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*Connecting and supporting farmers, millers, bakers, and grain artisans to build a vibrant, integrated, equitable, and regenerative grain economy in the Mid-Atlantic*

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# Growing Grain Handbook

## Chapter 1.1 The economics of small grain farms

By Heather Coiner

September 11, 2023

Most people think grain can't be grown efficiently on a small farm. It is true that the vast majority of grain in the US is currently grown and processed at a very large scale; in 2017 half of all corn was grown on farms bigger than 685 acres (MacDonald, 2020). This is mainly because of advancements in tractors, fertilizers, and other factors that drove agro-industrial consolidation following World War II (MacDonald, 2020). In recent decades, consolidation has been accelerated further by advances in labor-saving technology (Duffy, 2009). Larger farms can take advantage of economies of size, which means that the average cost of production goes down with increasing size. This is because fixed costs (like tractors) get spread out over greater production area, and because farms access volume discounts on inputs (Duffy, 2009). Political forces, like crop insurance payments, and social forces, like young people opting for non-farm jobs, have also played a role (MacDonald, 2018).

But as recently as 1987, on the heels of a Farm Crisis that saw a surge of farmers leave the land, half the corn harvested in the US was still on acreage smaller than 200 acres (MacDonald, 2020, Iowa Pathways, 2022). A look at what happened between 1987 and 2017 suggests that beyond a certain farm size threshold, farms have been forced to get bigger; the number of farms 2000 acres and larger doubled at the expense of farms with 50-1999 acres (MacDonald, 2020). But below 50 acres, the number of farms have either stayed the same (as for farms with 10-49

acres), or increased by 50% (as for farms on 1-9 acres) (MacDonald, 2020).

This size tipping point holds when considering farm efficiency too. The increase in farm efficiency (calculated as dollars in sales per every dollar of expenses) is dramatic up to about $143,000 in annual sales (adjusted to today's dollars), but after that, bigger farms don't continue to get all that more efficient (Duffy, 2009). Similarly, the number of farms reporting positive net incomes flattens out around the same amount of annual sales (Duffy, 2009). So while small farms can realize major gains in efficiency by getting bigger, after the size crosses about 2000 acres, efficiency gains are much smaller. Large farms become very large farms to make more money (even though efficiency doesn't increase that much), to pay for better technology (to compensate for a lack of labor), or because prices are so low that even small increases in efficiency improve margins (Duffy, 2009).

Additionally, small farms may be finding other ways to make more money without adding more land by taking advantage of economies of scope. This is where farms reduce costs by spreading resources over more than one enterprise. Many of the farmers in the CGA network grow grain in addition to other enterprises, like raising beef or baling hay. In this way, they can use fixed resources like tractors and grain bins several ways. If soil fertility is to be viewed as a resource, then growing grain adds value (that is admittedly difficult to quantify) to the whole farm system beyond the price per bushel (Table 1.1). This strategy works best when the additional enterprise fits into an otherwise slow time of year. But even if the farm year is full, growers can still take advantage of economies of scope by seeing their farm's resources as also belonging to their farming community. In this way, individual farmers that share resources, like cleaning facilities, equipment, or logistics, can help each other access economies of scope that would otherwise be unavailable.

Reducing costs is one way to increase efficiency—the other is to get a higher price. CGA farmers do this by adding value to the crop, which starts with choosing appropriate varieties and using agronomic practices that align with CGA standards. The value added steps are grain cleaning, packaging and delivery, and marketing. Each step of added value comes with a price bump (see Chapter 1.2). For example, if the growing practices are organic, simply choosing the right

varieties–that is, varieties a direct market buyer is interested in–will deliver a 60% premium over the commodity market. While these price benefits will be discussed more in Chapter 1.2, they come with costs. Not every farmer is interested in flogging their grain at a farmers' market. But for enterprises (like vegetable farms) that already have a market stand, these prices make the economics of growing a small plot of grain look a lot better.

Better, but not easy. Making small- and mid-size grain farming work out financially is tricky, even with premium prices. Whether it will work for a particular enterprise depends on whether the farmer believes that value can be added to the farm by growing grain (Table 1.1), how growing grain fits into the existing enterprises (in terms of labor availability, crop rotations, and infrastructure), what resources (like cleaning infrastructure) are present in the community (sharing costs, thereby improving economies of scope for everyone), and whether the farmer wants to grow grain or not (this last can trump any financial considerations, as for a homesteader).

