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# Contribution of the North Dakota Agricultural Products Utilization Commission Programs to the State Economy

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## Executive Summary

The North Dakota Agricultural Products Utilization Commission (APUC) was established in 1979 with the mission of adding value to agricultural products through the promotion of ethanol. APUC has since broadened its mission to include creating new wealth and jobs through the development of new and expanded uses for all North Dakota agricultural products. To achieve this mission, the Commission administers four grant programs encompassing basic and applied research, farm diversification, marketing and utilization, and prototype development. The aim of this study is to evaluate the Commission's success in attaining its goals.

The project team examined the outcomes of a sample of grant recipients from each program type to evaluate the overall effectiveness of the program in meeting its stated objectives. The time frame for the evaluation was 1995-2004. The APUC staff provided a list of projects funded in each program area during the study period. The project team then selected a cross section of grant recipients from each program area, with the exception of the prototype development grants. Because of the small number of prototype development projects (12) funded during the study period, an attempt was made to contact each one. Taking into consideration the goals of each grant program, an information collection template was designed for each grant program. Because of the expedited time frame for completing the project, telephone interviews were the primary method of data collection.

### Program Summary

During the study period, a total of $9.3 million was awarded to 396 projects. Included in the total distribution were $751,769 in federal funds which were USDA Rural Business and Enterprise Grants (RBEG) received in bienniums 2001-2002 and 2003-2004. Grant distributions per biennium varied from a high of $3.3 million in 1995-1996, to a low of $1.4 million in 2003-2004. Marketing and utilization grants accounted for 54 percent of awards and 72 percent of total funds awarded. The percent of grant awards and the percent of total funding for basic and applied research grants and prototype development grants were equal, 20 percent and 3 percent, respectively. Farm diversification grants represented 23 percent of the total grants awarded, but only 5 percent of total funds awarded.

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**Findings**

The review of the four APUC grant programs indicates that each program appears to be quite successful in meeting its objectives. The farm diversification grantees who were contacted generally indicated that their projects had been implemented as planned, and most had plans to continue or expand their new enterprises. To help put the program's impact in perspective, in the last ten years, APUC has awarded 90 farm diversification grants totaling $494,000, roughly $50,000 a year, and the 15 grant recipients interviewed for this study alone generated roughly $241,000 in annual gross revenues. While the reported levels of gross income from these new enterprises varied substantially, the average ($16,000) suggests that many of these enterprises were generating income levels that could provide a meaningful supplement to farm household incomes. Using the sample contacted, annual revenues from the new or expanded enterprises that received APUC farm diversification grants would be approximately $1.3 million annually.

In the past ten years, APUC has awarded nearly $300,000 in prototype development grants, roughly $30,000 per year. Of the seven grant recipients contacted, two had commercialized their products, reporting annual gross revenues of $100,000 and $750,000, respectively. Two others reported that their products were nearing commercialization and were planning to begin marketing in 2007.

Basic and applied research grants typically represent front-end efforts to develop and commercialize new products, crops, or value-added opportunities. The interviews conducted, with recipients of basic and applied research grants, demonstrated the wide range of potential outcomes. Several of the basic and applied research grant recipients contacted were able to report very concrete outcomes with substantial economic impacts. In some cases, research is ongoing, and outcomes at this time are uncertain pending additional research activities. Yet in other cases, research efforts have been discontinued.

Finally, the marketing and utilization grants program supports a diversity of projects directed at market analysis, feasibility studies, business plan development, and related services to support the launch and/or expansion of value-added enterprises. This program has supported the launch of a number of major processing ventures (e.g., Red Trail Ethanol, Dakota Skies Biodiesel), as well as a number of smaller projects. Alternately, the results of some market and feasibility analyses have led to the conclusion that the project, as conceived, was not commercially viable. While disappointing to project proponents, these findings may well have saved potential investors from substantial losses.

The larger and more successful projects assisted by this program have made very substantial economic contributions. For example, nine agricultural processing projects supported by APUC during the 1995-2004 period are estimated (when fully operational) to contribute more than $157 million annually to the state economy, to support almost 2,300 new jobs, and to result in $2.4 million in added state sales and use and personal income tax revenues annually. Similarly, four large processing plants, which received APUC support prior to 1995, contribute more than $580 million to gross sales, support more than 8,500 jobs, and add more than $10 million to state tax revenues. In addition, APUC support has assisted the launch of a number of smaller enterprises which may provide employment opportunities that would not otherwise exist, and may have potential for future growth.

In its efforts to support the development of new products and to assist groups seeking to launch new ventures, APUC is essentially acting as a venture investor. In the literature dealing with venture investment and new business development, it is virtually axiomatic that most of the net returns result from a small minority of investments. A commonly quoted statistic is that 10 percent of investments produce virtually all of the returns. Viewed in this context, APUC appears to not only be achieving a very high overall return on its investment portfolio but also is supporting a relatively large percentage of successful investments.

## Contribution of the North Dakota Agricultural Products Utilization Commission Programs to the State Economy

### Introduction

The North Dakota Agricultural Products Utilization Commission (APUC) was established in 1979 with the mission of adding value to agricultural products through the promotion of ethanol (APUC 2004). APUC has since broadened its mission to include creating new wealth and jobs through the development of new and expanded uses for all North Dakota agricultural products. The Commission administers four grant programs encompassing basic and applied research, farm diversification, marketing and utilization, and prototype development.[1] The aim of this study is to evaluate the Commission's success in attaining its goals.

### Approach

A program evaluation attempts to answer questions about the success of a program in achieving its goals or expectations, whether the program's activities were implemented as planned, and the social and economic effects of the program (Kosecoff and Fink 1982). While the goal of APUC is to create new wealth and jobs through the development of new and expanded uses for North Dakota agricultural products, the four grant programs advance this goal in somewhat different ways, which imply somewhat different evaluation criteria.

Basic and applied research grants and prototype development grants are long term in nature. Prototype development grants support development of technologies that have the potential to enhance agricultural production and processing. Basic and applied research grants are typically aimed at development of new or improved production systems for crops or livestock. A successful outcome for a basic and applied research grant would be the adoption of the new system by producers. For prototype development projects, successfully commercializing the product would be the desired outcome. Both positive outcomes would typically occur over a substantial period of time.

[1]While the 2005 Legislative session authorized additional programs, the evaluation reported here is limited to the four established programs.

Marketing and utilization grants and farm diversification grants support activities that take place in a shorter time frame, generally in one or two years. Marketing and utilization grants support feasibility studies, marketing studies, and/or business planning for producer groups or firms seeking to launch new ventures or expand existing ones. These efforts may lead to new or expanded enterprises that result in substantial job creation and economic contributions, both directly and indirectly. These efforts may also conclude further commercialization efforts would be ill-advised. Farm diversification grants provide support for individual producers seeking to diversify their farm or ranch with innovative non-traditional enterprises. If the new enterprise proves profitable and sustainable for that individual, the grant would be considered successful.

Measuring the success of each program requires a different rationale, and some programs more readily lend themselves to quantification than others. This project was aimed at examining the outcomes of a sample of grant recipients from each program type to evaluate the overall effectiveness of the APUC program in meeting its stated objectives. Program impacts were quantified where possible. When quantification was not possible, a modified case study approach was used to evaluate program outcomes.

