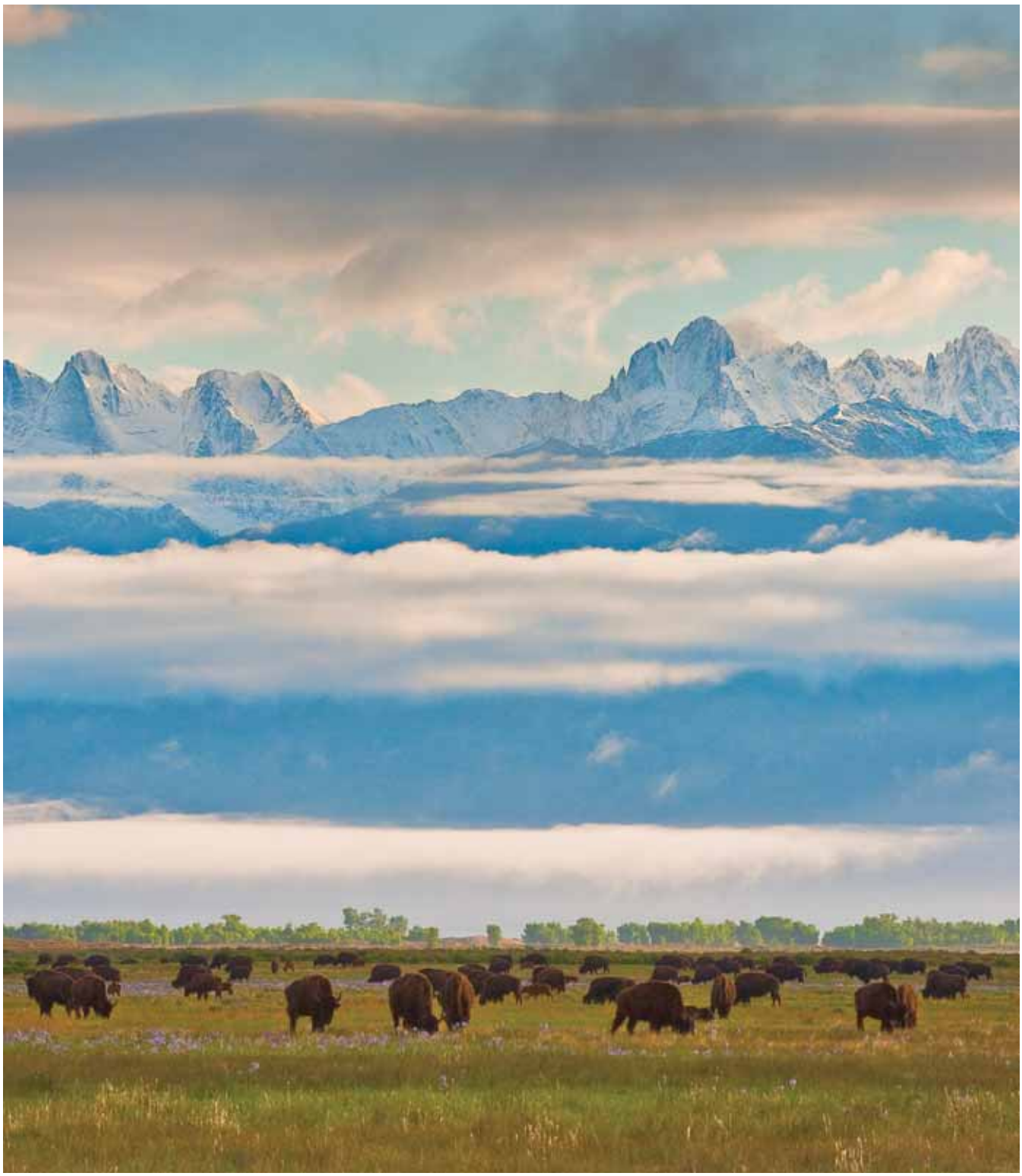

The 2010

COLORADO COLLEGE

STATE OF THE ROCKIES REPORT CARD

Agriculture in the Rockies

An Outreach Activity of Colorado College: Vision 2010

Colorado College's Rocky Mountain Study Region

The Colorado College State of the Rockies Project is designed to provide a thoughtful, objective voice on regional issues by offering credible research on problems faced by the Rocky Mountain West, and by convening citizens and experts to discuss the future of our region. Each year, the State of the Rockies provides:

- Opportunities for collaborative student-faculty research partnerships;
- An annual *State of the Rockies Report Card*;
- A companion State of the Rockies Speaker Series and Symposium.

Taken together, these arms of the State of the Rockies Project offer the tools, forum, and accessibility needed for Colorado College to foster a strong sense of citizenship for both our graduates and the broader regional community.

THE COLORADO COLLEGE
STATE OF THE ROCKIES PROJECT

AN OUTREACH ACTIVITY OF
COLORADO COLLEGE
VISION 2010

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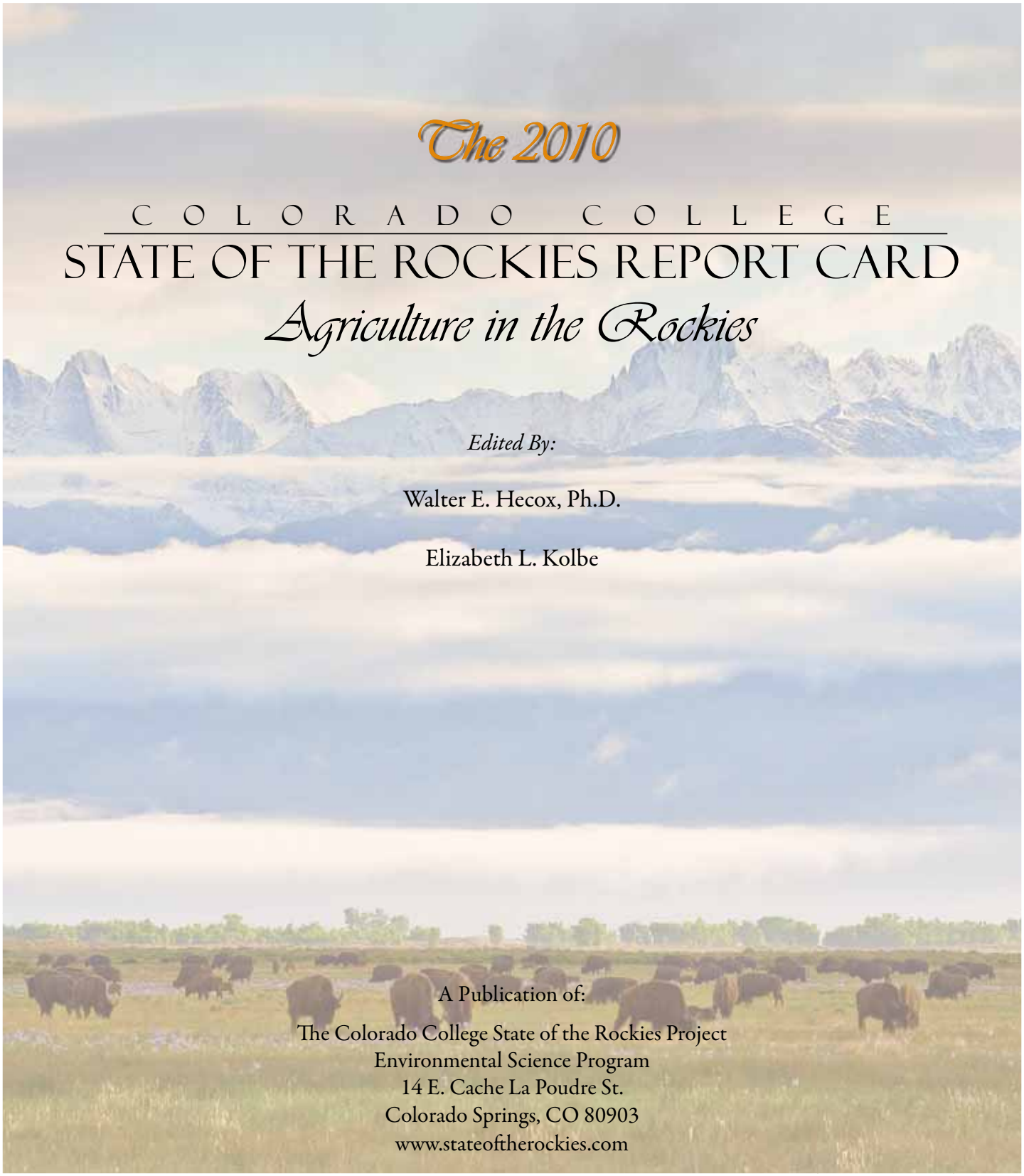

The 2010

COLORADO COLLEGE

STATE OF THE ROCKIES REPORT CARD

Agriculture in the Rockies

Edited By:

Walter E. Hecox, Ph.D.

Elizabeth L. Kolbe

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Research, Report, Engage!

An Introduction from the President

THE 2010 COLORADO COLLEGE STATE OF THE ROCKIES REPORT CARD

Welcome to Colorado College's seventh *State of the Rockies Report Card*. Building upon a strong start in 2004 and continuing each year since, the Rockies Project this year provides a fresh look, through thoughtful analysis, at a fundamental challenge to this beautiful but fragile region: maintaining the Rockies' key roles in the nation's food supply and vibrant agriculture. This *Report Card* and the companion series of 2009-10 monthly State of the Rockies Food and Agriculture campus speakers are significant outreach activities of Colorado College: Vision 2010, an agenda to strengthen our college and our engagement in the region.

In prior years, annual *Report Cards* have examined how specific issues challenge the Rockies region and its natural, cultural, and historic importance. These have included regional energy issues, the condition of our national parks and health of our forests, expected impacts of climate change, success stories among our Native American peoples, toxic waste, creative occupations, a host of wildlife topics, and civic engagement. Media coverage has supplemented our annual conference and speakers series efforts, bringing regional, national and international attention to the issues studied and the results found by our undergraduate researchers. We are proud to continue the decades' long tradition of Colorado College contributing to and strengthening our surrounding region's social, economic, and environmental qualities.

Our college has both prospered in and contributed back in unique ways to our Rockies "backyard." Since our founding in 1874, we have responded to the constant changes as America moved westward into our Rockies region, which currently consists of 281 counties with a population that in recent decades has grown at three times the national average.

Colorado College is a private, four-year liberal arts and sciences college enrolling 1,900 students, located on a 90-acre campus in downtown Colorado Springs near the base of Pikes Peak. The institution has been defined and continually redefined by the Rockies region since its founding by General William Jackson Palmer, whose goal was to educate and "civilize" the regional population in the New England liberal arts tradition. Evolving programs and majors have been relevant to the region's needs, from early day mining, forestry and engineering to our current regionally focused programs in environmental and southwest studies. Generations of students and professors have benefited from this magnificent region, using field trips and research to better understand disciplines such as geology, biology, economics, sociology, and the environment.

Our mission statement speaks to what we are all about:

> *At Colorado College our goal is to provide the finest liberal arts education in the country. Drawing upon the adventurous spirit of the Rocky Mountain West, we challenge students, one course at a time, to develop those habits of intellect and imagination that will prepare them for learning and leadership throughout their lives.*

To achieve these goals, Colorado College offers first and foremost an excellent education in the liberal arts and sciences. The college encourages a spirit of intellectual adventure: critical thinking, hands-on learning, and personal responsibility within an environment of small learning communities where education and life intertwine. Strong student involvement in endeavors such as the Rockies Project is one way we seek to connect with the challenging issues around us!

I invite you to explore the Rockies through the material in this *Report Card* and am confident that it will inform, challenge, and stimulate your knowledge and thinking. We welcome you to a growing number of people who care to learn more about and contribute to protecting the unique features and character that make the Rockies region everyone's special "backyard."

Richard F. Celeste
President of Colorado College

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Colorado College, the Rocky Mountain West, and

The State of the Rockies Project

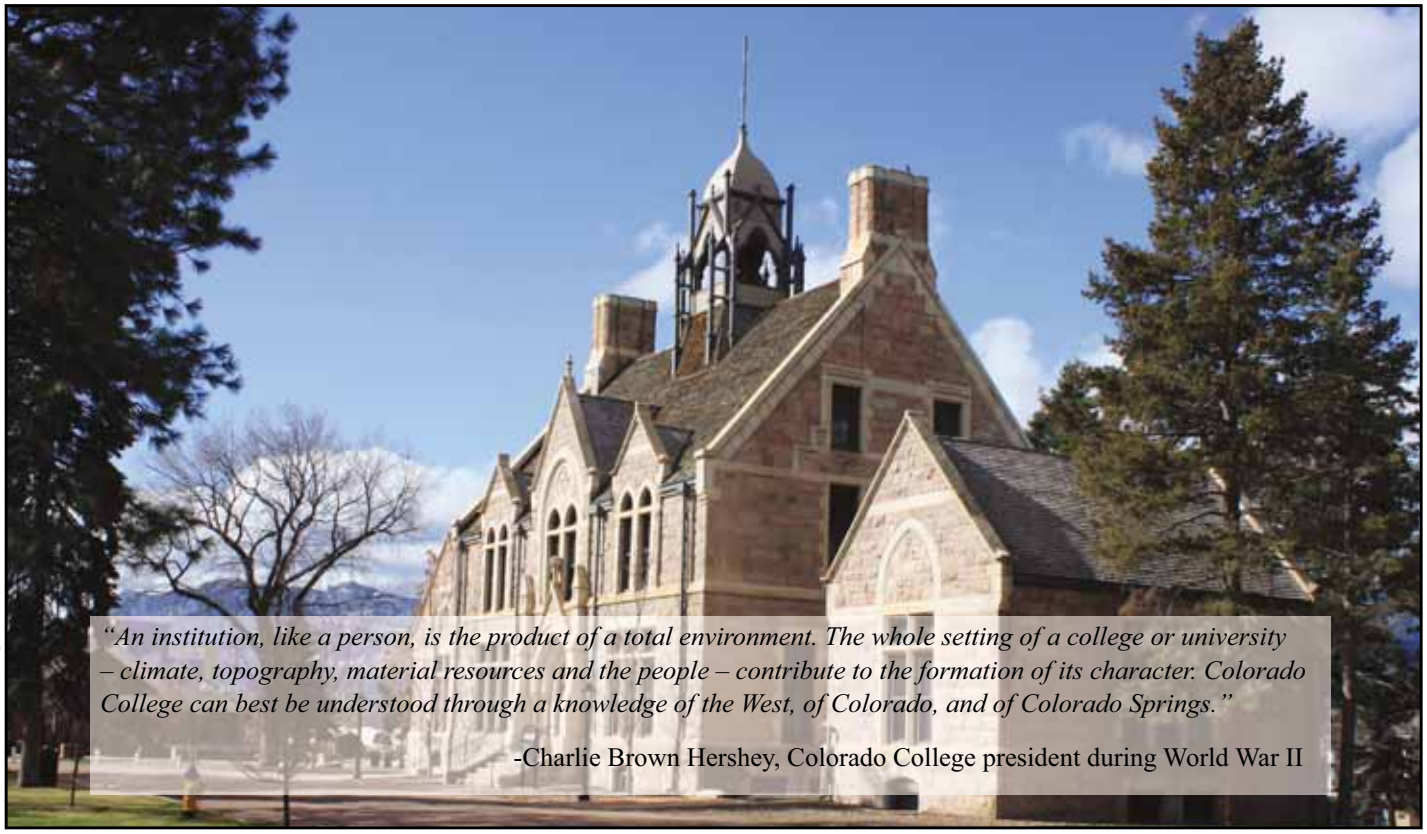
By Dr. Walter E. Hecox

The 2010 Colorado College State of the Rockies Report Card

Colorado College today, as for the past 136 years, is strongly defined by location and events of the 1800s. Pikes Peak abruptly rises out of the high plains that extend from the Mississippi and Missouri rivers towards the west. Peaking at 14,000 feet, this eastern-most sentinel of the Rocky Mountain chain first attracted early explorers and was later the focus of President Jefferson's call for the southern portion of the Louisiana Purchase to be mapped by Zebulon Pike in 1806. Gold seekers in 1858 spawned the start of the "Pikes Peak or Bust Gold Rush" of prospectors and all manner of suppliers to the mining towns. General William Jackson Palmer, while extending a rail line from Kansas City to Denver, in 1869 camped near what is now Old Colorado City and fell in love with the view of Pikes Peak and red rock formations now called the Garden of the Gods. An entrepreneur and adventurer, Palmer selected that site to found a new town with the dream that it would be a famous resort—complete with a college to bring education and culture to the region. Within five years both Colorado Springs and Colorado College came into being in the Colorado Territory, preceding Colorado statehood in 1876.

Early pictures of present-day Cutler Hall, the first permanent building on campus that was completed in 1882, speak volumes to the magnificent scenery of Pikes Peak and the lonely plains. Katherine Lee Bates added an indelible image of the region. In 1893 she spent a summer teaching in Colorado Springs at a Colorado College summer program and on a trip up Pikes Peak was inspired to write her famous "America the Beautiful" poem. Her poem helped spread a celebration of the magnificent vistas and grandeur of Pikes Peak and the surrounding region, and provided bragging rights for Colorado College as "The America the Beautiful College."

The last quarter of the eighteenth century was challenging both for Colorado Springs and Colorado College. Attempts to locate financial support in the east and ease the travails of a struggling college were grounded on the unique role of Colorado College in then President Tenney's "New West" that encompassed the general Rocky Mountain region. His promotion of this small college spoke of Colorado College being on the "very verge of the frontier" with a mission to bring education and culture to a rugged land. Even then, Tenney saw the college as an ideal place to study anthropology and archeology, use the geology of the



"An institution, like a person, is the product of a total environment. The whole setting of a college or university – climate, topography, material resources and the people – contribute to the formation of its character. Colorado College can best be understood through a knowledge of the West, of Colorado, and of Colorado Springs."

-Charlie Brown Hershey, Colorado College president during World War II

About the author: Dr. Walter E. Hecox is professor of economics in the Environmental Program as well as faculty director of the Colorado College State of the Rockies Project.

region as a natural laboratory, and serve the mining industry by teaching the science of mineralogy and metallurgy. In the early 1900s a School of Engineering was established that offered degrees in electrical, mining, and civil engineering. General Palmer gave the college 13,000 acres of forest land at the top of Ute Pass, upon which a forestry school was built, the fifth forestry school created in the US and the only one with a private forest.

Subsequent decades brought expansion of the institution, wider recognition as a liberal arts college of regional and national distinction, and creation of innovative courses, majors, and programs. The unique Block Plan, implemented in the 1970s, consists of one-at-a-time courses lasting three and one-half weeks each that facilitate extended course field study, ranging across the Rockies and throughout the Southwest. Thus CC has a rich history indelibly linked to the Rockies.

Today is no different: CC has new programs that meet evolving challenges in the Rockies, including environmental and Southwest studies programs, a sustainable development workshop, and exciting fieldwork offered by a variety of disciplines. Students can thoroughly explore the Rockies through the block plan and block-break recreation.

The State of the Rockies Project

The Colorado College State of the Rockies Project is designed to provide a thoughtful, objective voice in regional issues by offering credible research on challenges and problems facing the Rocky Mountain West, and through convening citizens and experts to discuss the future of our region. Each year the Project seeks to

- **Research**: offering opportunities for collaborative student–faculty research partnerships
- **Report**: publishing an annual Colorado College State of the Rockies Report Card
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Taken together, these three arms of the State of the Rockies Project offer the tools, forum, and accessibility needed for Colorado College to foster a strong sense of citizenship among our students, graduates, and the broader regional community.

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Editors' Preface

By Dr. Walter E. Hecox and Elizabeth L. Kolbe

Agriculture and the Rockies region have a symbiotic relationship. Agriculture depends on the land, water, and environment while simultaneously shaping settlement patterns, demographics, economic prosperity, and land use. The 2007 Agricultural Census, released in 2009, reveals gradual changes in agriculture in both the Rockies and the nation. Over the five years from the 2002 Agricultural Census, the number of farms and ranches grew, with these new operations demonstrating more diversified production, fewer average acres, lower sales, and younger operators - many of whom also work off the farm. The same five years brought a more demographically diverse range of U.S. farm operators, with significantly more women and minority groups as principal operators. By 2007 one-third of farms were classified as residential/lifestyle farms, with sales of less than $250,000 and operators primarily working outside farming; another one-fourth of farms were small and operated by retirees. While the number of small farms has increased, mega-agricultural enterprises are taking center stage in farm production, and new products are matching changing food preferences. The result: a dynamic landscape of agriculture and food throughout the eight-state Rockies region.

Rockies landforms have shaped and defined agriculture, with patterns of food and crops impacting rural communities, open spaces, water diversions, and transportation networks to major cities and elsewhere. All have evolved along with the region's agricultural heritage into the "wide-open spaces" we connect with the character of the Rockies. This synergism was true in the earliest decades of settlement in the American West and is still true today.

It would be remiss to measure the importance of agriculture today solely by its contribution to regional employment or income, which only totals a few percent nationally and in the Rockies. Over the past century, technological advancements in transportation, agricultural machinery, water conveyance, fertilizer, herbicides, and pesticides have contributed to abundant crop productivity and variety, a bounty so vast that even as employment dwindles to single digit levels, surpluses often create a glut at markets and require federal government programs. Agriculture's importance reaches far beyond sheer numbers of employees or shares of regional income. Agriculture should be considered an essential force in "cultivating open spaces" for wildlife habitat, riparian health, and the solace millions gain from these apparent "empty" places. Neither "empty" nor neglected, the rural fabric of the Rockies derives directly from the magnitude and health of agriculture. We allow agriculture to dwindle and become marginalized at our region's socioeconomic and environmental peril.

Now in its seventh year, the State of the Rockies Project has chosen a single focus for our summer 2009 research and linked sections of the *2010 Report Card*: food and agriculture in the Rockies. Thanks to continued generous funding, we selected a team of six student researchers to engage in summer research and field exploration, resulting in the research reports contained in this annual *Report Card*. Bringing new data and perspectives to foundational data from the 2007 Agriculture Census, we have set out to review current magnitudes and recent trends in key parts of food and agriculture in the Rockies: land, people, production, organization, and finances. The student researchers spent the summer developing their respective sections through scholarly research, discussions, and interviews.

Several field trips throughout Colorado, New Mexico, and Arizona complemented campus lab work, making possible selected case studies that "bring alive" aspects of Rockies agriculture. Traveling 1,800 miles, researchers saw not only the diverse land, people, and culture of the Rockies region, but also the myriad agricultural enterprises.

Beginning down I-25, the first stop for the Rockies' team was Javernick Family Farms, a 70-acre "beyond organic" establishment that raises vegetables, flowers, and beef in Cañon City, Colorado. The Rockies Project then visited Chile River Farm near Hatch, New Mexico. Though it was too soon for their world-famous chiles, the onion harvest was in full swing. The Rockies team left Hatch with burning mouths, some new friends, and 150 pounds of onions. Before leaving the area, the Rockies Project toured the Las Uvas Valley Dairy, one of the largest dairies in the United States. Loren Horton led the tour of the facility, including the 24-hour milking stations frequented by 15,000 cows.

The group made their way to Douglas, Arizona, to join the Malpai Borderlands Group for their annual meeting. The Malpai Group is a coalition of ranchers, environmentalists, and government employees who work together to ensure the sustainability of ranchlands in the area. On the way back north, the Rockies Project stopped in Marana, Arizona, at the cotton fields of Jon Post. In addition to cotton production techniques, Post discussed labor challenges and commodity market policy with the students and staff.

About the co-editors: Walter E. Hecox is professor of economics in the Colorado College Environmental Program and project director for the State of the Rockies Project. Elizabeth L. Kolbe is the 2009-10 Rockies Project program coordinator.

Back in Colorado, the research team spent a day at the Medano-Zapata Ranch in the San Luis Valley learning about sustainable cattle ranching and bison ranching techniques. The last research stop was at Aurora Organic Dairy near Mead, Colorado. The dairy was converted to organic in 2003 and now produces, pasteurizes, and bottles 5,000 gallons of milk every day.

From mountains to rivers to deserts, from one green chile to the next mole, researchers learned about challenges and progress in Rockies' agriculture, how citizens are working to shape the future, and how Colorado College students and the State of the Rockies Project fit into the warp and weft of the Rocky Mountain region.

In addition to the data analysis and field interviews presented in the main sections, the *2010 Report Card* includes graphical depictions of various "footprints" for food and agriculture. The sketches help highlight dimensions of agricultural production as we think about agriculture's impacts on human diets, water, land, energy, and climate.

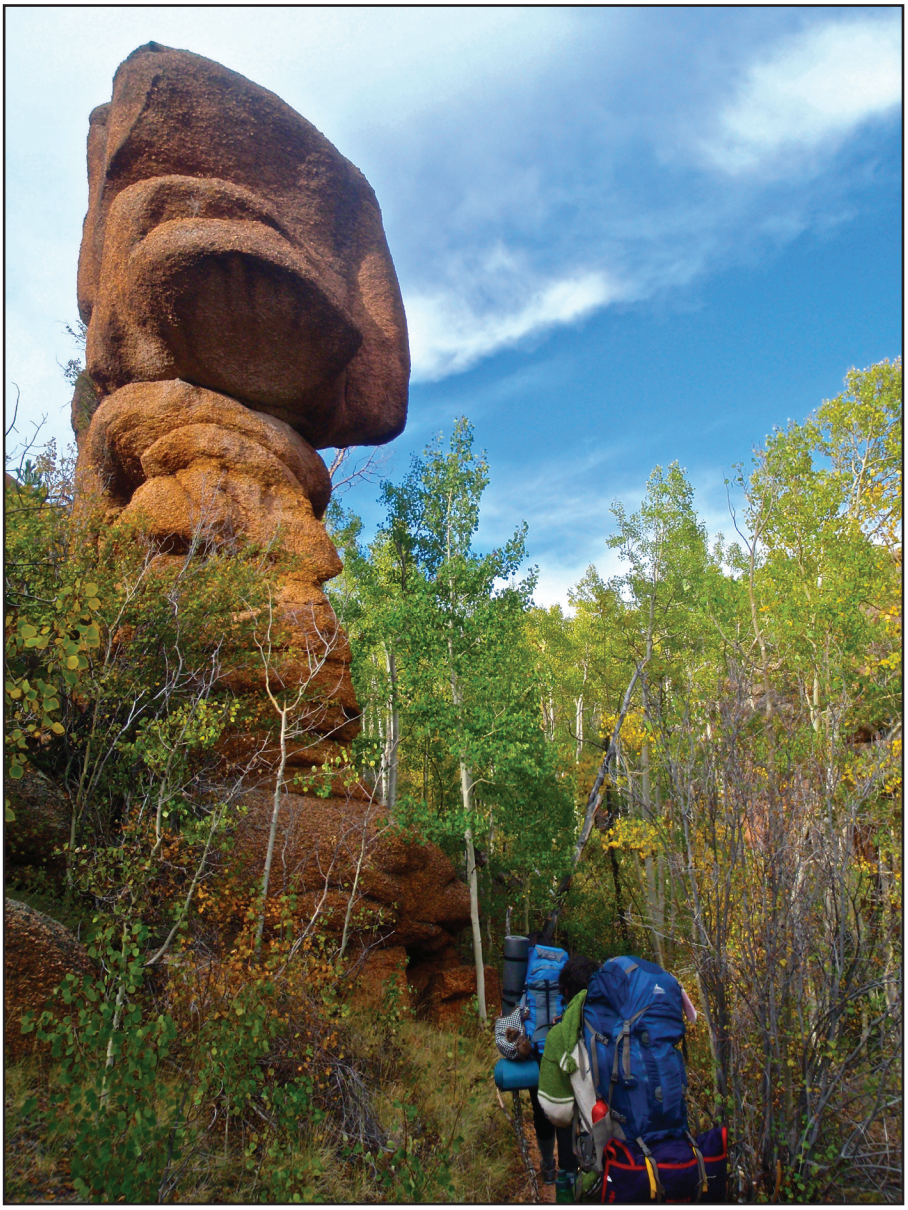
Making the best of the financial challenges faced nationwide during 2009, we have merged the traditional Rockies April Conference with a monthly speaker series, bringing experts to Colorado Springs throughout the academic year to share perspectives on "Food and Agriculture in the Rockies: Current Challenges and New Trends" with the campus and community. Capacity attendance has been evidence of how deeply people of all ages care about their food and the types of agriculture which produce that food. Our speakers have included Dr. William Weida, President of the Socially Responsible Agricultural Project; Dan Morgan and Elaine Shannon, both journalists of long-time affiliation with the Washington Post and other national publications; Dr. Rosamond Naylor, Director of the Stanford University Program on Food Security and the Environment; Richard Manning, awarding-winning author and journalist; and Dr. Bonnie Lynn-Sherow, professor of history at Kansas State University.

