ADDING VALUE
THE MINNESOTA FARMERS’ WAY

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Adding Value the Minnesota Farmers’ Way

By Lee Egerstrom
Minnesota 2020 Economic Development Fellow

Just like sugarbeet farmers before them, Minnesota corn farmers are again teaching an important lesson about economic development and why it makes sense for farmers and other producers of commodities, goods and services to invest in making their own markets.

A new study shows Minnesota farmers realized a $1.22 cent per bushel increase in price of their 2007 crop from creating local demand at the ethanol plants in the state. That raised Minnesota farm income by $1.67 billion over what it would have been without the plants lifting prices close to home.

Aparna Bhasin, a Macalester College senior and an undergraduate research fellow at Minnesota 2020, researched and wrote the accompanying report, Adding Value the Minnesota Farmers’ Way, to provide a theoretical approach to evaluating the economic impact of farmers’ investments in creating local processing companies that make markets for local commodities.

Ms Bhasin uses ethanol plants and their impact on corn prices, corn acreage and production, and farm income because ethanol is currently the most common value-added market development in Minnesota. Her study, however, has relevance to past market development efforts such as sugarbeet cooperatives that saved and expanded sugar production and processing in Minnesota and North Dakota. And it is especially relevant for current development efforts involving organic crop production and marketing, specialty crops and potential new crops that may be raised in Minnesota for biofuels and industrial material development.

Contemporary debate over proper federal energy policy, support for biofuels and ethanol and related issues are beyond the scope of this paper. Rather, it addresses why farmers are wise to invest in and develop their own markets to raise the economic value of their crops and, by extension, raise their own farm income.

A final note on the accompanying study: Ms Bhasin refers to Minnesota ethanol plants as New Generation Cooperatives (NGCs) – the cooperative business model that was primarily developed in Minnesota and neighboring Upper Midwest states. Legally, most of these Minnesota plants are incorporated as Limited Liability Companies (LLCs), and not formally as cooperatives under state legal codes.

Use of NGC designation works here because farm investments in creating nearby value-added plants are consistent with farmers’ cooperative objectives. The need for outside capital prompted farmers to seek non-cooperative partners and incorporate under a different business code.

Therein lies the clash of capital interests to be explored later; the Bhasin study shows why these investments make sense for the class of investors and economic developers we commonly call farmers. Given its economic impact on the state’s economy, it also makes sense for public policy support for value-added development.
Introduction

“A cooperative is an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise.”¹ Traditionally, agricultural cooperatives formed predominantly as a means for farmers to gain market power. Newer cooperatives aim to create production processes through which they not only gain market strength, but also add value to their crop.

This paper aims to find the economic impact of New Generation Cooperatives (NGCs) and hybrid forms of these structures, and their value-added processes, on farm income that in turn impacts local economic development. We use a study of ethanol cooperatives and hybrid firms in Minnesota as they are the newest wave of such enterprises utilizing a value-added production process to impact farm income from corn. It should be noted that sugarbeet cooperatives that developed earlier in Minnesota, or specialty crop cooperatives and community-based enterprises in other states are similar in concept and would produce similar if proportionate results.

The following section gives an overview of previously published literature on cooperatives and economic development, as well as a brief insight into the history of cooperatives in Minnesota. This section also enables us to define terms and concepts as they will be used throughout this paper.

The third section provides a theoretical framework for assessing the impact that new generation (NGC) ethanol cooperatives have on farm income in Minnesota. Using a simultaneous model for price and production, this leads us to the next section which defines our estimation equation and data set. The following section presents our results from both the estimation equations and creates a simulated model to help us assess overall impacts. Although the regression model we use provides an effective way for estimating the economic impacts of ethanol cooperatives on farm income, this does not show the complete picture. To supplement our quantitative research, this is followed by a case study of an ethanol cooperative in Minnesota that has been successful. The case study looks at impacts on both the farmer and the local community.

