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Arcadia Biosciences, Inc. (RKDA-NASDAQ)

Arcadia is Well Funded for Management's 2021 Growth Initiatives in GoodWheat & GoodHemp; Also a Review of 2020 Achievements

A discounted cash flow (DCF) model that applies a 10% discount rate and a terminal price-to-sales ratio (P/S) of 0.79 (which is the current average P/S ratio of a large agricultural products company) indicates a NAV share price target of $6.89.

Current Price (04/09/21)	$2.64
Valuation	**$6.89**

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** and **hemp,** under the trademarked names of GoodWheat and GoodHemp. **GoodWheat** is being rolled out in the U.S., initially via Three Farm Daughters. Distribution of **GoodHemp is expanding into Canada**. Bioceres is spearheading the **HB4** soybean and GoodWheat efforts in Latin America under licensing agreements with Arcadia.

SUMMARY DATA

52-Week High	**$6.40**
52-Week Low	**$2.26**
One-Year Return (%)	**-16.46**
Beta	**-0.732**
Average Daily Volume (shrs.)	**3,191,185**
Shares Outstanding (million)	**21.34**
Market Capitalization ($ mil.)	**$56.34**
Short Interest Ratio (days)	**0.82**
Institutional Ownership (%)	**8.2**
Insider Ownership (%)	**7.7**
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	7.1 A	8.0 A
2021	0.7 E	1.1 E	1.2 E	1.9 E	4.9 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	-$0.68 A	-$0.75 A	-$0.85 A	$0.87 A	-$1.13 A
2021	-$0.22 E	-$0.18 E	-$0.19 E	-$0.20 E	-$0.78 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 incremental $1.8 million in sales.

The company's IP portfolio continues to expand through additional patents being granted, and Arcadia is **well-funded** to advance management's growth initiatives pertaining to GoodWheat and GoodHemp.

GoodWheat: To help Arcadia Biosciences further transition into a company that provides high-value, **branded food ingredients**, management has embarked on a direct-to-consumer marketing campaign, which includes digital marketing programs, in order **to establish GoodWheat**, a non-GMO specialty wheat, **as a consumer brand**.

Furthermore, retail channel initiatives are being pursued, including the support of North Dakota-based **Three Farm Daughters** which has both **e-commerce** (threefarmdaughters.com and amazon.com) and **brick & mortar regional grocery store** (38 grocers in North Dakota and Minnesota) components.

In August 2020, Arcadia Biosciences entered into a collaborative effort with **GoodMills Innovation GmbH**. This relationship with Europe's largest milling company is expected to advance in the second quarter of 2021 with consumer tests in three European countries with three different formulations. If the tests are successful, GoodMills would commercially launch GoodWheat varieties in the second half of 2021.

During 2020, Arcadia was granted **10 additional GoodWheat patents in 2020**, bringing the total number of GoodWheat patents to 28.

GoodHemp: Arcadia's non-GMO hemp seed varieties have **superior growth characteristics** (productivity, pest resistance and crop quality) and deliver **hemp with compliant low THC profiles**. The company is advancing its hemp seed genetic development efforts and scaling up a sales/distribution network. Arcadia's hemp seed varieties have been developed both internally through its own breeding program and through acquisitions.

In August 2020, Arcadia **acquired Industrial Seed Innovations**, adding the popular Rogue and Umpqua to the GoodHemp catalog. Designed for northern latitudes, **Umpqua** is variety that matures faster than most existing varieties while **Rogue** is designed for lower latitude geographies with longer growing seasons, which allows these ultra-high yielding plants to fully mature. In addition to these seed varieties, Arcadia obtained Industrial Seed's genetic assets, including its germplasm library and intellectual property. Rogue and Umpqua are available on the websites of **International Hemp Exchange** and **Hemp Seed Florida**

In Late November 2020, Arcadia also entered into a key with Tritium 3H, a Canadian hemp seed company that provides hemp varieties that perform well in Canada's unique climatic regions to breeders and producers. Arcadia plans to distribute Rogue, Umpqua and Santiam in Canada through Tritium 3H once certification is received from Health Canada. The three varieties have already been certified by the Association of Official Seed Certifying Agencies (AOSCA) in early February 2021.

In 2020, regulatory framework for CBD became opaque in 2020 after the Drug Enforcement Agency (DEA) issued an interim final ruling (IFR). The domestic hemp seed market is expected to re-accelerate after the regulatory status of hemp is clarified and any additional regulations are implemented.

On the fourth quarter/year-end conference call, management indicated that there is a compliant pathway to produce Hawaiian CBD. Management stated that 40 acres of hemp are currently being planted with plans to bring premium Hawaiian CBD topicals to the consumer retail market in late 2021 or early 2022.

HB4 Soybeans: Two strategic transactions with Bioceres provide Arcadia with several immediate and long-term benefits.

First, the sale of Arcadia's 50% interest in Verdeca provided significant liquidity, a strong return on investment, a reduction in forward research and development costs, and a streamlining of management focus towards the wheat and hemp businesses.