Maintaining continuity with previous years' *Report Cards*, we have updated and begun this year's publication with "the Rockies Baseline," examining trends and latest data on key, annually updated demographic indicators for the U.S., the Rockies region, and each of the eight Rockies states. This Baseline helps readers orient themselves to basic facts and trends in this vast, rapidly changing region.

Central to this year's activities, as in the past, are the three goals of the Colorado College State of the Rockies Project:

- RESEARCH: To involve Colorado College students as the main contributors to the *Report Card* and conferences.
- REPORT: To produce an annual research document on critical issues of community and environment in the Rocky Mountain West (the *Report Card*); and
- ENGAGE: To host an annual monthly speaker series at Colorado College, bringing regional experts together with concerned citizens.

Through these goals, the Rockies Project and Colorado College aim to inspire *Report Card* readers and Rockies events attendees to creatively contemplate, discuss, and engage in shaping the future of our beloved, beautiful, and fragile region—the Rocky Mountain West. Enjoy!



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Rockies Baseline

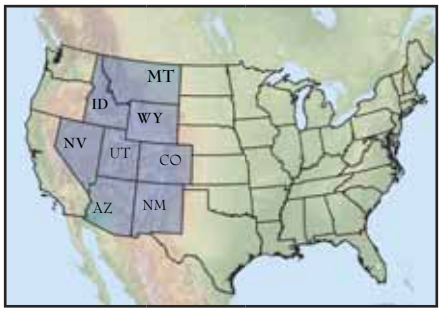
Vital Signs for a Region in Transition

By Elizabeth Kolbe

The 2010 Colorado College State of the Rockies Report Card

Each year, the Colorado College *State of the Rockies Report Card* updates the Rockies Baseline. This brief, data-rich section highlights the key statistics of the Rockies' states, the region, and the nation. Like a yearly check-up on a growing body, the baseline inventories the vital signs for a growing and changing region.

The Rockies Baseline utilizes the most recent data from the U.S. Census Bureau's American Community Survey (2008) and the Dicennial Census (2000).



Most of the trends and statistics reported in the 2010 Report Card mimic those of previous years. The categories that stand out not only highlight the unique qualities of the Rockies region, but show the effects of our continuing growth.

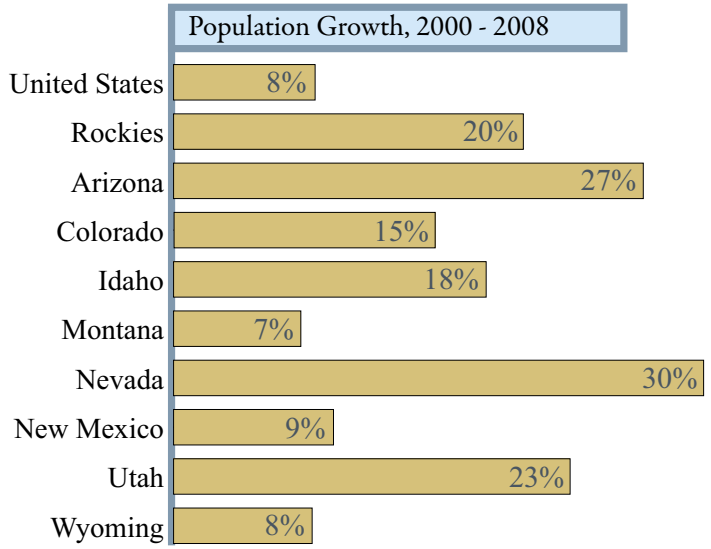
Looking at the region as a whole, the population is young and growing 18 percent faster than the national average. This accelerated growth is shown in six of the eight Rockies states. A higher percentage of Rockies students graduate high school, and an equal proportion continue on to college. Rockies median home values exceed the national average, as does median household income. Most impressively, employment has grown 24 percent in the Rockies, compared to 13 percent nationwide. These promising statistics are tempered, however, by related areas needing improvement. Led by Nevada, whose median rent is 38 percent higher than the rest of the region, the Rockies median rent is above the national average. Also, though more females graduate from high school, the Rockies shows a wider margin between males and females earning graduate and professional degrees than the rest of the country. This trend is magnified in Utah, where the gap between males and females earning college degrees is six percent.

As the American Community Survey catches up with the economic recession, the Rockies Project will keep a close on the pulse of the region.

About the authors: Elizabeth Kolbe (Colorado College, '08) is co-editor of the State of the Rockies Report Card, and program coordinator for the Colorado College State of the Rockies Project.

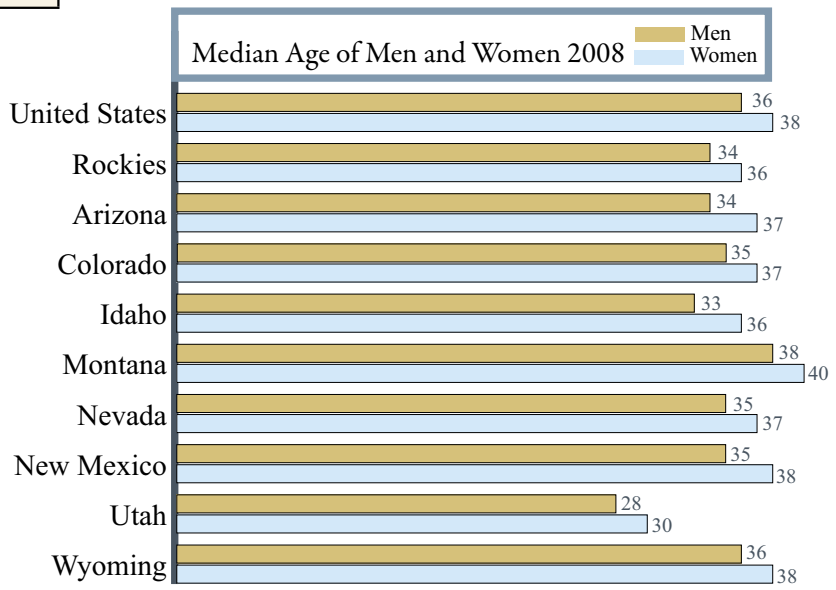
Population and Age, 2008

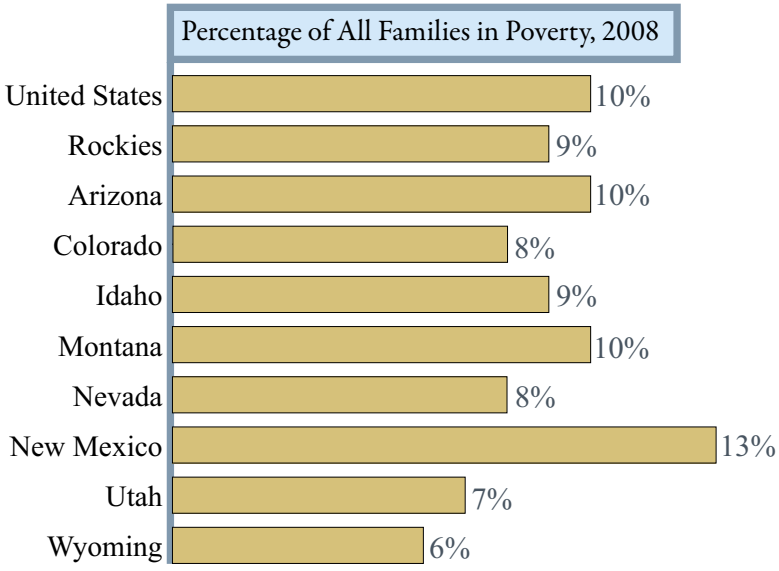
	Total Population, 2008	Percentage of Population Age 0 - 17	Percentage of Population Age 65+	Median Age
United States	304,059,728	24%	13%	37
Rockies	21,784,507	26%	12%	35
Arizona	6,500,180	26%	13%	35
Colorado	4,939,456	24%	10%	36
Idaho	1,523,816	27%	12%	34
Montana	967,440	23%	14%	39
Nevada	2,600,167	26%	11%	36
New Mexico	1,984,356	25%	13%	36
Utah	2,736,424	31%	9%	29
Wyoming	532,668	24%	12%	37



People in Poverty, 2000 and 2008

Percentage of the Following Groups Whose Income in the Past 12 Months is Below the Poverty Level	2008			2000
	All People	Male Share of People in Poverty	Female Share of People in Poverty	All People
United States	13%	44%	56%	12%
Rockies	13%	45%	55%	12%
Arizona	15%	45%	55%	14%
Colorado	11%	45%	55%	9%
Idaho	13%	43%	57%	11%
Montana	15%	45%	55%	14%
Nevada	11%	46%	54%	10%
New Mexico	17%	44%	56%	18%
Utah	10%	44%	56%	9%
Wyoming	9%	44%	56%	11%



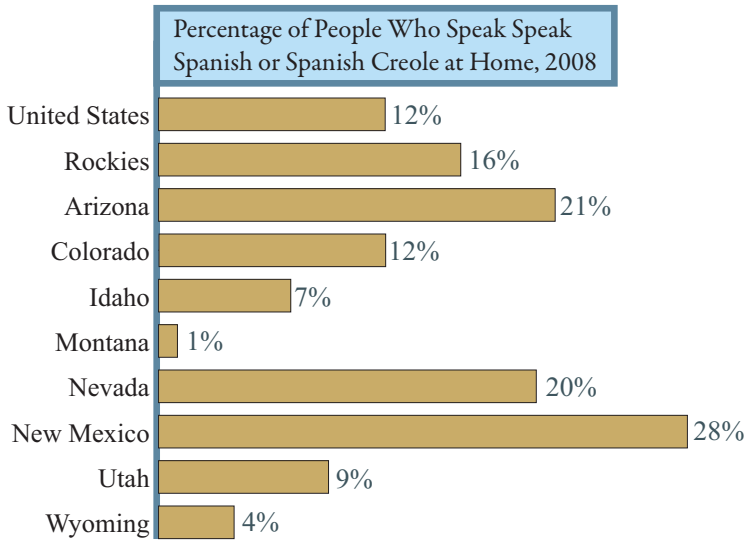


Families in Poverty with Children Under 18, 2008

Percentage of the Following Groups Whose Income in the Past 12 Months is Below the Poverty Level	All Families	Married-Couple Families	Male Householder, No Wife Present	Female House-holder, No Husband Present
United States	15%	6%	18%	36%
Rockies	14%	7%	16%	34%
Arizona	16%	8%	18%	36%
Colorado	12%	7%	16%	30%
Idaho	14%	7%	13%	41%
Montana	17%	8%	23%	42%
Nevada	12%	7%	10%	28%
New Mexico	19%	9%	21%	39%
Utah	9%	6%	11%	30%
Wyoming	10%	3%	11%	32%

Language, 2000 and 2008

	English Only, 2008	Language other than English, 2008	Language other than English, 2000
United States	80%	20%	18%
Rockies	79%	21%	20%
Arizona	72%	28%	26%
Colorado	83%	17%	15%
Idaho	90%	10%	9%
Montana	95%	5%	5%
Nevada	72%	28%	23%
New Mexico	65%	35%	37%
Utah	86%	14%	15%
Wyoming	94%	6%	6%



Race and Ethnicity, 2008

Percentage of the Population Who Identify as the Following	American Indian or Alaska Native	Black or African American	Hispanic or Latino	White
United States	1%	12%	15%	75%
Rockies	3%	3%	23%	83%
Arizona	4%	4%	30%	80%
Colorado	1%	4%	20%	85%
Idaho	1%	1%	10%	93%
Montana	6%	1%	3%	90%
Nevada	1%	7%	26%	77%
New Mexico	9%	2%	45%	73%
Utah	1%	1%	12%	91%
Wyoming	2%	1%	8%	92%

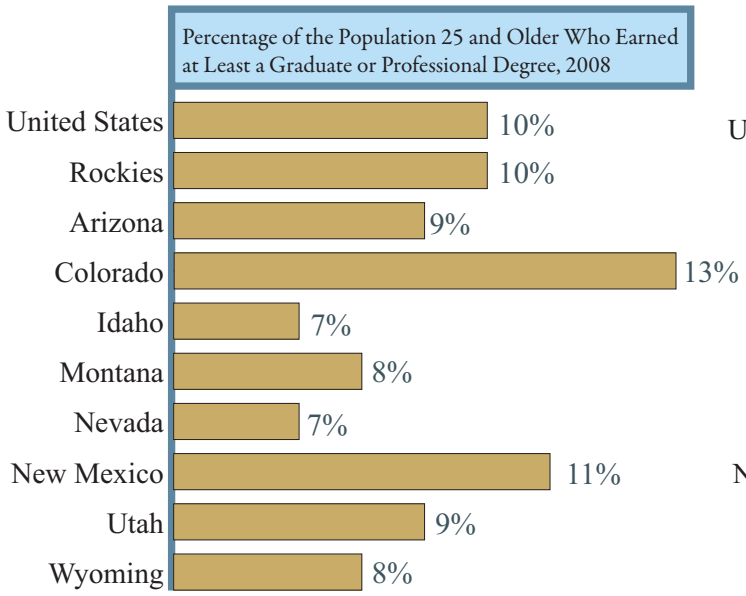
Foreign Born Population, Citizenship Status, and Year of Entry, 2008

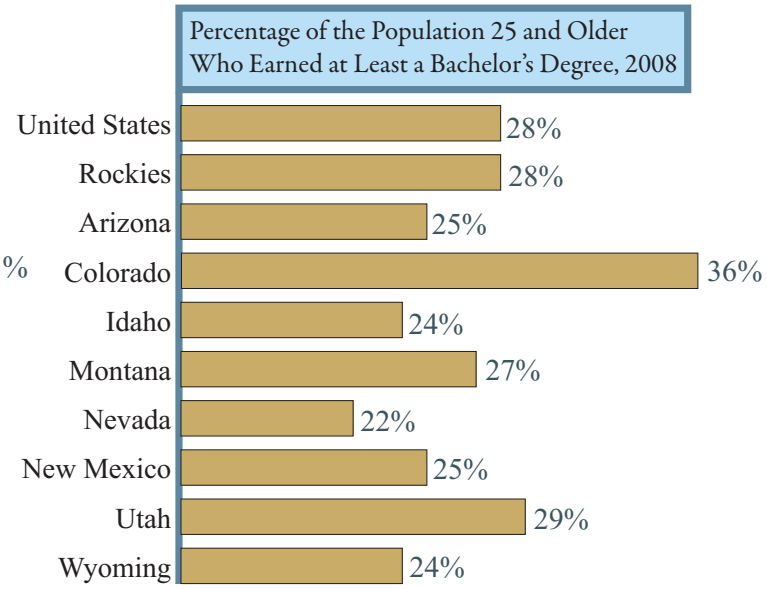
	Total Population Foreign Born	Percentage Foreign Born of Total U.S. Population	Percentage of Foreign Born that are Naturalized U.S. Citizens	Percentage of Foreign Born that are not U.S. Citizens	Percentage of Foreign Born that Entered Before 2000	Percentage of Foreign Born that Entered 2000 or Later
United States	37,960,935	12%	43%	57%	68%	32%
Rockies	2,463,025	11%	32%	68%	65%	35%
Arizona	932,518	14%	30%	70%	65%	35%
Colorado	499,179	10%	32%	68%	64%	36%
Idaho	89,489	6%	31%	69%	62%	38%
Montana	21,285	2%	53%	47%	63%	37%
Nevada	490,717	19%	37%	63%	67%	33%
New Mexico	191,025	10%	29%	71%	68%	32%
Utah	226,440	8%	32%	68%	62%	38%
Wyoming	12,372	2%	36%	64%	56%	44%

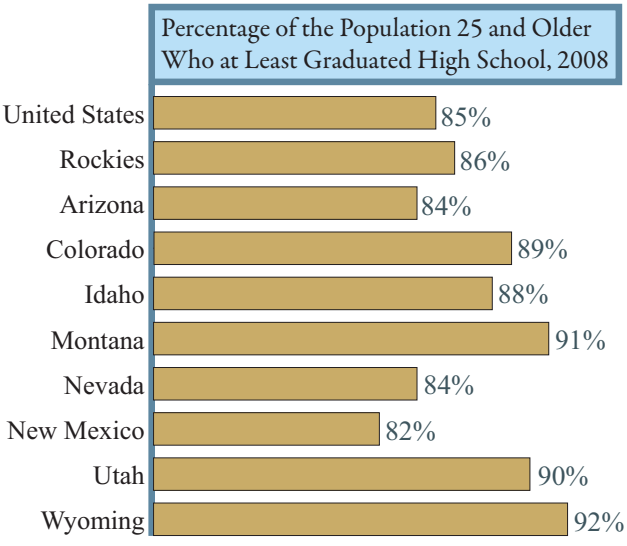
Education Attainment by Sex, 2008

Percentage of the Following Groups Who at Least:	Graduated High School		Earned a Bachelor's Degree		Earned a Graduate or Professional Degree	
	Male	Female	Male	Female	Male	Female
United States	84%	86%	28%	27%	11%	10%
Rockies	86%	87%	28%	27%	11%	9%
Arizona	83%	84%	26%	24%	10%	8%
Colorado	88%	90%	36%	35%	13%	12%
Idaho	87%	89%	25%	23%	9%	6%
Montana	90%	92%	27%	28%	9%	8%
Nevada	83%	84%	23%	21%	7%	7%
New Mexico	82%	83%	25%	25%	11%	10%
Utah	90%	91%	32%	26%	12%	7%
Wyoming	91%	92%	23%	24%	9%	7%

Education





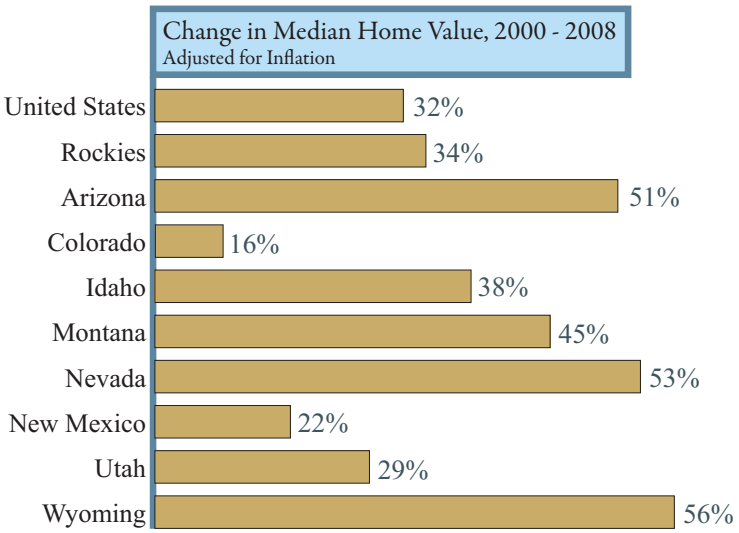


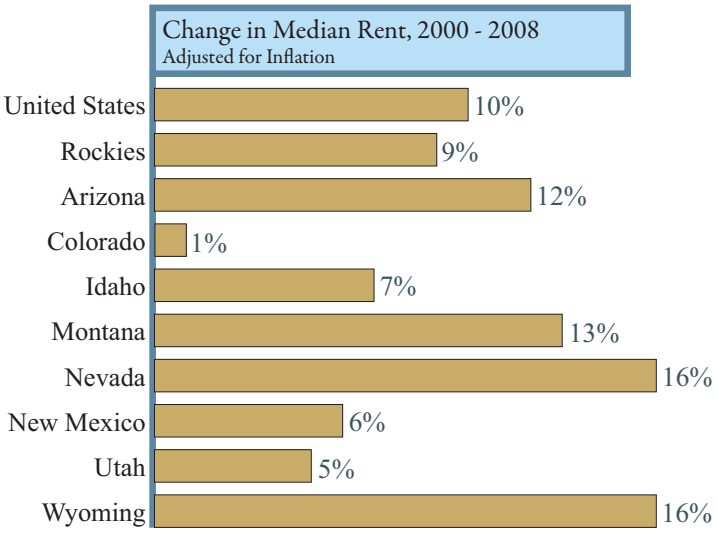
Home Values and Costs, 2008

	Median Home Value for Owner-occupied Units	Median Monthly Costs for Housing Units with Mortgage	Median Monthly Costs for Housing Units without Mortgage	Median Rent
United States	$197,600	$1,514	$424	$824
Rockies	$226,000	$1,493	$357	$829
Arizona	$229,200	$1,527	$357	$866
Colorado	$242,200	$1,620	$389	$848
Idaho	$183,700	$1,198	$320	$690
Montana	$180,300	$1,239	$362	$631
Nevada	$271,500	$1,818	$419	$1,011
New Mexico	$165,100	$1,173	$311	$668
Utah	$236,000	$1,445	$344	$784
Wyoming	$188,200	$1,272	$355	$636

Housing Units, 2008

	Total Occupied Housing Units	Owner-occupied Units as a Percentage of Occupied Housing Units	Renter-occupied Units as a Percentage of Occupied Housing Units	Percentage of Renter-occupied Units that are Nonfamily Households	Percentage Vacant of Total Housing Units
United States	113,101,329	67%	33%	49%	12%
Rockies	7,870,391	68%	32%	48%	14%
Arizona	2,273,842	68%	32%	47%	16%
Colorado	1,897,835	67%	33%	53%	12%
Idaho	566,004	71%	29%	44%	12%
Montana	375,598	69%	31%	56%	14%
Nevada	952,856	60%	40%	45%	15%
New Mexico	741,399	69%	31%	49%	15%
Utah	854,244	72%	28%	42%	10%
Wyoming	208,613	70%	30%	55%	15%





Household Income by Type, 2008

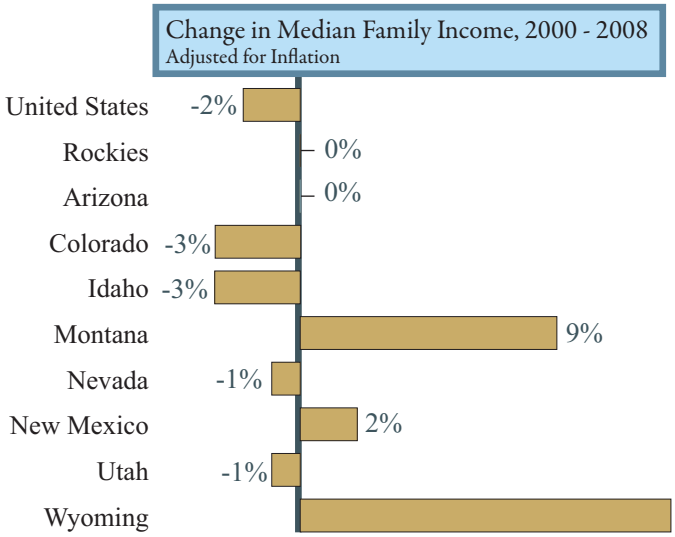
Adjusted for Inflation. Means found using the population receiving each income type.

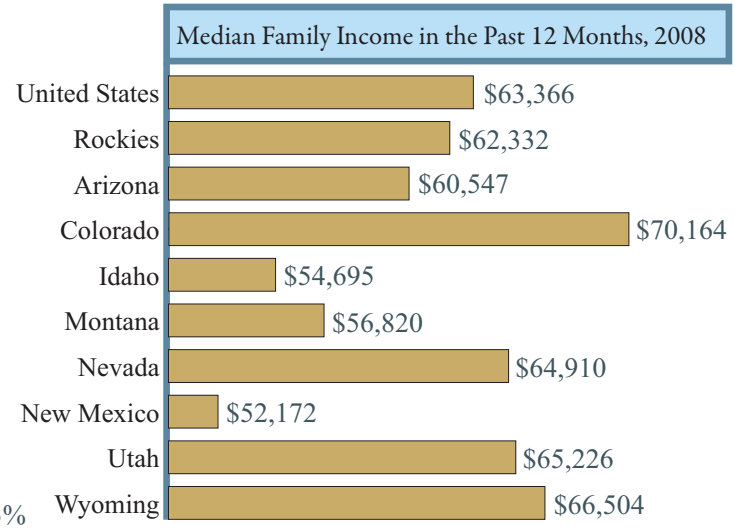
	Mean Earnings	Mean Earnings, Change since 2000	Mean Social Security Income	Mean Social Security Income, Change since 2000	Mean Supplemental Security Income	Mean Supplemental Security Income, Change since 2000	Mean Public Assistance Income	Mean Public Assistance Income, Change since 2000	Mean Retirement Income	Mean Retirement Income, Change since 2000
United States	$72,235	4%	$15,010	6%	$7,808	-1%	$3,255	-14%	$21,407	-1%
Rockies	$67,941	4%	$15,115	6%	$7,946	0%	$2,903	-10%	$22,588	0%
Arizona	$68,065	6%	$15,598	4%	$8,249	1%	$2,887	-11%	$22,185	-3%
Colorado	$74,119	-1%	$14,545	6%	$7,939	1%	$2,958	-2%	$25,100	4%
Idaho	$57,935	5%	$15,053	6%	$7,927	4%	$2,106	-8%	$20,813	5%
Montana	$56,326	6%	$15,008	8%	$7,854	3%	$3,167	4%	$17,871	-6%
Nevada	$70,503	6%	$15,096	6%	$7,861	-8%	$3,558	1%	$22,598	-3%
New Mexico	$58,367	7%	$14,060	6%	$7,241	-1%	$2,855	-20%	$22,975	-1%
Utah	$69,738	3%	$15,911	8%	$8,414	2%	$2,656	-26%	$22,077	0%
Wyoming	$68,750	19%	$15,239	7%	$7,108	-14%	$2,217	-26%	$20,758	2%

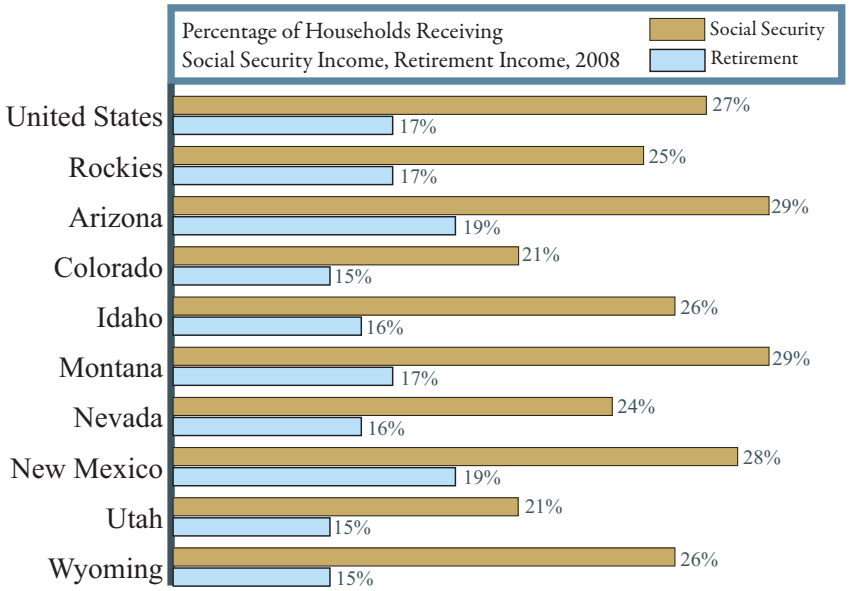
Income, 2008

Values for change calculation were taken from the 2000 Census and adjusted to 2008 dollars.

