

Early Generation Seed System Case Study

Michigan Dry Beans

February, 2018



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Michigan Dry Bean Case Study

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Acronyms

MBC | Michigan Bean Commission

MCIA | Michigan Crop Improvement Association

MI | The State of Michigan

MSU | Michigan State University

MSUT | Michigan State University Technologies



Executive Summary



Michigan State University Breeding Program Enables the System

VARIETAL DEVELOPMENT & SEED DEPLOYMENT



Varietal Development

The Michigan State University Dry Bean Breeding and Genetics Program develops high yielding, disease and stress resistant cultivars with upright architecture and improved canning quality in 10 commercial seed classes for production in Michigan.



Seed Multiplication

The Michigan Crop Improvement Association (MCIA), contracts Gen-Tech Seed Company to produce pre-breeder seed. MCIA then contracts out foundation seed production to private seed companies that produce and return or purchase foundation seed for their use in certified seed production.



Certified Seed Production

Certified seed production is completed by seed companies who purchase foundation seed from MCIA. MCIA acts as both the seed certifying and royalty collection agency for the seed system. MCIA collects a royalty from certified seed growers based on the amount of foundation seed purchased on a cwt basis.

FARMER PRODUCTION, MARKETING, AND KEY DEMAND SEGMENTS



Farm Production

Commercial farms plant certified seed purchased from seed companies to produce commercial beans. Certified seed planted by commercial growers is commonly protected by Plant Variety Protection Laws, which prevent the transfer and sale of non-certified seed. An estimated 4 million cwt of commercial beans are produced from MSU varieties annually.



Industry Advocacy

The Michigan Bean Commission is made up of more than 1,100 bean producers and related agri-business associates. The Michigan Crop Improvement Association assists the Michigan seed industry by taking on the commercially unattractive roles of seed certification and foundation seed production. The Michigan Bean Shippers Association advocates for the industry's downstream actors.



Demand Segments

The main MI bean classes (navy and black beans), are highly sought after internationally. International and domestic consumers consider dry beans from Michigan to be of higher quality than beans from other production regions. An estimated 85%* of MI navy beans are canned, while most of the MI black beans go to the Mexican packaged market.

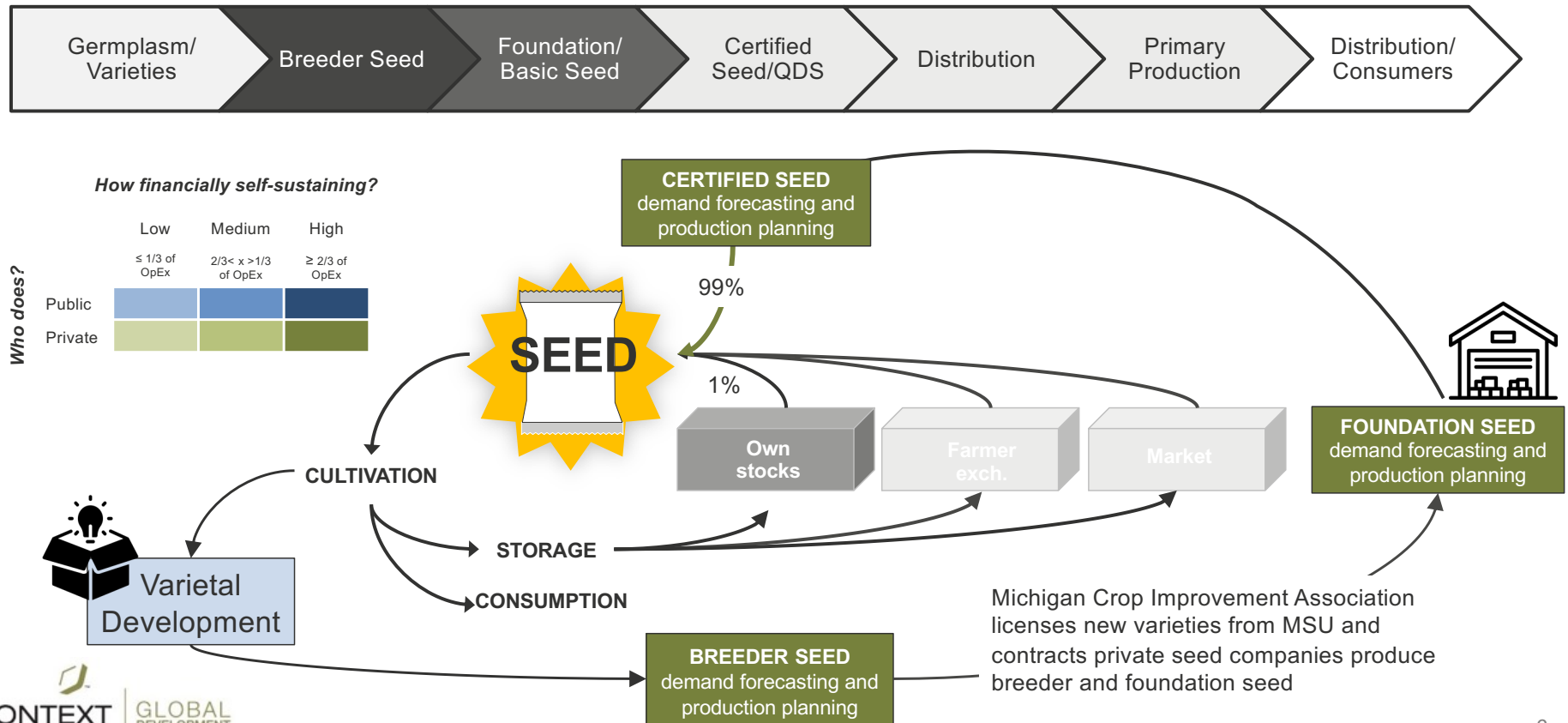
ENABLING ENVIRONMENT STAKEHOLDERS

[Michigan Crop Improvement Association](#) | [Michigan Bean Commission](#) | [Michigan Bean Shippers Association](#) | [USDA](#)

*SOURCE: Context Interviews with MSU researchers and MCIA members

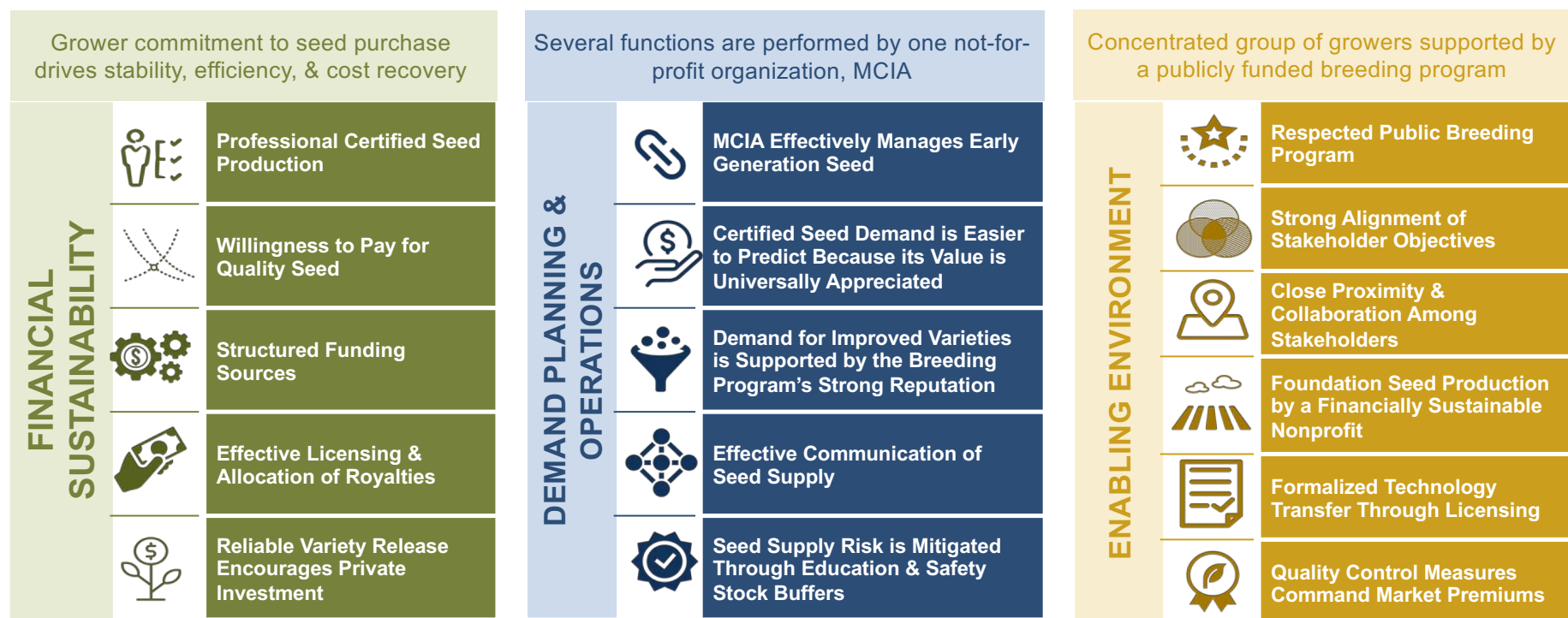
SEED SYSTEM STRUCTURE

Public Sector Funds Varietal Development and Contracts Private Sector to Produce EGS








KEY SUCCESS FACTORS

Summary of Key Success Factors








KEY SUCCESS FACTORS

Financial Sustainability

	Professional Certified Seed Production	A small group of private seed companies (~3) that produce and sell certified seed are highly regarded by Michigan commercial bean growers. The relationship between private seed companies and their clients (commercial growers), is personal and trust-based. It is grounded in repeated, successful negotiations for the purchase and timely delivery of clean, true-to-type certified seed of demanded quantities and varieties.
	Willingness to Pay for Quality Seed	Growers of certified, MSU varieties have profited from the relative yield increases and agronomic benefits, such as increased disease resistance, drought tolerance, and disease-free lab verified seed availability, compared to un-certified seed. Their appreciation for the value proposition of quality seed (risk adjusted return of planting certified seed exceeds the incremental cost of purchasing certified seed), has contributed to farmers' near 100% adoption of certified seed.
	Structured Funding Sources	The funding mechanisms that support the seed system are well defined, and provide a steady and predictable stream of cash flows for key value chain activities including research, breeder stock management, foundation seed production, certified seed production, commercial production, and commodity marketing. The predictability of funding gained from operations (as distinct from intermittent grant funding), allows actors to be more strategic and enables long-term planning efforts.
	Effective Licensing & Allocation of Royalties	MSUT has streamlined its licensing process by granting MCIA the first right of refusal on new varietal releases, charging a nominal annual licensing fee per variety (\$0-1,000), and establishing a fixed royalty schedule by dry bean seed class (royalty charge ranges from \$40-\$65 per cwt, with smaller sized beans, like black beans, carrying higher royalties). Royalties are paid on the volume of foundation seed that licensees sell to certified seed growers, not the revenue or volume of certified seed sales. The benefit of charging royalties earlier (e.g., at foundation seed sale), is increased transparency and lower accounts receivable. Licensees (MCIA), are responsible for collecting and remitting royalty payments to MSUT. The royalty amount is apportioned in one-third increments to the breeder of the variety, MSU's Department of Plant, Soil and Microbial Sciences, and the MSU Foundation.
	Reliable Variety Release Encourages Private Investment	The strong reputation of the MSU breeding program, combined with the high level of communication and coordination between value chain actors encourages investment in varietal adoption and promotes accurate demand planning between foundation seed producers, certified seed growers, and commercial growers.







KEY SUCCESS FACTORS

Demand Planning and Operations

	MCIA Effectively Manages Early Generation Seed	MCIA serves as the key link between MSU's Dry Bean Breeding and Genetics Program, and the private sector. It licenses nearly all of MSU's newly released varieties, and is responsible for foundation seed demand planning, production, and order fulfillment. It is also the seed certification authority in Michigan. MCIA's ability to effectively manage demand planning through constant communication with growers and the industry has enabled its status as a financially self-sustaining nonprofit. MCIA adds value to the industry by assuming exposure to the risk of errant demand projections by certified seed companies. In the absence of MCIA, the public and private sector would have to assume the commercially unattractive functions of dry bean early generation seed multiplication and certification.
	Certified Seed Demand is Easier to Predict Because its Value is Universally Appreciated	Commercial farmers value certified seed and are the driving force behind a certified bean seed system that features near 100% adoption and annual replacement of certified seed. Growers' valuation of certified seed has been informed by varietal field demonstrations and communication of varieties' features, attributes, and benefits by Michigan State University, Michigan Crop Improvement Association, Michigan Bean Council, and the Michigan Bean Shippers.
	Demand for Improved Varieties is Supported by the Breeding Program's Strong Reputation	MSU Dry Bean Breeding and Genetics program's robust germplasm bank, breeding expertise, and close collaboration with other regional bean breeding programs has contributed to its strong varietal pipeline. The Program's penchant for releasing new, improved varieties keeps growers interested in "what's next." Growers are informed about promising pre-release varieties through formal and informal channels (e.g., monthly, regional Michigan Bean Commission meetings and the annual Dry Bean Outlook Conference).
	Effective Communication of Seed Supply	Seed companies are in daily communication with their customers (commercial growers), and are vertically integrated commodity trading companies to anticipate certified seed demand. Dry bean certified seed dealers meet annually to share information on the anticipated supply of dry beans, by variety, for the coming year.
	Seed Supply Risk is Mitigated Through Education & Safety Stock Buffers	MSU Extension, MCIA, and industry-led outreach efforts aim to mitigate seed companies' exposure to seed quality losses, which come in many forms, including: seed producer issues, mixtures in processing, weather issues, seed borne disease, and genetic drift. MCIA and certified seed producers further manage their operational risk by building in a ~10% safety stock buffer to hedge against seed quality and seed supply issues.

KEY SUCCESS FACTORS

Enabling Environment

	Respected Public Breeding Program	Farmer and seed industry trusted breeding program that features a robust germplasm bank and is led by an accomplished breeder, who has a history of consistently releasing improved varieties that increase grower incomes via increased yields, disease resistance, and optimized plant structure that improves the efficiency of bean crop cultivation (i.e. erect plant structure that enables direct mechanical harvest).
	Strong Alignment of Stakeholder Objectives	Stakeholder incentives are aligned to support the expansion and profitability of Michigan dry bean production. Unlike in U.S. maize and soybean production, the profit pool in the Michigan bean industry is insufficient to support vertically integrated commercial seed companies that participate along the seed value chain – from varietal development to seed sales. As a result, there is a necessary interdependency among stakeholders (breeders, MCIA, certified seed growers, and farmers), who rely on one another to support the efficient deployment of released, public sector varieties to Michigan growers.
	Close Proximity & Collaboration Among Stakeholders	Michigan bean production is geographically focused, with a majority of production occurring within six contiguous counties in East Central Michigan. The close proximity of actors, including breeders, growers, seed certifiers, extension officers, and buyers, encourages the development of trust-based relationships, and an intense focus on addressing the prioritized issues of a largely homogeneous and agro-ecological environment.
	Foundation Seed Production by a Financially Sustainable Nonprofit	The Michigan Crop Improvement Association provides a critical link between varietal release and seed deployment to farmers. It manages the production and delivery of foundation seed to certified seed growers on a financially sustainable, but not-for-profit basis. Its assumption of this necessary, but non-commercial value chain step, enables private sector seed companies to focus on certified seed production where the business case is stronger due to lower unit production costs and higher seed volumes.
	Formalized Technology Transfer Through Licensing	MSU's Office of Technology streamlines the release of new varieties by executing standardized varietal licenses with the Michigan Crop Improvement Association, which has the first right of refusal on the first variety of each dry bean class that is released annually by MSU's Bean Breeding & Genetics Program.
	Quality Control Measures Command Market Premiums	Production quality has been a differentiating characteristic of Michigan black beans, and is the reason why they command a price premium in key export markets (e.g. Mexico). Grower assurance that the certified seed that they purchase and plant is true-to-type, and disease free, is supported by MCIA's strict seed certification process, which is unreserved in rejecting fields that do not meet Michigan's seed certification requirements. This is evidenced by its ~30% rejection rate of fields that it evaluates for certification.

EGS Seed System Pain Points

Financial Sustainability

Risk of Underperforming Varieties: All parties in the seed system face risk when investing in new bean varieties. Underperforming varieties have had significant time, labor, and capital investments made by the time they reach the commercial market. If varieties fail, MCIA, growers, and seed companies all bear the costs.

Farmer Ability to Switch Crops: Michigan commercial farmers have the ability to switch away from dry beans to other crops (e.g. corn, soy), threatening the seed system's overall stability. Growers must be incentivized through high-performance varieties and a healthy dry bean market to continue to produce dry beans over other crops.

Lack of Operational Funding: MSU's Breeding and Genetics Program lacks earmarked funding for necessary operational roles (e.g., field and lab technician salaries and graduate student stipends), which causes funding to be allocated from project-specific budgets. The practice of resourcing these positions is routine and necessary, but consumes a large number of high-value labor hours.

Demand Planning & Operations

Consumer Preference Shifts: Dry bean varieties are susceptible to changes in consumer preferences, which have corresponding demand implications. For example, navy beans are a focus variety for MSU, however demand from consumers has waned due to their use in baked beans, which has a higher relative sugar content to other types of bean products. This required the system to respond by reallocating resources to classes with increased demand.

Supply Variance: Seed companies contract the production of certified seed to specialized growers. The number of specialized growers fluctuates from season to season based on market conditions and their opportunity cost (*what is the highest return on the acre?*).

Demand Variance: Demand for certified seed, which is forecasted at least one year before it is ordered, fluctuates with the number of commercial growers each year. The timing of production decisions, and the variability of producer demand, makes accurate demand planning a challenge for MCIA and for certified seed companies.

Seed Quality Failures: Failures in seed quality affect all operations of the seed system and result in rejected fields and an interrupted supply. Failures can come in many forms including seed grower error, mixtures in processing, weather issues, seed borne diseases, and genetic drift effects. Michigan's global reputation as a premium source of dry beans is supported by growers' adherence to seed certification guidelines, which leads to higher prices at the expense of certified field rejections.

Enabling Environment

Public Good: The success of MSU's Dry Bean Breeding and Genetics Program in delivering new, improved varieties to the market has created a reluctance on the part of industry to increase its investment in research and development for a perceived public good. The rationale being, if the system is working, then there is no need to increase funding. As a result, industry funding in support of the Breeding Program has remained relatively flat, while its operational costs have increased with inflation, and prospective capital investments in infrastructure upgrades and advanced breeding technologies have gone un-resourced. This dynamic has caused the Breeding Program to perform the same operational activities with a smaller effective budget.

University IP Policy Constrains MSU's Germplasm Bank Potential: MSUT operates under a policy that limits the Breeding Program's ability to transfer and accept germplasm from third party institutions that could strengthen its germplasm bank.

