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Through the eyes of the potato| Northwest land grant universities and pest management research

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Through the Eyes of the Potato:
Northwest Land Grant Universities and Pest Management Research

by

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B.A. Colgate University, Hamilton, NY, 1997

presented in partial fulfillment of the requirements
for the degree of
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According to a United States Department of Agriculture poll, the average American consumes 142.7 pounds of potatoes per year. A large portion of those potatoes are grown in the Northwest; Idaho alone produces approximately 30% of the country’s potatoes. Yet, the high yields of conventional potato production come with high costs - to human health, ground water and drinking water, and to the very soil in which the potatoes are grown. Many of these impacts are associated with the widespread use of pesticides in potato production.

For over three decades, environmental organizations, alternative farmers, and concerned citizens have outwardly criticized the extensive use of pesticides in this country’s food production system. Often these critics call for increased research on alternatives to pesticides through public institutions. This paper addresses the role of Land Grant Universities in a potential shift towards an increase in research relating to alternative/non-toxic approaches to potato pest management in the Northwest. Land Grant Universities are the largest system for publicly endorsed agricultural research in this country, and therefore hold the responsibility of conducting agricultural research for all citizens - both farmers and consumers alike.

For this thesis, I cover two main objectives: 1) assess the current status of research related to pest management for potatoes at the University of Idaho and Washington State University, and 2) identify the major influences upon the direction of research on potatoes at these universities. I give special attention to comparing the research and educational programming specifically devoted to alternative and non-toxic pest controls (i.e., methods of reducing the need for the use of pesticides) and conventional pest controls (i.e., pesticides and associated technologies). I use interviews and a document analysis to portray the perspectives and research orientations of researchers working in potato pest management in two prominent potato research programs.
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In the fall of 2001, I attended a Seed Potato Conference sponsored by the Montana Potato Improvement Association in Missoula, Montana. The conference focused on instructing farmers in pest control and virus management in their seed potatoes. I sat in a large auditorium, filled with men in plaid flannel shirts and worn jeans, listening intently to experts talking in scientific terminology about the problems that can arise in a potato field. The farmers had many questions for the scientists after the lecture, questions that related to their fears of losing entire crops to pests, and other questions about how to ensure the highest yields. The scientists answers were often given in words such as metribuzin, chlorothalonil, diquat and methamidophos - all of which are pesticide chemicals.

In the main room outside the auditorium, corporations displayed their chemical products with handouts, information, and sometimes free samples. Although there was some discussion on alternatives to pesticides, these were addressed minimally at the conference. Not one table among the twenty or so set up in the hall offered the farmers information on alternatives to pesticides for seed potato production. I picked up some free magazines on my way out. Spudman and Potato Grower featured pesticide products for potatoes on almost every page. I felt inundated and overwhelmed by the heavy emphasis on pesticides - I could only imagine how the farmers felt.

Potatoes are a major commodity in the United States. According to a United States Department of Agriculture poll, the average American consumes 142.7 pounds of...
potatoes per year (USDA 1998). A large portion of those potatoes were grown in the Northwest; Idaho alone produces approximately 30% of the country's potatoes, while Washington produces 21% (NASS 2000). Yet, the high yields of conventional potato production come with high costs to human health, groundwater and drinking water, and to the very soil in which the potatoes are grown. Many of these impacts are associated with the widespread use of pesticides in potato production.

For over three decades, environmental organizations, alternative farmers, and concerned citizens have outwardly criticized the extensive use of pesticides in this country's food production system (Beeman and Pritchard 2001). Often these critics call for increased research through public institutions on alternatives to pesticides (Beus and Dunlap 1990; Friedland and Kappel 1979). Much of this disapproval seems to end up on the shoulders of researchers and extension educators of the largest system for publicly endorsed agricultural research in this country - Land Grant Universities.

Two of the speakers I heard at the conference were researchers from Land Grant Universities (LGUs) in Idaho and Washington. For over a hundred years, LGUs have been prominent voices in the agriculture arena by conducting research and providing information to farmers. LGU researchers and extension educators spend time generating and disseminating information to farmers. At the conference, the information shared with farmers was very pesticide-focused and academic. This "conventional" approach has become a main point in the critique of LGUs by the modern sustainable agriculture movement (Beus and Dunlap 1990).

This study is an attempt to sift through LGU critiques and literature on a complex potato industry and learn more about what really drives research in potato pest
management at two LGUs in the Northwest today. According to Thomas Lyson (1998), it is important to gain the perspectives of LGU researchers when assessing the direction of public agricultural research:

Despite the growing perceived importance of agricultural sustainability in the activities of land grant universities, there is a surprising lack of knowledge concerning the extent to which agricultural scientists themselves view this issue. Obviously, for agricultural sustainability to become a salient organizing concept for teaching, research, and outreach, a better understanding is needed of how sustainability is perceived within the land grant sector. (Lyson 1998: 128)

In keeping with this idea, I interviewed some of the foremost potato researchers at LGUs in the Northwestern United States to better inform this assessment of LGU research on potato pest management. This paper explores the influences and perspectives of Land Grant University researchers in potato pest management to best inform how these schools might assist in adapting alternatives to pesticide use in potato production in the Northwest.

The main audience for this paper is the Northwest Coalition for Alternatives to Pesticides (NCAP), a non-profit organization with a membership base in Oregon, California, Idaho, Washington and Montana. The group’s work involves a broad and diverse coalition of concerned people intent on creating an environmentally and economically sound agricultural system. The overall aim of this thesis is to create a report on potato production research in the Northwest that can inform a small portion of a larger, more intensive study by NCAP to develop a strategy to effectively influence LGU research agendas and facilitate collaborative actions to meet these ends. This information
will help the group make strategic choices for a successful campaign to advance sustainable potato farming in the region.

Given the significance of potatoes in the region’s agricultural economy, NCAP’s work has broad application. Their ability to leverage change in how pesticides are used in potato production will clearly benefit both human and environmental health. The mission of the Northwest Coalition for Alternatives to Pesticides is to work to protect people and the environment by advancing healthy solutions to pest problems. This project supports one of the three program goals in NCAP’s strategic plan: “To increase adoption of alternatives to pesticides in agriculture.”

Project Objectives

For this thesis, I cover two main objectives: 1) assess the current status of research related to pest management for potatoes at the University of Idaho (UI) and Washington State University (WSU). and 2) identify the major influences upon the direction of research on potatoes at these universities. I give special attention to comparing the research and educational programming specifically devoted to alternative and non-toxic pest controls (i.e., methods of reducing the need for the use of pesticides) and conventional pest controls (i.e., pesticides and associated technologies). Because the project needed a good overview of the structure of the Northwest potato industry in Idaho and Washington, I identify the groups, grant programs and companies that most influence the direction of university research and extension programs. Additionally, I offer recommendations for effective techniques that could be enacted to influence the potato pest management research agendas at UI and WSU.
Methods

The methodology I use in this study consist of 1) literature review, 2) analysis of research project documents, and 3) in-depth interviews.

Literature Review

The literature review portion of this paper comprises the foundation for Chapter Two, which is a background of potato production, pesticides and their environmental and human health impacts, and a history of Land Grant Universities. To fulfill this research need, I read various literature explaining everything from the physiology of the potato plant to the diseases, insects and viruses that are common in potato farming. Additionally, I attended the Thirty-Sixth Annual Montana Seed Potato Seminar in Missoula, Montana, in the fall of 2001, sponsored by the Montana Potato Improvement Association, and read articles in publications created for the use of potato growers, such as Spudman and Potato Growers.

Research Project Documents

My original intentions for researching this paper were to obtain documents from the University of Idaho and Washington State University’s Research Offices that identified the research projects currently (and over the past five years) devoted to pest management on potatoes. I had planned on receiving these documents including information on project funding, and abstracts that outlined the goals of each report. However, due to either the Research Offices’ unwillingness or inability to provide me with this information, I was not provided with such information and thus was forced to
change the course of my research. I decided to work with the limited information which I was provided by the Research Offices, and use it to identify prominent potato pest management researchers at UI and WSU. I then began an interview process with these researchers in order to gain an understanding of what types of research projects were being conducted and who influences such research at these two universities.

**Interviews**

I conducted interviews with 18 researchers at the University of Idaho and Washington State University. These researchers cover a wide geographic range in both states, from research stations and campuses across Idaho and Washington. They also span a range of expertise, studying issues related to potato production from insects to fungus.

Of the 18 interviews, I conducted nine of them with researchers working through the University of Idaho in the fall of 2001 as part of my preliminary research. I chose the researchers for these nine interviews based on a snowball method, in that I identified a few researchers in potato pest management and interviewed them, then asked who they felt I should talk to next.

In the spring of 2002, I conducted nine more interviews, including four at the University of Idaho and five at Washington State University. The questions focused on researchers' perspectives of current problems with potato production in the Northwest, studies they were working on to find solutions to pest problems in potatoes, and their sources of institutional support and research influence (see Appendix A). The method I used in choosing this second set of researchers was based on data I had collected from the
research offices at both universities. From this information, I attempted to target those researchers with the greatest levels of funding, and the largest portions of research projects in potato pest management.

The limitations to this interview method are that the researchers’ willingness to share varied, and subsequently I did not obtain information at an equal level of detail for all researchers. In addition, the interviews represent only a portion of the various perspectives held by researchers at LGUs in the Northwest. The 18 researchers I interviewed represent approximately half of the total amount of researchers at the two universities who focus on potato pest management research. If time had permitted, a larger sample group of researchers would have increased the array of ideas presented by these people. Furthermore, I was not able to obtain abstracts or project reports from all the researchers, thus limiting my range of data for certain researchers. Originally, I had hoped to use the interviews to complement my data on specific projects from the research offices at each university. yet the interviews became my primary data when the research offices proved unwilling or unable to comply with my request.

Additionally, from my preliminary research I determined that the potato commissions in Idaho and Washington are a major funding influence on the research that is conducted at the universities. Potato commissions are state organization run by growers and processors. Commissions are primarily concerned with expressing the general needs of the growers and processors in the potato industry as well as marketing their state’s potato for maximum sales. I conducted research on these commissions in Idaho and Washington, including history, purpose and structure of the organizations, as well as researchers’ perspectives on these commodity groups.
Data Analysis

I interviewed a range of researchers who are doing projects on a variety of potato pest management issues. I originally set out to follow the widely used typology developed by Beus and Dunlap (1990) which explains the opposing paradigms of conventional and alternative agriculture. Yet, I found that not all the projects fit into a definitive conventional or alternative category, and I thus attempted to complement these categories with a wider range of descriptive terms. These terms include conventional, chemical efficacy, integrated pest management, and alternative. I conducted research on similar studies, such as Beus and Dunlap (1990), and subsequently designed the categories I anticipated would emerge. Using this technique, I had established these categories prior to analyzing the content of each interview, rather than looking for these categories and themes to emerge from the data (Berg 2001).

After transcribing or taking notes on the interviews, I read and listened to each interview at least three times. I then coded the data into the categories described above, as well as into other major themes that emerged. These themes included funding sources, perceptions of problems facing growers, and types of solutions researched. From this information, I was able to see commonalities among the researchers, and noted those researchers who held views that differed from the others. This broad categorization serves the primary purpose of identifying the current state of potato pest management research at two LGUs in the Northwest. Ultimately, this will provide a clearer understanding of the potential of these schools to shift towards an increased emphasis on alternatives to pesticides.
In order to analyze the influences of the Potato Commissions, I obtained documents from the Idaho and Washington State Potato Commissions regarding the potato pest management research projects they support through the universities. I analyzed the research proposals, specifically focusing on the main objectives and the methods section, as well as terminology used in the proposal (i.e., IPM or pesticides), and subsequently applied each proposal to a defined category similar to those described above. Again, I defined the terms before reading and analyzing each report or abstract in detail.

For each report, I wrote the category name (i.e., conventional or IPM) on the first page, and placed it in a tally for each particular year. I then covered the category name I had written on each report and read them each again, following the same procedure to ensure I would categorize each report with the same definitions and guidelines and obtain the same categorization both times. I analyzed a total of 43 projects from the WSPC and 57 from the IPC, to make a total of 100 projects considered.

**Thesis Overview**

Chapter Two of this paper provides background information on the Northwest potato industry, pesticides used in potato production and some of their impacts on the environment and human health. I also discuss the history of Land Grant Universities and their role in agricultural research. Chapter Three is an analysis of the interviews I conducted with UI and WSU researchers, and includes their perspectives on problems in the potato industry, current solutions for pest problems they are researching, and funding sources and influences for their research topics. Chapter Four examines the role of state
potato commissions in LGU research including their purpose and structure, and the types of projects they support through the University of Idaho and Washington State University.

Finally, Chapter Five offers my conclusions as well as ideas on potential next steps in influencing LGUs to conduct increased research on alternatives to pesticides.
Potatoes: From Field to Plate

Potatoes are an integral part of the local economy for many communities in the Northwest. Both the industrialization of agriculture and the emphasis on maximizing production favor large farms (4,000 - 10,000 acres) with high-yields and force smaller farms out of business or to increase the scale of production (Strange 1988). In addition to the deleterious effects of high-cost, industrialized potato farming on local economies in the Northwest, some scientists are beginning to assess the impacts that intense pesticide use is having on human health and soil and water quality. Research shows that a number of the commonly used chemicals in potato production not only have negative health effects, but they are also surfacing in groundwater (USGS 1996).

In this chapter, I take a critical approach in analyzing the potato industry in the Northwest, including an assessment of the main reasons for pesticide use on potatoes. I outline the process of applying pesticides to potato crops and discuss the effects these chemicals are having on the environment and human health. This assessment helps to identify the problems that potato growers in the Northwest are facing and the common solutions that are currently in use. A large part of growers' decisions on what pest management practices to use relates to the demands of consumers and processors, along with what research is available to them, and what research they deem credible. For this reason, Land Grant Universities play a critical role in driving pest management practices for potato production in the Northwest, for they are a major research entity that is accessible to growers throughout the region. As a foundation for assessing the current
state of potato pest management research through LGUs in the Northwest, I explore the history of LGUs and their involvement in the potato industry.

The Potato and a Complex Industry

The potato is an ancient cultivated plant, traced hundreds of years back to early natives of Peru and the South American continent (Hawkes 1990). *Solanum tuberosum* is an annual, herbaceous plant belonging to the Solanaceae family, which includes eggplant, tomato, tobacco, and nightshades. Tubers arise on underground stems and new shoots are produced from them (Smith 1968). There are approximately 230 species of the wild potato, giving the domesticated potato more wild related species than any other cultivated plant (Zuckerman 1998). The potato is known for its versatility - it can be grown on many different types of land, stored for long periods of time, and it is a nutritious food that can be prepared in numerous ways. There are significant amounts of iron, thiamine, vitamin C and riboflavin in this high-carbohydrate, low-fat food (Hawkes 1990; Dean 1994). This combination provides a good source of energy, which Americans must enjoy, because according to a United States Department of Agriculture (USDA) poll, the average American consumes about 143 pounds of potatoes per year (USDA 1998).