	Median Household Income	Change in Median Household Income since 2000	Mean Household Income	Mean Family Income	Per Capita Income	Change in Per Capita Income since 2000
United States	$52,029	-4%	$71,498	$83,351	$27,589	-1%
Rockies	$52,123	-3%	$69,070	$79,725	$26,128	-1%
Arizona	$50,958	-3%	$68,066	$77,951	$25,415	-3%
Colorado	$56,993	-7%	$76,462	$90,616	$30,471	-2%
Idaho	$47,576	-2%	$59,429	$66,768	$22,748	-1%
Montana	$43,654	2%	$57,966	$70,741	$23,799	7%
Nevada	$56,361	-2%	$72,233	$81,931	$27,421	-3%
New Mexico	$43,508	-1%	$59,357	$68,857	$23,098	4%
Utah	$56,633	-4%	$71,271	$80,061	$23,198	-1%
Wyoming	$53,207	9%	$69,976	$82,770	$28,489	15%



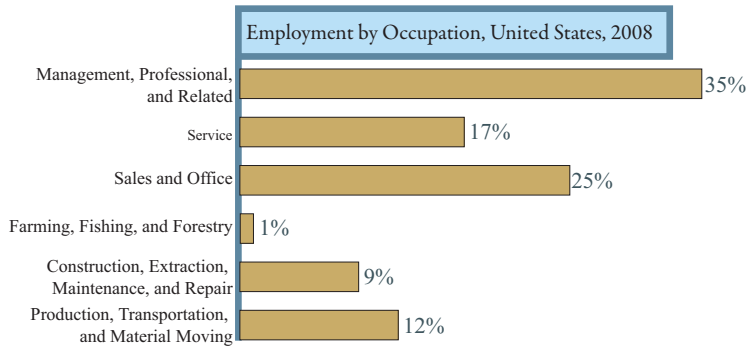


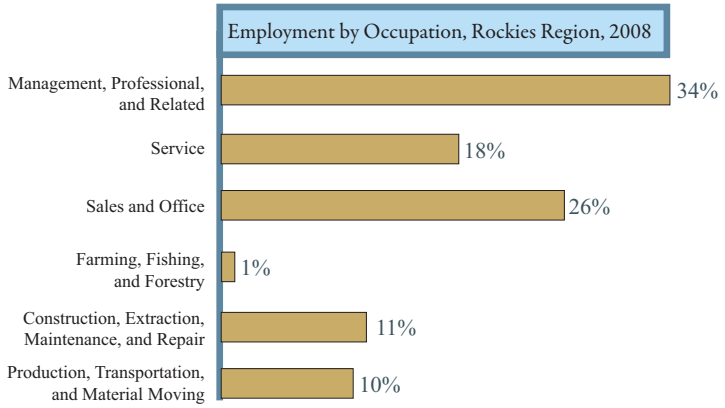


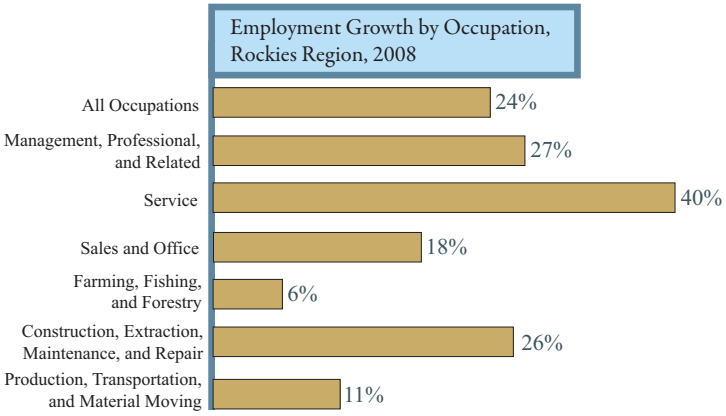
From the American Community Survey, 2008: Retirement income includes: (1) retirement pensions and survivor benefits from a former employer; labor union; or federal, state, or local government; and the U.S. military; (2) disability income from companies or unions; federal, state, or local governement; and the U.S. military; (3) periodic receipts from annuities and insurance; and (4) regular income from IRA and Keogh plans. THis does not include Social Security income.

Employment by Occupation, 2008

Percentage of Civilian Population 16 and Older in the Following Occupations	Management, Professional, and Related	Service	Sales and Office	Farming, Fishing, and Forestry	Construction, Extraction, Maintenance, and Repair	Production, Transportation, and Material Moving	Employed Civilian Population 16 and Older
United States	35%	17%	25%	1%	9%	12%	146,266,253
Rockies	34%	18%	26%	1%	11%	10%	10,513,750
Arizona	33%	19%	27%	0%	11%	9%	2,947,910
Colorado	38%	16%	25%	1%	11%	9%	2,583,902
Idaho	32%	16%	25%	3%	11%	13%	724,740
Montana	34%	18%	25%	1%	11%	10%	483,916
Nevada	27%	26%	26%	0%	12%	9%	1,273,822
New Mexico	34%	18%	24%	1%	12%	10%	903,291
Utah	35%	15%	28%	0%	10%	12%	1,312,261
Wyoming	30%	16%	24%	2%	15%	13%	283,908







Employment Growth by Occupation, 2000 - 2008

	Management, Professional, and Related	Service	Sales and Office	Farming, Fishing, and Forestry	Construction, Extraction, Maintenance, and Repair	Production, Transportation, and Material Moving	All Occupations
United States	17%	30%	8%	5%	11%	-4%	13%
Rockies	27%	40%	18%	6%	26%	11%	24%
Arizona	33%	56%	26%	-6%	34%	11%	32%
Colorado	19%	39%	7%	5%	20%	5%	17%
Idaho	24%	27%	19%	14%	23%	10%	21%
Montana	16%	19%	11%	-22%	21%	4%	14%
Nevada	45%	42%	28%	21%	40%	23%	36%
New Mexico	18%	27%	11%	43%	24%	15%	18%
Utah	34%	37%	20%	-15%	16%	15%	26%
Wyoming	17%	13%	17%	27%	24%	20%	18%

Employment by Industry, 2008

Percentage of Civilian Population 16 and Older Employed in the Following Industries	Agriculture, Forestry, Fishing/Hunting, and Mining	Construction	Manufacturing	Wholesale Trade	Retail Trade	Transportation/Warehousing, and Utilities	Information	Finance/Insurance, and Real Estate/Rental/Leasing	Professional, Scientific/Management, and Administrative/Waste Management Services	Educational Services, and Health Care/Social Assistance	Arts, Entertainment/Recreation, and Accommodation/Food Services	Other Services, (Except Public Administration)	Public Administration
United States	2%	7%	11%	3%	12%	5%	2%	7%	10%	22%	9%	5%	5%
Rockies	3%	9%	7%	3%	12%	5%	2%	7%	11%	19%	11%	5%	5%
Arizona	1%	10%	7%	3%	13%	5%	2%	8%	11%	20%	11%	5%	5%
Colorado	2%	10%	7%	3%	11%	5%	3%	7%	13%	18%	10%	5%	5%
Idaho	5%	9%	10%	3%	12%	6%	2%	5%	9%	20%	8%	4%	5%
Montana	7%	10%	5%	3%	12%	5%	2%	6%	8%	22%	10%	5%	6%
Nevada	2%	10%	5%	2%	12%	5%	2%	6%	10%	13%	24%	4%	5%
New Mexico	5%	9%	6%	2%	12%	5%	2%	5%	11%	24%	10%	5%	7%
Utah	2%	8%	10%	3%	13%	5%	3%	7%	11%	20%	8%	4%	5%
Wyoming	12%	9%	5%	2%	11%	8%	2%	5%	6%	20%	9%	4%	6%

Employment Growth by Industry, 2000 - 2008

Percentage of Civilian Population 16 and Older Employed in the Following Industries	Agriculture, Forestry, Fishing/Hunting, and Mining	Construction	Manufacturing	Wholesale Trade	Retail Trade	Transportation/Warehousing, and Utilities	Information	Finance/Insurance, and Real Estate/Rental/Leasing	Professional, Scientific/Management, and Administrative/Waste Management Services	Educational Services, and Health Care/Social Assistance	Arts, Entertainment/Recreation, and Accommodation/Food Services	Other Services, (Except Public Administration)	Public Administration
United States	9%	22%	-10%	-6%	12%	13%	-12%	13%	26%	23%	26%	12%	10%
Rockies	22%	37%	1%	2%	24%	26%	-12%	23%	38%	33%	27%	27%	21%
Arizona	17%	47%	-4%	2%	37%	32%	-10%	35%	39%	45%	38%	43%	30%
Colorado	34%	24%	-4%	4%	13%	18%	-24%	12%	32%	27%	24%	25%	17%
Idaho	8%	41%	-5%	-3%	17%	45%	11%	26%	36%	28%	26%	14%	20%
Montana	-5%	45%	1%	4%	7%	6%	-18%	19%	36%	17%	7%	10%	21%
Nevada	35%	53%	26%	11%	44%	30%	3%	35%	56%	42%	26%	41%	40%
New Mexico	34%	33%	7%	-6%	14%	15%	-7%	1%	34%	30%	17%	6%	1%
Utah	31%	28%	8%	-3%	27%	26%	-2%	29%	47%	34%	29%	22%	20%
Wyoming	32%	20%	30%	18%	12%	43%	-9%	14%	17%	11%	11%	4%	22%

Overview Section: History

A Look Back at the Historical Role of Agriculture in the Rockies

By Patrick Creeden

The 2010 Colorado College State of the Rockies Report Card

Key Findings:

- 46 percent of land in the Rockies was claimed for agriculture during the homesteading period from 1862 - 1976.
- Since 1870, the weighted average farm size has increased by 938 percent.
- The peak of the Rockies farm population percentage was 35 percent, reached in 1920, today it is 2 percent.
- Since 1870 over 145,000 new farms have been added to the Rockies region.

Introduction

Each day in the Rockies, farmers and ranchers produce agricultural commodities that are traded and sold across the country and world, in small local farmers markets and on global commodity markets. This production takes on a variety of forms from large-scale milk production in the nation's fifth largest dairy in Hatch, New Mexico, to small organic farms on Colorado's Western slope. Agriculture in this region of the country, spanning across mountain valleys and wide open plains, and ranging from organic wool to grain for cattle, has greatly shaped the unique environment and culture of the West.

This year's *State of the Rockies Report Card* focuses on the many aspects of agriculture that have changed since the initial settlement of the West. Drawing upon results of the *2007 Census of Agriculture*, this report sketches the current condition of agriculture and how it has evolved over the past decade. Though the ever-changing Rockies region is fast urbanizing and the economic importance of agriculture has decreased over the decades, the historical, cultural, and environmental aspects of agriculture are critical in helping maintain the wide open spaces and rural ranches, farms, and communities so central to the character of the region. Given agriculture's importance to the region as a

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whole, this *Report Card* attempts to summarize many of the various components of agriculture: demographics, production, land, financial aspects, and farm organization. These sections of the *Report* quantify and examine the changing role of agriculture as an essential determinant of the culture and physical landscape of the Rocky Mountain West. This introductory section briefly outlines the historical role of agriculture in shaping and being shaped by the Rockies' land and environment, both key elements in the opening of the interior West.

Origins of Agriculture in the Rockies

The evolution of agriculture has altered, for better or worse, many aspects of this delicate region. In 1879 John Wesley Powell, a Civil War veteran, published an account of his travels across America's Frontier: *Report on the Arid Region of the United States.* His report detailed the people and places of the unconquered and undocumented western United States. Commissioned by Congress to survey much of the West and Southwest, Powell is most well known for his expedition down the Colorado River through the Grand Canyon. Included in his report were a number of observations and suggestions about how the West could become livable for Anglos from the East. He described what we now call the Rocky Mountain West as, "Within the Arid Region agriculture is dependent upon irrigation. The amount of irrigable land is but a small percentage of the whole area."[1]

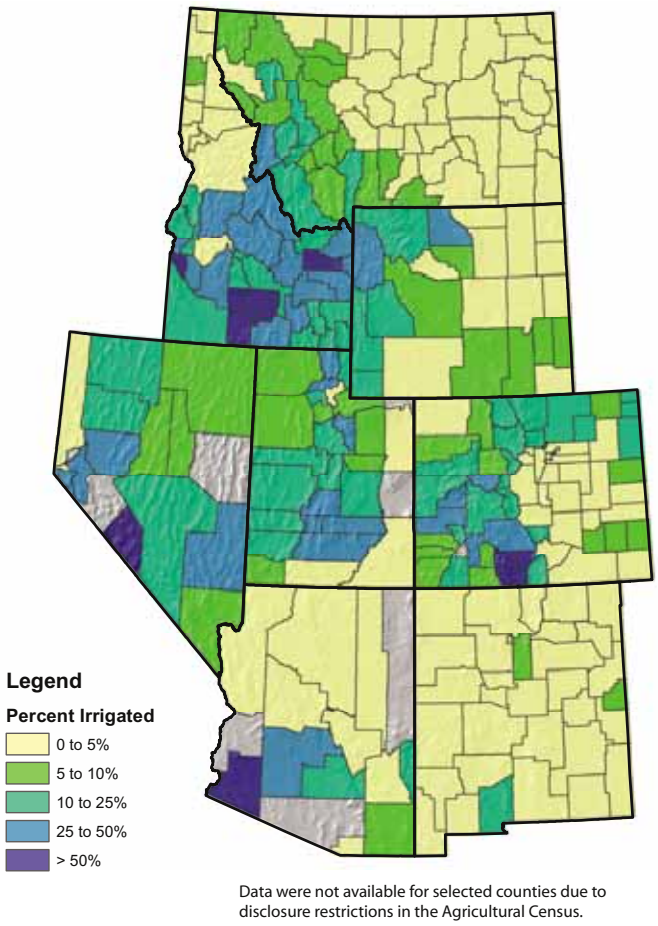
The water-starved West had supported American Indian and Hispanic agriculture for hundreds of years, but in its natural state would not be able to accommodate the increasing needs of settlers. Powell explained that given the climate and landscape of the West, this region only facilitated small-scale farming in the lower foothills and valleys where there was concentrated groundwater. Because of the cyclic drought possibilities, if the area was to support any large-scale agricultural production, major water diversion and irrigation projects would need to take place.[2]

Since John Wesley Powell's observations of the late 1860's, settlers in the Rockies have on a massive scale dammed rivers, built reservoirs, and diverted water for a number of uses. As population grew in the West, large quantities of water were diverted from rivers, used initially for mining and then later for agriculture and urban centers. This initial manipulation of the environment remains central to the viability of agriculture in the Rockies region today.

Both the agricultural and urban development of the West show humans' ability to alter and manage the arid regions of the Rockies. Establishing agriculture required the help of the federal government for land settlement, transportation, and infrastructure: all of which are foundations for farming and ranching in the Rockies.

It is difficult to quantify all of the agricultural production in the Rockies during the late 1800's because along with new Anglo settlers from the East, were the Hispanic and American Indian communities which had been farming for generations. The historical data in this *Report Card* deal mainly with crops produced by Anglo settlers,

Figure 1: 2007 Percent Irrigated Farm Land by County



Data were not available for selected counties due to disclosure restrictions in the Agricultural Census.

Source: 2007 Census of Agriculture, National Agriculture Statistics Service, U.S. Department of Agriculture.

but despite our inability to quantify American Indian and Hispanic production, it was still present during this time. Many settlers grazed smaller herds of cattle and sheep, producing largely for themselves; no large-scale crop and grazing activities were present in the early 1800's. However, as the frontier became more populated, key acts and bills passed by the federal government and state governments as they entered the Union throughout the late 1800's assisted the growth and expansion of the entire western United States and its agricultural economy.

1862 Opening the West

At the forefront of legislation to open the West was the Pacific Railway Act of 1862.[3] The Pacific Railway Act gave land grants to private railroad companies in return for construction of the transcontinental railroad. Not only did this land subsidy increase exploration of the West, but it also facilitated the building of a strong infrastructure of rail and associated communities and services, by which certain agricultural commodities would eventually be transported across the region and beyond. With a new method of efficient transit, farmers began to produce higher volumes of crops to meet growing demands for commodities in local towns and in distant markets alike.[4]

Although the railroads are not solely responsible

for the population boom, many companion legislative acts during 1862 aided expansion into the frontier. The United States Department of Agriculture (USDA), formed in 1862, was the first regulatory agency that set guidelines and monitored much of the agricultural production across the country. The USDA encouraged farmers to join co-ops and form alliances to improve the financial aspects of farming. The Morrill Land Grant College Act of 1862 set aside tracts of land throughout the West for the development of agricultural schools.[5] These acts exemplified the national goals of improving and expanding agriculture across the West.

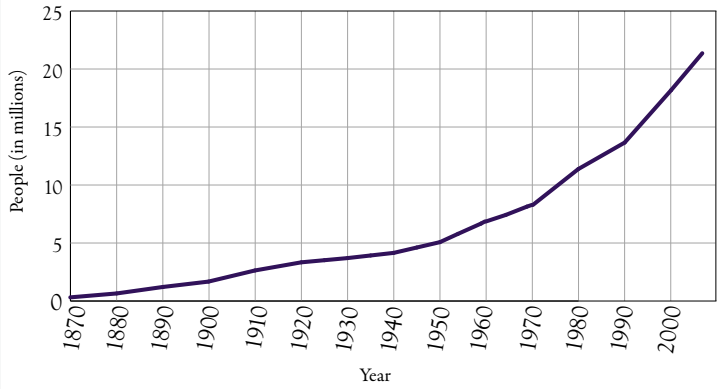
The Homestead Act of 1862 encouraged settlement in the western U.S. This legislative act gave various allotments of land to those who would spend a minimum of five years on each parcel to produce agricultural commodities. While the Homestead Act provided stability for new settlers, it drastically altered property distinctions and grazing patterns. The region once known as the open range began to be crisscrossed by barbed wire, delineating newly homesteaded private properties.[6] Although the Homestead Act spurred migration westward, large-scale settlement would not occur until further infrastructure was established in the Rockies.

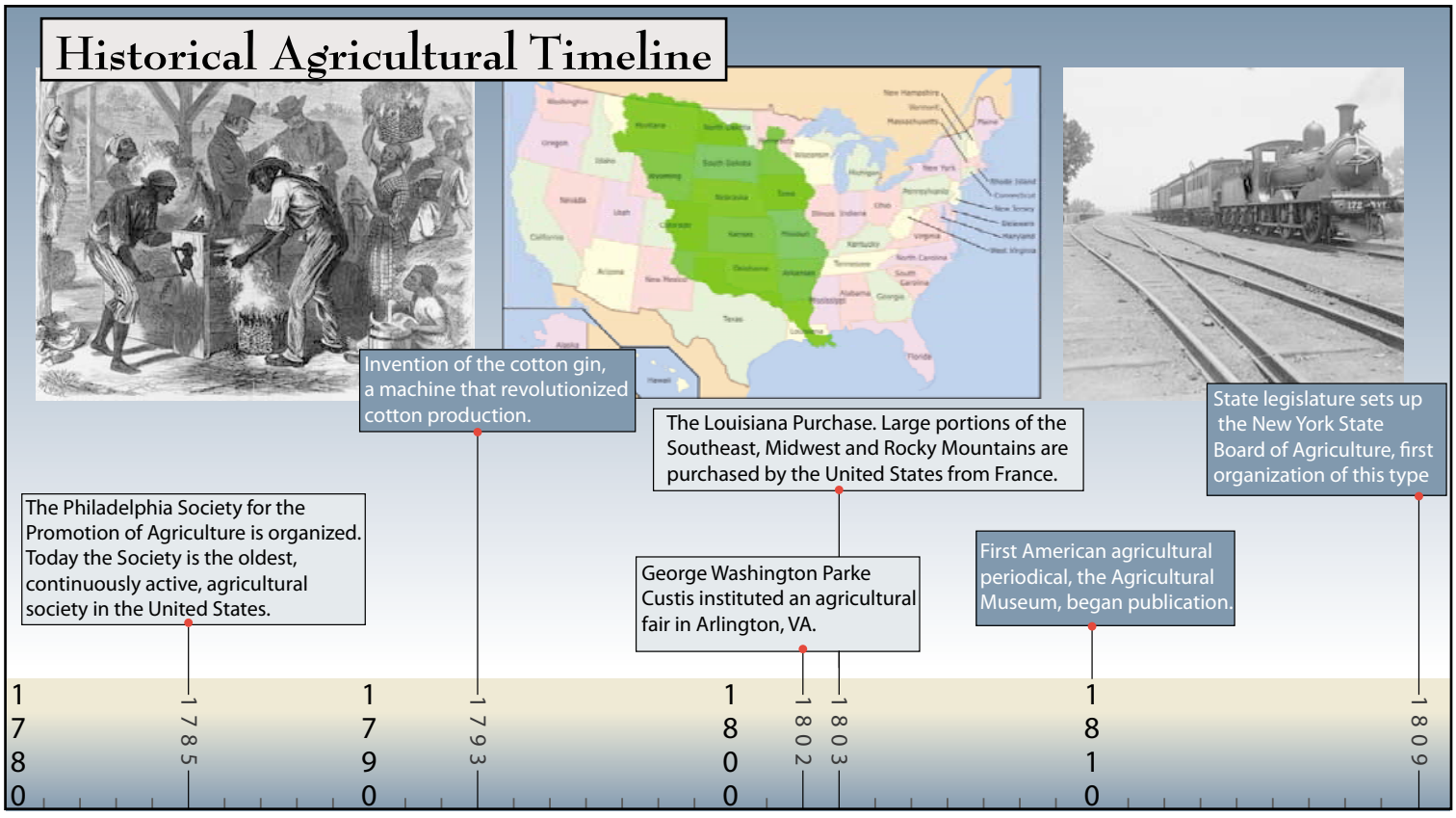
Growing the West with Water

As homesteaders and sodbusters acquired property to farm and ranch in the arid West, the region still lacked significant irrigation systems. To meet this need, the U.S. government passed the Reclamation Act of 1902. This act is arguably the single most important event in creating organized, large-scale agriculture in the Rockies region. Large-scale damming of rivers diverted water and supplied farms and expanding towns of the West with more consistent quantities of water.[7]

The growing infrastructure for water systems made the West more habitable, motivating more people to migrate west while also facilitating more intensive agriculture, largely in areas conducive to irrigation. Figure 1 shows the 2007 percentage of irrigated farmland by county in the Rockies region. Many areas within these counties, such as the San Luis Valley in Colorado (Alamosa, Costilla, and Huerfano counties) and Big Horn County near Dayton, Wyoming, were founded on agriculture because of their close proximity to rivers and water sources. In the following decades, as

Figure 2:
Historical Total Population, Rockies Region, 1870 to 2000
Source: Historical Statistics of the United States, 2006





shown in Figure 2, steady population increase occurred in the Rockies as miners and homesteaders from the east moved west in search of new opportunities, centered around mining and commerce as well as livestock and agriculture.

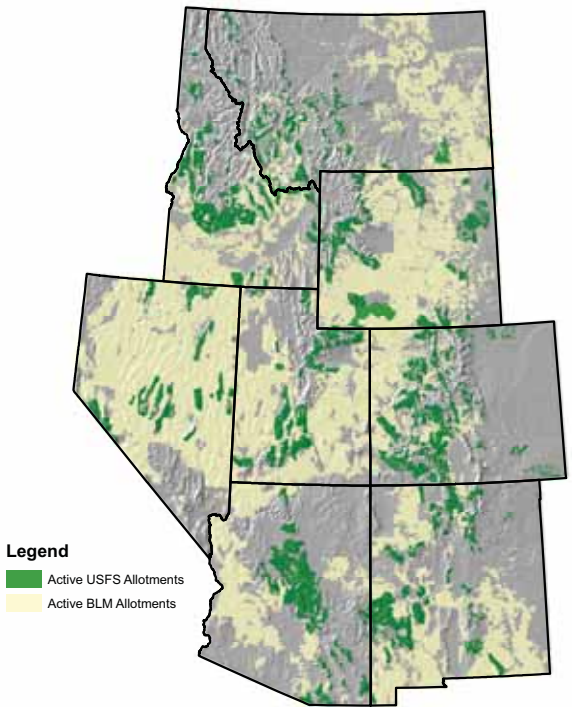
Ironically, Powell, who described this arid region as virtually uninhabitable because of the lack of available water sources died in the same year the 1902 Reclamation Act was passed. Were he to have lived longer, he likely would have been astounded to observe the massive reclamation projects that took place, literally reshaping the Rockies by the "hand of man." Many changes resulted in the growth of large-scale agriculture which brought with it associated major impacts on natural systems, a precursor to current environmental concerns so prevalent in the Rockies today.

The new irrigation projects and advances in farming technology helped settlers get started in the New West, but this development of agriculture also brought the regulation and consolidation of the industry towards an incentive-based approach to large-scale agriculture.[8]

The Taylor Grazing Act of 1934 authorized livestock grazing on public lands to encourage and regulate grazing across the West. The act helped retain in the public domain portions of federal and state lands that had not yet been homesteaded. It documented and divided much of the public land of the Rockies, but also provided a mechanism by which to sustain the livestock industry. After the act was passed, President Franklin D. Roosevelt's remarked,

> The Federal Government has taken a great forward step in the interests of conservation, which will prove of benefit not only to those engaged in the livestock industry but also to the Nation as a whole. [9]

Figure 3: Active BLM and Forest Service Grazing Allotments in the Rockies



Note: active USFS allotments were designated in the NILS data, whereas active BLM allotments were determined from the BLM RAS Public Reports.

Source: Bureau of Land Management, National Integrated Land System, 2009

Figure 3 shows the active grazing allotments

Historical Agricultural Timeline

- 1820: The U.S. House of Representatives Agriculture Committee is established
- 1825: The U.S. Senate Agriculture Committee is established
- 1830: Beginning of the railroad era: Peter Cooper's railroad steam engine, the Tom Thumb, runs 13 miles
- 1834: Cyrus McCormick's mechanical reaper is patented, replacing the labor of five men.
- 1837: John Deere begins manufacturing steel plows; practical threshing machine patented
- 1840: Pre-emption Act: squatters first rights to buy land
- 1841: The growing use of factory-made agricultural machinery increased farmers' need for cash and encouraged commercial farming.
- 1843: Sir John Lawes founds the commercial fertilizer industry by developing a process for making superphosphate
- 1845: Irrigation begins in Utah
- 1850: Graduation Act reduces price of unsold public lands
- 1854: Commercial corn and wheat belts begin to develop
- 1855

in the Rockies for 2007. These allotments are grazing districts that are regularly grazed with livestock such as cattle and sheep. These vast grazing lands exist today because of the original Taylor Grazing Act. The extent to which the Rockies is saturated by livestock production is linked to a partnership between private farms and ranches and adjudicated uses of adjacent public lands under preferential terms.[10] Ultimately, ranchers who owned land close to these BLM allotments were given preference for adjacent grazing permits. In recent decades the federal government's allowance and management of livestock grazing on federal and state lands has been a central and sometimes polarizing issue in conflicts between ranchers and environmentalists in the West.[11]

Figure 4:
Weighted Average Farm Size, Rockies Region

Source: Census of Agriculture for the year specified, USDA-NASS, 1870 to 2007
Note: Regional farm size was determined by weighing average farm size for each state by the number of farms.

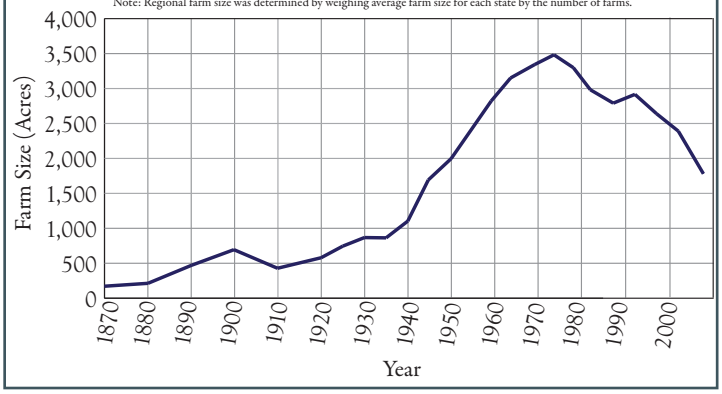
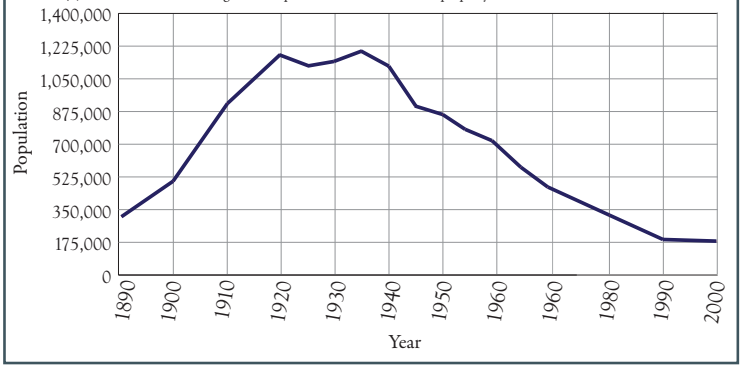


Figure 5:
Farm Population, Rockies Region, 1890-2000

Source: Historical Statistics of the United States, 2006
Note: Farm population consists of persons in households living in farm residences. An occupied one-family house or mobile home is classified as a farm residence if: (1) the housing unit is located on a property of 1 acre or more and (2) at least $1,000 worth of agricultural products were sold from the property.



The Green Revolution

Classified by some as the "Agricultural Revolution," advances in machinery, chemical inputs, and animal breeding all led to the increased efficiency of the agricultural industry throughout the 1950's. As farmers implemented new technology, they radically shifted the overall makeup of farms across the country.[12]

The size of farms increased because of the ability to harvest more crops per acre due to the new efficient technology.

