

# Agriculture

# Roadmap Supplement

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**PROPANE**  
EXCEPTIONAL ENERGY™

## Acknowledgements

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# INTRODUCTION

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Approximately 79 percent of all farms in the U.S. use propane because of its cost effectiveness, safety, efficiency, convenience, portability, and environmental friendliness. These farms depend on propane's superior value to keep their heating, power generation, irrigation, nutrient management, crop/food conditioning, and weed and pest control operations running efficiently.

As the third-largest retail propane market in the U.S., the agriculture sector receives at least five percent of the funds collected by the Propane Education & Research Council (PERC) for agriculture-related programs and projects. The Agriculture Advisory Committee (AAC) oversees PERC's efforts and actively seeks innovative solutions that help farmers keep productivity high and operating costs down while increasing propane sales at the same time to balance propane's seasonal business cycles.

The propane industry took an important step in 2002 with the AAC publication of the *Propane Agriculture Roadmap*, which defined the industry's vision of propane in agriculture, goals to help achieve that vision, and a corresponding strategy and set of priorities. With the institution of its current agriculture programs, the industry has put forth an effort to offer exceptional value and gain recognition from the agriculture industry as a preferred energy source. The industry must, however, continue to examine and improve its efforts in order to fully realize this vision. This 2006 Agriculture Roadmap Supplement is an up-to-date version of the challenges and priorities identified in the original Roadmap. The plan is based on lessons learned and prior accomplishments, and it recognizes emerging needs in the agriculture and propane industries.

The Agriculture Roadmap Supplement was developed by a diverse group of propane and agriculture industry leaders working together at a facilitated two-day workshop in May 2006. These experts provided a "snapshot in time" of the priorities for enhancing farm practices by specifying 17 challenges and 21 activities for overcoming them. This information was synthesized into this Agriculture Roadmap Supplement.

The propane industry envisions that, by 2010, the agriculture industry will recognize propane as a preferred energy source because it offers exceptional value. The Overview of the Propane Agriculture Roadmap on the following page shows how the integrated elements of the plan work together to achieve this vision.

## VISION OF PROPANE IN AGRICULTURE

By 2010, the agriculture industry will recognize propane as a preferred energy source because it offers **exceptional value**. This value is achieved by offering a unique combination of product benefits, including **cost-effectiveness, efficiency and productivity, safety, reliability, portability, and environmental friendliness**.

### STRATEGIC GOALS

**Markets and Customers:** Improve propane's market share in the agriculture sector; Increase counter-seasonal propane sales to agriculture.

**Production and Efficiency:** Increase the productivity of agricultural processes through the use of propane.

**Safety:** Minimize incidents and accidents associated with propane use in agriculture.

**Reliability:** Increase farmer confidence in the reliability of propane quality, supply, and equipment.

**Portability:** Exploit propane's portability in agriculture applications; Improve the efficiency of propane storage.

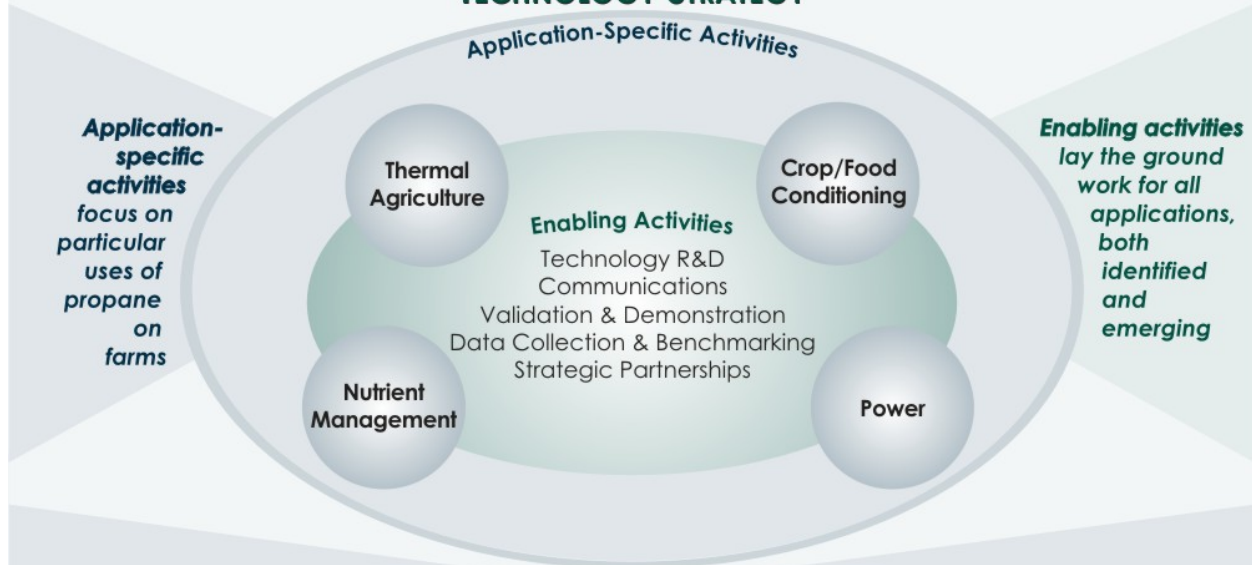
**Environmental Friendliness:** Capitalize on propane's clean characteristics; Exploit the potential of propane as an alternative to agricultural chemicals, particularly methyl bromide.