- Arcadia will receive $6.0 million in cash over the ensuing 12 months
- Arcadia will receive an additional $2 million in cash upon China granting import clearance for HB4 soybeans
- Arcadia received 1.875 million unregistered shares of BIOX common stock (valued at $15 million)
- Arcadia will receive trait royalties of 6% up to $10 million on HB4 soybean sales.

Second, in separate transaction, Bioceres acquired license rights to GoodWheat for South and Central America. Arcadia will receive 25% royalties on all future sales.

Financings: In order to fund the effort to market the company's new GoodWheat products to consumers and advance its hemp products business**, Arcadia Biosciences raised net proceeds of approximately $16.7 million in 2020** through common stock/warrant offering under an existing shelf registration statement in December 2020 and two warrant exercise transactions. Subsequently, the company completed a **private placement in January 2021 that provided $25 million in gross proceeds**.

<u>Outline of 2020 Highlights</u>

- **GoodWheat**
  - **Three Farm Daughters**
    - **E-commerce site** (threefarmdaughters.com) operative with four branded food products (flour and three pastas - artisan linguine, fusilli and fettuccine) powered by Shopify.
    - Three Farm Daughters GoodWheat products being sold by **Hugo's Family Marketplace** (a regional, family-owned supermarket grocery chain serving North Dakota and Minnesota), along with **Hornbacher's** and **Kowalski's Market**
  - **GoodMills Innovation** is 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
  - **Bioceres Crop Solutions** acquired **distribution rights of GoodWheat** product portfolio into **South and Central America** as part of sale of its 50% interest in Verdeca JV to Bioceres
    - Arcadia will receive **future royalties of 25%** on GoodWheat revenues
- **GoodHemp**
  - 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
    - 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 and during a period of regulatory confusion
- **HB4® soybean seed** commercialization
  - Arcadia **sold its 50% interest in Verdeca JV** to Bioceres Crop Solutions (NYSE: BIOX)
    - In exchange for
      - $6.0 million in cash
      - 1,875,000 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

RECENT NEWS - 2021

GoodWheat 2021 Developments

Awarded Additional U.S. Patent

In early March 2021, the U.S. Patent and Trademark Office awarded a patent for high fiber resistant starch GoodWheat to Arcadia Biosciences. This is Arcadia's 28th patent for GoodWheat.

Three Farm Daughters

In 2021, the e-commerce website of Three Farm Daughters is being scaled-up in order to better drive traffic to the website and improve sales conversions. The SEO optimization efforts will be supplemented with digital marketing campaigns with substantial increases in ad spending slated for late April and May

Part of the GoodWheat marketing campaign to reach out to consumers was **two articles in Ag Week**, one in December 2020 and another in January 2021. The articles highlighted the stories, ambitions and family history of the three daughters: Annie Gorder, Mollie Ficocello and Grace Lunski. The Sproule sisters grew up on a farm in in northeastern North Dakota on which a variety of GoodWheat is now grown. After attending college, the three moved backed back to focus on transforming the GoodWheat grown on the farm into flour and pasta products.



Arcadia BioSciences website - video scenes

Also, a **vimeo video** on GoodWheat has been produced and it is available on the home page of Arcadia Biosciences' website (https://arcadiabio.com/)

The **retail channel** is being developed through traditional brick-and-mortar supermarkets. Currently, GoodWheat products are being sold by Three Farm Daughters through **Hugo's Family Marketplace** (a regional, family-owned supermarket grocery chain serving North Dakota and Minnesota), along with **Hornbacher's** and **Kowalski's Market**.

GoodHemp 2021 Developments

In early February 2021, four (4) GoodHemp varieties (**Umpqua, Rogue, Santiam** and **Potomac**) were **approved by** the variety review board of **AOSCA** (National Association of Official Seed Certifying Agencies. These certifications give growers assurances of quality, uniformity and performance. The review board is composed of representatives from seed certifying agencies, academia, the seed industry and USDA.

- **Umpqua** is a CBD-dominant, early photoperiod variety with a unique terpene profile.
- **Rogue** is a CBD-dominant, high yielding intermediate photoperiod variety with extraordinary yields under low planting densities.
- **Santiam** is a CBD-dominant, early photoperiod variety with well above average yields in northern latitudes.
- **Potomac** is a CBD-dominant, full season photoperiod that produces large plants with a heavy yield.



Arcadia BioSciences website

This independent validation is a major milestone toward the ability of selling these GoodHemp varieties in **Florida** (which requires AOSCA certification) and **Canada** (which requires AOSCA certification and an approval by Health Canada).

2021 Financing – Private Placement

On January 28, 2021, Arcadia Biosciences closed a **private placement of 7,876,784 shares** of common stock and 7,876,784 5 ½-year ½–share warrants (exercisable into 3,938,392 common shares at a price of $3.13 per share). The **private placement** was priced at $3.1925 per share for **gross proceeds of $25,146,633**. H.C. Wainwright & Co. was the exclusive placement agent for the Private Placement.