Figure 4 depicts the growth of the weighted average farm size in the Rockies region from the late 1940's to the 1970's. Forces underlying the rapid growth of farm size in these decades included access to water via government-subsidized reclamation projects, enhanced transportation infrastructure, technological breakthroughs in agricultural seeds, supplements of

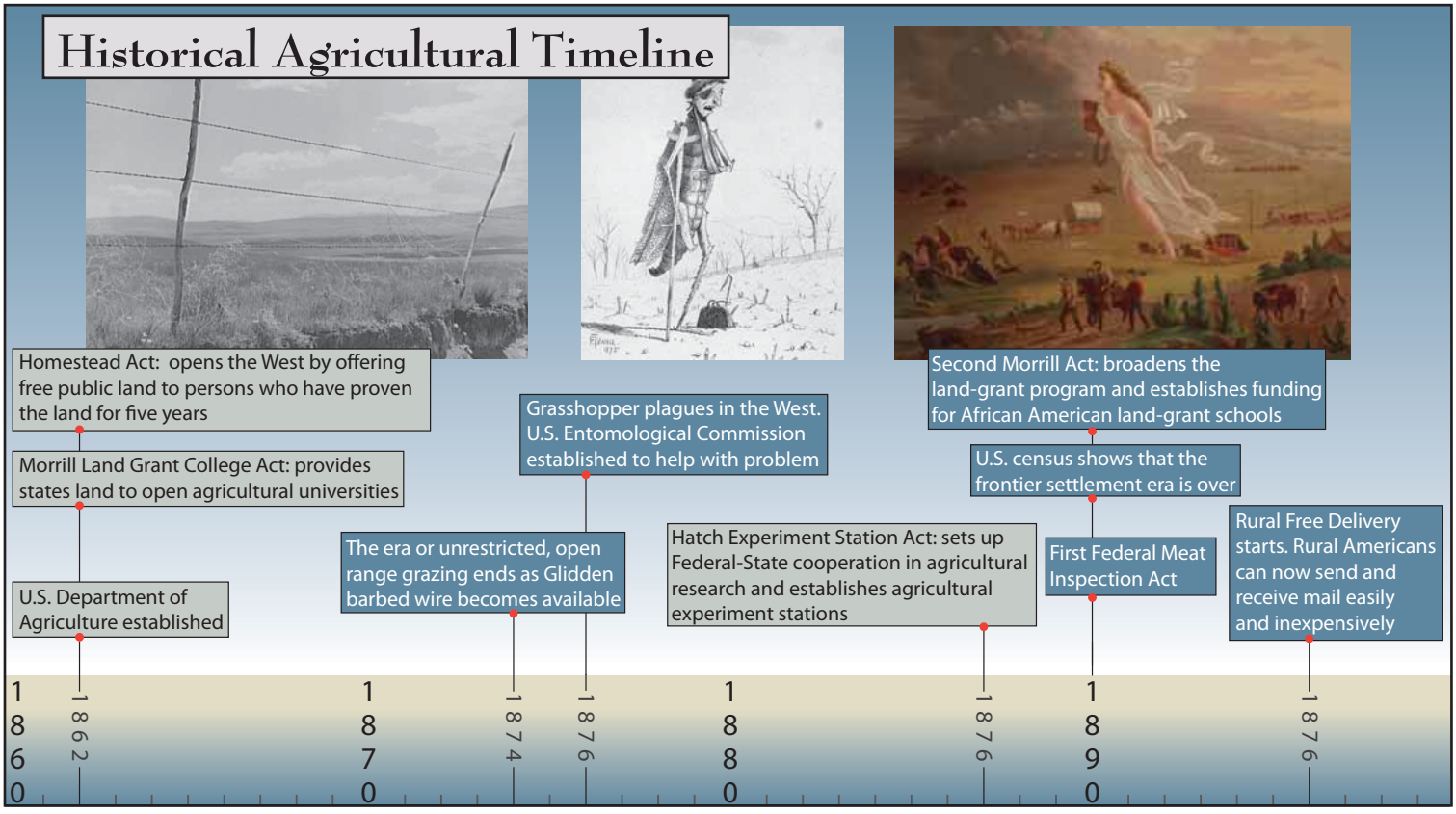


Figure 6:
Farm Population, by Percent, Rockies Region, 1890-2000
Source: Historical Statistics of the United States, 2006
Note: Farm population percentage was calculated with respect to the total population.

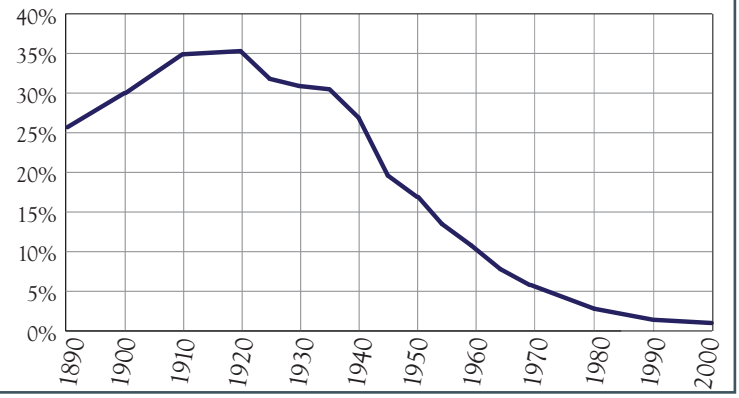
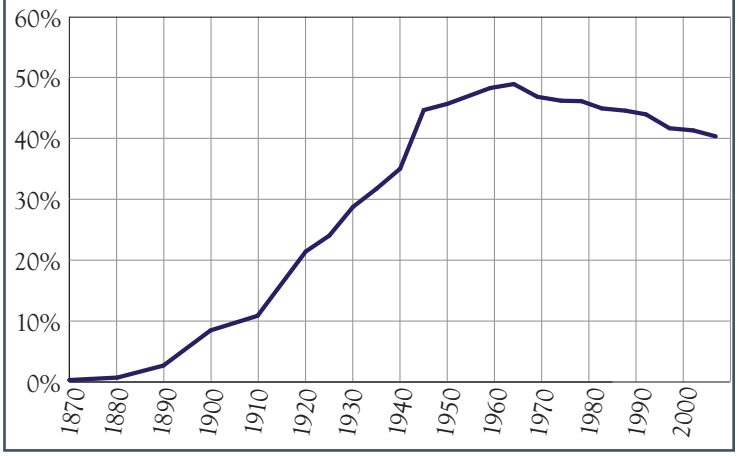


Figure 7:
Land in Farms, Percent, Rockies Region
Source: Census of Agriculture for the year specified, USDA-NASS, 1870 to 2007



fertilizers, herbicides, and pesticides, and inexpensive financial capital via USDA programs and subsidies. Post-World War II globalization trends further stimulated U.S. agriculture. Starting in the mid-1970's, however, a dramatic decrease in average farm size began in the Rockies region. This decrease opposes the national trend, where farm sizes continued to increase through the end of the 20th Century. The disparity could be due to Rockies' role in the rise of Confined Animal Feeding Operations (CAFOs) beginning in the 1960's. As Midwestern regions grew "fence row to fence row," the Rockies increased its cattle production, feeding not on grass, but on corn shipped across the great plains.

From 1950 to 1970 the farm workforce declined by 50 percent, while the value of agricultural goods increased by nearly 40 percent.[13] An unintended consequence of large agriculture based upon sophisticated technological advances and large financial underpinning was that it created barriers for those seeking to enter farming for the first time.

Equally significant to changing farm size were the dramatic decreases in workers and families engaged in agriculture in the Rockies over these decades. As shown in Figure 5, depicting total numbers of people on farms and Figure 6, giving the percentage of the Rockies population engaged in farming starting in the 1920's, the percentage of population engaged in farming has steeply declined since the mid-1930's. These changes were spurred by environmental and economic factors. The dust bowl made agricultural lands on the eastern plains unprofitable, causing many farmers to fold. The continued drop in farm population is an effect of the "get big or get out" mentality of industrialized agriculture.

Historical Agricultural Timeline

- 1902 — U. S. Forest Service created
- 1905 — President Roosevelt's Country Life Commission is established to improve social, sanitary and economic conditions on American farms
- 1906 — Pure Food and Drug Act: a landmark in food safety
- 1908 — Reclamation Act: funding for irrigation in the West
- 1914 — Rural Post Roads Act: begins regular Federal subsidies to build rural roads
- 1916 — Stock Raising Homestead Act: increased area limitation for homesteading
- 1914 — Smith-Lever Extension Act: creates a national extension service for direct farmer education
- 1924 — Future Farmers of America founded to promote youth agricultural education
- 1924 — Immigration Act: greatly reduces the number of new immigrants
- 1928 — Drought and dust-bowl conditions develop throughout the West
- 1928 — Agricultural Adjustment Act: initiates crop and marketing controls
- 1928 — Executive orders withdraw public lands from settlement and sale
- 1928 — Taylor Grazing Act: regulates grazing on public lands
- 1932 — Rural Electrification Act: brings electricity to rural areas
- 1936 — Soil Conservation and Domestic Allotment Act: links farm programs with conservation

1900 1910 1920 1930

Along with new technology for planting and harvesting commodity grains, the government subsidies for commodities and a drought-ridden Soviet Union made big farms more profitable.

Agriculture Today In the Rockies:
Report Card Preview

As briefly shown above, agriculture in the Rockies from 1870 to the present has undergone changes on a scale akin to a revolution, literally reshaping the topography, hydrology, and environment that compose the Rockies region. This *Report* tackles many of the different issues of agricultural production in the Rockies region, from the changing economies of agricultural towns to environmental impacts.

Currently, most crops produced through large-scale agriculture are planted and harvested with expensive machinery, complex GPS systems, and laser-guided tractors, allowing computer monitoring of fertilizer, seed dispersal, and soil quality.[14] In addition, farms now have closer ties with large-scale agri-businesses that help process, sell, and transport crops, and prices are established through commodity markets, making local products marketable on a global scale.

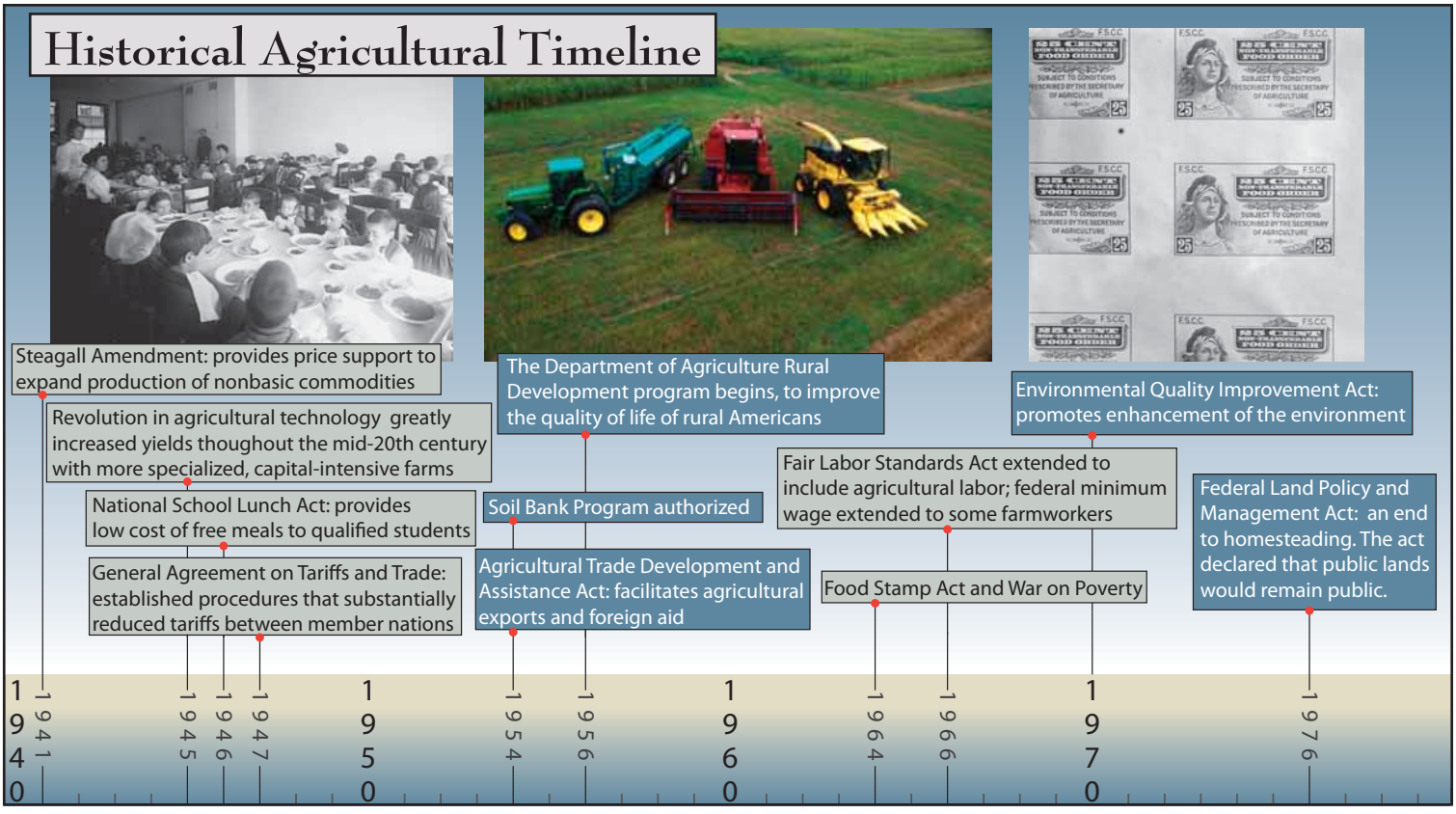
Today, although only three percent of Rockies residents are employed by agriculture and one percent are farmers, agricultural land occupies 40 percent of the region.[15] After a dramatic upswing in farmland during the homesteading period, the percentage of farmland has steadily decreased since the mid-1970's when the agricultural revolution leveled as displayed in Figure 7.

The percentage of farmers in the Rockies population shows a similar trend. As illustrated in Figure 6, after peaking in 1920 at 35 percent, the percent of the population in farming has plummeted.[16] The shift in the ratios of farmers to farmland shows not only the shift of agriculture, but also the general population growth in the Rockies region.

The number of small, organic, and natural farms is gradually increasing, mid-sized farms are disappearing, and large farms are becoming even bigger.[17] Farmers face difficulties maintaining control of their land in the face of sprawling urban development. There are also difficulties in obtaining a dependable agricultural workforce, especially in the southern Rockies, because of new international border regulations.

Although agriculture in the Rockies no longer defines the region economically, farms and ranches assert a geographic and cultural influence way beyond their "economic" size. Farms and ranches help maintain open space and habitat for wildlife as well as sustain the rural and scenic qualities of the Rockies region. As summarized above, changes in agriculture over fourteen decades have altered land, water, environment, people, and the culture of the Rockies. Each section of this *Report Card* discusses in more detail the evolution and current state of various aspects of agriculture, divided into the following sections.

• *Land*: Katherine Sherwood provides an overview of land and water use in the Rockies, and how the Rockies weighs the balance of municipal and agricultural use. Her overview section is supplemented by a case study on the New Food Economy.



• *People*: Zoë Wick details the changing demographics of agriculture in the region, accounting for race and ethnicity, sex, age, and tenure. She highlights the current and historic roles of hired farmworkers, American Indians, and Latinos in Southwestern Agriculture.

• *Production*: Russell Clarke delves into the agricultural production trends of the Rockies region, highlighting current production trends and how the Rockies' production has changed over time. In addition to his overview, he provides case studies on cattle and bison production.

• *Finance*: Emil Dimantchev focuses his overview section on the financial characteristics of agriculture in the Rockies. Going beyond the profit margins, and spending breakdowns, Dimantchev investigates the role federal subsidies play on farmers' production decisions.

• *Organization*: Jayash Paudel explains the intricacies of farm organization in the Rockies. Using a variety of organizational definitions, Paudel highlights the trends and possible consequences of organization and policy on beginning farmers and small family farms.

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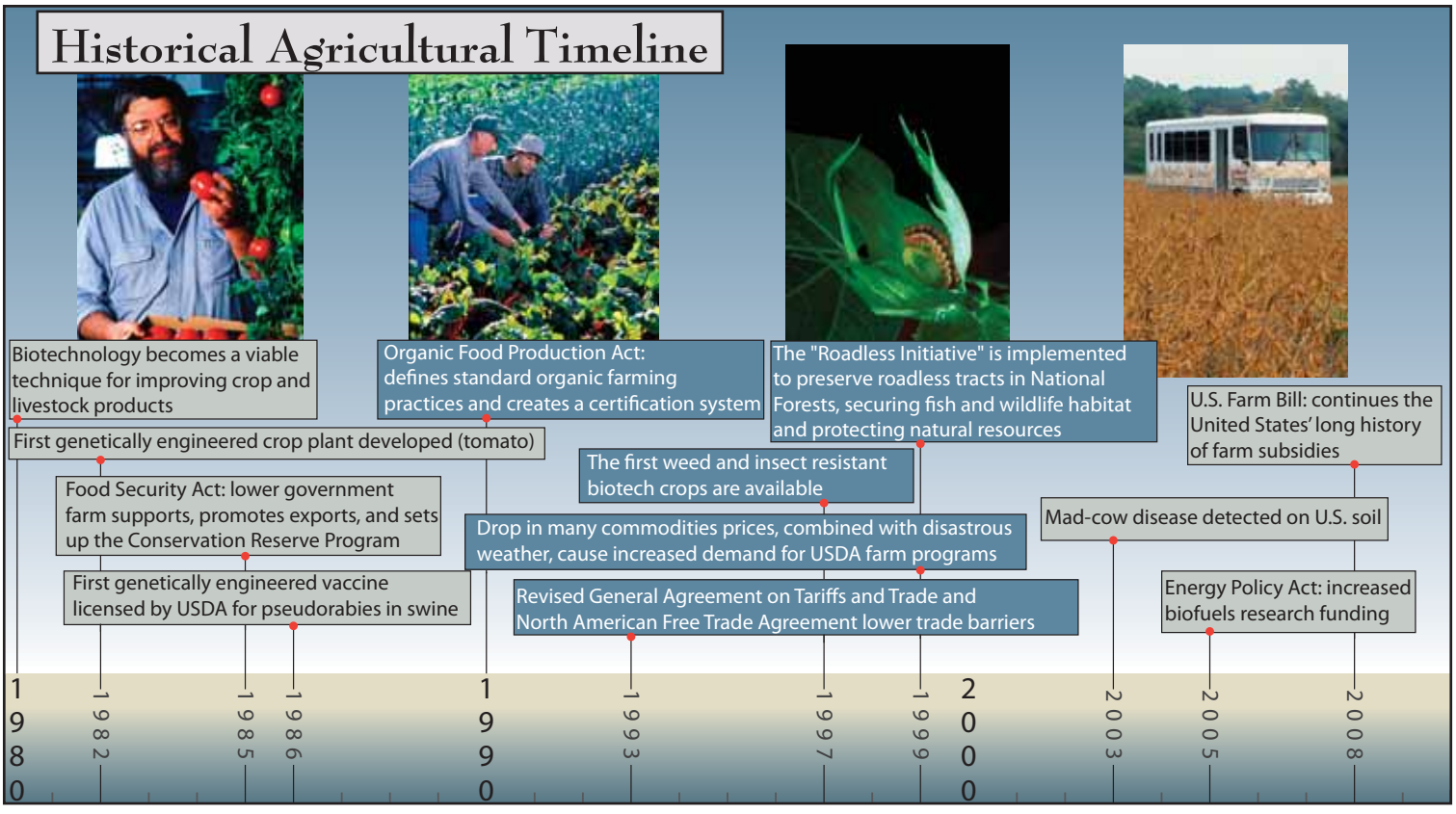


Threats to Farm and Ranchland in the Rockies

By Patrick Creeden

Introduction

There is a quiet but insatiable force nibbling away at agriculture in the Rockies. Week by week, American ranchers and farmers see, hear, and feel the "city" encroaching upon their land, bringing new urbanized neighbors and associated roads and infrastructure as well as tempting vulnerable "land-rich, cash-poor" owners of productive agricultural acreage to "sell out." They witness the disappearance of open space, a shifting culture in their local communities, and a declining interest in ranching and farming. The threats to ranches and farms have grown both in quantity and form, making it increasingly difficult for ranchers and farmers to sustain agricultural production as a way of life. This case study examines some of the key challenges that farmers and ranchers face in the Rocky Mountain West.

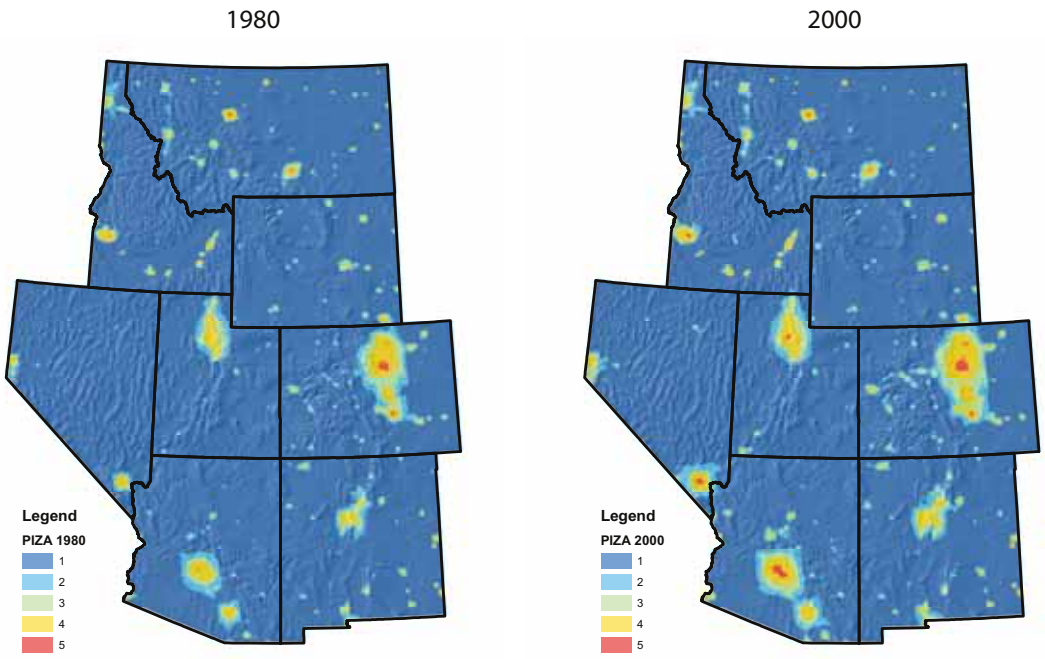
Population Increase

The Rockies remain predominantly rural as measured by sparsely populated area. And yet the region has experienced a great deal of land use change associated with the loss of farm and ranchland. With regional population across the Rockies growing at several times the national average, sprawling subdivisions and highways have infiltrated once-rural communities and redefined the culture and economy of the West.[1] Though "ex-urban" development is not a phenomenon exclusive to the West, the intensity of current population growth makes the changes more apparent, and more urgent.[2] The Rockies region experienced an 18 percent population increase from 2002–2007, with Arizona and Nevada growing by 24 percent and 28 percent, respectively.[3] Originally settled by farmers and ranchers, the landscape of the West is fast shifting toward a mosaic of land ownership and uses which juxtapose rural next to urban next to light industrial activities fueled by new economies and population growth, all helping further fragment the open spaces of the Rockies.

The growth of interaction between agricultural and urban areas can be displayed through a measure called "the population interaction zone for agriculture" (PIZA) developed by the USDA's Economic Research Service. Interaction zones in this case are areas where urban development and agricultural production are occurring in close proximity to one another. The PIZA maps in Figure 8 show increased agricultural and urban interaction across the Rockies region from 1980–2000. Though the locations of interaction have not changed substantially, the size and level of interactions have increased. These zones surrounding the urban centers (Colorado's Front Range, Tucson, Salt Lake City, and Las Vegas) show the highest threat levels. Some more rural areas with very little threat in 1980 are also seeing their threats increase, such as the I-70 corridor west of Denver, the I-10 corridor of Phoenix-Tucson, and the outskirts of the Carson City-Reno area and the area south of Las Cruces, New Mexico.

Table 1 shows the percent change and change in total acres of population interaction zones in the Rockies region. In 2000, 83 percent of private land in the Rockies was located in highly rural areas (PIZA rating of 1). These areas from 1990 to 2000 underwent only a three percent loss in their PIZA "rural" category displaying highly rural areas of the Rockies that practice agriculture and are currently safe from the pressures of urban development. The largest gains in threats to agriculture from 1980–2000 occurred close to urban areas where there was an 82 percent increase in rural land under threat. These changes show the profound impact of

Figure 8: Population Interaction Zones for Agriculture, 1980 and 2000



Warm colors denote a high degree of interaction between population centers and agricultural areas.

Source: Economic Research Service, U. S. Department of Agriculture, 2005

growing urban centers in the Rockies.

The Rockies region's population increased by 3.1 million from 2000–2007. However, in 2000 the farm population in the Rockies represented only one percent of the total population, making them a small percentage of the population that controls nearly 40 percent of the land in the Rockies.[4] The number of farms in the Rockies region is growing, but the total number of acres of farmland continues to decrease.[5]

Table 1:
Change in Population Interaction Zones for Agriculture (PIZA) area for Rockies Private Land, 1980 to 2000

PIZA Category	Category	PIZA Area, 1980 (acres)	PIZA Area, 1990 (acres)	PIZA Area, 2000 (acres)	2000 Percent Private Land	1980 to 1990, percent change	1990 to 2000, percent change
1	Rural (little or no urban-related population interaction)	175,947,745	173,835,493	169,146,580	82.9	-1	-3
2	Population interaction, low	11,188,217	11,658,198	12,495,329	6.1	4	7
3	Population interaction, medium	8,609,967	9,192,013	10,612,080	5.2	7	15
4	Population interaction, high	8,067,792	8,914,792	10,931,247	5.4	10	23
5	Urban	293,377	506,602	921,862	0.5	73	82

Source: USDA Economic Research Service, Population Interaction Zones for Agriculture data, 2005.

New Development

Due to the demand for new housing developments in the scenic landscapes of the Rockies, many states have lost a vast amount of prime agricultural land. In the Rockies region the amount of farm and ranchland decreased by two percent from 2002–2007, similar to the two percent national decrease. Figure 9 depicts regional disparities in land held in farms. By regional comparison, the Pacific and the South Atlantic regions in the U.S. have lost more than five percent of their total farmland, greater losses than in any other regions in the U.S. Although the Rockies region experienced only two percent farmland loss, a smaller magnitude than other U.S. regions, such losses of agricultural land have profound effects on rural economies, communities, and the environment. At the state level, Figure 10 shows similar changes in land in farms. Wyoming experienced nearly a 12 percent loss of its farmland from 2002–2007, followed by Nevada, with a seven percent loss over the same time period.

Figure 9:
Land in Farms, Percent Change, 2002 - 2007, by Census Division

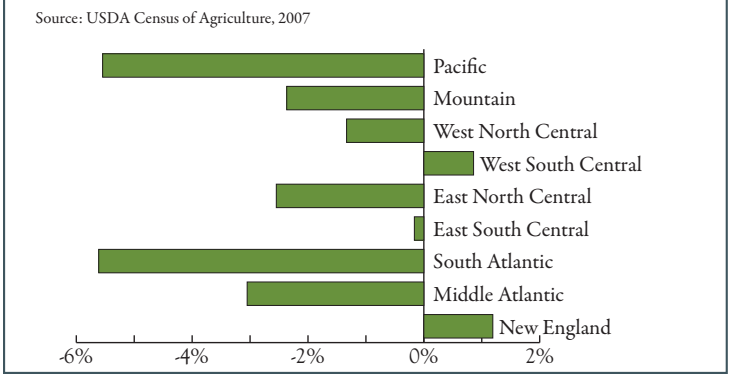
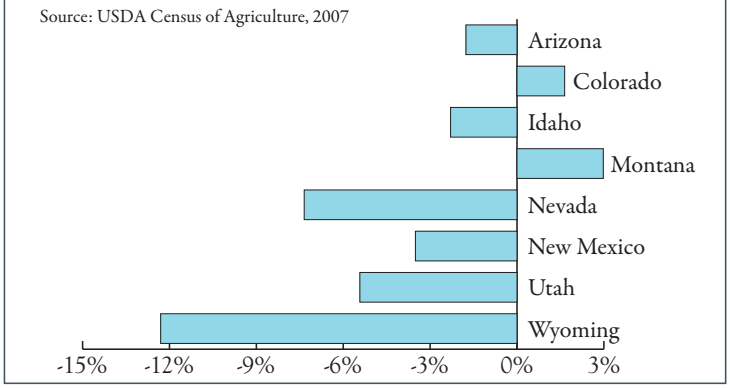


Figure 10:
Land in Farms, Percent Change, 2002 - 2007, by State



Rising Land Values and Water Rights

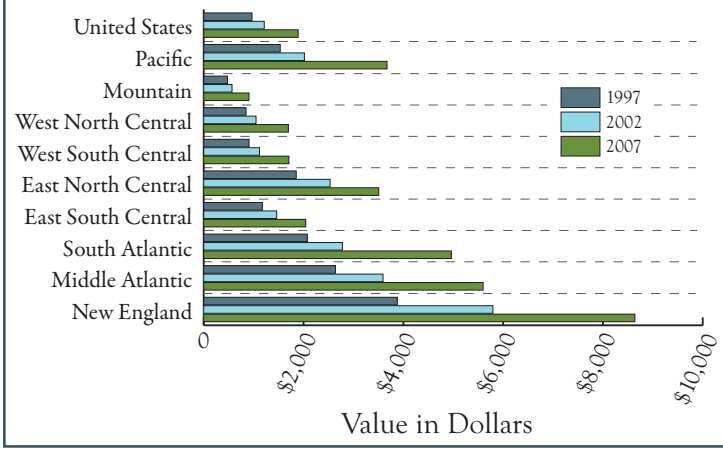
Economically, agriculture can be a high-risk occupation. In many cases, the incomes of farmers and ranchers largely depend on weather conditions, most importantly adequate precipitation. In times of drought bad crop yields historically meant that farmers were financially unstable for a short period of time but were then able to rebound in following years. However, as land values rose from 1997 to 2007, farmers and ranchers were pressured to sell their land in times of difficulty.