**Consumer Awareness:** Increase farmer and propane industry awareness of the competitive advantages of propane for the agriculture sector.

### GRAND CHALLENGES AND OPPORTUNITIES

- ▶ Protecting crop and livestock from loss
- ▶ Safe and efficient waste disposal
- ▶ Pollution control; environmental compliance
- ▶ Increasing energy requirements and costs
- ▶ Pesticide use reduction and replacement

### TECHNOLOGY STRATEGY



### PRIORITY ACTIVITIES

#### Top Application-Specific Activities

- Develop incineration technologies
- Develop soil sanitation technologies
- Develop structure fumigation technologies
- Convert agricultural waste to value-added products
- Find partners for engine development and certification

#### Top Enabling Activities

- Enhance propane refueling mechanisms
- Identify emissions credit trading mechanisms
- Analyze research and communicate and archive results
- Encourage incentives for technology replacement
- Improve R&D communications with technology partnerships

# GRAND CHALLENGES AND OPPORTUNITIES

The U.S. agriculture sector has been an anchor for rural development by ensuring adequate food supplies and providing livelihoods and incomes while sustaining natural resources. As the propane industry seeks to enhance all of these aspects, new economic, regulatory, environmental, and demographic requirements increasingly stress the importance of developing propane technologies for improved agriculture profitability.

The four issues described below are the key challenges faced in agriculture today that propane can best address. They are also opportunities because both the propane and agriculture industries stand to benefit if successfully addressed.

**Table 1 – Grand Challenges and Opportunities in Agriculture Today**

**Bold** – Indicates Most Critical Issue that Propane Can Address

<b>Economic Issues</b>	<ul style="list-style-type: none"> <li>▪ <b>Protecting crop and livestock from loss</b></li> <li>▪ <b>Increasing energy requirements and costs</b></li> <li>▪ Leveraging R&amp;D coordination and funds</li> <li>▪ Rising global competition</li> <li>▪ Changing government subsidies and regulations</li> <li>▪ Increasing number and variety of niche markets</li> </ul>
<b>Regulatory Issues</b>	<ul style="list-style-type: none"> <li>▪ Increasing biosecurity responsibilities to protect against agroterrorism threats</li> <li>▪ Dealing with environmental regulations and compliance issues</li> </ul>
<b>Environmental Issues</b>	<ul style="list-style-type: none"> <li>▪ <b>Safe and efficient waste material disposal or remediation</b></li> <li>▪ <b>Pollution control and environmental compliance with new air, soil, water, and noise regulations</b></li> <li>▪ <b>Pesticide use reduction and replacement for protecting crops</b></li> <li>▪ Fighting agriculture-based diseases</li> <li>▪ Special interest groups have conflicting environmental goals</li> <li>▪ Offensive odor control</li> </ul>
<b>Changing Demographics</b>	<ul style="list-style-type: none"> <li>▪ Industry consolidation (decreasing total number of farms; large farms are getting larger while small farms are getting smaller) means fewer support services, such as stores and points of service</li> <li>▪ Labor issues/language barriers often limit training and may impact safety</li> <li>▪ Urban/rural interface has conflicting objectives (i.e. balancing obligation to meet public food needs with decreasing acreage quality due to increased urbanization)</li> </ul>

# PROPANE INDUSTRY STRATEGY AND ACTIVITIES

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Significant research and development activities are needed to develop technologies that help farmers realize the full potential of propane to enhance farm profitability. The propane industry has adopted a dual approach to addressing today's agricultural challenges, while increasing sales to this important market:

1. Focused activities aimed at enhancing propane's benefits in **specific farm applications** strengthens the industry's ability to develop and tailor technologies, equipment, and practices to meet thermal, crop/food conditioning, power, and nutrient management needs.
2. **Enabling activities** such as technology R&D, validation and demonstration, data collection and benchmarking, communications, and strategic partnerships encourage rapid progress in the adoption and development of new and existing propane-use applications.