Net proceeds will be primarily directed toward building the GoodWheat consumer brand (e-commerce and direct-to-consumer digital marketing for Three Farm Daughters) and funding GoodHemp initiatives, particularly hemp cultivation by Archipelago Ventures in Hawaii and CBD extraction operations on the West Coast.

DETAILS OF 2020 ACHIEVEMENTS

2020 Financial Results

On March 25, 2021, Arcadia Biosciences reported financial results for the year ending December 31, 2020. Total revenues increased 587% to approximately $8.0 million, primarily due to the **recording of license revenues of $6.7 million from the Verdeca-related licenses granted to Bioceres in November**. Without the effect of the Verdeca transaction, total revenues increased 5.5%. **Product revenues increased 28.3%** (or $230,000) to approximately $1.04 million, primarily driven an increase in SONOVA® GLA product sales related to pet food orders. Royalty revenues were $83,000. Contract research and government grant revenues decreased 63.2% to $106,000 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 increased 44.2%. Cost of product revenues increased 487% to approximately $5.2 million, primarily due a two hemp-related write-downs: $1.6 million for contracted hemp seed production that did not meet quality specifications and $1.3 million for Archipelago JV inventory due to a regulatory ruling. **R&D expenses** increased 12.1% to approximately $7.96 million, primarily due to higher employee-related expenses and external hemp-related costs. **SG&A expenses** increased 21.4% to approximately $16.5 million, primarily driven by higher consulting activity, higher employee-related expenses, higher insurance premiums and increased rent expense.

Several other income and expense items were significant in 2020. An **$8,814,000 gain was booked from the Verdeca transaction**. Also, the non-cash change in the estimated fair value of common stock warrant liabilities resulted in recording income of $6.57 million in 2020, which was made more noteworthy when compared to 2019's negative $9.24 million, resulting in a positive swing of $15.8 million. Lastly, interest expense increased to $47,000 compared to $5,000 in 2019 due to new notes payable agreements entered into during 2020.

For 2020, Arcadia Biosciences reported a **net loss** attributable to shareholders of $4.65 million (or **$0.47 per diluted share**), of which $6.57 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 $11.2 million (or **$1.13 per diluted share**).

As of December 30, 2020, working capital was approximately $25.4 million, a $2.65 million improvement from December 31, 2019. In 2020, **shares outstanding increased by 55.6%** to 13,450,861 shares **since December 31, 2019**.

Hemp Distribution Agreement with Tritium 3H

In order to expand the distribution of GoodHemp into Canada, Arcadia Biosciences **signed an exclusive hemp distribution agreement for Canada with Tritium 3H** in late November 2020. Based in Alberta, **Tritium 3H** is a Canadian hemp seed company that works with breeders, producers and end-users in order to provide hemp varieties that will perform well in Canada's unique climatic regions. In order to ensure the performance that Canadian industrial hemp growers expect, **Tritium 3H** conducts field testing and confirms certified seed production before distributing hemp varieties in Canada.

Before the initial varieties of Rogue, Umpqua and Santiam are distributed in Canada, T3H requires that the plants be certified by the Association of Official Seed Certifying Agencies (AOSCA) and Health Canada. AOSCA certified the varieties in early February 2021. The company awaits certification by Health Canada

Late 2020 Financing - Registered Direct Offering

On December 21, 2020, Arcadia Biosciences closed a registered **direct offering** under a shelf registration statement for **2,618,658 common shares** a $2.93 per share. **Gross proceeds were $7,672,668**. In a concurrent private placement, Arcadia issued 2,618,658 unregistered 5 ½-year warrants (exercisable into 2,618,658 common shares at a price of $3.00 per share) at a price of $0.125 per warrant. The **gross proceeds for the warrants were $327,332**. H.C. Wainwright & Co. acted as exclusive placement agent for the offering.

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** and **wheat** under the trademarked names of **GoodHemp™** and **GoodWheat™** As of December 31, 2020, Arcadia Biosciences owns or exclusively controls 109 issued patents and 61 pending patent applications worldwide.



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.

Arcadia Biosciences was added to the **Russell Microcap Index** effective on the close of **June 26, 2020**. Being part of Russell Microcap Index also automatically includes the company's stock in the appropriate Russell Microcap Growth Index or Russell Microcap Value Index. The Russell indexes are reconstituted annually, and many mutual funds and institutional investors 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, and should broaden the investor base of the company.

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 two strategic crop categories: **wheat** and **hemp**. In the fourth quarter of 2020, **Arcadia** 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	Year ending 12/31/2020
Product	12.8%	44.9%	69.6%	13.0%
License	36.5%	10.2%	5.7%	84.7%
Royalty	0.0%	0.0%	0.0%	1.0%
Contract research & gov't grants	50.7%	44.9%	24.6%	1.3%

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 50%). 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 **sold 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 to commercially launch when China grants import clearance for HB4 soybeans

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
- November 2020 - exclusive hemp distribution agreement for **Canada** with **Tritium 3H**

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. However, 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.