The average market value of land (per acre) increased by nearly $430 in the Rockies region from 1997 to 2007, as shown in Figure 11. When compared to other regions, this increase seems marginal. However, many ranches and farms are composed of large tracts of land, and thus a $430 increase per acre applied to thousands of acres yields a hefty sum. As displayed in Figure 12, the largest value increase among Rockies states was in Idaho, where the average market value of land (per acre) increased by $937 from 1997 to 2007. Although rising land values have plagued agricultural markets over the past decade, new reports by the USDA suggest that because of the recent recession, agricultural land values across much of the West have plummeted. Figure 13 depicts the most recent available data on changes in farm values. While the nation's farm and ranchland values dropped three percent in 2008, the value of farm real estate in the Mountain[6] division dropped 11 percent, clearly creating new challenges for farmers and ranchers thinking of leaving agriculture and selling their land.[7]

The battle for water rights also threatens operators' tenure of ranch and farmland. Many agricultural operations own senior water rights, but senior water rights can raise the value of land for development as builders seek guaranteed and reliable water sources for new

subdivisions. Some farmers and ranchers sell their water rights to developers because the profit is often higher than many consecutive years of good crop yields.[8] Cities have also purchased water rights from farmers and ranchers to supply the growing urban populations across the Rockies with water.[9] Unfortunately, when farmers sell their water rights, their land value and productivity decrease. Some farmers who sell their rights have turned to dryland ranching and farming, which do not require diversion of water sources to produce crops or livestock. Diversion of water from agriculture to municipal and industrial uses often follows the adage: "water in the West flows up hill to money." This process further marginalizes agricultural activity in the Rockies.

Figure 11:
Market Value of Buildings and Land per Acre, 1997 - 2007, by Census Division
Source: USDA Census of Agriculture, 2007



Continuing the Family Farm

In addition to the many economic issues that contribute to the loss of farm and ranchland in the Rockies are myriad social components. In the past 30 years, when costs became too high, the most viable option for many family farmers and ranchers has been to sell their land.[10] Family conflicts over whether to divide or sell the farm or ranch plague the agricultural world, especially during times of economic hardship. One example of this is the Bair Family Farm in Longmont, Colorado. *High Country News* ran a special on their difficulties, and their family ranch was eventually sold because of the difficulty in maintaining or inheriting land.[11]

The Preservation of Agricultural Land

Various grassroots organizations have developed agencies and trusts to help protect and conserve agricultural land across the Rockies region and the country. Agencies and methods that have helped protect this land include:

- **Land Trusts:** A non-profit organization that through purchase, donation, or conservation easements, works to protect land in the public interest.[12]
- **Conservation Easements:** An agreement between a landowner and a private land trust or government. The agreement limits certain uses on all or a portion of a property for conservation purposes while keeping the property in the landowner's ownership and control. The agreement is usually tailored to the particular property and to the goals of the owner and conservation organization. It applies to present and future owners of the land.[13]
- **National Resource Conservation Service-Large-Scale Incentive Based programs**: Originally the Soil Conservation Service, the NRCS is a government-run program that provides technical and financial support for voluntary conservation measures. The NRCS houses over 50 programs, including the Farm and Ranchlands Protection Plan from the 2008 Farm Bill.[14]
- **Estate Planning:** A process involving the counsel of professional advisors who are familiar with your goals and concerns, your assets and how they are owned, and your family structure. Estate planning covers the transfer of property at death as well as a variety of other personal matters and may or may not involve tax planning.[15]

Many of these organizations have effectively conserved farm and ranchland on local and regional scales. The 2008 Farm Bill seeks to address many of the threats to farm and ranchland nationwide, extending protection of farmlands from simply soil conservation to lands that

have "prime, unique or other productive soil or contains historical or archeological resources."[16] This and a clause that ensures protection of lands that continue the "economic viability of agriculture" are two additions to the bill that will benefit a wider range of farmers and ranchers.[17] However, it is difficult for broad-based legislation to accommodate the many different types of agricultural land loss that have different causes in each region of the country.

The urban population increase and subsequent geographic expansion of Western cities is, to a degree, inevitable. The American Farmland Trust suggests that the solution to conserving farmland has to start with more efficient, wisely planned urban development, similar to the tenets of smart growth.[18] If counties and communities develop inclusionary zoning principles, install public transportation, and create high-density, livable communities, the rapidity at which farmland is destroyed can decrease.

Because of an aging agricultural population and high demand for agricultural land and water rights, the number of farmers and ranchers in the Rockies region could continue to decline. Preserving ranch and farmland helps protect ecosystems and wildlife while maintaining cultural traditions in the Rockies.

Figure 12:
Average Market Value of Land and Buildings per Acre, 1997 - 2007, by State
Source: USDA Census of Agriculture, 2007

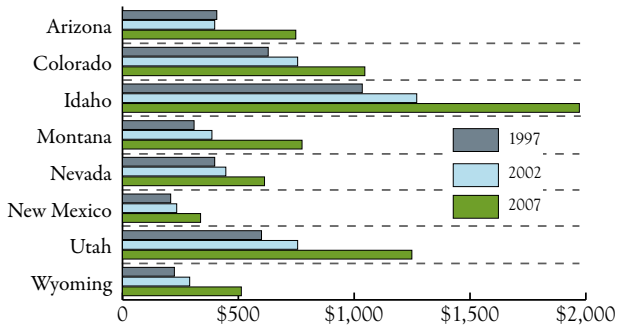


Figure 13:
Percent Change in Farm Real Estate Value, 2008-2009
Source: USDA, National Agricultural Statistics Service, 2009

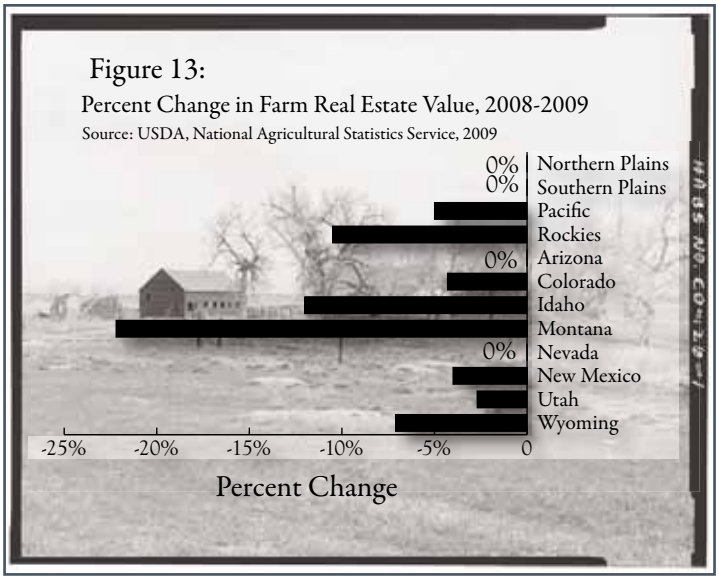


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Photo: USDA-NRCS

The Malpai Borderlands Group: Community-Based Land Management in a Changing West

By Patrick Creeden

Controversy on the Range

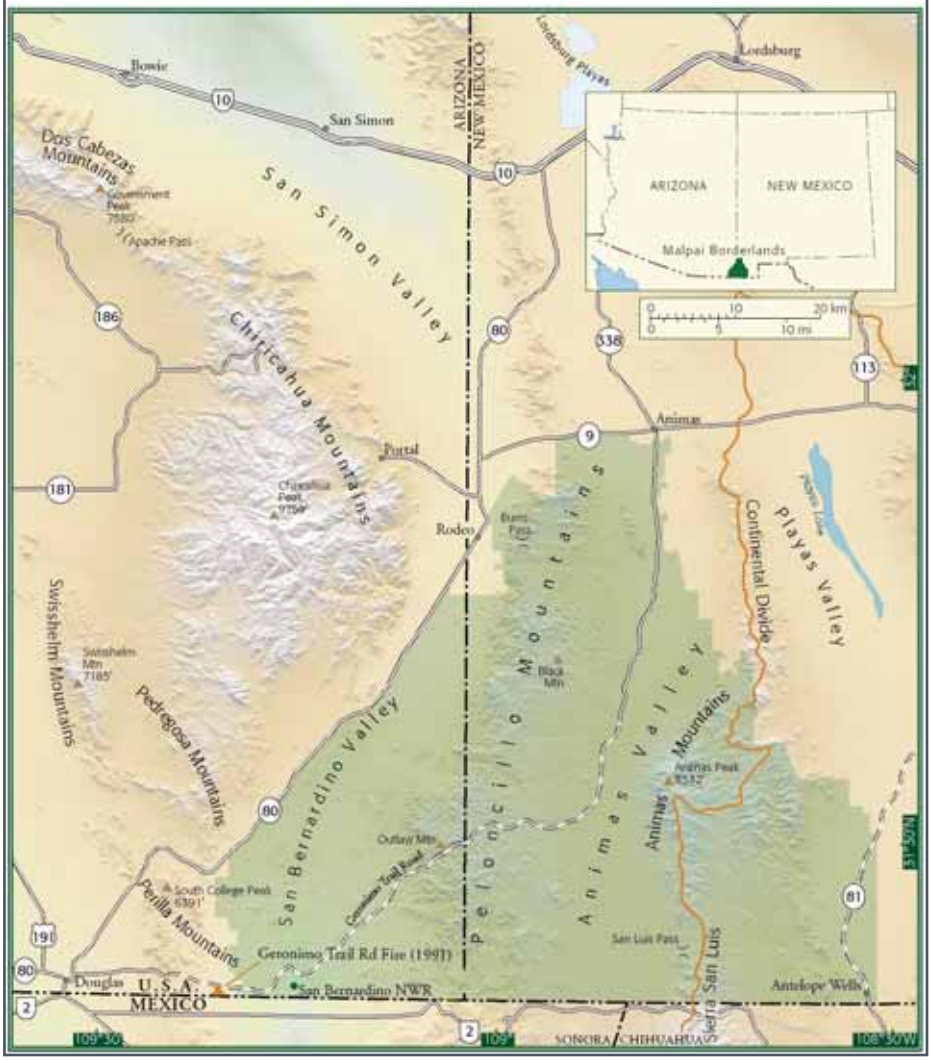
The picture of the iconic American cowboy working cattle in a majestic setting embodies a common myth: working livestock in the West is simple, romantic, and carefree. However, the working cowboy of the late 1800's and early 1900's is rare in the West today; ranchers have to manage more than just a healthy herd of cattle to maintain ranching as a way of life. Livestock growers are assuming additional jobs to diversify their income. They also must cooperate with various land management organizations to make their operations profitable. Similarly, more and more ranchers consider themselves managers of ecosystems instead of just livestock, working to ensure the health of their soil, grasslands, and watersheds to increase the productivity of their herds over time.

As ranching has evolved, so too have its values and practices. Throughout the 1980's and 1990's, ranchers were criticized by environmentalists for being profit-hungry, solely viewing the land from a profit-maximizing perspective.[1] Critics suggested that the production-based management strategy of ranching had little regard for the health of the rangelands, many of which were seen as being ruined by overgrazing. This stereotypical view of ranchers was endorsed by many environmental groups throughout the early 1990s' in a campaign titled "Cattle Free by 93" aiming to end all livestock grazing on public lands by 1993. The movement was supported by the Sierra Club and Earth First, two environmental organizations that accused ranchers of destroying public lands.[2]

Many ranchers were angry because they were all being placed in one group, accused of overgrazing public lands. Decades of poor management across much of the West had led to the destruction of many riparian areas, wildlife, and native plants. However, not all ranchers were guilty of this offense, and a complete removal of cattle from these lands seemed like an excessive solution to the overgrazing problem.[3] On the other side, environmentalist groups had concerns that the federal government was subsidizing the outright destruction of public lands across the West and that reform was needed to save the ecological integrity left on public lands.[4]

In response to the "Cattle Free by 93" campaign and the ensuing controversy, a group of ranchers in southern Arizona and New Mexico sought to work effectively with environmentalists who did not necessarily seek an end to grazing, but wanted to restore the damaged rangelands across the American West. The ranchers attempted to form alliances among environmental organizations and federal land management agencies. Wendy Glen, a New Mexico rancher and founding member of the Malpai Borderlands Group (MBG), described the conflict: "We would go to a meeting about land conservation and there would be police officers outside to prevent

Figure 14:
Malpai Borderlands Region
Source: Malpai Borderlands Group



physical altercations between the ranchers and environmentalists…there was just too much fighting."[5]

The MBG was created to improve communication among these diverse groups and to work toward common goals. Each side of the grazing debate needed to understand their counterparts better, and through a series of discussions at many local ranches, compromise was found.[6] An important part of this compromise is to sustain ranching as a profitable career for future generations. The MBG pioneered a cooperative land management plan that was the first of its kind in the West. This case study examines the successful land management strategies employed by the MBG through private-public partnerships.

Malpai and the "Working Wilderness"

Today, the MBG, whose location is shown in Figure 14, has grown into a broad-reaching organization. Members include representatives from The Nature Conservancy, National Resources Conservation Service, United States Geological Survey, U.S. Forest Service, Arizona and New Mexico Divisions of Wildlife, stream restoration hydrologists, the United States Border Patrol, and local ranchers. Representatives from organizations with often differing opinions come together and constructively tackle land restoration and conservation issues specific to the borderlands region. Figure 15 displays the many different land managers, public and private, that control property in this region. The borderlands region of southern Arizona and New Mexico is an extremely diverse area, culturally and geographically. The Malpai region includes high mountain peaks and lowland valleys, at elevations ranging from 4,000 to 8,500 feet above sea level. This varied topography creates a significant amount of precipitation in parts of the borderlands, but strong winds and warm temperatures evaporate most of the precipitation that may fall making the region extremely arid.[8]

They MBG works to protect endangered species, restore water sheds, and manage ecosystems within a "working wilderness."[9] This name includes human management in the definition of wilderness, which is not included in most classifications of the term. Additionally, it maintains that rangelands do work as they produce commodities, both quantifiable and theoretical for humans.[10] As stated by Nathan Sayre, an expert on ranching, "These values (or commodities) are produced by the interaction of natural processes and human activities."[11] Essentially this interpretation of wilderness asserts that humans work

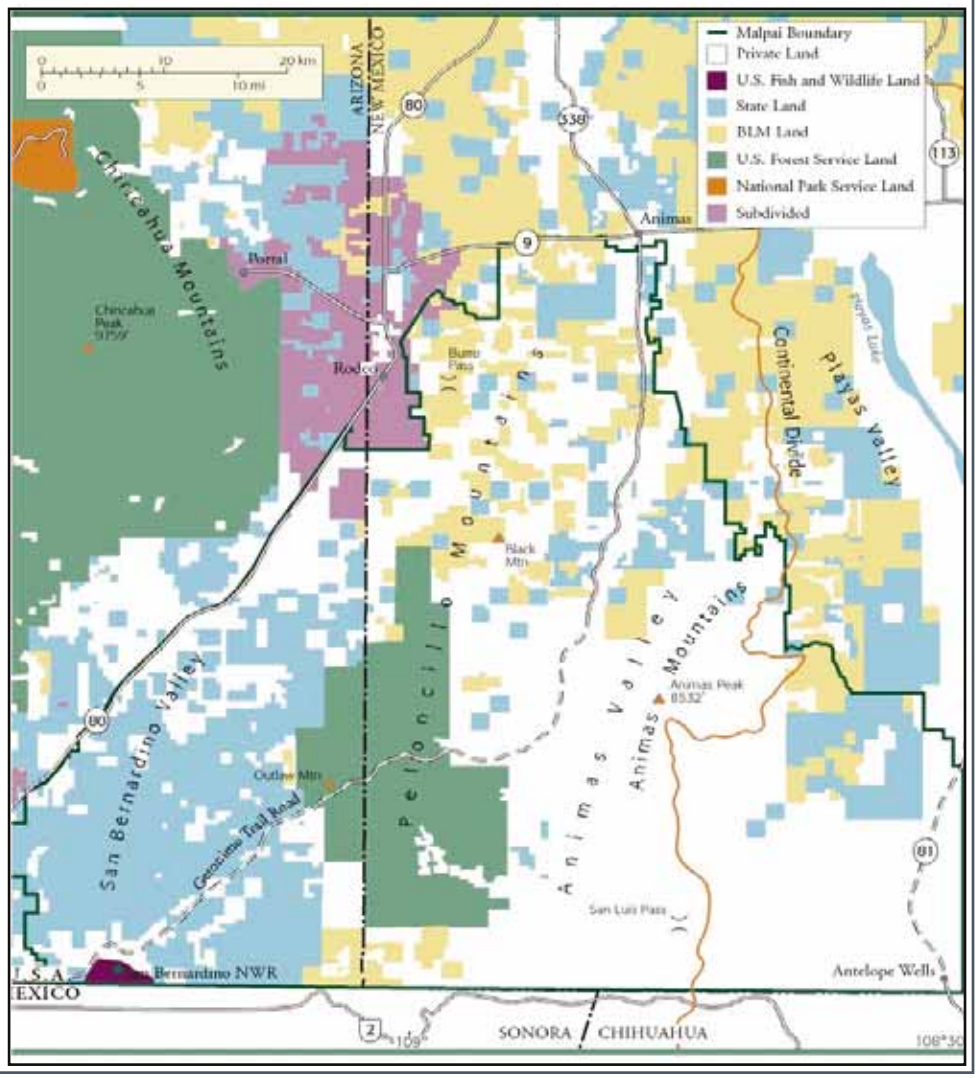
Malpai Borderlands Group Mission Statement:

"Our goal is to restore and maintain the natural processes that create and protect a healthy, unfragmented landscape to support a diverse, flourishing community of human, plant and animal life in our borderlands region. Together, we will accomplish this by working to encourage profitable ranching and other traditional livelihoods, which will sustain the open space nature of our land for generations to come." [7]

Figure 15:

Malpai Region Land Management Agencies

Source: Malpai Borderlands Group



in conjunction with natural processes.[12] The working wilderness depends on human management as these lands have already been altered by human activities.

Land Conservation

To preserve the various ecosystems and maintain ranching in the Malpai region, the group needed to ensure that private ranchlands could be protected from threats of development and subdivision. Because much of the private ranchland was located adjacent to public lands where their cattle grazed, the Malpai members formed a land trust that would help encourage conservation and maintain large grazing areas for both cattle and wildlife. The MBG land trust was formed using a concept developed by Drum Hadley, a rancher and member of the Borderlands group. Hadley developed the concept of a "grassbank," a parcel of land that would provide grazing allotments for ranchers whose land was in poor condition and needed to be rested.[13]

Grassbanking was created by allowing ranchers to graze animals on the grassbank ranch, and in return for the lease, a conservation easement would be placed on the resting land. Instead of using regular cash leases for payment of grazing fees, grassbanking allows ranchers to sell the development rights to their land as compensation for grazing fees. The conservation easements are held and managed by the Malpai group.[14] Grassbanking was also used by the MBG to accumulate vegetation on resting parcels of land for prescribed burns. This new method of land conservation and management worked well until drought conditions hit the grassbank, causing it to shut down.

© Russell Clarke '10. Malpai Ranch, July 2009

Although, the Malpai's grassbank is not currently operating, the group's model conserved nearly 310,000 acres of private land in the borderlands region,[15] protecting nearly 56 percent of the Malpai borderlands area in southern Arizona and New Mexico from possible development. In addition, media attention about the Malpai's activity gained national as well as regional attention in the 1990's, helping inform the ranching community about conservation easements and grassbanks. Though many Western ranchers were wary of these new conservation methods, throughout the late 1990's numerous grassbanks were formed across the West, following the Malpai model. Those operations have encountered similar challenges, but the model that the Malpai pioneered provided an initial blueprint for grazing lands across the new West.[16]

Fire

Central to the management practices of the MBG is the reintroduction of low-intensity ground fires. Land management agencies such as the U.S. Forest Service and the Bureau of Land Management had become extremely efficient at extinguishing wildfires across the West; however, fire suppression was preventing natural ecosystem services and cycles,[17] and part of the rangeland degradation blamed on cattle may in fact be attributable to the disappearance of fires as early as the 1890's.[18] Additionally, the combination of overgrazing and drought conditions during the late 1880's eliminated many of the native grasses of these ecosystems, and because of the inconsistent ground cover, natural fires were unable to spread.[19] Fires return nutrients to the soil and kill encroaching shrubs. Without fire, grasses were unable to recover and eventually woody species such as mesquite spread across the borderlands region.[20] The Malpai petitioned these agencies both to allow natural fires to burn on publicly grazed land and private property, and to set prescribed fires in these areas.

Prescribed fires are commonly used in the Malpai region today to help decrease the density of woody plant species. These fires and subsequent grassland development have helped restore the historical biological diversity, wildlife habitats, and watershed stability.[21] Setting low-intensity fires as a form of disturbance was traditionally not consistent with the U.S. Forest Service's fire policy. However, through collaboration with the Malpai group, the regional land management agencies altered their position on extinguishing fires. Through this partnership of private landowners and public land managers, the MBG has taken great steps toward returning fire to the region and restoring natural ecosystem disturbances.

Community-Based Management for the Future of the Western Range

In addition to specific conservation and restoration programs, the MBG has also provided a

new model of community-based land management that has been used on small scales across the West. Viewing wilderness and rangelands as places requiring community-based management was a radical idea when the group was first formed.[22] Managing these areas rich in biodiversity through multiple viewpoints and perspectives has proved to be an effective method of preserving land, conserving species, and maintaining ranching as a way of life in southern Arizona and New Mexico.

© Elizabeth Kolbe '08. Malpai Ranch, July 2009

However, this model may not be completely sustainable partially due to a current lack of funding. With much financial support coming from philanthropic organizations, the current state of the economy will make these conservation projects more difficult. These partnerships are essential to the group's survival. Much like the MBG, more land management agencies are adopting a "working wilderness" approach to their management models.[23] The Nature Conservancy has now adopted some of the same principles in running western rangelands while maintaining ranching as a primary practice on the landscape.[24]

The MBG acknowledges and understands that much of the land throughout the Southwest has been damaged, and in some cases partially destroyed, because of grazing. However, what they have discovered is that the proper use of animals, fires, and rest can help restore some of these degraded lands.[25] As noted by Van Clothier, a stream restoration hydrologist and member of the MBG, diverse ideas can foster improved environmental solutions and disparate parties can effectively work together. When asked how he felt about working with this group of ranchers given their different political viewpoints from his, he responded "I am blessed to have these people in my life,"[26] an opinion historically not often used by environmentalists to describe a community of ranchers.

This type of collaboration has provided a land management model that sets a standard for the whole Rockies region. As the Rockies region continues to develop and expand, multiple organizations with varied interests can successfully partner to accomplish common goals: open space, healthy ecosystems, and the preservation of cultural traditions such as ranching and farming.

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Agricultural Overview Table

	Variable	United States	Pacific	Rockies	West North Central	West South Central
Farms and Farmland	Number of Farms	2,204,792	158,870	159,394	458,055	413,454
	Percent of Total U. S. Farms		7%	7%	21%	19%
	Land in Farms (acres)	922,095,840	58,740,045	220,976,322	261,859,259	187,468,859
	Land in Farms (percent of total land)	41%	10%	40%	81%	69%
	Average Farm Size (acres)	418	357	1,386	571	453
	Median Farm Size (acres)	80	25	119	213	95
	Small Farms (1 to 500 acres, percent)	85%	90%	75%	74%	84%
	Medium Sized Farms (500 to 1000 acres, percent)	7%	4%	7%	12%	7%
	Large Farms (1000+ acres, percent)	8%	6%	17%	14%	9%
	Farms with Harvested Cropland (percent)	60%	60%	50%	67%	49%
	Farm Land Dedicated to Harvested Crops (percent)	34%	26%	11%	50%	20%
	Percentage of Farms that Irrigate	14%	54%	49%	7%	8%
	Percent Irrigated Farm Land	6%	20%	6%	5%	6%
Farm Economics, Value, and Subsidies	Market Value of Agricultural Products Sold (in thousands)	$297,220,491	$45,064,063	$23,049,075	$83,685,373	$36,933,922
	Market Value of Crops, Including Nursery and Greenhouse Crops (in thousands)	$143,657,928	$30,634,006	$8,851,608	$41,039,991	$12,258,821
	Market Value of Livestock, Poultry, and Their Products (in thousands)	$153,562,563	$14,430,056	$14,197,466	$42,645,384	$24,675,102
	Net Cash Farm Income of Operation (in thousands)	$74,581,098	$10,759,790	$4,770,068	$24,075,118	$6,731,481
	Sales: Percent Farms with Total Sales to $10,000	60%	57%	63%	46%	68%
	Sales: Percent Farms with Total Sales, $10,000 to $100,000	24%	25%	22%	27%	23%
	Sales: Percent Farms with Total Sales, $100,000 or More	16%	19%	14%	27%	9%
	Expenses: Livestock and Poultry Purchased or Leased (percent)	16%	5%	18%	24%	26%
	Expenses: Feed Purchased (percent)	20%	15%	23%	17%	24%
	Expenses: Fertilizer, Lime, and Soil Conditioners (percent)	8%	5%	6%	9%	6%
	Expenses: Gasoline, Fuels, and Oils (percent)	5%	4%	6%	5%	6%
	Expenses: Hired Farm Labor (percent)	9%	19%	10%	4%	6%
	Expenses: Interest (percent)	5%	4%	5%	5%	4%
	Expenses: Chemicals (percent)	4%	5%	3%	4%	3%
	Farms Receiving Government Payments	838,391	19,754	44,416	305,674	97,124
	Percentage of Farms Receiving Payments	38%	12%	28%	67%	24%
	Total Government Payments (in thousands)	$7,983,922	$459,028	$631,698	$2,916,430	$1,369,149
	Percent Government Payments, with Respect to Products Sold	3%	1%	3%	4%	4%

Source: USDA 2007 Census of Agriculture, 2009.
Census Divisions determined by the U.S. Census Bureau. Pacific: CA, OR, WA; Mountain: AZ, CO, ID, MT, NV, NM, UT, WY; West North Central: ND, SD, MN, NE, IA, KS, MO; West South Central: OK, AR, TX, LA.

Agricultural Overview Table

	Arizona	Colorado	Idaho	Montana	Nevada	New Mexico	Utah	Wyoming
Farms and Farmland	15,637	37,054	25,349	29,524	3,131	20,930	16,700	11,069
	0.7%	2%	1%	1%	0.1%	0.9%	0.8%	0.5%
	26,117,899	31,604,911	11,497,383	61,388,462	5,865,392	43,238,049	11,094,700	30,169,526
	36%	48%	22%	65%	8%	56%	20%	48%
	1,670	853	454	2079	1,873	2,066	664	2,726
	4	109	52	320	51	40	36	230
	92%	75%	83%	57%	79%	77%	87%	62%
	3%	9%	7%	10%	7%	6%	5%	10%
	5%	17%	10%	33%	14%	17%	8%	28%
	32%	48%	55%	56%	50%	45%	61%	50%
	3%	19%	37%	15%	9%	2%	9%	5%
	33%	43%	64%	35%	66%	49%	75%	52%
	3%	9%	29%	3%	12%	2%	10%	5%
Farm Economics, Value, and Subsidies	$3,234,552	$6,061,134	$5,688,765	$2,803,062	$513,269	$2,175,080	$1,415,678	$1,157,535
	$1,913,014	$1,981,399	$2,324,789	$1,273,721	$219,341	$553,140	$372,396	$213,808
	$1,321,538	$4,079,735	$3,363,976	$1,529,340	$293,928	$1,621,940	$1,043,281	$943,728
	$583,946	$968,925	$1,361,761	$827,156	$125,672	$367,493	$259,403	$275,712
	81%	64%	60%	53%	57%	73%	65%	52%
	12%	22%	23%	25%	23%	19%	25%	29%
	7%	14%	17%	22%	20%	8%	10%	19%
	11%	33%	13%	12%	8%	10%	11%	22%
	22%	23%	25%	9%	19%	37%	32%	16%
	6%	4%	8%	9%	5%	3%	3%	3%
	5%	5%	5%	9%	7%	6%	7%	7%
	14%	7%	11%	7%	16%	12%	12%	10%
	2%	4%	5%	8%	5%	5%	5%	7%
	5%	2%	4%	5%	3%	2%	1%	1%
	1,140	11,572	9,214	13,080	331	3,329	2,960	2,790
	7.3%	31.2%	36.3%	44.3%	10.6%	15.9%	17.7%	25.2%
	$55,947	$155,980	$99,494	$221,977	$4,007	$43,377	$22,759	$28,157
	2%	3%	2%	8%	0.8%	2%	2%	2%

Source: USDA 2007 Census of Agriculture, 2009.