By combining application-specific technological breakthroughs with a foundation of enabling activities, the industry has and will continue to strengthen propane's position as the fuel of choice for farms. The activities deemed most promising today are explained below.

## Application-Specific Activities

- **Thermal Agriculture** involves research and development of equipment that applies extreme heat via flame, steam, or other means to control pests such as weeds, insects, dangerous pathogens, and others that, left unchecked, have a negative affect on the production of agriculture commodities. A key activity is to provide a replacement for high-risk or banned agricultural chemicals, such as methyl bromide.
- **Crop/Food Conditioning** research develops technologies that protect or enhance the quality of agriculture commodities through harvest, storage, and processing, enabling farmers to harvest healthy crops quicker, earlier, and easier.
- **Power** activities focus primarily on the validation and demonstration of power generation technologies for agricultural uses, including investment in engines, fuel cells, and microturbines, and exploring ways to better compete or partner with alternative fuel sources. The AAC works closely with the Engine Fuel Advisory Committee (EFAC) and the Research and Development Advisory Committee (RDAC) who lead the efforts to research and develop propane-related power technologies.
- **Nutrient Management** research develops technologies that help farmers dispose of or remediate waste materials. These materials are often rich in valuable nutrients that can support or enhance other agricultural needs, such as heat and power.

## Enabling Activities

- **Technology R&D** activities are intended to support many agricultural propane uses. Enhancing refueling mechanisms is critical to gaining widespread acceptance on farms, especially in thermal, crop/food conditioning, and power applications.
- **Communications** initiatives raise awareness of agriculture programs to key partners; communicate the benefits of propane; create greater awareness of new applications for propane to agriculture producers, propane industry, and key agricultural industry influencers; and promote the safe use and handling of propane. These efforts are coordinated with PERC's Consumer Education and Safety & Training Advisory Committees as appropriate.
- **Data Collection and Benchmarking** efforts gather data aimed at identifying new farm markets, such as organic and ruralpolitan, and other data that may further PERC's agriculture mission. Other key activities include studying emissions trading mechanisms, examining the progress of propane research, identifying emerging needs, and periodic evaluation of agriculture activities.
- **Strategic Partnerships** leverage PERC research funding by identifying potential funding sources and developing new and matching grants for maximum return on investment. This area focuses on funds partnership development, project development, project monitoring, and other duties carried out by AAC, and supports technology development, commercialization, and adoption.

**Table 2 – Priority Activities**

**Bold** – Indicates Top Priority Activity

<b>Application-Specific Activities</b>	
<b>Thermal Agriculture</b>	<ul style="list-style-type: none"> <li>▪ <b>Develop soil sanitation technologies</b> <ul style="list-style-type: none"> <li>- <b>Provide replacement for methyl bromide for conventional growers</b></li> <li>- <b>Provide solution for organic growers</b></li> </ul> </li> <li>▪ Expand applications for steam weed control in row crops and pest control</li> <li>▪ Develop technologies that prevent crop and livestock loss</li> <li>▪ Improve weed control equipment effectiveness, efficiency, and safety</li> </ul>
<b>Crop/Food Conditioning</b>	<ul style="list-style-type: none"> <li>▪ <b>Develop structure fumigation technologies</b></li> <li>▪ Add value to grain via rehydration or protect them by other means</li> <li>▪ Improve post-harvest processing</li> </ul>
<b>Power</b>	<ul style="list-style-type: none"> <li>▪ <b>Find partners for engine development and certification</b></li> <li>▪ Advocate regulatory neutrality with regard to engine standards</li> <li>▪ Coordinate with EFAC and RDAC on power development activities</li> </ul>
<b>Nutrient Management</b>	<ul style="list-style-type: none"> <li>▪ <b>Develop incineration technologies</b></li> <li>▪ <b>Convert agriculture waste to value-added products</b> <ul style="list-style-type: none"> <li>- <b>Energy</b></li> <li>- <b>Combined heat and power</b></li> </ul> </li> </ul>