The Northwest region of the United States boasts the largest potato production area of the country. Idaho alone produces 30% of the country's potatoes, and Washington 21% (NASS 2000) (see appendix B). Idaho's elevation, temperatures, abundant water supplies, and fertile volcanic soils make this state an ideal environment for growing potatoes (Schlosser 2001). In the year 2000, farmers grew and harvested 413,000 acres of potatoes in Idaho, and 175,000 acres in Washington (NASS 2000).
Those statistics make Idaho the number one potato-producing state in the country, and Washington is ranked the second state in potato production.

Driving along a trucking road in central Idaho last October, I passed a potato storage facility. Potatoes were outside the building in piles reaching about 25 feet high, and spanning approximately 400 yards. A back hoe operator was maneuvering his vehicle between the potato piles and a train, where he was filling the open train cars above the rim with these vegetables. At first I thought large rocks were filling the train cars, but as I slowed my truck and took a closer look, I saw some of the “rocks” had fallen and were cracked open to reveal the natural tan color of potato flesh. Some of these potatoes seemed the size of footballs, and I marveled at the massive amount being prepared for a train journey.

Later, during an interview with a University of Idaho potato researcher, I was told that these large potatoes were most likely being shipped to processing plants to be turned into granulated or dehydrated potatoes, and that this shipping process is an almost daily event! According to the USDA, over half of the potatoes consumed in the United States each year are processed in some way (USDA 1998). The processing industry for potatoes is enormous. The USDA collected data in 1998 regarding potato uses and found that of the 142.7 pounds of potatoes consumed by the average American, only 48.1 pounds of these are fresh potatoes, while 58.9 pounds are frozen, 18 pounds are dehydrated, 16 pounds are potato chips and 1.7 pounds are canned (USDA 1998) (see appendix C). This emphasis on the processing of potatoes proves to be an important characteristic in determining who influences the potato industry because it defines the quantity of potatoes grown, as well as the agricultural techniques needed to produce such a large quantity of
potatoes with the specific characteristics the processors want. The processing industry shapes how farmers are planting, treating, and storing potatoes.

An example of the extensive influence of potato processing is apparent within the frozen French Fry industry. There are three main corporations that control approximately 80% of the American market for frozen French Fries: Lamb-Weston, McCain, and Simplot (Bean and Runsten 1993a; Schlosser 2001). Simplot is the smallest of the three, and it processes 1 million pounds of potatoes each day. The potatoes used for frozen French fries are usually Russet Burbank- which make the much-loved long, thin French fry. In fact, fast food restaurants dictate a great deal of the frozen French fry industry, as 90% of French fries consumed are purchased at fast food restaurants (Schlosser 2001).

The potato processing industry exacerbates the issues of poor environmental quality caused by potato production. A major conclusion of a study conducted in the Columbia River Basin about the effects of the potato industry is:

...states’ failure to protect ground water from contamination and overdraft by the (potato) industry has resulted in widespread contamination of water supplies and depleted aquifers in potato growing and processing areas of the Columbia Basin. McDonalds’ drive for uniformity in the shape and quality of the tuber which becomes the frozen French fry, and the requirements of the industrialized production and storage of potatoes for year round processing, have encouraged heavy use of fertilizers and pesticides in potato production. (Bean and Runsten 1993b: 3)

Large corporations, such as Simplot or McCain, often sign contracts with farmers detailing the variety and manner in which the potatoes must be grown, and many detail the amount and type of pesticides to be used. In this form of production, farmers supply their land and labor while the corporation contributes such necessities as the seed.
potatoes; some farmers appreciate the financial stability this provides. Yet critics, such as William Heffernan (2000), note that contracting with corporations symbolizes the trend in economic concentration among processors that does not benefit the producer. According to Heffernan (2000: 66), contracting allows for corporations to “have a disproportionate amount of influence on the quality, quantity, type, location of production, and price of the product at the production stage and throughout the entire food system.” Furthermore, during the growing process, the corporations make all the major decisions, and growers can be dropped at any time (Heffernan 2000).

According to the researchers I interviewed, today more and more farmers are contracting, and fewer sell on an open market. A drawback mentioned by a few researchers is that contracting production has a large emphasis on cosmetics - apparent in both the frozen and fresh potato markets - and is a major contribution to intense pesticide use on potatoes. The potatoes are expected to have a blemish-free appearance, and to create such potatoes, the farmer must spray, fumigate and dust with maximum coverage to create the perfect product.

In an open market, farmers grow potatoes on their own terms and try to sell to multiple buyers. For some growers, this is a good option because there is less corporate control of their agricultural techniques. Along with this independence, however, comes the instability of not obtaining the money upfront when planting time comes, as well as going through the process of marketing their potatoes themselves. In such a fluctuating industry, it is not always easy for farmers to find buyers. Researchers related a fear that farmers have of investing their time and money into producing potatoes, only to have the entire crop rot in their fields because they cannot find an interested buyer. According to
researchers, this has happened in the past when yields outnumber demands, and for growers, contracting is one way to ensure this fear will not materialize in their fields.

In addition to processing, another important factor that affects pesticide use on potatoes is the variety of seed. There are a number of varieties of domesticated potatoes (cultivars) that a grower can choose from. The number of varieties currently grown and processed in the Northwest is limited, however, and does not reflect the many varieties available for cultivation. There are about fourteen cultivars in the United States that make up the largest amount of potatoes in production (Dean 1994). The number one in production is the Russet Burbank. Russet Burbank potatoes constituted 78% of potato acres planted in Idaho in 1992 (Love 1993). Although the most popular overall, and the favorite for processing (Rowe 1993), this variety is not the most efficient because it has a medium to high yield yet is susceptible to all common potato viruses (Love 1993). This monoculture approach and reliance on few genetic resources in agriculture can be detrimental to the health of the soil and crop (Altieri 2000). Potato production would benefit from a wider use of varieties (Love 1993).

**Pesticide Use on Potatoes**

Northwest potato production relies heavily on pesticides, and regionally potatoes are the most pesticide-intensive crop grown in the region, using approximately 60 million pounds of pesticides per year (Farm Chemicals Handbook 1995). According to recent studies, potatoes are one of the top ten most pesticide-laden crops in the country (CUUS 1999). Studies conducted in the Northwest indicate that this high pesticide use is at a cost to the environment and human health. Pesticides common in potato production
are being discovered in groundwater, and the Environmental Protection Agency (EPA) has deemed some of the active ingredients in these pesticides carcinogenic (Dannaker et al. 1993).

Potatoes are an asexually propagated plant, a characteristic which tends to make them more vulnerable to viruses, insects and disease. As a result, potatoes generally are treated with a variety of chemicals throughout the growing, storage, and processing periods. The term pesticide refers to a broad category of chemical and biological substances used in agriculture (and many other settings). The EPA (2002) notes on their website, “though often misunderstood to refer only to insecticides, the term pesticide also applies to herbicides, fungicides and various other substances used to control pests.” In this paper, I will use the definition of pesticide established by the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and used by the EPA. According to this act, the term pesticide means: “1) any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest, 2) any substance intended for use as a plant regulator, defoliant, or desiccant.”

A pesticide use survey showed that U.S. potato growers rely heavily on pesticides. According to the survey, U.S. growers used 67 different pesticides during the years 1990-94 (Guenthner et al. 1999). It is a matter of assurance for the growers that they will be able to get by without significant yield reductions due to pest damage. After all, it is beneficial for a farmer’s well-being to ensure a crop with maximum yield and maximum quality. Additionally, the average consumer in the United States has come to expect a plentiful supply of high quality, low-priced potatoes (Guenthner et al. 1999).

The following explanation is an attempt to illustrate an average chemical
application process for pest management in potato production. This process does not include other practices such as scouting (looking for insects in potato fields before applying insecticides) or soil sampling (looking for insects such as wireworms before fumigating), which are important steps in potato pest management that do not involve pesticides, but that are often used to predict when to apply pesticides (Rowe 1993).

Pesticides are used at many stages of the potato production process beginning with the seed-piece treatment. One crucial step in ensuring a healthy potato crop is to use a healthy seed potato. If the seed potato is even mildly impure, the crop will be more susceptible to virus and disease. According to a Potato Management Guidebook (Slack 1993: 61), "the use of certified seed potatoes is the foundation of any management program designed to maintain a healthy potato crop." Pesticides are used to prevent disease that will spread and cause the seed-piece to rot. Farmers who grow seed potatoes must work hard in keeping their crop pure, as there are potato seed-certifying agencies that certify the potatoes as virus-free and pathogen-free (Smith 1968).

Before actual planting of the seed-pieces, farmers use a soil fumigant to control nematodes and pathogens (disease), including Potato Early Dying, which is caused by Verticillium, a fungus in the soil. Fumigation is an expensive procedure that entails the use of specific equipment, and furthermore, "fumigation completely alters the community of living organisms in the soil and thus may have unintended side effects... soil microorganisms that normally play a role in nutrient cycling or herbicide breakdown are killed" (Rowe 1993: 16).

Sometimes farmers take further steps to control nematodes by applying a chemical during planting. The insecticide is absorbed by seedlings to kill insects that eat the leaves
for the next several weeks. This also helps prevent damage caused by wire-worms, which leave small holes in the potatoes which marks them as blemished for fresh pack (Dean 1994).

Next, as the potatoes begin to grow, herbicides and insecticides are often applied. Farmers apply a combination of two to four insecticide applications to help get rid of problem-causing insects. This often occurs when leaves and branches of the potato plant show above ground and while roots are developing in the soil. During this time, farmers can also dust the crop for aphids every two weeks. Aphids transmit the leaf-roll virus which causes net necrosis, a brown spotting on the skin and flesh of a potato. This is a purely cosmetic problem, yet it can destroy the grower’s chances of selling the potatoes for fresh pack or frozen French fry processing (Dean 1994).

During the season, further pesticide applications vary according to the climate and weather conditions for a particular area. For example, in a particularly rainy growing season where the soil is moister than usual, more preventative measures might be taken to control Late Blight, which tends to spread quicker in damp conditions. If there is a problem with Late Blight in the area, the grower might have a weekly fungicide spraying schedule. Late Blight is known as one of the most devastating diseases of potatoes in the world, and that which caused the Irish potato famine in the 1840’s (Rowe 1993). The grower may also use fungicide applications for Early Blight. Additionally, there are a range of insecticides used depending on the particular insects that may create problems on potatoes in the grower’s area.

During this process, some of the pesticides and fertilizers are added to the irrigation system (known as chemigation) which often entails ten weekly sprayings of
chemical fertilizers. The final step is to kill the potato vines (referred to as “vine-kill”) shortly before harvest begins, in order to prevent bruising or scuffing the potatoes during the digging process. This may be done using a chemical desiccant (Dean 1994).

Yet the pesticides do not stop when the potatoes are taken from the field. The storage of potatoes is very critical in maintaining tuber health and quality appearance. Potatoes tend to sprout in storage, and there are various chemical sprout inhibitors that can be used (Plissey 1993). Furthermore, potatoes in storage are susceptible to viruses and diseases, such as Fusarium dry rot, and thus coating the potatoes with fungicide sprays before and during storage (and even as the potatoes are removed from storage) is common (Plissey 1993).

Although not every grower includes each application step described above, it is clear that potatoes go through a process of chemical inundation from seed-piece to storage. Such an exorbitant amount of pesticide application is not uncommon in potato production, yet it is not without costs to the environment, human health, and grower’s economic livelihood.

**Effects of Pesticides**

Negative impacts on water quality are the main environmental problems associated with pesticide applications on potatoes in the Northwest. Because potatoes are grown underground, the soil and groundwater near the potato crop tend to be more negatively impacted by soil fumigants and related chemicals than with other plants (CUUS 1999). Many of the soils that are best for potato production have low water-holding capability, causing percolation of chemicals and nitrates into groundwater to
become problematic (Bean and Runsten 1993a). Potato plants have a shallow root zone that can maintain normal amounts of nitrogen, yet if there is too much nitrogen in the soil from improper management, the residual nitrogen tends to leach out of the root zone and can contaminate the groundwater (Rowe 1993).

Runoff is a term used for a hydrologic process that moves pesticides from the target area. Runoff brings pesticides in water across the surface of the soil, presenting a serious risk to water quality in the area (Renner et al. 1990). There are at least four major use pesticides in potato production, including Chlorothalonil, Diquat, Phorate, and Pendimethalin (Guenthner et al. 1999), that are considered as having high run off potential (Renner et al. 1990).

Groundwater contamination from the production and processing of potatoes is widespread, particularly in the mid-Columbia River Basin. The problems occur mainly in the alluvial or “perched” aquifers close to the surface (Bean and Runsten 1993a). Contaminated groundwater is extremely difficult and sometimes impossible to clean. Furthermore, it is difficult to detect until it appears in a well, and is expensive to test for.

In addition to the deleterious effects of these pesticides on ground and drinking water, pesticides can have a grave impact on soil quality, wildlife, and fish. Significant numbers of fish and other wildlife are killed by pesticides each year (Altieri 2000). According to a 1990-94 pesticide survey, phorate is the second most popular insecticide to use on potato crops. Phorate is an organophosphorous chemical that was withdrawn from the market in British Columbia due to a study that related phorate to secondary poisoning deaths of birds of prey (Elliot et al. 1997).

Pesticides can also affect human health in numerous ways. Studies have been
conducted on the effects of agricultural chemicals on human health in which pesticides are implicated in numerous human diseases, including cancer and sterility. It has been estimated that 6,000 people each year die from pesticide exposure (Pimmentel et al. 1999). Many more suffer illnesses from these chemicals. Furthermore, over 60% of agricultural herbicides used in the United States are reported to disrupt the endocrine and reproductive systems of animals (Short and Colborn 1999). Organophosphates are a group of insecticides that are common in potato production. Because organophosphates are nerve toxins, they “are responsible for most of the occupational deaths and poisonings in the U.S. and throughout the world” (Reeves et. al 1999: 18). Additionally, a 1999 study showed that organophosphorous pesticide residues were detected in potato tubers and prepared products (Soliman 1999).

High rates of pesticide inputs in potato production result in exorbitant costs to the farmers. The average potato farmer in Idaho spends roughly $1,950 an acre to grow a crop that in a good year may earn him $2,000 (Pollan 2001). Since 1980, the amount of potatoes grown in Idaho has almost doubled and the average yield per acre has increased by almost 30% (Schlosser 2001). These statistics seemingly represent a thriving agricultural economy in Idaho and a healthy foundation for potato-growing communities. According to the Columbia Basin Institute’s report on the processed potato industry, fertilizer and pesticide expenses are 54% of growers’ costs in the production of potatoes for processing (Bean and Runsten 1993a). The farmers are simply spending too much on inputs and not getting enough in return.