Michigan Dry Bean EGS System

	1900-1959	1960-1999	2000-Present
FINANCIAL Levies Royalties	<p>1862- MSU became a NIFA-Funded Land Grant University</p>	<p>1964- MI Bean Commission, est. by the MI state legislature, began collecting voluntary assessments from growers to fund breeding, research & promotion</p> <p>1990- MSU created the MSU Tech IP office and initiated royalty fee collections on dry bean varieties, ending the voluntary grower assessment. The result was that the breeding program now only receives 1/3 of these royalties, decreasing its overall funding</p>	<p>2014- MCIA raised foundation seed prices from \$120/cwt to \$125/cwt</p> <p>2018- MCIA raised foundation seed prices another 5%</p> <p>Continued review of check off fund collection every five years</p>
DEMAND PLANNING/OPERATIONS Technology Systems	<p>1900s- Est. of bean breeding program at MI agricultural Experiment Station, MI State College (later becomes MSU)</p> <p>1915- Dr. Spragg released MI's first navy bean variety from the MI Agricultural Experiment Station- beginning of dry bean breeding program</p>	<p>1980- Dr. Jim Kelly joined MSU Dry Bean Breeding & Genetics Program</p>	<p>2014- MCIA installed Buhler/Sortex Color Sorter into foundation seed production warehouse to increase seed output quality. Result was increased demand from members and need for increased warehouse space in 2015</p> <p>2015- MCIA provided interested growers with printable seed tags, allowing growers to print their own tags and save on delivery time and postage costs</p> <p>2016- MCIA Seed Lab began accepting credit card payments for services. Foundation seed still required to be paid by check</p>
ENABLING ENVIRONMENT Policies Stakeholders	<p>1927- Michigan Crop Improvement Association incorp. as a nonprofit by Michigan seed growers for seed certification, quality assurance, identity preserved program, foundation seed production, conditioning, seed quality testing, and phytosanitary disease inspections</p>	<p>1965- Michigan Seed law Act enacted to regulate sale of seed, provide for seed inspections and testing, prohibiting certain activities related to seed, and prescribing penalties for violation</p> <p>1980s- MI Bean Commission and Bean Shippers developed disaster relief initiative for MI growers suffering from flooding loss and signed contracts with Mexican government, launching the state's colored bean business</p> <p>1996- Field beans provision made to MI Seed Law that requires all dry bean seed produced in MI to be field inspected and lab tested</p>	<p>2014- MI selected for pilot insurance program by the USDA Risk Management Agency, helping level risks in dry beans with the same assurances growers receive in soybeans and corn</p>

Michigan Dry Bean EGS System Key Takeaways

Michigan Crop Improvement Association is the key (and critical) factor in tying the main actors of Michigan dry bean industry together:

MSU's Dry Bean Breeding and Genetics Program develops improved varieties that reach growers through outreach and foundation seed multiplication conducted by MCIA

MCIA collects royalties on MSU-released dry bean varieties and remits them to MSU Technologies to be used in further variety development

The Michigan Bean Commission represents dry bean growers who receive seed from MCIA to operate their farms

MCIA was established at the request of growers in 1927 and continues to provide them with value and improvements in operations and quality. The Association is open to taking suggestions on improving how growers receive services (credit card payments for seed lab uses) and responds to meet increases in grower demand (new warehouse in 2015). The ability of MCIA to provide several services to growers while also being willing to listen to their needs and evolving to meet those needs is a key success factor in the evolution of the dry bean industry

Prior to 1990, the MI Bean Commission instituted a voluntary assessment on all seed produced and acres grown from MSU varieties. That assessment went straight back to MSU to fund commodity research and the breeding programs in the respective crops. In 1990, MSU created an IP office (MSU Technologies) and initiated fee/ royalty collection on all intellectual property (including dry bean varieties), effectively ending the voluntary assessment collection. As a result of this change, now, only 1/3 of royalties collected on seed produced go back to the breeder and/or breeding program at the discretion of the breeder/inventor. In Dr. Kelly's view, this change negatively impacted the breeding programs by putting them at a disadvantage as the costs to conduct research increase



Market Dynamics

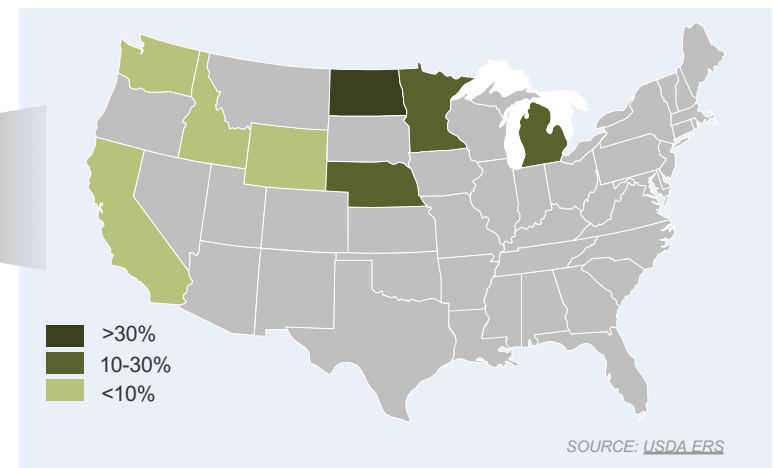
U.S. is a Premium Producer of Several Dry Bean Classes

The U.S. Ranked 4th for Total Production of Dry Beans in 2016*

#Country	2016 Production Total (tons)	% of Total
1 Myanmar	5,708,975	19%
2 India	4,287,372	15%
3 Brazil	2,877,415	10%
4 United States of America	1,396,908	5%
5 United Republic of Tanzania	1,273,843	4%
6 China (incl. Taiwan)	1,253,853	4%
7 Mexico	1,197,644	4%
8 Uganda	1,109,251	4%
9 Kenya	800,976	3%
10 Ethiopia	532,315	2%
11 Rwanda	481,440	2%
12 All Others	8,596,741	29%
Total	29,516,733	100%

SOURCE: FAOSTAT

Michigan is the Second-Highest Producer of Dry Beans in the U.S., Preceded by North Dakota



30% INCREASE in acres harvested for dry beans may be attributed to low prices in commodity crops

West and Northern Plains states experienced drought in 2017 that lead to **YIELD DECLINES** to levels not seen since 1944

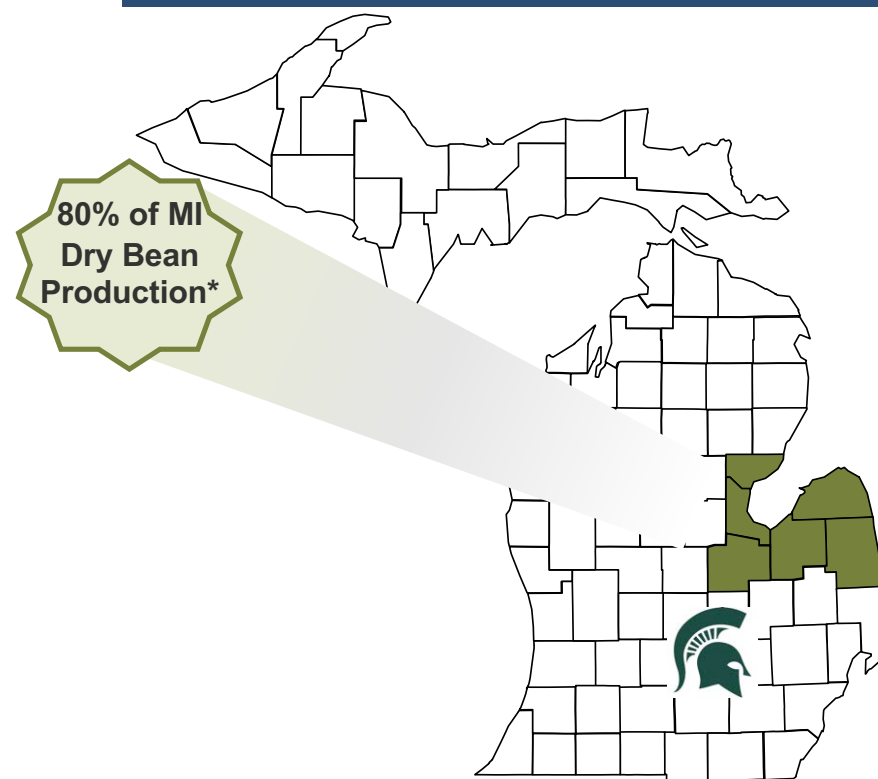
PINTO, NAVY, and BLACK BEANS accounted for **78% of area planted** in 2017

More Than 80% of MI Dry Bean Production is Concentrated in Six Counties

Close Proximity of Researcher and Producers. East Lansing is Michigan's state capital and is home to Michigan State University, the MSU Dry Beans Breeding and Genetics Program, MSU Extension, and Michigan Crop Improvement Association. It is located in close proximity to the primary production counties of the state (within a hundred miles).

Michigan Beans Are a Premium Brand. Michigan Dry Beans command a price premium in the global market due to their consistent, high-quality production, and their preferred cooking characteristics (e.g. the higher relative moisture of MI black beans reduces their cooking time).

Map of the State of Michigan



*Conversations with Michigan dry bean growers 16

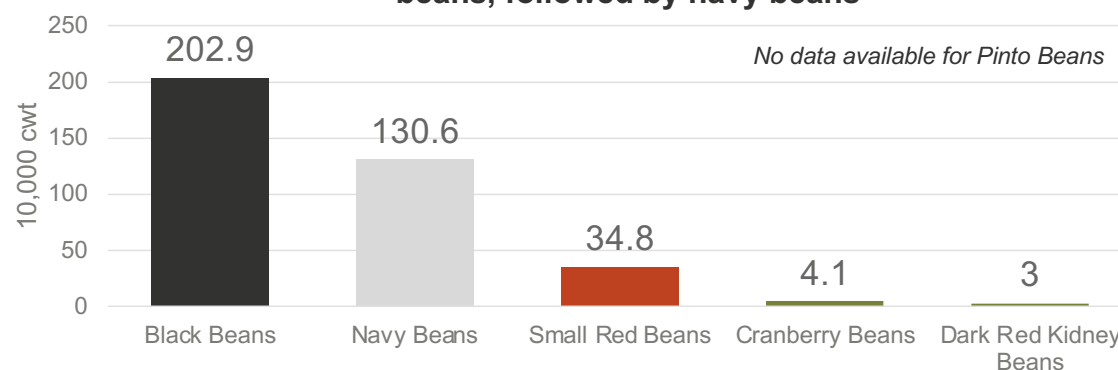
Michigan Bean Classes & Facts

Michigan Dry Bean Classes



SOURCE: Dr. Jim Kelly various presentations

In 2016, black beans represented the greatest production of dry beans, followed by navy beans



Michigan is the **SECOND HIGHEST** producer of dry beans in the U.S.

Michigan was a leader in producing white beans for several years, but **DIVERSIFICATION** was needed for exports

Now, **12 DIFFERENT CLASSES** of dry beans are grown in the state

MSU EXPANDED BREEDING to several different classes to alter growth habit, local adaptations, and different levels of disease resistance

Michigan Dry Bean Production Trends

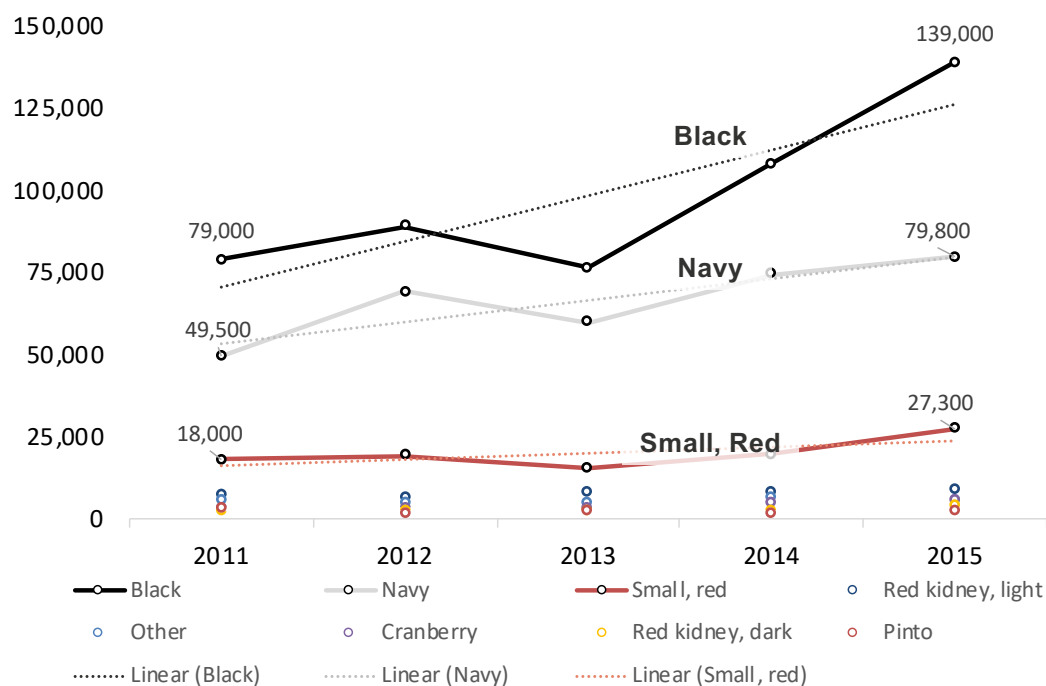
Takeaways From 2011-2015 Harvested Acres

Dry Bean Production Acres
Increased by 10.1%

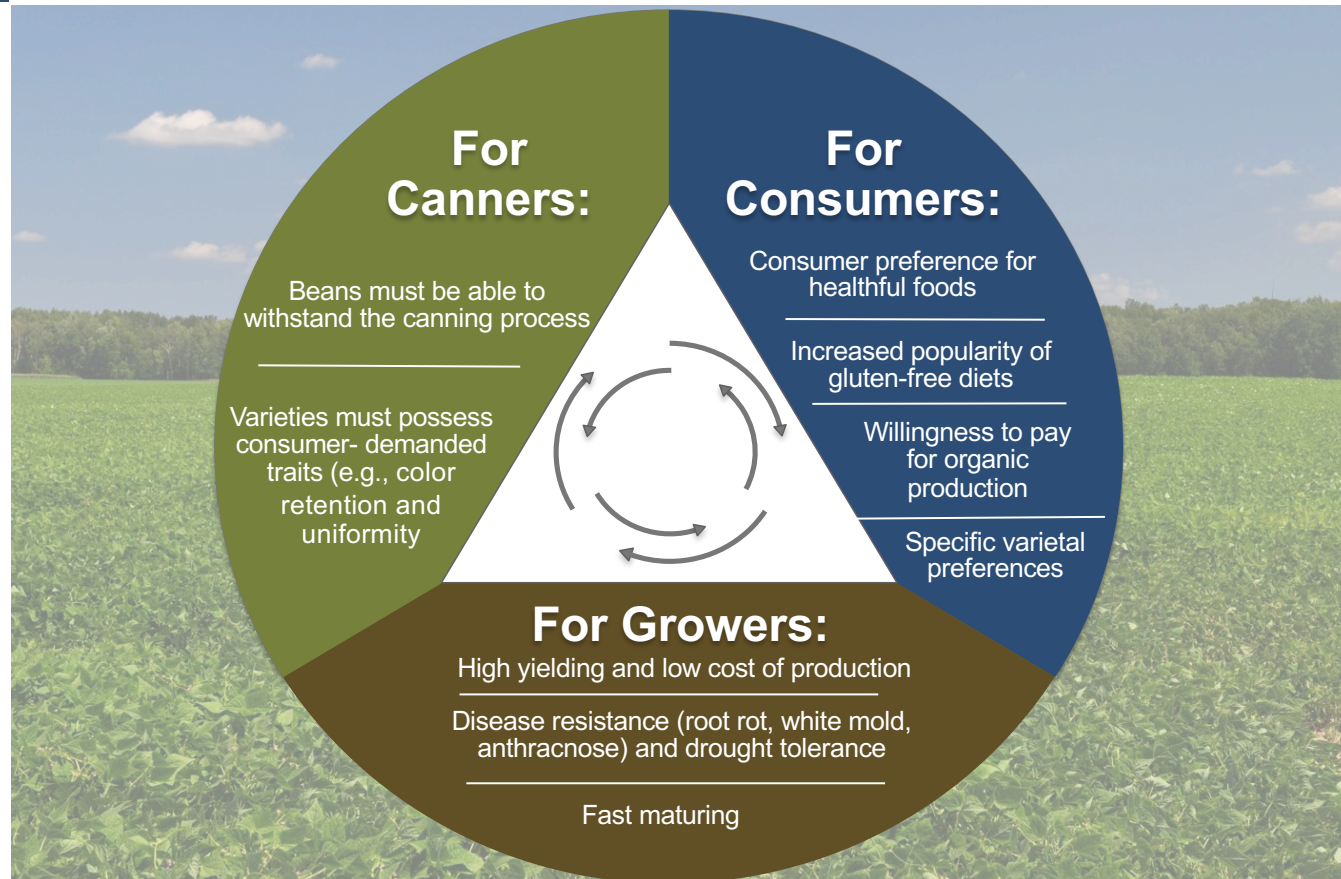
Black Bean and Navy Bean Were CAGR Growth
Leaders at 12% and 10%, Respectively

The Small, Red, Cranberry, and Red Kidney, Dark
Classes Grew at +5% CAGR From 2011 and 2015

Harvested Acres of Dry Bean Varieties in Michigan



Dry Bean Demand Drivers by Stakeholder










Leadership

LEADERSHIP

Organizational Value Chain Leadership Summary

	A	B	C	D	E
ORGANIZATION	Michigan State University Dry Bean Breeding and Genetics Program 	MSU Technologies (MSUT) 	Michigan Crop Improvement Association 	Michigan Bean Commission 	Michigan Bean Shippers 
VALUE CHAIN ROLE	<ul style="list-style-type: none"> Varietal development Basic genetic research Student training Industry outreach about new varieties 	<ul style="list-style-type: none"> Facilitates the commercial development and public use of MSU-developed varieties 	<ul style="list-style-type: none"> Licensee of new varieties Foundation seed order management, contract producer, and supplier Royalty collection Seed certification 	<ul style="list-style-type: none"> Advocate for the interests of Michigan dry bean producers 	<ul style="list-style-type: none"> Advocate for the interests of Michigan bean shippers, processors, and marketers
FUNDING SOURCES	<ul style="list-style-type: none"> Federal and state funding via university allocation Federal grants (USAID, NIFA) Special projects (Dept. of Agriculture, MBC) Partial royalties on licensed MSU varieties Partial allocation of check off funds; majority of check off funds allocated for industry agronomist salary from the Michigan Bean Commission 	<ul style="list-style-type: none"> University funding through MSU'S Vice President for Research and Graduate Studies Office and the MSU Foundation 	<ul style="list-style-type: none"> Revenue from foundation seed sales Seed company association dues Seed certification charges NOTE: MCIA remits all collected royalties to MSU Technologies 	<ul style="list-style-type: none"> Assessment on dry bean producers based on their production acreage (more commonly known as a 'commodity checkoff program') 	<ul style="list-style-type: none"> Membership dues and corporate sponsorships through the Michigan Agri-Business Association
FINANCIAL SUSTAINABILITY	PUBLIC SECTOR SUBSIDIZED	FINANCIALLY SUSTAINABLE	FINANCIALLY SUSTAINABLE	FINANCIALLY SUSTAINABLE	FINANCIALLY SUSTAINABLE