This multi-faceted approach gives us a better understanding of the impacts of cooperatives on their local economy as well as their effects on farmers in the larger state community. We found that not only does the local economy benefit from the construction and functioning of the ethanol plant, but also from the increased farm and community income. From our simultaneous regression model, we found that New Generation ethanol cooperatives raise farm income by approximately $1.67 billion (2006/2007). This in itself has a huge impact on the local economy. These findings are consistent with previous research, and show the importance of local policies that support the cooperative business form.

¹International Co-operative Alliance
Literature Review

Cooperatives in Minnesota
Cooperatives play numerous social, ethnic, political and economic roles. It is hence very important to accurately define our use of the term cooperative. Economist Heflebower defined a cooperative as “the means whereby members by-pass the market adjacent to them, the market where they would otherwise make individual arms-length transactions with investor-owned enterprises (1980).” Instead, members deal with a company they own, a cooperative, which aims not to accumulate profits but to maximize its members’ income.

Cooperatives are an essential part of Minnesota’s economic and cultural history. With 1,026 cooperatives, it is the leading state in the U.S. with this form of business structure (USDA, 1990). In addition to being a democratically controlled business that is user owned, controlled and benefited, this business form is supplemented by the seven principles of the International Co-operative Alliance (ICA):

(1) Democratic Control (One person, one vote)
(2) Open and Voluntary Membership
(3) Member’s Economic Participation
(4) Autonomy and Independence
(5) Education, Training and Independence
(6) Cooperation among cooperatives
(7) Concern for Community

These principles were designed and employed to ensure that the cooperative was run in the interest of members and not investors (Keillor, 2000).

New Generation Cooperatives (NGCs)
Over the last two decades within Minnesota and the United States we have seen a movement from the traditional form of cooperatives to what have come to be known as New Generation Cooperatives (Egerstrom, 1994). These are value-added processing, closed membership cooperatives. NGCs create opportunities for producers to be more directly involved in business ventures, and often are started as a means to enhance farm income by creating local markets and obtaining greater income from higher-valued agricultural products. The two main elements that distinguish NGCs from more traditional cooperatives are delivery rights and restricted membership. The cooperative sells delivery shares as a way to both raise capital and allocate the right of delivery among members. These shares create a contract between the cooperative and the member, specifying the amount the member is required to deliver and the co-op is required to buy (Merrett & Walzer, 2001). Table 1 on the following page further describes NGCs and how they differ from the more traditional form of cooperatives.
Ethanol Production Cooperatives

Ethanol production cooperatives are value-added agricultural cooperatives that have emerged in Minnesota over the last two decades. The goal of this type of cooperatives is to add value to the raw materials produced on the farm and to return this added value back to the producers rather than to a “middleman” (Nadeau & Thompson, 1996). In the case of ethanol cooperatives it is value-added to corn, with returns to corn farmers.

In recent years, the actual ownership of ethanol plants in Minnesota and around the Midwest has taken a variety of legal forms. Farm investment in these firms, however, remain tied to the economic objectives already explained and are viewed as NGC investments for purposes of this paper.

Cooperatives and Economic Development

There is a vast literature spanning this topic, including theoretical, case study and fiscal/employment analysis approaches. USDA’s study of the role of cooperatives in rural economic development provides examples of cooperatives in the United States that have succeeded at meeting member and community needs. The study found that cooperatives have the potential to be effective economic development tools, particularly in instances of market failure (USDA, 1989).

Nadeau and Wilson use a case study approach to study the impacts of agriculturally based NGCs on their communities. They conclude, “Cooperative community development can be an effective strategy for creating and expanding locally based businesses and for creating and retaining jobs.” They also find that cooperatives enable the possibility of incorporating social and environmental objectives, thereby improving community development (Merrett & Walzer, 2001). Holmes et al. also use this approach, but focus on the process of development rather than community impacts (Holmes et al., 2001). Trechter looks more directly at cooperative
contributions to economic development, finding these to be significant. He suggests there is difficulty in quantifying these benefits, as the relationship between cooperatives and their communities is so intricate (Trechter, 2001).