On the fourth quarter/year-end conference call, management indicated that there is a compliant pathway to produce Hawaiian CBD and the company is currently **planting 40 acres**.

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.

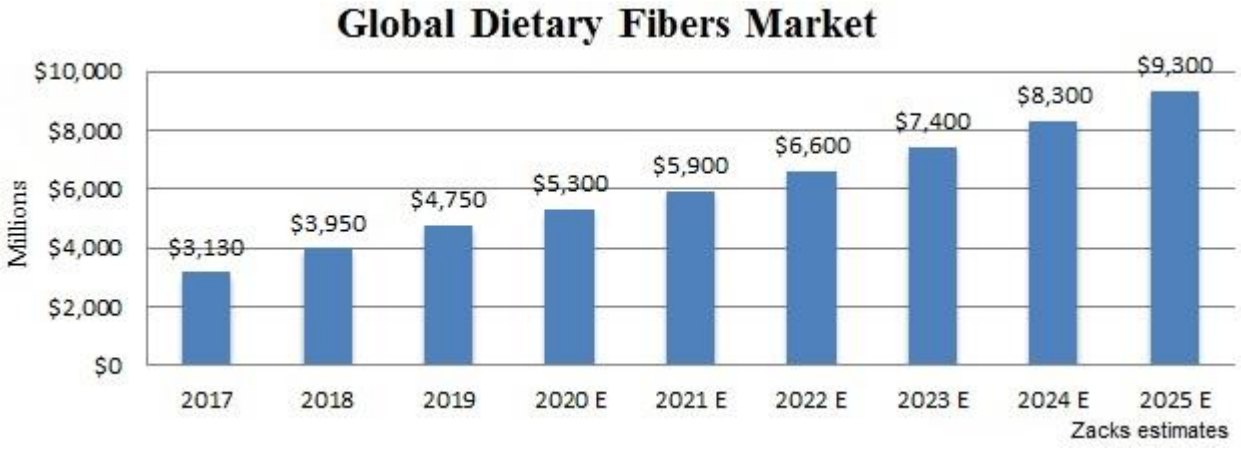
GOODWHEAT™

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.

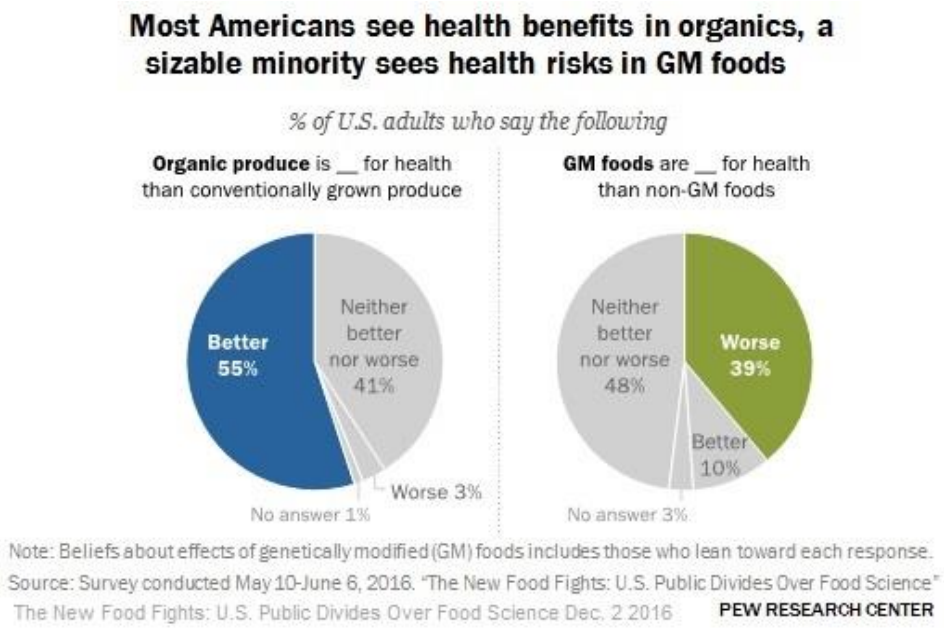
The average American's daily diet includes approximately 500 calories from wheat products, which is equal to roughly 25% of the FDA's total recommended caloric intake for women and 20% for men. Consumers are placing increased importance on fiber-rich grain foods as they are becoming increasingly aware 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 2020), 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 2020, 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.

During 2021, 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."

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.

- 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** became 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 announced with **GoodMills Innovation** with the capabilities to spark distribution across seven European countries
- November 2020 - **Bioceres Crop Solutions** (NYSE: BIOX) acquired licensing rights to GoodWheat in Central America and South America



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 now being sold through **Hugo's Family Marketplace** (a regional, family-owned supermarket grocery chain serving North Dakota and Minnesota), along with **Hornbacher's** and **Kowalski's Market**. Three Farm Daughters products are also available on amazon.com.