Here, we define four different sizes of operations. Garden plots are the smallest, on less than one acre. Small plots are up to ten acres, midsize plots are 11-100 acres, and large plots are any grain field more than 100 acres. Of the four sizes, large plots and garden plots are the easiest to figure out economically (I. Hertzmark, personal communication, January 2022). On a large plot, standard equipment like seed drills and combines are worth the investment (i.e. they provide economies of size). In a garden, the farmer is probably more interested in the experience, and in providing food for their family, than in making money. Plus, there is little capital investment since most of the work can be done with existing hand tools and household supplies.

Table 1.1 Adding grain to a farm can confer value beyond the sale price of the harvest. Shown are examples of existing enterprises that may benefit from a particular value.

| Value added to farm by grain | Example of existing enterprise that may benefit from a value |
|---|---|
| Sales | Direct market farms of all types, row crops, livestock (esp. if growing feed), other seed & feed |
| Soil health–through diversity | Pasture & hay, row crops |
| Soil health–through winter cover | Vegetables, row crops |
| Cool season forage | Livestock, dairy |
| Reduced costs / increased control over feed | Livestock, dairy |

[Table 1.1]

At the small- and mid-scales, the economics are trickier, but not impossible. They depend on the farmer's ability to leverage higher prices and marshall economies of scope, both on individual farms, and in farming communities. The latter, in particular, have demonstrated their power. History shows that participation in a community allows the individual small farmer to persist despite barriers. For example, the political, social, and economic forces that drove farm consolidation are related to those that fostered a reliance on economies of scope in under-resourced communities (Hendrickson et al., 2020). When those forces conspired to deny black farmers access to land and capital after WWII, for example, they organized to form the Federation of Southern Cooperatives (https://www.federation.coop), which helped slow land loss among black farmers. Similarly, the Intertribal Agriculture Council was formed in direct

response to the Farm Crisis of the 1980s, which caused disproportionate harm to indigenous farmers (https://www.indianag.org). Above all, organizations like these promote a sense of community and support. Fast-forward to today, that sense of community can also sustain regional grain economies against the forces of consolidation. Regional economies, then, can be viewed as incorporating values of resource sharing and community into conventional agro-economic thinking. In contrast to economies of size, which drive consolidation and the loss of small farms as growers adopt them, economies of scope drive the proliferation of small farms as growers adopt them.

Throughout this handbook, we will reiterate the importance of leveraging the resources of the Common Grain Alliance network to help growers maximize economies of scope. We will also put the end-use of grain front and center, working backwards to guide growers on how to get to the price points they want to achieve. In this way, we hope this guide serves as a supplement to the many other agronomic resources out there by helping small and mid-size grain farmers figure out how to make growing grain in the Mid-Atlantic make economic sense.

## Resources

Worksheet 1.1 to investigate whether growing grain might be right for you.

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# Growing Grain Handbook

## Chapter 1.3 End-uses of grain

By Heather Coiner & Ben Shorofsky

September 21, 2023

Regional grain markets differ from commodity markets in that the grower can tailor their choice of crop and their agronomic practices to the grain's intended end use. It may seem strange to put marketing before growing in an agronomy handbook, but we do it to emphasize the importance of growers staying focused on both an intended buyer, and the options for alternative buyers should something not go according to plan. This chapter will provide an overview of some common end uses in the Mid-Atlantic, but in service of generality it will leave out much of the flexibility embraced by the creative artisans that buy regional grain. These buyers know a great deal about the grain they like to work with, so a conversation with the buyer is an indispensable part of the planning process for growers hoping to access this market. To supplement the descriptions of end uses, Table 1.3 lists some general agronomic requirements for crops.

Table 1.3 General agronomic requirements of selected end-uses of grain.