Yet, farmers do not always want to use this amount of chemicals on their potato crop. They are simply trying to ensure a viable potato crop in order to make a living.
Additionally, research in other agricultural sectors has shown that farmers might be willing to use alternative techniques if information on them was more easily available (Hassanein 1999). Pimentel et al. (1991) suggest that it is technologically feasible to reduce pesticide use in the United States 35-50% without reducing crop yields. Why isn’t the average potato farmer adapting such feasible techniques to reduce pesticide use? One possible answer is that there is a substantive lack of research and information on alternatives to pesticides available to these farmers. As an information resource to farmers for well over 100 years, Land Grant Universities in the United States play a critical role in disseminating cutting-edge agricultural research to growers and the public.

**Land Grant Universities: History and Critique**

Due to the fact that LGUs have the distinct responsibility of representing a diversity of needs in a complex agricultural system, these institutions have often been the center of much criticism regarding the proper methods and topics for research studies. Recent sustainable agriculture and related social and environmental movements have increasingly expressed a dissatisfaction towards LGUs and groups have begun to look elsewhere for information supporting a broader agricultural focus and alternatives to pesticides (Hassanein 1999). G. Edward Schuh reflected on these criticisms in a paper presented at a meeting of the Southern Agricultural Economics Association in 1993:

This (land grant university) system is under a great deal of stress, ranging from a decline in financial support, to charges of lack of relevance, to complaints about too much emphasis on research and not enough emphasis on teaching to questions about what faculty actually do with their time and attempts on the part of state legislatures to regulate faculty time in the classroom. These stresses are a reflection of changes in the economic, political, and
As Schuh suggests, the recent and longstanding critiques of LGUs are manifold and place pressure on the universities to enact changes within their agricultural research programs. In some instances, LGUs have responded to these criticisms by altering goals and appeasing some public concerns, resulting in institutions that are not static, but rather have changed greatly over time.

The origins of LGUs marked a time in the United States when thoughts surrounding agriculture were largely centered on beliefs of farming as virtuous and heroic. These perceptions were central arguments of the "agrarian" and "Jeffersonian" beliefs. These ideologies lauded farmers for their ability to provide basic needs such as food and fiber to the American people. In response to these popular beliefs, as well as pressure to create a source of economic viability for America, Congress passed the Morrill Land-Grant College Act in 1862. This act provided land that could be sold by the states for the creation of colleges which would teach the scientific principles of agriculture (Danbom 1986). This was also the year Congress created the United States Department of Agriculture (USDA), which further emphasizes the government's desire to place great importance on the agricultural activities of this country, focusing on the potential financial returns.

The motivations surrounding public research institutions were to create greater economic security and to promote science as a necessity to all fields of research, including agriculture. This created an image shift to occur from the "virtuous" farmer to a farmer who was incapable of understanding and putting to use scientific principles, and
thus the farmers now needed their own scientists to extend this knowledge into the fields and throughout the food system (Danbom 1986).

The land-grant system was soon expanded to include agricultural experiment stations with the Hatch Act of 1887 (Danbom 1986). The purpose of experiment stations was to provide researchers with their own facilities to conduct intensive agricultural research, while also providing a place where farmers could visit and learn how different agricultural techniques worked through first-hand experience. By this time, factions had already been created regarding the extent to which these schools were to serve and represent the public with their research topics.

Farmers, policy makers and scientists harbored different views about what land grants should offer. Some began to question the emphasis placed on science. Was agriculture truly a place for science to reign supreme? A statement by farm editor Clarence Poe reflected this idea of the changing role of farming “from an industry requiring only physical strength to one requiring skill and trained intelligence means that it has now acquired a dignity which it has never had before” (cited in Danbom 1986: 112). And yet, “…self-improvement through scientific advancement was the only way to solve (the problems) which would elevate the farmer and serve the nation. Those who believed otherwise were wrongheads, cranks, or dangerous radicals” (Danbom 1986: 113).

By the late 1800’s a conservatism had developed among agricultural intellectual groups, due perhaps to the professionalism that was created and the emphasis on science. Yet at the same time, the agricultural schools that had been created were not deemed as valuable as more established institutions. It was difficult for these schools to attract
reputable scientists, and thus equally difficult to maintain a quality student body.

As tensions grew within the various factions, farmers started to ask what the agricultural schools were doing for them. Shouldn’t farmers be the main people benefiting from this system? And yet, many farmers expressed a lack of acceptance for the agricultural schools (Hassanein 1999). Agricultural schools became extremely political, because their progress depended largely on political decisions. Furthermore, researchers held and acted on beliefs that did not necessarily represent the good of the farmers or communities.

Tensions continued among land grant schools through the next decades, although the conflicts often remained within small groups, and change within the land grant system was not considered a priority. During the 1960s and 1970s, however, land grant schools came under increased scrutiny, which can be largely attributed to the publication of Rachel Carson’s *Silent Spring* in 1962. This book led to the growing questioning of science’s role in agriculture, and how science was being used to endorse chemical companies rather than to expose the detrimental effects of pesticides (Hassanein 1999). Ardent critics of the land grant system such as author Jim Hightower in his *Hard Tomatoes, Hard Times* (1973) expressed their dissatisfaction with the growing corporate control of land grant research, and the subsequent silencing of consumers and farmers whose health and livelihood were dependent on research results. A common sentiment conveyed at this time was that land grant universities “...served an elite of private, corporate interests in rural America, while ignoring those who have the most urgent needs and the most legitimate claims for assistance” (Hightower 1973: xxvi).
The contemporary sustainable agriculture movement has continued to raise concerns regarding the lack of a balanced approach of LGU research. There has been a recent rise in the influence of environmental and consumer organizations in establishing research agendas at LGUs (Middendorf and Busch 1997). As a result of such influence, the Low-Input and Sustainable Agriculture (LISA) program was established by the federal government in 1987 to support and encourage an increase in sustainable agriculture research projects at these institutions (Harp and Sachs 1992). This program was renamed and is currently known as the Sustainable Agriculture Research and Education (SARE) program. The SARE programs focus on “efforts to bring about farming systems that are more profitable, environmentally sound, and supportive of viable local communities” (SARE 2001). Additionally, some LGUs are beginning to profess the need for alternatives to pesticides agriculture, apparent by the creation of sustainable agriculture centers. Examples of such are the Leopold Center at Iowa State University and the Minnesota Institute for Sustainable Agriculture (MISA) through the University of Minnesota.

Despite the apparent progress towards a more sustainable perspective in research, programs such as SARE are not the perfect answer in seeking a balanced approach to LGU research. SARE is funded minimally in proportion to other programs within the agriculture research and education budget (Gerber 1997). Additionally, a number of researchers have noted in interviews with me that the grants are too time-consuming and the funds provided are not always worth the amount of extra work for such a competitive grant.
The question of who the LGUs are conducting research for has clearly changed over the years. According to Middendorf and Busch (1997: 46), “serving a changing public must include a continuing dialogue with that public. The ‘public good’ in agricultural research will emerge as the broadest possible constituency involved in determining the priorities of research, and social benefits accrue because decisions are more responsive to the full range of public interests and concerns.”

A public dialogue has begun in efforts to reduce pesticides in potato production in the Northwest. There is clearly a serious need for this focus on alternatives to pesticides; the detrimental effects on the environment and human health are reason enough to reexamine the accepted use of high inputs, and to explore options in potato pest management beyond chemicals. Additionally, the pesticides are costing farmers more and more, and simultaneously, farmers must sell their produce into a highly concentrated market where a few corporations dominate. These factors result in a financial strain that can negatively impact the livelihood of Northwest potato growers. Yet potato crops are complex by nature; whereas other primary commodity crops generally have a few major pest and disease problems, potatoes have a complexity of insects, weeds, viruses and diseases that can create major problems in the field and in storage. LGUs could play a key role in altering the current emphasis on pesticides by increasing research conducted on alternative techniques in this complex crop. University of Idaho and Washington State University are two such institutions that could be pivotal links in bringing such research to the forefront in this country’s top potato production states.

Due to the importance of potato crops in the Northwest, and in Idaho and Washington in particular, potato research programs at the public agricultural institutions
of these two states are strong and boast some of the most renowned potato researchers in
the country. The land grant university in Idaho is the University of Idaho (UI), with the
primary campus located in Moscow. The mission statement for UI reads:

The University of Idaho has a distinctive role as a land-grant
university for the 21st Century, which extends statewide through
the Colleges of Agriculture (and other colleges) ... this distinctive
mix of professional colleges and disciplines, with an excellent
liberal education, provides students and external constituents with
a multidisciplinary problem - solving approach to education,
especially well-suited to present and future needs of the state,
nation, and world. (UI 2002)

Washington State University in Pullman, WA is ten miles away across the border,
and is the land grant university in Washington. This school also has a strong potato
research program. The mission statement expresses that “as a premier public, land-grant
and research institution, WSU enhances the intellectual, creative, and practical abilities of
the individuals, institutions and communities that we serve by fostering learning and
inquiry in all their forms.” On the value of leadership, the WSU mission states: “We are
guided by an ethic of leadership and service that recognizes the importance of identifying,
creating, and responding to the interests and needs of WSU’s diverse constituencies.”
This study is an attempt to gain a better understanding about what drives potato pest
management research conducted at these universities and assess the potential for change
towards a greater emphasis on alternatives to pesticides.
Three

Views from Within: University Researchers’ Perspectives on Potato Management

The Northwest potato industry represents a complex system of production, processing and marketing. Land Grant University (LGU) researchers must break down and sort through this complexity by focusing on the intricate details of managing a potato crop. As researchers at publicly funded institutions, they are delegated the task of conducting the most necessary and applicable research, while also standing in a position that is open to public scrutiny.

In order to get a clearer picture of the research conducted at the University of Idaho and Washington State University regarding potato pest management, I talked with researchers to gain their thoughts and perspectives on the possibility of moving toward fewer inputs in potato production. Although some of the researchers work on other crops in addition to potatoes, most of the researchers I talked with have devoted their live’s work to studying the potato. Working in the two largest potato producing states in the country, these researchers are the top in their field nationwide, and often in the world. Their passion for this vegetable was frequently clear when I spoke with them. In the words of one researcher, “I will work on potatoes my whole life and will never get tired of it.” Whether this passion translates into a more sustainable and less toxic potato production in the future remains to be seen.

In this chapter, I relate some of the perspectives of potato pest management researchers at WSU and UI that were expressed to me during interviews. I explain the
interview process and how I chose the researchers in these groups. I then identify the major themes that emerged from these interviews, with researchers’ reflections on the major problems facing potato growers, the research they are conducting, sources of funding, and the various approaches they use in disseminating their study findings. The thoughts from those studying potato pest management expressed in this chapter offer a window of understanding into the influences upon research in this area, and the current state of options available to potato producers in the Northwest.

**Interview Process**

The 18 researchers I interviewed at the University of Idaho and Washington State University cover a wide geographic range in both states, from research stations and campuses across Idaho and Washington. They also span a range of expertise, studying issues related to potato production from insects to fungus. Of the researchers interviewed, six were plant pathologists, three entomologists, two weed specialists, two in traditional breeding, two in administrative positions, one horticulturist, one cropping systems specialist and one extension educator. The extension educator does a small percentage of research each year, so I include him as a researcher. I include perspectives from the administrators as well, but I specify “administrator” rather than “researcher” because they are not currently conducting research at the universities, and I subsequently make reference to 16 researchers when I am referring to research data, and 18 interviewees when I am including the perspectives of the administrators. The researchers focused on potatoes as either their sole topic of study, or at least 50% of their research. In asking researchers why they chose to study potatoes, I was given a range of answers from
"That's what the Dean (of the University) asked me to do," to funding opportunities, to having grown up on a potato farm.

Of the 18 interviews, I conducted nine of them with researchers working through the University of Idaho in the fall of 2001 as part of my preliminary research. I chose the researchers for these nine interviews based on snowball sampling, in that I identified a few researchers in potato pest management and interviewed them, then asked who they felt I should talk to next. Two of the interviews were conducted over the phone, while the rest were in person. My interviews were in a one-on-one setting, although in one instance I was able to interview three of the people together as well as separately. The interviews that I conducted in person were tape-recorded, and later transcribed, whereas for the interviews over the phone I took detailed notes.

In the spring of 2002, I conducted nine more interviews, including four at the University of Idaho and five at Washington State University. The method I used in choosing this second set of researchers was based on data I had collected from the research offices at both universities. I asked the research offices to provide me with a list of all researchers currently working on potato pest management related research topics, any research projects they had conducted over the last five years, the funding source and the funding amount. From the University of Idaho research office, I received a list including the researcher, research topic and funding amount. From this list of 30 researchers, I identified the ten with the most projects and the ten with the greatest level of funding. From this list, I came up with eight researchers with the highest combined scores to interview. However, of these eight, three were retired and one never returned
my phone calls or emails. As a result, I interviewed four from the University of Idaho in
the spring of 2002.

From Washington State University, the list I was given had the researcher, topic
and funding source, but not the funding amount. Thus, in identifying researchers to
interview, I simply made a list of the ten researchers with the most projects and worked
down the list in contacting them. As with UI, some of the researchers on the list had
either retired or moved on to other jobs. In the end, I interviewed a total of five
researchers from this list, but not necessarily the top five in terms of number of research
projects underway.

All nine interviews conducted in the spring of 2002 were over the phone. I tape-
recorded the interviews of those who agreed, and took notes on all of the interviews. My
method of analysis was to identify common themes in the topic areas of research
conducted, the problems the researchers see in potato production, and the source of their
funding. At the end of each interview, I requested that the researcher send me abstracts or
reports from recent studies they have worked on. I did receive some of these reports, and
included them in identifying themes and comparisons.

The limitations to this interview method are that the researchers' willingness to
share varied widely, and subsequently I did not obtain information at an equal level of
detail for all researchers. Furthermore, I was not able to obtain abstracts or project
reports from all the researchers. Originally, I had hoped to use the interviews to
complement data on specific projects from the research offices, yet the interviews became
my primary data when the research offices proved unwilling or unable to comply with my
request.
Overall, the researchers were friendly and willing to talk at length with me regarding their research projects and perspectives on the potato industry. They were approachable and accessible, some even offering to help beyond what I asked of them. Due to their public positions and out of respect for their professional careers, I chose to keep the identity of the researchers anonymous. They are referred to in this paper by the letter code I gave them during my analysis of the data. The following are the themes that emerged from these interviews along with researchers’ perspectives on the direction of potato pest management.

Problems Facing Growers

Researchers' answers varied in regards to problems facing growers in potato production. Even though these researchers work on pest management issues for a living, surprisingly few of the researchers noted that environmental problems related to heavy pesticide use are a major problem in potato production. Instead, they expressed a greater concern for the economic well-being of the growers, noting the instability of the potato industry and the inconsistency with price issues. The three main problems facing potato producers in the Northwest according to researchers are overproduction and land use, pesticide resistance, and specific pest problems. These three dimensions are discussed below.

Overproduction

Three of the 16 researchers stated that the Northwest is producing too many potatoes to maintain a steady price level. Researcher F noted that "tremendous economic
pressures are causing changes in the way farmers operate.” With lower prices and increased inputs farmers are “struggling to make enough money just to survive” (Researcher R). Similarly, Researcher E noted that overproduction causes “tremendous price fluctuations and causes acreage to go in and out, therefore exacerbating pest problems.”

