Family as a catalyst in farms' diversifying agricultural products: A mixed methods analysis of diversified and non-diversified farms in Indiana, Michigan and Ohio

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1. Introduction

One aspect of 20th century agricultural development in temperate, industrialized societies such as the United States has been the specialization of farm products as opposed to diversification (Mazoyer and Roudart, 2006). Specialization was made feasible and logical for farms by advancements in technology that were supported by policy (Lin, 2011; Ray et al., 2003). Mechanization on the farm, and in the transportation and distribution systems connecting farms to markets “freed” farms and whole regions from the need to satisfy most of their material needs, to instead simplify their range of agricultural outputs (Mazoyer and Roudart, 2006, 392). One piece of this evolution germane to specialization was that farms were no longer obligated to keep livestock on hand for draft purposes, nor as a source of fertilizer, as machines, fuel, and manufactured fertilizers became available for purchase (Naylor et al., 2005). Consequently, farms became able to specialize by separating crop production from livestock/poultry production. This trajectory has prevailed such that, in the U.S., among the 17 crop and livestock products the U.S. Department of Agriculture (USDA) monitored throughout the 20th century, the number of outputs produced per farm fell from an average of 4.2 various crops and animals in 1950 to 1.3 in 2000 (Dimitri, 2010; Gardner, 2002). This number held at 1.2 in 2012, indicating that most farms now produce a lone agricultural product per year (Effland, 2017; USDA-Census of Agriculture, 2012). Assessment of land covers at the county level agrees that diversity has declined since 1978, especially in the Corn Belt, which supports the lowest crop diversity in the nation (Aguilar et al., 2015).

Counter to this pattern, some farms are nevertheless diversifying products. We examine motivations for diversifying among farmers in the eastern sub-region of the U.S. Corn Belt. Analyses in comparable agricultural settings find evidence of substantial product diversification amidst specialization. For example, in Saskatchewan, Bradshaw finds that farms diversified production of arable crops between 1994 and 2000, although the 23% increase in farm size during this period produced a more specialized agricultural landscape overall (2004). This Saskatchewan study assessed land coverage of 11 principal crops, summer fallow, and 14 less common crops. An analysis of 9 crop and livestock products and maple syrup in Quebec found product diversification to have increased there since 1966 (Renard et al., 2016). Since product diversification is an avenue for farms to increase their economic and environmental resiliency (see 1.1), efforts to understand what motivates farmers to diversify their agricultural outputs can contribute valuable insight. This paper examines farmers’ prospective outlooks on potentially further diversifying products. The question we address in statistical analysis pursues a narrative that farmers and agricultural advisors expressed in the project’s phase 1 exploratory interviews, and is informed by analysis by Inwood and Sharp (2012): Do farms that place greater emphasis on creating opportunities for descendants to continue farming also have a more favorable outlook on diversifying farm products?
1.1. Product specialization and product diversification

While farm specialization greatly reduced the labor required to manage a farm, this shift contributed to a decline in the number of farms, as it allowed a single farmer to operate more acres (Ray et al., 2003). This concentration of farmland into fewer and larger farms has led to increased inequality and declines in rural populations, civic infrastructure, and social support systems, contributing to the outmigration of rural youth leaving to pursue careers away from farming (Carr and Kefalas, 2009; Jackson, 2008; Lobao and Meyer, 2001). On an individual level, specialization reduces the decision-making capacity of farm families, increases their vulnerability to market and weather fluctuations, and reduces their economic power in relation to farm input supply firms (James et al., 2013; Rotz and Fraser, 2015; Stuart, 2009).

Farm specialization has also created a number of unintended environmental consequences. While “specialization” is the term the economic literature uses, the analogue in the ecological literature is landscape “simplification,” or managing agricultural ecosystems to support fewer species (FAO, 2011). Proximate effects of farms in this region producing fewer types of products while applying purchased inputs include loss of biodiversity, increased use of pesticides, and contamination of groundwater and surface water (Rehan and Gratton, 2016). Among the downstream effects is a “dead zone” in the Gulf of Mexico, a 9000 square mile area of low oxygen levels (Ding et al., 2010).