| Application | Seed | Flour | Grain for malting | Grain for milling--retail | Grain for milling-direct wholesale | Grain for distilling | Animal feed |
|---|---|---|---|---|---|---|---|
| **Object** | | | | | | | |
| *Stones* | OK | none | none | a few | none | none | a few |
| *Dirt* | OK | none | none | none | none | none | a few |
| *Wild garlic bulblets* | none | none | none | none | none | none | a few |
| *Unthreshed heads* | a few | none | none | a few | none | a few | OK |
| *Plant debris* | a few | none | none | none | none | a few | OK |
| *Other crop seeds* | none | a few | none | a few | a few | a few | OK |
| *smaller or undeveloped seeds* | none | a few | none | a few | a few | a few | OK |
| *diseased seeds (other than Fusarium)* | none | a few | none | none | a few | none | OK |
| *DON from Fusarium Head Blight* | none | < 1 ppm | < 1 ppm | < 1 ppm | < 1 ppm | >10 ppm (a) | 1-10 ppm |
| *Dead insects* | OK | none | none | none | none | none | OK |
| *Living insects* | none | none | none | none | none | none | none |
| *Beards* | OK | none | none | none | none | none | OK |
| *Falling number* | >300 | >300 | >300 | >300 | >300 | any (b) | any |
| Test weight class (c) | highest | high | highest | high | high | medium | any |

(a) as long as spent grain is not fed to animals
(b) unless the grain is to be malted, then >300
(c) Jones et al., 2017; Center for Food Safety and Applied Nutrition, 2010

[Table 1.3]

## *Bread*

The major crop is hard wheat, followed by spelt and rye, and the ancient wheats emmer and einkorn. All other grains can feature in breads as minor crops. Gluten-free bread bakers favor rice, barley, corn, millet, oats, sorghum, and buckwheat. Bread wheats need to be higher protein (12%+) for machine mixed, yeast-risen breads; sourdoughs and hand-mixed breads can have lower total protein contents (10-12%) as long as the ratio of glutenins to gliadins is correct (see Chapter 2.3). Soft wheat is sometimes blended with high protein bread wheats to make them more suitable for sourdoughs. This blending can happen at the mill or in the bakery. Spelt, emmer, and einkorn must be dehulled.

### *Pasta*

The major crop is hard wheat, followed by spelt. Thus far, no variety of durum wheat—the standard pasta wheat—has been identified that will do well in the Mid-Atlantic. The protein quality of durum wheat resembles that of spelt, emmer, and einkorn, in that all of these crops have higher relative amounts of gliadins to bread wheat (Geisslitz et al., 2019). Higher gliadins make doughs more extensible—not great for holding a bread shape, but good for pasta. There is much variation in protein quality among seed sources (Geisslitz et al., 2019), though, so some experimentation is merited—not all spelt will perform the same (see Chapter 2.3 for more detail). Some seed sources may be more suitable to pasta than others. If a hard wheat or spelt crop doesn't do well for bread, try pasta. Spelt, emmer, and einkorn must be dehulled.

### *Pastry, quick breads, and snacks*

This end use encompasses pastry (laminated breads like croissant, cakes, pies), quick breads (corn bread, biscuits, tea cakes), and pantry goods (cookies, crackers, bars). The major crop is soft wheat, though any grain crop is suitable for at least one of these applications, including non-cereals like buckwheat and sorghum. There is vast scope for growth here because these products are, for the most part, less demanding of the grain. That means that crops that aren't suitable for bread, pasta, or malting may be useable for pastry and snacks that rely more on other ingredients for structure rather than on specific gluten properties.

### *Beverages*

The major crop for malting is barley, followed by wheat and rye. Beer brewers and distillers buy malt, and sometimes they buy unmalted corn, wheat, or rice too. Malting quality grain must pass stringent testing, but unmalted grain is more flexible (see Table 1.3). Grains should retain their hull.

### *Cooking*

The major crops are corn, oats, buckwheat, barley, rice, millet, and beans. Beans, rice, barley, and millet are usually cooked whole. Buckwheat is either dehulled and cooked (groats), roasted

and then cooked (kasha), or milled into flour (with or without the hull). Corn is usually milled into flour, meal, polenta, or grits, or nixtamalized. The nixtamal is then dried for hominy or wet-milled for masa. Oats are usually dehulled (unless they are hulless oats), cracked for steel-cut oats, rolled, or milled into flour. Soft wheat is cooked as whole berries, or parboiled, dried, and cracked for bulgar (Lazor, 2013). This grain must meet retail standards (Table 1.3).

### *Seed*

All crops can be grown for seed. Seed grain is the highest quality tier (in terms of test weight), and can bring prices on the order of retail without the same fuss. But seed quality is difficult to achieve; only part of any harvest will have a sufficiently high test weight, and the grain will need to pass germination testing. Access to some cleaning infrastructure (for example, a fanning mill plus a gravity table) will be necessary to sell grain as seed. Also, if the seed is to be sold off the farm, it must not violate federal laws (Agricultural Marketing Service, n.d.; Minnesota Department of Agriculture, n.d.). Seed grain should retain its hull.