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

- April 2015 – received regulatory biosafety approval from **CONABIA**
- October 2015[ix] – HB4 soybean stress tolerance trait **granted regulatory approval for crop growth and consumption** by the **Ministry of Agroindustry**
- October 2018 - received **approval** from Argentina's Secretariat of Food and Bioeconomy for **HB4 soybeans** with drought tolerant trait **stacked with herbicide tolerant traits** (IND 00410-5 x MON-04032-6) which is resistant to both ammonium glufosinate and glyphosate

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[x] - 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 with both drought 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 traits 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 and herbicide tolerant traits)

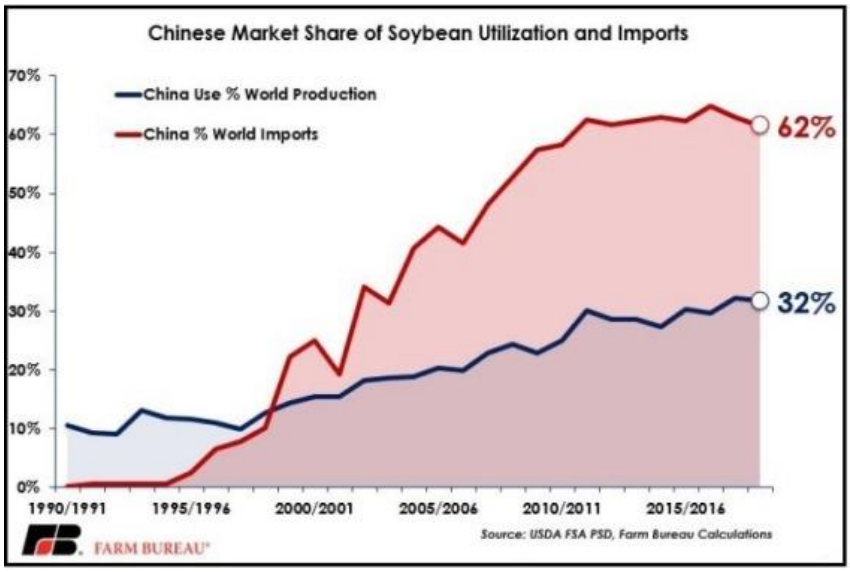
Paraguay – soybean crop grown on over 3.5 million hectares

- 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 and herbicide tolerant traits)

The **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, Verdeca has a sufficient to seed supply for 90,000 acres of soybean production. Approximately **23,000 hectares** were planting in the 2021 crop.

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.

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.[xi] Once import approval is secured for HB4 soybeans in China, Arcadia will receive an additional $2 million in cash for Bioceres Crop Solutions.



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 a 2% 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 10%-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 year, we are using a discount rate of 10% 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 0.79, which is the average P/S ratio of a large agricultural products company.

Arcadia BioSciences, Inc.

DCF Model

	2021	2022	2023	2024	2025	2026
Revenues	4,928,000	8,161,364	12,546,038	17,386,400	23,616,200	32,371,238
Cash costs	18,576,224	20,380,350	22,482,451	24,357,501	26,310,773	28,531,512
R&D costs	7,531,000	7,907,550	8,302,928	8,718,074	9,153,978	9,611,676
Tax rate	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%
Free Cash Flow after R&D costs	(21,179,224)	(20,126,536)	(18,239,341)	(15,689,174)	(11,848,550)	(5,656,512)

Discount Rate	**10.0%**	
NPV	**107,981,986**	
Terminal Value	**34,977,869**	
Cash From Option Exercise	**2,150,674**	**4Q:2020**
Cash From Warrant Exercise	**31,466,945**	**4Q:2020**
Cash From Warrant Exercise	**12,327,167**	**January 2021 Private Placement**
Probability	**95%**	
Total Sum of Parts	**167,748,601**	
Debt	**2,105,000**	**4Q:2020**
Cash	**49,167,000**	
Current Shares	**21,340,000**	
Warrant/Option Shares	**9,819,851**	**4Q:2020 plus January 2021 Private Placement**
Diluted Shares	**31,159,851**	

Total NPV	**214,810,601**
Share Price	**$6.89**

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 $6.89 per share** on a fully diluted basis. 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 the initial $2 million contingent on China permitting the importation GoodWheat from Argentina and Brazil either in 2021 or 2022, followed by a ramp up tor royalties from Bioceres, which is capped at $10 million.