The case study approach is descriptive and although they indicate a strong impact of cooperatives on their local communities, they do not quantify the magnitude of these impacts. The USDA Rural Business-Cooperative Service includes studies of the fiscal, employment and income impacts of cooperatives within each state and within the US (USDA, 2000). The most recent study uses an Input-Output Analysis to measure the economic impact of cooperatives at a local level. The report divides impacts by sector and finds that cooperatives have a larger impact on the economy due to output and employment impacts (Folsom, 2003).

A far more detailed study of the economic impact is underway at the University of Wisconsin’s Center for Cooperatives in Madison. A preliminary report was issued in early April, but state-by-state data are not yet completed.

The varying study approaches provide very different insight into the impacts of cooperatives on their local economy. For the purposes of this study, we use a regression model to analyze the impact of ethanol cooperatives, a relatively new value-added cooperative venture, on farm income in Minnesota. Additionally, this is supplemented by a case study of the Chippewa Valley Ethanol Company that provides further insight into the economic impacts.
Theoretical Framework

In order to understand the impact that cooperatives have on individual farmers and communities, it is important to first look at the effect of cooperatives on the general price level for the agricultural good. Using our example of ethanol cooperatives in Minnesota, this implies measuring the impact of these cooperatives on the price of corn within the state. Figure 1 shows that the local demand for corn is initially lower than the universal demand for corn. As a result, due to transportation costs and middleman sales, local farmers only receive $P_{\text{local}}$, while consumers are paying $P^d$. This difference, $P^d - P_{\text{local}}$, is the basis. Additionally, in order to maximize their profits, local farmers choose to produce at $Q_0$, which is below the optimum amount.

![Market for Corn](image)

**Figure 1:**

Ethanol Cooperatives in Minnesota enable the pooling of farm resources to create ethanol production plants locally. As a result, we see the development of local markets in rural Minnesota that strengthens local demand for corn. Therefore, local farmers manage to overcome the “basis” price discount for shipping corn out of their market and instead receive a higher price locally for their crop. These higher corn prices boost the amount of corn acreage planted and harvested which could, in turn, result in a negative impact on corn prices. Hence, in order to quantify the impact of ethanol cooperatives on corn prices, we use a simultaneous equation model that predicts the price and production of corn (Evans, 1997).

We first consider the impact on the price of corn. Using a price equation (Ibid.), the price of corn is a function
of production of corn, corn exports, the support price for corn and the ethanol production capacity of New Generation Cooperatives in Minnesota. The production of corn is predicted to have a negative sign because as production increases (the supply of corn increases), the price of corn is likely to fall. Both corn exports and the ethanol production capacity of NGCs are predicted to have positive signs, as they are both factors that impact the demand for corn.

The price equation will give us an estimate for the impact of ethanol cooperatives on the price of corn. But in order to assess the overall effect, it is necessary to estimate a second equation in which the corn acreage planted is a function of the price per bushel and NGC ethanol production capacity in the previous year, assuming that the yield is exogenous.

The impact of ethanol cooperatives on corn prices and production can now be combined, accounting for (1) the amount that NGC ethanol production increases corn prices and (2) the amount that the higher corn prices increase production. These effects are then combined to form a simulation model.
Data and Estimation

Using the conceptual framework above, our estimation equations are:

\[ P = \hat{\alpha}_1 \text{Production} + \hat{\alpha}_2 \text{Exports} + \hat{\alpha}_3 \text{NGC Ethanol} + \hat{\alpha}_4 \text{Price Support} \]

Where:
- \( P \) = Price per bushel of corn ($)
- Production = Corn Production (Thousand Bushels)
- Exports = Corn Exports (Million Bushels)
- NGC Demand for Corn = NGC Ethanol Production Capacity (Million Gallons)
- Price Support = Corn Subsidies (Million $)

\[ \text{Corn Acreage} = \hat{\alpha}_1 \text{Lag P} + \hat{\alpha}_2 \text{Lag NGC Ethanol} \]

Where:
- Corn Acreage = Corn Harvested for all purposes (thousand acres)

The data are collected by the United States Department of Agriculture and The Minnesota Department of Agriculture. A time-series approach is used, spanning the time period 1975-2007. The study begins in 1975 so as to avoid complications due to the price controls and large export orders to the Soviet Union during the 1973-4 period. Table 2 provides a summary of the data used. It is important to note that during the 32-year period the price per bushel of corn rose by $2.39. Additionally, between 1989-2007, the ethanol production capacity of NGCs rose from 0 to 620 million gallons.