### *Feed*

Most crops that can't be sold to any other buyer can usually be sold as feed (Table 1.3). If the crop is certified organic, the price can be higher. As we will discuss in Chapter 3.1, selling or trading feed grain to neighboring livestock farms may offer growers access to the excess fertility (in the form of manure) on those farms. This practice would help both operations rebalance their nutrients in the service of better soil health for everyone (see Chapter 3.1). Feed grain can retain its hull.

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# Growing Grain Handbook

## **Worksheet 1.1:** Can grain add value to your operation?

By Heather Coiner & Ben Shorofsky
September 26, 2023

1) **What goal(s) would growing grain help you accomplish for your whole farm?** For example: Would you like to extend your crop rotation? Would you like to get a little more money for the grain you already grow? Would you like to feed your family grain you've grown yourself? Use Table 1.1 to help you identify ways grain can add value to your operation.

2) **How much land do you have available for growing grain?** Are there fields that are being underutilized? Write down the time windows where you have available land. Make a note of your scale (<1 acre = garden scale; 1-10 acres = small scale; 11-100 acres = mid scale; >100 acres = large scale).

3) **What time do you have in your existing operation setup or schedule?** Write down the time windows where you can imagine adding another enterprise. Is there a time of year when you aren't as busy? Does it match the time windows your identified in (2) when you have available land?

4) **What equipment do you have access to?** This could be equipment you own or can rent or borrow from neighbors or other members of your community that will help you to prepare fields, plant, cultivate, harvest, dry, clean, and store grain.

5) **What other resources are available in your community to help you?** Are there other

grain growers in your area? Is there a farmer's market grower or farm stand nearby who can help you market your grain? Is there a market for your grain? Use Worksheet 1.2 to help.

6) **Could grain add value to your operation?** Given your answers so far, do you see a path towards meeting your goals in (1)?

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# Growing Grain Handbook

## **Worksheet 1.2:** Think through your market options

By Heather Coiner & Ben Shorofsky
September 26, 2023

Identifying the market you want to focus on, and which products you want to produce, is a combination of practical and subjective factors. This worksheet focuses on some of the subjective or 'gut-feeling' factors.

1) **Which end-use appeals to you?** Use Chapter 1.2 to imagine growing for different end-uses. Do you see yourself being able to achieve the quality requirements? What are your backup end-uses, in case things don't go as planned?

2) **Do you like working with people?** Do you like the idea of interacting with lots of buyers or would you prefer to build a relationship with just one or two buyers?

3) **Do you want your own brand?** Can you imagine yourself creating a brand, online presence, and labels for your grain?

4) **How do you imagine selling your grain?** For example, do you already have sales channels (like a website, farm stand, or restaurant relationship) that could be used to sell your grain? Are you excited about selling at a farmer's market? Or are you hoping to deliver two-ton totes to someone else to sell?

5) **What is your risk tolerance?** Do you like the idea of taking a chance on a higher price, or would you rather take a lower price and be sure that you're selling all of your grain?

6) **Now write down the end uses and markets that are consistent with your answers.** Use Chapters 1.2 and 1.3 to help you. Compare your answers so far to the results of Worksheet 1.1. Do your answers match the time, land, and resources you have available?

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## Growing Grain Handbook

## Chapter 1.2 The direct market for grain


By Heather Coiner & Ben Shorofsky



September 21, 2023


This handbook is focused on producing grain for the local food system, which most people associate with farmers markets, farm stands, or farm-to-table restaurants. While these are part of the regional food system, there are other participants too. When a customer buys a loaf of bread, they are the last stop in the local food system, called the “consumer”. One step upstream in the value chain is the baker, called a “processor”. If that baker buys flour, the miller is the next stop upstream; they are also a processor. In the local food system, millers source grain directly from farmers (not through a broker or elevator), so the farmer, or “producer”, is where it all starts. This farmer-miller-baker value chain, then, has four participants: a producer (the farmer), two processors (the miller, then the baker), and a consumer. The producer can choose to sell to any of the other three participants and still be within the local food system.