**Methods**

The time frame for the evaluation was 1995-2004. Projects funded in the most recent biennium were not included in the study period as many projects may not yet be completed or would have been so recently completed that project outcomes are unknown. The APUC staff provided a list of projects funded in each program area during the study period. Summary statistics were compiled to describe the number and amount of grants awarded during the study period. Summary statistics also include grants funded by USDA Rural Business and Enterprise Grants (RBEG). APUC applies for these federally funded grants and awards them based on the terms and conditions of the grant. The project team then selected a cross section of grant recipients (e.g., size of grant, time period, types of enterprise, etc.) from each program area, with the exception of the prototype development grants. Because only 12 prototype development projects were funded during the study period, an attempt was made to contact each one. Taking into consideration the goals of each grant program, an information collection template was designed for each grant program.

Because of the expedited time frame for completing the project, telephone interviews were the primary method of data collection. Multiple attempts were made to contact each individual in the sample; however, some proved impossible to reach. Contacting recipients of farm diversification grants was especially difficult. Even though the phone survey was conducted in the evening and letters were sent notifying recipients they would be contacted, the survey team was not able to contact each individual in the sample. The ability to screen calls with caller I.D. may have had some impact on the results. With the prevalence of telemarketing and other solicitation, it is not uncommon for people to screen their calls, choosing not to answer a call from an unknown number. Ultimately, however, information was obtained from an adequate number of grant recipients in each program area to provide an overview of outcomes for each program area. A description of the information template used for each grant program, a summary of the telephone interviews, the outcomes described by the project representatives interviewed, and other respondent comments are provided for each of the APUC programs.

Within the marketing and utilization grants program area, some projects were known to have led to major new agricultural processing ventures (e.g., ethanol plants, biodiesel plants). A special effort was made to contact representatives of these projects in order to obtain information regarding each facility's employment, payroll, construction costs, and other information needed to quantitatively assess their contribution to the North Dakota economy. Information collected from project representatives was supplemented with information developed in other recent studies. For example, other operating expenses (repairs, supplies, etc.) were assumed to be in the same proportion to payroll as has been found for other recently developed agricultural processing facilities (Coon and Leistritz 2003; Coon and Leistritz 2001; Coon and Leistritz 1997). The North Dakota Input-Output Model was used to estimate the secondary economic impacts based on these data. For a complete description of the input-output model, see Coon and Leistritz (1989). The procedures used in this analysis parallel those used in estimating the impact of other facilities and activities (Leistritz 1995; Bangsund and Leistritz 2004, Hodur et al. 2006). Data from the other grant programs (farm diversification, prototype development and basic and applied research grants) examined were not used in estimating secondary economic impacts. More detailed information than was permitted by the scope of this study would be required to include the other programs in the estimate of secondary impacts. A qualitative case study approach was used to evaluate program effectiveness for the other grant types.

## Results

### Program Summary

During the study period, a total of $9.3 million was awarded to 396 projects (Table 1). Included in the total distribution were $751,769 in federal funds distributed through USDA RBEG grants received in bienniums 2001-2002 and 2003-2004. Grant distributions per biennium varied from a high of $3.3 million in 1995-1996, to a low of $1.4 million in 2003-2004. Marketing and utilization grants were awarded most frequently. Fifty-four percent of the total number of awards was marketing and utilization grants. Farm diversification and basic and applied research grants each made up roughly 20 percent of the awards, and prototype development grants accounted for only 3 percent of the total number of grants awarded. While roughly half of the grants were marketing and utilization grants, they accounted for 72 percent of the awarded funds. The number of grants and the percentage of total funding for basic and applied research grants and prototype development grants were equal, 20 percent and 3 percent, respectively. Alternately, farm diversification grants represented 23 percent of the total grants awarded, but only 5 percent of total funds awarded. Average size of grants and biennium allocations per grant program will be discussed separately.

Table 1. Grant Expenditures by Program Area, APUC, 1995-2004

| Item | Farm Diversification | Prototype Development | Basic and Applied | Marketing and Utilization | Total |
|---|---|---|---|---|---|
| **Biennium** | ---dollars--- | | | | |
| 2003 - 2004 | 47,750 | 67,950 | 218,346 | 1,108,165 | 1,442,211 |
| 2001 - 2002 | 113,617 | 97,125 | 140,364 | 1,166,335 | 1,517,441 |
| 1999 - 2000 | 129,625 | 58,500 | 259,763 | 1,546,561 | 1,994,449 |
| 1997 - 1999 | 88,750 | 75,000 | 562,935 | 1,236,375 | 1,963,060 |
| 1995 - 1996 | 104,544 | 0 | 496,350 | 724,583 | 3,288,537 |
| Total[1] | 494,602 | 298,575 | 1,833,493 | 6,687,012 | 9,313,396 |
| (N) | (90) | (14) | (78) | (214) | (396) |
| | ---percent--- | | | | |
| **Percent of grants** | 22.7 | 3.5 | 19.7 | 54.0 | 100.0 |
| **Percent of total funding** | 5.3 | 3.2 | 19.7 | 71.8 | 100.0 |

[1]Includes Federal RBEG funds.

## Farm Diversification Grants

Farm diversification grants provide assistance to North Dakota farm and ranch operations looking to diversify their operations. The program is directed at non-traditional crop or livestock production or on-farm value-added processing of agricultural commodities. Applicants must be farm operators with at least 25 head of cattle and/or 100 acres of land or more. Farm revenues must be the primary source of income with at least 51 percent of total income from farm operations. Awards are on a one-time basis for a specific enterprise and are capped at $5,000. Applicants may include in their application a fiscal agent fee of up to 5 percent of the grant request for professional services.

APUC awarded a total of 90 farm diversification grants totaling $494,602 during the study period (Table 2). Nearly all of the grants were funded with APUC funds as very little of the RBEG funds were used to fund farm diversification grants. Only $10,316 of the total awards were federally funded. Grants on average were $5,495, and roughly half were for the maximum award of $5,000, plus the 5 percent fiscal agent fee. A third of the grants awarded during the study period exceeded the $5,000 ceiling. Some of the grants that exceeded the $5,000 limit were made to dairy enterprises which have a $10,000 ceiling, and the other grants that exceeded the $5,000 ceiling were awarded before the $5,000 limit was established in 1998. Grants were fairly evenly distributed across the 10-year time period with the fewest grants made in 2003-

2004 (10) and the most in 1999-2000 and 2001-2002 with 25 and 24, respectively. The grants went to a wide range of projects, some dealing with non-traditional crops like various types of fresh produce, berries, herbs, grapes, or greenhouse operations or non-traditional livestock enterprises such as elk, bison, or reindeer.

