences at $10.00 per share** on a fully diluted basis.

Arcadia BioSciences, Inc.

DCF Model

	2021	2022	2023	2024	2025	2026
Revenues	9,055,000	18,648,256	25,659,531	33,376,558	42,496,001	57,993,727
Cash costs	18,000,000	27,745,846	24,665,276	27,076,800	30,225,366	38,348,469
R&D costs	7,095,000	7,662,600	8,275,608	8,937,657	9,652,669	10,424,883
Tax rate	0.0%	5.0%	10.0%	12.0%	15.0%	21.0%
Free Cash Flow after R&D costs	(16,040,000)	(15,922,180)	(6,553,218)	(2,321,351)	2,225,271	7,284,097

Discount Rate	12.5%	
NPV	104,397,398	
Terminal Value	27,571,722	
Cash From Warrant Exercise	6,817,022	
Cash From Warrant Exercise	19,226,976	
Probability	95%	
Total Sum of Parts	150,112,462	
Debt	2,548,000	3Q:2020
Cash	10,202,000	3Q:2020
Current Shares	10,832,203	
Warrant/ Option Shares	4,942,183	3Q:2020
Diluted Shares	15,774,386	3Q:2020

Total NPV	157,766,462
Share Price	$10.00

Product line assumptions rely on an average of publicly-available market forecasts.

GoodHemp CBD products: The 2021 addressable market size is estimated to be approximately $1.4 billion. We forecast a rapid increase to $5.7 billion by 2025, with growth primarily being driven by deregulation and an increasing level of demand for CBD health and wellness products. We model a 0.48% market penetration by 2025 with growth driven by the company's aggressive go-to-market plan that involves both increasing hemp production and broadening the company's distribution footprint.

GoodWheat: The initial addressable market size in 2021 is estimated to be approximately $8.0 billion, which is forecasted to increase at a CAGR of 11% to about $15 billion by 2026, with growth being driven by increasing demand for low-gluten, resistant starch products. We are modeling only a 0.02% market penetration in 2020, ramping up to 0.124% in 2026 as production increases and partnerships result in branded GoodWheat products being marketed under the company's brand strategy.

HB4 Soybeans: The estimated soybean market is huge with an estimated size of $150 billion in 2021. The addressable drought resistant soybean market is estimated to be around 16%-to-17% of the global market or approximately $25 billion. The addressable market is expected to increase at a 5% CAGR to about $33.5 billion in 2026. We model an initial 2021 market share of 0.004%, followed by a ramp up to 0.036% share in 2026, with the growth contingent on China permitting the importation GoodWheat from Argentina and Brazil.

SONOVA GLA Oils: The addressable market is estimated to be approximately $70 million in 2021 and forecasted to increase at a 2.5% CAGR to roughly $81 million by 2026. Market penetration in 2021 is expected to be about 4.25%. The product line is growing modestly, indicating a moderate rate of increasing market share. While SONOVA GLA is not a high growth segment, there is value in the product line and the underlying genetic technology.

Arcadia Biosciences, Inc.

Markets ($000)	2021	2022	2023	2024	2025	2026	2027
GoodHemp	1,400,000	2,660,000	3,990,000	4,788,000	5,745,600	7,756,560	10,471,356
GoodWheat	8,000,000	8,880,000	9,856,800	10,941,048	12,144,563	13,480,465	14,963,316
HB4 Soybeans	25,000,000	26,250,000	27,562,500	28,940,625	30,387,656	31,907,039	33,502,391
SONOVA GLA	70,000	71,750	73,544	75,382	77,267	79,199	81,179
Market Penetration	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
GoodHemp	0.400%	0.421%	0.442%	0.463%	0.484%	0.505%	0.526%
GoodWheat	0.006%	0.026%	0.046%	0.066%	0.086%	0.106%	0.126%
HB4 Soybeans	0.000%	0.004%	0.011%	0.028%	0.030%	0.033%	0.036%
SONOVA GLA	4.25%	4.38%	4.51%	4.64%	4.78%	4.93%	5.07%
Revenues ($000)	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
GoodHemp	5,600	11,199	17,636	22,168	27,809	39,171	55,079
GoodWheat	480	2,309	4,534	7,221	10,444	14,289	18,854
HB4 Soybeans	0	2,000	174	486	547	632	724
SONOVA GLA	2,975	3,141	3,316	3,501	3,696	3,902	4,120
Total	**$9,055**	**$18,648**	**$25,660**	**$33,377**	**$42,496**	**$57,994**	**$78,776**