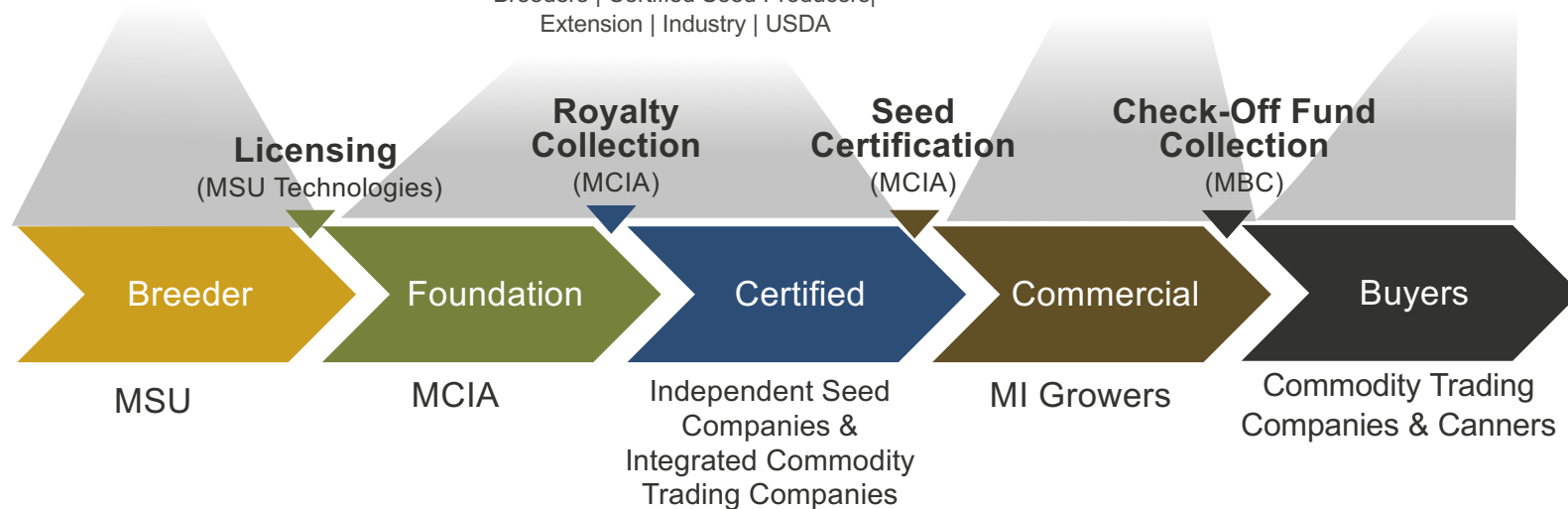
LEADERSHIP

Organizational Leadership by Value-Chain Step

MICHIGAN STATE
UNIVERSITY



Board Representation: Farmers |
Breeders | Certified Seed Producers |
Extension | Industry | USDA



MSU Dry Bean Breeding and Genetics Program

OBJECTIVE: “To Develop Improved Dry Bean Varieties in Several Commercial Classes to Serve the Bean Growers, Bean Seed Producers, and Bean Industry of Michigan” Breeding Program

KEY RESPONSIBILITIES:

New Variety Development: The breeding program focuses on developing varieties that are high-yielding, stress and disease resistant, have upright architecture, and improved canning qualities in 10 classes of dry beans.

Industry Outreach: The breeding program disseminates new research information to growers, crop advisors, and other industry professionals at industry events and conferences. Information sharing often centers on research developments about disease resistance & pest management and new variety progress.

FUNDING

Breeding program activities are funded by: Federal and state funding allocated by MSU, state- and federally-funded grants, special projects sponsored by MBC, and royalties collected on released varieties.



Dr. Jim Kelly, Head Breeder

Dr. Kelly leads the MSU Dry Bean Breeding and Genetics Program. He joined MSU faculty in 1980, has developed over 49 bean varieties, and is well respected within the U.S. dry bean industry.



Dr. Kelly's Bean Laboratory Team

The MSU Dry Bean Breeding and Genetics Program currently employs 35 Master and PhD level researchers focused on dry bean breeding and research.

MSU Technologies (MSUT) – Licensing of Released Varieties

OBJECTIVE: To facilitate the commercial development and public use of technologies and copyrightable materials developed by MSU faculty and staff.

KEY RESPONSIBILITIES:

Varietal Licensing & Technology Transfer: MSUT is responsible for licensing released MSU dry bean varieties.

Negotiate Royalty Amounts: MSUT negotiates royalty amounts with MCIA once a new variety is approved for release. The royalty amount varies by bean class to account for the difference in seed size and seed weight by class.

Royalty Allocation: MSUT receives and allocates royalties from the sale of foundation seed.

FUNDING:

MSUT's operational budget is funded by MSU'S Vice President for Research & Graduate Studies Office and by the MSU Foundation.

LICENSING PROCESS:

Screening & Assessment

Varieties are subjected to a three committee review, which include representation from:

- MCIA
- MI Department of Agriculture
- MCIA Crop Specialists
- MSU AgBioResearch Representatives

Marketing

MSUT provides assistance in identifying potential licensees for new varieties. MCIA has the first right of refusal for all MSU varieties, so very few MSU varieties are made available for licensing to other entities.

Licensing & Compliance

MSUT negotiates licenses and royalties with MCIA. While licensed varieties are in the market, MSUT assists in assuring all license conditions are met.

Michigan Crop Improvement Association (MCIA) – Foundation Seed Production & Seed Certification

PURPOSE: “To foster and promote the production and use of improved seed stocks in Michigan, to serve as an official seed certification agency for the state of Michigan and to provide other related services to benefit its members and the agricultural industry.” [MCIA](#)

KEY RESPONSIBILITIES:

Breeder Seed Bulking & Foundation Seed

Production: MCIA contracts the bulking up of breeder seed (1 company), and the production of foundation seed (~4 companies), on dry bean varieties that it licenses from MSU.

Foundation Seed Demand Planning and Sales:

MCIA coordinates foundation seed orders from certified seed growers.

Royalty Collection: MCIA collects payments from the sales of foundation seed and remits the royalty payments to MSUT.

Seed Certification: MCIA is charged as the certifying authority for MSU varieties. Thirty-five seed certifying inspectors are employed by the Association.

LEADERSHIP:

MCIA's Board of Directors provides strategic direction and features broad industry representation, including senior leaders from MSU, the Michigan Bean Commission, Certified Seed Producers, USDA, and Growers.

FUNDING:

MCIA is a nonprofit organization that covers its operating expenses through revenues on the foundation seed it sells to certified seed growers. Revenues from foundation seed sales fully fund MCIA foundation seed production activities. MCIA remits 100% of collected royalties to MSU Technologies and does not use any royalties to fund its operations. Sales of dry bean foundation seed contribute 65% of revenues to MCIA.

VARIETAL LICENSING:

MCIA has the first right of refusal to license the first dry bean variety in each class released by MSU annually. It licenses the new varieties from MSU's Technology Office for a fixed royalty that is established by the class of the dry bean. To date, all but one MSU released varieties have been licensed by MCIA.

MCIA also provides foundation seed production and seed certification services for corn, wheat, rye, oats, barley, soybeans, and peas

Michigan Bean Commission (MBC) – Farmer Advocacy



OBJECTIVE: Benefit Michigan's dry bean growers by promoting research on varieties and production practices; improving bean products' food, therapeutic and dietetic value; conducting market development and research studies; and implementing promotional programs.

KEY RESPONSIBILITIES:

Facilitate Industry Connections: Commission meetings & events connect growers, researchers, shippers, the U.S. Dry Bean Council, and MBC leaders to share industry news and MBC initiatives.

Collect & Manage Check Off Funds: MBC collects check off funds from commercial growers (\$0.10 per hundredweight sold). \$0.01 is allocated to pay the salary of the dry bean industry agronomist and \$0.09 is allocated for industry marketing efforts.

Disseminate Market Information & Cultivate Export Markets: Promote the value proposition of Michigan dry bean production, domestically and internationally, to capture premium pricing.

ORGANIZATIONAL STRUCTURE:



An executive committee oversees the Commission's operations and each bean growing district is represented by a commissioner. Commission meetings are held every two months and additional events are held throughout the year (e.g. Annual Dry Bean Outlook Conference).

FUNDING:

MBC's operations are funded through agricultural assessments collected on the volume of beans sold (\$0.10/cwt sold) each season. The agricultural assessment amount is renegotiated every 5 years.

Michigan Bean Shippers Association



OBJECTIVE: Serve the Michigan dry bean industry by connecting Michigan bean growers and members of the elevator industry to dry bean customers around the world. [MBSA](#)

ASSOCIATION DETAILS

Member of a Larger Michigan Agricultural Association: “The Michigan Agri-Business Association comprises the heart of the industry-seed, fertilizer, and crop protection manufactures, retailers and advisers, grain handlers, feed suppliers, and food processors. All major commodity groups in Michigan are represented as well.” [MABA](#)

The Michigan Bean Shippers Association is made up of a 6-person board: One president and five trustees oversee the operations of the Association

Provides Funding for Breeding & Research: The Michigan Bean Shippers Association matches the research funding allocated by the Michigan Bean Commission from check off fund revenues. This money is the main funding source for employing the bean industry agronomist.

MICHIGAN BEAN SHIPPERS – 2016-17		
LISTINGS ALPHABETICALLY BY COMPANY		
<p>- A -</p> <p>Ackerman Marketing, Inc. 4910 South Gera Rd P.O. Box 361 Frankenmuth, MI 48734 (989) 652-3469 Fax: (989) 652-0064 Email: lyne@ackermanmarketing.com Lyle Ackerman, President Neil Mosher, Sr. Trader - email: neilmosher@aol.com Kevin Ackerman, Operations - Email: kevin@ackermanmarketing.com Cell: 989-930-9210 Brad Ackerman, Jr. Trader - Email: brad@ackermanmarketing.com Cell: (989) 529-7068 BB, CB, WB, DRY BEANS, PEAS & LENTILS</p> <p>ADM Edible Beans 4066 Faries Parkway Decatur, IL 62525 (217) 451-7236 Fax: 217-451-2634 Email: Scott.reisner@adm.com Scott Reisner</p> <p>- B -</p> <p>BAMP Marketing & Consulting, Inc. 11840 Myers Road Silsbee, MI 48759 (989) 551-BAMP (2267) Email: beaman@bamp.net or beaman@bampmarketing.com Mike Elvinger, President CB, WB, DRY BEANS</p> <p>Bayside Best Beans LLC 418 Union St. Silsbee, MI 48759 (989) 883-2628 Fax: (989) 883-2639 Web Site: www.baysidebestbeans.com Email: brad@baysidebestbeans.com Brad D. Vittek, Plant Mgr. CB, D, CCL, MO, RR, SD, WB</p>	<p>Blanchard Bean Co. 10830 W Co Line Rd Blanchard, MI 49310 (989) 561-2510 Fax: (989) 561-2182 Email: daniel@blanchardbean.com Denny Nelson CB, GDL</p> <p>- C -</p> <p>Carlson-Arbogast Farms LLC 4795 Reed Rd Howard City, MI 49329 (231) 937-5470 Email: beafr@frontier.com Brandon Carlson</p> <p>Clearwater Farms 140 W Elmwood Rd Cairo, MI 48723 (989) 551-3393 Fax: (989) 367-6907 Email: jonfindlay1979@hotmail.com Jonathan Findlay G</p> <p>Cooperative Elevator Co. 7211 Michigan Ave P.O. Box 619 Pigeon, MI 48755-0619 (989) 453-4500 Fax: (989) 453-3942 Web Site: www.coopellev.com Email: scott.gordon@coopellev.com Scott Gordon, CEO Mike Janowicz, (989) 553-1081 (cell) Email: mjanowicz@coopellev.com Mark Boyne, V.P. Agronomy, (989) 975-1234 mboyne@coopellev.com Dan Armstrong, Marketing Mgr., (989) 550-2533 Email: danarmstrong@coopellev.com AA, BB, C, CA, CB, D, DP, F, G, GDL, LP, MO, P, RT, RR, SB, SD, S, SDT, WB, S14M, H & E</p>	<p>- D -</p> <p>D.W. Sturt & Company 5444 Jones Landing Rd Patsburg, MI 49770 (231) 347-7974 Email: dsturt@dsturt.com Dan Sturt COMMODITY BROKER</p> <p>- F -</p> <p>Freeland Bean & Grain, Inc. 1020 E. Washington P.O. Box 515 Freeland, MI 49623 (989) 695-5131 Fax: (989) 695-5241 Web Site: www.freelandbeanandgrain.com Email: freeland@att.net Roger Hupler, President Victor Hupler, Secretary, Agronomy Mgr. Troy Hupler, Treasurer, Safety, Food Safety, Equip. Mgr. C, CA, CB, D, DP, F, FE, G, GDL, LP, MO, O, RR, RT, SB, SD, S, S14M, RR-4S</p> <p>- H -</p> <p>Harrington Seeds, Inc. 2586 Bradleyville Rd. Reese, MI 48757 (989) 868-4790 Fax: (989) 868-3671 Email: hseeds@harrington.com Jeff Harrington, President CB, G, GDL, MO, O, SB, SD, S, SDT, WB</p> <p>- I -</p> <p>Iltner Bean & Grain, Inc. 301 Park Ave. P.O. Box 4 Auburn, MI 48611 (989) 662-4461 Fax: (989) 662-4664 Web Site: www.iltnerbg.com Email: tom@iltnerbg.com Tom Iltner, Plant Mgr. Marty Schman, Sales Mgr.</p>

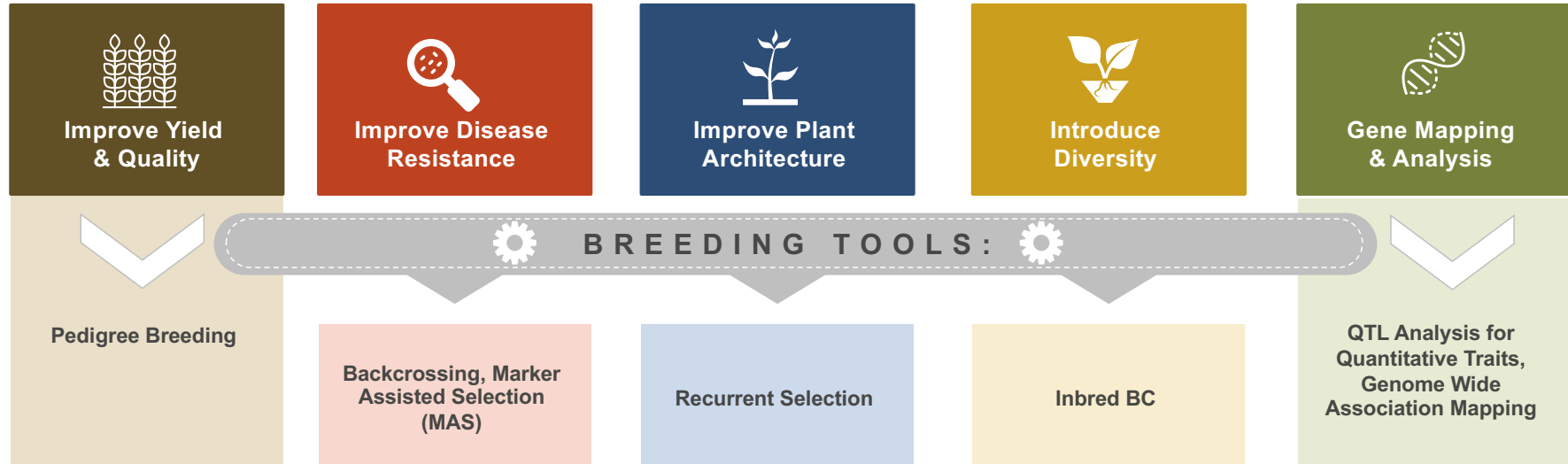
The Association provides an [online directory](#) of bean shippers and elevators in Michigan through the Michigan Agri-Business Association Website.



Research & Varietal Development

MSU Breeding Objectives and Systems

Breeding Objectives for the MSU Dry Bean Breeding Program include:



SOURCE: MSU Dry Bean Breeding & Genetics Program

The Breeding Program Functions Within a Larger, University Enabled System

MSU AgBioResearch is the key to connecting all MSU entities involved in new variety development and release

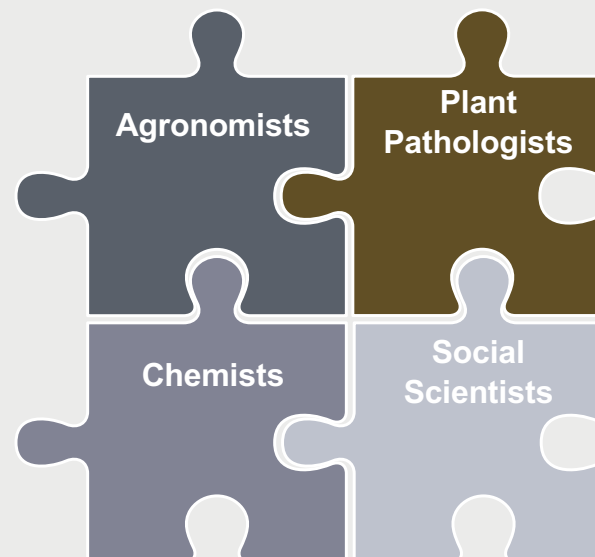


AgBioResearch
MICHIGAN STATE UNIVERSITY

“MSU AgBioResearch encompasses the work of more than 300 scientists in seven colleges at MSU: Agriculture and Natural Resources, Arts and Letters, Communication Arts and Sciences, Engineering, Natural Science, Social Science and Veterinary Medicine.

These researchers, in on-campus laboratories and at 13 outlying research centers across the state, investigate topics that range from agricultural production, alternative energy and biofuel production, food safety and environmental stewardship to childhood obesity, community development, and the quality of life of Michigan youth and families. Michigan citizens reap the benefits of this work in the form of new or improved foods and plants, new production methods and enriched lifestyles.” [MSU AgBioResearch](#)

Effective breeding and varietal releases are possible through the **collaboration** of MSU research programs including:



Breeding Program Prioritized Plant Architecture Which Allowed Mechanized Harvesting and Increased Profitability

Dry Bean breeding methods over the past 20 years have focused on developing an **IMPROVED TYPE OF BEAN STALK** that is:



Taller



Has longer maturity



Has greater stand strength



Has a deeper taproot



Stands upright as an architectural avoidance to white mold and other diseases

These improved methods Have led to the ability to **DIRECT HARVEST** beans in the US and Canada, resulting in:



Labor, Time, Equipment Savings



Improved Quality & Flexibility



More Acreage Covered

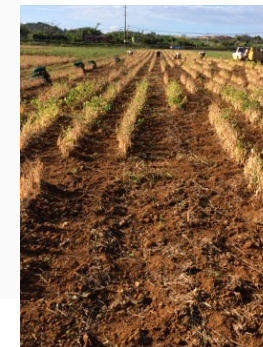
Stage Gate Process – Breeding to Seed Deployment

10-year breeding process for breeding new varieties:

	Breeding Phase	Seed Generation	Location of Phase
Year 1-3	Crossing and Early Generation Selection	Generations: Parent through F6	Greenhouses, Fields in MI and Puerto Rico
Year 4-6	Yield Testing, Canning Testing	Generations: Replicated F6-Prerelease	Fields in MI
Presentation to committees for permission to release variety			
Year 7-9	Seed increases (Breeder, Foundation, Certified)	Breeder seed through Certified seed	Western states (ID, WA)
Year 10	Certified Seed Available to Commercial Growers		




Potential New Bean Varieties
Planted in one of the Dry Bean Breeding and Genetics Program's greenhouses on MSU's campus. These plants are used for crossing and selection during Years 1-3 in the breeding process.



