Department of Agriculture, Trade and Consumer Protection
Division of Marketing
Agricultural Development & Diversification Program (ADD)

Grant Project Final Report

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Grant Project Title Commercial Organic Cranberry Production in Wisconsin

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Commercial Organic Cranberry Production in Wisconsin

2002-2003 Project Summary:

The purpose of this two-year project was to learn how to grow commercial quantities of organic cranberries in Wisconsin. Because so few acres of organic cranberries are grown in the United States, very little information exists on several critical aspects of cranberry culture. In the first year of this project, we examined a broad range of objectives. For the second year, we focused on five specific objectives that needed clarification and further study. This report summarizes the critical factors that needed to be solved so growers can be 'ahead of the game' when they decide to convert to organic culture.

In this yearlong project, we had five objectives all-leading to one goal: successfully culturing organically grown cranberries. I will highlight each of these objectives that were covered in the 2002 ADD grant, and then combine the information from the past two seasons work for a publishable paper.

Irrigation Uniformity is critical for successful organic cranberry culture

Many commercial cranberry growers will tell you that moisture uniformity is the most critical aspect of growing cranberries. This is true for conventionally grown cranberries, but even more critical for organically grown culture. Soil moisture levels can adjust your yields more significantly than fertilizer, pH, and insect infestation. Likewise, soil moisture levels will impact all of these inputs, including fertilizer usage, insect infestation, and fungal organisms.

In our studies, we determined that one successful method for establishing a diversified ecosystem in the cranberry bed, we can plant seeds to establish our bed. When growing cranberries from seed, water deficiencies are compounded because each seed has its own small root system, as opposed to established vines with a larger rooting area. Cranberry seeds must germinate in order to grow, and adequate levels of moisture must be provided on a consistent basis. Secondly, after the seed germinates, water levels must be maintained at high levels until the taproot is established. As we have found out, this takes nearly an entire season. Thus, we must have a high quality, reliable irrigation system.

Through casual observation, or even with data presented by irrigation uniformity programs, cranberry irrigation systems appear to irrigate thoroughly, but there is question as to the uniformity across the bed. Whether the grower is managing conventional or organic cranberries, uniformity is important, but never really documented. When a grower orders an irrigation system, the irrigation company has diagrams that show moisture uniformity calculations, but the system is never tested or quantified to determine how close the calculations match the estimates.

We developed a unique and effective procedure to determine the uniformity of our cranberry bed. We collected 50- #9 cans to catch water in the field. We went into the field and laid them out in a grid pattern of 10' x 10', turned on the water for 30 minutes, collected the water, then measured the milliliters of water that was collected in each bucket.

The results for one of our tests is outlined below:

	1	2	3	4	5	6	7	8	9
1	90	92	322	62	66	223	173	163	170
2	91	70	138	84	120	132	85	107	48
3	90	196	174	170	218	78	96	116	33
4	98	72	122	64	111	140	112	112	55
5	89	113.		75.	.		182	160	174

This data is presented in a graph below. The high peaks in this test were areas nearest to a sprinkler tip. Interestingly enough, the greatest water deficit was found to be directly in front of the sprinkler. It appears that cranberry irrigation nozzles are effective at throwing water at distances up to 55', but not very effective at making a truly uniform application.