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RISKS

- Arcadia has funded operations primarily with the net proceeds from the initial public offering in 2015, private placements and stock offerings in 2018 and 2019, the exercise of warrants in 2020 and operating revenues and grants (particularly in 2015 and 2016). Funds are still necessary to commercialize the company's efforts toward developing hemp, wheat and soy initiatives. Existing cash and short-term investments are not be sufficient to meet the company's anticipated cash requirements over the next year, which will require the company to access the capital markets for continues fund. Thus far, management has been able to effectively fund the company's operations and initiatives to date.
- Shares outstanding increased dramatically in 2018 (+124%) and 2019 (+81%) as private placements and stock offerings funded the company's activities. Additional capital raises are expected despite the current impressive ramp up in hemp revenues. Considerable investments are still required to continue the R&D in hemp, wheat and soybeans.
- There are inherent risks related to the hemp industry. United States Federal and state laws (and regulations) are broad in scope and subject to interpretation. Any restrictions or requirements on hemp may negatively impact the company's operations and prospects. For example, currently, if Arcadia produced a "hot crop" (i.e. exceeds 0.3% THC), Arcadia must bear the costs of destroying the crop by a person authorized under the CSA to handle marijuana.
- As an agricultural biotechnology company, research and development expenses, operating costs and unexpected write-offs may impede the company from attaining profitability.

BALANCE SHEET

Arcadia Biosciences, Inc. (In thousands)	Year 12/31/2016	Year 12/31/2017	Year 12/31/2018	Year 12/31/2019	3Q 2020 9/30/2020
ASSETS					
Cash and cash equivalents	2,013	9,125	11,998	8,417	10,201
Short-term investments	48,547	3,898	9,825	16,915	0
Accounts receivable	349	1,231	165	602	373
Unbilled revenue	184	4	3	0	0
Inventories, net	252	229	181	1,794	9,416
Prepaid expenses	877	560	704	712	1,204
Total current assets	**52,222**	**15,047**	**22,876**	**28,440**	**21,194**
Restricted cash	-	-	-	-	2,001
Property and equipment, net	508	299	395	1,799	3,484
Right of use asset	-	-	-	1,963	6,013
Inventories, net — noncurrent	1,327	1,168	746	364	461
Goodwill	-	-	-	-	301
Intangible assets	-	-	-	-	400
Long-term investments	2,498	0	0	0	0
Other noncurrent assets	19	56	7	8	23
TOTAL ASSETS	**56,574**	**16,570**	**24,024**	**32,574**	**33,877**
LIABILITIES AND STOCKHOLDERS' EQUITY					
Accounts payable and accrued expenses	2,359	2,496	2,645	4,685	6,711
Amounts due to related parties	30	29	29	40	29
Notes payable	-	-	-	24	705
Unearned revenue — current	740	1,000	96	42	0
Operating lease liability - current	-	-	-	611	700
Other current liabilities	0	0	284	306	263
Total current liabilities	**3,129**	**3,525**	**3,054**	**5,708**	**8,408**
Notes payable - noncurrent	25,127	-	-	107	2,548
Operating lease liability - noncurrent	-	-	-	1,497	5,574
Unearned revenue — noncurrent	3,120	2,038	-	-	-
Common stock warrant liabilities	-	-	5,083	14,936	3,065
Other noncurrent liabilities	3,000	3,000	3,072	2,000	2,280
Total Liabilities	**34,376**	**8,563**	**11,209**	**24,248**	**21,875**
Stockholders' Equity					
Common stock	44	42	45	49	51
Additional paid-in capital	173,723	175,223	191,136	214,826	231,954
Accumulated other comprehensive income	(19)	(1)	0	1	0
Accumulated deficit	(151,550)	(167,257)	(178,366)	(207,171)	(220,725)
Total Arcadia Biosciences stockholders' equity	**22,198**	**8,007**	**12,815**	**7,705**	**11,280**
Non-controlling interest			-	621	722
Total shareholder's equity	**22,198**	**8,007**	**12,815**	**8,326**	**12,002**
TOTAL LIABILITIES & STOCKHOLDERS' EQUITY	**56,574**	**16,570**	**24,024**	**32,574**	**33,877**
Shares outstanding	2,224,384	2,134,154	4,774,919	8,646,149	10,832,203

Arcadia Biosciences, Inc.

