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Topic 2 - Product and process quality in Organic Agriculture: methods and challenges

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ORGANIC FARMERS' DESIRED QUALITIES FOR BARLEY

Brian Baker*¹, Patrick M. Hayes¹, Meints Brigid¹

¹Crop and Soil Science, Oregon State University, Corvallis, OR, United States

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Abstract: Barley is a versatile crop that can fit well in many organic farming systems. However, organic farmers in the United States have had limited adoption of barley as a regular crop in rotation. Researchers conducted a survey of organic barley producers to find out what they considered to be the main obstacles to growing barley. The primary obstacles are limited markets and price. The breeding and development of better-quality barley suitable for specialty markets may be a way to expand markets and secure a better price. Yield was identified as the most important characteristic to the farmers responding, but other traits such as nutritional quality were also ranked high. Naked or hull-less barley is one possible alternative that allows organic farmers to sell into multiple markets. Most respondents expressed interest in the development of such varieties suitable for organic farming conditions.

Introduction: Organic farmers rely on crop rotations to break pest, weed, and disease cycles, and to provide biodiversity. Barley is a versatile small grain that offers many advantages to organic farming systems. It can be malted for beverages, eaten as a food grain, and provided to livestock as a feed. It can also be intercropped with legumes and used as a green manure. Organic farmers have been reluctant to plant barley. To address these needs the authors initiated a project to develop a multi-use naked barley suitable for organic farming systems. The researchers sought to understand what obstacles organic producers face to growing barley and what qualities, traits or characteristics organic farmers consider important for breeding, selection and development. The project was particularly interested in the development of naked (hull-less) barley that can be used for food, feed, and malting. Naked barley can be marketed as a whole grain and retains nutrients that are removed in the dehulling process.

Material and methods: The investigators drafted a survey instrument that was pre-tested by one barley producer in each of the USDA's Northeast, North Central and Western regions, as well as by project cooperators at Cornell University and Oregon State University. The final instrument contained 29 questions and was designed to take less than a half-hour to complete. The on-line survey was designed for ease of response as part of a mixed mode for data collection that will also involve follow-up telephone interviews for more in-depth questions of a subsample of the population (Dillman, Smyth, and Christian 2014).

Certified organic barley producers in the US were identified through the USDA's Organic Integrity Database (USDA NOP 2019) and from lists of farmer participants in project events, such as field days. On February 11, 2019, a survey was sent by Qualtrics to 374 email addresses (Qualtrics 2018). Nine of these emails were returned and three were added on February 26 for an adjusted target audience of 368. Multiple contacts were used to increase the response rate (Dillman, Smyth, and Christian 2014). Reminders were sent 15, 32, and 46 days after the initial survey was sent. The survey was closed on April 1, 2019. A total of 84 full or partial responses were received for a 22.8% response rate. Of these, 81 active farmers responded. Two respondents were researchers with certified organic experimental land. One was no longer farming. These three responses were excluded from the responses reported below. Summary statistics and charts were produced using Qualtrics and Excel (Microsoft 2016; Qualtrics 2018). Statistical analyses were conducted using SAS University Edition (SAS 2018).

All respondents were certified organic, with 69% farming their entire operation organically and 31% split operations. The responses were geographically diverse, with farmers from every USDA region responding. About half of the responses were from the Western region. Average farm size was about 89 ha, with an average of 50 ha farmed organically. Over 30% farmed more than 400 ha. Average yield of organic barley was reported to be 3,316 kg/ha.

Results: The primary use of barley (61%) was for feed, with food and malt accounting for less than a third of the organic barley used. The remaining "other" was mostly production of seed. Of that, some of the producers indicated that they produce barley for on-farm use as feed or haylage and do not market it. It was not clear in some cases whether producers grew barley with the intention to sell into the feed market or if they sold it as feed because the higher value food, malting, and seed markets were not available to them. Most of the respondents indicated that they were willing to grow a multi-purpose barley suitable for malting, food, and feed.

Figure 1 shows the main obstacles that organic farmers reported to growing more barley. Most of the obstacles were related to economic as opposed to agronomic factors. Limited markets and price were cited as the two main obstacles by nearly half of all respondents. "Not enough land" was given as the main obstacle by 19% and "doesn't fit in my rotation" was the reason for 10%. All other reasons provided in the survey instrument were viewed as obstacles by less than 10%, including poor yield, weeds, diseases, and insect pests. "Other" reasons given were also more often economic than agronomic. Producers reported lacking the equipment or having insufficient on-farm storage as obstacles.

About 78% of all producers indicated that they received a premium for organic barley over the conventional (non-organic) commodity price. The average premium was 115%, more than double the conventional price, but individual farms reported a wide range of variation from no premium to a four-fold (400%) premium over conventional. Segmenting the data into primary markets, those whose crop went mostly or exclusively to feed received an average premium of 97%. Some of those using barley exclusively for feed were livestock producers who used it on farm, sometimes in the form of haylage not harvested as mature grain. Those who were primarily malt producers received a premium of 131% on average. Those selling into the food market reported only a 68% average premium over non-organic. Seed producers reported a consistent premium of 120% over conventional.

