# Galen Crouse

(Continued from Page A21)

Ephrata Church of the Brethren for 37 years.

Crouse was named "Outstanding Farmer Over 40" by the Ephrata Area Young Farmers' Association.

The Master Farmer program, established in 1927, is sponsored by the Pennsylvania Farmer magazine, Harrisburg, and Cooperative Extension Service of The Pennsylvania State University.

Formal award ceremonies will be held January 13 at a special luncheon in Harrisburg. Crouse will be inducted into the Pennsylvania Master Farmers' Association whose membership consists of all former award winners.


Crouse poses with Lime-Hollow Elevation Jessie. This cow made Holstein history last March when she was purchased by a syndicate for $116,000. Crouse, who is one of the partners owning Jessie, serves as guardian of the sixth generation Excellent cow.

# *Fighting ice with ice to save fruit crops*

UNIVERSITY PARK — Imagine an apple, pear or lemon bud. Sensing spring, it bursts into bloom one warm day in February, March or April–only to freeze to death that night as temperatures plunge.

Multiply such occurrences by millions, and it's easy to see the plight of the nation's fruit farmers.

Seeking to protect fruit trees on freezing early spring nights, Penn State researchers are trying to fight ice with ice.

They're developing a computer method to predict when and where frost will occur in mountainous terrain, to monitor its arrival and to activate sprinklers automatically-in order to keep fruit buds and leaves "warm" by coating them with ice.

"Though the original concept wasn't ours," says project director C. T. Morrow, associate professor of agricultural engineering, "we think it offers important and inexpensive protection for highly vulnerable fruit crops; and we're trying to adapt and perfect it for conditions in the Northeast."

As Morrow explains, the fruit frost protection technique has been used for a few years in the drier West and South. There, due to different climate and terrain, sudden frosts are more common, and economic losses are greater than in the humid Northeast.

The ice method is the most promising alternative to farmers' traditional practice of heating orchards on freezing nights, with wood, oil, gasoline, or charcoal-fired braziers. While heating remains one of the most reliable techniques, spiraling energy costs have sparked a search for cheaper ways.

The most effective of these is a sprinkler system, whereby tree boughs and branches are continually sprayed with water. As the water turns to ice, a "heat of fusion" is emitted. Absorbing this heat, the crucial plant parts are kept above a critical temperature.

Conversely, to prevent buds from blooming prematurely on warm spring days, a technique called "bloom delay" is used. Intermittently during the day, the trees are sprayed to keep the plant's flowering parts below, rather than above, a critical temperature-probably 45 degrees Farenheit.

Thus far, such methods have not gained wide acceptance in Pennsylvania and the rest of the Northeast. The practices are new and not well understood; compared to some other parts of the country, frosts are infrequent; and the method can do harm, if not used properly.

Consequently, most Northeastern farmers do nothing, and often get away with it.

Essentially, Morrow's group is trying to make the method work well in the Northeast, and to take the guesswork out of when to spray.

'We think the system is particularly useful and economically worthwhile," explains Morrow, "because, in addition to protecting fruits from frost, the system can be utilized for other purposes.

"Water flowing naturally downhill or pumped through a pipeline system connected to a central water source, also can be used for drought relief, and to apply water-soluble nutrients and pesticides."

However, Morrow continues, both frost protection methods are fraught with uncertainties and problems. The main difficulty with the bloom delay technique, he explains, is that an enormous water supply is needed under Pennsylvania-type conditions , because there are so many warm early spring days when night temperatures plunge below freezing.

To be safe, farmers have to spray, day after day. Also, it's still unknown what the critical temperature is–the temperature below which the buds are likely to develop.

As for the "heat of fusion" technique, the dangers are even greater, says Morrow. A mistake can lead to unnecessary bud deaths or even to death of entire trees, as in the case of very sensitive citrus trees.

"One danger," says Morrow, "is that the trees can be overloaded with ice. As water is added all night, ice layers will build up, causing structural damage.

"Another hazard of too much water is a condition called 'wet feet.' The tree roots become surrounded by too much water, which chokes off their oxygen supply. On the other hand, too little water will result in too thin an ice film, causing plant temperatures to fall below the critical 32 degrees."

Still anger danger, he adds, is associated with wind, even wind as low as five miles per hour. For if the sprinkling and freezing is occurring in the presence of such wind, the heat of fusion may be dissipated into the atmosphere, and the plant parts will sustain more damage than if nothing had been done.

To overcome these and other problems, Morrow's group is trying to develop better prediction and detection methods for ice formation; to learn how much water to supply at different intervals; and how to use as little water as possible.

Monitoring such climiatic parameters as air temperature, temperature inversion (temperature at diffrent atmospheric heights), relative humidity, wind speed, and, possibly, blossom temperature, a computer would automatically activate a sprinkler system, adjust the water supply as conditions change and shut the sprinkler off when necessary.

"We have four years' data and we're confident that we're well on the way to solving the problems," says Morrow, adding that his team hopes to continue testing their system next spring.