RESEARCH FINAL REPORT TO:
THE AGRICULTURAL RESEARCH FOUNDATION
FOR 1997 TO 1998

TITLE: Oregon Processed Vegetable Commission
On-farm Weather Station

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Background:

There is a growing network of on-farm weather stations in the Willamette Valley. A network of local weather stations may provide the processed vegetable industry with more accurate weather forecasts. Local weather data may enhance our ability to predict crop developmental stages, insect pest population trends, and disease high-risk periods. In 1997, the Oregon Processed Vegetable Commision provided monies for the purchase of a weather station to be used in future research projects related to the Processed Vegetable Industry in Oregon.

Objectives:

To establish, maintain, and evaluate an on-farm weather station for use in crop development, disease and insect pest population forecasting.

Evaluation of available weather stations:

During the summer and fall of 1997, weather station equipment providers were contacted by phone. Promotional materials were gathered and evaluated. Follow up conversations were held with company representatives and Oregon State University personnel with experitise in weather monitoring (George Taylor) and weather based disease forcasting (Jay Pscheidt). The companies were invited to bring their equipment to Oregon and participate in a weather station field day for the processed vegetable industry. The field day was held on September 30, 1997 at the OSU Vegetable Research Station near Corvallis, Oregon. The following companies participated: Metos/Gempler, Spectrum Technologies, Davis Instruments, Luft/Abbeon, Automata, Adcom/Western Farm Service, and E.R.F. Company/Phil Volker (See attached).

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Results:

1) A summary of the questions and issues that need to be addressed by growers prior to purchasing an on-farm weather station was developed into a handout for processed vegetable growers (See Attached).

2) Each weather station provider had strengths and weaknesses. The biggest dilema facing growers who are considering a weather station purchase is finding a company that provides combined features, weather forcasting, a good instrumentation package, and good service including cooperation in the testing and refinement of weather based disease and insect forecasting models. A decision was made to purchase a weather station from the Adcom/western farm service and to subscribe to the E.R.F Company weather forecasting service.

- **Adcom company representatives have agreed to work with Oregon State University in testing disease and insect forecasting models. At this time, Adcom does not provide any weather forecasting services.**

- **The E.R.F Company provides free weather monitoring equipment to subscribers of it's weather forecasting service.**

The weather station will be set up prior to the 1998 growing season at the OSU Vegetable Research Farm near Corvallis, Oregon. Weather data will be received by computer modem at the OSU Plant Disease Clinic where it will be available to OSU researchers and others working with local weather data.

During the 1998 growing season, Dr. Len Coop with the OSU Department of Entomology working with Adcom/Western Farm Service, will begin testing insect population degree day models of selected pests of Willamette Valley vegetables. Dr. Mary Powelson with the OSU Department of Botany and Plant Pathology will begin to evaluate the Snap Bean "Wisdom" program, a computer software program from Wisconsin that used weather data to predict risk of mold in snap beans.

Weather Station Field Day

Tuesday September 30, 1997 - 8:30am to 12:00 noon
OSU Botany and Plant Pathology Research Farm
Corvallis, Oregon

Field demonstration of weather stations and weather monitoring instruments for weather, disease, and insect forecasting. The following weather stations will be set up for your review:

Adcom/Western Farm Service
Metos/Gempler
Spectrum Technologies
E. R. F. Company/Phil Volker
Davis Instruments
Luft/Abbeon
Automata

Directions:
The OSU Botany and Plant Pathology Research Farm is ¼ mile east of Corvallis and the Willamette River on Highway 34 next to the Trysting Golf Course on the north side of the road. Turn north on Electric Road off of Highway 34 and follow the tour signs.

Sponsors:
OSU Integrated Plant Protection Center
Oregon Processed Vegetable Commission
Willamette Valley Ag Professionals Association

For more information contact:
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So you want to buy a weather station.

Jay W. Pscheidt and Daniel McGrath, Oregon State University Extension Service, September 30, 1997

There is growing interest in site-specific weather information generated by on-farm weather stations and weather sensors. Local information may improve the accuracy of weather forecasting. Local degree day accumulation, leaf wetness periods, and evapotranspiration data can be used to predict insect and plant disease trends and irrigation and spray requirements. There are dozens of weather instrumentation companies and weather services to choose from. The following questions are designed to help you asses the weather instruments you are considering and the costs associated with their purchase, operation and maintenance.