Organic producers were asked what traits were most important for barley varieties grown in their farming systems. Yield was named the most desirable trait by nearly half the producers responding, with 82% putting it in the top three. The second and third most desirable traits had strong regional preferences. Many barley growers in the arid parts of the Western US—particularly in California, where water shortages have been common in recent years—want varieties that are drought tolerant or had low irrigation requirements. Growers in colder regions, such as the North Central and Northeast regions, as well as in the interior Intermountain West, named winter hardiness as a preferred trait.

Discussion: Organic producers said that they would grow more barley if the price was higher and the profit margin was greater. Barley, like wheat, has low operating costs, high capital costs and tends to be a low-margin or break-even crop. The gross margin for food barley was US\$1,159/ha, for malting barley was US\$954/ha, US\$809.80/ha for feed, and US\$488/ha for seed.. However, when overhead costs were factored in, the net margin was slightly negative given the relatively high capital investment costs. Organic wheat is similarly a low margin crop when compared with maize and soybeans (McBride *et al.* 2012).

Yield was by far the most important trait, followed by disease resistance and competitiveness with weeds. The current shortage of organic feed in the US is one driver of demand. While the feed market is the easiest to access in terms of available marketing and processing infrastructure, and has the lowest quality requirements, it offers a relatively low return. The expansion of the malting and food barley markets can be served by the development of varieties with qualities better-suited for organic farming conditions. Most farmers surveyed were supportive of the development of a multi-use naked barley.

References: Dillman, D, Smyth, D, and Christian, L. 2014. *Internet, Phone, Mail, and Mixed-Mode Surveys: The Tailored Design Method*. New York, NY: Wiley.

McBride, W, Greene, C, Ali, M and Foreman, L. 2012. The structure and profitability of organic field crop production: The case of wheat. Paper presented at the Agricultural and Applied Economics Association's 2012 Annual Meeting, Seattle, Washington, USA, August 12-14.

Microsoft. 2016. *MS Excel 365*. Redmond, WA: Microsoft.

Qualtrics. 2018. *Qualtrics Survey Software*. Provo, UT: Qualtrics.

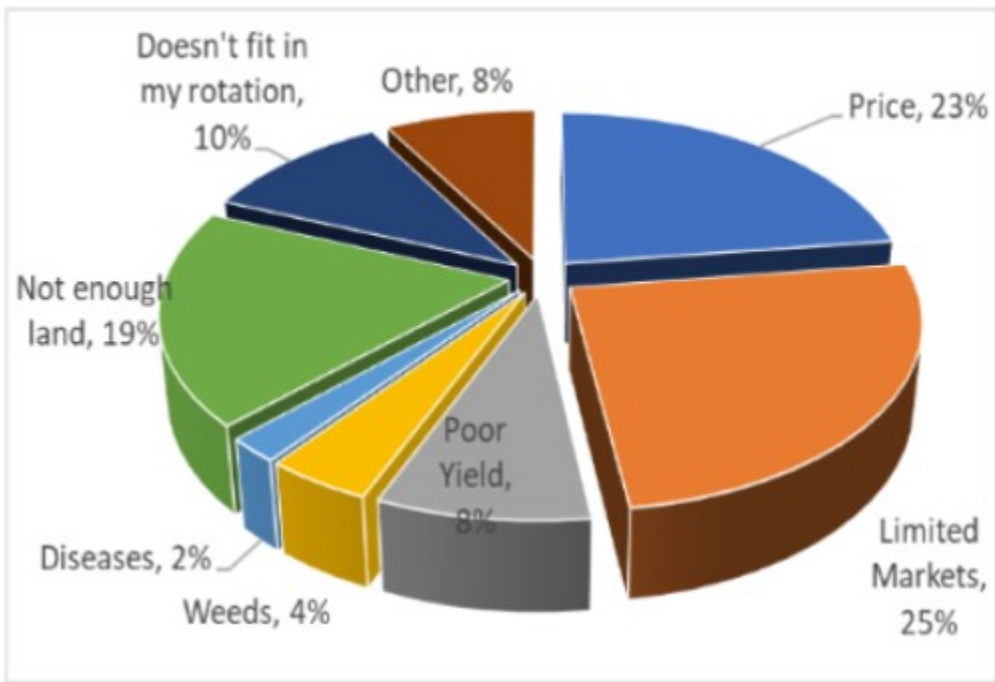
SAS. 2018. *SAS University Edition*. Cary, NC: SAS Institute.

USDA / NASS. 2019. Census of Agriculture 2017. Washington, DC: US Department of Agriculture, National Agricultural Statistical Service.

USDA /NOP. 2019. USDA Organic Integrity Database. Washington, DC: US Department of Agriculture. <http://https://organic.ams.usda.gov/integrity/>.

Image:

Figure 1: Obstacles to Growing Barley



Disclosure of Interest: None Declared

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