The adoption of new technologies has always been a central driver of agriculture productivity, farm operator profitability and change in rural America. Largely as the result of genetic science advances, new chemical processes and the introduction of mechanized processes into agriculture, the number of people fed by one US farmer has grown from 19 to 129 in the last 50 years.

The Internet, enabled by the invention of the World Wide Web in the early 1990s, may over time become one of the most profound technological tools yet in its impact on agriculture and rural communities. On a typical day in 2004, over 61 million US households (54.6%) accessed the Internet. Even at this early stage of development, the Internet is changing practices within farm operations and is shaping both opportunities and challenges for rural communities.

This presentation highlights current trends in the adoption of computer and on-line technologies among US farm operators and within rural communities. In addition, I provide a brief review of how the Internet is presently being utilized within agriculture and rural communities. Several thoughts on how these trends in computer and on-line usage will impact the future of agriculture and farm communities are offered.

**The Adoption of On-line Technologies within US Agriculture and Rural Communities**

At the start of the 1990s, use of the Internet was largely confined to “computer geeks” and viewed as an interesting tool, but its practical application in the day-to-day life of ordinary people and within business was still quite limited. However, with the invention and cultivation of the World Wide Web, the Internet now reaches into the majority of homes and business in the United States and the industrialized world.

This incredible growth and adoption of on-line technologies is central to encouraging farm operators to purchase and utilize computers and software programs helpful to their business operation. Data collected through the US Census of Agriculture indicates 30 percent of US farmers utilize computers in their farm operations—up 10 percent from 1997. Farmers in the Northwest utilize computers more extensively in farm business than the national average with Idaho having the highest rate of 46% of farmers using computers in their business and Washington having the lowest rate of farm computer adoption in the Northwest with 39% (See Table 1). However, when size of farm operation is considered, it is clear that computers have become even more important to the larger operations with 58 percent of US farm operators with annual sales $100,000 or more utilizing computers as a component of their farm operation.

The growth of Internet access has most certainly been a factor in the increased agricultural use of computers. Notably in 1997, only 13 percent of US farmers had an opportunity to access the Internet. Today, nearly half of US farmer have the opportunity to access the Internet. In the Northwest, 72 percent of Oregon farms can access the Internet with a little over 60 percent of farmers in Idaho and Montana reporting they can access the Internet. Only 54 percent of Washington farmers report they can access the Internet.

More generally the Internet has found its way into homes and businesses within rural communities. While different analysts report different numbers, in general, the use and availability of Internet with rural, suburban and urban communities of the US is similar. What is different in rural communities is
that families and businesses utilizing the Internet are much less likely to have the option of purchasing broadband (or high speed) Internet connections. According to data collected by the US Department of Commerce, Among those using the Internet in urban locations, 40.4 percent connect to the Internet over broadband compared to only 24.7 percent of those living in rural areas.

Data specifically pinpointing the availability of broadband Internet connection opportunities for farm families and businesses is not generally available. However, it is likely farm families are among the least likely to have broadband connections today because technologies that provide higher speed data access can be expensive to install and consequently are less likely to be deployed in areas where there is a substantial distance between customers. That said, broadband technology is rapidly evolving and the economics are quickly tipping towards economic deployment even to geographically dispersed farms.

**How are computer and on-line technologies being utilized?**

Connection to the on-line world opens doors to many opportunities for farm operators and rural residents that might otherwise be more difficult to access. The Internet can help overcome the limitations rural communities face in being a distance from critical medical, educational, business and other services. Among the most pervasive uses of the web is simply staying in touch with friends, family and business contacts utilizing e-mail. Eighty eight percent of Internet users report they send and receive e-mails in a typical day.

Some of the fastest growing uses of the Internet include searching for information on the web such as researching a health problem, exploring and comparing different product options or comparing prices of alternative travel arrangements. On a typical day, about three-quarters of those utilizing the Internet searched for information of some type.

Another major use of the web is for the purchase and selling of products or services. About half of those utilizing the Internet report they buy or sell products on the web. A smaller but significant number of Internet users bank on-line or manage finances.