Income Statement

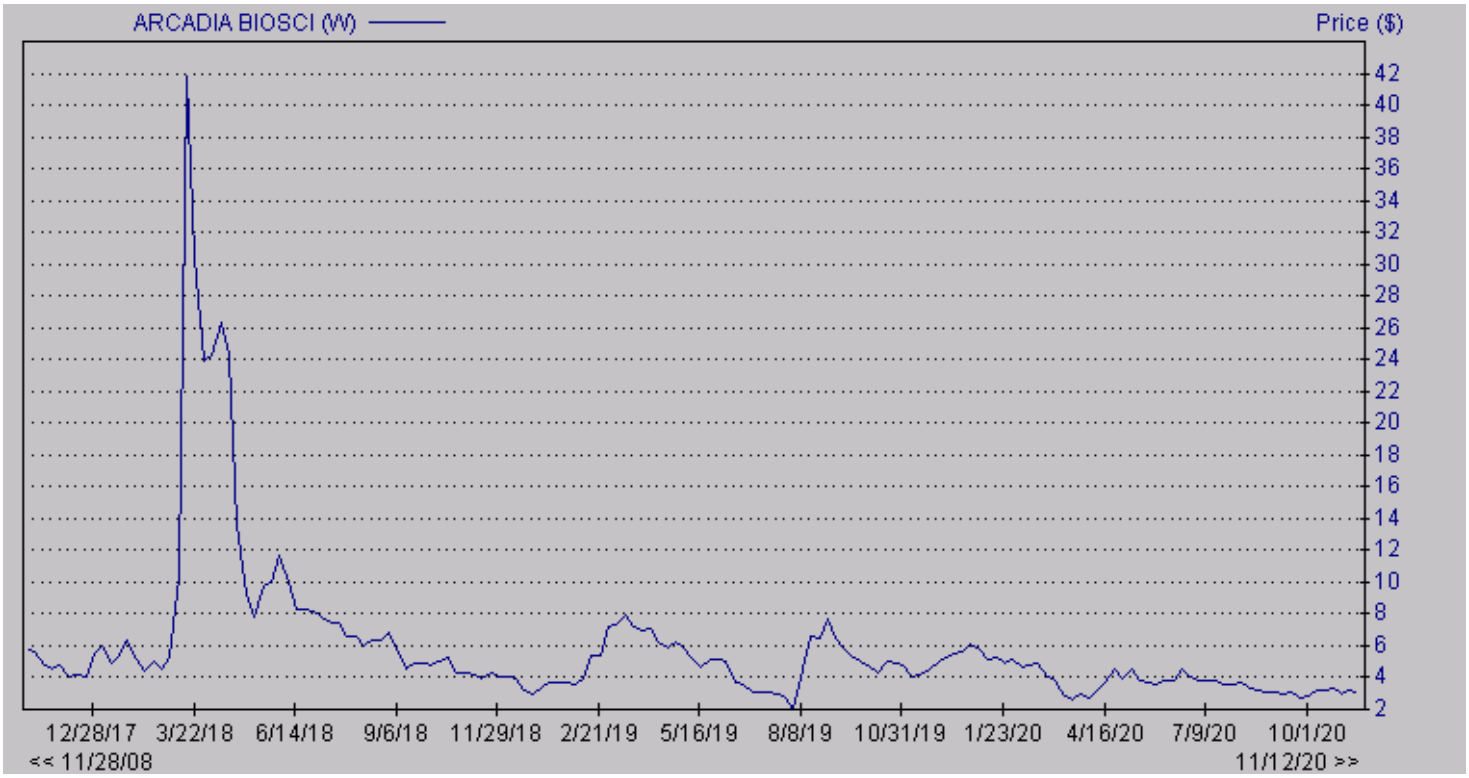
(In '000, except share and share data) (For Years Ending December 31)	Year ending 12/31/2016	Year ending 12/31/2017	Year ending 12/31/2018	Year ending 12/31/2019	Year ending 12/31/2020 E
Revenues:					
Product	669	514	657	814	2,007
License	144	1,470	150	67	100
Royalty	0	0	0	0	42
Contract research & gov't grants	2,375	2,042	657	288	83
Total revenues	**3,188**	**4,026**	**1,464**	**1,169**	**2,232**
Cost of product revenues	895	283	661	885	2,927
Research and development	8,663	7,407	6,069	7,098	8,556
Selling, general & administrative	12,250	10,651	11,604	13,567	14,979
Chg in FV of contingent consideration	-	-	-	(1,000)	0
Total operating expenses	**21,808**	**18,341**	**18,334**	**20,550**	**26,462**
Gross profit (loss) from Operations	**(18,620)**	**(14,315)**	**(16,870)**	**(19,381)**	**(24,230)**
Interest (expense)	(1,319)	(747)	0	(5)	(21)
Stock warrant & adjustments (loss)	0	0	(4,000)	-	47
Chg in fair value of stock wt & adjust	0	0	9,561	(9,243)	5,082
Offering costs	0	0	(2,555)	(708)	(350)
Extinguishment of debt (loss)	0	(900)	0	0	0
Other income (expense)	340	281	394	466	106
Total other income (expense):	**(979)**	**(1,366)**	**3,400**	**(9,490)**	**4,864**
Income (loss) before income tax	(19,599)	(15,681)	(13,470)	(28,871)	(19,366)
Provision for income tax benefit (expense)	(25)	(26)	(10)	(2)	13
Attributable to non-controlling interest	-	-	-	68	717
Net Income (loss)	**(19,624)**	**(15,707)**	**(13,480)**	**(28,805)**	**(18,636)**
Net earnings per share (basic and diluted)	**($8.85)**	**($7.28)**	**($3.58)**	**($4.53)**	**($1.77)**
Net operating earnings per share (diluted)	**($8.85)**	**($7.28)**	**($6.12)**	**($3.07)**	**($2.25)**
Wgtd. avg. shares outstanding	2,218,341	2,156,201	3,766,419	6,363,112	10,536,159