Table 2. Summary Statistics, Farm Diversification Grants, APUC, 1995-2004

| Item | Sum of Awards | Number of Awards | Percent of Total Awards |
|---|---|---|---|
| | ----dollars----- | ----number---- | --percentage-- |
| **Award summary** | | | |
| APUC Awards | 484,286 | -- | -- |
| Federal dollars | 10,316 | -- | -- |
| Matching funds – $2,625 | | | |
| Supporting funds – $7,691 | | | |
| **Total awards** | 494,602 | -- | -- |
| **Total number of grant awards** | 90 | -- | -- |
| **Average grant size** | 5,495 | -- | |
| **Grant awards by year** | | | |
| 1995 - 1996 | 104,544 | 16 | 21.1 |
| 1997 - 1998 | 88,750 | 15 | 17.9 |
| 1999 - 2000 | 129,625 | 25 | 26.2 |
| 2001 - 2002 | 123,933 | 24 | 22.9 |
| 2003 - 2004 | 47,750 | 10 | 9.6 |
| **Awards by grant size** | | | |
| Less than $5,000 | 47,665 | 11 | 9.6 |
| $5,000 - $5,250 | 350,343 | 47 | 70.8 |
| More than $5,250 | 96,594 | 30 | 19.5 |
| (N) | | (90) | |
| **Awards by grant type** | | | |
| Non-traditional activities | 97,466 | 20 | 19.7 |
| Crops/commodities | 107,868 | 29 | 21.8 |
| Livestock | 147,468 | 25 | 29.8 |
| Value-added processing | 78,800 | 16 | 15.9 |
| (N) | | (90) | |

To help describe the farm diversification projects funded, a four-category classification system was created. Grants were classified by the research team as ‘crops/commodities,’ ‘livestock production,’ ‘value-added/processing,’ or ‘non-traditional activities.’ ‘Crops/commodities’ included ventures that grew and marketed non-traditional crops such as berries, grapes, herbs, or other fresh produce. The ‘livestock’ category included traditional livestock enterprises such as dairy and beef, as well as non-traditional animal production such as bison, elk, or reindeer. The ‘value-added/processing’ category included ventures that either further process an existing commodity such as meat processing, or produced a new product from an agricultural input. Finally, the ‘non-traditional farm activity’ category included enterprises

that offered activities such as a corn maze, a pumpkin patch, horseback riding, and/or hunting activities. By briefly examining the project descriptions, the study team was able to reasonably determine the nature of the enterprise receiving the grant and classify the enterprise into one of the four descriptive categories. This classification system is not used by APUC and was created for illustrative purposes related to this evaluation.

Funding was fairly evenly distributed among the various venture types (Table 2). Non-traditional crops received the most grants (29), and ventures related to value-added or processing activities received the fewest (16). Twenty grants were awarded to ventures related to non-traditional farm activities and 25 were awarded to non-traditional livestock ventures. Many of the non-traditional farm activities were related to hunting, and many of the livestock operations were related to either dairy or elk production (data not shown). Some of the elk operations may have an activity component (e.g., trophy hunts) as well, but it was impossible to ascertain if the elk production was for trophy hunting or for other uses. Accordingly, elk operations were included in the non-traditional livestock category rather than non-traditional farm activities.

All but two of the 17 enterprises interviewed were able to successfully carry out their project as planned. Since receiving their APUC grant, 12 of the 17 successful enterprises interviewed had either expanded or stayed the same with only 5 that had downsized or discontinued operations. Only 2 of the 17 operations had full-time employees, both of which were enterprises that fell into the value-added processing category, but 9 enterprises had part-time or part-time seasonal employees. Eight enterprises had between 1 and 5 part-time employees or part-time seasonal employees, with one that had 8-10 seasonal part-time employees. Respondents were also asked to report their annual gross income. Gross income reported varied substantially; 5 businesses reported annual gross income between $2,000 and $11,000, 2 reported annual gross income of $30,000, 1 reported annual gross income of $60,000, and 1 reported annual gross income of $80,000. The total annual gross incomes of the 15 operational enterprises interviewed for this report totaled $260,000. Six enterprises had definite plans to expand, 1 would like to expand, 5 planned to maintain, and only 1 had plans to downsize.

Respondents' comments regarding APUC were generally positive. Eleven of the 15 enterprises with continuing operations indicated the APUC grant was 'critical' in helping launch their operation. Most commented that APUC was very helpful, and several commented that it would have been very difficult for them to start their enterprise without the APUC grant. Several individuals said the application and review process worked smoothly and quickly and said the board members were very easy to work with. One individual commented that his business had done very well and would like to expand operations to meet demand. Currently, he is turning customers away. He would like to apply for another grant but is not interested in a marketing grant, but would like funding for equipment. Another grant recipient suggested APUC should do a better job of making its presence known. Had it not been for a friend that told the recipient of APUC, the recipient would never have known of the program. And finally, one recipient indicated that no one had previously contacted her to follow-up on her project, and it had been over seven years since they had received their grant.

**Prototype Development**

Prototype development grants were designed to support the development of technologies that have the potential to enhance agricultural production and processing. While technologies related to agriculture are very broad in scope, the program limits funding to those technologies related to food processing equipment and agricultural equipment. APUC's definition of technology includes hardware, software, devices, or processes. Grants are normally limited to a one-time award of $25,000, but additional awards can be made if substantial modifications are required or if the product is moving toward commercialization within five years and the market potential appears to be very good. Applicants may also include a 5 percent fiscal agent fee for charges for professional services. Prototype development grants also require a one-to-one match by the applicant or other local entity.

Fourteen prototype development grants were awarded to 12 prototype development projects in the last 10 years. Seven of the 12 grant recipients were interviewed. An attempt was made to contact all prototype development grant recipients by phone; however, researchers were unable to reach anyone associated with five of the projects. In one instance, the contact number was no longer in service; for the other four projects, repeated attempts to contact recipients failed. The total dollar amount awarded was $298,575 with an average grant award of just over $21,000 (Table 3). Grants ranged in size from $8,400 to $50,000, with two projects that received two awards of $25,000 each. Only 1 grant over the $25,000 maximum was awarded, and that grant was awarded prior to the creation of the $25,000 cap. Grants were fairly evenly distributed over the study period. Two grants were awarded in the 1997-1999 biennium, 3 in 1999-2000, 5 in 2001-2002, and 4 in the most recent biennium.

All but two projects were geared toward either a new or improved piece of equipment or implement. The two that were not, were related to computer software technology. Two of the grant recipients interviewed completed the research and development activities as planned in the APUC proposal, but research has since been discontinued. In one of the discontinued projects, a lack of understanding of the manufacturing and commercialization process was identified as a key factor for discontinuing research and development activities. Further research on the other discontinued project was due to unresolved technical issues. The project was described as an idea ahead of its time. At the time the research was completed, some of the required technology simply was not sophisticated enough to be effective. The individual contacted about the project said it is possible the idea will be revisited. Only one of the grant recipients interviewed indicated the prototype development project had not been completed as planned. The contact person indicated they were no longer involved with the project and could not provide information on the current status of the project.

Two prototype development grant recipients also applied for marketing and utilization grants, but were denied. The recipients interviewed indicated their proposal was denied because the products did not meet the definition of an agricultural product under APUC guidelines for marketing and utilization grants. In both cases, the products had a very close link to and direct applications in agriculture, but did not qualify under current guidelines as either food processing equipment or agricultural equipment. In one case, the grant recipients found a commercialization partner and research and development activities are continuing. Grant recipients indicated the product will be at a marketable stage in 12 months (mid-2007).