Utilizing Test Fields in Puerto Rico
Allow for extra production cycles of new bean varieties each year, decreasing the total number of years required for testing before release.

Seed Multiplication Timeline

5-year process from Pre-Breeder Seed to Commercial Seed:

	Breeding Phase	Approx. Amount of Seed Generated	Description	Location of Phase
Year 6	 Pre-Breeder Seed	1 lb.	Establishing Phase	MSU
Year 7	 Breeder Seed	40 lbs.	Multiplication Phase	
Year 8	 Foundation Seed	1,600 lbs.		
Year 9	 Certified Seed	64,000 lbs.		
Year 10	Distribution of Commercial Seed		Distribution Phase	Michigan and other locations based on distribution company

Most of the seed increases for Foundation and Certified Seeds occur in Western U.S., not in Michigan:

The **BREEDER SEED SOURCE** is increased by contracted growers and local companies in WA and ID

Top companies include Treasure Valley Seed, ADM, and Kelley Bean

Drier conditions out West decrease the **RISK OF SEED-BORNE DISEASE ISSUES** present in Michigan

MULTIPLICATION PROCESS takes 3 years

Improved Dry Bean Varieties Begin in the MSU Breeding Greenhouses

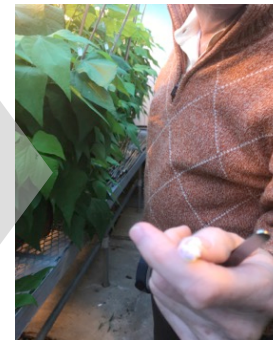
Dr. Kelly and his breeding staff are responsible for managing the all stages of new dry bean variety development



Greenhouses in Lansing, MI house the improved dry bean varieties **currently in development.**



Dr. Kelly and his team **make selections and crosses** based on data collected over several months.



Once crosses are made, the most promising varieties are **chosen for planting** and **further testing.**

Disease resistance is a main breeding goal for dry beans and Dr. Kelly's team does **extensive resistance testing** of new varieties.



New lines and varieties are kept separate in greenhouses through the use of a **hand-tagging** and **naming system.**



Pre-breeder seed is established at MSU before being sent for multiplication in Western U.S. states.




Growers and Industry Learn More About New Varieties Through MSU Release Bulletins

New Variety Bulletins Are Made Available To The Public Through The MSU Dry Bean Breeding and Genetics Program Website, The MSU Dry Beans Extension Website, And Industry Events

NEW from MSU

'Zenith'

A New Black Bean Variety for Michigan



- New upright full-season black bean variety suited for direct harvest.
- Highest yielding black bean variety in five years of testing.
- Matures in 100 days, similar to 'Zorro'.
- Fulfills uniform maturity coupled with good dry down similar to 'Zorro'.
- White mold resistance due to upright plant habit.
- Resistant to race 71 of anthracnose.
- Attractive black bean seed that possesses unique canning quality.

'ZENITH' is a new erect, high-yielding black bean variety from Michigan State University (MSU) that has out-yielded all current black bean varieties. This fall-season maturing variety has an upright, short vine growth habit. The upright mature plant profile, combined with resistance to lodging, makes 'Zenith' suitable for direct harvest under narrow row production systems. 'Zenith' is resistant to race 71 of anthracnose to which most current black bean varieties are susceptible. 'Zenith' is equivalent to 'Zorro' in tolerance

to white mold and is resistant to strains of bean rust and bean common mosaic virus (BCMV) present in Michigan. The seed of this variety is similar in size to that of 'Zorro', yet it possesses unique canning properties. Following canning, 'Zenith' retains the black color better than current black bean varieties such as 'Telique' that tend to bleed and produce a less desirable chocolate-brown canned product.

Michigan State University Extension
E-3248
2015

Origin and Breeding History

'Zenith', named in MSU black bean breeding line B10244, was developed from the cross of black bean breeding line B04644 and the black bean variety 'Zorro' from the MSU breeding program. B04644 is an upright black bean derived from the three-way cross of B06306/Jaque/NGR025. B04644 carried the anthracnose resistance gene Ca-1 from the 'Jaque' parent. In testing, it exhibited superior canning quality as it retains black color following canning, a characteristic coming from the black bean parent NGR025 from Mexico. 'Zorro' is a high-yielding upright black bean variety well adapted to Michigan that lacks resistance to anthracnose. The cross was made to transfer anthracnose resistance and superior canning quality into new high-yielding upright black bean varieties.

Agonomic and Disease Information

'Zenith' exhibits the upright type-1 indeterminate short vine growth habit combined with good resistance to lodging (1.4 on a 1-5 scale). Plants average 21 inches in height, similar to the heights of 'Zorro' and 'Shania'. 'Zenith' is a fall-season maturing 100 days after planting. The range in maturity is from 95 to 105 days, depending on season and location. It matures with 'Zorro' and 'Loreto', one day earlier than 'Shania' and four days later than 'Telique'. 'Zenith' has demonstrated the same uniform maturity and dry down as 'Zorro', and is more erect than 'Shania'. 'Zenith' has a high agonomic acceptance rating based on its upright habit, resistance

to lodging, excellent pod load and favorable high pod placement in the plant canopy.

'Zenith' has been tested for five years (2010-2014) at 41 locations by MSU researchers in cooperation with colleagues in Michigan, New York and Ontario. The combined yield data comparisons with other black cultivars are shown in Table 1. Over 41 locations, 'Zenith' yielded 28.4 bushels/acre per acre (bwa) and significantly out-yielded 'Zorro' by 6%, 'Shania' by 1%, 'Telique' by 12%, 'Loreto' by 9% and 'T-39' by 13%. Yield ranged from a high of 41.2 cwt/acre in Blyth, Ontario, in 2012, to a low of 13.4 cwt/acre under severe white mold conditions in Hiram County, Michigan, in 2014.

Planted in narrow rows (20 inches) and combined with direct harvest, 'Zenith' has produced competitive yields in excess of 30 cwt/acre in Michigan and appears well adapted to a range of production systems in New York and Ontario (41 cwt/acre), where black beans are grown commercially. 'Zenith' appears to be well adapted to this increasingly popular management system. Growers should follow current recommended practices for fertility and weed control in growing 'Zenith' beans. Recommendations can be found online from the Saginaw Valley Research and Extension Center (<http://agresearch.msu.edu/agresearch/>) and MSU Weed Science (<http://weeds.msu.edu/>).

'Zenith' possesses the single dominant hypersensitive 1 gene, which confers resistance to seed borne BCMV. All the black varieties listed in Table 1 possess the same resistance gene. 'Zenith' possesses the Ca-1 gene that provides resistance to anthracnose race 71 to

which all other black bean varieties except 'Loreto' are susceptible. 'Zenith' exhibits similar tolerance to white mold compared to other black bean varieties. Percent white mold was 16% compared to 'Zorro' (35%) and 'Shania' (63%). 'Telique' (37%) and 'T-39' (70%) when grown in irrigated trials over 4 years. 'Zenith' exhibits a range of reactions to other pathogens similar to commercial black bean varieties. It is susceptible to common bacterial blight, it possesses resistance to some races of rust but is susceptible to rust race 22-2 now prevalent in Michigan.

Quality Characteristics

'Zenith' has a typical small-seed black bean seed, averaging 27 g/100 seeds and a size range from 20 to 21 g/100 seeds. The seed is similar in size and appearance to 'Loreto' and 'T-39' (22g), is slightly larger than 'Zorro', 'Shania' and 'Telique' (20g), and resembles the round plump appearance of 'T-39'.

In canning trials, 'Zenith' has been subjectively rated by a team of trained panelists as being excellent in cooking quality. This evaluation is based on whole bean integrity (no splitting or clumping), uniformity of size (uniform water uptake), cooked seed color (limited color leaching) and clear bean (no starch extrusion into cooking liquid). 'Zenith' rated 4.5 on a scale of 1 to 5 where 1 is best and 5 is mid-scale (neither acceptable nor unacceptable). Within the commercial black bean class, 'Zenith' was rated highest in visual color (4.6) when compared to 'Zorro' (3.5), 'Telique' (2.5) and 'T-39' (3.5). Data on L-color (lightness scale) of cooked beans showed that 'Zenith' was blacker (13.1)

Traits	Varieties					
	'Zenith'	'Zorro'	'Shania'	'Telique'	'Loreto'	'T-39'
Agonomic traits						
Days to flower	43	46	46	43	44	43
Days to maturity	100	100	101	96	100	100
Height in inches	21	21	21	20	21	18
Lodging score: Average (1-5)	1.4	1.7	1.8	1.3	2.3	3.1
Agonomic index ^a (average 1-7)	5.5	5.3	5.8	4.2	3.8	3.4
100-seed weight in grams	21.7	20.2	20.3	20.1	22.1	21.5
Mean yield ^b (cwt/acre)	28.4	26.7	26.6	25.2	25.6	24.5
Yield percentage	100	94	95	88	91	87
Disease resistance traits^c						
BCMV ^d	R	R	R	R	R	R
Anthracnose: race 71	R	S	S	S	R	S
Rust race 22-2	S	S	S	S	S	S
Common bacterial blight	S	S	S	S	S	S
White mold percentage ^e	16	35	63	52	—	70
Canning quality traits						
Color L-scale ^f	13.1	15.8	16.9	18.1	16.2	16.2
Visual color ^g	4.6	3.5	3.1	2.3	3.1	3.3
Texture (kg/100g)	41	43	39	47	37	38
Visual rating ^h	4.5	4.0	3.2	3.6	3.4	3.5

^a Lodging: 1 = Erect, 5 = Prostrate

^b Agonomic index: 1 = Worst, 7 = Excellent

^c Yield was averaged over 41 locations from 2010 to 2014

^d Diseases: R = Resistant, S = Susceptible

^e BCMV = Bean Common Mosaic Virus

^f White mold: Percentage of disease incidence and severity

^g Color L-scale: Lightness scale, lower number the blacker the product

^h Visual color: 1 = Undesirable brown color, 5 = Desirable black color

ⁱ Texture: kg of force needed to compress 100 g canned beans

^j Visual rating: 1 = Very undesirable, 3 = Neither desirable nor undesirable, 5 = Very desirable

than all other black beans in the lower value indicates darker color and better color retention following canning. No major differences were observed for texture ranging from 30 to 41 kg (100g) and 'Zenith' (41 kg) was within the acceptable range of 30 to 40 kg/100g for processed black beans. 'Zenith' possesses superior canning quality for black beans sought by the canning industry.

Release and Research Fee

'Zenith' was released by Michigan State University with the option that 'Zenith' be sold for seed by variety name only as a class of certified seed under the three-class system used in Michigan (breeder, foundation,

certified). A variety will be assumed on each hand-drawn seed of either foundation seed or certified seed, depending on the production location (east or west of the continental divide). Plant Variety Protection (PVP) from the USDA Agricultural Marketing Service is anticipated. Parties interested in licensing 'Zenith' may contact MSU Technologies (technologies.msu.edu) by phone at 517-855-2166 or by e-mail at msutech@msu.edu.

Acknowledgments

Authors

• J. D. Kelly, Plant, Soil and Microbial Sciences Department, MSU

• E. M. Wright, Plant, Soil and Microbial Sciences Department, MSU

• G. V. Varner, Production Research Advisory Board, Michigan Bean Commission

• C. L. Sprague, Plant, Soil and Microbial Sciences Department, MSU

Produced by MSU Extension/ANR Communications (extension.msu.edu).

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MICHIGAN STATE UNIVERSITY Extension

MSU is an affirmative action, equal opportunity institution committed to achieving excellence through a diverse workforce and inclusive culture that ensures the success of all people in our state. Michigan State University Extension programs and materials are open to all without regard to race, color, national origin, gender, gender identity, sexual orientation, marital status, family status or veteran status. Based on feedback of MSU Extension work, as of May 1 and June 15, 1975, in cooperation with the U.S. Department of Agriculture, Bill Hammel, Extension Director, MSU Extension, East Lansing, MI 48824. This information is for educational purposes only. Resistance to common diseases in this variety is not guaranteed by MSU Extension as this variety does not meet the requirements of the Plant Variety Protection Act (7 U.S.C. 2321-2326).

Canning: A Special Case of Trait Importance

“Breeders have to ensure that the line meets the essential characteristics - yield, agronomics, and canning - that are superior to what is already in the market.” – Jim Palmer, MCIA

THE SITUATION:	Beans must be PROCESSED before being consumed. This requires that beans be bred to WITHSTAND THE CANNING PROCESS.			
THE BREEDING SOLUTION:	ELIMINATE the varieties that prove to BREAK EASILY from the breeding program and only keep those varieties with other DESIRABLE CANNING TRAITS.			
CANNING QUALITY TRAITS:	Visual Selection by trained judges	Whole Seed integrity	Color Retention and Uniformity	Clear Brine
	Hydration Ratios	Drained Weights	Texture	Commercial Evaluation of elite lines



Industry Agronomist, Greg Varner, shows Dry Beans Separated by Dry Bean Class for Canning Testing.

Dr. Varner and his team portion out the sampling beans to streamline the canning testing process.



Specialized equipment allows for testing of hydration ratios in new bean varieties.

This testing enables efficient evaluation of new bean varieties.



Demand Planning and Operations

Michigan State University Breeding Program Enables the System

VARIETAL DEVELOPMENT & SEED DEPLOYMENT



Varietal Development

The Michigan State University Dry Bean Breeding and Genetics Program develops high yielding, disease and stress resistant cultivars with upright architecture and improved canning quality in 10 commercial seed classes for production in Michigan.



Seed Multiplication

The Michigan Crop Improvement Association (MCIA), contracts Gen-Tech Seed Company to produce pre-breeder seed. MCIA then contracts out foundation seed production to private seed companies that produce and return or purchase foundation seed for their use in certified seed production.



Certified Seed Production

Certified seed production is completed by seed companies who purchase foundation seed from MCIA. MCIA acts as both the seed certifying and royalty collection agency for the seed system. MCIA collects a royalty from certified seed growers based on the amount of foundation seed purchased on a cwt basis.

FARMER PRODUCTION, MARKETING, AND KEY DEMAND SEGMENTS



Farm Production

Commercial farms plant certified seed purchased from seed companies to produce commercial beans. Certified seed planted by commercial growers is commonly protected by Plant Variety Protection Laws, which prevent the transfer and sale of non-certified seed. An estimated 4 million cwt of commercial beans are produced from MSU varieties annually.



Industry Advocacy

The Michigan Bean Commission is made up of more than 1,100 bean producers and related agri-business associates. The Michigan Crop Improvement Association assists the Michigan seed industry by taking on the commercially unattractive roles of seed certification and foundation seed production. The Michigan Bean Shippers Association advocates for the industry's downstream actors.



Demand Segments











The main MI bean classes (navy and black beans), are highly sought after internationally. International and domestic consumers consider dry beans from Michigan to be of higher quality than beans from other production regions. An estimated 85%* of MI navy beans are canned, while most of the MI black beans go to the Mexican packaged market.

ENABLING ENVIRONMENT STAKEHOLDERS

[Michigan Crop Improvement Association](#) | [Michigan Bean Commission](#) | [Michigan Bean Shippers Association](#) | [USDA](#)

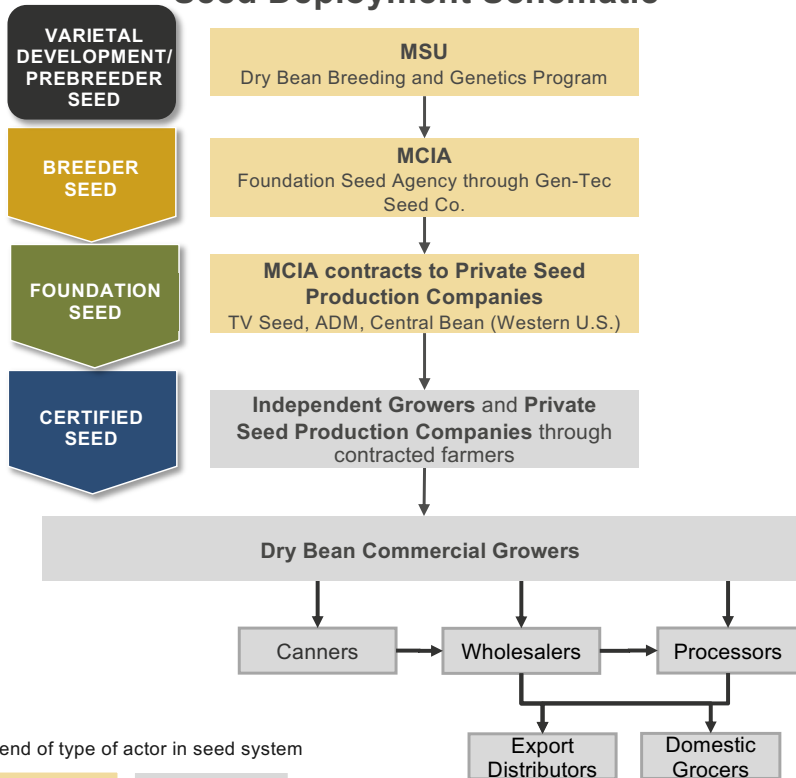
*SOURCE: Context Interviews with MSU researchers and MCIA members

Early Generation Seed Deployment Model

	Pre-Breeder Seed	Breeder Seed	Foundation Seed	Certified Seed	Commercialization
Who	MSU Dry Bean Breeding and Genetics Program	Michigan Crop Improvement Association Foundation Seed Agency through Gen-Tech Seed Company	Private Seed Companies on Contract Basis for Michigan Crop Improvement Association TV Seed (Trinidad Benham), ADM, Central Bean	Independent Growers on Contract Basis with Certified Seed Companies Buys Foundation Seed from MCIA	Independent Growers Buy from Certified Seed companies
Sector	 Public	 Public	 Public	 Private	 Private
Input	Pre-Breeder Seed to MSU Greenhouses for multiplication	1 lb. Pre-Breeder Seed	40 lb. Breeder Seed	1,600 lb. Foundation Seed	64,000 lbs. of certified seed
Output	1 lb. Pre-Breeder Seed 	40 lb. Breeder Seed 	1,600 lb. Foundation Seed 	64,000 lb. Certified Seed 	2.5 million lb. of Commercial Beans 
Capital Sources	<ul style="list-style-type: none"> Federal and state funding Federal grants Special projects funding Partial royalties on licensed MSU varieties 	Sales of foundation seed to certified seed companies		<ul style="list-style-type: none"> Sale of certified seed NOTE: Certified seed companies pay royalties on the volume of foundation seed they purchase from MCIA 	<ul style="list-style-type: none"> Sale of dry beans 4 million cwt of commercial beans produced from MSU varieties annually

EGS System Structure

Seed Deployment Schematic



BREEDER SEED

40 lbs.