<b>Enabling Activities</b>	
<b>Technology R&amp;D</b>	<ul style="list-style-type: none"> <li>▪ <b>Enhance propane refueling mechanisms</b></li> </ul>
<b>Communications</b>	<ul style="list-style-type: none"> <li>▪ <b>Improve R&amp;D communications with technology partnerships</b></li> </ul>
<b>Data Collecting and Benchmarking</b>	<ul style="list-style-type: none"> <li>▪ <b>Identify emissions credit trading mechanisms</b> <ul style="list-style-type: none"> <li>- <b>Carbon credits</b></li> <li>- <b>NO<sub>x</sub> credits</b></li> </ul> </li> <li>▪ Analyze research activities and appropriately communicate and archive results</li> <li>▪ Explore role of propane in niche markets           <ul style="list-style-type: none"> <li>- Determine needs of organic markets and other crops</li> <li>- Examine biodigester opportunities</li> </ul> </li> <li>▪ Determine role of rural/urban farmers</li> </ul>
<b>Strategic Partnerships</b>	<ul style="list-style-type: none"> <li>▪ <b>Encourage incentives for technology replacement (i.e., determine funding mechanisms that are simple and easy access)</b></li> <li>▪ Advocate regulatory fairness with diesel fuel; promote environmental benefits of propane compared to diesel</li> <li>▪ Develop research and commercialization partners to build on research</li> </ul>

# COMMUNICATIONS STRATEGY

PERC's Agriculture Advisory Committee is committed to funding programs aimed at developing or improving propane technology for agriculture. To optimize the results of this research and development, AAC's goals, efforts, and progress should be appropriately publicized to the proper audience. The industry's primary objectives in this regard are to:

- Raise awareness of AAC programs among key partners
- Communicate the benefits of propane use and create greater awareness of new applications to agricultural producers, key influencers in agriculture, and the entire propane industry
- Promote the safe use and handling of propane

To meet these objectives, the industry will adopt the following communications strategy, which is comprised of three elements: PERC progress, new technologies, and niche markets.



**PERC Progress** – To reach target audiences, information should be spread through the appropriate channels. Industry events, trade shows, media events, and product demonstrations offer the best opportunities for marketing and communication on propane. By tracking media coverage and performing results analysis of communication efforts, the industry can effectively monitor progress and steer current and future efforts.

**New Technologies** – For agricultural producers to accept new propane technologies, they must be informed about how equipment and system innovations will help them improve productivity and minimize costs. Over the next several years, the AAC will promote advanced technologies in thermal weed control, cotton defoliation, orchard frost protection, poultry house sanitation, and other emerging projects.

**Niche Markets** – Many new propane innovations offer an alternative to using chemicals to accomplish a specific task. A primary target for these new applications is the organic market. To foster developments in such niche markets and to uncover additional opportunities, the industry must constantly broaden its understanding of producer needs and identify the trade associations influencing such markets.

# PARTNERSHIPS

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Developing robust partnerships with agricultural producers, equipment manufacturers, universities, and other trade associations will continue to be essential for achieving industry goals. Partnering with all of these groups will be crucial for fulfilling the potential of propane to grow in application and use.

- **Producers/Farmers** – Because farmers and producers can help validate new technologies, the industry must cultivate these relationships through influencer organizations, such as agricultural media. Government, trade associations, and marketers can assist with finding the most appropriate field test partners and with funding these efforts. These efforts should be targeted based on the technology or message being delivered.
- **Original Equipment Manufacturers (OEMs)** – Equipment manufacturers are needed for engine development and emissions certification. Because OEMs often have more of a stake in the success of their equipment than other researchers, they may be more proactive partners. In addition, OEMs can help with demonstration and validation projects, which are often necessary for commercialization.
- **Trade and Associations** – Partnering with trade associations that have overlapping interests in agriculture or energy efficiency will help leverage industry resources to more quickly achieve propane use goals. These associations can help with identifying strong agricultural academic programs and a secretariat for agricultural equipment standards, such as the American Society of Agricultural and Biological Engineers.
- **Academia** – Academic institutions are often at the forefront of propane technology development, demonstration, and placement. By identifying academic programs with interest and expertise in research areas relevant to its research and development goals, the industry can leverage its resources and decrease the time between the research phase and the widespread use of new propane innovations and applications.
- **Government** – Government grant programs have the potential to provide funds for energy technology development. Finding and engaging in these government partnerships will remain a key part of the industry strategy for successful technology development and deployment. In addition, providing government agencies with timely and accurate information during the policy and regulation development process will help officials to make more informed decisions on policy questions of fundamental importance to the industry. The AAC will continue to provide the National Propane Gas Association with educational materials as needed.