Agricultural Overview Table

	Variable	United States	Pacific	Rockies	West North Central	West South Central
Farm Demographics and Organization	Principal Operators (number)	2,204,792	158,870	159,394	458,055	413,454
	Percent of Total U. S. 2007 Population (percent)	0.7%	0.3%	0.7%	2%	1%
	Percent of Total U. S. Farm Operators (percent)		7%	7%	21%	19%
	Principal Operator: No Days of Off-Farm Work (percent)	35%	34%	35%	38%	33%
	Principal Operator: Any Days of Off-Farm work (percent)	65%	67%	65%	62%	67%
	Principal Operator: 200 Days or More of Off-Farm Work (percent)	40%	38%	38%	39%	41%
	Principal Operator: Farming as Primary Occupation (percent)	45%	48%	47%	50%	41%
	Principal Operator: Other Primary Occupation (percent)	55%	52%	53%	50%	59%
	Average age of principal operator (years)	57	57	58	57	58
	Family or Individual Farms (percent)	87%	81%	82%	86%	88%
	Partnership Farms (percent)	8%	10%	9%	8%	8%
	Corporation Farms (percent)	4%	7%	7%	5%	3%
	Other Farms - Coop, Estate, Trust, Institutional (percent)	1%	2%	2%	2%	1%
Farm Production: Specialization and Inventory	Cattle and Calves, Farms Producing (percent)	44%	29%	44%	42%	60%
	Percentage of U.S. Cattle and Calves Inventory		8%	13%	31%	23%
	Hogs and Pigs, Farms Producing (percent)	3%	3%	3%	5%	2%
	Percentage of U. S. Hogs and Pigs Inventory (percent)		0.3%	3%	54%	6%
	Chickens, Farms Producing (Layers and Broilers, percent)	8%	10%	8%	5%	7%
	Percentage of U. S. Chicken Inventory		4%	0.1%	5%	24%
	Corn for Grain, Silage, or Greenchop, Farms Producing (percent)	20%	3%	5%	38%	2%
	Percentage of U. S. Corn Inventory (Grain)		0.5%	2%	52%	4%
	Percentage of U. S. Corn Inventory (Silage or Greenchop)		14%	13%	23%	4%
	Wheat, Farms Producing (percent)	7%	3%	9%	14%	5%
	Percentage of U. S. Wheat Inventory (All Types)		10%	17%	46%	13%
	Oats, Farms Producing (percent)	2%	0.03%	0.07%	0.7%	0.06%
	Percentage of U. S. Oat Inventory		5%	5%	47%	5%
	Barley, Farms Producing (percent)	0.9%	0.8%	4%	1%	0%
	Percentage of U. S. Barley Inventory		9.5%	43.1%	40.3%	0.2%
	Sorghum for Grain, Silage, or Greenchop, Farms Producing (percent)	1%	0.2%	0.6%	4%	2%
	Percentage of U. S. Sorghum Inventory (Grain)		0.2%	2%	50%	43%
	Percentage of U. S. Sorghum Inventory (Silage or Greenchop)		9%	15%	35%	31%
	Soybeans, Farms Producing (percent)	13%	0%	0%	29%	2%
	Percentage of U. S. Soybean Inventory (percent)		0%	0%	53%	5%
	Cotton, Farms Producing (percent)	0.8%	0.5%	0.3%	0.1%	2%
	Percentage of U. S. Cotton Inventory (percent)		8%	3%	4%	58%
	Forage, Farms Producing (percent)	39.4%	19%	38%	42%	39%
	Percentage of U. S. Forage Inventory (percent)		11%	16%	26%	16%

Source: USDA 2007 Census of Agriculture, 2009.
Census Divisions determined by the U.S. Census Bureau. Pacific: CA, OR, WA; Mountain: AZ, CO, ID, MT, NV, NM, UT, WY; West North Central: ND, SD, MN, NE, IA, KS, MO; West South Central: OK, AR, TX, LA.

Agricultural Overview Table

	Arizona	Colorado	Idaho	Montana	Nevada	New Mexico	Utah	Wyoming
Farm Demographics and Organization	15,637	37,054	25,349	29,524	3,131	20,930	16,700	11,069
	0.2%	0.8%	2%	3%	0.1%	1%	0.6%	2%
	0.7%	2%	1%	1%	0.1%	0.9%	0.8%	0.5%
	43%	30%	32%	40%	36%	36%	30%	35%
	57%	70%	68%	60%	64%	64%	70%	65%
	31%	40%	41%	34%	37%	35%	43%	39%
	61%	40%	46%	51%	53%	48%	38%	49%
	39%	60%	54%	49%	47%	52%	62%	51%
	59	57	57	58	58	60	57	57
	88%	81%	84%	77%	81%	87%	82%	79%
	6%	10%	8%	10%	9%	7%	10%	9%
	5%	6%	6%	12%	7%	4%	6%	9%
	1%	2%	2%	2%	2%	2%	3%	2%
Farm Production: Specialization and Inventory	49%	40%	42%	42%	48%	45%	45%	51%
	1%	3%	2%	3%	0.5%	2%	0.9%	1%
	2%	3%	3%	2%	3%	2%	4%	2%
	No Data	1%	0%	0.3%	0.0%	0.0%	1%	0.2%
	12%	9%	7%	6%	10%	8%	8%	7%
	No Data	0%	No Data	0%	No Data	No Data	0%	0%
	1%	9%	7%	2%	1%	2%	5%	6%
	0%	1%	0.1%	0%	0%	0.1%	0%	0.1%
	0.9%	2%	6%	0.9%	0.1%	2%	0.9%	0.6%
	1%	10%	11%	18%	1%	3%	4%	3%
	0.4%	4%	4%	7%	0.1%	0.4%	0.3%	0.1%
	0.00%	0.01%	0.01%	0.02%	0.00%	0.00%	0.01%	0.01%
	0.1%	0.6%	1%	2%	No Data	0.%	0.4%	0.4%
	0.7%	0.9%	9%	8%	0.3%	0%	3%	3%
	2%	4%	21%	14%	0%	0%	0.9%	2%
	0.9%	1%	No Data	No Data	No Data	2%	0.1%	No Data
	0.4%	1%	No Data	No Data	No Data	0.6%	No Data	No Data
	7%	3%	0%	No Data	No Data	5%	0.1%	0.1%
	No Data	0.1%	No Data	0%	No Data	0%	No Data	No Data
	No Data	0%	No Data	0%	No Data	No Data	No Data	No Data
	2%	No Data	No Data	No Data	No Data	1%	No Data	No Data
	3%	No Data	No Data	No Data	No Data	0.5%	No Data	No Data
	8%	38%	44%	43%	46%	27%	53%	48%
	1%	3%	3%	4%	1%	1%	2%	2%

Source: USDA 2007 Census of Agriculture, 2009.

Overview Section: Land and Water

Common Ground for Competing Uses

By Katherine Sherwood

The 2010 Colorado College State of the Rockies Report Card

Key Findings:

- In the Rockies, 90 percent of total water use is for agricultural purposes.
- Only 20 percent of agricultural land was used for cropland in 2007.
- The Rockies region falls in the middle of other regions in terms of land enrolled in conservation programs. Montana had the most conservation land (3 million acres) and Colorado saw the biggest increase (44 percent) in conservation between 2002 and 2007.
- From 1992 to 1997, more than 11 million acres of rural land were developed for non-agricultural use.

The Importance of Agricultural Land

The cowboy, "an independent, steadfast, resourceful" icon of the frontier who embodied Manifest Destiny by "taming nature and bringing order," is one of the greatest symbols of the American West.[1] Although the traditional idea of the cowboy has become a romanticized myth, the imagery of the American cowboy remains a symbol of our past. Like the cowboy, agricultural land also represents the founding of our country. The idea of owning property and making a living off the land is integral to the story of westward expansion and takes us back to our historical roots.[2] Conserving agricultural land is thus important for the preservation of American culture.

Agricultural land also plays a critical role in regional environments and economies. It preserves open space and wildlife habitat, and increases groundwater recharge and carbon sequestration. Soil that is adequate for plant growth takes thousands of years to develop; productive farmland is therefore a unique and non-renewable resource.[3]

Aside from providing non-market-value services, agriculture accounts for $100 billion of U.S. gross domestic product, around one percent of the total

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GDP, and similarly employs just under two percent of the labor force.[4] Agriculture supports the economies of rural communities and contributes significantly to the global economy and food supply.[5]

For all of these reasons, agriculture is the primary use of land in America. However, encroachment by urban areas is causing declines in farmland and ranchland acreage. Water transfers from agriculture to urban areas remove irrigation water from farms, ultimately leading to the loss of productive agricultural land. Pasture and rangeland are the primary uses of agricultural land in the Rockies, even though livestock production is highly water intensive and is threatened as the region struggles with water availability. Attempts to save agricultural land have included soil-bank type conservation programs which provide financial incentives for farmers to take land out of production or to practice farming techniques that are less intensive.

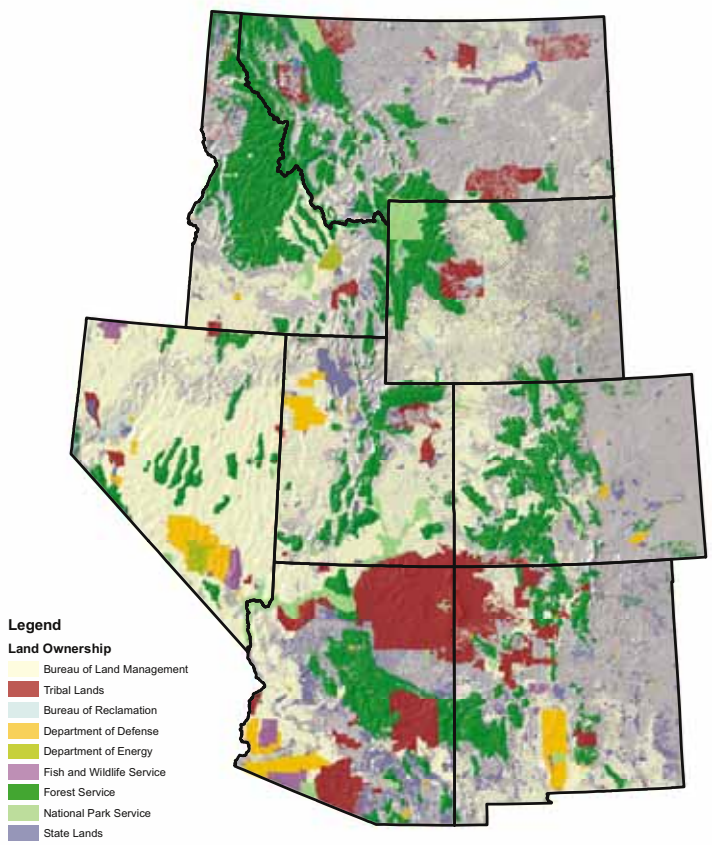
This section examines current trends in farm and ranch land in the Rockies region, looking at types of land use, developed agricultural land, irrigated land, and conservation practices based upon data from the 2007 Agriculture Census.

Table 1: Ownership and Use of Land in the Rockies, by Major Categories (in Millions of Acres, 2002)

Ownership	Cropland	Grassland, Pasture, and Range	Forest Land [1]	Special Uses, Urban Uses, and Miscellaneous Land [2]	Total Land Area [4]
Federal	-	152	246	237	635
State and Other Public	3	40	70	82	195
American Indian [3]	2	36	11	7	56
Private	436	358	422	162	1,378
Total	442	587	749	487	2,264

Source: USDA, Economic Research Service, 2002
Notes: -
- = Less than 500,000 acres.
[1] Includes reserved forest land in parks and other special uses.
[2] Excludes an estimated 98 million acres in special uses that have forest cover and, therefore, are included with forest land in this table.
[3] Managed in trust by the Bureau of Indian Affairs for American Indian and Alaskan Native tribes and individuals.
[4] Distributions may not add to totals due to rounding.

Figure 1: Federal, State, and Local Land Ownership in the Rockies



Source: Bureau of Land Management, 2009

Types of Agricultural Land Use

Agricultural Land Use

Of the 2.3 billion acres of land that make up the United States, 52 percent is used for agriculture, and the Rockies region[6] contains 23 percent of the total agricultural land in the U.S.[7] Agricultural land includes cropland, pastureland, and woodland. Cropland falls into several sub-categories: harvested, failed or abandoned, cultivated summer fallow, cover crops for soil improvement, and pasture or grazing. Woodland includes pastured and unpastured land. Pastured woodland is any woodland or timber tracts, either natural or planted, that is used for grazing, while unpastured woodland includes deforested land that has potential for future wood production[8].

Agricultural land in the U.S. has been declining. From the 1940's to 2002 there was a consistent upward trend in special-use land (including rural transportation uses, national and state parks, national defense, industrial developments, farmsteads, and farm roads) and urban areas, with decreases in land used for agricultural purposes.[9] From 1992 to 1997, more than 11 million acres of rural land were developed for non-agricultural use and more than half of those converted acres were agricultural land.[10]

Public Land

The Federal government owns 28 percent of the land in the U.S., with 41 percent of that land located in the Rockies region. Local and state governments own nine

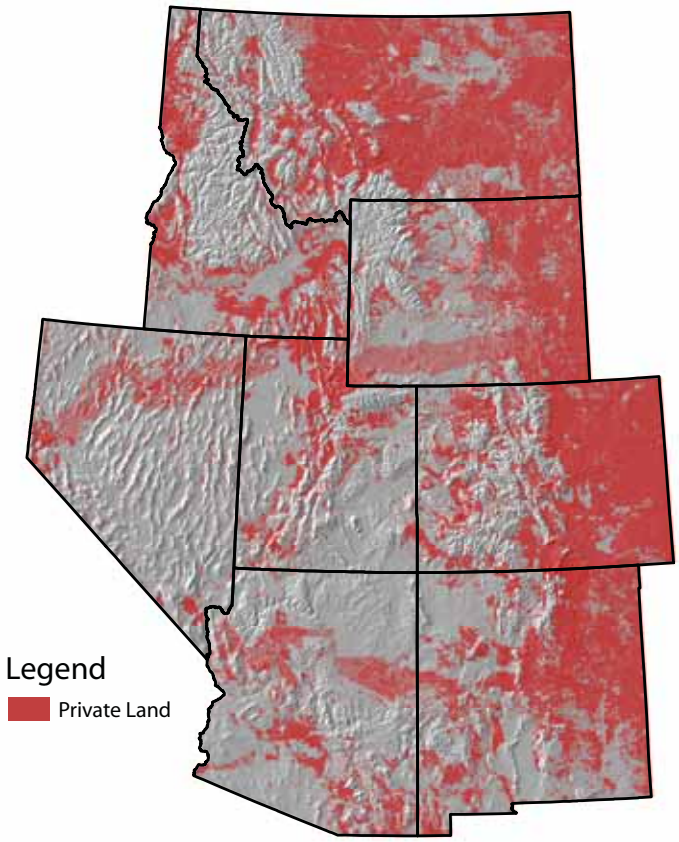
percent of the land, and Indian trust land makes up two percent of the total (See Table 1)[11] A land ownership/ management map of the Rockies (Figure 1) shows high concentrations of Bureau of Land Management (BLM) land located in Nevada and Utah, and tribal lands concentrated in Arizona, particularly in the northeast corner of the state

Most of the public land in the U.S. that has the potential to be used for pasture is leased for grazing: 90 percent of BLM land and 69 percent of United States Forest Service land is used for grazing. Most of these public grazing lands are in the Rockies and Pacific regions, where 95 percent of total public land is leased for grazing.[12]

Public land grazing is a controversial issue and has created an ongoing battle between ranchers and environmentalists. Some conservationists argue that ranching is destructive to public lands because cattle are not native to the ecosystem. They reduce habitat for native species, overgraze forage, and trample riparian areas. However, if ranchers and environmentalists work together to develop techniques that reduce the overall impact of the cattle, public grazing may become less destructive, and perhaps even beneficial to an ecosystem. For example, the Malpai Borderlands Group, based in southern Arizona, has shown that compromise between ranchers and environmentalists can promote healthy ecosystems while keeping cattle on public lands (see the case study on *Threatened Agricultural Land (p. 24)*.

The most prominent agricultural land use in the Rockies is livestock production on rangeland and pastureland. Large corporations and wealthy individual ranchers are the prevalent owners in the livestock industry. A 1992 General Office Accounting Report determined that the ten largest BLM permit holders are all corporations or billionaires, and the largest ten percent of ranches control 74 percent of the grazing on public lands.[13] According to Paul Robertson, director of the San Luis Valley Nature Conservancy Program, it is nearly impossible today for an individual to start up a ranch without being independently wealthy.[14]

Figure 2: Private Land Ownership in the Rockies



Source: Bureau of Land Management, 2009

Private Land

Private land in the U.S. accounts for over 60 percent of land ownership. Privately owned land includes 99 percent of cropland, 61 percent of grassland, pasture, and range, and 56 percent of woodland.[15] Figure 2 shows high concentrations of private land in the eastern Rockies, including Colorado, Wyoming, New Mexico, and most of Montana where cropland is most prominent. The western Rockies, where most of the BLM land is concentrated, have higher percentages of pastureland.

Changes in Agricultural Land

Agricultural land in the U.S. decreased between 1987 and 2007. In 1987, 442 million acres were devoted to cropland, but by 2007 cropland had decreased eight percent to 406 million acres. In the same time period, pastureland dropped nine percent from 516 to 473 million acres, while woodland dropped by six percent from 79 million acres to 75 million acres. Although these changes may not seem rapid on a regional basis, dramatic changes have occurred on local and regional levels.

In the Rockies region between 1987 and 2007, total farmland acreage decreased by 16 percent from 252 million acres to 220 million acres. Total cropland in the Rockies region was relatively unchanged between 1987 and 2007. Woodland, however, changed significantly from 12 million to eight million acres, a 48 percent decrease. In the same period, pastureland decreased from 198 to174 million acres, a 14 percent decrease.[16]

Pastureland and Livestock Production

Livestock production is resource intensive and can have negative impacts on the land if poor management techniques are used. Cattle consume large amounts of water; an estimated 3,430 gallons of water are needed to produce one steak,[17] and that does not include the water needed to irrigate feed crops. From the perspective of water demands, the Rockies region is a less than an ideal location for cattle production.

Despite the semi-arid/arid climate, the Rockies region had the most pasture and rangeland in the U.S. in 2007, with 163 million acres in pastureland and rangeland, representing 39 percent of the total pasture and rangeland in the U.S.[18] Of the total agricultural land in the Rockies, 74 percent was used for pasture and rangeland (See Figure 3).[19]

Cropland and Woodland

In the Rockies region, only about 20 percent of the land was used for cropland in 2007. Woodland made up a very small portion of the total land, with four percent designated as woodland and around three percent of that woodland used for pasture.[20] Woodland is concentrated in mountainous areas of the Rockies, whereas most agricultural land for crop and livestock production is located in lower and flatter areas.

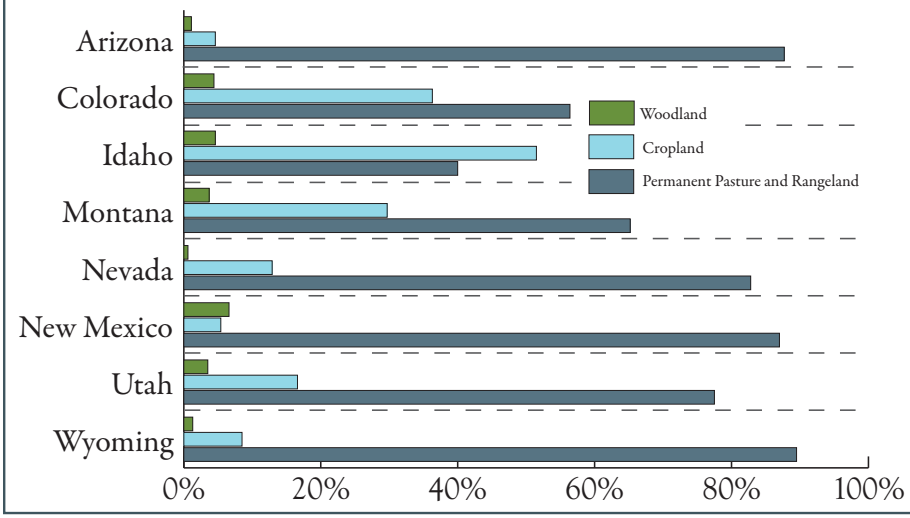
Rockies State Trends

The extent of cropland varies across the Rockies states, ranging from 50 percent of the total agricultural land in Idaho, to around five percent in Arizona. In the Rockies states, cropland used for pasture or grazing decreased between 2002 and 2007. Cropland used for pasture or grazing requires lower inputs, such as fertilizers and machines, and generally requires less maintenance. Typically, lands used for agricultural production shift between high and low labor and input use.[21] Thus, decreases in cropland used for pasture or grazing between 2002 and 2007 are a part of that cycle.

Arizona, New Mexico, and Wyoming had the highest percentages (around 85 percent) of land in permanent pasture and rangeland in 2007, while Idaho had 40 percent of agricultural land in permanent pasture, the lowest percentage of pastureland out of all the Rockies states (See Figure 3). In 2002 and 2007, New Mexico had the highest percentage of total land in woodland, with around six percent of land in woodland, most of which was pastured.

Figure 3:
Type of Land Use by Percent of Total Agricultural Land, by State, 2007

Source: USDA Census of Agriculture, 2007
Note: Permanent Pasture and Rangeland does not include Cropland and Woodland Pastured

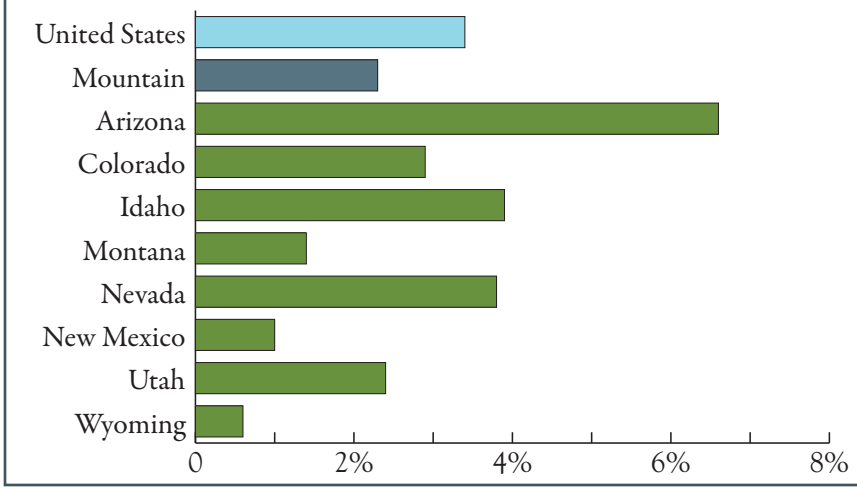


Developed Agricultural Land

Developed agricultural land includes farmsteads, buildings, livestock facilities, ponds, roads, and wasteland. The amount of developed land on a farm depends upon the size of the farm and the type of production. Farms that require more labor may have a greater number of buildings for housing. For example, John Post, the operator of a cotton farm in Marana, Arizona, provides housing on his land for most of his farm workers.[22] Shifts in outside involvement on the farm, such as community-supported agriculture, may also lead to increased roads in order to provide better access to the farm.

The Rockies region had a relatively low percentage of developed agricultural land in 2007. As shown in Figure 4, approximately two percent of the total Rockies land was developed, compared to three percent in the U.S. For perspective, four percent of land is developed in the Pacific Division.[23] At the national level some 50 percent of farms had some developed land.[24]

Figure 4:
Developed Agricultural Land as a Percent of Total Agricultural Land
(Farmsteads, Buildings, Livestock Facilities, Ponds, Roads, Wasteland, Etc.), 2007
Source: USDA Census of Agriculture, 2007



State Trends

In the Rockies states, Arizona had the largest percent of developed agricultural land (eight percent in 2002 and seven percent in 2007), whereas Wyoming had the lowest percent of developed land, with one percent in 2002 and less than one percent in 2007 (Figure 4).[25] The greater the number of farms,

the more total developed land. Wyoming had 2,274 large-scale farms (larger than 2,000 acres), while Arizona only had 515 large-scale farms. Meanwhile, Arizona had 9,873 small-scale farms (one to nine acres) compared to Wyoming which had 652 small-scale farms. Thus Arizona is divided into a greater number of small-scale farms, each of which requires different numbers and types of buildings, contributing to more overall development.

Irrigation

Agricultural irrigation accounts for more than 80 percent of the total water used in the U.S.[26] In the Rockies region, 90 percent of water use is for agricultural purposes.[27] The semi-arid/arid climate of the Rockies region provides a limited supply of water resources, and crop and livestock production largely depends on water availability. With increases in urban areas that also have high water demands, the availability of water for agriculture is constantly jeopardized.

Urban Water Transfers

According to the *2007 State of the Rockies Report Card*,[28] alternative water transfers from farms to cities are effective methods to balance competing urban and agricultural water needs. Several strategies currently exist. **Interruptible supply agreements** allow cities to gain access to agricultural water rights during droughts through annual payments or a "signing bonus." **Rotational crop management** involves an agreement between the farmer and buyer of the water rights. The farmer agrees to leave land fallow to make water available to the buyer. **Water banks** store surplus water that is not being used for irrigation. Those unused water rights are leased to other users who have access to the water bank. **Alternative crops or efficient irrigation systems** conserve water and allow the farmer to sell any water that is leftover to urban areas. **Purchase and lease back** is another water transfer practice. The city buys land from a farmer and gains some of the associated water rights. If the farmer needs the land back, he or she can lease it from the city.

photo: NRCS

Irrigation Systems

The type of irrigation system used has a large impact the success of water conservation goals. Irrigation techniques include flood irrigation systems, which convey water through open ditches and pipelines. Water is dispersed at the top of the field through siphon tubes, ditch gates, and pipe valves or orifices. Flood irrigation systems are inefficient because of surface water runoff, evaporation losses, and percolation below the crop root zone.

Pressurized irrigation systems include sprinklers and low-flow irrigation, and have been used as water and labor-conserving alternatives to gravity flow systems. However, a significant amount of water is still lost to evaporation.

Low-flow systems, which include drip, trickle, and micro-sprinklers, have 95 percent efficiency, compared with gravity systems which have 40–65 percent efficiency and pressurized systems which have around 75 percent efficiency. [29] In 2003, six percent of irrigated acres used low-flow systems. Although there are incentives to use low-flow systems, such as water conservation in dry years, possible increases in productivity, reduced energy costs, and reduction in labor, most farmers have not adopted these irrigation systems.[30] Often it comes down to initial cost; many farmers cannot afford low-flow systems. Increased international competition and increasing input costs, in combination with low water prices, provide little economic incentive to invest in low-flow systems.[31] Gravity flow systems are the predominant irrigation method in the Rockies, where uncontrolled flooding is used for hay and pasture production, a prominent land use in the region.[32]

In the U.S., large farms use the most irrigation water. The largest ten percent of irrigated farms in the western U.S. use half of the total irrigation water.[33] Farms with over 2,000 acres irrigated 150 million acres on average in 2002 and 2007, compared with farms with one to nine acres, which irrigated around 300,000 acres. Figure 5 depicts shares of total irrigated water used by farm size, with the largest farms (2,000 acres+) using 27 percent and small farms (1 to 9 acres) using only 1 percent.

Regional Trends

The Rockies region had the second-most land in irrigated farms out of all the U.S. divisions. However, the Pacific division had 20 percent of total farmland under irrigation, whereas the Rockies region irrigated only six percent of total farmland. This suggests that irrigated farmland is less concentrated in the Rockies region, and that there is greater abundance of non-irrigated grazing land.