Other researchers expressed frustrations at the “boom or bust” cycle of potato production in this country. In good years, when production is high, researchers notice a trend in increasing acres, and therefore lower prices. The natural result is more growers not making enough profit to continue with such a large production, and subsequently cutting back their potato acreage. Cutting back then causes price increases and more people interested in growing potatoes to take advantage of the higher profits. Researchers note that this waxing and waning of the industry provides little stability for farmers, and particularly growers with smaller acreage cannot survive such economic fluctuations. Accordingly, Researcher O tries to communicate to growers that “top yield is not where agriculture should be.”

In contrast, Researcher H noted that farmers are not provided the opportunity to produce as much as they could due to loss of farmland in the Northwest. She claims that a lack of land for farmers to rotate is the major problem for potato growers in the Northwest, stating the importance of rotating crops between potatoes and other commodities. She asserts that this is becoming increasingly difficult for farmers to do because urban sprawl is limiting the amount of land available for agricultural use.

The concerns of overproduction are reflected in the recent increase in potato acreage (Schlosser 2001). At the same time, the number of farmers has decreased which
means that there are more large scale farms. With these larger farms come more problems; according to one researcher, “the more acres a farmer has, the more incentive he has for pest control.”

Pesticide Resistance and Product Options

With increased chemical pest control, there is another concern voiced by researchers; the possibility of increased pesticide resistance in major pests of potato crops. Researcher G noted that this is currently a particularly imminent issue due to the new environmental requirements and stricter rules and regulations for chemical companies creating pesticides. The newer pesticides are touted to be “softer” on the environment, and researchers are finding that these chemicals generally do not have the lifespan of former chemicals. In other words, plants and insects have developed resistance to them in an average of five years. For example, this proved to be the case for the “miracle pesticide” that worked against Late Blight in the early 1990’s. Most strains of the Late Blight fungus are now resistant to the fungicide Metalaxyl. According to Researcher I, “We never would have had a Late Blight problem, except when it became resistant to Metalaxyl. We haven’t been able to come up with a chemical since then that’s actually a good protectant and systemic product.”

Other researchers noted that in regards to pesticides, growers suffered from a lack of options. Particularly for weed control, Researcher A noted that there are a limited number of products registered, and of the herbicides that are available, a number are ineffective due to developed resistance in weeds. Furthermore, Researcher B noted that when these new “friendlier” chemicals come out on the market, the prices are always
higher than before. This places further economic strains on growers as they try to keep up with the increased price of inputs.

These concerns of pesticide resistance in addition to the constant development of newer pesticides have been voiced by critics of pesticide use. "The reliance on pesticides to deal with crop pests has created the need to continually develop new pesticides. This keeps the farmer on a 'pesticide treadmill' as the older pesticides lose their effectiveness and new ones need to be used" (Altieri 2000: 82). The following section explains specific pests that growers in the Northwest deal with in potato fields, according to researchers, and the problems these pests create.

**Pest Problems**

In addition to problems of overproduction and pesticide resistance and regulation, researchers cited some key insects, viruses, diseases and weeds that pose major problems for growers in the Northwest. Researcher B offered that growers are faced with different problems depending on what will be the end use for their potatoes. For example, the growers will want to control more for a virus that may affect the potato skin if they are growing the potatoes for fresh pack (to sell in a supermarket), as opposed to if they were selling to a French fry processor who will peel the skin off to make the fry. The main pests researchers mentioned are discussed below, and are the focus of a number of study topics for these researchers.

The main insects that researchers mentioned are Green Peach Aphid, Colorado Potato Beetle and Wireworms. Researcher B commented that insect control is not always conducted to manage for the insect itself, but rather to prevent any virus transmission that
may occur due to the insects' presence. For example, the Green Peach Aphid (which can transmit over 30 viruses according to Researcher B) is known to transmit the Potato Leaf Roll Virus, which causes net necrosis in a potato. Net necrosis is a brown spotting that occurs in potatoes that is not harmful if the potatoes are consumed, but they do not have the premium quality appearance that processors and buyers desire. According to Researcher P, "in varieties like the Russet Burbank the Leaf Roll Virus causes necrosis ... Well you can still eat that potato, it's not going to hurt you ... but no one wants to eat a brown-speckled potato. So you control an insect to control a quality factor."

Two major problems that cause serious yield limitations and blemishes are Late Blight and Early Blight. These are both fungi that cause different problems in a potato field. Early Blight infects leaves and immature tubers, and sometimes results in circular lesions on mature tubers (Dean 1994). Late Blight causes much more damage, as it affects leaves and can kill potato foliage within a few days, and can cause extensive rotting in the tubers (Dean 1994). Researcher B noted that Late Blight is "an old disease with a new face. The strains today can take out a crop of potatoes in two weeks by attacking foliage and tubers." Furthermore, Late Blight is difficult to predict and can be carried by the wind from field to field. Researcher I noted, "Late Blight is definitely a devastating, ugly disease. The only way you can deal with it is to be proactive and protect your foliage (with a foliar fungicide). Despite what the growers think, the risk factor is still there when it is sunny and beautiful out, so we recommend for them to spray every 14 days."

The weed problems mentioned by researchers were Hairy Nightshade, Lambsquarter and Red-Root Pigweed. As mentioned earlier, one of the primary concerns
researchers expressed regarding weeds is that there are not enough herbicides on the market to adequately control these plants. Additionally, Researcher G referred to the problem of volunteer potatoes (tubers left in the ground from a previous crop) as a major weed concern in current potato or other crops. He claimed this is also an area of management that could use improved chemicals to integrate into a management program.

According to the researchers, pests in potato crops have a number of different effects, from quality factors to yield reducers. As farm size increases and the wide range of pest problems continues, the solutions generally seem to be the same: pesticides. The following section reflects researchers’ perspectives on current solutions to these pest problems, and their thoughts on the feasibility of alternative techniques.

**What Research Is Being Done?**

The research conducted in the area of potato pest management at the two schools is multi-faceted. I interviewed a range of researchers who are doing projects on a variety of potato pest management issues. Beus and Dunlap (1990: 593) note that “it is impossible to separate clearly the practices and technologies which make up agriculture from the beliefs and values that underlie them.” Thus, in presenting a picture of the different research topics and categorizations of themes at UI and WSU, I hope to portray the values of the researchers themselves and the values of the industry they represent. Table 1 displays the definitions I applied in my analysis of researcher interviews, particularly in the process of categorizing researchers' orientations. The following section presents the research topic themes among the 16 people interviewed who are currently conducting research projects.
### Table 1. Definitions of Project Categorizations

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional</td>
<td>Those projects that focus on studying pesticides as solutions to pest management problems.</td>
</tr>
<tr>
<td>Chemical Efficacy Testing</td>
<td>The screening researchers do on certain chemicals recently introduced (or directly proceeding introduction) to the pesticide market. The researchers study these products for such factors as effectiveness and influences on the environment.</td>
</tr>
<tr>
<td>Integrated Pest Management (IPM)</td>
<td>IPM uses naturally occurring pest management techniques (weather patterns, scouting, predatory insects, etc.), and includes chemical agents minimally and as a last resort. IPM involves a careful management plan that considers the growers’ needs and the determination of an economic threshold indicating when a pest population reaches a level where controls are necessary.</td>
</tr>
<tr>
<td>Variety Development</td>
<td>Projects that focus on creating a new variety of potato by selecting a desired gene from a wild potato plant, other cultivar, or clone, and crossing it with genes of another potato. This process can create a potato that is resistant to certain diseases and viruses or a potato that is ideal for a specific end use.</td>
</tr>
<tr>
<td>Alternative</td>
<td>Projects that have an emphasis on environmentally sound solutions to pest problems. These projects use naturally occurring pest management and do not use synthetic chemicals to solve pest problems.</td>
</tr>
<tr>
<td>Basic</td>
<td>Basic research addresses a long-term study focus, and is not intended to pose an immediate solution to a management problem.</td>
</tr>
</tbody>
</table>

**Conventional Research**

I classify “conventional” research projects as those that focus on studying pesticides as solutions to pest management problems. I use the definition of pesticide stated in Chapter 2, which includes terms such as fungicides, insecticides, and herbicides. Beus and Dunlap use the following definition of conventional from Knorr and Watkins.
"Capital-intensive, large-scale, highly mechanized agriculture with monocultures of crops and extensive use of artificial fertilizers, herbicides and pesticides, with intensive animal husbandry." This reflects my definition, in that these projects do not address small-scale, non-mechanized techniques and they focus primarily on chemical solutions to pest problems.

Of the 16 people I interviewed conducting pest management research, eight were focusing on conventional research as a major aspect of their research program. Of these eight, three are studying insecticides, two are studying herbicides, two fungicides, and one is studying a variety of pesticides. The resounding sentiment among these researchers is a recognition of the fact that growers and the potato industry itself are dependent on chemicals for the continuation of high yields and maintenance of large monoculture farms. According to some of these researchers, chemicals are the best thing out there in sustaining this type of farming. For example, Researcher I referred to a sprout inhibiting compound used in storing potatoes, "CIPC is inside the risk (group) that the EPA is always looking at. So we are always under concern, are they going to take away this compound from us? To this point there is nothing that even comes close to being as good as CIPC. CIPC is one of the best chemicals we have being used."

The researchers seem to see their roles as helping farmers retain pesticides or providing access to new ones. Researcher A expressed the importance of working with chemical companies in getting new pesticides on the market. She noted that potatoes are an incredibly complex crop; compared to other crops that generally have two or three major pest problems, potatoes can have over 30. Similarly, Researcher F noted that, "the number and seriousness of problems that have a real impact on potato crops are wide-
ranging.” As a result, she claimed that pesticides are an integral part of growing potatoes. Her focus is on studying weed control and she claims that herbicides currently cannot be replaced with alternative methods for weed control. Furthermore, she noted that there are simply not enough herbicides available for potato growers to use.

Generally, it seems that researchers were hesitant to move away from conventional modes of research until they felt certain that another option would be valid and credible enough to study. Researcher F claimed that a movement away from chemicals is difficult when dealing with monocultures. He expressed concern that monocultures are susceptible to more insects and disease than a more diversified cropping system. Furthermore, Researcher P noted that chemicals work well in maintaining high yields, and thus saw no reason to change a good thing, “You can see that our management; water management, fertility, pesticide inputs have all helped make a healthier plant that stays greener longer, and grows and produces more. We’re growing a lot more potatoes in the same land as the 1950s. The same land that once grew 185 sacks is now growing 350.”

In talking with researchers, it was clear this debate over pesticides is an apparent source of pressure for LGU researchers. Administrator Q reflected on the tension created among faculty in the agriculture arena regarding the term ‘sustainability’. When she first joined the University in the early 1990s, it was not uncommon to have arguments take place at faculty meetings over how to define the term sustainable. The result seems to be a general ambiguity among the researchers as to where they stand on their perspectives of pesticide use in agriculture. It seems difficult for researchers to commit to either
"conventional" or "alternative," and as Researcher O notes, he finds himself "sitting between both camps" of the sustainability debate.

Another researcher provided that although current solutions in pest management revolve around insecticide use, he saw his colleagues trying to move away from "spray them until they're nuked." He claimed that for now, though, insecticides are still a "very viable option." Researcher I claimed that:

... a lot of the (push towards pesticides) comes from the industry. Industry is constantly coming up with new chemistry...The last couple years or so, many of the chemical companies have come out with very friendly (for the environment and farmer health) insecticides that work extremely well...So the whole industry is shifting to friendlier chemistry.

Yet this shift still includes pesticides as crucial to the success of potato production. For example, another researcher lauded the effects of a specific fungicide he was currently researching. In his words, "this product is dynamite on Early Blight, put this on your crop and it stays green and clean- it's wonderful!" Others took a more cautious approach towards support of chemicals. Researcher I warned, "Idaho's reputation with potatoes is global. People think potatoes, they think Idaho, so any kind of chemical issue, we don't ever want to associate with Idaho potatoes. That would be devastating."

In trying to maintain and promote an image, researchers seem to feel pressure to stay with what has worked in the past. Although they express concern about negatively associating chemicals with their state's potatoes, they also do not seem to want to promote an alternative technique that might impact the current level of productivity and potato quality. The next section discusses an aspect of LGU research that seems to steep researchers even more into the chemical aspect of agricultural production.
Chemical Efficacy Testing

It is apparent that many researchers adhere to the belief that is ingrained in the current form of industrial agroeconomics. This is the belief that pesticides create and maintain a successful, abundant and healthy food supply (Beus and Dunlap 1990). In keeping with this, and in order to appear to be on the cutting edge of agricultural technology, researchers conduct chemical efficacy testing. This is an important aspect in the role of pesticides in LGU research. Chemical efficacy refers to the screening researchers do on certain chemicals that companies are just bringing out on the market. The role of the researcher is to take a look at the chemical and study it on a small plot in order to assess various aspects of the chemical such as effectiveness and influences on the environment. Researchers are in turn paid by the chemical company, and such testing tends to be fairly costly. Researcher N recognizes chemical efficacy testing as an opportunity to answer other questions pertaining to his work, while remaining abreast of the multitude of options available to growers. He claimed, “I try to use those trials to answer other research-based questions. It allows us to get a handle on how these chemicals are supposed to be used. People come to us to ask how to use a chemical, because the company always tells you to spray more than you need to. Growers rely on us to give a balanced view as to how these things work.”

Eight of the 16 researchers I interviewed conduct chemical efficacy testing. As with Researcher N, most claim that this helps them better address the needs of growers by being able to explain how to use certain chemicals and offer advice to the growers.
regarding the best and newest chemical options. According to Researcher I,

There's always chemical companies out there trying to sell products that don't really benefit the grower. And yet our growers are always desperate to get one leg up, one edge, so there's a part of us that has to muddle through those (pesticides) and prove yes or no whether they're worthwhile. We've got questions coming in from certain growers about pesticides and we need to deal with those issues quickly.

Chemical corporations certainly benefit from this type of relationship, too. With chemical efficacy testing, companies can compare their products to other products that are being studied. Additionally, it is beneficial to the sale of their product if the University has approved it and recommends the product to growers.

Chemical efficacy can take a number of years to complete. The researchers claim to thoroughly study a chemical and its effect on the crop, as well as on human and environmental health, before they endorse the chemical as safe and efficient to use. In this sense, researchers note that testing provides them with an opportunity to assess the effects a chemical might have on the environment, and screen out those that will have significant negative impacts. It is rare for researchers to sign secrecy agreements while doing chemical efficacy studies, because the company feels confident enough about its product that they are ready to hold it up for public review. Furthermore, researchers claim that it is important to do chemical efficacy testing, particularly for potatoes, because chemical companies rarely create a pesticide solely for use on potatoes. Companies primarily focus on developing pesticides for major crops such as corn, soybeans and wheat. According to researchers, the testing is important to make sure that it works on "non-major" crops such as potatoes.
Whether or not LGU researchers should be conducting chemical efficacy testing could be a contentious topic. Important questions to ask regarding this area of research are, Who is benefiting from this research, and who is harmed? Clearly, the chemical companies are benefiting in product testing and promotion. In return, the researchers receive more money in their budget. For growers, they gain an increased supply of commercial pesticides for use in their crops, but is that really helping the grower who is "desperate to get one leg up," or does it merely place the grower on a fast moving 'pesticide treadmill'?