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 $79 million by 2026. Market penetration in 2021 is expected to be almost 6.0%. 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	0.050%	0.071%	0.092%	0.113%	0.134%	0.155%	0.176%
GoodWheat	0.006%	0.026%	0.046%	0.066%	0.086%	0.106%	0.126%
HB4 Soybeans	0.000%	0.011%	0.020%	0.030%	0.055%	0.070%	0.100%
SONOVA GLA	5.14%	5.29%	5.45%	5.62%	5.79%	5.96%	6.14%
Revenues ($000)	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
GoodHemp	700	1,889	3,671	5,410	7,699	12,023	18,430
GoodWheat	480	2,309	4,534	7,221	10,444	14,289	18,854
HB4 Soybeans	150	165	331	521	1,003	1,340	2,010
SONOVA GLA	3,598	3,799	4,010	4,234	4,470	4,719	4,982
Total	**$4,928**	**$8,161**	**$12,546**	**$17,386**	**$23,616**	**$32,371**	**$44,276**

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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, 2019, 2020, and 2021; the exercise of warrants in 2020 and operating revenues and grants (particularly in 2015, 2016 and 2020). Funds are still necessary to commercialize the company's efforts toward developing hemp and wheat initiatives. Existing cash and short-term investments appear to be sufficient to meet the company's anticipated cash requirements over the next 12 months. Thus far, management has been able to effectively fund the company's operations and initiatives.
- Shares outstanding increased dramatically in 2018 (+124%), 2019 (+81.1%) and 2020 (+55.6%) 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	Year 12/31/2020
ASSETS					
Cash and cash equivalents	2,013	9,125	11,998	8,417	14,042
Short-term investments	48,547	3,898	9,825	16,915	11,625
Accounts receivable	349	1,231	165	602	1,406
Unbilled revenue	184	4	3	0	0
Inventories, net	252	229	181	1,794	3,812
Prepaid expenses	877	560	704	712	811
Total current assets	**52,222**	**15,047**	**22,876**	**28,440**	**31,696**
Restricted cash	-	-	-	-	2,001
Property and equipment, net	508	299	395	1,799	3,539
Right of use asset	-	-	-	1,963	5,826
Inventories, net — noncurrent	1,327	1,168	746	364	3,485
Goodwill	-	-	-	-	408
Intangible assets	-	-	-	-	370
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**	**47,348**
LIABILITIES AND STOCKHOLDERS' EQUITY					
Accounts payable and accrued expenses	2,359	2,496	2,645	4,685	4,105
Amounts due to related parties	30	29	29	40	80
Notes payable	-	-	-	24	1,141
Unearned revenue — current	740	1,000	96	42	8
Operating lease liability - current	-	-	-	611	717
Other current liabilities	0	0	284	306	263
Total current liabilities	**3,129**	**3,525**	**3,054**	**5,708**	**6,314**
Notes payable - noncurrent	25,127	-	-	107	2,105
Operating lease liability - noncurrent	-	-	-	1,497	5,389
Unearned revenue — noncurrent	3,120	2,038	-	-	-
Common stock warrant liabilities	-	-	5,083	14,936	2,708
Other noncurrent liabilities	3,000	3,000	3,072	2,000	2,280
Total Liabilities	**34,376**	**8,563**	**11,209**	**24,248**	**18,796**
Stockholders' Equity					
Common stock	44	42	45	49	54
Additional paid-in capital	173,723	175,223	191,136	214,826	239,496
Accumulated other comprehensive income	(19)	(1)	0	1	0
Accumulated deficit	(151,550)	(167,257)	(178,366)	(207,171)	(211,825)
Total Arcadia Biosciences stockholders' equity	**22,198**	**8,007**	**12,815**	**7,705**	**27,725**
Non-controlling interest			-	621	827
Total shareholder's equity	**22,198**	**8,007**	**12,815**	**8,326**	**28,552**
TOTAL LIAB. & STOCKHOLDERS' EQUITY	**56,574**	**16,570**	**24,024**	**32,574**	**47,348**
Shares outstanding	2,224,384	2,134,154	4,774,919	8,646,149	13,450,861

Arcadia Biosciences, Inc.

Income Statement

(In '000, except share and share data) (For Years Ending December 31)	Year ending 12/31/2017	Year ending 12/31/2018	Year ending 12/31/2019	Year ending 12/31/2020	Estimate Year ending 12/31/2021
Revenues:					
Product	514	657	814	1,044	4,608
License	1,470	150	67	6,801	170
Royalty	0	0	0	83	150
Contract research & gov't grants	2,042	657	288	106	0
Total revenues	**4,026**	**1,464**	**1,169**	**8,034**	**4,928**
Cost of product revenues	283	661	885	5,199	2,995
Research and development	7,407	6,069	7,098	7,960	7,531
Selling, general & administrative	10,651	11,604	13,567	16,467	15,580
Chg in FV of contingent consideration	-	-	(1,000)	0	0
Total operating expenses	**18,341**	**18,334**	**20,550**	**29,626**	**26,107**
Gross profit (loss) from Operations	**(14,315)**	**(16,870)**	**(19,381)**	**(21,592)**	**(21,179)**
Interest (expense)	(747)	0	(5)	(47)	(47)
Stock warrant & adjustments (loss)	0	(4,000)	-	0	0
Chg in fair value of stock wt & adjust	0	9,561	(9,243)	6,570	0
Offering costs	0	(2,555)	(708)	0	0
Extinguishment of debt (loss)	(900)	0	0	0	0
Other income (expense)	281	394	466	740	400
Total other income (expense):	**(1,366)**	**3,400**	**(9,490)**	**7,263**	**353**
Income (loss) before income tax	(15,681)	(13,470)	(28,871)	(6,150)	(20,826)
Provision for income tax benefit (expense)	(26)	(10)	(2)	124	0
Attributable to non-controlling interest	-	-	(68)	(1,371)	(4,643)
Net income (loss) attrib. to stockholders	**(15,707)**	**(13,480)**	**(28,805)**	**(4,655)**	**(16,183)**
Net earnings per share (basic and diluted)	**($7.28)**	**($3.58)**	**($4.53)**	**($0.47)**	**($0.78)**
Net operating earnings per share (diluted)	**($7.28)**	**($6.12)**	**($3.07)**	**($1.13)**	**($0.78)**
Wgtd. avg. shares outstanding	2,156,201	3,766,419	6,363,112	9,959,018	20,723,965