However, the product application will not be in agriculture. In the other instance, the technology was commercialized without APUC funding, and the business is operating and expanding its services. The business has three full-time employees and gross sales of over $100,000 annually. Only one prototype development grant recipient applied for and was awarded a marketing and utilization grant. However, repeated efforts to contact that grant recipient failed and, consequently, no information on the project's progress or outcome is available.

Table 3. Summary Statistics, Prototype Development Grants, APUC, 1995-2004

| Item | Sum of Awards | Number of Awards | Percent of Total Awards |
|---|---|---|---|
| | ----dollars----- | ----number---- | --percentage-- |
| **Award summary** | | | |
| APUC awards | 298,575 | -- | -- |
| Federal dollars | -- | -- | -- |
| **Total awards** | 298,575 | -- | -- |
| | | | |
| **Total number of grant awards** | 14 | -- | -- |
| | | | |
| **Average grant size** | 21,327 | -- | |
| | | | |
| **Grant awards by year** | | | |
| 1995 - 1996 | 0 | 0 | 0.0 |
| 1997 - 1998 | 75,000 | 2 | 25.1 |
| 1999 - 2000 | 58,500 | 3 | 19.6 |
| 2001 - 2002 | 97,125 | 5 | 32.5 |
| 2003 - 2004 | 67,950 | 4 | 22.7 |
| (N) | | (14) | |
| **Awards by grant size** | | | |
| Less than $25,000 | 94,825 | 7 | 31.7 |
| $25,000 - $26,250 | 153,750 | 6 | 51.5 |
| More than $26,250 | 50,000 | 1 | 16.7 |
| (N) | | (14) | |

Another of the prototype development grant project recipients interviewed has completed research and development activities and is nearing commercialization. A new company has been formed, and the product will be introduced at a regional trade show in 2007. While no units have been sold at this time, the enterprise has commitments on four to five units with an estimated sale price of $65,000 each.

The final prototype development grant recipient interviewed also completed their prototype project as planned, and the enterprise was successfully commercialized. The product is being manufactured and marketed commercially with gross revenues of roughly $750,000 per year. However, the grant recipient commented that ongoing issues related to the availability of capital have slowed growth.

All grant recipients had generally positive things to say about APUC. All were grateful to have received the grant. One recipient said that the prototype development grant was very

helpful in developing the product, but complained of the lack of assistance with the commercialization process. A second individual voiced a similar opinion, that additional help with the commercialization process is needed. Another recipient commented on difficulties securing capital after completing research and development work. They all generally suggested that, at a minimum, some advice on where to look for additional resources for help with the commercialization process would be welcome.

Both of the grant recipients that applied for marketing grants, subsequent to the completion of prototype development activities, expressed frustration over guidelines that did not qualify them for marketing grants. In both cases, they indicated there was a direct link to agriculture with good economic development potential and benefits to the agriculture sector in North Dakota. However, because the product did not meet the APUC guidelines, they did not qualify for the grant. In one instance, the grant recipient said that because they did not qualify for a marketing grant, agriculture will not be the first industry to benefit from the new technology.

**Basic and Applied Research Grants**

Basic and applied research grants support research efforts on agricultural products and by-products. Guidelines are quite broad and left to the discretion of the Commission. As the name implies, basic and applied research grants generally represent some of the first steps in the development of a new product or enterprise, such as cultivation of a new crop or implementation of a new production practice. Not unlike prototype development projects, basic and applied research grants represent front-end efforts to develop and commercialize new products, crops, production practices, or value-added opportunities. In many cases, outcomes are difficult to ascertain. Basic research often takes years to complete and, even after the research has been completed, additional research may be required or other issues may prevent further commercialization activities. In other instances, the initial research may indicate the project is not feasible, and research efforts are discontinued.

Seventy-eight basic and applied research grants were awarded in the study period totaling $1,833,493 (Table 4) with 10 projects that received multiple grants. In most cases, projects that received multiple grants received 2 grants while 1 project received 3 grants. Included in total disbursements was $155,735 in federal RBEG funds. Five grants were fully funded by federal grants totaling $82,040, and 3 grants received matching funds totaling $73,695. Federal awards averaged $19,500. The number of grants awarded per biennium varied considerably, with 26 awarded in 1995-1996 and 21 in 1997-1998, compared to 8 in 1999-2000 and 9 in 2003-2004. Grants averaged $23,688 and ranged in size from $1,000 to $85,000. Just over half (52 percent) of the grants were for $20,000 or less. Nineteen percent were in the $20,000 to $29,999 range, 4 percent in the $30,000 to $39,999 range, and 9 percent were over $50,000. While only 9 percent of the grants were awarded $50,000 or more, they accounted for 30 percent of the total dollars awarded. Sixty percent of the total dollars awarded were for grants of $30,000 or more.

Table 4. Summary Statistics, Basic and Applied Research Grants, APUC, 1995-2004

| Item | Sum of Awards | Number of Awards | Percent of Total Awards |
|---|---|---|---|
| | ----dollars----- | ----number---- | --percentage-- |
| **Award Summary** | | | |
| APUC awards | 1,677,758 | -- | -- |
| Federal dollars | -- | -- | -- |
| Matching funds – $82,040 | | | |
| Supporting funds – $73,695 | | | |
| **Total awards** | 1,833,493 | -- | -- |
| **Total number of grant awards** | 78 | -- | -- |
| **Average grant size** | 23,688 | -- | -- |
| **Grant awards by year** | | | |
| 1995 - 1996 | 496,350 | 26 | 27.1 |
| 1997 - 1998 | 562,935 | 21 | 30.7 |
| 1999 - 2000 | 259,763 | 8 | 14.2 |
| 2001 - 2002 | 1,833,493 | 14 | 7.6 |
| 2003 - 2004 | 258,040 | 9 | 11.9 |
| (N) | | (78) | |
| **Awards by grant size** | | | |
| Less than $10,000 | 122,533 | 21 | 6.7 |
| $10,000 - $19,999 | 285,290 | 20 | 15.5 |
| $20,000 - $29,999 | 314,531 | 15 | 17.1 |
| $30,000 - $39,999 | 436,654 | 12 | 23.8 |
| $40,000 - $49,999 | 120,000 | 3 | 6.5 |
| $50,000 or more | 554,485 | 7 | 30.2 |
| (N) | | (78) | |

Fourteen grant recipients were interviewed to provide a sample of outcomes. Respondents were asked if the research funded (or partially funded) by APUC had been completed and were asked to describe the research findings and/or outcomes. Outcomes fell into three general categories: 1) research had been completed with no further or discontinued research and/or commercialization efforts, 2) basic research is ongoing, 3) commercialization activities have begun or producers have begun to adopt a new practice. In many cases, it is difficult to quantify exactly to what degree a new practice has been adopted.

Seven of the 14 projects examined were discontinued after research was completed. In one case, a feasibility study indicated the project was not feasible without the addition of services that were not currently available. Accordingly, commercialization activities were discontinued. Another project conducted a feasibility study and made an application for federal funds for the construction of a handling facility, a critical component of the project. The project did not qualify for federal funds, and the project was discontinued. Research on two other projects had been completed, but further research discontinued. Specifics on the research findings and why efforts had been discontinued were unavailable because the individuals that had conducted the research were no longer at the research facility. Time constraints prevented

further efforts to ascertain the outcome of the research efforts other than they had been discontinued.