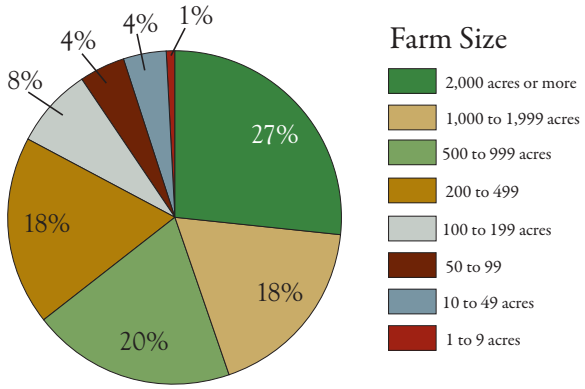
Figure 6 shows that the eastern Rockies had a lower percentage of irrigated land than the western Rockies. This is most likely a result of the Colorado River Compact which was established in 1922 and apportions certain Colorado River water rights to the western states.[34]

The Rockies region, when compared to other U.S. Census regions in Figure 7, had the highest percentage and number of irrigated acres dedicated to pastureland in 2007. While most regions put around 95 percent of their irrigation into cropland, the Rockies region put around 80 percent of irrigation toward cropland, and 20 percent toward pastureland. In total, the Rockies irrigated nearly 3 million acres of pasture in 2007. Although the percentage of irrigated acres in pastureland was lower than irrigated cropland, hay is one of the most water-intensive crops. Thus, livestock production, through the cultivation of forage, still requires a considerable amount of water.

State Trends

Among the Rockies states, Idaho had the most irrigated acres, over 3 million. As shown in Figure 8, Arizona had highest percentage of total irrigated acres as harvested cropland at 94 percent, and Colorado had the most irrigated pastureland, with over 500,000 acres. In 2002 and 2007, irrigated pastureland land represented between 30 and 40 percent of total pastureland in Wyoming. Arizona, which had a high percentage of land in pasture, only had five percent of land in irrigated pastureland, suggesting that much of the pastureland was non-irrigated grazing land.

Figure 5:
Percent of Total Irrigated Water Used, by Farm Size, Rockies Region, 2007
Source: USDA Census of Agriculture, 2007

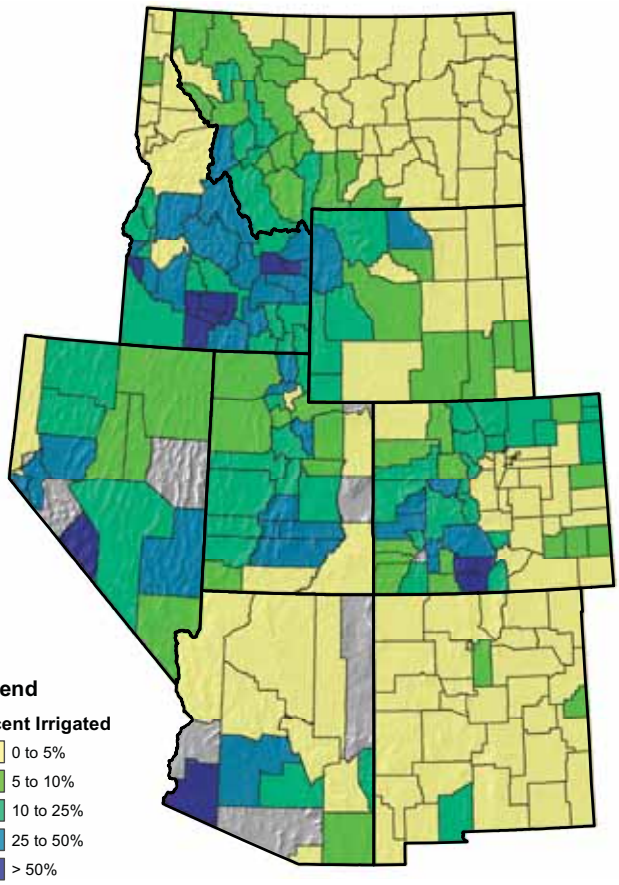


With increasing agriculture-to-urban water transfers, the irrigation-dependent cropland in the Rockies will struggle to survive, as hay is one of the most water-intensive crops in the West. In Colorado, 25 percent of all water is used to irrigate alfalfa.[35] Thus the livestock industry, the most predominant form of agriculture in the Rockies, is impacted by decreases in agricultural irrigation water.

Conservation of Agricultural Land

The federal government began addressing agricultural conservation in 1894 with the Division of Agricultural Soils. The department now focuses on air and water quality and wildlife preservation as well as soil erosion. [36] The Dust Bowl of the 1930's, a result of drought and poor soil management, slowed farm production and deepened the Great Depression. Because of this, many of the New Deal recovery programs were directed toward farmers. In particular, the Soil Conservation Service was developed, known today as the Natural Resources Conservation Service (NRCS).[37] Water is the most limiting resource in the arid/semi-arid Rockies region; conservation techniques directed at reducing water use and retaining soil moisture are vital to agricultural productivity.

Figure 6: 2007 Percent Irrigated Farm Land by County



Data were not available for selected counties due to disclosure restrictions in the Agricultural Census.

Source: 2007 Census of Agriculture, National Agriculture Statistics Service, U.S. Department of Agriculture.

Today, producers may be motivated to adopt conservation practices for numerous reasons, including cost reduction, continuation of subsidy payments, and cost-sharing to reduce the initial economic risk of adopting conservation practices. Some voluntary conservation programs provide farmers and ranchers with an economic incentive to retire land or integrate conservation practices into their farming methods. In short, a variety of voluntary programs exist to suit different farm types and managers.

Figure 7:
Irrigated Land Use, by Census Divisons, 2007
Source: USDA Census of Agriculture, 2007

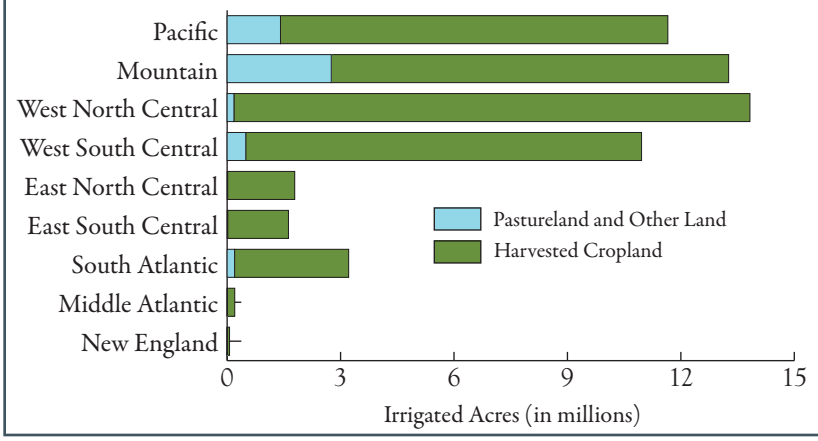


Figure 8:
Irrigated Land Use, by State, 2007
Source: USDA Census of Agriculture, 2007

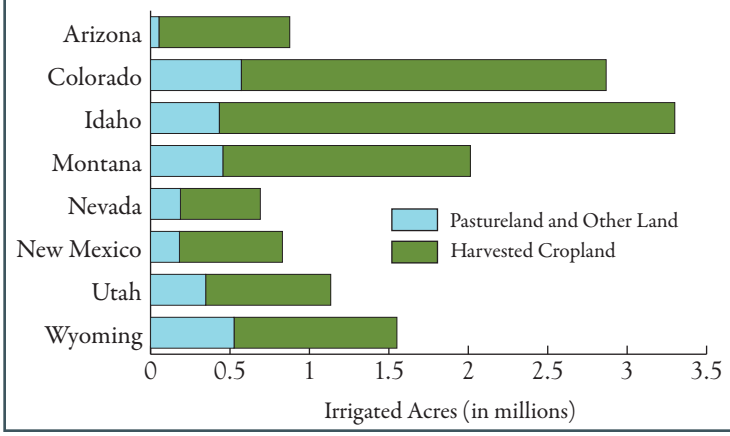
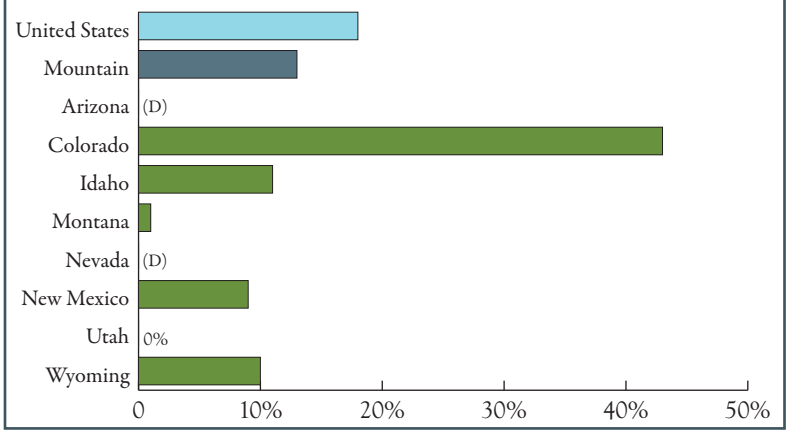


Figure 9:
Change in Acres Employing Conservation Practices, 2002 - 2007
Source: USDA Census of Agriculture, 2007
Note: Due to disclosure issues, data for Arizona and Nevada were not available.



Conservation Programs

The **Conservation Reserve Program** (CRP) was designed to retire environmentally degraded agricultural land (generally cropland) in exchange for an annual payment. Land is removed from production and replaced with cover crops, trees, and grasses.[38] Typically, CRP contracts require a 10–15 year period of time during which land must be taken out of production.[39] The **Environmental Quality Incentives Program** (EQIP) gives financial and technical support for farmers to adopt conservation strategies. The program pays for 75 percent of the cost for implementation, and 60 percent of the program's reimbursements go toward livestock production.[40] Finally, the **Conservation Security Program** (CSP) gives farmers and ranchers financial rewards for conservation efforts. It is similar to EQIP, but it gives producers financial assistance for conservation practices that have already been implemented and will be continued in the future.[41]

The area of cultivated cropland in the U.S. declined from 1982 to 1997, and part of this decline can be attributed to increased land enrollment in conservation programs. Thirty million acres of land were converted to CRP land between 1982 and 1997, contributing to the 1.8 percent decrease in cultivated cropland.[42] However, land that is taken out of production is still considered agricultural land, and thus is not included in the overall decrease of total agricultural land which is related to increases in urban development.

In the Rockies region, agricultural land enrolled in conservation programs increased 13 percent from 2002 until 2007, compared with the Middle Atlantic region which had a 13 percent decrease in conservation program acreage. The Rockies region ranked in the middle of regions nationwide in terms of percent of land in conservation programs. In 2007, the Rockies region had four percent of land enrolled in conservation programs, whereas the West North Central division had six percent of its land enrolled in conservation, the highest percent out of all the regions.

Among the Rockies states, Montana had the most land enrolled in conservation programs, with three million acres in 2007, compared to 700,000 acres in Nevada. However, Montana had very few changes in land that was enrolled in conservation programs between 2002 and 2007 (around a one percent increase), whereas Colorado showed a 44 percent increase in land enrolled in conservation programs during the same time period (see Figure 9).

Conclusion

Steady decreases in agricultural land in the Rockies since the 1980's suggest that rising urban land uses and high water demands are threatening pasture and rangeland. Conservation programs have been successful, but generally do not address the issues of growing demand from the urban sector, which threatens agricultural water use and places urban development pressures on farmland.

To further illustrate agricultural land issues in the Rockies, two case studies are presented: *Threats to Agricultural Land* and *The Northern Colorado Water Crisis*.

photo: © Monica Mueller '13. Jackson, Wyoming

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[40] *Ibid.*
[41] *Ibid.*
[42] *Ibid.*

Case Study: The New Food Economy

By Katherine Sherwood

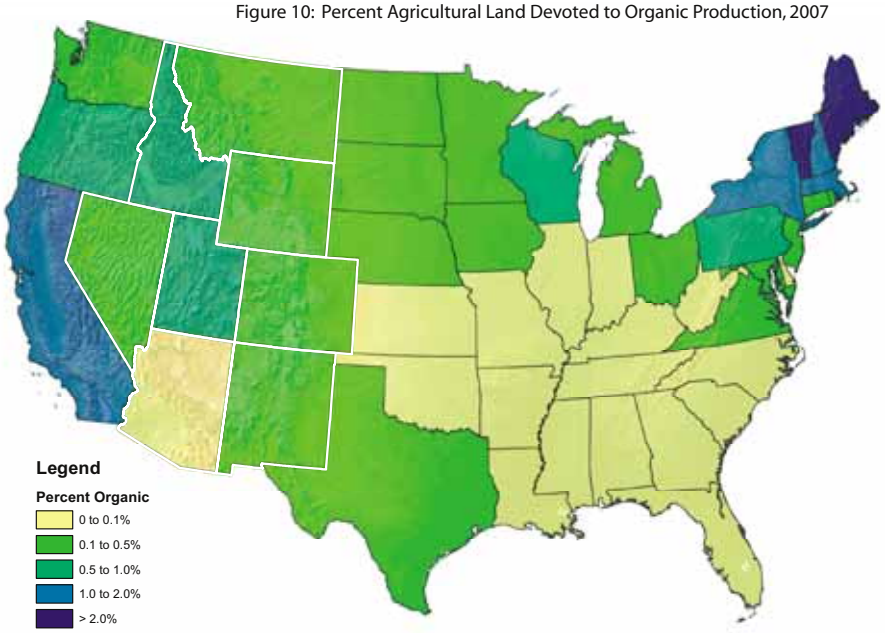
Introduction

Traditionally, the food economy has represented the entire food chain from research in labs to the process of growing crops, and the resulting intermediate and end crops and food products that are sold to consumers.[1] The "new economy" represents the revolution in production and distribution resulting from breakthroughs in transportation, communication, and manufacturing processes. A synthesis of these phenomena results in the "new food economy," which presents both a challenge and opportunity to revolutionize agriculture through new processes, products, and techniques as well as dramatic shifts in consumer preferences for the way food is grown, transported, packaged, and sold. A healthy, local "food chain" is rapidly evolving within which consumers are willing to pay more for the food attributes they value, resulting in higher prices and profit opportunities for the agricultural sector. In the new food economy, food characteristics such as natural, organic, value-added, and local food, as well as distribution and communication have become important means for differentiating products.

The new food economy has also been shaped by marketing dynamics. Retailers that were not traditionally involved in the sale of foods, such as drugstores, convenience stores, and supercenters, grew from approximately 14 percent of food sales for at-home use in 1988 to around 33 percent in 2006.[2] Upscale food supermarkets, such as Whole Foods, offer a wider variety of perishable, ethnic, natural, and organic products. Even fast food chains such as McDonalds and KFC now offer some healthy choices in response to rapid changes in consumer preferences. Another indication of a new food "dynamic" to consumer purchases is shown by mainstream food chains such as Safeway and Walmart[3] offering increasing proportions of products popular in the new food economy**.** For example, supermarkets, which traditionally stock store brands at lower prices, have increased their store-brand organic products, which are sold at premium prices. The new food economy is catering to a wealthier and more socially and environmentally conscious consumer through "niche products" to give consumers the ability to express individuality, social status, and social and environmental awareness. Corporate social responsibility (CSR), including the use of Fair Trade Coffee and American Humane Certified labels, has become a way for businesses to advertise these niche products. Competition between these new sectors of the food economy has created more "customized" products.[4]

A focus on higher end, specialized, and socially and environmentally responsible products has given farmers significant incentives to produce using methods that are less harmful to the environment. For example, defining production as organic and natural, using permaculture methods, and implementing "holistic resource management" are important marketing tools. Environmentally and socially conscious consumers purchase local foods through community-supported agriculture and farmers' markets, and increasingly through grocery stores that stock local products. (See Appendix A for more details on different aspects of the new food economy).

Figure 10: Percent Agricultural Land Devoted to Organic Production, 2007



Source: 2007 Census of Agriculture, National Agriculture Statistics Service, U. S. Department of Agriculture

The 2007 Census of Agriculture was the first to collect data on one dimension of the new food economy, organic production. This case study will therefore focus on trends of organic agriculture in the Rockies, as an aspect of the new food economy. In future agriculture census years, it is likely that other aspects of the new food economy will be included as important aspects of American agriculture.

Introduction to Organic Agriculture

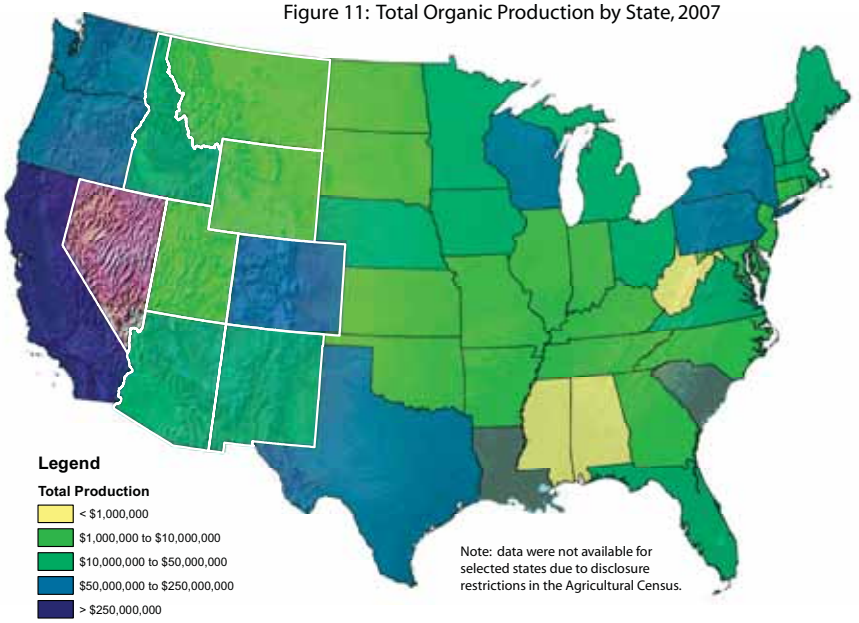
Organic farming was born in the 1920's with Rudolf Steiner's creation of biodynamic agriculture. Food was grown using methods that intertwined philosophy, spirituality, and the earth. In the 1960's, Rachel Carson's *Silent Spring* was a catalyst for the modern organic food movement. Her book shed light on the detrimental effects of pesticides

on human and environmental health.[5] In the 1990's, Congress passed the Organic Foods Production Act to create a national standard for organic production. The act requires that all farmers who claim to be organic must be certified by a state or private agency that is accredited by the USDA.[6] Today, organic production appeals to many farmers because it can lower input costs, mitigate use of nonrenewable resources, and take advantage of premium market prices.[7]

Since the 1990's, consumer demand for organic products has dramatically increased. A study conducted by the Hartman Group in 2007 found that 66 percent of consumers bought organic products for health reasons. Other reasons for organic purchases were taste, environmental concerns, and availability. Organic food has become less of a niche product and more available and affordable in mainstream markets.[8] The "mass market channel," which includes supermarkets, grocery stores, and mass merchandisers, was involved in 46 percent of organic sales in 2007.[9] In the early 1990's, mass markets made only seven percent of organic sales.[10] More than two thirds of consumers buy organic products and 28 percent of consumers buy organic products on a weekly basis.[11]

In 2008, Congress reacted to decreases in supplies of organic commodities by increasing funding for organic research and gave financial incentives to farmers who used conservation practices related to organic production.[12] Greater incentives for farmers to adopt organic practices will increase the quantity of organic commodities to meet the growing consumer demand. An analysis of organic farming in the Rockies indicates that organic production is increasing in the region, as described below.

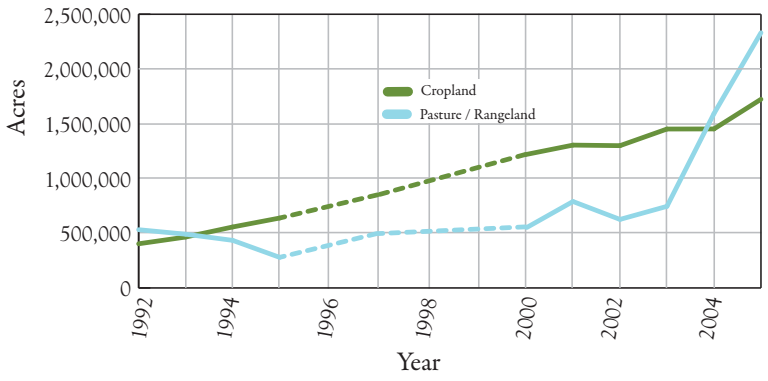
Figure 11: Total Organic Production by State, 2007



Source: 2007 Census of Agriculture, National Agriculture Statistics Service, U.S. Department of Agriculture

Figure 12:
Change in Organic Acreage, United States, 1992 - 2005

Source: USDA, Economic Research Service, 2009
Note: No data were available for 1996, 1998, and 1999



Organic Land

Organic Land in the U.S.

The U.S. has seen tremendous growth in organic agriculture, with production of organic crops quadrupling between 1992 and 2001.[13] Although organic agriculture has expanded over the last two decades, in 2005 only 0.5% of all U.S. cropland and pastureland was certified organic.[14] Organic cropland and pasture/rangeland both steadily increased from 1992 until 2005, with a rapid increase in the growth of pasture/rangeland from 1.5 million to 2.3 million acres from 2004 to 2005 (See Figure 10 and Figure 11) Looking at organic acreage for crops vs. pasture/rangeland, Figure 12 shows that before 2004, acres of organic cropland exceeded acres of organic pastureland and rangeland. Factors that inhibit the growth of organic agriculture include high initial costs, risks of changing farming methods, lack of knowledge, lack of infrastructure and technology, and lack of processors and distributors.

Conversion to Organic Land in the Rockies Region

By 2007 the Rockies region had 677,993 total acres certified organic and 147,962 total acres in the process of being converted to organic land, the highest total organic acreage and total acreage being converted in the U.S. (see Figure 13). However, regions with less land devoted to agriculture had a greater percentage of land being converted to organic relative to the existing total organic land, an indication of the widespread growth of organic agriculture.

Conversion to Organic Land in the Rockies States

In the Rockies states, by 2007 Montana had 195,204 acres certified organic, the largest total acreage used for organic production in the Rockies region, with only 37,000 acres in the process of being converted to organic land (see Figure 14). Comparatively, Nevada had

6,237 acres of total organic land, and 1,603 acres in the process of being converted (Figure 14). Nevada's total organic acreage and acreage being converted to organic production were very low compared with the other states, but land being converted to organic agriculture, relative to preexisting organic land, was higher. This is an indication that organic agriculture is catching on, even in places where traditionally organic agriculture was not as prevalent as other industries.

Figure 13:
Total Acres For Organic Production and Acres Undergoing Conversion to Organic Production, by Census Division, 2007

Source: USDA Census of Agriculture, 2007

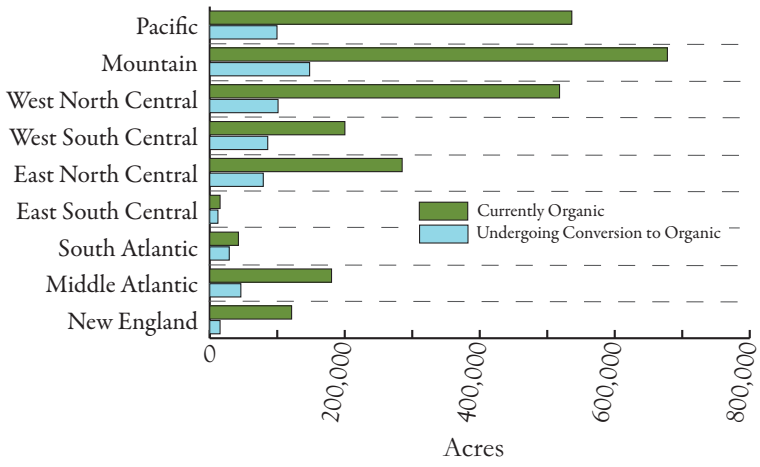
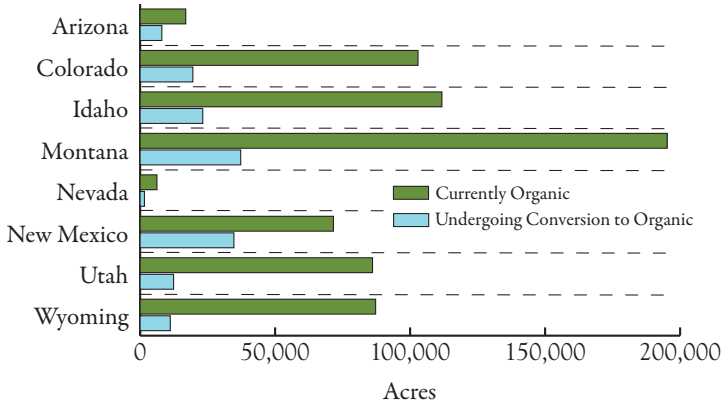


Figure 14:
Total Acres For Organic Production and Acres Undergoing Conversion to Organic Production, by State, 2007

Source: USDA Census of Agriculture, 2007



Who Is the Organic Farmer?

Farm Income and Place of Residence

If the externalities[15] of conventional agriculture were reflected in the market price of conventional food, it is likely that organic foods would be equal in price or cheaper than that their conventional counterparts.[16] Unfortunately, the environmental and health costs of farming techniques and chemical use in conventional agriculture are often not included in the "nominal" market price. The substitute for the lack of harmful chemicals in organic farming is an increase in labor. Crops must be constantly tended to mitigate weeds and pests that cannot be eliminated by pesticides and herbicides. In the Rockies region, organic farmers were more likely to live on their farm than conventional farmers, a widespread trend seen in other regions as well.[17] This could be a reflection of higher labor demands on organic farms. However, both conventional and organic farmers spent six percent of days on average working off the farm.[18] This suggests that supplemental income from off-farm work was not more of a necessity for organic farmers than for conventional farmers, because their earnings are supplemented by the premium prices for organics.

Gender

Findings from the International Federation of Organic Agriculture Movements show that conventional farming "is strongly identified with the expression of rural masculinities."[19] Increasingly, however, primary operators are female (see *Demographics Overview Section*, p. 56), and across the nation a higher percentage of female operators are organic farmers.[20] (See Figure 15) This trend is also true in the Rockies region, where 18 percent of conventional operators were female, and 22 percent of organic operators were female. Three states in the Rockies had a higher percentage of females in conventional operations: Arizona (by a 14 percent margin), Nevada, and Wyoming. In New Mexico 28 percent of total organic principal operators were female, the highest percentage of female operators for organic agriculture in the Rockies states.

Age

Organic farmers in the Rockies were, on average, the same age as conventional farmers (in their 50's).[21] In states outside the Rockies region, there was a greater age discrepancy between methods of farming. This indicates that in the Rockies region, organic farms are operated by the mainstream age demographic, instead of being preferred by an older generation of retired farmers or a younger generation who are motivated to try new farming methods.

Organic Commodities in the Rockies States

The Rockies produce only a small percentage of the nation's food crops in 2007. Vegetable production in the Rockies made up three percent of the U.S. total, and fruit production in the Rockies made up 10 percent. In 2005, Arizona led organic fruit production in the Rockies region and accounted for 92 percent of the state's organic acres. Low elevation deserts provide a climate suitable for winter crops, enabling Arizona to fill a supply niche during a time when other states cannot meet the market demand.[22]

The remainder of the Rockies states specialized in different commodities. Table 2 shows the share of each Rockies states' certified organic acreage by product. Arizona was the top organic producer of fruits and vegetables; Colorado was the top producer for livestock and herbs, nursery, and greenhouse products; Idaho produced the most organic hay and silage; and Utah was the top organic oilseed producer.

Farm Size and Specialization

As organic agriculture increases in scale, it begins to resemble conventional farming. Often large organic farms are owned by conventional mega-farms and the organic food is grown within the boundaries of the conventional farm. Large-scale organic farms often produce monocrops, confine their cows (but feed them organic grain), and ultra-pasteurize milk to keep it fresh longer. [23] Michael Pollan describes large-scale organic farms as contradicting the roots of organic farming:

> When I think about organic farming, I think family farm, I think small scale, I think hedgerows and compost piles and battered pickup trucks. I don't think migrant laborers, combines, thousands of acres of broccoli reaching clear to the horizon.[24]

These industries sometimes wipe out mid- and small-sized farms that cannot compete with lower prices.

Organic Farm Size in the Rockies

By 2007 the Rockies region had the greatest abundance of large-scale organic farms in the U.S., whereas the Pacific division had the greatest number of small-scale organic farms. In the Rockies region, 253 organic farms were large scale (greater than 500 acres), and 687 farms were small scale (one to nine acres). In comparison, the Pacific division had 149 large-scale farms and 3,492 small-scale farms. Small-scale farms outnumber large-scale farms in both regions. However, the Pacific division had more than four times the number of small-scale farms in the Rockies region, while the Rockies region had almost twice the number of large-scale farms.[25] Furthermore, the Rockies had 32 percent of the large-scale farms in the U.S. but only seven percent of the total small-scale farms in the U.S.