A recent Ohio State University Study specifically tracked farm operator use of the Internet. Nearly 55 percent of farmers surveyed in the Ohio State University study reported price tracking on the internet, 29 percent performed online banking or bill paying, 26 percent reported the purchase of farm inputs using the internet, 16 percent traded stocks, bonds or other financial instruments online, 13 percent sold farm products over the internet, 9 percent reported online trading of agricultural commodity contracts, and 73 percent use the internet for general information searches.

**A look to the future**

The impact and potential of Internet Technologies for Agriculture and Rural Communities is only now just beginning to unfold. Like all major technological change, the impact can be a double edged sword for rural places with both desirable and potentially undesirable consequences.

The dramatic genetic, chemical and mechanical technological advances of the past 50 years have produced great benefits to society as a whole resulting in lower cost and widely available food and profitable agribusiness opportunities for those that have successfully applied these technologies. At the same time the impact of technological change on rural communities and individual farm families has been mixed. Along with dramatic increases in farm productivity has come a challenge for rural communities of dealing with the loss of local families as farms consolidate and resulting impacts on local commerce and public
The growing availability of high speed access to the Internet in rural locations has created optimism among many that these new technologies can help create new opportunities in rural communities to reverse the loss of population and tax base facing many of our smaller rural communities. Indeed there are many good examples of just that. One of the more dynamic examples is the community of Forks, Washington that has set about reinventing itself after the dramatic loss of its forestry and fishing resource base in the mid-1990s. Focused explicitly on the goal of stopping the “export of its youth” Forks for the past 10 years has systematically taken steps to introduce on-line technology as a tool for accessing education and health care resources from outside the area; supporting new job development and improving community access to local services. While still a work in progress, the community does indeed seem to be turning the tide.

Other good examples can be found in communities of Northeastern Washington that also are systematically pursuing strategies to deal with declining employment and income opportunities in natural resource and agricultural communities. In the community of Colville, approximately 60 people now have full time jobs in this small rural community of less than 5,000 people that are directly tied to employment with Seattle area companies utilizing the Internet and telecommunications linkages. Further to the north in Ferry County, a new economic development strategy is unfolding with the creation of a “Virtual Frontier”. The Virtual Frontier will provide a common web site local entrepreneurs can use to sell their products to distant customers, while providing order fulfillment and business support services to entrepreneurs over hosted online space. These are just several of many great examples of rural communities utilizing the Internet to reinvent themselves.

Specific to the farm sector, the opportunities are again just emerging. Not only can farmers check the weather online and plan their harvesting or do online banking. They can create online communities where they can do the type of purchases where they had to be present to evaluate the product in the past (for example the sale of animals), and they can lower the costs of the products dramatically, since they can access products all over the world. Farmers can build new partnerships and expand their credit and sales opportunities. Having more information available, farmers can improve the quality of their decisions. They can combine web technology with precision agricultural systems to effectively manage chemical or water applications in the field; the end result being greater productivity and profitability for farms that are successful in adopting these on-line technologies.

Looking to the future, the challenges lie in eliminating barriers making it easier for farm operations and rural residents and business to access the benefits of the web; but also in taking steps necessary to minimize the potential undesirable consequences of expanded use of the Internet.

Among the immediate challenges is ensuring that rural places including the surrounding farm properties are adequately served with the opportunity to access the web using broadband technologies. There is hope in emerging new technologies and in particular those associated with a new generation of satellite and fixed wireless services. However, the availability of affordable and accessible broadband technology does not necessarily translate into the effective application of those technologies to support farm and rural needs. Advocacy is needed to ensure the software being developed considers the special needs of farms and rural businesses and that training and education is widely available to support the adoption of technology and integration within farm operations and rural lifestyles. Adequate education and training access is required to ensure those that can benefit for web technology have the skills and confidence to use it.

Some worry, and rightfully so, if farmers and rural citizens expand their use of the Internet to purchase
supplies and services, the net economic benefit for rural places will be negative as business is drained away to other locations, much as the interstate highway system made it easier for local residents to go elsewhere to shop. This indeed is a realistic scenario that must be anticipated and addressed up front. The answer however does not lie in resisting a powerful new technology that can be beneficial and in fact is inevitable. Rather the answer lies with getting on board early and strategically finding ways to make sure the new digital highway results in channeling more dollars into the local community than will be lost. This indeed is possible.