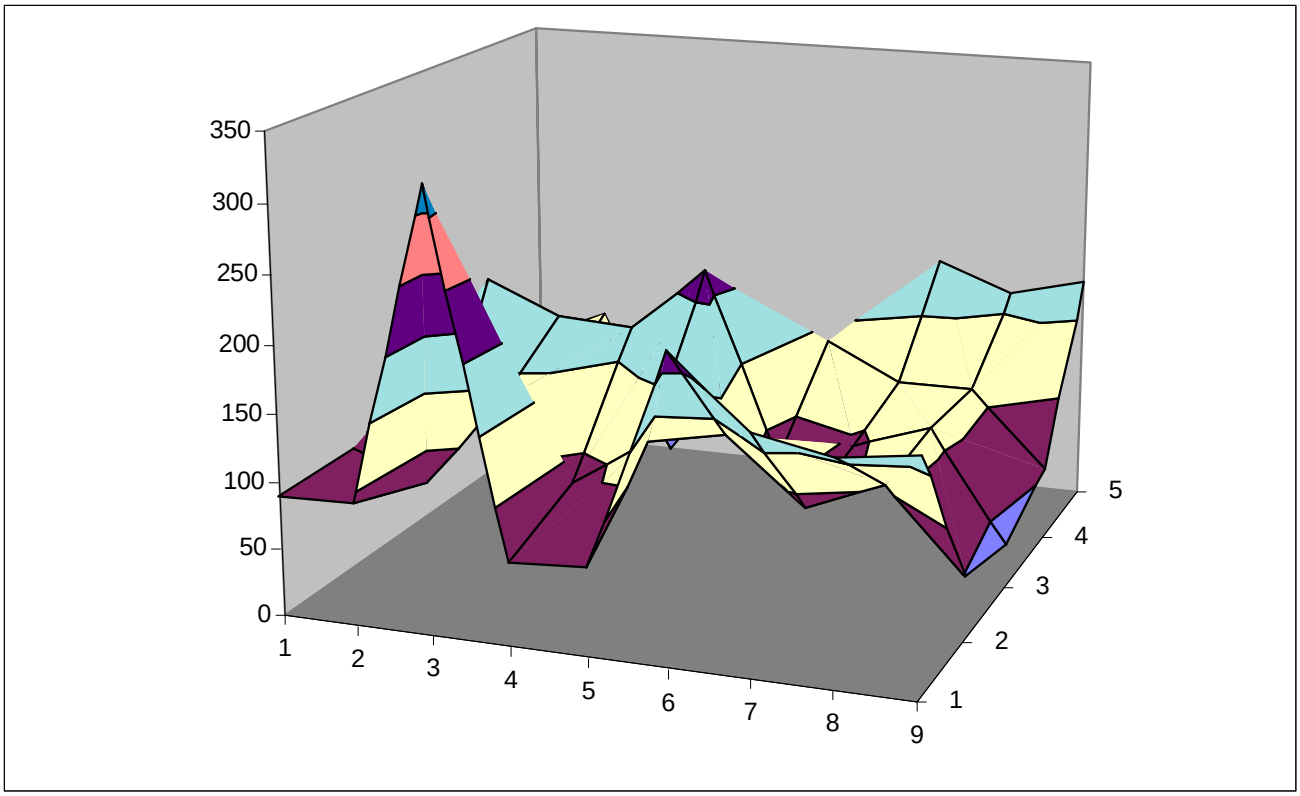
The turf grass industry focuses specifically on irrigation uniformity. In essence, our cranberries are similar to the blades of grass in a yard with each one competing for moisture and nutrients from its neighbors. The irrigation industry has developed an algorithm to assess irrigation uniformity. When a system is theoretically 'perfect', it has 100% distribution uniformity (DU). As system variation becomes larger, the distribution uniformity decreases. I learned that irrigation systems in the cranberry industry are designed to have a 70% DU. To determine the distribution uniformity, DU, one takes the data gathered from a catch-can test as conducted above, and applies the numbers into the following algorithm:

DU = 100 x (LQ / Avg)

LQ = The average value of 25% of the numbers with the lowest values
Avg – the average value of all the numbers collected

In our cranberry bed we had the following values: LQ = 62.1 Avg = 121

Thus, our DU = 51%.