MCIA

Pre-breeder seed is developed in an MSU greenhouse once it is determined that the variety will be released. The pre-breeder step can occur prior to the official variety release announcement if the breeder is confident that the three release committees will approve its release. MCIA licenses pre-breeder seed through MSUT to Gen-Tec Seed Company, which multiplies the pre-breeder seed out to 40 lbs. of breeder seed in western U.S. states. Royalty amounts are determined by market class.

FOUNDATION SEED

1,600 lbs.

MCIA through contracted seed companies

Breeder seed is multiplied to ~1,600 lbs. of foundation seed by contracted seed production companies located in western U.S. states, including Idaho, Washington, and Wyoming, due to the drier climate and lower relative disease pressure in those areas as compared to Michigan. MCIA specifies the volume of foundation seed to be produced based on orders it receives one year in advance from certified seed growers and based on current seed inventories.

CERTIFIED SEED

64,000 lbs.

Contracted growers

Certified seed is produced by certified seed companies, mostly on a contract basis from seed production companies, both within and outside of Michigan. Most royalties are paid by certified seed companies on the amount of foundation seed they purchase from MCIA for their contracted growers, with options to pay royalties on certified seed for in-state seed companies. More than 90% of commercial acreage grown from MI varieties is certified seed production.

MCIA is the Vital Foundation Seed Link Between University Breeders and Certified Seed Producers



"MCIA's Foundation Seed Division is dedicated to serving the seed industry through the production of genetically pure Foundation Seed. The Foundation Seed Division is the **VITAL LINK** between the University plant breeders and certified seed producers." [MCIA](#)

MCIA History & Roles:

Established 100 years ago to provide the link of distribution between university breeders and industry

Provide feedback on desired new dry bean varieties from growers to university breeding program

Sole provider of foundation seed for MSU dry bean varieties

Collect royalties on foundation seed sales

Acts as industry seed certifying agency

Other crops served by MCIA include: Corn, Barley, Rye, Oats, Soybeans, Wheat, Peas



MCIA Leadership & Staff:



Board of Directors Includes:

President and Vice President

MSU Representative

Industry Representative

Michigan Department of Agriculture Representative

Grower Representatives

Association Staff Includes:

Foundation Seed Operations Manager

Office & Association Managers

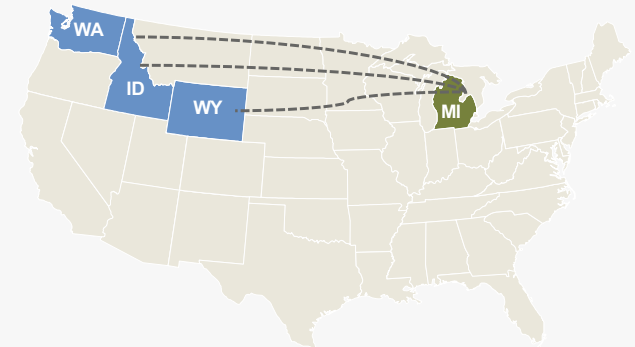
Field Inspection Supervisor

Lab Manager & Lab Technician

Seed Processors & Supervisor

Foundation Seed Quality Manager

Foundation Seed Production Regions:



MCIA works with contracted seed companies in Western U.S. states to produce foundation seed separate from the disease pressures in Michigan

MCIA uses the Advance Seed Orders to direct the contract growers on how much foundation seed to produce

Foundation Seed Supply Planning Details:

Foundation Seed is available to growers in 50 lb. bags, 2,000 lb. tote bags, or in bulk

MCIA Foundation Seed Advance Order Form is located on the [MCIA website](#) for growers to download and return.

In the case of foundation seed production underages, MCIA allocates foundation seed to certified seed companies based on their 3-5 year average order applied to the percentage of total demand that was produced

MCIA is the Acting Royalty Collection Agency

Royalty Collection Methods Have Evolved Over Time:

The Original Collection Method:

- Royalties used to be collected on each grower's reported certified seed sales
- Growers would report number of certified seed bags sold and pay a royalty of ~\$5/100lb of seed
- In-state (Michigan), seed companies may still opt to use this method of royalty collection

The Issue:

- It became increasingly difficult to collect royalties on all bags sold by certified seed growers
- Large volumes of seed were being sold, but volumes were underreported for royalty collection by MCIA
- Out-of-state production of certified seed makes collection even more difficult for MCIA

Today's Royalty Collection Solution:

A

MCIA collects royalties on foundation seed sold (per 100lb), to certified seed growers west of the Continental Divide, instead of requiring certified seed growers to report bags sold post-season

B

Certified seed growers in Michigan have the choice to pay royalties on the amount of foundation seed purchased or on amount of certified seed sold, and the growers assume all risk if foundation seed is rejected (30% rejection rate). 80% of seed companies choose to pay royalties on foundation seed purchases

C

MCIA charges a \$10-15 fee per collection on the RedHawk variety, but does not charge a collection fee on any other varieties. MCIA then remits 100% of royalties collected to MSU Technologies

MCIA Royalty Collection Methods and Financing Details

MCIA is a Self-Sustaining Non-Profit Organization:



MCIA's Foundation Seed Agency pays for the increase of MSU Dry Bean Breeding and Genetics Program's breeder seed to foundation seed levels



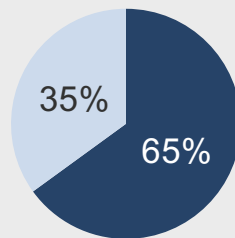
Seed increase activities are **fully funded through sales of Foundation Seed to Certified Seed companies** (seed price x units sold)



MCIA's foundation seed sales **generate enough income to run the program and cover all operational costs**



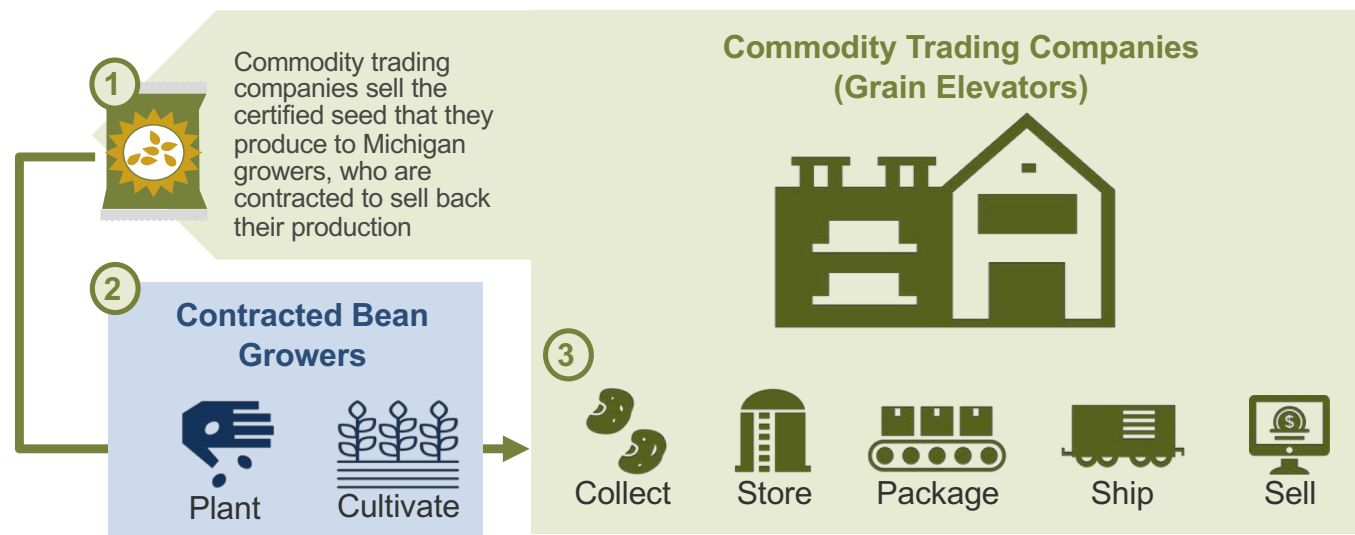
MCIA raises prices on foundation seed as needed. In 2014, the price was raised from \$120/cwt to \$125/cwt. In January 2018, foundation seed prices were increased another 5%.



Dry Bean Foundation Seed sales generate **65% of overall revenues** for MCIA's Foundation Seed Agency

Commodity Trading Companies – Certified Seed Production & Sales and Contracted Commodity Production

Commodity trading companies, which are also known as grain elevators, are vertically integrated into seed and commodity production. An estimated 90% of Michigan dry bean production is contracted by commodity trading companies.



Commodity trading companies participate along the value chain and influence the availability and uptake of dry bean varieties

Dry Bean Production Process

The Michigan Bean Commission published the following video in January of 2018 that visually documents key steps in the production process, including: seed selection, production contracting, field cultivation, commodity delivery, inspection, and packaging of key value chain steps.

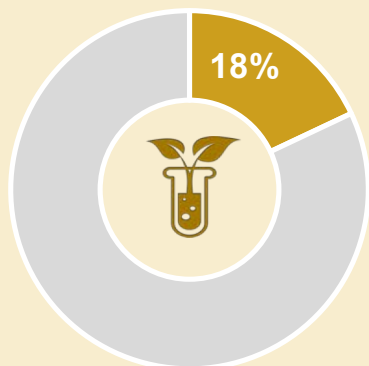




Financial Sustainability

Financial Sustainability by EGS Value-Chain Step

Varietal Development



Managed by a State University
18% Financially Self-Sustaining

Foundation Seed Production



Managed by a Nonprofit
100% Financially Self-Sustaining

Certified Seed Production



Managed by Private Sector
100% Financially Self-Sustaining

Key Seed System Funding Mechanisms



GRANTS: Fund focused breeding program initiatives, not operational overhead costs.



Royalty Fees: Certified seed growers pay a royalty based on the volume of foundation seed they purchase. MCIA collects the royalty amount, and remits it to MSU in accordance with its licensee responsibilities. Royalties are allocated in one third increments.

*Royalty fees vary by class, with smaller sized seed classes (e.g., black beans and navy beans), commanding a higher prices per cwt

1/3

allocated to **variety breeder** who can choose whether to distribute it to the program or to individual team members. Kelly often opts to distribute it to his program.

1/3

allocated to **MSU Department of Plant, Soil and Microbial Sciences** for use in development and improvement of programs. Dr. Kelly receives ~50% of this funding for the breeding program.

1/3

allocated to **MSU Foundation** for support of university research and technology initiatives.



Check Off Funds: Funds research and marketing

- Revenue managed by the Michigan Bean Commission
- Renewed every 5 years by grower referenda
- \$0.10 per hundredweight of beans sold

\$0.09

allocated to fund **INDUSTRY MARKETING**

\$0.01

allocated to fund **BEAN RESEARCH** & is matched by the Michigan Bean Shippers

Funds Industry Agronomist

Varietal Development and Foundation Seed Production is Largely Subsidized by the Public Sector

Varietal Development



The public sector subsidizes the MSU Dry Bean Breeding and Genetics Program, which underpins the Michigan dry bean industry

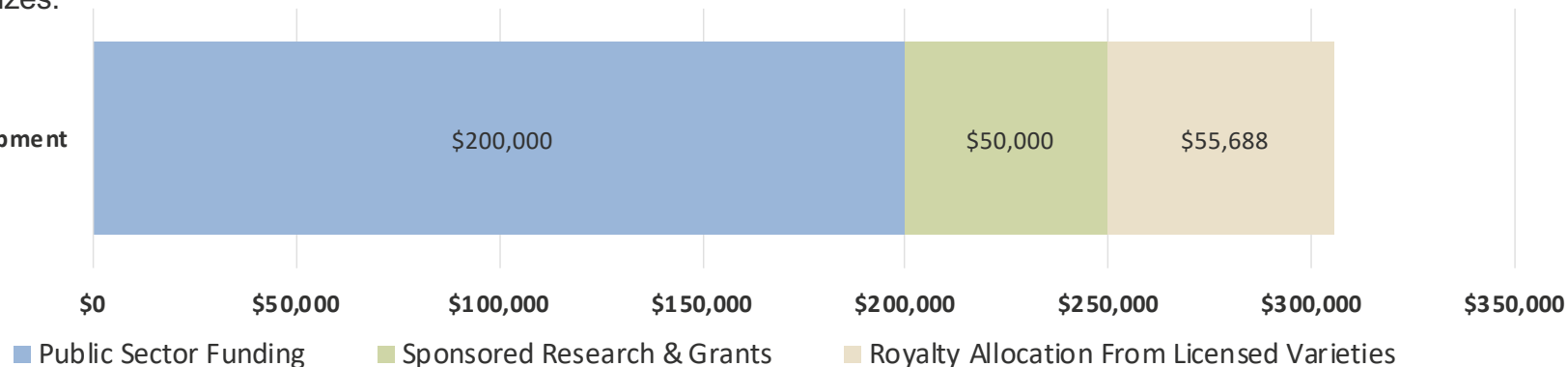
Sponsored Research



Operational costs are augmented by royalties collected on licensed MSU varieties and from sponsored research projects

MSU Dry Bean Breeding and Genetics Program's estimated annual operating costs, excluding researcher salaries and the rent, repair, and depreciation expenses associated with the publicly owned buildings and equipment that it utilizes.

Varietal Development



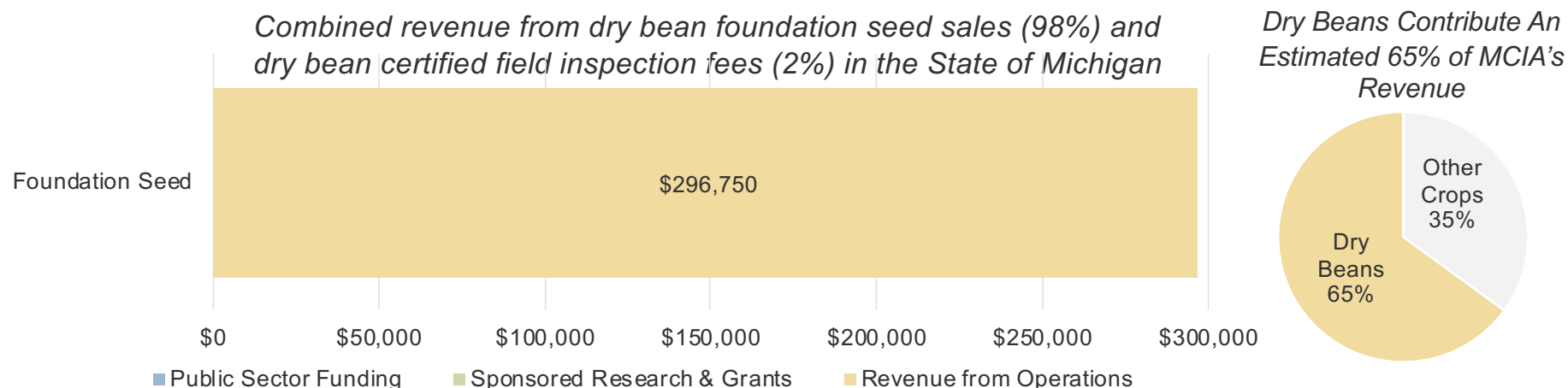
Royalties on the sale of MSU licensed dry beans contributes less than 20% of the Bean Breeding and Genetics Program's annual operating budget

SOURCE: Stakeholder Interviews with the MSU Dry Bean and Genetics Program

Foundation Seed Demand Forecasting, Production, and Delivery is Managed by a Nonprofit

MCIA's ability to effectively manage demand planning through constant communication with growers and the industry has enabled its status as a financially self-sustaining, nonprofit.

MCIA adds value to the dry bean industry by assuming exposure to the risk of errant demand projections by certified seed companies. In the absence of MCIA, the public and private sector would have to assume the commercially unattractive functions of dry bean early generation seed multiplication and certification.



While not included in the above analysis, MCIA also sells dry bean foundation seed to out-of-state certified seed growers.

SOURCE: Stakeholder Interviews with the MSU Dry Bean and Genetics Program

Early Generation Seed Subsidization Enables Profitable Certified and Commercial Dry Bean Production in the State of Michigan



A small number (~3) of certified seed companies contract the production of certified seed, which is purchased and planted on 90% of Michigan's dry bean acres¹

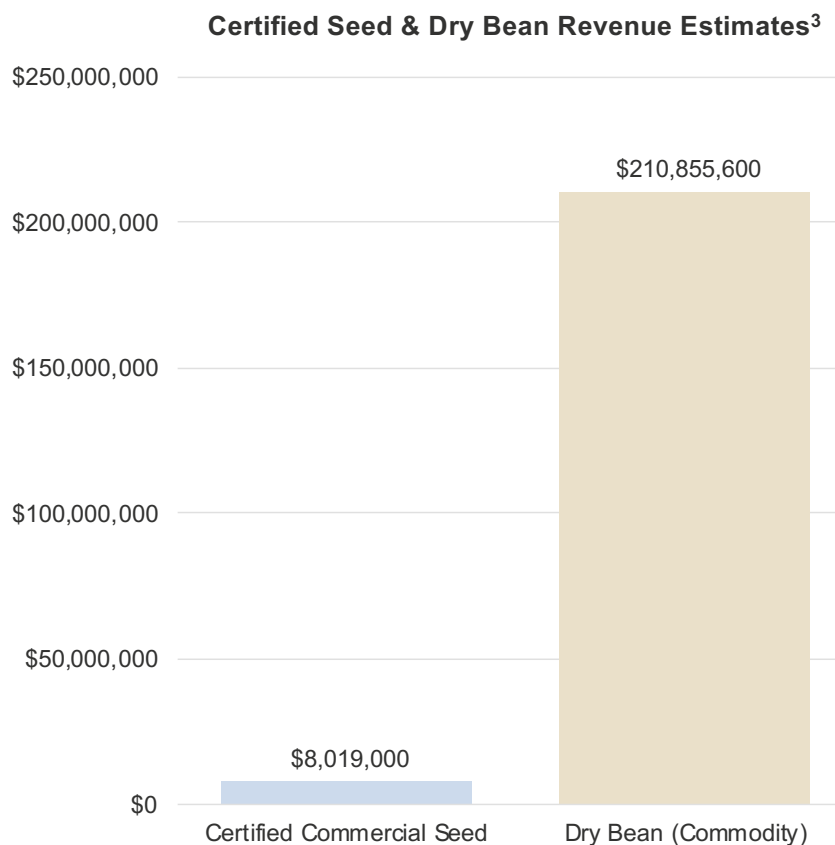


The Michigan Bean Commission estimated the economic impact of dry bean farming to be over \$270 million, and that 1,770 jobs created by the industry (1,120 directly in farming and 650 employed in related industries)²

(1) SOURCE: Industry Stakeholder Interviews

(2) SOURCE: Michigan Bean Commission based on average estimated economic impact between 2011 and 2013

(3) SOURCE: Stakeholder Interviews



In 2014-15, \$60M in State Funding for Research and Extension was Leveraged to Create Over \$1B in Statewide Impact

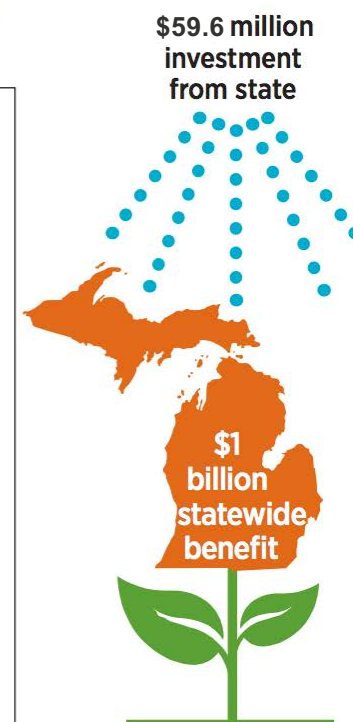
Every dollar the State of Michigan invested in MSU AgBioResearch and MSU Extension resulted in an estimated additional:

\$2.59 in federal funds and external contracts, grants and other revenues to serve Michigan residents

\$6.37 in additional community benefits

\$8.07 in economic stimulus is state economic activity and state tax revenues

MSU AgBioResearch/MSU Extension Leverage Economic Stimulus and Community Benefits (millions of dollars)



Economic analysis by Steven R. Miller, Center for Economic Analysis, MSU Department of Agricultural, Food and Resource Economics



Enabling Environment

MSU Extension Outreach

MISSION: “MSU Extension works to increase farmers’ success while protecting the environment, ensuring food safety, reaching new markets and advancing agriculture through applied research. Agriculture is now one of the fastest growing sectors of the Michigan economy.” [MSU Extension Agriculture](#)

EXAMPLES OF INDUSTRY OUTREACH:

MICHIGAN STATE UNIVERSITY
EXTENSION Michigan State University Extension helps people improve their lives by bringing the vast knowledge resources of MSU directly to individuals, communities and businesses.