**Integrated Pest Management**

Research is being conducted at LGUs under the auspice of decreasing pesticide dependency. Researcher H stated of LGU researchers as a whole, "Hardly anyone is traditional anymore." She followed by claiming that all researchers do some type of integrative management research that looks at options other than chemicals. Another noted, "We can't go completely organic at this time. However, there are currently more chemicals and fertilizers used than needed. What would be best is an across the board cut of 10-15% pesticide use." According to a seminal work by Dale Bottrell (1979: v), the definition of Integrated Pest Management (IPM) is:

>(T)he selection, integration, and implementation of pest control based on predicted economic, ecological, and sociological consequences. IPM seeks maximum use of naturally occurring pest controls, including weather, disease agents, predators, and parasites. In addition, IPM utilizes biological, physical, and chemical control and habitat modification techniques.
Yet IPM can be viewed as a loosely defined term, and is defined on many levels by various groups. For instance:

At its simplest level, farmers who use IPM principles generally resist routine spray schedules and instead will scout for pest problems before deciding to apply a pesticide. At a more complex level, biointensive IPM includes practices that promote species diversity and support natural enemies of pests to balance the agricultural ecosystem and avoid the buildup of damaging pest problems (Benbrook 1996:27).

In analyzing research projects, I define IPM projects as those that focus on a “mixture” of solutions to pest problems, not just chemicals. I recognize that the projects I term IPM vary widely, however, with some leaning more towards conventional projects and others with a greater emphasis on alternatives. Thus, with my definition, IPM offers a way for researchers to find successful techniques to lessen the impact of pesticides but not abandoning them all together. It looks at ways to combine various management needs and concerns, although with an emphasis still on maintaining economic returns. IPM is not just alternative or conventional methods of growing potatoes, but rather it includes techniques from both methods and combines them for a kind of compromise.

Of the researchers conducting pest management studies, eight claimed a major focus on IPM. The techniques they studied for IPM varied according to their areas of expertise. However, many maintained the key to this form of pest management is to collaborate with other researchers in order to adhere to a broader view. Thus, many of the research abstracts that I looked at pertaining to IPM listed at least five different researchers working on the project.
An example of an IPM project is that conducted by Researcher D, which focuses on monitoring and managing the Green Peach Aphid. According to a proposal written by the researcher,

The central purpose of this project is to keep the industry apprized of the aphid’s status, forewarn and alert growers of critical happenings with the aphids, develop improved sampling and scouting methods, and provide timely recommendations on best management strategies. The project addresses issues regarding aphid overwintering, aphid biological control, and Monitor® insecticide resistance.

In keeping with IPM criteria, this project addresses steps that can be taken in managing for the Green Peach Aphid with an integrative approach, assessing options for the grower beyond simply using pesticides. It involves an attentive look at the biological and environmental factors of agriculture. Yet this researcher still intends to include Monitor in the management plan. This is where IPM tends to display a “gray area.” How much will the researcher rely on pesticides?

In IPM, the management plan can revolve around pesticide use, thus merely a conventional project with a so-called IPM approach, or the plan can use pesticides only as the last resort. From talking with the researchers, I sensed there was a range of levels of adherence to IPM, but more often than not, they seemed to express an emphasis on the conventional end of the continuum.

According to Researcher R, the critical analysis of whether an IPM project will be successful is whether it will work for the farmer. He asserted that “If IPM is not economically viable or if it does not represent a reasonable level of efficiency, (growers) cannot adopt it!” Feasibility both economically and in regards to labor input seem to be
the primary considerations for researchers when they approach IPM projects; environmental concerns appear to be of lesser import.

Variety Development

A major area of study that researchers overwhelmingly expressed as a means for pesticide reduction is breeding. Traditional breeding, or variety development, is an important area to be considered in potato pest management according to researchers. Traditional breeding involves creating a new variety of potato by selecting a desired gene from a wild potato plant, other cultivar, or clone, and crossing it with the genes of another potato (Dean 1994). Breeding potatoes is a complex and laborious process, but the result can be important new varieties that have a natural resistance to viruses and disease, and thus are crucial to reducing pesticide use. Many of the researchers referred to variety development as the most promising answer in pesticide reduction. Researcher L works on breeding and claims, “The idea is that basically you incorporate genetic resistance to decrease the production cost to growers. You’re also benefiting the environment and consumer perception.” Variety development through traditional breeding is a major focus in potato research nationwide, and even worldwide. Researcher R works in variety development as a variety "tester," in that he conducts field trials to assess the quality of each new variety. He claims that he evaluates material from around the world in his variety testing position.

This solution does not bear immediate results, however. Traditional breeding methods tend to require extensive studies over a long period of time, generally 10 to 20 years. Additionally, because this area of study does require time, researchers must choose
problem areas that they foresee will still be pertinent in the future. For example, if a breeding study is conducted in attempts to create a potato variety that is resistant to the Late Blight virus, researchers must assume that it will still be a concern when the variety is approved and placed on the market 10 to 20 years later.

The breeding programs are a major emphasis in the potato research and extension programs at UI, WSU, and Oregon State University. In fact, these schools have established a “Tri-State Breeding Program,” in which the researchers collaborate on breeding projects, sharing different aspects of the research and reviewing results.

Researchers whom I spoke with relate that variety development is not only an important component in potato pest management, but it can also be a crucial step in diversifying the potato industry and creating greater market niches for a larger group of farmers. For example, Researcher R noted that a grower might like a particular variety because it is easy to grow and manage, but that ultimately it is up to the potato markets to decide what varieties will work. Researcher I worked on a project on eight different varieties of specialty potatoes (for example, blue and red potatoes), looking at the feasibility for an alternative market for small family farms and organic farms. The study looked at how well these varieties would fit into the Idaho potato industry, and whether or not there is a market for them. According to this researcher, the results of this study showed that “Yes, people want these different varieties, but supermarkets aren’t going to take the risk of having them in their market.” She compared this supermarket mentality to the experiences of the apple industry, in that stores tended to carry only one or two apple varieties. “There was a huge overhaul of supermarkets when they went from just
having red delicious in the apple section to having up to eight different kinds,” she explained, and asked, “Can we do something like that for the potato market?”

Furthermore, in variety development, researchers can work with specific dimensions of the potato industry to create a variety that fits the needs of a certain company. For example, researchers can work on creating a potato that processes well for potato chips. According to one researcher, “Each element of industry wants the type of variety that will make their process the most efficient and capable of producing the best end product. We want a potato that will contribute to better economics by adopting specific varieties for specific uses.” Researcher F recognized the potential problem that could occur with such a relationship, however, and claimed that researchers in variety development are not creating varieties for only a certain company or individuals to use. In this area, it seems that researchers would feel particularly vulnerable to critiques like Hightower’s (1973) *Hard Tomatoes, Hard Times*, because he argued that researchers were maintaining relationships with corporate entities that resulted in research that was benefiting only these corporations. In this vein, one might argue that variety development researchers create varieties for certain corporations and do not consider how this variety affects soil quality, how much water it uses, and other management concerns. Yet, Researcher F notes that potato breeders within his program thought about signing secrecy contracts with certain companies to create the exact potato to fit their needs, but that researchers in variety development decided quickly that it would not be ethical to create a variety solely for use in one area of processing or production. They do not sign secrecy or patenting contracts with their audience, but rather they do work with specific users to try to meet their needs.
Traditional variety breeding is not to be confused with genetic engineering, although there is a small overlap. Traditional breeding works with material from approximately 225 related wild potato species to incorporate genetic resistances that may not be found in a typical crop of cultivated potatoes (Dean 1994). On the other hand, with genetically modified organisms (GMOs), the genes can be taken from any organism, not necessarily a related species. The overlap is simply that in both techniques, researchers can change original characteristics of a potato cultivar.

In fact, genetic engineering tends to be a volatile topic in the research arena. Researcher H noted that the WSU administration does not allow researchers in her program to conduct research on genetically modified organisms (GMOs). She associated this restriction to a violent protest against GMOs that occurred in a research lab nearby. A handful of GMO projects are conducted at UI in potatoes, and overall biotechnology seems to be a growing emphasis at this school.

Alternative Potato Production Methods

Alternative research projects are those that have an emphasis on environmentally sound solutions to pest problems. Alternative projects focus on natural pest control solutions, rather than a reliance on chemicals. Additionally, alternatives incorporate a holistic view of an ecological system, and note the importance of avoiding monocultures and focusing on more diversified cropping systems (Hassanein 1999). Examples of alternative options include green manures, biocontrol, and use of compost and other soil building techniques. Of the 16 researchers, four claimed to have a significant focus on alternatives to pesticides. Three of these researchers referred to projects they are working
on related to green manures, or related cover crops. Cover crops provide an alternative to pesticides when dealing with insects and virus transmission in potato fields by growing other crops over a certain area where potatoes will be planted to actually create a protective ‘cover’. Green manure refers to legumes grown and then turned into the soil to provide a source of nitrogen. Another researcher is working on a number of biocontrol projects, in which he is looking primarily at insect predation in dealing with the Colorado Potato Beetle and Green Peach Aphids.

Researcher I referred to her colleague, who “puts a great deal of emphasis on alternative sprout inhibitors.” He did a several year study to see if volatiles or aromatic oils (essential oils, peppermint oils) could actually be used as a sprout inhibitor. The alternatives actually worked in physically burning off the sprouts; however, two main drawbacks were that continuous applications needed to be made, which would be costly, and the taste test panels were able to pick up the spearmint in the potato. Researcher I claims that this is a big project researchers are continuing to work on.

Researcher R noted a project that WSU researchers are currently working on which uses an organic potato sample plot to compare the cost and value of organically grown potatoes. This study uses plant debris and livestock waste as fertilizers, and also focuses on different varieties and how each works in fighting certain diseases and insects. This researcher noted the importance of economic assessment with this project, “It has to be cost effective,” he said.

One researcher who generally has an IPM or conventional focus noted that she tried a study which looked at using compost teas as a fertilizer and soil builder, rather than synthetic fertilizers. She laughed as she reflected how this project, “just didn’t
administrators for trying alternative projects that people may be skeptical about. She expressed a fear of a disapproving public, “We try not to do research on ‘snake oils’.”

Administrator J noted the emerging support for alternative research projects, “The word is out there and there is interest in getting sustainable work done.” Yet this apparently has not yet materialized into an intended shift away from pesticides. Alternatives to pesticides are not currently a major focus for the researchers I spoke with. In large part, the paucity of research on alternatives results from pressures to do what is perceived to be more credible research. Additionally, a large part of researchers’ focus could be where they gain funding, and the interests of these organizations and corporations providing financial support.

**Who is Funding the Research?**

Administrator Q noted that when researchers are choosing what solutions to pest management problems to study, “Funding is key.” There are a number of potato pest management research grant funding opportunities, and funding sources vary according to different researchers and their topics. For instance, Researcher H noted that there are much more funding opportunities in IPM and alternative research topics now than there were ten years ago. Researcher P also mentioned this, and attributed the increase in opportunities in part to the internet, and the vast amount of information on research funding sources that can be accessed there.

In seeking funding, the researchers undertake a process that varies according to the funding source. For example, with the Idaho Potato Commission, the researchers
receive a list of topics the IPC is interested in learning more about. The researcher can then decide how they might approach the topic and submit a proposal to the commission. By contrast, with federal grants from programs such as Sustainable Agriculture Research and Education (SARE), the application process is lengthy and highly competitive. Additionally, according to interviewees, funding from private corporations can be made extremely easy for the researcher to obtain, to the extent that the proposal is actually written for the researcher by the corporation. This is the extreme case, and although it may be the exception rather than the norm, these examples illustrate the varying degrees of effort the researcher must extend in applying for funding.

There are five major sources of funding mentioned by the researchers and administrators I interviewed. These sources are Cooperative State Research, Education and Extension Service (CSREES), Agricultural Research Service (ARS), National Potato Council (NPC), Idaho Potato Commission (IPC) and Washington State Potato Commission (WSPC), and private corporations such as Sagenta, Valent, and Dupont. Each funding source may express certain research interests. Thus, different researchers receive funding from sources depending on their area of study. For example, Researcher F works in potato breeding, and receives a potato breeding grant from the federal Cooperative State Research, Education, and Extension Service (CSREES) program. According to Researcher R, CSREES is currently offering a significant amount of funding for research agendas focused on variety development. Three of the researchers interviewed had CSREES funding and were working in traditional breeding. The CSREES also funds myriad other programs in agriculture research throughout the country.
Four of the researchers I interviewed have United States Department of Agriculture - Agricultural Research Service (USDA-ARS) positions. This means that the federal funding is usually greater than their outside funding, and finding money for their research is not as critical as those without this assignment. One of the researchers noted that his ARS funding was small, however, and a minimal percentage of his overall program budget. According to the USDA website (2002), ARS is the “principal in-house research agency of the USDA.” The stated objectives of ARS are to:

- Ensure high-quality, safe food and other agricultural products,
- Assess the nutritional needs of Americans,
- Sustain a competitive agricultural economy,
- Enhance the natural resource base and the environment, and
- Provide economic opportunities for rural citizens, communities, and society as a whole.

These goals, such as “assess the nutritional needs of Americans,” and “enhance the natural resource base,” seem broad and ambiguous. However, of the major federal funding programs (with the exception of SARE), the researchers with ARS funding had a more focused approach on finding alternatives to pesticides. Two of these researchers are working in variety development to create varieties that need less inputs, and one ARS funded researcher is working on weed management. This researcher proclaims an IPM approach, and has done a recent study which looks at using cover crops to control weeds in potato crops.

The National Potato Council (NPC) is a source of funding for three of the researchers interviewed. For one researcher, it is her main source of funding, and for the other two it consists of about one quarter of their funding. According to the NPC's mission statement:
The National Potato Council represents all U.S. potato growers, providing a unified voice on a national level in legislative, regulatory, environmental, and trade areas crucial to its members’ long term success. The number and complexity of issues facing the industry make it imperative that NPC’s voice remain strong and clear if the best interests of all concerned are to be served (NPC 2002).

NPC seems to focus on a mixture of IPM and alternative projects in its efforts to meet the “best interests of all.” Researcher H noted that the NPC is different from state potato commissions in that it is national in scope. Additionally, an NPC published Press Release dated February of 2002 announced, “The National Potato Council, representing U.S. potato growers, stormed Washington, D.C., voicing industry priorities and concerns at meetings with senators, representatives and top agency officials” (Stubblebine 2002: 1). During this effort, the NPC voiced concerns such as a desire for an “expansion of access into foreign markets,” and “industry’s need for crop protection chemicals.” This reflects a specific group of growers’ needs, and implies that the NPC believes that more chemicals on the market would best represent the “best interests of all concerned.” Furthermore, it implies that the tendency for this organization to support research projects that look at conventional means for pest management. Researcher G claims that NPC grants are competitive, and he views this organization as favoring certain researchers, referring to it as a “good old boys” organization.