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>MEAN</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production (Thousand Bushels)</td>
<td>748463.2</td>
<td>322000</td>
<td>1191900</td>
</tr>
<tr>
<td>Price per Bushel ($/bushel)</td>
<td>2.284412</td>
<td>1.46</td>
<td>3.85</td>
</tr>
<tr>
<td>Exports</td>
<td>592.25</td>
<td>205.2</td>
<td>1009.1</td>
</tr>
<tr>
<td>Ethanol Production by NGCs (Million Gallons)</td>
<td>111.8824</td>
<td>0</td>
<td>620</td>
</tr>
<tr>
<td>Price Support in State (Millions of Dollars)²</td>
<td>221.9412</td>
<td>85</td>
<td>976</td>
</tr>
</tbody>
</table>

²Data for the price support of corn is only available through a certain period of time, hence for purposes of this paper, we used extrapolated values for older years.
Results & Analysis

The table below summarizes the results of the estimated Price equation.

| Dependent Variable : Price of Corn per Bushel ($) |
| Sample: 1975-2007 |
| Included Observations: 32 |

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
</tr>
</thead>
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<tr>
<td>Production (Log)</td>
<td>-0.5377488***</td>
</tr>
<tr>
<td>Exports</td>
<td>0.0013342***</td>
</tr>
<tr>
<td>NGC Ethanol Production Capacity</td>
<td>0.0019682***</td>
</tr>
<tr>
<td>Price Support</td>
<td>-0.0012568***</td>
</tr>
</tbody>
</table>

*** Significant at the 1% Level

R-Squared: 0.5454
Adjusted R-Squared: 0.4827

Table 3: Regression Results: Price Equation

As we can see, the coefficients of Production, Exports, Ethanol Production Capacity of NGCs and Price Support are all significant at the 1% level and the signs (Holding all else constant, a negative coefficient would imply that a one unit increase in the variable would decrease the price of corn per bushel by the value of the coefficient) confirms the suggestions of our theoretical framework. The coefficient on the NGCs Ethanol Production Capacity is 0.0019682. Although this appears small, holding everything else constant, an increase in ethanol production capacity from 0 to 620 million gallons (1990-2007) results in a $1.22 price increase per bushel of corn.

We next look at the results from the second estimation equation, summarized on the following page:
As predicted in the theoretical model, the price per bushel of corn and the NGC Ethanol Production Capacity in the previous year have a positive impact on the corn acreage planted. The coefficient on the lagged price is 679, which implies that holding everything else constant, a $1 increase in the price/bushel of corn will increase the corn acreage by 679 thousand acres. As predicted, creation of NGC ethanol production plants result in an increase in the price per bushel of corn. That causes an increase in the production of corn in the following year, and then has a negative impact on the price of corn.

We can now combine the two models for price and production in order to form a simulation model. The table below shows the actual price per bushel of corn and planted corn acreage in Minnesota from 1990-2007 as well as the simulated price per bushel of corn and planted corn acreage in the absence of ethanol cooperatives. Since 1990, New Generation ethanol cooperatives have increased the price/bushel of corn in Minnesota by $1.22 and increased corn acreage in the state by approximately 735,000 acres.

