Outline – Plan of Work
Michael Fields Agricultural Institute – East Troy, Wisconsin

Project Title: Replacing Synthetic Methionine in Poultry Diets with High-Methionine Corn.

Project Outcomes: The *long-term outcomes of our project include:* 1) creation of a model demonstrating how team-work among governmental, non-profit and private sectors can meet farmers' needs for alternative technologies; 2) financial stabilization of organic poultry farms during their transition away from synthetic methionine so that consumers have no disruption in their ability to purchase organic poultry and eggs; 3) a new winter location in Hawaii developed specifically for organic seed production and off-season breeding nurseries to serve the needs of organic breeders and small seed companies; 4) a diverse, source of elite, high-methionine cultivars available for seed companies to sell to organic farmers and others; 5) price incentives and logistical systems put in place by the organic poultry industry that encourage farmers to grow high methionine corn.

The *intermediate-term outcomes include:* 1) our ongoing breeding project maintains its efficiency in breeding high methionine corn cultivars; 2) poultry farmers participate in testing high-methionine corn on-farm in feeding trials, provide results to us, and judge whether it is useful for them; 3) less disruption for the organic poultry industry by the ban on use of synthetic methionine; 4) an array of useful cultivars for farmers produced by small seed companies to supply the methionine needs of poultry; and 5) reduction of the yield drag accompanying the high-methionine trait (estimated to be 10-30% with our first set of high methionine cultivars).

Short-term outcomes include: 1) accelerated release of elite high methionine cultivars for farmers; 2) increased understanding of the yields, feed value, and financial value of high methionine corn; 3) increased understanding about using high methionine corn to replace synthetic methionine by poultry farmers and associated companies before the use of synthetic methionine in organic agriculture is banned; 4) professional development of one farmer in Hawaii to develop an organic winter nursery and of several farmers in the national north central region to produce seed; 5) small agribusiness participation in feeding trials and learning about our corn as seed or feed; and 6) increased consumer awareness of the issue.

To our knowledge there does not exist a single organic winter nursery business in the world. Professional development of a farmer to manage an organic winter nursery business would fill a need that is lacking. Evaluating breeding genotypes under organic conditions, that often have increased weed, pest and disease pressure, and slow-releasing nutrients, is important so that cultivars are adapted to the farming system in which they will eventually be used to produce grain. Up to now, our breeding lines have been grown both in the Midwest during the summer and in a conventionally managed, pesticide-intensive winter nursery in Puerto Rico. Because of USDA funding cuts, after this winter we will no longer be able to afford a winter nursery. Funding this project will allow us to maintain breeding efficiency by halving the time needed to develop a cultivar compared to when only a summer nursery is used.

The audiences for our long-term outcomes include all the partners in our model system (public and private breeders, various companies involved in the market channels from seed-to-grain-to-poultry-to-consumers, farmers who produce grain and poultry products, and consumers who will buy them). The primary audience most immediately impacted by our short-term outcomes is farmers who market organic, natural or non-GMO fed poultry. Our secondary audience includes small seed companies, feed mills, and the organic poultry industry. Our short-term outcomes will

enhance awareness of the issues and potential solutions. We anticipate that the secondary audience will become increasingly involved in the intermediate-term outcomes. Consumers who buy organic eggs, chickens and turkeys are also an important audience and we need to cultivate their awareness. We anticipate that breeders will benefit from the cultivars/germplasm released from our programs and from the access to a professional winter nursery for organic crops.

Context, Background, Rationale, and Need:

This project directly addresses several outcomes. Our goal is to avoid an abrupt disruption in the cost or supply of organic poultry and eggs by creating a reliable supply stream of affordable, natural high methionine corn. Through our collaborative efforts with farmers, grain buyers, the organic poultry industry, and small seed companies this project will *improve the profitability of farmers and associated agricultural businesses* by helping them to smoothly transition from using synthetic methionine to a more natural source*. We will enhance the quality of life for farmers, rural communities and society by making sure production continues uninterrupted.* A potential disruption would have lasting effects on the profitability of farmers who currently grow feedstocks for poultry growers and the poultry growers themselves. This disruption could potentially send a lasting signal to poultry consumers that organic poultry products are too expensive to be economically feasible in a family's food budget. *Finally, by decreasing the use of synthetic methionine and replacing it with high-methionine corn in poultry diets, we are improving the environmental quality on which agriculture depends.* Feeding of isolated amino acids encourages confinement production of animals which has the potential for nutrient loading on soils. In addition, without a good substitute soybean meal could be over-fed which causes increased fecal-nitrogen pollution from the animal.

Issue: *The north central region of the United States is home to at least 40% of the production of organic poultry products in the U.S* (Harms and Russell, 1998).

Issue: *Current corn cultivars do not provide enough high quality protein for poultry needs*

Issue: *The NOP wants to ban the use of synthetic methionine in poultry diets in 2010.*

Issue: *There has been movement to finding an alternative to synthetic methionine.*

Issue: *Our high-methionine corn is a promising alternative source of methionine for poultry producers but there is a yield drag.*

Issue: *Our current project lacks funding to be ready with enough high-yielding, high quality, high-methionine corn before the looming ban.*

Issue: *Weather can prove disastrous without the option of a winter nursery.*

Issue: *Organic corn breeding projects are few even though farmers are asking for it.*

Literature Review

Corn hybrids with reliably high methionine content in grain are not commercially available. Major corn breeding companies do not have active programs breeding corn for organic farmers probably because the market is too small.

Our group [MFAI, USDA-ARS, Practical Farmers of Iowa (PFI), Iowa State University, the University of Minnesota, several private breeders, and a consortium of organic poultry companies called the Methionine Task Force] is developing classically-bred, high methionine corn for organic poultry producers. We are breeding cultivars with soft and hard kernels which have higher methionine and lysine contents than normal corn.