Potato Commissions are state run, growers’ entities. Commissions tend to support research that is directly applicable to growers and helps the growers with current pest management problems. Every researcher I spoke with has some grant money from a state commission. Because of this, and the fact that commissions are grower and
processor run organizations, the next chapter provides a detailed analysis of the role of the potato commissions in research and what types of projects they support.

As part of the shift mentioned earlier towards ‘friendlier’ chemicals, many researchers work alongside chemical corporations in getting these new products on the market. It is clear that there is a wide range in researchers’ relationships with corporations, from hardly much contact at all, to a constant working relationship. Accordingly, there is also a diversity of researchers’ views on chemical corporations. For example, Researcher R noted that the grants he usually receives from the private sector are so small and variable that he has come to appreciate them when he gets it, but does not rely on that money for his research budget. Researcher H also receives only a very small portion of her funding from corporations. She claims that in the past, she worked with corporations much more on pest management research projects, but that she began to face complications when her focus changed more towards IPM and pesticide alternatives.

One of the researchers formerly worked as a in-house scientist for a large chemical corporation before her position at a LGU. She left the company due to what she referred to as the “instability of the chemical industry,” in search of a more stable, though much less lucrative, research position at a university. In her university position, she still works with chemical companies a fair amount and receives funding from such corporations as BASF, Dupont, Bayer, Syngenta, Dow, FMC, and Valent.

The researchers I spoke with had mixed feelings about being associated with chemical corporations. Researcher N recognized that chemical companies still look to LGUs to help them with research:
They rely a lot on us, in fact. They need the universities' stamp of approval, they need the university to say whether the chemical works or not. The university carries a lot of weight in that realm. Growers rely on what the university has to say. Now, having said that, it's not something I value very much with my program.

Although this researcher claims that most of the time the relationship between researcher and chemical corporation is positive, he admits that sometimes there can be friction. He claims that there are some companies that "would like to see the university go away."

These companies, he claims, want to be the one resource for the grower. "It's interesting to see how it will evolve in the future. I know they would like to cut out every link in between, but I doubt it will happen."

There are other opportunities for funding which researchers can explore, though the sources mentioned in this section are the ones most common among the researchers I interviewed. Although funding is certainly pivotal in influencing the research agenda at LGUs, the next section discusses other sources of influence on research decisions.

**Research Influences and Avenues for Dissemination**

To some extent, funding is key, in that who provides researchers with money will inevitably influence that research. Yet, most researchers expressed that they were doing their job in order to benefit the farmer first and foremost. In fact, each researcher with an extension assignment has an "advisory council," made up of growers and other industry stakeholders including processors and potato promotion boards. The researcher meets with their council generally once or twice a year to identify the major concerns of the potato industry. These councils are a major source of influence for the researcher. These meetings help researchers "develop plans on what we should be doing to meet the needs
of the community. We don’t just sit here at a Land Grant University saying, ’Oh, this needs to be done.’ We try to collect information from the clientele” (Researcher P). According to the general sentiment among researchers, the clientele he is referring to seems to be a group of farmers with larger operations who do not have the tendency to experiment with alternative means of pest management.

Not only do the researchers claim an interest in understanding farmers’ needs, some recognize that this is an essential part of gaining credibility and research support, “You need farmers’ confidence to successfully implement a new technique. It is especially important to have the cooperation of large growers. When you have their confidence, change will occur” (Researcher O). Similarly, Researcher I noted that “our major clientele or industry are the larger operations,” yet she expressed concern over the increasing amount of smaller family farms going out of business. She said there is a need for university research to represent the concerns of this group of farmers. Essentially, the researchers expressed genuine concern regarding the well-being of growers and implied a concerted effort to understand their needs and reflect these in research topics. At the same time, I heard a recognition that the growers who form the main ‘clientele’ are the larger-scale operations.

In assessing the influences upon LGU researchers, it is important to look at the researchers’ avenues for information dissemination. Where a researcher chooses to publish or extend their research may reflect where they are getting their support, and in turn what groups they tend to reach out to. One researcher noted the importance of sharing research findings with the public, “My goal, or my mission as I see it, is to take information that the University generates through research and make sure that gets out to
the industry.” To do so, researchers have a variety of options to choose from, including newsletters to growers, websites, magazines, phone “hotlines,” scholarly journal articles, and presentations at conferences held by grower organizations.

In the midst of pesticide product advertisements in magazines for potato growers such as Spudman or Potato Country, one can also find articles written by LGU researchers. Researchers play a role in the publications of these magazines; a UI researcher is the Technical Editor of Potato Grower, and a WSU researcher is the Technical Review Director of Spudman. Furthermore, a WSU researcher has a regular column that appears in Spudman. The appearance of works by these reputed researchers in a magazine laden with chemical advertisements may imply that these researchers endorse chemical products. Despite such seemingly purposeful positioning, one researcher maintains that:

(W)e are providing unbiased research. If we test a product or a method, we don’t care if the product works or not, we’ll just tell you the end result. We have no products to sell, so all the information is unbiased. The information we provide is based on sound science. There are no short cuts.

Other avenues for research dissemination include the internet. Both UI and WSU have pest management information pages for potato growers which list major pest problems and suggested management techniques. The techniques for management on these websites generally seem to range between a chemical and IPM focus. Unfortunately, these websites decrease the interaction level between researcher (or extension educator) and grower. According to Researcher P, “I see the role of extension changing in that we are providing instant - access information. I don’t work with
individual farmers so much ... a phone call of 60 seconds or an easy click of the mouse ... the way we deliver the final product is changing."

Another avenue is a potato pest management “hotline,” in which growers can call a number to obtain updated recordings from university researchers on what problems they should look out for and techniques in managing these problems. Currently, the chemical corporation Syngenta, sponsors these hotlines for LGUs nationwide. An April 23, 2002 Syngenta Press Release cited a quote from Kem Cunningham, Syngenta crop manager,

> It is important that we provide growers with the fungicides they need to protect their crop, but it is also important to give them the information needed to get the most out of these products. By sponsoring the blight hotline, Syngenta assists universities in providing growers with information vital to the production of a top-quality, high-yielding crop (Syngenta 2002: 1)

This association with Syngenta regarding crop protection implies a close (and unsettling) relationship between researcher and chemical corporations.

Researchers clearly have many choices to make in generating and disseminating information from university research. How they choose to do so reflects who the intended clientele or audience is that they wish to address.

**Conclusion**

LGUs today reflect a fluctuating system, as the agricultural environment is shifting and the needs of the public are voiced through varying perspectives among farmers, legislatures, corporations, and citizens alike. It is clear that LGU researchers within the potato industry are wrestling with these problems while still attempting to conduct the most appropriate research for the changing needs of the public. Researchers
Researchers at UI and WSU voiced primary concerns in improving the current economic positions of potato farmers. They would like to see these farmers spending less money on chemical inputs, and receiving greater returns for their potato crops. Intertwined with these economic issues is the concept of IPM, a management plan that symbolizes an attempt to decrease pesticide use. A dimension of this IPM focus is an endorsement of new 'softer' chemical products in agriculture. In efforts to advance this progression towards pesticides that have fewer environmental impacts, researchers work alongside chemical corporations to endorse and market their products.

In addressing where potato pest management research is heading, an obvious approach is to examine the funding sources that support such research. Yet, sifting through this information reveals a wide range of financial support and somewhat ambiguous goals from these funding programs or organizations. Regardless, a common theme appears to be a shift towards greater recognition of environmental concerns. Will this recognition result in increased research for alternatives to pesticides, or does it merely represent a facade of environmental concern shrouded by a loosely defined term such as IPM? In addressing this question, I take a closer look at a significant influence for both UI and WSU researchers - state potato commissions. These organizations are supporting a majority of research at these two LGUs. In the next chapter, I will explore the many dimensions of potato commissions, in order to gain a better understanding of what drives potato pest management research at these LGUs.
State Potato Commissions:  
A Growing Clientele

Potato Commissions are state organizations run by growers and processors. Commission budgets are funded by a tax levied on potatoes paid by growers and processors. Through promotion, marketing and research, these organizations work to maintain high yields and consumer support that is meant to translate into improved financial situations for growers and processors.

Of the 16 researchers (not including the two administrators) I interviewed, all receive funding from either the Idaho or Washington State Potato Commissions. A significant amount of financial support comes from these commodity commissions. The commissions not only have a large impact on Land Grant University research, but they also play an active role in structuring a complex potato industry. It is therefore important to take a closer look at commissions and their role in the potato industry of the Northwest.

For each commission I address the purpose and structure of the organization, what groups the members represent, and the general budget of each commission. I also take a closer look at the projects these commissions fund, and similar to Chapter Three, I categorize the research projects as conventional, basic, integrated pest management, and alternative. Although there are a number of similarities, the Idaho Potato Commission (IPC) and Washington State Potato Commission (WSPC) vary in regards to management and budget, and I note some of these apparent differences.
**Background**

The Idaho Potato Commission began in 1937 as the Fruit and Vegetable Advertising Commission (IPC 2001). It became its own entity, focused solely on potatoes, in 1967 when it officially became known as the Idaho Potato Commission. The concept behind a potato commission is to provide marketing, scientific and production information to farmers, addressing the general needs of potato growers as a whole.

IPC funding comes from a tax levied on all Idaho grown potatoes. The growers pay 6 cents per hundredweight of potatoes they grow for sale, and commercial buyers pay 4 cents per hundredweight to the IPC (Idaho Potato Commission 1967, 1211). These funds provided IPC with a budget of $10.2 million for 2001, which is down from $11 million in 2000 (Rawlings 2001). Similarly, the WSPC is funded mainly by a “levied annual assessment,” which is paid by the grower.

In addition to research, the IPC budget is used for advertisement and promotion of Idaho potatoes, and for a strict certification process through which testers and inspectors ensure that potatoes sold as “Idaho potatoes” were indeed grown in Idaho (IPC 2001). The statute establishing the Idaho Potato Commission reads, “The purpose of this act is to expand the markets and increase consumption of potatoes produced in this state, thereby promoting the general welfare of our people” (Idaho Potato Commission 1967, 1201).

The Washington Potato Commission legally follows the rules established in the Washington Agricultural Enabling Act of 1955, which refers to commodity commissions. The Declaration of Purpose for commissions reads:

> The marketing of agricultural products within this state is affected with a public interest. It is declared to be the policy and purpose of this chapter to promote the general welfare of the state by enabling
producers of agricultural commodities to help themselves in establishing orderly, fair, sound, efficient and unhampered marketing, grading and standardizing of the commodities they produce, and in promoting and increasing the sale of such commodities. (Washington Agricultural Enabling Act 1955, 020)

Section 30 of this Act is a list of ‘marketing orders,’ which the commissions are authorized to make. Order Two reads, “To provide for carrying on research studies to find more efficient methods of production, processing, handling and marketing of any agricultural commodity” (Washington Agricultural Enabling Act 1955, 030). Although this market order does not express a need to emphasize conservation techniques in the proposed research studies, Order Seven states that the commission can authorize a market order “To provide information and services for meeting resource conservation objectives of producers of an agricultural commodity” (Washington Agricultural Enabling Act 1955, 030). For these marketing orders, the director of the commission must notify affected producers in order to give them the opportunity to attend a public hearing “upon the proposed issuance, amendment, or termination of the marketing order...” (Washington Agricultural Enabling Act 1955, 060).

Each Washington state commodity commission is composed of not less than five nor more than thirteen members. Section 110 states:

No less than two-thirds of the commission members shall be elected by the affected producers and such elected members shall be affected producers. The remaining members shall be appointed by the commission and shall be either affected producers, others active in matters relating to the affected commodity or persons not so related. (Washington Agricultural Enabling Act 1955, 110)

Therefore, the membership of the WSPC must be at least two-thirds potato producers.
"Others active in matters relating to the affected commodity" include processors. The term of office for these commissioners is three years.

IPC is composed of nine commissioners, including five potato growers, two packer/shippers, and two processors. The term of office for the commissioners is three years, and cannot exceed more than two consecutive terms. According to some of the researchers I interviewed, the growers on these commissions generally come from larger, commercial farms. Yet some researchers claim they are not aware of whose needs are expressed by the commission. For instance, Researcher N notes “I have no idea how representative the potato commission is of the industry. I have no idea how the growers are represented.” Yet, this researcher notes that he tries to listen to the needs of smaller farmers through other means, such as advisory councils and potato conferences.

This researcher also noted that often the smaller farmers attend the potato conferences because, he said, “these are the guys that are fighting to survive. They are trying everything they can.” Larger farmers do not generally attend these conferences, he claimed, usually they send their agronomist. This is important to note, because these same small farmers who are “fighting to survive,” still have to pay the tax levied on all potatoes produced in the state. These taxes fund the potato commission that tends to speak for larger growers. Would these farmers be desperate to “try everything” if they were better represented by the potato commission?

The research projects funded by commissions are a collaborative effort between commissions and researchers, and somewhere in this effort, it appears that the needs of certain farmers fall through the cracks. The process of applying for a commission grant involves significant communication between the commission and the researchers. The
commission decides the major topics they would like to see the Universities focus on. They submit these topics to the schools as a "call for proposals." It is then the responsibility of the individual researcher to decide what solution they would like to research to address that problem and then submit a proposal to the commission.

The Idaho Potato Commission has a liaison at the university who works to facilitate the "channeling of information flow between both entities (university and commission)," and this person is available to answer questions from both sides. Primarily, this liaison helps researchers with the logistics of creating a proposal for the Idaho Potato Commission. According to Researcher F,

> Generally, the (Idaho) Potato Commission is very responsive to ideas that come out of the university that address specific problems that they see as important. They approve projects that are developed in such a way that the commission can see it will impact the industry. They don't generally fund basic research— they want things that immediately address the problems of their growers and processors.

He continued, noting that the main thing to remember about the IPC is that "they don't fund altruistically. In supporting research, they always ask the question, 'How will this help me make a better living?'" Similarly, Researcher K noted that "Each of the potato commissions in the three states (WA, ID, OR) has a research committee. The needs of the farmer are channeled through that research committee every year."

Examples of research areas IPC supports are breeding and technology, physiology and crop management, economics, food science/quality, storage, and pest management/control. The grant awards range in size depending on the researcher's needs; they can be anywhere from $5,000 to $60,000. The commissioners base their acceptance decisions on the applicability of the proposed research to the potato industry.
Overall, IPC seems particularly interested in the projects that aid in quality appearance, marketing, or disease/pest resistance.