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Related Topics
Agriculture
Cover Crops
Dairy

Milk and Grain Marketing Series 2017-2018
Date: June 12, 2018
Time: 10 a.m. - 12 p.m.
Location: Location: Isabella County Building, Room 320, 200 N. Main Street, Mt. Pleasant, MI 48858
Contact: Paul Gross, 989-317-4079, 989-560-1371

Dates: June 12, 2018; September 11, 2018
Cost: \$400/farm for series
Agriculture markets are more volatile than ever. For most farms, profits are largely determined by how well you market your production. Now more than ever your farm's future success depends on your ability to understand the markets and use the basic marketing tools.
Fred Hinkley, retired MSU Extension educator and marketing specialist, will provide an insight and outlook on the milk and grain markets, and suggest strategies to minimize financial risk.

MICHIGAN STATE UNIVERSITY
EXTENSION Michigan State University Extension helps people improve their lives by bringing the vast knowledge resources of MSU directly to individuals, communities and businesses.

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Related Topics

2017 Northeast Michigan dry bean variety trial results
Michigan State University Extension and ADM Edible Bean partnered to test nine dry bean varieties in an on-farm observation trial.
Posted on January 15, 2018 by James DeDecker, and Christian Tollini, Michigan State University Extension

Presque Isle County Michigan State University Extension partnered with ADM Edible Bean once again in 2017 to evaluate promising dry bean varieties for northeast Michigan. This year's variety trial was hosted by Ableidinger Farms of Hillman, Michigan. Three black bean, two dark red kidney bean and four navy bean varieties were included in the trial. Navy bean varieties evaluated this year included Merlin, Indi, Alpena and Vigilant. Dark red kidney varieties included Red Hawk and Red Cedar. Unfortunately, black bean yield data was thrown out due to compromising field conditions that contributed to significant harvest loss.

Late winter dry bean update held Feb. 28, 2018

Growers will hear from MSU and industry experts on a variety of pest, production and marketing issues.
Posted on February 22, 2018 by Fred Springborn, Michigan State University Extension

Michigan State University Extension will host a free, online Late Winter Dry Bean Production Update at 1 p.m. on Feb. 28, 2018. You will have the option of attending from the comfort of your home or office by following this link:
<https://msu.zoom.us/j/312201164>

You can also come to one of the following two locations to view the online meeting and interact with the speakers:

MSU Extension Isabella County
3rd Floor Room 340
200 N. Main St.
Mt. Pleasant, MI 48858

MSU Extension Delta County
2840 College Ave.
Escanaba, MI 49829

The agenda for the day includes:

- MSU bean breeders update – Jim Kelly, MSU Plant, Soil and Microbial Sciences
- Pathology research – Martin Chilvers, MSU Plant, Soil and Microbial Sciences
- Insect overwintering and 2017 western bean cutworm levels – Fred Springborn, MSU Extension
- PRAB (Production Research Advisory Board) update – Greg Varner, Michigan Bean Commission
- Market update – Larry Sprague, Kelly Bean Company

Participants at the in-person sites will be eligible to receive three Restricted Use Pesticide credits.

This article was published by [Michigan State University Extension](#). For more information, visit <http://www.msue.msu.edu>. To have a digest of information delivered straight to your email inbox, visit <http://www.msue.msu.edu/newsletters>. To contact an expert in your area, visit <http://expert.msue.msu.edu> or call 888-MSUE4MI (888-678-3464).



U.S. Land-Grant Institution Overview

Mission:

“Teach such branches of learning as are related to agriculture and the mechanic arts . . . in order to promote the liberal and practical education of the industrial classes. ” -Morrill Act 1862

U.S. Land-Grant Universities Were Founded Based on Three Principle Functions, Which Continue to Drive Them Today :

Teaching



The First Morrill Act (1862) provided grants in the form of federal lands to each state. States sold these lands and established public institutions with the proceeds. The goal of land-grant universities was initially to meet the increasing demand for agricultural and mechanical education. Currently, land-grant universities continue to offer education programs centered on agriculture and engineering.

Research



The Hatch Act (1887) authorized direct payment of federal grants to each state to establish agricultural experiment stations.
Funding remains in place today for these programs. A major portion of federal funds invested must be matched by state funding.

Cooperative Extension



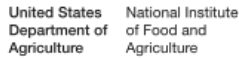
The Smith-Lever Act (1914) created the Cooperative Extension Program within each land-grant institution to disseminate research findings from the agricultural experiment stations.
The act authorized ongoing federal support (matched by state support) for the Cooperative Extension Systems, which still exists for extension programs today.

The USDA plays a large role in the allocation of funds for each function of the U.S. land-grant university system. These funds are essential to assure that the functions of the universities can continue to benefit all industries, including the agricultural industry.

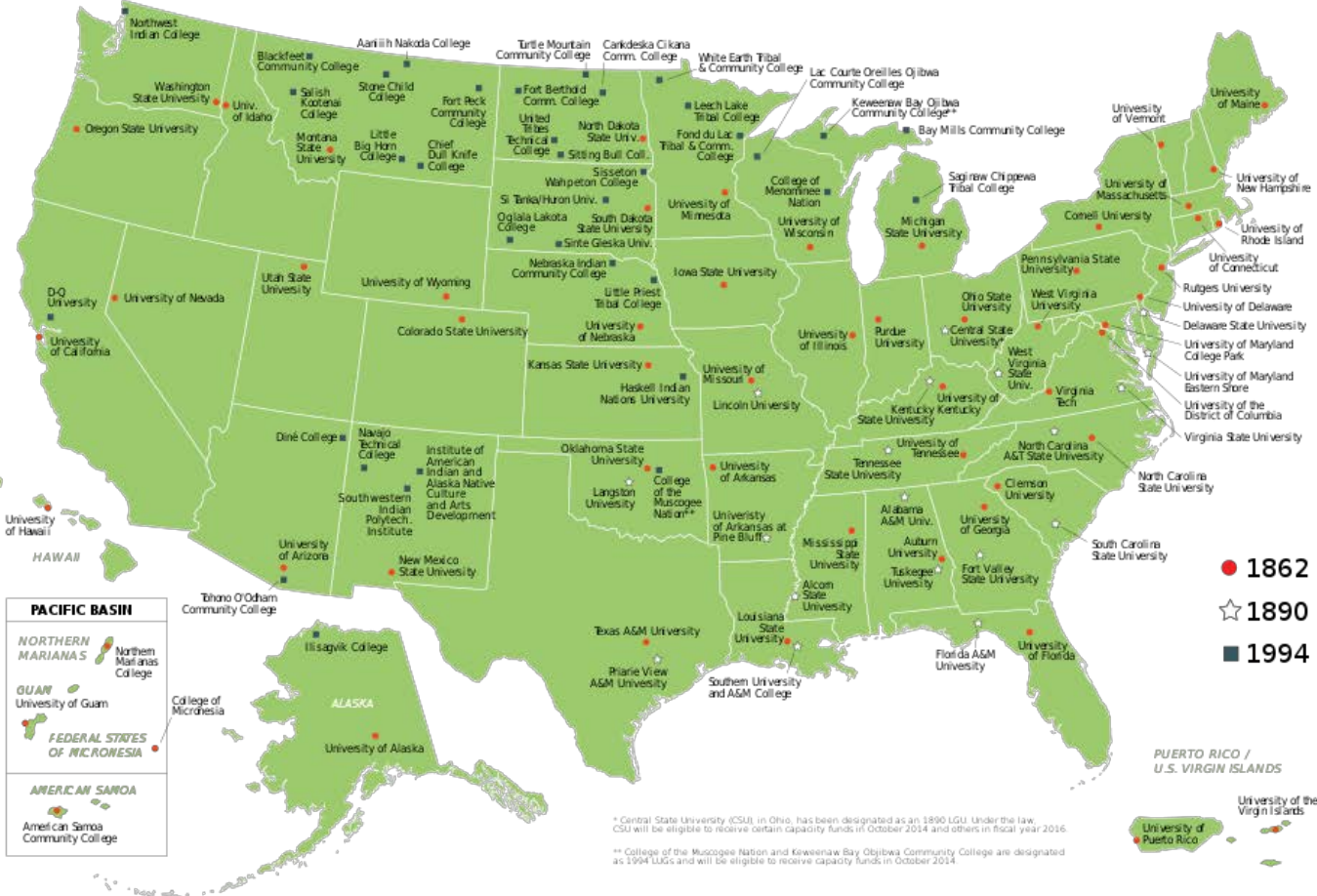
“The Morrill Act symbolizes the public trust that has given life to our nation's entire educational system for the past 150 years—and it reminds us all of the public commitment that will be necessary for the system to thrive for 150 more.”

—**Christopher P. Loss, Vanderbilt University**

Land-Grant Colleges and Universities in the United States



NIFA LAND-GRANT COLLEGES AND UNIVERSITIES



thank you



5550 Wild Rose Lane, Suite 40039
West Des Moines, IA 50266
P: 515.225.2204
F: 515.225.0039



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+1 607.592.4947

www.cgd.global
www.contextnet.com





Appendix



ACKNOWLEDGEMENTS

Thank You For Your Time & Support in the Development of the MSU Dry Beans EGS Profile!

Key Stakeholders Interviewed

Name	Position	Organization
Dr. Jim Kelly	University Distinguished Professor & Bean Breeder	MSU Dry Bean Breeding and Genetics Program
Dr. Douglas Buhler	Director	MSU AgBioResearch
Dr. Irvin Widders	Director	Legume Innovation Lab-MSU
Mr. Jim Palmer	Foundation Seed Operations Manager	Michigan Crop Improvement Association
Mr. Paul Varner	Former Co-Owner	Treasure Valley Seed Co.
Mr. Greg Varner	Research Director	Michigan Bean Commission
Dr. Tom Herlache	Technology Manager & Asst. Director for Commercialization	MSU Technologies
Mr. Dan Hensler	Marketer	ADM



A Risk Management Agency Fact Sheet

2017 Crop Year

Springfield Regional Office — Springfield, IL

Revised December 2016

Dry Beans Michigan

Crop Insured

You can insure dry beans if:

- Premium rates are provided;
- They are grown on insurable acreage;
- You have a share;
- They are planted in rows wide enough to allow cultivation; and
- They are intended for harvest as dry beans.

Counties Available

Dry Beans are insurable in Alcona, Alpena, Arenac, Bay, Clinton, Delta, Eaton, Genesee, Gladwin, Gratiot, Huron, Ingham, Ionia, Iosco, Isabella, Kalamazoo, Kent, Lapeer, Mecosta, Midland, Montcalm, Ogemaw, Presque Isle, Saginaw, Sanilac, Shiawassee, St. Clair, and Tuscola Counties.

Causes of Loss

You are protected against the following:

- Adverse weather;
- Earthquake;
- Failure of irrigation water supply;
- Fire;
- Insect damage and/or plant disease, unless you have insufficiently or improperly applied pest or disease control measures;
- Volcanic eruption; or
- Wildlife.

Insurance Period

Coverage begins on the later of:

- The date we accept your application, or
 - The date you plant the beans.
- Coverage ends at the earliest of:
- Total destruction of the crop;
 - Harvest of the crop;
 - Final adjustment of a loss;
 - Abandonment of the crop; or
 - October 31, 2017.

Important Dates

Sales Closing/Cancellation..... March 15, 2017
Final Planting..... June 25, 2017
Acreage Report..... July 15, 2017

Reporting Requirements

You must report all of your dry bean acreage, production, and any losses, when evident, to your insurance agent.

Coverage Levels and Premium Subsidies

Crop insurance premiums are subsidized as shown in the following table. For example, if you select the 75-percent coverage level for an Enterprise Unit, the premium subsidy is 77 percent and your premium share is 23 percent of the base premium.

Subsidy Factors	Coverage Level (percent)	50	55	60	65	70	75	80	85
	Enterprise Unit	80	80	80	80	80	77	68	53
	Basic Unit	67	64	64	59	59	55	48	38
	Optional Unit	67	64	64	59	59	55	48	38

Price Elections

A price election is the price you are paid per pound if you have a loss.

Prices for types with true revenue coverage -

Projected and harvest prices for black, dark red kidney, navy, pinto, and small red types will be determined as shown in Section 7(e) of the dry bean revenue endorsement. Contact your insurance agent for established prices for dry bean varieties.

Prices for all other types - Harvest price will be equal to the projected price for all dry bean types not covered by the dry bean revenue endorsement.

Coverage Options

Yield Protection - Protects against a production loss.

Revenue Protection - Protects against loss of revenue due to a production loss, change in price, or a combination of both.

Revenue Protection with Harvest Price

Exclusion - Protects against loss of revenue due to a production loss, price decline, or a combination of both.

Catastrophic Risk Protection Coverage (CAT) -

Available only with yield protection. Pays 50 percent of your average yield and 55 percent of the projected price. CAT has no premium but does have a \$300 administrative fee per crop per county.

Replanting and Prevented Planting

Practical to Replant - Your company will determine if it is practical to replant. The processor must agree, in writing, that it will accept production from replanted acreage.

Replant Provisions

You may receive a replant payment if:

- It is practical to replant; and
- The appraisal does not exceed 90 percent of your production guarantee.

Replant payments are not available on CAT coverage.

Late Planting Period - If you choose to plant after the final planting date, the insurance guarantee is reduced by one percent for each day after the final planting date. After 25 days, the guarantee is 60 percent.

Prevented Planting - You may receive a prevented planting payment if you are unable to plant on or before the final planting date because of an insurable cause.

Loss Example

Yield Protection Example - This example assumes 1,600 pounds per acre APH yield for navy type, 65-percent coverage level, and basic unit coverage.

1,600 pounds/acre APH yield
x 0.65 coverage level
1,040 pound guarantee
- 700 pounds/acre produced
= 340 pounds/acre loss
x \$0.25 projected price
\$85.00 Final Payment per acre

Revenue Protection Example:

1040 pound guarantee
x \$0.25 projected price
\$260.00 guarantee per acre

700 pounds/acre produced
x \$0.23 harvest price
\$161.00 revenue per acre

260.00 guarantee per acre
- 161.00 revenue per acre
\$99.00 Final Payment per acre

Where to Buy Crop Insurance

You can buy a crop insurance policy from approved participating insurance agents. A list of crop insurance agents is available at all USDA service centers and on the RMA website at www.rma.usda.gov/tools/agent.html.

Contact Us

USDA/RMA
Springfield Regional Office
3500 Wabash Avenue
Springfield, IL 62711
Phone: (217) 241-6600
Fax: (217) 241-6618
Email: rsolil@rma.usda.gov

Download Copies from the Web

Visit our online publications/fact sheets page at www.rma.usda.gov/about/rma/fields/il_rso/.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD).

To file a complaint of discrimination, complete, sign and mail a program discrimination complaint form, (available at any USDA office location or online at www.ascr.usda.gov), to: United States Department of Agriculture; Office of the Assistant Secretary for Civil Rights; 1400 Independence Ave., SW; Washington, DC 20250-9410. Or call toll free at (866) 632-9992 (voice) to obtain additional information, the appropriate office or to request documents. Individuals who are deaf, hard of hearing, or have speech disabilities may contact USDA through the Federal Relay service at (800) 877-8339 or (800) 845-6136.

This fact sheet gives only a general overview of the crop insurance program and is not a complete policy. For further information and an evaluation of your risk management needs, contact a crop insurance agent.

The Michigan Seed Industry Is Subject to State and Federal Law

INTERSTATE & FOREIGN

Federal Seed Act

An Act to regulate interstate and foreign commerce in seeds; to require labeling and to prevent misrepresentation of seeds in interstate commerce; to require certain standards with respect to certain imported seeds; and for other purposes.¹

MICHIGAN

The Michigan Seed Law of 1965

"An Act to regulate the labeling, coloration, advertising, sale, offering, exposing, or transporting for sale of agricultural, vegetable, lawn, flower, and forest tree seeds; to authorize the director of agriculture to adopt rules for the enforcement of this act; to provide for the inspection and testing of seed; to prescribe license fees; to preempt ordinances prohibiting or regulating certain activities with respect to seeds; and to prescribe penalties for violation of this act."



Primary to ASTA's state legislative agenda is to ensure that state regulations relating to the seed industry remain consistent between the states. This allows for smoother interstate trade, equalized competition, and elimination of unnecessary, duplicative and burdensome regulations. The Recommended Uniform State Seed Law (RUSSL) is the preferred model for state seed regulations.³

(1) SOURCE: United States. Cong. House, Committee on Agriculture. *Federal Seed Act*, P.L. 76-354. 76th Congress. H. Rept. 5625.. 4 February, 1940.
 (2) SOURCE: North Carolina Seed Law of 1963, (1941, c.114, s.1;1945, c. 828; 1949, c. 725; 1963, c.1182.), Article 31.
 (3) SOURCE: "State." ASTA. N.p., n.d. Web. 05 Apr. 2018.