After this experiment, we realized that our irrigation system needed to be upgraded if we were going to grow cranberries from seeds. Turf grass professionals design systems for 90% uniformity. Rainfall has 95% uniformity. It is apparent that we will need to design new cranberry beds around a different type of irrigation system. When visiting local, regional, and national irrigation dealers and distributors at trade shows last fall, I found that there are higher uniformity systems available, but most of them are untested on cranberries. The biggest drawback with cranberries is the need for frost protection. I learned that cranberry irrigation systems are not designed to supply uniform moisture to the soil; they are designed to protect the plants from frost damage. Frost control is first in importance and irrigation is second. As a result we are utilizing one system to do two different jobs. For organic cranberry production using seed, we must focus our efforts on attaining a highly uniform irrigation system and worry about frost protection using alternative methods such as flooding, or a combination of flooding and irrigation.

pH

pH is probably the third most important variable that must be maintained. As a general rule I don't feel that it is wise to grow organic cranberries in a high pH environment. I also recommend that the natural acidic soil have a pH below 4.5. The low pH will inhibit weed growth and maximize cranberry upright health. In this project we attempted to modify the soil with elemental sulfur. Elemental sulfur is not a registered organic product for pH control, but can be used as a fungicide. If we use elemental sulfur for pH modification, there is a three-year lag in harvest until the crop is once again certified organic. Additionally, your organic field inspector could impose additional time for the non-organically certified sulfur to naturally be removed from the area. In our study we attempted to apply elemental sulfur (90% prilled) to the soil during or soon after planting. We found that seeds and roots that came into contact with the elemental sulfur were killed. We feel that it may be possible to incorporate a larger volume of elemental sulfur into the soil prior to planting, but in general, if high pH is an issue with your natural soil profile, a little pH correction at planting will be short-lived. Plant in a natural acidic soil and pH will not be an issue.

Management of cranberry pests

Management of cranberry pests is probably the second more important variable that must be managed in organic culture. There are three different management options for cranberry growers: flooding, organic pesticides, and mating disruption lures. Luckily, many new organically certified products are continuously entering the market. They include improved formulation of Bt products as well as the new IGR (insect growth regulator) products. In our studies, we evaluated these products and talked with others who are also using them. We have discovered that efficacy seemed to be related to the manager's overall program. Thus, one product was not superior for all growers. Based on these observations and the continuous supply of new products on the market, it was difficult to make general statements on efficacy of a particular product.

We did however monitor cranberry mating disruption pheromones. Organic cranberry growers are extremely lucky because they can purchase mating disruption lures for each of the three major cranberry pests. Mating disruption lures have been produced for the Black headed fireworm, Sparganothis fruitworm, and cranberry fruitworm. On organic cranberry beds, I recommend that all growers utilize this valuable management tool.

In our studies, we came across several management factors that can improve the efficacy of the lures. First, purchase and concentrate as many mating disruption lures as you can feasibly afford on your cranberry beds. This is especially important if you have high existing populations of insects. We discovered that wind is the biggest culprit for efficacy. High winds blowing across a portion of a bed would eliminate the efficacy of the lures. Shaded or blocked sections of the property (by either trees of buildings) had little wind and the lures worked best. Even high grass on the dikes helped moderate wind speed and improve efficacy.

Cranberry growers that plan to initiate an organic cranberry field using seed have a definite advantage for insect management. As of this report writing, seeded beds were devoid of insects for three seasons, even when planted in the immediate vicinity of conventionally grown cranberries. For organic culture, managing insects with low populations is much more effective than trying to manage a high pest population. Growers with very high insect population in conventional culture should be wary of converting to organic culture until pest populations are under control. I recommend that a grower converting from conventional to organic on an established bed to: manage your property conventionally for all other inputs but attempt to manage pests organically. If successful, convert the entire property to organic culture.

Fertilizer for conventional organic properties

Over the past several years, I have evaluated a multitude of granular and liquid fertilizers. I have found and continue to recommend that growers should use cold-processed fish fertilizers from fresh water sources. Fresh water fish fertilizer had a lower salt content, which will protect the new seedlings from injury. From my personal observations and reviewing the research, I came to the conclusion that cold-processed fish fertilizer is more ideally suited for soil application than heat processed fish fertilizer, due to its higher bioactivity in the soil.