Three projects reported favorable results but, for various reasons, commercialization activities were not undertaken. In one case, the findings indicated the crop under examination would make a suitable feed stock but, because of larger market and economic considerations, cultivation of the crop was determined to not be feasible. In another case, the research findings were positive and several products suitable for commercialization were identified, but the parties involved chose not to initiate commercialization activities. It is impossible to speculate as to why. Another research project concluded that North Dakota had favorable growing conditions and could produce a very good product; however, several substantial marketing issues would need to be addressed before any type of commercial cultivation would be feasible.

Three of the 14 projects examined reported continuing research efforts. Two of the three projects completed the research supported by APUC, but since then additional research has been undertaken and is ongoing. In one instance, commercialization trials are underway with strong interest from commercial growers and industry. Commercial production, however, is still well into the future. In the other case of ongoing research, additional research on how various varieties grow in North Dakota is underway. While marketing issues have yet to be addressed, the researcher interviewed indicated the potential for a small number of producers appears to be very good. The final project with ongoing research was unable to report any findings at this time. Basic research and data collection efforts were continuing. The researcher interviewed for this study indicated interest among growers appears to be good.

Finally, four research projects have resulted in very tangible outcomes with substantial economic impacts. The first project was a research and demonstration project initiated in 1998. APUC was one of multiple funding sources for the project, awarding two grants, one for $80,000 and one for $40,000. Since the research and demonstration project has been completed, 1,500 acres of dryland cropland have been converted to irrigated potato production in a 6,000 acre rotation. The conversion of land from dryland production to irrigated production has resulted in much higher per acre returns, $2,400 per acre on the irrigated acres compared to $120 per acre on the dryland production (Bergman 2006). In addition, two warehouses have been built to support local potato production. Researchers interviewed indicated they did not believe producers would have been interested in converting dryland acres to irrigated potatoes without the demonstration project. Researchers also indicated producers in the area are very interested in expansion; however, the key to further expansion would be a processing facility. Research efforts continue as additional varietal trials are under way.

Another basic and applied research grant led to a successful commercialization effort and the establishment of a certified seed potato farm. APUC funds were used for a feasibility study and for research to design and develop a specialized crate system that enables the grower to manage many varieties, keeping them stored and properly ventilated. The operator interviewed for this study said starting the seed farm without the APUC grant would likely have been impossible. A second APUC grant was awarded in the most recent biennium, but that grant is outside the scope of this study. The respondent said that projections suggest that within two years, roughly 80 percent of the potatoes grown in North Dakota will originate from this farm.

Without an in-state producer, commercial growers would have to go out of the state for seed potatoes.

APUC also supported another research project with multiple contributors. This research project examined the health benefits of a sunflower oil made from a new variety of sunflowers. The research, initiated in 2000, has begun to have substantial effects on producers and agribusinesses in North Dakota. As a result of the demonstrated health benefits of this new sunflower oil, industrial users are switching to the new product. A major snack food producer has already shifted two of its flagship products to the new oil. The sunflower industry collectively generates nearly $1 billion in direct impacts in the United States (Bangsund and Leistritz 1995) and 50 percent of the sunflowers that feed that market are grown in North Dakota. Producers have already seen a 30 to 40 percent increase in prices (Klingartner 2006). In addition to the benefits accruing to sunflower producers, the shift has spurred investment and expansion in refining capacity in North Dakota. A new $30 million refinery has been built in Enderlin, and another refiner has built a $12 million expansion on their facility in West Fargo. While the APUC grant supported only a small percentage of the overall research, the APUC grant was used as matching funds for leveraging grants from other states.

The final basic and applied research project examined for this report was a research and demonstration project to demonstrate and communicate the value-added opportunities associated with backgrounding feeder cattle. The project has been well-received, and livestock producers in the area have shown a fairly high level of interest, according to the researcher interviewed for this report. Producers in the area are incorporating the project's findings into their production systems. Although the total number of adopters is not known, Nudell et al. (2005) report that during the period 2000-2004, in Adams County alone, several feedlot construction or expansion projects were undertaken, with a combined capacity of 9,789 head. The construction costs for these feedlots were estimated to be $1.3 million, and each animal backgrounded was estimated to contribute $390 to the area economy. The respondent also indicated that the APUC-funded project was the rationale for additional research currently underway examining issues related to backgrounding beef cattle in southwestern North Dakota with the goal of increasing value-added opportunities for producers in the region.

Each of the individuals interviewed for this report had very positive remarks about APUC's basic and applied research grants and were very appreciative of APUC's support of basic and applied research efforts. Some respondents indicated their research would not have been possible without the APUC grant.

**Marketing and Utilization Grants**

APUC marketing and utilization grants were designed to support marketing efforts for North Dakota agricultural products or by-products. Grants can be for either new or existing enterprises and are generally awarded in a one-year time fame, but projects that have advanced can re-apply for a second grant. Often the initial grant will be used to help launch a business, with subsequent grants used for business development and expansion. Over the course of the study period, APUC awarded 212 marketing and utilization grants totaling $6,687,012 (Table 5). The average grant size was $31,542 with 27 projects that received multiple awards. The average total funding for projects that received more than one award was $66,393 (data not

shown). Included in the $6.8 million award total was $585,718 in federal RBEG funds. Twenty-five projects received federal funding; 15 were supporting grants totaling $145,130 and 10 provided matching funds totally $440,488. Federally funded awards averaged $23,428.

Table 5. Summary Statistics, Marketing and Utilization Grants, APUC, 1995-2004

| Item | Sum of Awards | Number of Awards | Percent of Total Awards |
|---|---|---|---|
| | ----dollars----- | ----number---- | --percentage-- |
| **Award summary** | | | |
| APUC awards | 6,101,294 | -- | -- |
| Federal dollars | 585,718 | -- | -- |
| Matching funds – $145,130 | | | |
| Supporting funds – $440,588 | | | |
| **Total awards** | 6,687,012 | -- | -- |
| **Total number of grant awards** | 212 | -- | -- |
| **Average grant size** | 31,542 | -- | |
| **Grant awards by year** | | | |
| 1995 - 1996 | 1,043,858 | 35 | 10.8 |
| 1997 - 1998 | 1,236,375 | 36 | 18.4 |
| 1999 - 2000 | 1,546,561 | 48 | 23.1 |
| 2001 - 2002 | 1,645,598 | 49 | 17.4 |
| 2003 - 2004 | 1,214,620 | 44 | 16.6 |
| (N) | | (212) | |
| **Awards by grant size** | | | |
| Less than $15,000 | 689,404 | 65 | 10.3 |
| $15,000 - $29,999 | 1,391,432 | 64 | 20.8 |
| $30,000 - $44,999 | 1,324,477 | 37 | 19.8 |
| $45,000 - $59,999 | 925,616 | 18 | 13.8 |
| $60,000 - $74,999 | 810,585 | 13 | 12.1 |
| $75,000 or more | 1,545,495 | 15 | 23.1 |
| (N) | | (212) | |

Grant awards were fairly evenly distributed over the study period with just slightly more awarded in the last three bienniums, 44, 49, and 48, compared to 35 and 36 awards in the first two bienniums of the study period. A majority of the grants were for fairly small dollar amounts. A third were for less than $15,000, and 61 percent were for less than $30,000 (Table 5). While a third of the grants were for $15,000 or less, those smaller grants accounted for only 10 percent of total dispersed funds. Twenty-three percent of total funds were awarded to 7 percent of the grants, those that were for $75,000 or more (Table 5).