Dry Bean Seed Produced in Michigan is Required to be Field Inspected and Laboratory Tested

EXCERPT FROM MICHIGAN SEED LAW

286.707a Field beans. Sec. 7a. (1) Field bean seed produced east of a line dividing the central and mountain time zones and sold or offered for sale in Michigan, including seed offered for sale by its producer, shall be field inspected and laboratory tested for seed borne diseases including, but not limited to, common blight (*Xanthomonas phaseoli*), fuscous blight (*Xanthomonas phaseoli* var. *fuscans*), halo blight (*Pseudomonas phaseolicola*), and anthracnose (*Colletotrichum lindemuthianum*), which are determined by the director to be a threat to the bean industry. The director may inspect and test seed, from other sources as necessary, to determine the presence of or freedom from seed borne diseases. (2) The director shall approve standards, tolerances, methods, procedures, and protocols employed in field inspections and laboratory tests of field beans. The field inspections and laboratory tests for disease approved by the director shall be at least equal to those field inspections and laboratory tests utilized for certified seed under Act No. 221 of the Public Acts of 1959, being sections 286.71 to 286.75 of the Michigan Compiled Laws, and rules promulgated under that act. The director may modify those standards, tolerances, methods, procedures, and protocols described in this subsection if their application would threaten the normal propagation of a type or variety of field bean seed. (3) In the case of field beans sold by variety name, the director may waive the requirement of inspection and analysis relative to a specific field bean disease if it is determined by the director that, through consultation with Michigan state university or other authorities recognized by the director, the variety is resistant to 1 or more specific field bean diseases. (4) The director shall take enforcement action against any seed lots which he or she determines to be infected. History: Add. 1996, Act 86, Imd. Eff. Feb. 27, 1996.

Plant Variety Protection

USDA's Plant Variety Protection program helps to protect the varieties that MSU develops:

Plant Variety Protection for seeds is issued by the Plant Variety Protection Office of the **USDA AGRICULTURAL MARKETING SERVICE**

Seed varieties are protected from unauthorized distribution for **20 YEARS**

Policy assures that seed varieties **CANNOT BE SOLD** in any form by anyone other than MSU or MSU licensees

Grower ability to easily sell seed varieties without authorization **THREATENS THE PURITY** of the variety

Ensuring that growers can only buy seed from certified sources helps **PRESERVE THE CERTIFIED SEED QUALITY**

Protection also ensures that **ROYALTIES** are being duly paid through the **CORRECT CHANNELS**

Plant Variety Protection in the United States

The Plant Variety Protection Office (PVPO) provides intellectual property protection to breeders of new varieties of seeds and tubers. Implementing the [Plant Variety Protection Act](#) (PVPA), we examine new applications and grant certificates that protect varieties for 20 years (25 years for vines and trees). Our certificates are recognized worldwide and allow faster filing of PVP in other countries. Certificate owners have rights to exclude others from marketing and selling their varieties, manage the use of their varieties by other breeders, and enjoy legal protection of their work¹.

In the U.S. there are 3 types of intellectual property protection that breeders can obtain for new plant varieties:

	1 Patent Law ("Utility" or Invention)	2 Plant Patent Law	3 Plant Variety Protection Law
Applicable to:	Plant, plant part, gene, protein, method, etc.	Asexually propagated plant and its asexually propagated progeny	Sexually (seed), propagated plant varieties
Rights to Exclude Others From:	Making, using, selling, offering for sale and importing the plant, or any of its parts	Making, using, selling, offering for sale and importing the plant, or any of its parts	Selling, marketing, conditioning, stocking, offering for sale, reproducing, importing, or exporting, using the variety to produce (as distinguished from develop), a hybrid or different variety
Terms of Protection:	20 year term from date of filing	20 year term from date of filing	20 year term (25 years for trees or vines), from issuance of the certificate
Exemption:			A person (farmer), may save seeds for planting on the person's land, but may not transfer to others for seed reproduction purposes

(1) SOURCE: "Plant Variety Protection." *Plant Variety Protection* | Agricultural Marketing Service, www.ams.usda.gov/services/plant-variety-protection.
 (2) SOURCE: Calvert, J. (2014). Impact of Plant Variety Protection [PowerPoint slides]. Retrieved from <http://slideplayer.com/slide/751825/>.

Research Spotlight: “Cultivar Development in the U.S. Public Sector” – Shelton, A. C., and W. F. Tracy. 2017

192 US-Based Plant Breeders Responded to a Survey in 2015 on Key Industry Questions



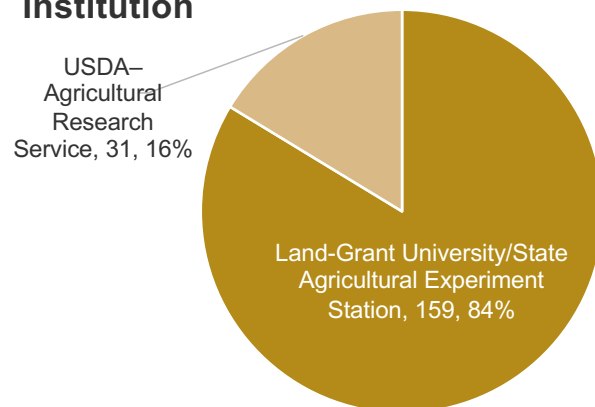
Abstract: Public plant breeders at land grant universities and USDA play a critical role in the development of improved cultivars for farmers in the United States. Over the past 20 yr, a series of reports have documented the decrease in public plant breeding programs, breeder positions, and government financial support. Publicly funded programs allow breeders to focus on crop types, geographic locations, and management systems that are not sufficiently profitable to warrant significant investment from private industry. A survey was conducted in 2015 to understand the current state of cultivar development in the U.S. public sector. The survey respondents were public plant breeders actively releasing finished cultivars and inbred lines, and questions included: (i) demographic and background information; (ii) germplasm usage and exchange; (iii) intellectual property rights; (iv) breeding program funding; (v) institutional support and program size. Results indicate that public cultivar development is in a state of decline, with insufficient numbers of younger breeders working in the public sector today to maintain the current level of cultivar development as the most senior breeders retire. Funding public breeding programs continues to be a challenge, as is access to improved germplasm due to overly restrictive licensing agreements. Potential opportunities include redistribution of royalty funds to bolster revenue streams, and simplifying the germplasm exchange process to increase the likelihood of successful cultivar releases.



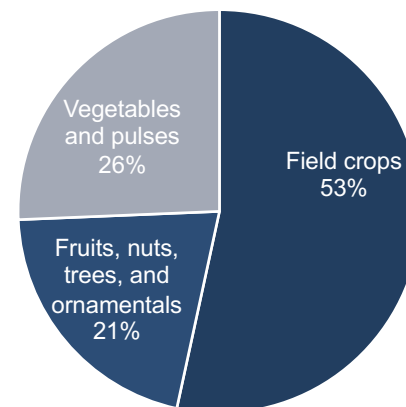
Conclusion: Public plant breeders play a critical role in determining the future of agriculture. Their work is varied, and includes long-term research in areas such as assessing and broadening genetic diversity, introgression of traits from wild species, development of new breeding methodologies, and expanding applications for genomic tools. Public plant breeders are responsible for the education of the next generation of plant breeders (both public and private), and require active breeding programs to provide hands-on learning for students, from initial crosses through the release process. In this study, we have focused on their role in cultivar development. Plant breeders in the public sector often focus on minor crops, cover crops, perennial crops, and geographies and farming systems that are under-served by the private sector. By improving these crops, regions and systems with well-adapted varieties, public plant breeders create a more resilient agricultural landscape that buffers against the increasing climactic and economic fluctuations of the 21st century. Yet plant breeding in the public sector is in a current state of crisis due to lack of sufficient funding to support this public good. In addition, the increasing use of restrictive IP limits public plant breeders' access to useful germplasm necessary for the development of improved cultivars. Public plant breeders have an opportunity to address this challenge by working with their universities and technology licensing offices, and one another to reduce the restrictive nature of their licensing agreements, especially for germplasm exchange with other public programs, and by redistributing royalty money allocations to increase support directly for cultivar development.

Public Plant Breeder Respondent Distribution by...

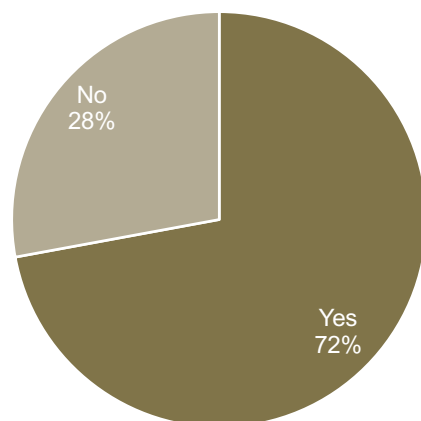
Institution



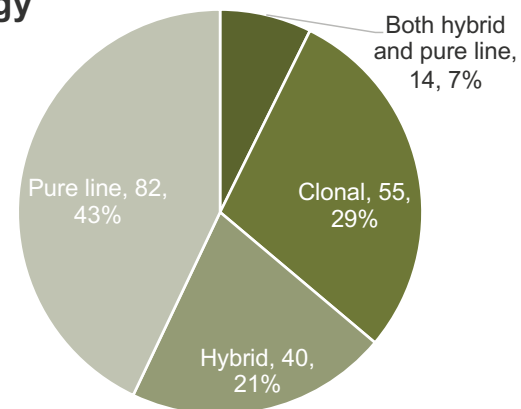
Crop Type



Tenure

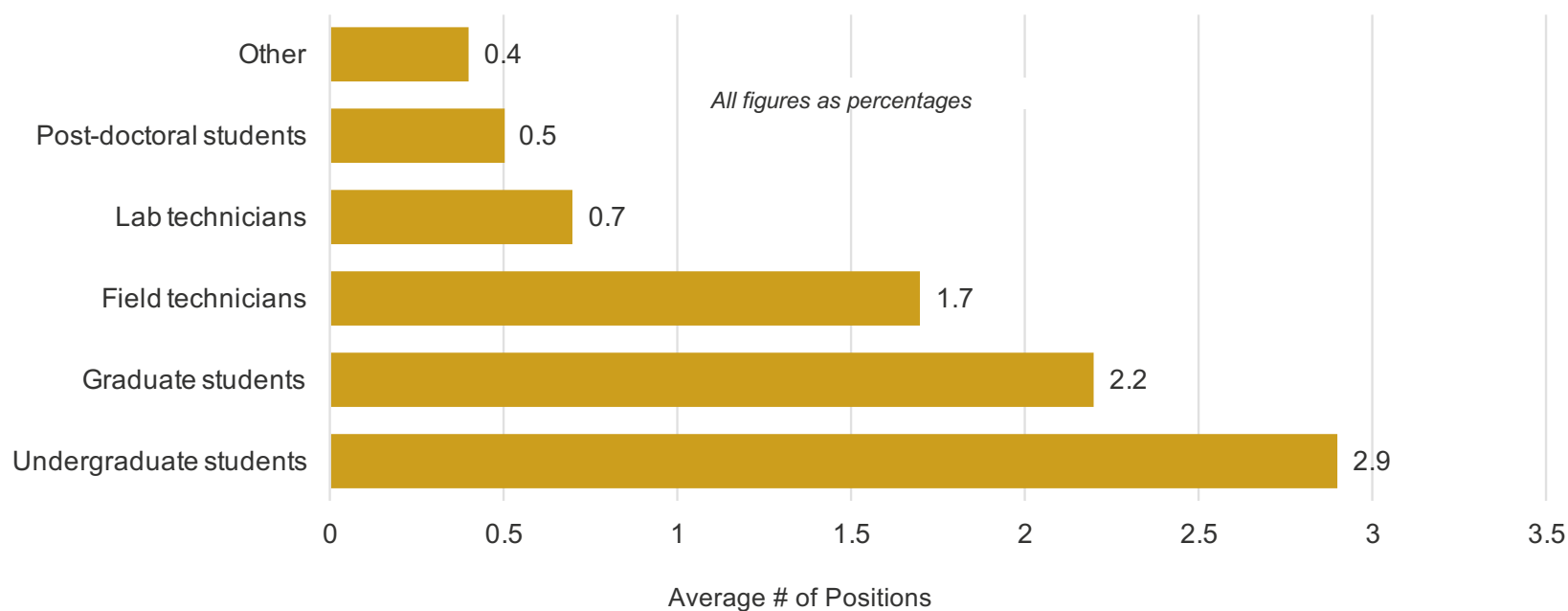


Crop Biology



SOURCE: Shelton, A. C., and W. F. Tracy. 2017. Cultivar Development in the U.S. Public Sector. *Crop Sci.* 57:1823-1835. doi:10.2135/cropsci2016.11.0961

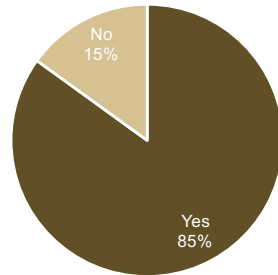
Breeders Report Employing an Average of 8.4 Persons



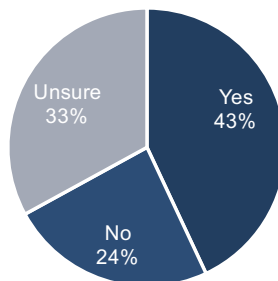
SOURCE: Shelton, A. C., and W. F. Tracy. 2017. Cultivar Development in the U.S. Public Sector. *Crop Sci.* 57:1823-1835. doi:10.2135/cropsci2016.11.0961

Breeding Programs Encourage and Incentivize Cultivar Development, But Only 43% of Breeders Report That Their Position Would Be Replaced if they Left

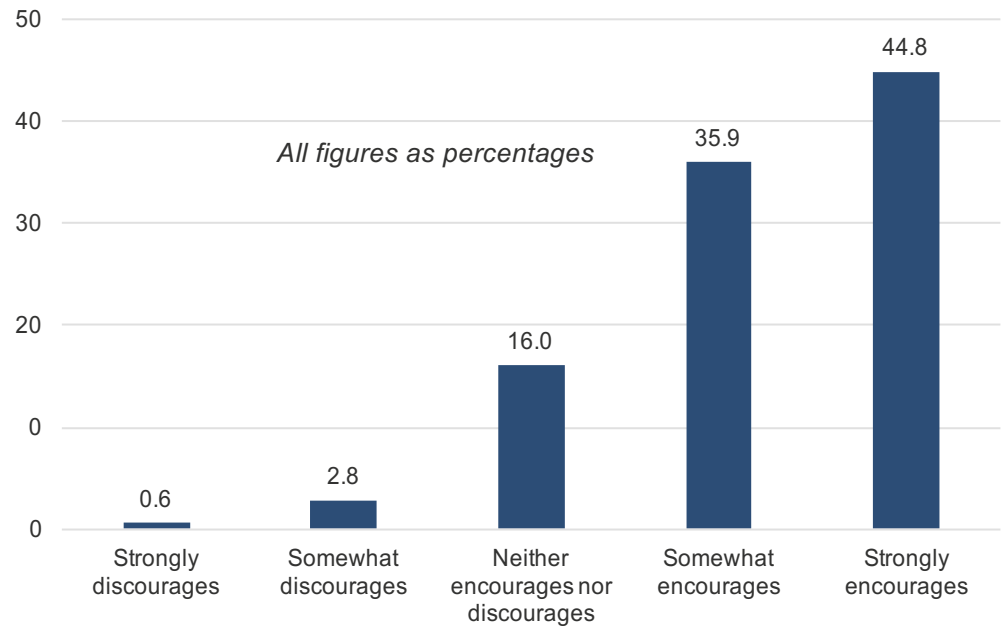
“If you work for an institution that offers tenure, does cultivar development count towards the tenure process?”



“If you were to leave your job for any reason, will your position be replaced?”

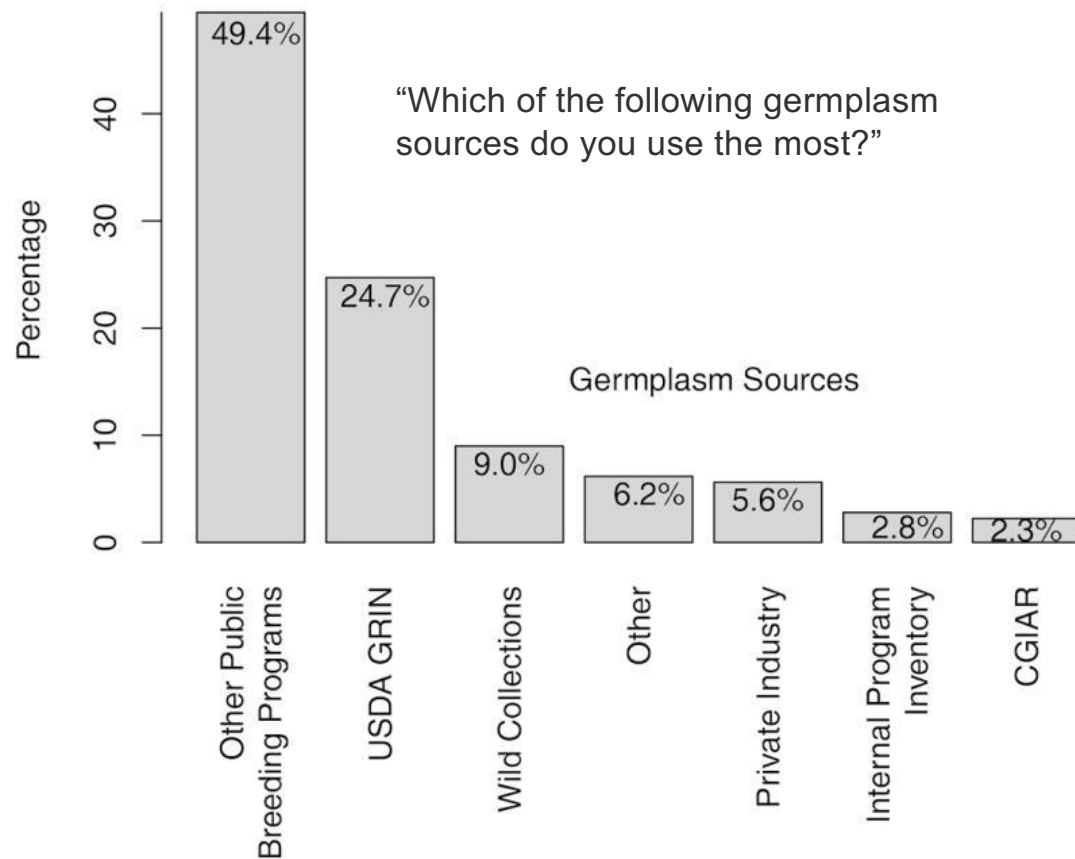


“How much does your institution encourage your cultivar development work?”