1. What is your main purpose for the weather station?

- Insect and disease modeling
- Irrigation scheduling
- Weather forecasting
- Frost warning
- Storage monitoring
- Harvest scheduling
- Other

Weather forecasting requires the services of a professional meteorologist. Determine if there is a weather forecasting service associated with the weather station you are considering. Weather equipment varies widely in the amount of work required to calculate degree day accumulation or infection periods leading to insect or plant disease events The lowest priced is for "strip chart recorders" which mechanically record temperature and leaf wetness, for example, on a strip of paper. The grower must read and calculate the length of time leaves are wet and the average temperature during the wet period. Although easy to do, it does take time and a regular commitment (at least once per week) to read the chart. One must then go to another chart to see if an infection period has occurred.

Most weather equipment companies offer computer software that will calculate infection period, degree day accumulation, etc. These software packages are based on mathematical models of complex biological systems. There are often more than one mathematical procedure for calculating degree days and infection periods for a specific insect or disease. A given model may or may not be appropriate for our growing area and climate. Determine where the models were developed, what equipment and sensors were used and where the sensors were placed during the model development and testing.

2. What kind of sensors do you need?

- •Temperature (air, water, soil)
- •Humidity, leaf wetness, rain fall,
- •Wind speed and direction
- •Light intensity
- •Soil moisture
- •Other sensors

Where should the sensors be located? In the tree canopy, in the open air, close to the ground, underground, in the shade? Can the sensors associated with a weather station be physically separated from the unit or are they all tied to one spot? Can you access the unit and the sensors easily? Can you keep them out of the way of field implements, irrigation equipment, and sprayers?

- Rain gauges must be placed where there are no obstructions.
- Temperature sensors require shields from direct sunlight.
- Humidity sensors require rain shields

3. How will you determine if the sensors are reading correctly?

There are two issues here, accuracy and calibration. Accuracy depends on the quality of the instrument. But, even a high quality instrument can report the incorrect information if it is not properly calibrated. Determine from the manufacturer how often and in what manner the equipment should be calibrated.

4. What external hook ups, if any, are needed?

- Power supply
- Telephone line
- Radio telemetry

How is power supplied to the station? Batteries (rechargeable or not), solar power, direct AC hook up? If the weather station is designed to automatically report weather data, will it require a phone line? If it uses radio telemetry, will the system require a separate base station radio receiver? Will a modem need to be installed on the desk top computer receiving weather data?

5. Will additional instillation items be needed?

- Weather tight boxes,
- Weather shelters,
- Conduits for sensor leads
- Poles to mount equipment on
- Other items

6. Who is going to supply the computer?

Does the weather station come with a computer or does one have to supply a computer? How does one actually see the weather information? Most weather equipment measures weather parameters electronically. The less expensive ones measure weather and may do some calculations of average temperatures, etc. But, one still has to use a chart to look up the degree day accumulation or infection period. Some weather equipment companies offer computer software to take the weather data, calculate degree days and infection periods, but you supply the computer. The most expensive units are mini computers which not only monitor the weather but also calculate wet periods and then run calculations using various predictive models. All you have to do is push a button or two to find out if an infection period has occurred. Some units print results on paper for your permanent record.

7. What kind of post-sales service can you expect?

Are there knowledgeable people who can answer technical information about the weather instruments? Are there knowledgeable people who can answer questions about the insect, disease, and evapotranspiration model(s) you might be running?

8. What kind of software do you get or do you need?

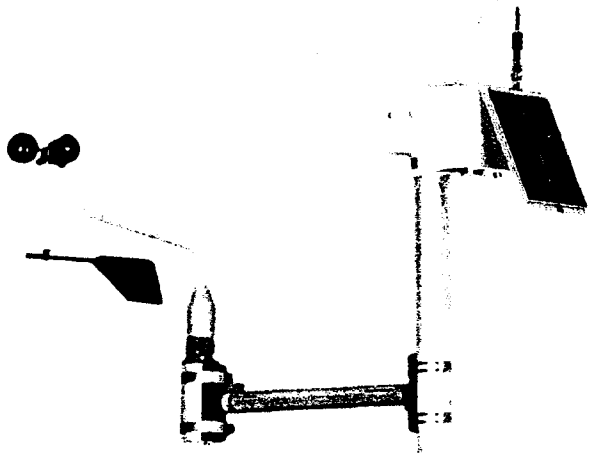
9. What annual maintenance is needed to keep the unit operating correctly?

Are factory re-calibrations available? How often should they be performed? Do the sensors need to be covered during pesticide applications? What is the annual subscriber fee associated with receiving radio telemetry data from a base station? How long will the sensors last before they need to be replaced?