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**Dependent Variable: Planted Corn Acreage (Thousand Acres)**

Sample: 1975-2007  
Observations: 32

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price per bushel (Lag-1 year)</td>
<td>678.6767***</td>
</tr>
<tr>
<td>NGC Ethanol Production Capacity (Lag-1 year)</td>
<td>2.34638***</td>
</tr>
</tbody>
</table>

***Significant at the 1% Level

R-squared= 0.4256  
Adjusted R-squared= 0.3846

Table 4: Regression Results: Production
Earlier we assumed that the yield is exogenous. We can therefore transform the increase in acres harvested into bushels produced to give us the overall economic impact of ethanol cooperatives. Let us take, for example, the 2006/2007 year: We have determined that (1) prices were $1.22/bushel higher due to ethanol cooperative production capacity and (2) production was approximately 107 million bushels higher. We can now apply these estimates to understand the impact on incremental cash flow. Total cash receipts in 2007 are 1,138,800 thousand bushels times $3.85 per bushel, or $4.38 billion. However, without the New Generation ethanol cooperatives in Minnesota, the total cash receipts would be approximately $2.71 billion. Hence, the gross cash receipts to corn in Minnesota are $1.67 billion higher due to the value-added processes of NGCs, which is also the net increase in farm income.

This evaluation of the economic impact of ethanol NGCs gives us a better understanding of investment in value-added processes. The returns to corn growers that are calculated above are throughout the state. However, individual member-owners and local communities receive benefits beyond those described above from ethanol production cooperatives. The case study approach gives a better insight into these impacts.

### Table 5: Simulated Model: Comparing Price and Production with and without ethanol NGCs.

<table>
<thead>
<tr>
<th>Year</th>
<th>Price per Bushel of Corn with Ethanol Cooperatives ($)</th>
<th>Price per Bushel of Corn without Ethanol Cooperatives ($)</th>
<th>Difference ($)</th>
<th>Corn Acreage without Ethanol Cooperatives (thousand acres)</th>
<th>Corn Acreage with Ethanol Cooperatives (thousand acres)</th>
<th>Difference (thousand acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>2.17</td>
<td>2.15</td>
<td>0.02</td>
<td>6700</td>
<td>6700</td>
<td>0</td>
</tr>
<tr>
<td>1991</td>
<td>2.22</td>
<td>2.19</td>
<td>0.03</td>
<td>6600</td>
<td>6585.31</td>
<td>14.69</td>
</tr>
<tr>
<td>1992</td>
<td>1.91</td>
<td>1.84</td>
<td>0.07</td>
<td>7200</td>
<td>7177.29</td>
<td>22.71</td>
</tr>
<tr>
<td>1993</td>
<td>2.26</td>
<td>2.19</td>
<td>0.07</td>
<td>6300</td>
<td>6253.25</td>
<td>46.75</td>
</tr>
<tr>
<td>1994</td>
<td>2.23</td>
<td>2.15</td>
<td>0.08</td>
<td>7000</td>
<td>6949.24</td>
<td>50.76</td>
</tr>
<tr>
<td>1995</td>
<td>3.14</td>
<td>3.04</td>
<td>0.10</td>
<td>6700</td>
<td>6645.23</td>
<td>54.77</td>
</tr>
<tr>
<td>1996</td>
<td>2.47</td>
<td>2.33</td>
<td>0.14</td>
<td>7500</td>
<td>7431.88</td>
<td>68.12</td>
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<tr>
<td>1997</td>
<td>2.15</td>
<td>1.93</td>
<td>0.22</td>
<td>7000</td>
<td>6907.83</td>
<td>92.17</td>
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<tr>
<td>1998</td>
<td>1.71</td>
<td>1.47</td>
<td>0.24</td>
<td>7300</td>
<td>7150.39</td>
<td>149.61</td>
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<tr>
<td>1999</td>
<td>1.6</td>
<td>1.23</td>
<td>0.37</td>
<td>7100</td>
<td>6934.36</td>
<td>165.64</td>
</tr>
<tr>
<td>2000</td>
<td>1.71</td>
<td>1.28</td>
<td>0.43</td>
<td>7200</td>
<td>6946.20</td>
<td>253.80</td>
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<tr>
<td>2001</td>
<td>1.9</td>
<td>1.40</td>
<td>0.50</td>
<td>6800</td>
<td>6506.13</td>
<td>293.87</td>
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<tr>
<td>2002</td>
<td>2.15</td>
<td>1.56</td>
<td>0.59</td>
<td>7200</td>
<td>6863.39</td>
<td>336.61</td>
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<tr>
<td>2003</td>
<td>2.35</td>
<td>1.64</td>
<td>0.71</td>
<td>7200</td>
<td>6799.27</td>
<td>400.73</td>
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<tr>
<td>2004</td>
<td>1.94</td>
<td>1.15</td>
<td>0.79</td>
<td>7500</td>
<td>7020.46</td>
<td>479.54</td>
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<tr>
<td>2005</td>
<td>1.86</td>
<td>1.03</td>
<td>0.83</td>
<td>7300</td>
<td>6765.69</td>
<td>534.31</td>
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<tr>
<td>2006</td>
<td>2.89</td>
<td>1.81</td>
<td>1.08</td>
<td>7300</td>
<td>6738.98</td>
<td>561.02</td>
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<tr>
<td>2007</td>
<td>3.85</td>
<td>2.63</td>
<td>1.22</td>
<td>8400</td>
<td>7665.33</td>
<td>734.67</td>
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Case Study - Chippewa Valley Ethanol Company (CVEC)