Outputs
Outputs that will help us to achieve our short-term outcomes include a variety of written materials for our audiences and forums that will allow us to interact with relevant participants. We will use feeding trial data to help formulate **feed recommendations**. These feed recommendations will be integrated with **yield and financial information** in popular articles that we will write for newsletters and farm publications. The upfront investment to create these outputs associated with our intermediate-term outcomes will yield returns long after this project is finished.

Long-term outputs include **improved hybrids** for organic farmers that have yields comparable to conventional hybrids and methionine levels needed for economic and sustainable organic poultry production. There will be outputs of **new and healthier food products** for consumers. These outputs will help to maintain the market share enjoyed by organic poultry products. An **organic winter nursery site** and a **diverse supply of corn** breeding germplasm will aid public and private breeding. The team approach to meeting our goals can be a model of project organization for other crops.

Approach, Activities, Methods and Inputs
Our approach builds on our active partnership between public, private and the non-profit sectors to establish a network of stakeholders whose goal is to create improved varieties of non-GMO, high methionine corn. Active participation from the stakeholders is critical to efficiently and effectively produce and provide farmers with good corn cultivars during the next two years. Because breeding can take up to 10 years to release improved cultivars, our core funding has presently been provided through a USDA/ARS project on breeding high-quality corn for sustainable farmers in the Corn Belt. This funding allows us to run breeding nurseries in Iowa and Wisconsin, testing sites at research stations in Iowa, and some outreach through PFI and MFAI. Other funds allow us to work with the MTF on multiplying seedstocks and producing hybrid seed for farmers but not in breeding.

***Appendix 1*. Outcomes**	**Outputs**	**Activities**	**Inputs**	**Evaluation Plan**
Long term: Team model	Increased supply of diverse and elite germplasm for public and private breeding	Breeding, field days, outreach bulletin, information delivery and acceptance.	Work by researchers, organizers, farmers, companies	Annual review and questionnaire to participants on improving teamwork at annual meetings
Farmers adopt our corn to produce natural products	New, healthier products in the marketplace	Replace synthetic methionine with high methionine corn	New high methionine hybrids and high methionine grain	Adoption of high methionine corn by companies and farmers
Functioning organic winter nursery in Hawaii	Improved organic varieties	Winter nursery activities	Train farmer on nursery technique and equipment	Breeding success review at annual team review meeting
Diverse elite cultivars with high methionine made available to seed companies	Cultivars competitive with conventional hybrids but with enhanced quality	Breeding and testing in the NCR and in Hawaii by USDA and MFAI	Nurseries, test plots, screening for quality and stress resistances, statistical analyses	Number of cultivars released and their acceptance

Price incentives by organic poultry industry	Established production relationships for our corn	Teamwork among breeders, farmers, and industry partners	Contracts for production and feed supplies	Farmers, MTF, breeders, and companies monitor progress
Short term: Release of cultivars is accelerated	Elite cultivars produced in half the time	Breeding in Hawaii	Winter nursery	Compare timeframe with and without winter nursery
Increase knowledge of yields, feed value and financial value	Bulletin ,feed recommendations	Yield and feed trials, enterprise budgets recommendations	Yield trials, feed trials, feed formulation and cost analysis	Review success at meetings including questionnaires
Poultry farmers and poultry companies learn about alternative feedstocks	Feed recommendations: 1 PFI and 1 MFAI newsletter articles, field days	Conduct feeding trials on-farm, write publications	Feeding trial results, farmers, write publications, organize field day	Self evaluation questionnaires at meetings
Professional development of farmer for nursery business	4 teaching sessions/year	Teach and work with farmer on all aspects of winter nursery	USDA/ MFAI staff travel to and conduct nursery in Hawaii	Review nursery success at annual team review meeting
Professional development of farmers to do research and seed production	Seed workshop session	Conduct on-farm research trials or seed increases and present at field day or meetings	Farmer cooperators learn how to and conducting research with PFI/MFAI assistance	Interaction with farmers and their report quality, evaluation at annual team meetings.
Small ag-business awareness of alternative feedstock	Field day, newsletters, publications, workshops	Meeting invitation and literature to relevant companies	Articles with farmer input, joint farmer/staff field days	Industry participation in meetings and other activities
Consumers awareness of the issue	Targeted press releases, popular magazine articles	Write newsletter articles and work with journalists	Newsletters and popular articles	Assessment of consumer feedback at team meeting.
Intermediate term: Increase breeding efficiency	Winter nursery establishment	Integrate summer nurseries with winter breeding activities	Early processing of top lines for sending to Hawaii	Evaluate speed of development of elite breeding lines
Poultry farmer participate in trials, share results, use corn	Farmer participation and use of corn	Farmers participate in trials, share results, and feed corn	Write articles and organize field days with farmer input	Questionnaires at meetings, input from MTF and companies.
Less disruption from the 2010	Steady supply of organic poultry and	Jointly implement supply and	Meetings among MTF,	Substituting corn for synthetic

ban on synthetic methionine	eggs	commercialization channels	seed industry, breeders and farmers	methionine in poultry industry
High methionine corn sold by seed industry	Seed licenses, seed production, seed sales	Industry seed production and farmer grain production	Industry, farmers and breeder devise seed and grain channels	Cultivar licensing and other seed company interactions
Reduce yield drag associated with high methionine corn	All forms of publications, field day demonstrations	Breeding and testing work	All breeding and testing work, articles with farmer input.	Compare aspects of feed value vs. yield drag, farmer feedback

Appendix 2. Literature Citations

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