Clarifying the motives leading farm families to diversify their products is important because product diversification offers environmental and economic benefits to a farm operation. Environmentally, farms that diversify into more agricultural products deviate in some capacity from simplification, potentially supporting a more complex ecosystem. Granted, there are many definitions of product diversification circulating in the literature. Diversification at its most basic definition can refer to replacing one output with a different one, which would suggest an equivalent relationship to the ecosystem. As Bradshaw explains in this journal, it often goes unspecified whether a farm is necessarily augmenting its output diversity, or merely substituting outputs, or “re-specialization” (2004, 37). Adding crops to a field or to a rotation would be farther along the diversification spectrum (Ponisio et al., 2012). Farther still would be a definition by Kremen et al. (2012), which frames diversified farming systems as farming practices and landscapes that intentionally include functional biodiversity at multiple spatial and/or temporal scales ... spatially heterogeneous and variable across time. While variably defined, diversified farming systems have been found to improve soil nutrient balances and carbon sequestration capacity, reduce pest pressures, and increase biodiversity (Franzluebbers et al., 2014; Hilmire, 2011; Lemaire et al., 2014; Rudel et al., 2016). Biologically diversified agricultural systems are a key component of sustainability, increasing the capacity of the agri-food system to absorb fluctuations and shocks by increasing ecological and economic diversity (Lin, 2011; Rotz and Fraser, 2015). In the larger context, product diversification is a strategy for increasing the adaptive capacity of agricultural systems to deal with climate change and other challenges (Hendrickson, 2015; Hilmire, 2011; Rotz and Fraser, 2015), and indeed, farmers in the eastern U.S. have ranked product diversification as among the most feasible adaptations to climate change (Crane et al., 2011; Rejesus et al., 2013). Many recent recommendations for high priority research in sustainability focus on farms with diversified production systems, because of the insights they may yield as a result (Meehan’s differences from dominant agricultural systems (National Resource Council, 2010).

Economically, agricultural risk management theory positions product diversification as a strategy to spread risk while increasing income (Bradshaw, 2004). An aim of diversification is to increase net revenue, with some evidence that this strategy can improve the long- and short-term viability of the farm (Barnes et al., 2015). Diversification also functions as an adaptation strategy to better tolerate fluctuations in productivity and markets (Fritz and Myers, 2002). In the U.S. context, there are four categories of products that a farm may add. These categories are: (1) commodities (such as wheat), (2) non-commodities or “specialty crops” (such as vegetables), (3) value-added products (such as jam), and (4) differentiated products (such as USDA certified organic wheat) (Agricultural Marketing Resource Center, 2016; Salvioni et al., 2013; USDA-AMS, 2015). This study is focused on farms adding a product from categories 2, 3, or 4, that is, something other than a commodity. In this case, the farm gains not only the potential revenue of a new activity, but a role in the marketplace as a “price maker.” Farms that sell non-commodities often get to set the price of their product, whereas commodity farms must function as “price takers,” their products only able to command the going rate for commodities (Bramley and Kirsten, 2007; Che et al., 2005; Hayes et al., 2004; Saccomandi, 1998). The USDA offers recent evidence of higher survival among farms at any scale that produce non-commodities and market them through intermediated or direct-to-consumer channels, or both (Low et al., 2015).

1.2. Research definitions of on-farm diversification

Much of the recent research about the reasons farms diversify has taken place in Europe (e.g. Bowler et al., 1996; Hansson et al., 2013; Heggem, 2014; McNally, 2001; Meraner et al., 2015; Price and Conn, 2012), where for more than a decade European Union (EU) rural development policy has incentivized farms to diversify activities beyond “conventional agricultural products” (European Commission, 2005). EU policy and these European studies use a broad definition of diversification that includes a range of on-farm, and sometimes off-farm, activities, such that Shucksmith et al., providing a history of the term, refer to it as “a catch-all category” (Shucksmith et al., 1989, 353; Turner et al., 2003). Barbieri and colleagues also define diversification broadly, and have conducted comparable analyses in North America by Barbieri (2010), Barbieri and Mahoney (2009). Fig. 1 presents a typology of activities for farm income diversification, the purpose of which is to clarify the definitions of farm diversification circulating in the literature (Evans and Ilbery, 1993; McElwee and Bosworth, 2010). This paper focuses on the left-hand column, which presents on-farm production activities, or farms diversifying their agricultural outputs, whereas typical in contemporary literature is a focus on non-production activities.

Examples of the extent to which research tends to focus on non-production types of diversification is the sample of diversified farms surveyed by Hansson et al. (2013), only 7% of which had diversified agricultural products (all via added-value processing) as opposed to services (n = 309). Another large EU survey study of determinants of “farm diversification” by Meraner et al. (n = 70,392) actually did not consider crop/product diversification at all, excluding this class of diversification to achieve a “very narrow” definition comparable with other studies (2015, 769). In addition to product diversification being perhaps less prevalent, the tendency of research to focus on non-production activities may be guided by evidence of product diversification being the least profitable of the three categories (Bowler, 1999; Shucksmith et al., 1989). This paper speaks to the associated literature about farm diversification, however we focus on diversification of material agricultural products for the reasons justified above and because of the importance that farmers in this study region have imputed to this form of diversification for their operations (Bruce and Som...
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