Precise Weather Information[185]

for Decision Makers

Adcon Telemetry



Solar Radio Weather Sensing Station

Versatile Applications from One System

ERF Company, Inc

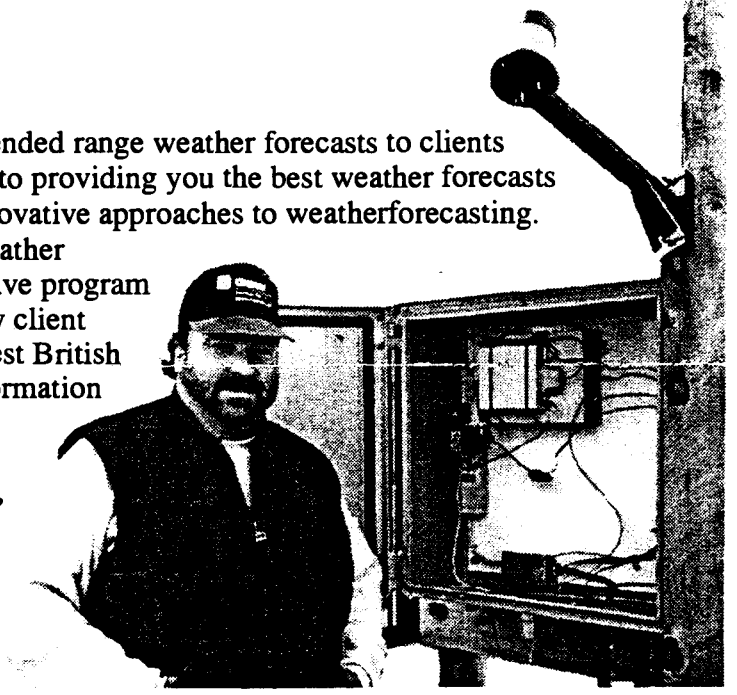
Extended Range Weather Forecasting
15 and 30 Day Specialists

Client Newsletter — Spring 1997

The Latest from ERF

ERF is entering its 21st year of delivering extended range weather forecasts to clients throughout the Northwest. Our commitment to providing you the best weather forecasts means we're always looking for new and innovative approaches to weatherforecasting.

This past year, we've embarked on our ERF Weather Information Network (EWIN). EWIN is a cooperative program that supplies weather stations for deployment at key client locations throughout the Western U.S. and Southwest British Columbia. This provides the best microclimate information available.



Each EWIN station provides a wide range of weather data: temperature, wind chill, precipitation, barometric pressure, wind speed and direction, relative humidity, and dew point.

We poll the weather stations via modem. Data collected is presented in a table format by our fax service or our new InfoNet.

ERF will supply each EWIN site with the weather station, including the microprocessor, sensors, wind cup and vane, and 50 feet of cable to each of the sensors. Also available are optional leaf wetness, solar radiation, and/or infrared temperature sensors. All EWIN stations are maintained by ERF.

Weather data is used for ERF's frost protection service and for input into disease and pest models.

We require a five-year commitment to ERF's year-round daily forecast service. Clients also need to supply AC power, a dedicated phone line, and installation.

We've had requests for about 210 stations and have sent out the lease agreements and contracts. We

continued on page 2

Above: Pat Sams of Milton-Freewater set up his own EWIN weather station and Phil was on hand to document the results.

News and Views from Phil Volker

El Niño: more hype than fact

Even though I believe in El Niño and its affect on climate over the tropical regions, I do not believe it has as strong an affect on Northwest weather as some folks think. In fact, I am not too sure that it has any affect – or if it does, it is limited. El Niño is often used as a "catch-all" phrase to lump changeable or unusual weather events into one phenomenon. In fact, El Niño is only a short-term event that lasts from three to six months during the Southern Hemisphere's summer (November through February).

El Niño is simply a reversal or weakening of the normal easterly trade winds that allow the warmer waters of the Western Pacific to flow eastward toward the west coast of Central and South America. This warm water flow heats up the normally cool waters off the Peruvian Coast, causing a disruption in fisheries and the weather. Typically, it is very wet over Central America during these events, with warmer water and heavier rainfall moving north into the southern U.S.

The stronger the warming, the greater the impact on regional weather. In other words, the stronger the departure from normal ocean temperatures, the greater the impact on regional weather. The greater the El Niño, the greater the chances that the Northwest and Southwest are stormy and wet. The weaker the event, the less likely we are to see a correlation to the El Niño incident.

continued on page 2

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