The three downstream value chain participants in the above example represent the three categories of buyers for the Mid-Atlantic. Retail customers are the largest and most familiar group. Wholesale buyers, like bakers, brewers, and restaurants, take processed grain and turn it into food or beverages, selling it on to the public or to other wholesale buyers. One step further upstream are the intermediate processors, like millers and maltsters, who buy grain from the farmer and prepare it for other processors, but also for wholesale buyers or retail customers.

Regional food systems do not enjoy the same economies of size (see Chapter 1.1) as commodity

systems, but the prices are substantially higher. The price a farmer has access to depends on their growing practices and their ability to add value to their crop by cleaning, packaging, processing, or marketing it (Table 1.2). Currently, the CGA bulk processors who will buy conventional grain require it to be cleaned and tested, but they still offer a price premium compared to the commodity price. For example, growers can deliver wheat in totes to a conventional CGA processor and get a 4-fold or more price premium compared to the commodity price (Table 1.2). A grower who can clean, bag, and market their wheat to a baker-miller in the DC area can charge 6-10 times the price paid for bin-run grain (uncleaned grain straight from the field); a grower who can take it to a farmers market can get twice that or more (Table 1.2). There are other benefits too. Grain grown by regional producers tends to preserve its identity down the value chain, since end users are often proud to name the farmers who grew the grain. Consumers love feeling a direct connection to the land, which helps them justify paying a higher price. Farmers can grow named varieties, or more specialized grain, like heritage varieties, or less common but culturally important grain like buckwheat and millet. For farmers this adds up to the pride of providing a staple food to their community.

Table 1.2 The three categories of buyers in the regional grain value chain along with the farm infrastructure needed to access that market, and the price premium a farmer can expect, using wheat as an example.

| Buyer | Example | Farm infrastructure (1) | Price Premium (2) | Typical volume (lb) |
|---|---|---|---|---|
| Processor | Miller<br>Maltster | Some testing (4) + transportation in totes | 1.6 (3) | 1000-10,000 |
| | | Above + some cleaning | 4 - 6 | |
| Wholesale customer | Restaurant<br>Craft brewery<br>Mill-bakery<br>Tortilla maker | More testing + bagging + additional cleaning + some marketing | 6 - 10 | 100-1000 |
| Retail customer | Home miller / baker<br>Home cook | Smaller bags + milling + labels + heavy marketing | 12 - 55 | 1-10 |

(1) In addition to basic planting, harvesting, drying, and storage
(2) Multiplicative factor above $8.70 or $14.25, the conventional and organic prices for bin-run wheat (as of Jan 2022)
(3) Certified organic only
(4) See Table 1.3

[Table 1.2]

The farther downstream the buyer, the higher the price. But access to those prices require substantially greater investments in farm infrastructure, more effort to locate buyers, more buyer relationships, and substantially greater assumptions of risk. If someone doesn't buy a five pound bag of grain at a farmers' market, the farmer is left holding it, whereas if they deliver a tote to a miller, they also deliver the risk associated with not selling that grain down the value chain.

Whether this risk-reward calculus is right for a particular grower depends on many things, including their stomach for risk and their access to infrastructure and capital. As we outlined in Chapter 1.1, one way the economics of small and mid-size grain plots work out is if resources are already available on the farm or in the community. A market vegetable farm that grows grain on the side can reasonably target retail customers by leveraging their existing marketing

infrastructure (farmers' market stand) as long as their neighbors can help them out with cleaning and testing the grain. The other main way growers access the higher prices is by vertically integrating. A grower that invests in cleaning, bagging, testing, and marketing infrastructure can not only access the high prices, but sell those services to others in their community. In this way, those who have the capital can help those who don't, making the value chain more equitable.

## Resources

Worksheet 1.2 Think through your market options


Appropriate Technology Transfer for Rural Areas (ATTRA) (n.d.) *Local Food Systems.* https://attra.ncat.org/local-food-systems/

Bachman, J & Gegner L. (2002) *Grain processing: Adding value to farm products*. Appropriate Technology Transfer for Rural Areas (ATTRA). http://www.attra.ncat.org/attra-pub/PDF/grainpro.pdf. (Note: Includes a long list of books, companies, vendors, and other resources.)

Born, H. (2005). *Marketing organic grains.* Appropriate Technology Transfer for Rural Areas (ATTRA). http://www.attra.ncat.org/attra-pub/PDF/marketingorganicgrains.pdf. (Note: Includes abundant resources for organic seed dealers, GMO-test kit vendors, and other resources.)

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