QUARTERLY INCOME STATEMENTS

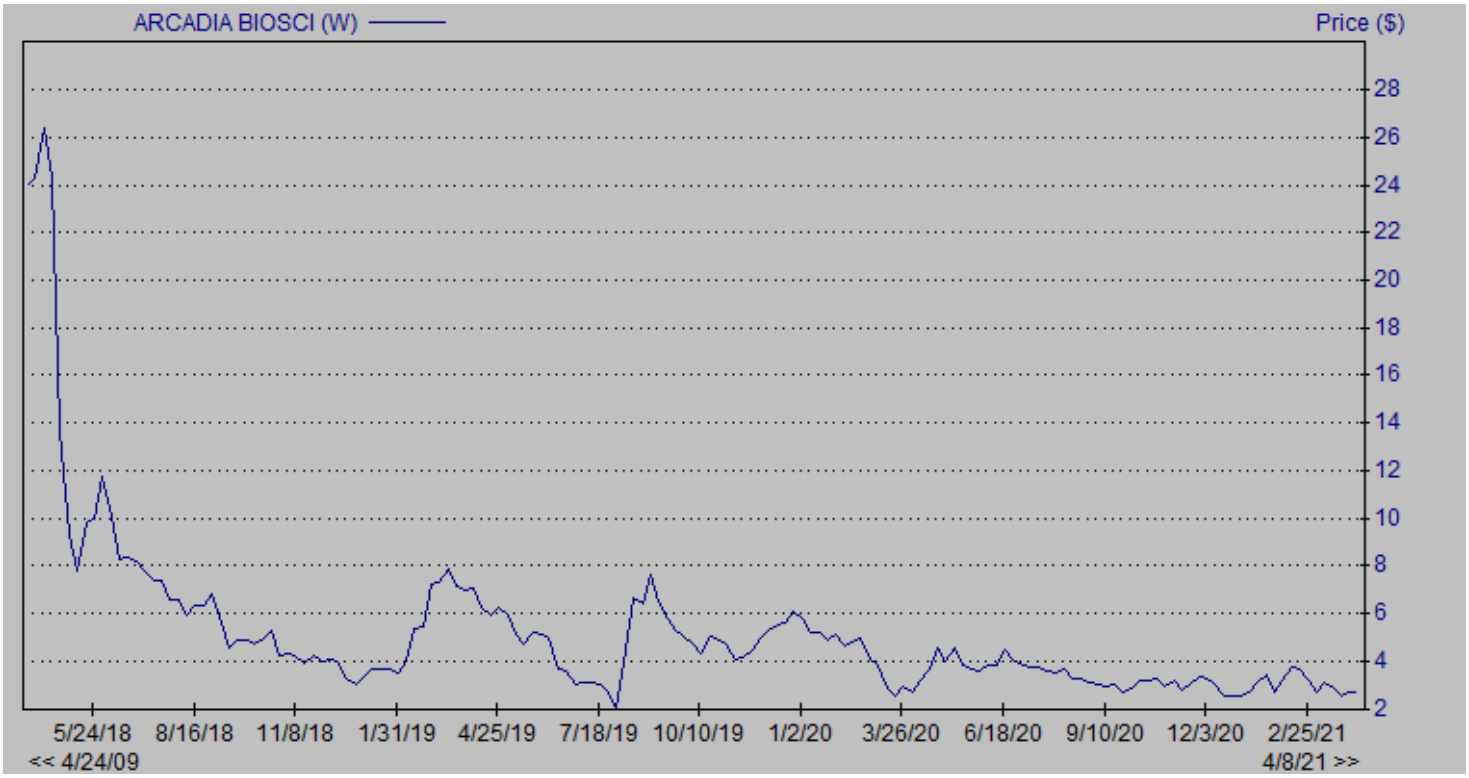
Arcadia Biosciences, Inc.