Twenty APUC marketing and utilization grant recipients were interviewed. Respondents were contacted by phone and asked how they used the APUC funds and whether or not they were able to meet their marketing objectives. Respondents were also asked if their business had expanded as a result of their marketing effort and if they had added either full- or part-time

employees. Respondents were also asked about payroll and total construction costs (if applicable). Data on payroll, employment, and capital expenditures were used in estimating the economic contribution of these businesses.

Marketing and utilization grants reviewed were used for one of four basic activities: 1) feasibility studies, 2) developing marketing or business plans and other activities associated with the launch of a new business, 3) marketing activities for an existing business, or 4) legal and professional services.

Four of the grant recipients interviewed used APUC funding for feasibility studies. Grant awards totaled $459,624 with three of the four projects receiving two grants. Two of the projects examined the feasibility of new enterprises, and two examined opportunities for expansion. While the grant recipients interviewed indicated the grant objectives had been met, none of the four projects reviewed in this report that completed feasibility studies were commercialized. In three of the four cases, the feasibility studies indicated that pursuing or continuing commercialization activities was not feasible. The fourth project did attempt to commercialize, but the equity drive was short of the required investment.

Six of the marketing and utilization grants examined were used to launch new enterprises. Total grant dollars awarded for the six business start-ups was $229,488, with four of the six receiving two grants each. Those that received two grants used the initial grant either to launch the enterprise or to develop a marketing plan. After successfully launching the business or developing the marketing plan, the subsequent APUC grants were used for business expansion and development and marketing efforts. Examples of specific activities were attending trade shows, travel expenses, advertising and marketing activities, and professional services (e.g., marketing consultant). The combined payrolls of four of the six start-ups were reported to be $931,000 and ranged from $10,000 to $500,000 for individual firms. Two of the enterprises did not report payroll figures as the economic benefits accrued in one case to cooperative members and the other in the form of royalties to a non-profit enterprise and profits to a for-profit enterprise. The for-profit enterprise was not interviewed for this report. One of the projects reported capital expenditures associated with their start-up of over $2 million.

Six of the marketing and utilization grants examined were for activities aimed at expanding existing businesses. Only two of the six grantees received more than one grant. Awards totaled $236,404, and respondents indicated they had met their objectives. One business that received two awards reported they would not be in business without the first APUC grant, and the second APUC grant gave them a little bump that has translated into sustained steady growth. Another recipient indicated not only had their efforts been successful, but they cannot meet demand and would need to double in size in order to satisfy current demand. Another recipient used APUC funding for marketing efforts to shift the focus of the business from wholesale only to include retail activities as well. However, it is too soon to gauge to what degree their marketing objectives have been reached. Of the three remaining existing businesses that received APUC grants, two indicated sales had doubled and the third indicated an increase in sales of 20 percent. Four of the six enterprises that used APUC funding for business expansion reported total payroll of $918,000; however, the size of the businesses varied considerably. One business was a husband and wife operation with seasonal employees only,

two were small businesses with payrolls of $38,000 and $75,000, one was somewhat larger with a payroll of $180,000, and one was a large business with a payroll of $650,000.

Funds from the final four marketing and utilization grants examined were used to pay for professional services. Total grant awards were for $407,000. These were some of the largest grants awarded, but also were projects with some of the most substantial outcomes. One grant was used to pay for an executive marketer for a consortium interested in value-added vegetable crops. As a result, a new enterprise was launched that currently employs approximately 33 full-time employees with a $500,000 annual payroll. (Note: This new enterprise also applied for and received a second marketing and utilization grant, but that award was not included in the sample for this report.) The other three projects used their marketing and utilization grants for various business and professional services such as legal and accounting fees, engineering services, and other activities related to the relocation of a business, and to the construction and launch of new enterprises. These final three projects examined were large-scale projects. One has a current payroll of $500,000; the other two, upon completion, will have payrolls of approximately $2 million each.

Respondents that expanded their enterprise spoke very positively of APUC and in general spoke of the importance of APUC in their efforts to expand their enterprises. One respondent indicated their project would not have gone forward without the infusion of funds from APUC to do a business plan. Another indicated it would not have been able to contract for the feasibility study without the APUC grant. And yet another respondent applauded APUC for supporting a project that involved the relocation of a business to North Dakota. The respondent said that often efforts are focused only on “new” enterprises, as relocating an existing business is an often overlooked business model.

Recipients of APUC grants that launched new enterprises commented that the APUC funding was extremely helpful in getting the business started as was the ability to apply and receive a second grant to help expand business opportunities. One respondent reported that the first grant helped them gain credibility in the marketplace and that their APUC grant was crucial in getting the business started. One respondent also commented that one very positive aspect of APUC is that grants are not limited to traditional crops, that the program also supports enterprises with a small scale but high yield.

Respondents that had projects that did not go forward all expressed the opinion that just because a project does not go to commercialization does not mean the project was a failure. Rather, respondents suggested just the opposite, that it is equally important to know when not to pursue a venture.

Respondents reported that the Commission was very easy to work with. One individual commented that the staff and Commission work with you to help you succeed rather than putting up road blocks to prevent you from receiving the grant. Two of the recipients indicated they would not be in business today without APUC.

## Economic Impacts

Examination of APUC's marketing and utilization grants program led to identification of several substantial agricultural processing projects that are either operational or under construction. These include two ethanol plants (one of which was directly supported by APUC), two biodiesel plants (one directly assisted by APUC), and five smaller projects with annual payrolls between $100,000 and $1 million, with total direct employment of 69 full-time equivalents (FTEs) (Table 6). The direct economic impact of these facilities when fully operational was estimated based on a number of sources. The APUC-supported ethanol and biodiesel facilities provided estimates of their payroll and construction costs. Other operating expenses (repairs, supplies, etc.) were assumed to be in the same proportion to payroll as has been found for other recently developed agricultural processing facilities (Coon and Leistritz 2003, Coon and Leistritz 2001, Coon and Leistritz 1997). A recent study of ethanol production in Iowa was used to estimate corn requirements and transportation and fuel costs for the ethanol plants (Swenson and Eathington 2006). The smaller processing plants also provided payroll information and construction costs, which gave a basis for estimating other expenditures.