PROJECTED QUARTERLY INCOME STATEMENTS

Arcadia Biosciences, Inc.

Income Statement (In '000, except share and share data) (For Years Ending December 31)	2019 12/31/2019	1Q 2020 3/31/2020	2Q 2020 6/30/2020	3Q 2020 9/30/2020	4Q E 2020 12/31/2020	Estimate Yr. ending 12/31/2020
Revenues:						
Product	814	154	231	245	373	1,003
License	67	100	0	10	60	170
Royalty	0	30	12	16	18	76
Contract research & gov't grants	288	25	38	43	25	131
Total revenues	**1,169**	**309**	**281**	**314**	**476**	**1,380**
Cost of product revenues	885	132	1,490	1,841	168	3,631
Research and development	7,098	2,244	1,993	1,762	1,500	7,499
Selling, general & administrative	13,567	3,723	3,674	4,292	3,800	15,489
Chg in FV of contingent consideration	(1,000)	0	0	0	0	0
Total operating expenses	**20,550**	**6,099**	**7,157**	**7,895**	**5,468**	**26,619**
Gross profit (loss) from Operations	**(19,381)**	**(5,790)**	**(6,876)**	**(7,581)**	**(4,992)**	**(25,239)**
Interest (expense)	(5)	(3)	(6)	(23)	(23)	(55)
Stock warrant & adjustments (loss)	0	0	47	(682)	0	(635)
Change in fair value of stock warrants	(9,243)	8,161	(3,079)	1,130	0	6,212
Offering costs	(708)	0	0	0	0	0
Other income (expense)	466	72	10	0	0	82
Total other income (expense):	**(9,490)**	**8,230**	**(3,028)**	**425**	**(23)**	**5,604**
Income (loss) before income tax	**(28,871)**	**2,440**	**(9,904)**	**(7,156)**	**(5,015)**	**(19,635)**
Provision for income tax benefit (expense)	(2)	(17)	10	(9)	(9)	(25)
Attributable to non-controlling interest	68	102	205	774	774	1,855
Net Income (loss)	**(28,805)**	**2,525**	**(9,689)**	**(6,391)**	**(4,250)**	**(17,805)**
Net earnings per share (basic and diluted)	**($4.53)**	**$0.29**	**($1.04)**	**($0.60)**	**($0.39)**	**($1.80)**
Net operating earnings per share (diluted)	**($3.07)**	**($0.65)**	**($0.71)**	**($0.70)**	**($0.39)**	**($2.43)**
Wgtd. avg. shares outstanding	6,363,112	8,651,213	9,327,317	10,719,618	10,832,203	9,882,588

HISTORICAL STOCK PRICE



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