Researchers from WSU expressed appreciation for the work their state potato commission does. According to Researcher C, “The state of Washington is blessed with a lot of good commissions on many commodities.” Researchers at UI also seem appreciative of the work of the IPC. One researcher even noted that the IPC has been, “A good support for alternatives if they are workable and economically viable.” Yet, one frustration researchers expressed with the IPC was that the IPC tends to be “short-sighted.” This same researcher commented that needs change frequently in the potato industry, and “this year’s problems may not be next year’s problems.” However, one researcher also noted that “usually when the IPC funds someone, they will provide funding until the process comes to fruition.” This allows researchers to count on multi-year funding if necessary, and provides flexibility if they need more time to complete the research process.

Project Analysis Process

In order to gain a better understanding of the types of projects the state potato commissions fund, I analyzed research proposals and reports funded by these commissions over the past five years. My method for this analysis was to obtain information about the research projects the commissions support (including abstracts and funding amount), the statutes that established each commission, marketing or promotional information created by the commission (including websites and brochures), and contact commission director or members. From the Washington State Potato
Commission (WSPC), I received project abstracts for potato pest management projects
they had funded from 1997 to the present, with the principal investigator(s) listed,
objectives and purpose. I did not receive funding amounts from WSPC. The IPC did not
make such information available, so instead I gathered information from the University of
Idaho. The agricultural science department keeps a publication of all the projects funded
by the IPC each year, and a researcher who works as a liaison between the commission
and the university sent me the publications from 1997 to the present. These reports
include detailed information on the proposals, principal investigators, methods and
funding amount. I analyzed a total of 43 projects from the WSPC and 57 from the IPC, to
make a total of 100 projects considered.

For the project categorization, I analyzed the research proposals, specifically
focusing on the main objectives and the methods section. I read each proposal and
categorized by the language the researchers used (i.e., IPM or chemicals) as well as the
techniques they proposed to apply.

Research

Tables 2 and 3 display the results of my analysis of the 100 proposals of projects
funded by the Idaho and Washington Potato Commissions. The tables show the number
of projects in each category of conventional, integrated pest management, alternative, and
basic for each year. Additionally, there is a category termed ‘uncategorizable’ to identify
the projects for which I had incomplete information, which was insufficient to permit
categorization. The tables indicate the tendency for the WSPC to fund primarily
conventional research (i.e., 49% of the projects), whereas the IPC takes a somewhat more
balanced approach between conventional (35%) and IPM (39%) research. However, neither the IPC nor the WSPC have a significant focus on alternative projects (only 2% for WSPC, and 11% for IPC). Following the tables is a discussion of research projects that fall under each category.

### Table 2. Potato Pest Management Projects by WSU Researchers Funded by the Washington State Potato Commission 1997-2003

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>21</td>
<td>49%</td>
</tr>
<tr>
<td>IPM</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>8</td>
<td>19%</td>
</tr>
<tr>
<td>Alternative</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2%</td>
</tr>
<tr>
<td>Basic</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>9</td>
<td>21%</td>
</tr>
<tr>
<td>Uncategorizable*</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>9%</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>9</td>
<td>7</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>43</td>
<td>100%</td>
</tr>
</tbody>
</table>

*I use this term to identify the projects for which I have incomplete information, which was insufficient to permit categorization.

### Table 3. Potato Pest Management Projects by UI Researchers Funded by the Idaho Potato Commission 1997-2002

<table>
<thead>
<tr>
<th>IPC Projects</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>6</td>
<td>20</td>
<td>35%</td>
</tr>
<tr>
<td>IPM</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>22</td>
<td>39%</td>
</tr>
<tr>
<td>Alternative</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>6</td>
<td>11%</td>
</tr>
<tr>
<td>Basic</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>7</td>
<td>12%</td>
</tr>
<tr>
<td>Uncategorizable*</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>3%</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>9</td>
<td>6</td>
<td>6</td>
<td>13</td>
<td>13</td>
<td>57</td>
<td>100%</td>
</tr>
</tbody>
</table>

*I use this term to identify the projects for which I have incomplete information, which was insufficient to permit categorization.
Conventional

Conventional projects are those that have pesticides as the primary focus for a solution to a pest management problem. Furthermore, conventional projects generally emphasize “consumerism and dependence on the market,” and “highly specialized, reductionist science and technology” (Beus and Dunlap 1990: 598-99). A large portion of research projects funded by the potato commissions are conventional; 46% for the WSPC, and 35% for the IPC. Conventional projects vary in their emphasis on chemicals, but all identify pesticides as a primary solution to a pest problem.

An example of a conventional project is one funded by the WSPC during the 2001-2002 period. In the proposal for this project, the stated pest problems are flea beetles, which attack potatoes in certain regions of Washington, causing severe damage to the crop and “losses as high as 100% if no treatment is applied.” Under the ‘Objectives’, the proposal states, “Evaluate several new insecticides for control of flea beetle species in Skagit Valley and to identify the products that are most effective. Work toward obtaining a registration or section 18 for the most effective product.”

Another example of a conventional project is one funded through the IPC. This 2001 project looks at herbicide options for weed control in potato crops. The project proposal lists five objectives, the first one is “Herbicide evaluations,” which includes determining “optimum rates, timings, and tank - mixtures for new and currently registered herbicides...”. This proposal targets hairy nightshade as the main problem weed, and notes that it is becoming resistant to current herbicides. Furthermore, the proposal notes that “only seven herbicides are registered for use in Idaho potatoes,”
therefore implying the need to have more herbicides available to farmers and hence the push to get more products tested and made available.

A third conventional project example is one that was funded by the IPC in 1997. This project sought to look at the “Effects of Fungicide Applications on Green Peach Aphid Population Dynamics in the Potato Crop.” Under the ‘Justification’ section of the proposal, the researchers identify major problems associated with the potato Leaf - Roll virus, a yield-reducing virus that is transmitted by the Green Peach Aphid. The first objective is to: “Determine if fungicides commonly used in Idaho potato production cause increased green peach aphid population growth.” The second is to “Determine which commonly used fungicides have the greatest effect on increased green peach aphid population growth.” Under the ‘Anticipated Benefits’ section, the authors note “understanding the relationship between control practices for the various pests attacking potatoes is important to an effective integrated pest management program.” Thus, although the project is completely focused on fungicide testing and product evaluation, the authors claim that this study will help inform an integrated pest management program. There were no alternative techniques either focused on within this study or in another one funded by the IPC this same year.

**Integrated Pest Management (IPM)**

Integrated Pest Management (IPM) is defined as “the selection, integration, and implementation of pest control based on predicted economic, ecological, and sociological consequences” (Bottrell 1979: v). IPM involves the careful consideration of the impacts of chemicals, and integrates them into management only after seeking and implementing
alternative options. Projects categorized as IPM constitute the greatest number (39%) of projects funded by the IPC in potato pest management over the past five years. Yet, with the WSPC, projects identified as IPM constitute only 17% of the projects over the past five years. As mentioned earlier, IPM tends to be a term that is subject to much interpretation, and that seems to lack a sound, consistent definition within LGU agriculture programs. Some of the projects categorized may lean more towards a conventional approach to pest management, whereas others might be more alternative. The following examples represent some of the solutions researchers are exploring with potato pest management, and how these solutions can vary widely.

An IPM project funded in 2002 by the IPC is entitled, “Integrated Management of Late Blight and Other Important Potato Pests and Problems in Idaho.” Listed under the ‘Objectives’ section are such techniques as scouting the fields for early detection, provide disease forecasts, determine fungicide sensitivity or pink rot isolates, determine which species of the early blight fungus are active in Idaho, disseminate information to growers, provide fungicide, insecticide and other management recommendations, and develop information on the economic impact of late blight and other biotic and abiotic problems on potato production in southern Idaho. This proposal notes that this is the eighth year of a continuing project. In total, this is an approximately $100,000 project, with eight researchers listed as the project leaders and five as the support personnel. This project is meant to span the various areas of expertise of the researchers involved.

Another example of an IPM project is one funded by the WSPC in the years 1998-99. This project focused on the “Management of Meloidogyne chitwoodi (Columbia root - knot nematode) on Potato.” The ‘Justification’ section of this proposal
identifies this nematode as one of the most important factors affecting potato production in Washington. The proposal states that "continued efforts are needed to give the grower additional and improved management options to keep a step ahead of the problem." This project, as with many IPM projects, notes that the availability of certain nematicides is a major concern to agriculture due to heightened restrictions from the EPA. This seems to be a major motivating factor in seeking alternative management options. The main alternative that this project seeks to identify is green manure. The project looks at various plants that would be effective as cover crops and green manures. It also looks at the effectiveness of new chemistry nematicides that are "developed to be less toxic and more environmentally friendly."

The IPC also funded a third IPM project in 2000. The first few paragraphs under the 'Justification' section note the importance of insecticide use on potatoes in Idaho. The final paragraph of this section reflects the general fear that these insecticides could be taken away due to increased regulations. It reads:

Important potato insecticides may be lost over the next decade due to re-registration procedures and socio-political pressures. It is possible that the use of all granular insecticides will be canceled. This factor, coupled with the probability of increased resistance to existing insecticides, makes it important to evaluate alternative methods and insecticides for future insect control programs in the Idaho potato industry. Currently registered products should be evaluated in field tests to provide data to support continued registration until replacements are available.

Certainly a reoccurring theme among IPM projects is the motivation to address alternative methods of pest control primarily as the result of pressures that certain chemicals will no longer be available due to EPA regulations or other restrictions.
Alternative Projects

Alternative projects have an emphasis on environmentally sound solutions to pest problems, and they do not include chemical pesticides. Of the research projects I analyzed, only 11% of the IPC and 2% of the WSPC focus on alternative methods for potato production. In fact, for the WSPC, I categorized only one project as alternative. This 2001-2002 project studies predatory insects as a solution to reducing the frequency of pesticide applications. Even though this project focuses on an alternative method for pest control, the authors note that there is an inevitable use of pesticides in potato production. Yet, they claim that this pesticide use can be narrowed down to a selection of only the most necessary ones, and that: “As we move towards increased use of selective pesticides, these predators will become more abundant and thus more important in biological control.” The proposal claims that “by increasing the impact of the most effective predators we could allow the postponement of the first pesticide application of the year, and perhaps reduce the frequency of spraying thereafter.” Thus, this project intends to gradually increase the use of alternatives while decreasing the use of pesticides in order to effectively reach a level of successful production without chemicals.

An example of an alternative project funded by the IPC is one from 1998 that studied the use of biofungicides on potatoes. The proposal refers to a project conducted during 1994-97 (funded by the IPC) which studied the effects of two biocontrol agents against fungal root and tuber diseases. This proposal notes that, “control of fungal diseases is achieved without detrimental effects on potatoes or the soil microbial system, while the use of the biocontrol agents reduces yields of cull (those that are unfit for fresh pack sale or processing) potatoes, while increasing marketable potato yields.” This
project proposes to study two more strains of biocontrol formulations, and asserts that “while some commercial use of the agents is now occurring, success in this research will lead to wider acceptance of these products by Idaho potato growers.”

A third example of an alternative project is one funded by the IPC, which focuses on seed-feeding beetles as potential agents of potato weed control. In the proposal, the researchers note the hazards posed by the use of herbicides, even within an IPM program. The proposal notes, “Over-reliance on a limited number of herbicides poses well-known risks, including selection for pesticide-resistant weeds. But perhaps even more important is the potential for shifting consumer confidence in food safety.” The authors continue with: “we believe it prudent to begin now with studies that might lead to a novel tactic for potato weed management...” Furthermore, under the ‘Anticipated Benefits’ section, the researchers express their intent on continuing this project in the future, citing a long-term goal of designing “practical strategies for incorporating biological control into commercial potato production.”

Basic Research Projects

Basic research is research that focuses on a particular problem to learn more about it, and to inform decisions for solutions in the future. Basic research is generally not intended to pose an immediate solution to a management problem. The WSPC has a greater emphasis on basic projects (20%) than the IPC (12%). Although basic research is not meant to immediately effect the ways growers produce potatoes, these projects are important in informing future pest management decisions. An example of a basic research project funded by the WSPC is a 2000-01 study entitled, “Qualification of
Spider Mite Feeding Damage to Potatoes.” This study examines such factors as the “relationship between when mite infestations occur on potatoes and the subsequent yield loss and quality reduction in harvest,” as well as various sampling techniques that farmers can use to determine the abundance of mite populations in their field before planting and harvest periods.

The IPC funded a project in 1999 that focused on basic research pertaining to potato nematode management. This project focuses on the “diagnosis and documentation of nematode genetic diversity,” as a primary objective, in order to examine the differences in host - parasite relationships among different root lesion nematodes. This basic research project is meant to inform alternative methods in nematode management by also looking at “whether fall planted cover crops can reduce potato nematode populations, minimize nematode damage to potatoes, and improve potato yield under field conditions.” This proposal includes a plan for information dissemination that states that “information will be transferred to growers and industry personnel through newsletters, progress reports and presentations.”

Marketing/Promotion

The Potato Commissions are extremely focused on marketing and sales of potatoes, as well as creating a “potato image.” Although they fund research on potatoes, their main interest is in high yields, and selling as many Idaho and Washington potatoes and potato products as possible. The IPC statute reads, “The commission shall plan and conduct a campaign for commodity advertising, publicity and sales promotion to increase the consumption of potatoes and may contract for any advertising, publicity and sales
promotion service” (Idaho Potato Commission 1967, 1208). This marketing approach is apparent from exploring their website and promotional information. They range from selling potato dolls to offering recipes or supporting running races and other community activities (see appendix D). The statute continues that to accomplish such purposes, “it shall be the duty of the commission to disseminate information relating to potatoes and the importance thereof in preserving the public health, the economy thereof in the diet of the people and the importance thereof in the nutrition of children...” (Idaho Potato Commission 1967, 1208).

A large motivation behind potato advertising campaigns is the apparent competition between commissions to create the best potato image for their state. For example, the Declaration of Policy for the IPC reads:

...all major producing states of potatoes are and have been advertising their products throughout the United States to the extent that if Idaho is to enjoy her equitable share of the trade in the state, (that) the potatoes of this state must be advertised to be able to retain their place on the markets of the United States... (Idaho Potato Commission 1967, 1201)

Similarly, the WSPC website establishes their mission as:

The mission of the WSPC is to serve the potato growers of Washington State. The main function of the Washington State Potato Commission is to work toward the enhancement of marketing opportunities through promotion, advanced production and cultural practices through research, and preserve the rights and enhance the ability of growers to produce potatoes through legislative and regulatory actions. (WSPC 2001)

Generally, these commissions are competitive with potato commissions in other states. It is unusual for these commissions to entertain a joint marketing effort. In fact, the only such effort occurred in June, 2001 when IPC, WSPC, and the Oregon Potato Commission
received a $50,000 federal grant to fund a project promoting potatoes from these three states to Japanese potato chip processors (WSPC 2001). They are each contributing to the grant to make a total of $100,000 for the effort.