Table 6. Direct Economic Impacts of Agricultural Processing Projects Related to APUC Funding, 1995-2004

| Item | Ethanol Plants | Biodiesel Plants | Other Ag Processing Projects | Total |
|---|---|---|---|---|
| | ----------$000---------- | | | |
| **Plant operation expenditures** | | | | |
| Construction | 1,233 | 1,390 | 460 | 3,073 |
| Transportation | 2,000 | 3,165 | 1,048 | 6,213 |
| Communications & public utilities | 3,062 | 3,480 | 1,153 | 7,695 |
| Retail trade | 2,200 | 2,625 | 869 | 5,694 |
| Finance, insurance & real estate | 959 | 1,090 | 361 | 2,410 |
| Business & personal services | 559 | 635 | 210 | 1,404 |
| Households | 7,175 | 5,000 | 1,656 | 13,831 |
| Coal mining | 16,500 | | | 16,500 |
| **Total** | 33,678 | 17,385 | 5,757 | 56,820 |
| **Direct employment (FTE)** | 80 | 138 | 69 | 287 |
| **Construction cost** | 167,000 | 138,000 | 3,820 | 309,107 |
| **Number of projects** | 2 | 2 | 5 | 9 |

The resulting estimates of direct economic impacts are substantial (Table 6). The nine projects will directly employ 287 workers, with annual payments to North Dakota households of $13.8 million annually. Total in-state expenditures are estimated to total $56.8 million annually. Construction of these facilities represents a one-time expenditure of more than $309 million, although a substantial portion of this likely represents specialized equipment purchased from suppliers located outside North Dakota.

The North Dakota Input-Output (I-O) Model was used to estimate the secondary and total economic impacts associated with these direct expenditures. When the direct economic impacts of facility operations are applied to the I-O coefficients, estimates of total (direct plus secondary) impacts are obtained (Table 7). The total annual impacts of these facilities' operations are estimated to be $157.4 million, including $51.5 million of additional personal income for North Dakota households and $34.4 million in added retail sales. These levels of added economic activity would be expected to support about 1,986 new jobs in various sectors of the North Dakota economy, in addition to the 287 workers employed directly at the facilities. The added retail sales would also result in about $1.6 million in added sales and use tax collections while the additional personal income would generate approximately $0.8 million in added personal income tax collections, for a total added state revenue from these two sources of $2.4 million annually.

Table 7. Total (direct plus secondary) Economic Impacts of Agricultural Processing Projects Operation, 1995-2004

| Item | Ethanol Plants | Biodiesel Plants | Other Ag. Processing Projects | Total |
|---|---|---|---|---|
| | ---------- | $000 | ---------- | |
| **Sector** | | | | |
| Construction | 3,276 | 2,501 | 828 | 6,605 |
| Transportation | 2,316 | 3,346 | 1,108 | 6,770 |
| Communications & public utilities | 5,848 | 5,060 | 1,676 | 12,584 |
| Retail trade | 18,556 | 11,896 | 3,939 | 34,391 |
| Finance, insurance & real estate | 4,450 | 3,196 | 1,058 | 8,704 |
| Services | 3,847 | 2,498 | 827 | 7,172 |
| Households | 29,332 | 16,692 | 5,528 | 51,552 |
| Other[1] | 24,072 | 4,173 | 1,382 | 29,627 |
| **Total** | 91,697 | 49,362 | 16,346 | 157,405 |
| **Secondary employment (FTE)** | 995 | 747 | 244 | 1,986 |

[1] Includes agriculture, mining, manufacturing, energy conversion, and government.

The one-time economic impacts associated with the construction of these facilities are summarized in Table 8. Based on experience with recently constructed, large-scale processing plants (Coon and Leistritz 2001), it was assumed that 15 percent of the construction cost for the ethanol and biodiesel plants would represent expenditures to in-state entities. For the five smaller projects, based on information obtained from the interviews, it was assumed that 50 percent of construction costs would be in-state expenditures. When the in-state portion was applied to the I-O multipliers, the resulting estimates of total economic impact were $121 million, including $20.3 million in additional retail sales and $30.2 million in additional personal income for North Dakota households. The construction spending was estimated to result in 1,482 person-years of additional employment during the construction period.

Table 8. Total (direct plus secondary) Economic Impacts of Agricultural Processing Projects Construction, 1995-2004

| Item | Ethanol Plants | Biodiesel Plants | Other Ag. Processing Projects | Total |
|---|---|---|---|---|
| **Sector** | ----------$000---------- | | | |
| Construction | 26,305 | 21,737 | 4,011 | 52,053 |
| Transportation | 263 | 217 | 40 | 520 |
| Communications & public utilities | 1,513 | 1,250 | 231 | 2,994 |
| Retail trade | 10,271 | 8,487 | 1,566 | 20,324 |
| Finance, insurance & real estate | 2,097 | 1,733 | 320 | 4,150 |
| Services | 1,726 | 1,426 | 264 | 3,416 |
| Households | 15,253 | 12,604 | 2,326 | 30,183 |
| Other[1] | 3,769 | 3,116 | 574 | 7,459 |
| **Total** | 61,197 | 50,570 | 9,332 | 121,099 |
| | | | | |
| **Secondary employment (FTE)** | 751 | 622 | 109 | 1,482 |

[1] Includes agriculture, mining, manufacturing, energy conversion, and government.

In addition to the projects that can be directly associated with APUC funding during the 1995-2004 period, there are several projects which received APUC support prior to 1995 that have developed into substantial agricultural processing ventures. Four of these projects (Dakota Growers Pasta, Cavendish Farms potato processing, ProGold corn wet mill, and North American Bison packing plant) were identified as APUC-supported projects that have contributed substantially to the state economy. An estimate of the current annual economic impact of these facilities is summarized in Table 9. These four projects are estimated to make $202.7 million in annual expenditures to North Dakota entities and to directly employ 700 workers. When these expenditures are applied to the I-O model, the estimated total economic impact is $582 million annually. This level of economic activity would support 7,855 secondary jobs in various sectors of the state economy. These projects also result in approximately $10.3 million in additional state sales and use tax and personal income tax revenues each year (Table 9).

## Implications

The review of the four APUC grant programs indicates that each program appears to be quite successful in meeting its objectives. The farm diversification grantees who were contacted generally indicated that their projects had been implemented as planned, and most had plans to continue or expand their new enterprises. To help put the program's impact in perspective, in the last ten years, APUC has awarded 90 farm diversification grants totally $494,000, roughly $50,000 a year, and the 15 grant recipients interviewed for this study alone generated roughly $241,000 in annual gross revenues. While the reported levels of gross income from these new enterprises varied substantially, the average ($16,000) suggests that many of these enterprises were generating income levels that could provide a meaningful supplement to farm household incomes. Further, the total gross revenues of all farm diversification grants is undoubtedly higher than that of the 15 enterprises interviewed. Using the sample contacted, annual revenues from the new or expanded enterprises that received APUC farm diversification grants would be approximately $1.3 million annually. Because of the small sample size, caution should be

exercised when assuming the sample's representation. Regardless, these results put some perspective on the return on APUC investment. If one only considers the gross revenues of enterprises interviewed for this study, one would most assuredly underestimate the return on APUC's investment. Alternately, if one was concerned that the $1.3 million estimate over states the return on APUC's investment, that figure could be viewed with caution. In either case, it would seem reasonable to conclude that APUC's return on investment for farm diversification grants is positive and that the program has successfully aided farm operations' efforts to diversify.