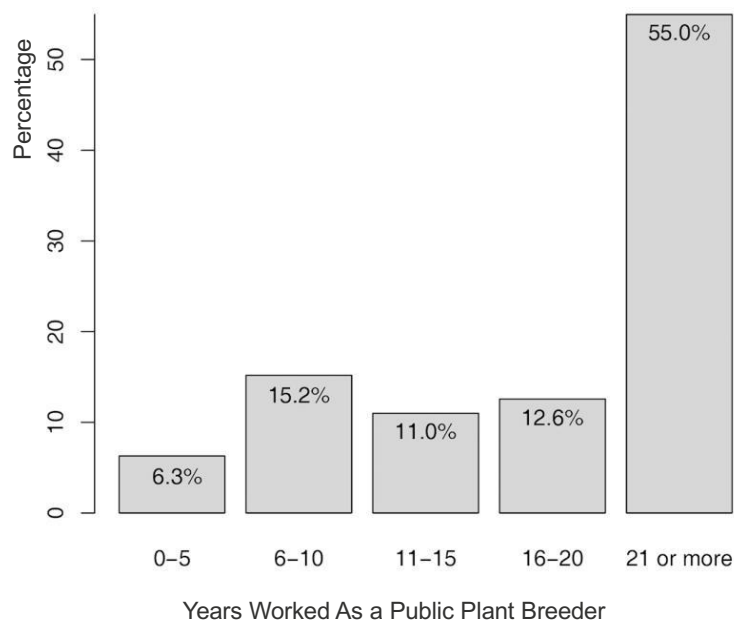
SOURCE: Shelton, A. C., and W. F. Tracy. 2017. Cultivar Development in the U.S. Public Sector. Crop Sci. 57:1823-1835. doi:10.2135/cropsci2016.11.0961

Breeders Most Commonly Source Germplasm From Other Public Breeding Programs

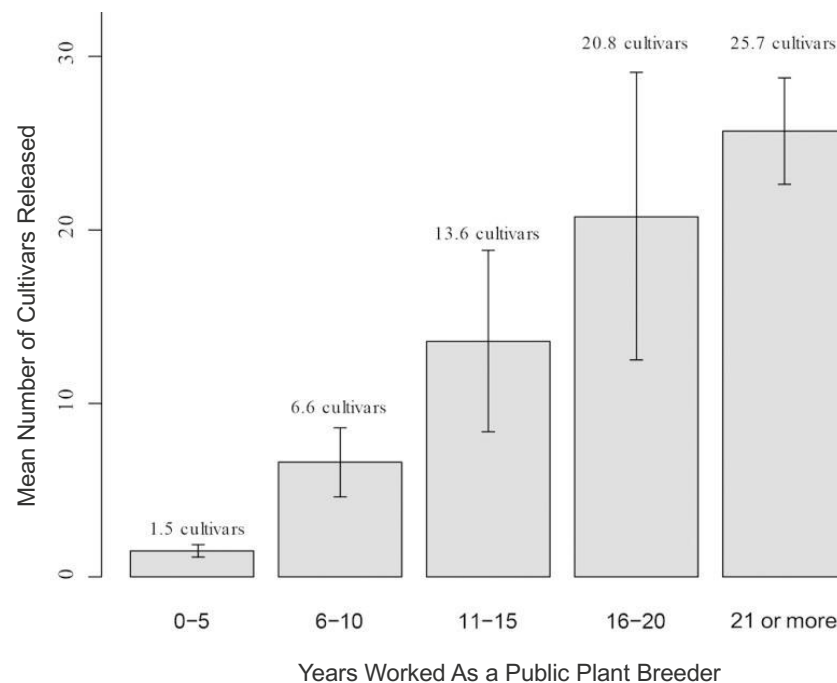


Positive Correlation Between Years Worked as a Public Plant Breeder and the Number of Cultivars Released

How many years have you worked as a plant breeder?



Number of cultivars released by number of years worked as a public plant breeder



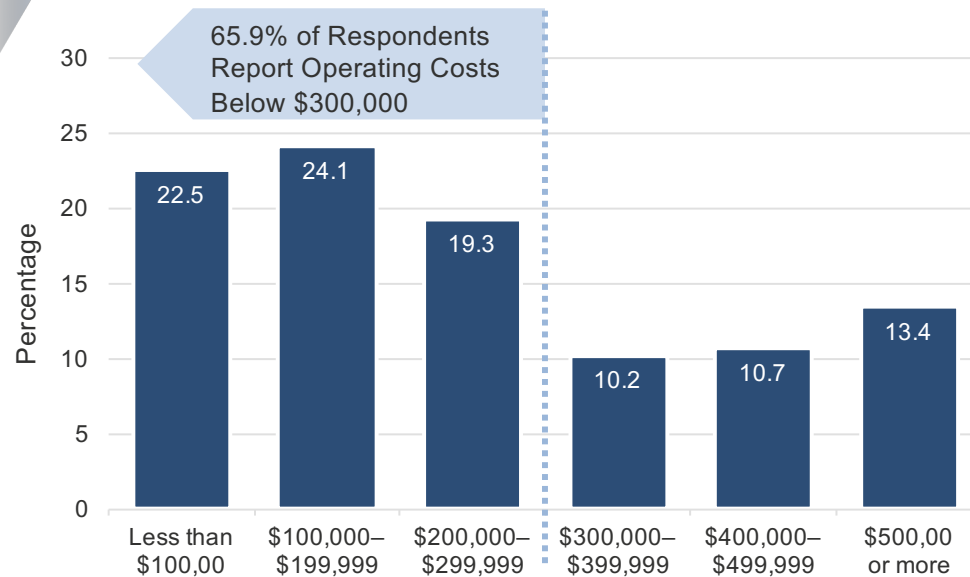
SOURCE: Shelton, A. C., and W. F. Tracy. 2017. Cultivar Development in the U.S. Public Sector. *Crop Sci.* 57:1823-1835. doi:10.2135/cropsci2016.11.0961

Breeders' Employers Contribute Less Than 25% of Annual Operating Costs

Funding Source	% of Breeding Program Funding
Employer	24.1
Commodity check-off programs	17.8
USDA competitive grants	14.2
Royalty money	12.3
Private industry	12.3
Federal formula funds	11.6
Other	7.6

Mean percentage distribution of funding sources for breeding programs based on public plant breeder respondents releasing finished cultivars (including inbred lines) and surveyed in 2015 ($N = 177$).

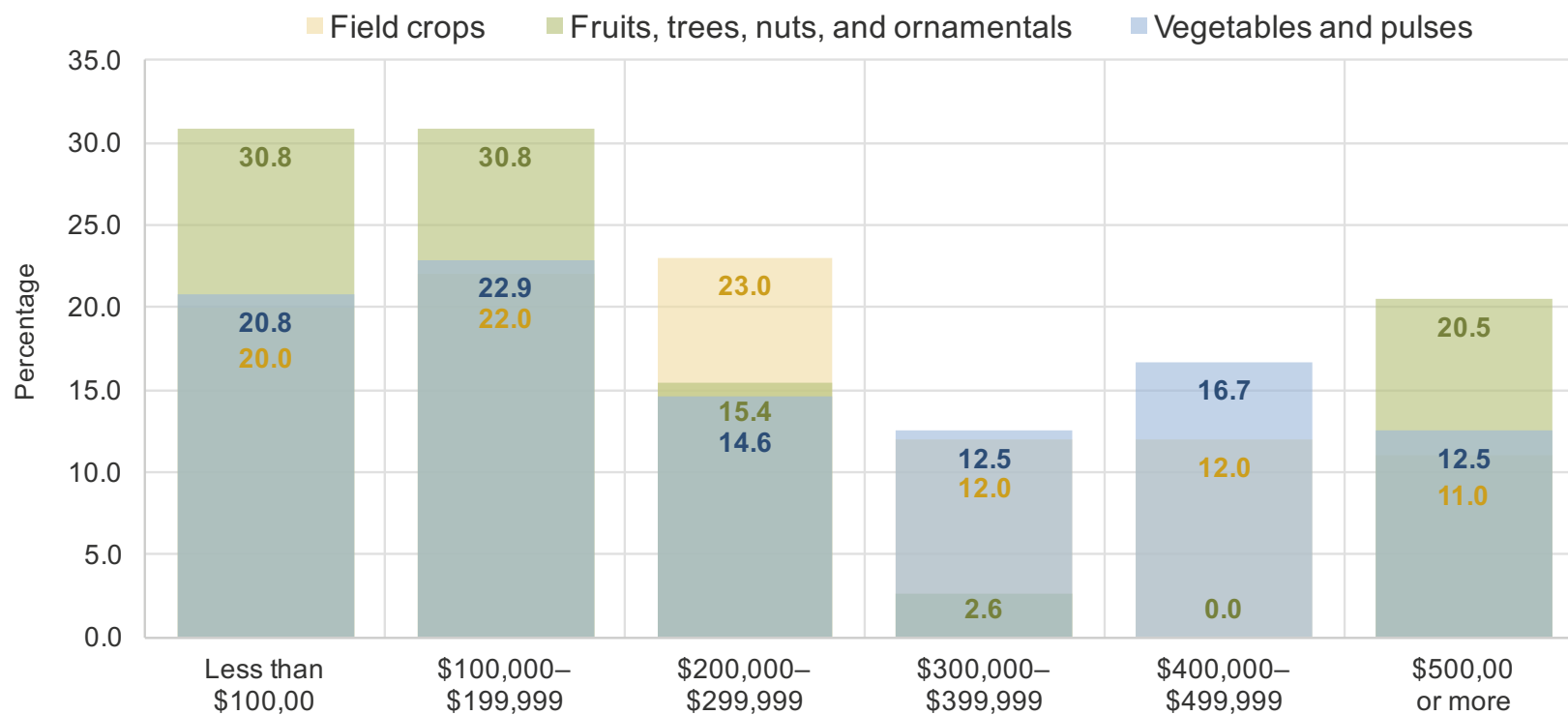
Distribution of Breeding Programs' by Annual Operating Costs



SOURCE: Shelton, A. C., and W. F. Tracy. 2017. Cultivar Development in the U.S. Public Sector. *Crop Sci.* 57:1823-1835. doi:10.2135/cropsci2016.11.0961

Regardless of Crop Type, Breeding Programs' Average Annual Operating Costs is Reported to be Below \$300K

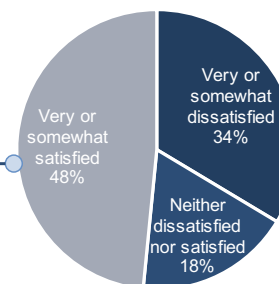
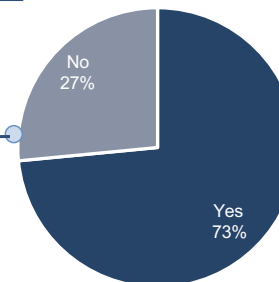
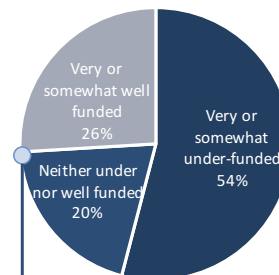
Number of Respondents	
All	187
Field crops	100
Fruits, trees, nuts, and ornamentals	39
Vegetables and pulses	48



SOURCE: Shelton, A. C., and W. F. Tracy. 2017. Cultivar Development in the U.S. Public Sector. Crop Sci. 57:1823-1835. doi:10.2135/cropsci2016.11.0961

Majority of Respondents Indicate That Their Breeding Program is Under-Funded

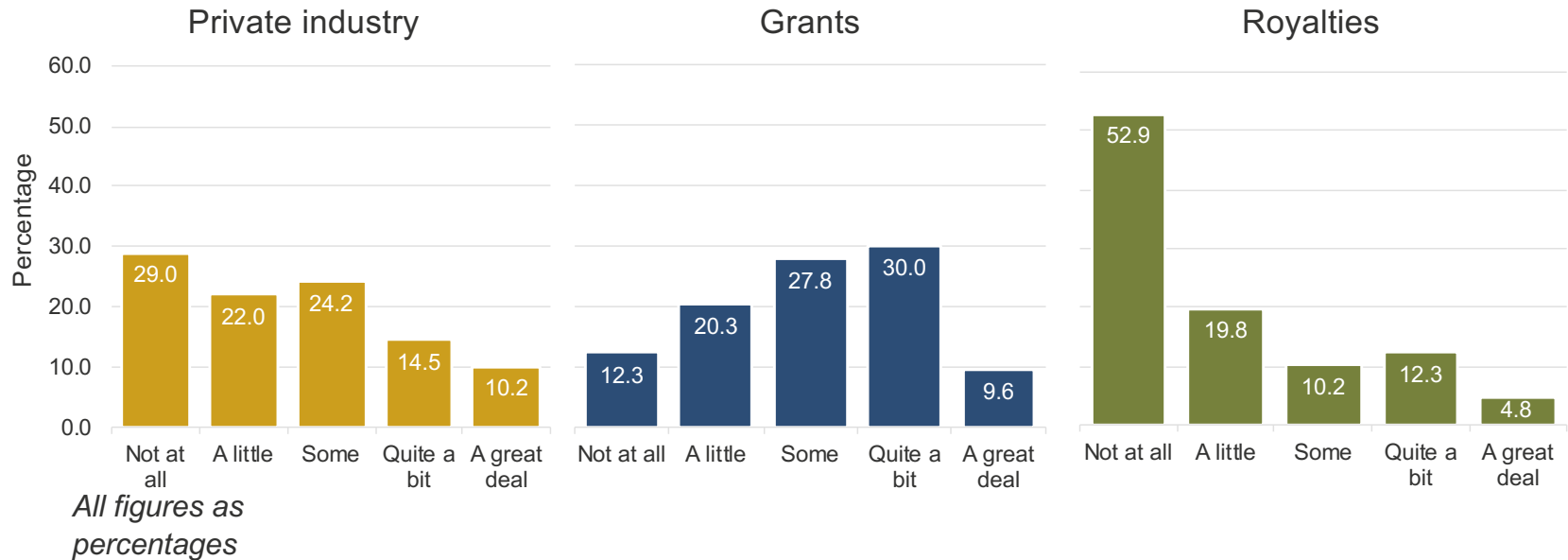
		Breeding Programs by Annual Operating Costs					
<i>All figures as percentages</i>	<i>N</i>	Less than \$100,00	\$100,000– \$199,999	\$200,000– \$299,999	\$300,000– \$399,999	\$400,000– \$499,999	\$500,000 or more
Do you feel your program is:							
Very or somewhat under-funded	100	34.0	30.0	17.0	10.0	4.0	5.0
Neither under nor well funded	37	13.5	27.0	18.9	8.1	16.2	16.2
Very or somewhat well funded	48	6.3	10.4	22.9	12.5	20.8	27.1
Does your program generate royalties?							
Yes	133	15.8	22.6	22.6	9.8	13.5	15.8
No	48	43.8	31.3	4.2	12.5	4.2	4.2
Satisfaction with royalty distribution:							
Very or somewhat dissatisfied	43	14.0	18.6	16.3	18.6	18.6	14.0
Neither dissatisfied nor satisfied	23	8.7	30.4	21.7	0.0	13.0	26.1
Very or somewhat satisfied	62	19.4	22.6	25.8	6.5	11.3	14.5



SOURCE: Shelton, A. C., and W. F. Tracy. 2017. Cultivar Development in the U.S. Public Sector. Crop Sci. 57:1823-1835. doi:10.2135/cropsci2016.11.0961

Respondents Believe Grants Have a Larger Influence on the Focus of Breeding Work Than Private Industry

Table 8. Impact of funding sources on focus of breeding work reported by public plant breeder respondents releasing finished cultivars (including inbred lines), and surveyed in 2015.


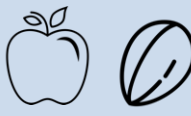



SOURCE: Shelton, A. C., and W. F. Tracy. 2017. Cultivar Development in the U.S. Public Sector. Crop Sci. 57:1823-1835. doi:10.2135/cropsci2016.11.0961

Intellectual Property Rights Are Routinely Secured on Public Breeders' Cultivars

Likelihood of usage of various forms of intellectual property rights to protect cultivars (including inbred lines) released by public plant breeder respondents and surveyed in 2015.

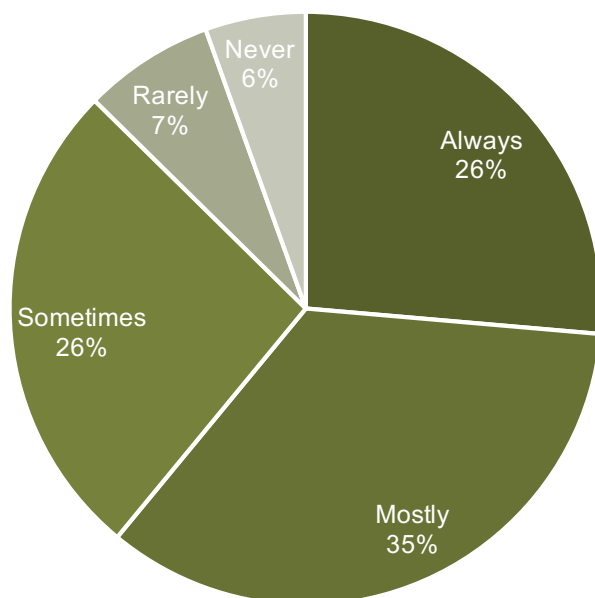
All figures as percentages

	Field crops	Fruits, nuts, trees, ornamentals	Vegetables and pulses
Form of intellectual property rights			
License	78.2	77.1	79.4
Plant variety protection certificate	85.4	34.4	85.3
Plant patent	12.5	86.5	9.7
Trademark	11.1	65.7	25.8
Utility patent	20.9	3.3	6.7

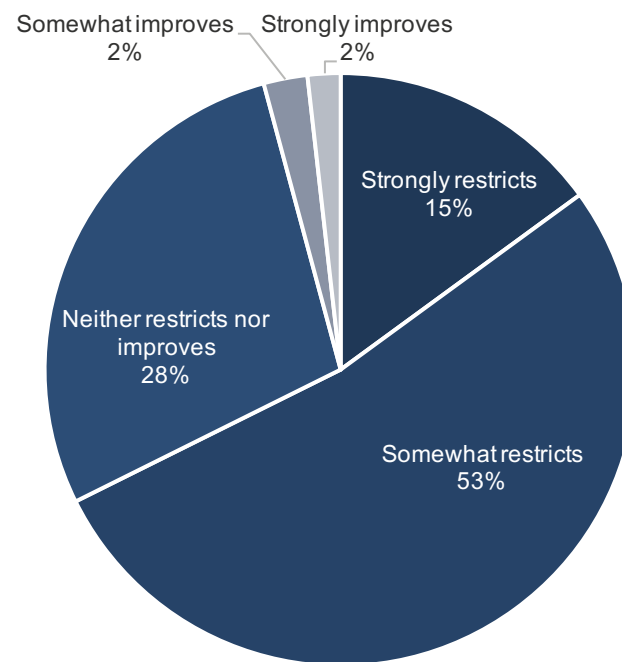
SOURCE: Shelton, A. C., and W. F. Tracy. 2017. Cultivar Development in the U.S. Public Sector. *Crop Sci.* 57:1823-1835. doi:10.2135/cropsci2016.11.0961

Breeders Commonly Share Germplasm (95%), but the Associated Material Transfer Agreements Restrict Breeders' Freedom to Operate

How do often does germplasm leave your institution with a material transfer agreement (MTA)?



How does the language of the MTA that you receive impact your freedom to operate as a plant breeder?



SOURCE: Shelton, A. C., and W. F. Tracy. 2017. Cultivar Development in the U.S. Public Sector. *Crop Sci.* 57:1823-1835. doi:10.2135/cropsci2016.11.0961