It is not uncommon for commissions to hire Public Relations firms to assist in advertising campaigns. For example, in the fall of 2001, the IPC hired an advertising firm in New York City to help with a potato promotion campaign. This firm organized an elaborate series of events in which the commissioners were to fly to New York City and take part in lavish dinners created by professional chefs at the restaurant in the World Trade Center, “Windows of the World.” Additionally, they were scheduled to appear on such television shows as “Good Morning America.” The event was scheduled for September 12, 2001, and for obvious reasons, never took place.

Both commissions appear frequently in the magazines Spudman, Potato Grower and Potato Country. In fact, Potato Grower lists the IPC as one of its contributing organizations. The November, 2001 issue of Potato Grower provided an update on the members of the Idaho Potato Commission and a brief description of their recent meeting. It read, “The group will work with a budget of $10.2 million ... The bulk of the budget will be spent on advertising and public relations” (Rawlings 2001: 34). Similarly, Potato Country includes the WSPC and Oregon Potato Commissions on the Editorial Advisory Board.

**Conclusion**

Potato Commissions clearly have an emphasis on pushing for high yields and a maximum profit-oriented potato production. These organizations are concerned with
competing with other states to be the best and most well-known potato state in the
country. Although these commissions support a range of research projects, only a handful
of projects have had an emphasis on alternatives to pesticides over the past five years.

The state potato commissions in Washington and Idaho are representative of the
profit-driven dimensions of the potato industry in the Northwest. It is important to
address the needs these commissions represent, but it is equally important to hear the
voices of those groups that are currently silenced. Such groups include those that are
representing smaller farmers and alternative methods for potato production. The next
chapter offers my conclusions of this study, as well as potential next steps in encouraging
potato research at WSU and UI that is inclusive of the varying needs of communities and
growers involved in potato production in the Northwest.
Digesting the Politics of Potato Research:  
The Next Steps

Northwest potato production relies heavily on pesticides, causing significant negative impacts on water and soil quality, and human health. There is a serious need for a focus on alternatives to pesticides; in addition to the detrimental effects on the environment and human health, the prices farmers pay for these chemical products continues to increase. Such a financial strain can negatively impact the livelihood of Northwest potato growers, as well as the economic well being of rural agricultural communities throughout this region.

A public dialogue has begun over efforts to reduce pesticides in potato production in the Northwest. Land Grant Universities could be important voices in this dialogue by making efforts to alter the current emphasis on pesticides by increasing research conducted on alternative techniques in this complex crop. University of Idaho and Washington State University are two such institutions that could be a pivotal link in bringing such research to the forefront in this country’s top potato production states.

The opportunity to talk with researchers at UI and WSU provided me with a better understanding of the concerns and pressures LGU researchers face, and how these pressures in turn affect their research. Researchers working in potato pest management at the University of Idaho and Washington State University expressed a range of perspectives on key issues regarding potato production in the Northwest. The researchers voiced primary concerns in improving the current economic positions of potato farmers.
They would like to see these farmers spending less money on chemical inputs, and receiving greater returns for their potato crops. A paradox is apparent, however, because half of these researchers devote a significant amount of their time to studying the newest chemical products on the market, products that are much more expensive than older ones. These products are marketed as ‘friendly’ to the environment, and researchers claim this represents the entire chemical industry’s shift towards agricultural stewardship. This creates an ambiguity as to researchers’ motivations. Are they trying to help the financial status of growers first and foremost, or are they riding the chemical industry’s wave of pricey, yet ‘softer’ chemical products in attempts to appease environmentalists?

Intertwined with this ambiguity of motivations is the concept of integrated pest management (IPM). Researchers at UI and WSU claim a major emphasis on incorporating IPM as a means for pesticide reduction, and 39% of the projects funded by the Idaho Potato Commission and 19% by the Washington State Potato Commission are IPM projects. Yet this effort appears hampered by the multiple perspectives of IPM that exist. In this sense, the terms IPM and sustainability can be viewed similarly, in that they tend to be loosely defined and subject to much interpretation. As Allen and Sachs (1993: 140) observed: “... the new struggle of the sustainability movement is to ensure that the meaning of the term is not subverted to equate with ‘business as usual’.”

In addressing where potato pest management research is heading, sifting through research funding sources at WSU and UI reveals a wide range of financial support and somewhat ambiguous goals from these funding programs or organizations. In many cases, researchers reflected research orientations according to their main source of funding. For example, those who are applying for, or who have received funding from
the Sustainable Agriculture Research and Education (SARE) grant program, expressed the most interest in conducting alternative projects. Those with significant funding from corporations tended to express most the benefits of chemical efficacy research and the purported effectiveness of new pesticide products. The researchers with the most flexibility, or interest in an array of options for pest control were those with funding from a variety of sources, or those with secure funding from one main source (such as a USDA position). Over the past ten years, state and federal funding for LGUs has steadily decreased (Jones 1994), and in such tough economic times, aligning goals with outside funding sources is often a necessary reality for researchers who wish to continue with their ongoing research.

Of the researchers I interviewed, all receive funding from either the Idaho (IPC) or Washington (WSPC) State Potato Commissions. This is clearly a significant amount of support from these commodity commissions, and not only are they having a large impact on Land Grant University research, they play an active role in structuring a complex potato industry. Potato Commissions have an emphasis on pushing for high yields and a maximum profit-oriented potato production. These organizations are concerned with competing with other states to be the best and most well-known potato state in the country. Although these commissions support a range of research projects, only 2% of WSPC and 11% of IPC funded research projects have had an emphasis on alternatives to pesticides over the past five years.

In closely aligning themselves with potato commissions that seek to attain maximum-profit and highest yields, could researchers be exacerbating the very problems which they consider the most devastating to growers, such as overproduction? For
instance, researchers noted that the problems of overproduction are severe and manifold for the growers. They claimed that it causes drastic price fluctuations and detrimental land use techniques such as monocultures. Yet commissions push for maximum production, as the Idaho Potato Commission statute declares, "The purpose of this act is to expand the markets and increase consumption of potatoes produced in this state, thereby promoting the general welfare of our people" (Idaho Potato Commission 1967, 1201). These commissions are the primary funding source for researchers, and thus the projects they work on continue this overproduction cycle.

It is important to address the needs these commissions represent; after all, they present voices and concerns of growers. Yet it is equally important to examine who exactly these commissions represent. Buttel and Gillespie (1989: 387) note that "farmer groups that provide dependable support for agricultural research appropriations from state legislatures consist primarily of those who operate large farms." Furthermore, researchers claim they tend to work for a clientele of growers with larger-scale operations. What is apparently missing from agricultural research and commissions are the voices of farmers from small-scale, family farms, and even small, local processing companies. These voices seem to be absent from the research focus of potato pest management research programs at UI and WSU.

As noted in this paper, LGUs are not static institutions. As one researcher mentioned, during his position as extension educator, his role has changed greatly over the past twenty years. Now, he has very little contact with the growers themselves. Much of his responsibilities of information dissemination are conducted via the internet, with websites and pest management information search engines. This represents the loss of a
crucial link between LGUs and their agricultural clientele. In a study on farmer ambivalence to agricultural research, Buttel and Gillespie (1989) note that extension contact is the most important connection related to farmer support of agricultural research. Not only are researchers with extension assignments not emphasizing these important personal connections with growers, they are also choosing to disseminate information from their research in ways that are geared towards reaching specific audiences. What about the farmer who does not have access to the internet? Or what about the farmers that subscribe to alternative farming magazines, rather than Spudman or Potato Grower? It is understandable, and even preferable, that LGUs change along with the changing times.

Despite a continued emphasis on conventional research, a common theme expressed among researchers is a belief that a shift is occurring towards greater recognition of environmental concerns. Will this recognition result in increased research for alternatives to pesticides, or does it merely represent a facade of environmental concern shrouded by a loosely defined term such as IPM? Whose needs will these shifting research projects represent? Where will funding support come from? In addressing these questions, I offer a few suggestions on next steps in helping to influence the research conducted at UI and WSU towards alternatives to pesticides in potato management.

Now What?

Researchers from UI and WSU expressed concern pertaining to three major aspects of potato production: overproduction, pesticide resistance, and pest management.
It is important to recognize these perceived problems because they are coming from people who know the potato industry well. Furthermore, the problems these researchers mentioned are related to various barriers faced by potato growers and researchers themselves, barriers that pose limitations on attempts to increase use of alternatives to pesticides in potato production.

According to the researchers I interviewed, overproduction is a problem that causes a ripple effect of detrimental results to growers’ economic well-being and the environment, and that determines the continuance of other unfavorable aspects of the current potato production system. Potato processing corporations play a crucial role in this cycle of overproduction by demanding large quantities of a specific variety (and even size and color) potato, and therefore contribute significantly to the problems mentioned by the researchers. Because of this, a successful campaign to encourage alternative methods of production must include attempts to alter the ways and means by which potatoes are being processed. A way to address this includes conducting a media campaign that focuses on the significant influence processing corporations, such as Lamb Weston, have on the growing techniques used by potato farmers, and the large quantity of pesticides these corporations encourage the farmers to use through contracting. It would be effective to associate specific chemical pesticides with the processing corporations that push for the use of these pesticides in growers’ fields.

In addition to potato processors, state potato commissions have a significant influence on facilitating the continuance of potato overproduction in the Northwest. With a large emphasis on marketing and high-yields, these commissions strive to produce the maximum yield of potatoes. These commissions not only have a great influence on the
current state of potato production, as researchers note, they also have a considerable impact on research orientations at Northwest Land Grant Universities. One way to affect change towards a more alternative approach in pest management research is to influence the interests of the state potato commissions. This could entail getting growers or processors elected as commissioners who represent a wider range of interests that impact growers in the Northwest. For example, if a few of the members of the IPC expressed the concerns of sustainable farms or local, small scale processing facilities, then these needs could be better met by the research this commission supports.

Additionally, growers who do not feel their needs are represented by the potato commission in their state could collectively refuse to pay the tax levied on their potato production. The Livestock Marketing Association has been undertaking a similar effort over the past few years with beef check-off programs. Heffernan (2000) notes that this organization is leading a petition drive to recall beef check-off programs so that not all beef producers have to subsidize programs that do not benefit them. According to Heffernan (2000: 67), these protesters “suggest the check-off funds are being spent directly or indirectly on projects that benefit processors and retailers rather than beef producers, and that the results are increased concentration and integration of the industry.” Potato producers interested in alternatives and their allies could undertake similar protests that would allow them to support only those commodity commissions and associations that best represent a greater diversity of grower’s needs in Idaho and Washington.

In addition to overproduction, researchers also noted that pesticide resistance is a serious problem facing potato growers in the Northwest. The current state of potato
production in the Northwest relies heavily on the continual development of new pesticides. As Altieri (2000) notes, this focus on pesticides results in large portions of target weeds becoming resistant to certain pesticides. Altieri also notes that a primary reason for this pesticide dependency is the lack of diversity in current cropping systems. Along with other agroecologists, Altieri argues that compared with monocultures, a diverse agricultural system is much healthier and is much more likely to enhance natural pest control. Therefore, in order for growers to move away from this "pesticide treadmill," more emphasis must be placed on opportunities to move away from a monoculture approach to farming.

Two ways to address these concerns are encouraging production of a wider range of potato varieties and influencing the supermarket sector. Currently, researchers at UI and WSU are working on developing new varieties that have resistance to specific insects and diseases. Yet a great deal of the success of this research for the potato industry depends largely upon the willingness of consumers to purchase the many varieties that become available. This would entail a consumer education program that encourages the sales of a wider range of potato varieties. At the same time, consumers cannot easily purchase these varieties if they are not available in larger supermarket chains. Thus, an emphasis needs to be placed on influencing the supermarket mentality of selling only a few varieties of potatoes to offering up to ten or more varieties. This change would not only offer consumers more choices and support traditional breeding research at universities, but it would also diversify farm systems and enable farmers to grow varieties that have resistance to pests, which therefore entails significantly fewer pesticide inputs.
As stated earlier, funding is a key influence upon LGU research. Therefore, a next step in this project is to seek and identify potential funding sources for research focusing on alternatives to pesticides, in order to expand the current limited possibilities for funding grants in this area of pest management. Such funds could be solicited through public and private sources.

The sentiment of the majority of the researchers I interviewed was a sincere concern to address the needs of the growers. In the past, this concern generally translates into the needs of growers with large operations. An effective technique in influencing researchers' studies is to target certain researchers who may be interested in alternative research but who do not feel there is enough support for it. This effort would also involve identifying and organizing alternative farmers to approach the researchers. Working with these particular researchers to reflect interests in alternative research might provide them with the necessary public support to deem their research 'credible', while also enabling them to enact their purported goal of addressing the needs of growers.

Although interest in focusing on alternatives to pesticides in research has not been a general theme reflected in the projects conducted on potato pest management at UI and WSU over the past five years, I believe their is a general receptivity among the researchers to move towards a more ecologically - sound potato production. Certainly, there is enough receptivity among these researchers to merit a campaign for an increase in alternative research at these universities. Due to their expertise of various dimensions of potato production and their broad knowledge of the potato industry, these researchers play a vital role in a shift towards an increase in alternative potato production methods in the Northwest. In fact, it is necessary to engage researchers in a campaign for alternatives
to pesticides in order for important changes to take place in a movement towards a more sustainable system of potato production.
References


Idaho Potato Commission Statute. 1967. Title 22, Chapter 12.


Appendix A: Interview Questions

1. What % research and extension is your position?

2. What do you see as the major concerns that potato growers in the Northwest face?

3. Do you focus primarily on potatoes? If yes, how and why did you become a potato specialist?

4. What solutions are being researched for (insert researcher’s area of expertise)?

5. What would you tell a grower who called now about a problem with (area of expertise)?

6. Are there many successful alternatives to pesticides for growers to use against (insects, diseases, weeds, etc.)?

7. Do you do chemical efficacy testing? For Whom?

8. What are the sources of funding for your research?

9. Do you have any abstracts/reports from your research?

10. Can I email you if other questions come up?
U.S. Potatoes: Production in Leading States

2000 output at 515,964 (1,000 Cwt)

- Idaho - 30%
- Washington - 21%
- Oregon - 6%
- Colorado - 6%
- Wisconsin - 7%
- North Dakota - 5%
- Minnesota - 4%
- Maine - 3%
- California - 3%
- Michigan - 3%
- Others - 12%

Source: USDA/NASS
Appendix C: Potato Consumption

The average American eats 142.7 pounds of potatoes each year. That average diet is broken into the following proportions:

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<tr>
<td>48.1 pounds</td>
<td>Fresh Potatoes</td>
</tr>
<tr>
<td>58.9 pounds</td>
<td>Frozen - French fries, hash browns, etc.</td>
</tr>
<tr>
<td>16.0 pounds</td>
<td>Potato chips</td>
</tr>
<tr>
<td>18.0 pounds</td>
<td>Dehydrated - mashed potato flakes, au gratin mixes, etc.</td>
</tr>
<tr>
<td>1.7 pounds</td>
<td>Canned</td>
</tr>
</tbody>
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Source: USDA, 1998
Appendix D
Commission Marketing: "Spuddy Buddy"