My experience with granular fertilizers has been mixed. Weed seed introduction to the bed has been my biggest concern. For that reason I prefer to utilize fish fertilizers on a consistent basis. However, one must remember that, for uniform application, you must have a highly uniform irrigation system established. Old irrigation systems with poor uniformity will wreak havoc with the growth of the

cranberries. If growers feel that they can grow cranberries with an inefficient irrigation system, granular boom applied fertilizers such as chicken and turkey composts will be required.

When expanding a new planting to generate root and shoot growth, it is important to be aggressive with the fertilizer to achieve maximum growth. We have found that cranberry seeds can handle up to 3 gallons per day per application of a 2-1-1 fish fertilizer. Each day we applied approximately 7200 gallons of water per acre to the bed. And given its very sandy nature, the plants were constantly starved for additional fertilizer. We supplemented all treatments with weekly applications of the same fish fertilizer, applying 2.5 gal / acre with the foliar boom. The combination of a weekly foliar treatment and a daily application of 3.0 gal through the irrigation system provided adequate nutrition to the rapidly growing plants.

The cost for this fertilizer program was significantly higher than a conventional fertilizer program, but with discounting due to volume purchases, we received the fertilizer at $2.00 per gallon. In our 90-day fertilization period, our total cost was $580 per acre.

Conclusion

The results and conclusions that were discovered during this second year of the project were of significant importance for developing a sound organic cranberry program. As with any agricultural venture, irrigation, pest management, soil type, and fertilizer are all extremely important factors that cannot be glossed over lightly. As I have learned over the past two years, ANY small variation or variable that is missed will be magnified many times. This is the reason I have incorporated my organic cranberry notes into a handbook that is concise but conclusive. It is very important to know the details of your operation and understand if your selected cranberry acreage is suitable for an organic purpose.

Please use the following questions as a guide for your grant project final report. Answer each question that relates to your grant project. Please type the final report and mail it to the ADD office along with your final invoice.

1) Describe the original intent of the grant project.
   - How was it projected to benefit Wisconsin Agriculture? To show other cranberry growers the methods for establishing and growing organic cranberries
   - Was it necessary to adjust the objectives during the project? Not in this second season. We knew what we had to do.

2) Describe the work conducted in this project.
   - How did the grant funds assist you in this project? They helped pay for some of the additional expenses incurred in the experiments. It all took more time, effort, and money than expected.
   - What successes did you achieve with this grant project? We learned most of the basics for establishing an organic cranberry farm.
   - What challenges did you face with your grant project? Mother nature was not good to us. With the fall drought and the June flood, it was a challenge for even the conventional growers.

3) Describe the public outreach efforts of this project.
   - What literature or educational materials were produced through this project? We have a booklet to be published.
   - What presentations, field days or other events were given related to this project? I will conduct a presentation at the WI cranberry school.
   - What media outreach did you conduct through this project? Please identify specific papers or stations. We will be working on that later this fall with the help of DATCP.

4) Describe the results of this project.
   - Did the grant project results meet your original expectations? Why or why not? Yes, they did meet our expectations. We can now look forward and begin growing organic cranberries with a much broader knowledge base.
   - What new agricultural products, technologies or production methods were developed through this project? Growing cranberries from seed is very unique in a commercial setting. Likewise, altering the soil profile to be more suitable for growing cranberries is a novel idea.
   - What did you learn from your grant project? What conclusions can you make? We can grow organic cranberries, but we cannot expect to utilize the same methods as conventional growers. We must learn and adapt very quickly to changes in the bed.
   - How will the grant results affect your business? We are buying farmland to convert to organic acreage.
   - How will this project benefit the Wisconsin family farm? Many growers are interested in the organic cranberry approach.

- What impact will this grant project have on the future of Wisconsin agriculture? I believe that we will see many more acres of organic cranberries in WI due to the high demand.

5) How will the Wisconsin agriculture industry be able to use the information from this project? The publication we wrote will provide growers with many answers to the pitfalls that we experienced. Information is lacking in organic cranberry culture, and the information from this grant will help tremendously.