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 2020 12/31/2020	Yr. ending 12/31/2020
Revenues:						
Product	814	154	231	245	414	1,044
License	67	100	0	10	6,691	6,801
Royalty	0	30	12	16	25	83
Contract research & gov't grants	288	25	38	43	0	106
Total revenues	**1,169**	**309**	**281**	**314**	**7,130**	**8,034**
Cost of product revenues	885	132	1,490	1,841	1,736	5,199
Research and development	7,098	2,244	1,993	1,762	1,961	7,960
Selling, general & administrative	13,567	3,723	3,674	4,292	4,778	16,467
Chg in FV of contingent consideration	(1,000)	0	0	0	0	0
Total operating expenses	**20,550**	**6,099**	**7,157**	**7,895**	**8,475**	**29,626**
Gross profit (loss) from Operations	**(19,381)**	**(5,790)**	**(6,876)**	**(7,581)**	**(1,345)**	**(21,592)**
Interest (expense)	(5)	(3)	(6)	(23)	(15)	(47)
Gain (loss) on sale of Verdeca	0	0	0	0	8,814	8,814
Stock warrant & adjustments (loss)	0	0	47	(682)	635	0
Change in fair value of stock warrants	(9,243)	8,161	(3,079)	1,130	358	6,570
Extinguishment of wt. liability (loss)	0	0	0	0	(635)	(635)
Offering costs	(708)	0	0	0	0	0
Extinguishment of debt (loss)	0	0	0	0	0	0
Other income (expense)	466	72	10	0	658	740
Total other income (expense):	**(9,490)**	**8,230**	**(3,028)**	**425**	**9,815**	**15,442**
Income (loss) before income tax	**(28,871)**	**2,440**	**(9,904)**	**(7,156)**	**8,470**	**(6,150)**
Provision for income tax benefit (expense)	(2)	(17)	10	(9)	140	124
Attributable to non-controlling interest	(68)	102	205	774	(2,452)	(1,371)
Net income (loss) attrib. to stockholders	**(28,805)**	**2,321**	**(10,099)**	**(7,939)**	**11,062**	**(4,655)**
Net earnings per share (basic and diluted)	**($4.53)**	**$0.27**	**($1.08)**	**($0.74)**	**$0.90**	**($0.47)**
Net operating earnings per share (diluted)	**($3.07)**	**($0.68)**	**($0.75)**	**($0.85)**	**$0.87**	**($1.13)**
Wgtd. avg. shares outstanding	6,363,112	8,651,213	9,327,317	10,719,618	12,251,930	9,959,018

Arcadia Biosciences, Inc.

Income Statement (In '000, except share and share data) (For Years Ending December 31)	2020 12/31/2020	1Q E 2021 3/31/2021	2Q E 2021 6/30/2021	3Q E 2021 9/30/2021	4Q E 2021 12/31/2021	Estimate Yr. ending 12/31/2021
Revenues:						
Product	1,044	643	968	1,152	1,845	4,608
License	6,801	43	43	43	43	170
Royalty	83	25	50	50	25	150
Contract research & gov't grants	106	0	0	0	0	0
Total revenues	**8,034**	**710**	**1,061**	**1,245**	**1,912**	**4,928**
Cost of product revenues	5,199	418	629	749	1,199	2,995
Research and development	7,960	2,123	1,886	1,667	1,855	7,531
Selling, general & administrative	16,467	3,523	3,476	4,061	4,521	15,580
Chg in FV of contingent consideration	0	0	0	0	0	0
Total operating expenses	**29,626**	**6,063**	**5,991**	**6,477**	**7,575**	**26,107**
Gross profit (loss) from Operations	**(21,592)**	**(5,353)**	**(4,930)**	**(5,232)**	**(5,663)**	**(21,179)**
Interest (expense)	(47)	(7)	(9)	(12)	(19)	(47)
Gain (loss) on sale of Verdeca	8,814	0	0	0	0	0
Stock warrant & adjustments (loss)	0	0	0	0	0	0
Change in fair value of stock warrants	6,570	0	0	0	0	0
Extinguishment of wt. liability (loss)	(635)	0	0	0	0	0
Other income (expense)	740	100	100	100	100	400
Total other income (expense):	**15,442**	**93**	**91**	**88**	**81**	**353**
Income (loss) before income tax	**(6,150)**	**(5,260)**	**(4,839)**	**(5,144)**	**(5,582)**	**(20,826)**
Provision for income tax benefit (expense)	124	0	0	0	0	0
Attributable to non-controlling interest	(1,371)	(1,173)	(1,079)	(1,147)	(1,244)	(4,643)
Net income (loss) attrib. to stockholders	**(4,655)**	**(4,088)**	**(3,761)**	**(3,997)**	**(4,338)**	**(16,183)**
Net earnings per share (basic and diluted)	**($0.47)**	**($0.22)**	**($0.18)**	**($0.19)**	**($0.20)**	**($0.78)**
Net operating earnings per share (diluted)	**($1.13)**	**($0.22)**	**($0.18)**	**($0.19)**	**($0.20)**	**($0.78)**
Wgtd. avg. shares outstanding	9,959,018	18,650,861	21,340,000	21,340,000	21,565,000	20,723,965

HISTORICAL STOCK PRICE



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