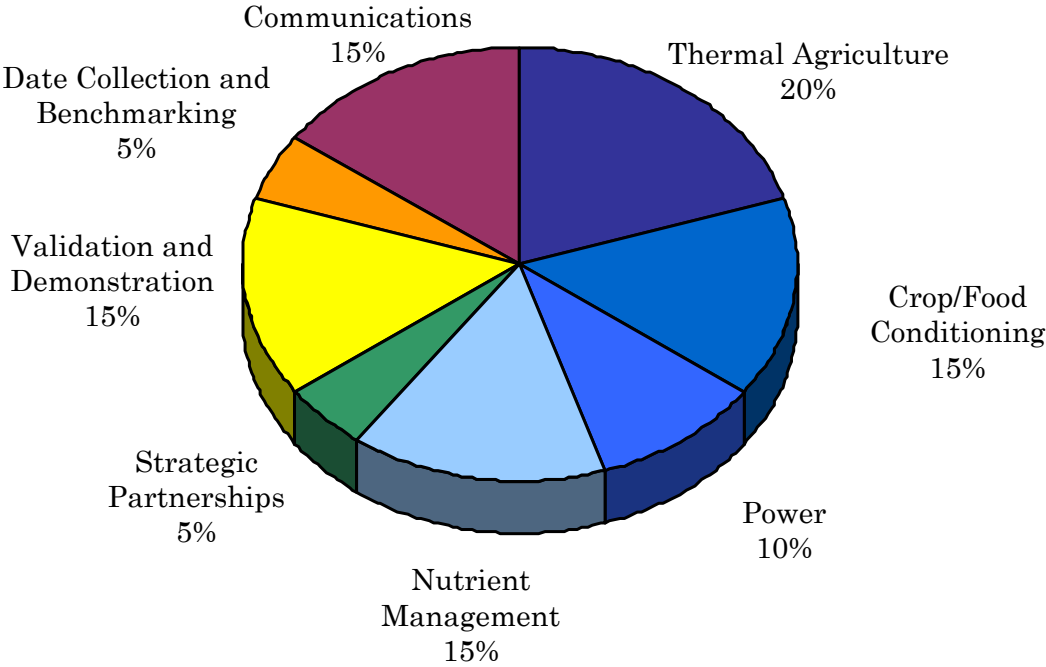
# PORTFOLIO DEVELOPMENT

Over the next several years, the predominant priority is new technology development. Therefore, the majority (60%) of funds shall be allocated to application-specific research and development in the four goal areas of thermal agriculture, crop and food conditioning, nutrient management, and power. While the overall R&D allocation remains unchanged from the 2002 roadmap, specific areas have been modified to reflect changes in the agriculture industry’s needs and PERC’s Advisory Committee structure.

Of the remaining 40% of the agriculture budget, the following allocation targets have been set: communication activities (15%), validation and demonstration (15%), strategic partnerships (5%), and data collection and benchmarking (5%). The communications allocation has been reduced somewhat given that many core outreach materials have been produced in the last few years and efforts will be more targeted in the future. The allocation for strategic partnerships replaces the 4% allocation for project management in previous budgets and reflects the effort to expand the development of partnerships to carry out our mission.

As with any medium-term budgeting estimates, the determined allocations are recommended only as a guide to the AAC. As such, the AAC will continually review and assess the mix of projects to ensure that funded activities lead to success both today and in the future.

**Budget Allocation Targets**



# CONCLUSIONS

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This Agriculture Roadmap Supplement sets forth the priority activities for developing propane technologies to improve agriculture profitability. It serves as a resource for the Agriculture Advisory Committee, Engine Fuels Advisory Committee, and Research and Development Advisory Committee, Safety & Training Advisory Committee, as well as for agriculture producers, equipment manufacturers, universities, trade associations, and other industry members to follow as they continue to address agricultural challenges while increasing propane sales to this important market. The strategies encompassed in this document are capable of enhancing propane value for agriculture users over the next several years, and will continue to improve propane's position as an important fuel in agriculture in the years to come.

# CONTRIBUTORS

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