Description of Business
CVEC is a 46 million gallons per year corn ethanol plant located in Benson, Minnesota, originally formed by more than 650 shareholders (producers, elevators and local investors) as a means to return a higher value for area corn production and stabilize electric rates. Since then, CVEC has developed a reputation for efficiency and policy leadership. It also took advantage of the production capacity of the facility by founding a vodka distillery. This enables them to produce two premium vodka products at low levels of additional cost, hence adding further value to area corn and small grain crops.

Benefits to Farmers
In addition to raising the general price level of corn in the area, the cooperative also provides an average of 13.3% annual return on investment over 10 years to a farmer who invests $20,000 (Campbell, 2008). Hence, the overall increase in farm income is even higher. Additionally, the cooperative structure of CVEC allows farmers to both own and control the production process, simultaneously strengthening family farmer control of agriculture (USDA, 1990).

Benefits to the Local Economy
Approximately 15 years ago, Benson was facing problems of a declining population, a stagnant economy, loss of jobs and an eroding tax base. However, the creation of a cooperatively owned ethanol plant has a dramatic impact on the local economy. A study by the Renewable Fuels Association (RFA) shows that a 40-million gallons per year ethanol plant is likely to expand its local economic base through direct spending, provide a one-time boost during construction, create jobs both within the plant and throughout the economy, boost tax receipts and increase household income. Benson has been seen to reflect all these predictions (USDA, 2008). In addition, a recent research grant may enable CVEC to eliminate 90% of its natural gas use. This would not only cut costs and benefit member-owners, but would also have groundbreaking environmental impacts.
Conclusion

Although this study does not quantify all the benefits that the local economy derives from the cooperative business structure, it finds that agricultural value-added cooperatives have a significant impact on local and especially rural economic development. Our quantitative study finds that farm income has increased by approximately $1.67 billion due to the formation of ethanol cooperatives within Minnesota.

Additionally, the case study of The Chippewa Valley Ethanol Company provides further evidence of the benefits of the cooperative business structures. We find that these cooperatives or hybrid enterprises can offer a strong boost to the economy while simultaneously increasing household and community income. These findings show the importance of encouraging and supporting the cooperative value-added business form through local and state policies.

Although our findings are significant and cover an important aspect of the economic impacts of cooperatives, there remain gaps in quantitative research in this area. Minnesota is the leading state in the U.S. in utilizing the cooperative business form. More detailed research on the benefits and limitations of cooperatives would better enable the value-added cooperative model to spread to other parts of the country. But Minnesota’s experience with ethanol production makes clear that value-added cooperatives can be an effective economic development tool, particularly in rural areas.
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