Table 9. Direct and Total Economic Impacts of Four APUC-sponsored Agricultural Processing Projects (funded previous to study period)

| Item | Direct Impacts | Total Impacts |
|---|---|---|
| | ----------$000---------- | |
| **Sector** | | |
| Construction | 8,851 | 22,875 |
| Transportation | 17,265 | 19,334 |
| Communications & public utilities | 18,107 | 37,308 |
| Retail trade | 34,750 | 151,552 |
| Finance, insurance & real estate | 15,905 | 42,212 |
| Services | 15,988 | 41,207 |
| Households | 91,863 | 220,572 |
| Other[1] | -- | 46,936 |
| **Total** | 202,729 | 581,996 |
| | | |
| **Direct employment (FTE)** | 700 | -- |
| **Secondary employment (FTE)** | -- | 7,855 |
| | | |
| **State tax revenue** | | |
| Sales & use tax | | 7,017 |
| Personal income tax | | 3,309 |
| **Total** | | 10,326 |

[1] Includes agriculture, mining, manufacturing, energy conversion, and government.

Prototype development by its very nature is somewhat speculative at best. Not all ideas pan out and even some good ideas may never make it to commercialization, while those that do, could take many years to do so. While only a few projects were funded during the study period, outcomes seem generally positive, and the prototype development program quite successful. In the past ten years, APUC has awarded nearly $300,000, roughly $30,000 per year. Of seven grant recipients contacted, two had commercialized their products, reporting annual gross revenues of $100,000 and $750,000, respectively. Two others reported that their products were nearing commercialization and were planning to begin marketing in 2007. Without more detailed information about the businesses that have commercialized, it is not possible to estimate their total (direct plus secondary) contribution to the economy of North Dakota. But even without that information, the results suggest a net positive return on APUC's support of prototype development projects. While recipients were generally very positive about APUC and grateful for the grant support, several indicated that they had difficulties with subsequent

business and commercialization aspects, such as obtaining adequate capital. Given that North Dakota has several organizations and programs that support entrepreneurial efforts, perhaps more effort could be made to make APUC recipients aware of these programs.

Basic and applied research grants typically represent front-end efforts to develop and commercialize new products, crops, or value-added opportunities. Time-lines for evaluation are substantial and because of the very nature of basic research, the likelihood that research efforts will lead to a successful commercial venture or widespread adoption of a new production process is varied at best. Given the exploratory nature of many of these efforts, it would seem likely that a relatively high percentage would not lead to commercialization (i.e., only the most favorable possibilities will be pursued for commercial development). The interviews conducted, with recipients of basic and applied research grants, demonstrated the wide range of potential outcomes. Several of the basic and applied research grant recipients contacted were able to report very concrete outcomes with substantial economic impacts. In some cases, research is ongoing and outcomes at this time are uncertain pending additional research activities. Yet in other cases, research efforts have been discontinued.

While only a few research projects may result in substantial economic impact, those impacts can be quite large. To illustrate the impacts of basic and applied research, consider that APUC's investment in basic and applied research was roughly $1.6 million or about $167,000 annually. Now consider the impact of the conversion of dryland production to irrigated potato cultivation. The conversion of 1,500 acres of dryland production to irrigated production has resulted in a net gain in gross revenues of $3.4 million annually. Also consider the impact of the conversion of the snack food industry to a new sunflower oil, where 50 percent of the sunflowers for that new oil are grown in North Dakota. As was the case with prototype development grants, estimating the economic contribution of these efforts was beyond the scope of this study and would require more detailed information than was collected for this study. These projects do, however, illustrate what kind of substantial impacts basic and applied research efforts can have on production agriculture and surely suggest a net positive return on APUC's support of basic and applied research.

Finally, the marketing and utilization grants program supports a diversity of projects directed at market analysis, feasibility studies, business plan development, and related services to support the launch and/or expansion of value-added enterprises. This program has supported the launch of a number of major processing ventures (e.g., Red Trail Ethanol, Dakota Skies Biodiesel), as well as a number of smaller projects. Alternately, the results of some market and feasibility analyses have led to the conclusion that the project, as conceived, was not commercially viable. While disappointing to project proponents, these findings may well have saved potential investors from substantial losses.

The larger and more successful projects assisted by this program have made very substantial economic contributions. For example, as discussed earlier, nine agricultural processing projects supported by APUC during the 1995-2004 period are estimated (when fully operational) to contribute more than $157 million annually to the state economy, to support almost 2,300 new jobs, and to result in $2.4 million in added state sales and use and personal income tax revenues annually. Similarly, four large processing plants which received APUC support prior to 1995 contribute more than $580 million to state gross sales, support more than

8,500 jobs, and add more than $10 million to state tax revenues. In addition, APUC support has assisted the launch of a number of smaller enterprises which may provide employment opportunities that would not otherwise exist and may have potential for future growth.

## Research Limitations and Recommendations

As highlighted in the introduction, because each of the APUC programs advances APUC goals in a different manner, evaluating the programs also requires slightly different evaluation systems. This evaluation, the first done for APUC, provided some insight into improvements that may aid future efforts. Several observations were made regarding research shortcomings and how they may be addressed.

The creation of a working database of all grant awards would allow for better classification and tracking of grant recipients. Indicator variables could describe the key characteristics of the grants and be used in future evaluation efforts. The database should include some qualification of size of enterprise, type of enterprise, use of funding, amount of funding, project description, and other relevant information. A single database with contact information and variables that describe the project would facilitate the evaluation process substantially.

Future evaluation efforts should include a mail survey. This is especially relevant for farm diversification grants and marketing and utilization grants. Contacting farm diversification grant recipients by phone proved very difficult. A brief mail questionnaire not only would be more effective in tracking outcomes over time, but also would allow for the collection of more detailed information that would likely provide enough observations to confidently make generalizations about the population of farm diversification recipients. A mail survey of all marketing and utilization grants would allow for detailed information to be collected from a much larger sample of projects.

Collecting data with a mail questionnaire at the end of each biennium would provide the highest degree of tracking. A simple mail questionnaire could be developed for each program area, and the questionnaire could be distributed at the conclusion of each biennium. Data collected would be entered into the working database. At the end of the next biennium, new grant recipients as well as previous recipients could be polled again. This would allow APUC to track outcomes over time, and a rich data set would be in place the next time the Commission undertakes an evaluation of this nature.

Tracking for basic and applied research grants requires a long time frame. Often the research itself takes several years to complete. Continued follow-up until such time as research has been discontinued or the project has been commercialized will perhaps require multiple contacts. Because basic and applied research grants can be very different, a combination of mail and telephone surveys may be required depending on the level of information desired. The same considerations would apply to prototype development grants.

## Conclusions

In its efforts to support the development of new products and to assist groups seeking to launch new ventures, APUC is essentially acting as a venture investor. In the literature dealing with venture investment and new business development, it is virtually axiomatic that most of the net returns result from a small minority of investments. A commonly quoted statistic is that 10 percent of investments produce virtually all of the returns (Heard and Sibert 2000). Viewed in this context, APUC appears to not only be achieving a very high overall return on its investment portfolio but also is supporting a relatively large percentage of successful investments.

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