Large-Scale Organic Farms in the Rockies States

Farms in Montana, Idaho, and Colorado account for more than half of the large-scale organic farms and ranches in the Rockies region. Montana had 51, Idaho had 72, and Colorado had 77 large-scale organic farms and ranches (see Figure 16). Idaho has the most large-scale farms focused on livestock and poultry products, while Montana has the largest number of large-scale organic livestock operations. Colorado, which has the highest total number of organic farms in the region, also boasts the most large-scale organic crop farms.

Small-Scale Organic Farms in the Rockies States

Colorado and New Mexico had the most small-scale organic farms. Colorado had 163 small-scale organic farms, and New Mexico had 211, again making up nearly half of all the small-scale organic farms in the Rockies region, as shown in Figure 16. Most of the small-scale organic farms in New Mexico were used for crop production, whereas most of the small-scale farms in Colorado were used for livestock, poultry, and their related products.

Figure 15:
Organic and Conventional Female Operators, by Percent, 2007
Source: USDA, Economic Research Service, 2009.

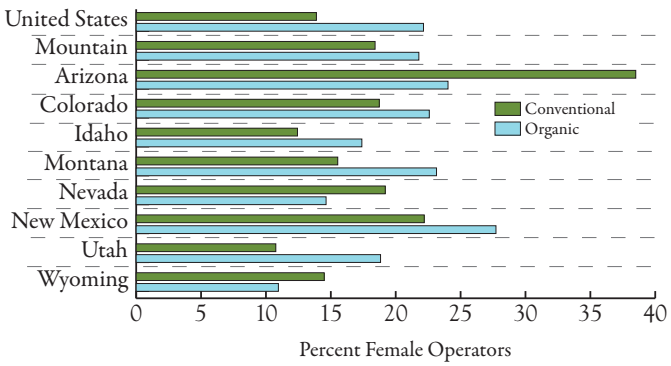


Table 2:
Distribution of Organic Acreage in the Rockies, by Product, 2007

	Livestock	Grain Crops	Beans	Oilseeds	Hay and Silage	Vegetables	Fruits	Herbs, Nursery, and Greenhouse
Arizona	0%	2%	6%	7%	1%	54%	92%	2%
Colorado	76%	25%	23%	1%	10%	29%	4%	71%
Idaho	6%	13%	6%	2%	61%	2%	0%	6%
Montana	14%	37%	59%	42%	17%	3%	1%	4%
Nevada	0%	0%	0%	0%	3%	0%	1%	0%
New Mexico	4%	2%	4%	0%	1%	9%	2%	3%
Utah	0%	11%	0%	48%	2%	3%	0%	14%
Wyoming	0%	10%	1%	0%	5%	0%	0%	0%

Source: USDA, Economic Research Service, 2009

Small-Scale Organic Perspective

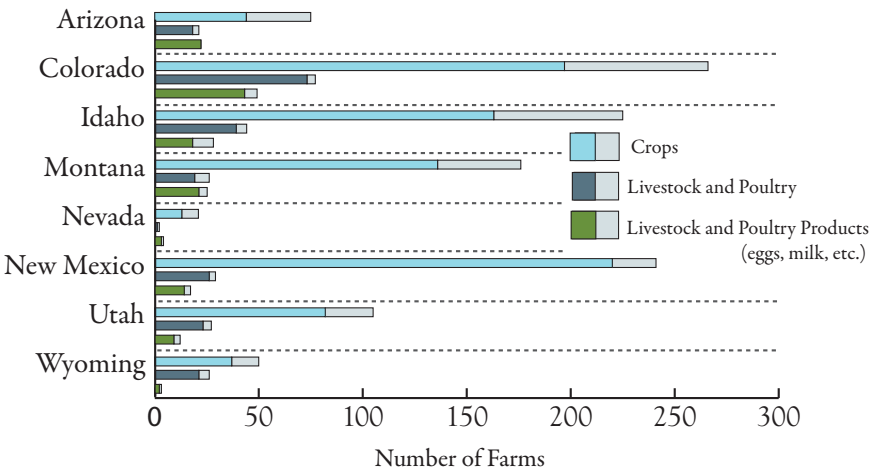
Javernick Family Farms

On a morning at Javernick Family Farms in Canon City, Colorado, fields of squash, garlic, melons, and beans lie against the backdrop of the Sangre de Cristo Mountains and a clear blue Colorado sky. A small white house on the side of the dirt road running through the fields is the home of Beki Javernick and her husband.

Beki's grandparents bought the land in 1947 and grew cabbage and cauliflower. In 1992, Beki's parents switched to hay and cattle production. Today, 10 acres are devoted to produce and the remaining 60 to hayfields, where they raise cattle. All of their cattle are grass-fed and free of growth hormones and antibiotics. They also produce sheep for wool and meat. They grow plant starts in their greenhouse, which they sell to local farms such as Larga Vista Ranch and Venetucci Farms.

When Beki and Carl began operating the farm, they moved to organic production without going through the USDA certification process which was too expensive for their small operation. This does not mean that they are not committed to growing plants free of pesticides and synthetic fertilizers. Beki believes that not being USDA certified is only detrimental if they were selling to a large corporation such as Whole Foods. Most of the produce from Javernick Family Farms is sold at farmers markets and to 88 community-supported agriculture (CSA) members, with the rest sold to local restaurants. Beki estimates that only about one percent of customers are bothered by the fact that her produce is not USDA certified.

Figure 16:
Number of Organic Farms, by Type of Product and Value of Sales, 2007
Source: USDA Organic Production Survey, 2007
Note: Colors indicate sales of less than $50,000; gray indicates sales greater than $50,000.



Javernick Family Farms is fortunate in terms of their water rights. They have 69 water shares for their 70 acres and thus are able to use flood irrigation on their crops. However, the farm faces problems with weeds and pests. The Mexican Bean Beetle, which looks like an orange lady bug, eats the entire leaf of the bean plant. They have tried organic sprays but have not had much success in getting rid of the bug. The farm has one full-time employee and four full time "WWOOFers" (World Wide Opportunities on Organic Farms Participants). Beki describes them as a "blessing" on an organic farm with high labor demands.

Beki expresses worry that they will never be able to afford to pay the inheritance tax when the time comes for her to inherit the farm. However, she optimistically adds, we'll "worry about that when it happens." Although data indicate that small organic farms are threatened by large-scale organic farms, Beki does not feel threatened. She believes that educating people on the difference between local organic production and industrial organic production will strengthen the small-scale organic industry.

Large-Scale Organic Perspective

Aurora Organic Dairy

Green pastures scattered with black and white Holstein cows span the 400 acre Aurora Organic Dairy in Platteville, Colorado. The farm was bought as a feedlot and then converted to a part conventional, part organic dairy. The company owns five farms located in Colorado and Texas and has 11,000 cows and 325 employees. Sonja Tuitele, the Public Relations and Communications Vice President, noted that the neighbors also appreciated the change in scenery and reduction in smell when the feedlots were replaced with grass pasture for the dairy cows.

In 2003, the opportunity arose for the dairy to produce USDA certified organic milk for the private label market, including 14 grocery store brands. Since the dairy owns the whole supply chain, the private labels can be 10 to 15 percent less expensive than other organic labels. Aurora's products are distributed to all 50 states.

At the Platteville farm, 70 employees work on the farm and in the milk processing plant. Ninety percent of the employees live on the farm, benefiting from subsidized rent, which also helps keep employees on the farm longer. Some of the employees have worked there for 25 years, providing the dairy with experienced, skilled labor.

The farm additionally includes a $40-million-dollar, state-of-the-art milk and cream processing plant. Ninety percent of the milk produced is ultra-pasteurized, a process that involves rapidly heating the milk to just below boiling point, which gives it a shelf life of 60 days. The plant has the ability to produce 5,000 gallons of milk per hour.

The conversion to organic from conventional on a dairy farm is a much shorter process than for crop conversion. A dairy cow can be transitioned to organic in 12 months by switching to organic feed and eliminating antibiotic and hormone use. After the cow has been converted to organic, it cannot be switched back to conventional, which would allow producers to take advantage of the changing market for organic and conventional milk. Management of the organic dairy cows becomes an issue of prevention and sanitation once they have been converted. Employees examine every cow three times a day when the cows are milked, in order to

detect any health abnormalities.

Sonja Tuitele discussed the benefits and difficulties of USDA organic certification. "How do you trust an organic farmer who says they don't want to pay [for USDA certification]?" She explained that there is a lot of record keeping involved, which is the hardest part. Earning the trust of the consumer by following the comprehensive USDA regulations makes the process worthwhile. She does not believe that the cost of certification is so high that small organic farmers should use it as an excuse to not seek USDA certified status.

Conclusion

Although both Javernick Family Farms and Aurora Organic Dairy follow the guidelines for organic production, they each represent opposite ends of the spectrum in terms of organic agriculture. Javernick Family Farms produces for the local consumer and has gained consumer trust through creating relationships with buyers through community-supported agriculture. On the other hand, Aurora Organic dairy has created that trust by going through the USDA organic certification process in order to provide for a much larger and widespread market. Javernick Family Farms has more flexibility in terms of experimenting with different organic techniques because they have the support of a local community who purchases their food. However, Aurora Organic Dairy distributes to a much larger population and its sales are dictated by the market. Large-scale and small-scale organic production could be two separate categories in the new food economy, each filling a different niche. It is likely that small-scale organic farms are not accurately represented in the 2007 Agriculture Census because many are not USDA certified. Perhaps in the future, like other aspects of the new food economy, small, non-certified organic operations will be incorporated in the census data.

© Russell Clarke '10, Aurora Organic Dairy, COlorado

APPENDIX A:
The New Food Economy Matrix

Organic Agriculture

In order for a farm to become certified organic, it must be approved by a certifier that is accredited by the National Organic Program (NOP). Certification standards include using farmland that has been chemical free for three or more years, separating organic products from conventional ones, avoiding fertilizers, pesticides, antibiotics, food additives, genetic modification, irradiation, and sewage sludge, and feeding only organic feed to organic livestock. Certified farms must keep a record of sales and production, and are subject to on-site inspections. [26]

Organic products may be labeled "100% organic" or "organic" if they contain 95–99 percent organic ingredients. If the product is 70% organic, it can be labeled "made with organic ingredients" but will not bear the organic seal. Products with less than 70% organic cannot advertise that the product is organic, except in the ingredient facts.[27]

Permaculture

Permaculture systems are small-scale designs for the use of land that mimic nature while integrating humans, plants, animals, and the earth. Every component of the system has multiple functions. Permaculture systems may be implemented in rural or urban settings, and every design is specific to the location. These systems are not only focused on food production, but also include energy-efficient buildings, waste water treatment, recycling, and land stewardship. [28]

The Permaculture Institute is located near Santa Fe, New Mexico, and is the leading permaculture educational institution in the U.S. To learn more, visit www.permaculture.org.

Local/Farmers Markets

Locavores are consumers who eat food that is primarily grown within a 100-mile radius. Local food has gained popularity among consumers because it supports local economies, may have a higher nutritional value due to its freshness, tastes better because it has longer to ripen, reduces use of fossil fuels in food transport, ensures food security, and supports small farms, which protects open space. [29]

Farmers' markets are a means for consumers to purchase

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local food. They provide urban communities with fresh food that is often hard to find and give community members the opportunity to interact with local small-scale farmers. The number of farmers' markets increased 6.8 percent from 2006 to 2008. [30]

Farmers' markets across the country have begun to accept food stamps which has brought local food to a wider variety of consumers. State and local governments have set up electronic systems to accommodate the new debit cards used in place of paper food stamps. In 2008, 753 farmers' markets nationwide were accepting food stamps.[31]

To find a local farmers' market, visit www.localharvest.org/.

Community Supported Agriculture (CSA)

Community- supported agriculture establishes social and economic connections between community members and farmers. Before the growing season, members sign an agreement that commits them to pay a fixed amount of money for the season, in return for a share of whatever is grown. This fixed membership cost is beneficial because it allows the farmer to focus on sustainable production, without worrying about prices and market fluctuations. It is beneficial for members because they have a direct connection with the food that they are consuming. [32]

To find local CSA in your community, visit www.localharvest.org/csa/.

Slow Food

Slow Food International was founded in 1989. The "eco-gastronomic" organization is non-profit and member supported with 100,000 members in 132 countries. It was founded in 1989 in an attempt to raise awareness of fast life and fast food, through focusing on local, fresh, seasonal, and organic food and protecting local food cultures. [33]

Slow Food International founded the Slow Food movement. Visit their website at www.slowfood.com/.

Holistic Resource Management

Holistic resource management is a method of land management that reduces the negative effects of cattle grazing and restores damaged land. Advocates claim it is beneficial environmentally, socially, and economically. The methods used attempt to mimic nature as closely as possible and focus on frequent rotating of livestock to different pastures in order to reduce overgrazing and over-resting. HRM challenges the traditional management techniques to reduce the impacts of grazing. For example, overstocking cattle, which is normally considered harmful, is a technique that is used to graze the land more evenly.[34]

Rockies Example: The Medano-Zepata Ranch, located in the San Luis Valley, is the largest Nature Conservancy ranch in Colorado. They raise cattle using holistic resource management techniques.
www.zranch.org/

Information on Holistic Management

International, founded by Allan Savory, can be found at www.holisticmanagement.org/.

Hydroponics

Hydroponics is a method for growing plants in fertilized water, with or without the use of an "artificial medium," such as sand, gravel, or sawdust to support the plant roots. Hydroponic systems are an example of controlled environment agriculture (CEA) because they are often enclosed in a greenhouse, in order to regulate temperature, air, light, and water. Although hydroponic systems are often highly productive, they are capital intensive. [35] Hydroponics reduces reliance on agricultural land and also may be more energy efficient than importing produce from other countries, although the creation of an artificial growing area is energy intensive. [36] Water use is also reduced due to recirculation, and herbicides are not needed. [37]

Rockies Example: Hydro-Pure Growers is a hydroponic producer located east of Pueblo, Colorado. www.hydro-puregrowers.com/.

Value-Added Products

Any raw product that is altered in some way by the farmer and sold as a product with a higher value than the original product due to the labor and creativity that were put into creating the product. For more on value-added products, see p. 122.

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Case Study: The Northern Colorado Water Crisis: The Big Thompson Project

By Katherine Sherwood

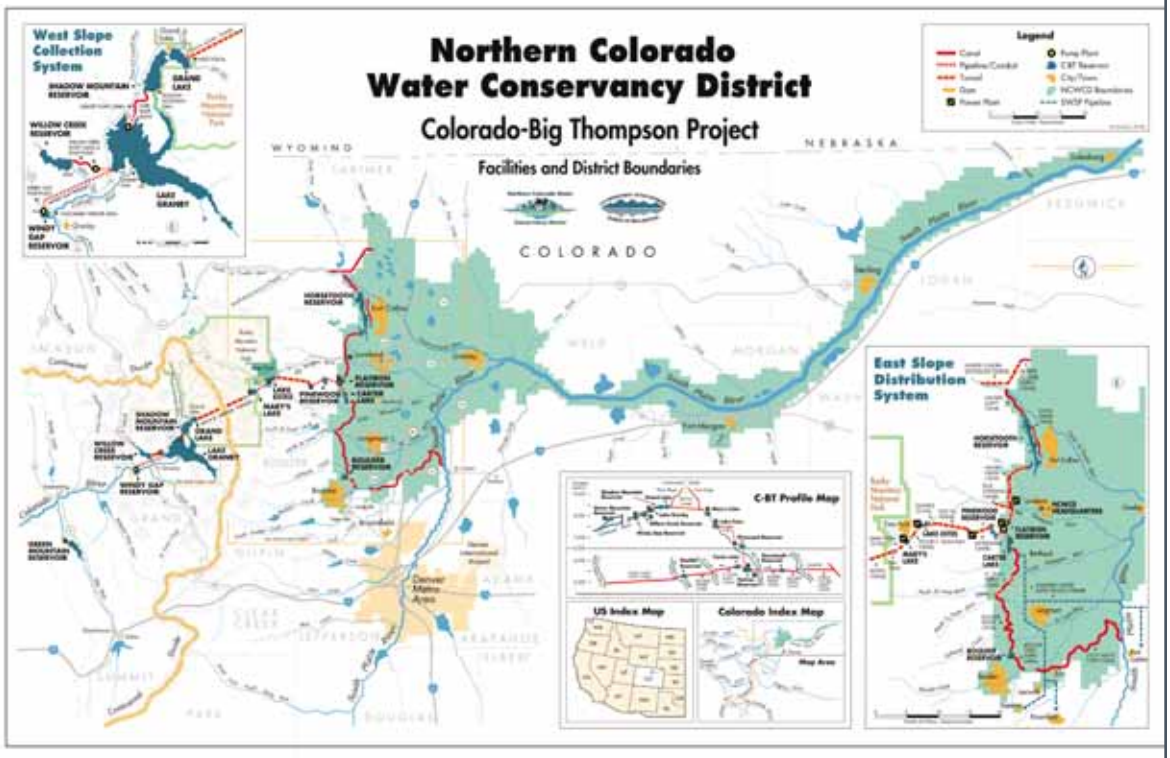
The Colorado Big Thompson Project

In the semi-arid/arid region of the Rockies, agriculture is only economically viable with irrigation. Agricultural land makes up 40 percent of the total land in the Rockies region,[1] and agricultural irrigation accounts for about 90 percent of freshwater use in the Western United States.[2] Water diversion projects, once relatively unchallenged as beneficial "reclamation" of the land and rivers, created a breakthrough in agricultural productivity in the Rockies region. Today, however, diversion activities are increasingly scrutinized as environmental concerns question the trade-offs that occur as water is moved in location and use.

With its hot sunny days, cool nights and long growing season, the Eastern Slope of Colorado's Front Range is a prime regional agricultural location. However, lack of precipitation makes farming a challenge. The average annual precipitation in Greeley, Colorado is 12-14 inches, compared with 30 inches at elevations over 10,000 feet on the Western Slope.[3] Irrigation is necessary in regions where annual precipitation is less than 20 inches.[4] Although 80 percent of Colorado's water is located on the Western Slope, 80 percent of the population and farmland are located on the Eastern Slope.[5] Water Projects that transport water from West to East were developed to meet Eastern Colorado's demands. The Colorado Big Thompson Project (C-BT) was designed in the 1930s for the enhancement of the Northern Front Range agriculture and municipal use.

The Colorado Big Thompson Project spans 250 miles east to west from Brush in Eastern Colorado to Kremmling in the mountains of Western Colorado.[6] Colorado's pipeline for the Big Thompson Project diverts 220,000 acre-feet of water each year from the Colorado River Basin west of the continental divide to Eastern Colorado.[7] Water is collected from the Colorado River headwaters at Lake Granby and Willow Creek Reservoir, where the water is lifted up to 186 feet to the Granby Pump Canal. The water from the canal is transported 1.8 miles to Shadow Mountain Reservoir, which is connected to Grand Lake where it flows to the Alva B. Adams tunnel, where it travels under the continental divide to the Big Thompson River on the Eastern Slope[8] (See Figure 17). Today, the diverted water irrigates 650,000 acres, supplies water to more than 800,000 people in the South Platte River Basin, and provides power to numerous Front Range cities, including Boulder, Greeley, Fort Morgan, Sterling, Longmont, Loveland and Fort Collins.[9] The project consists of 12 reservoirs, 35 miles of tunnels, 95 miles of canals, and 700 miles of transmission lines.[10]

Figure 17:



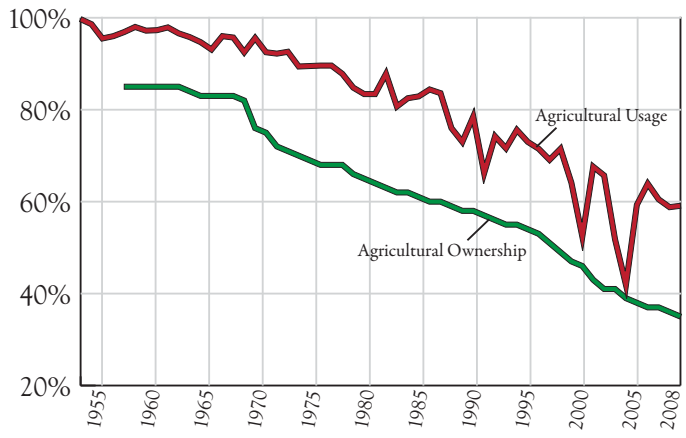
Source: City of Longmont Public Works & Natural Resources, 2009

In 1938, the Northern Colorado Water Conservancy District (NCWCD) had 6,400 irrigated farms, but by the 1990s, that number had decreased to 2,700 farms.[11] Population in the South Platte Basin has also increased. The population is expected to increase by 1.9 million by 2030. The total water use is predicted to reach twice the amount of current water use by 2030, which will leave a shortage of 92,000 to 184,000 acre feet of total irrigation water.[12] The increase

in population has caused a shift in water ownership from agricultural to municipal use, in order to provide more water for urban uses. C-BT water ownership went from 95 percent agricultural in 1956 to 74 percent in 1991.[13] By 1997, 50 percent of ownership was designated to agriculture and 50 percent to municipal and industrial use. Today, ownership is 35 percent agricultural and 65 percent municipal.[14] Figure 18 shows the decreasing trend in agricultural ownership from 1953 to 2008 and the associated change in water usage, which is directly related to ownership.

The high urban and suburban demand for water, coupled with the lower financial return to water used for agriculture, faced with stagnant markets and prices, has steadily motivated farmers to sell their water rights to urban areas. Figures 19 and 20 show the change in ownership of agriculture "project units" between 1957 and 2002.[15] One unit is equal to a full share which is 1/310,000 of the annual project yield (around 0.72 acre feet). The share size varies over the years depending on the quota that is set. The maps reveal that ownership of agricultural project units decreased from 1957 to 2002. Additionally, agricultural units are much more dispersed, and fewer in number, as indicated by the shift from a high concentration of dark blue and green, to yellow and light green. Front Range cities in the South Platte valley that benefit from the Big Thompson project have seen increased growth in food processing, telecommunications, biotechnology and energy sectors,[16] all of which require more water to be allocated from agriculture. These supplement growing urban requirements for municipal water.

Figure 18:
NCWCD Agricultural Water Usage and Ownership, 1953 - 2008
Source: Data provided by Brian Werner
Note: Data for Agricultural Ownership begins in 1957



NCWCD Water Market

The NCWCD's water market is a unique and successful system that defies traditional water rights and Colorado's Prior Appropriation Doctrine. Every share of the project controls the same amount of water annually without priority and water transfers do not have to be approved by the water court (they only have to be authorized by the NCWCD.)[17] This system lowers the cost of water transfer transactions. However, water in this district cannot be transferred to outside the NCWCD boundaries.[18]

The NCWCD's C-BT water market uses the April Quota, developed in April of 1957. The quota, which is set annually, is the maximum amount of water that an owner can use each year. The quota has never gone below 50 percent of the water owner's total allocation. In wet years the quota is usually set lower, whereas in dry years it usually is higher to compensate for drought, lower snowfall and less runoff. This means that the "district acts as the collective conscience for the system… If the quota is set high, everyone shares the wealth at the same percent, if it is set low, everyone conserves in a like manner." [19] Figure 18 shows annual and seasonal variation in water usage due to the April Quota. Agricultural usage has high variation due to seasonal climate patterns and the associated need for irrigation water. Municipal/ industrial usage is indirectly dependent on year-to-year climate variability, as the April Quota determines allowed withdrawals.

The NCWCD's model for transferring water challenges the traditional system of allocation. Prior Appropriation, which dates back to the 1860s in Colorado, gives priority to those who were first to use the water and put it to beneficial use from a particular stream. After going through the court to verify their "priority status", the user becomes the senior water right holder. The senior holder gets their full allocation before any other junior appropriators receive theirs. One of the main issues with this system is over-appropriation, which means that the junior holder does not receive their entire allocation in very dry years.[20] The success of the NCWCD system, which does not use the traditional system of prior appropriation, is demonstrated by the greater amounts of trading due to the equality of water shares, a decrease in cost due to the bypassing of the water court for review, and the ability to trade often, which means that buyers do not have to "buy ahead", a trend seen with traditional transfers.[21] The system of water allocation within the NCWCD is based on a free market, allowing water rich areas to transfer water to drier areas in any given year.

Despite the size of the Colorado Big Thompson project, population growth and development continue to increase the demand for water. New water projects are underway to meet these demands, including the Northern Integrated Supply Project and the Windy Gap Firming Project.

The Northern Integrated Supply Project

The Northern Integrated Supply Project is part of the Northern Colorado Water Conservancy District's (NCWCD) attempt to divert more water to the Front Range. The project would extract water from the Cache La Poudre River. The Galeton and Glad reservoirs would supply water for suburbs and farms in Weld, Laramer, Boulder and Moran Counties.[22]

The project is controversial. On one side, supporters of Save the Poudre, a group that is dedicated to preserving the Cache La Poudre River, argue that draining the river will be destructive to the surrounding ecosystems. Furthermore

it will impact drinking water and waste water treatment operations. If there is not enough water to dilute the wastewater, it will harm aquatic life and create undesired odors. The NCWCD argues that the project will save agricultural lands, because water that would be transferred from agriculture to urban areas would be replaced by water from the Cache La Poudre River. However, Save the Poudre argues that the Environmental Impact Statement for the project never mentions preserving agricultural land as its purpose. If the focus was on water conservation, rather than increasing development, more water would not be needed.[23]

On the other side of the controversy, many farmers argue that the project would preserve agricultural land. Bob Sakata, a farmer in Weld and Adams counties, visited farms in Denmark and Spain and observed their noticeable respect for American farmers: "They told me that we in the United States have never gone hungry…It is not possible to survive in an impoverished land and that can happen to us if we continue to stop these kinds of projects." [24] Farmers look at the precedent set by the Big Thompson Project and argue that without it, Weld County would not be the fourth richest agricultural producing county in the U.S.[25] In order for the agriculture sector to continue to prosper, more water is needed to maintain productivity.

Both perspectives present valid opinions that reflect the tensions between environmentalists, farmers and growing Front Range cities. Both sides of the issue must be examined in order to come to a satisfactory result for all stakeholders.

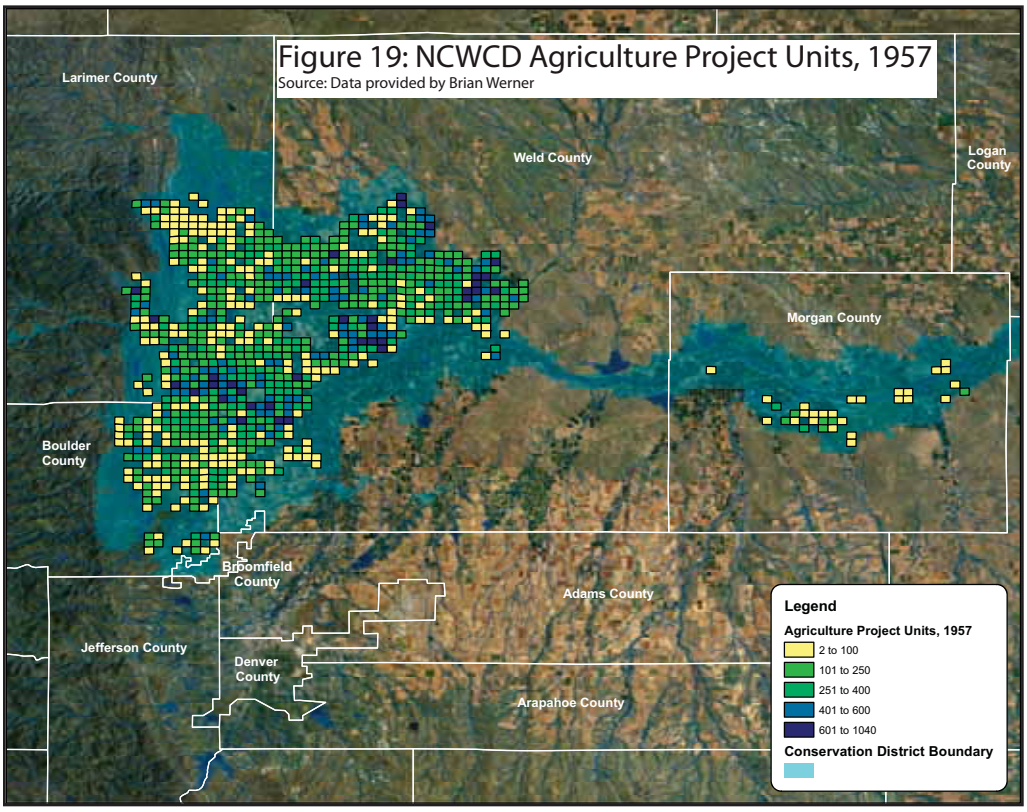


Figure 19: NCWCD Agriculture Project Units, 1957
Source: Data provided by Brian Werner

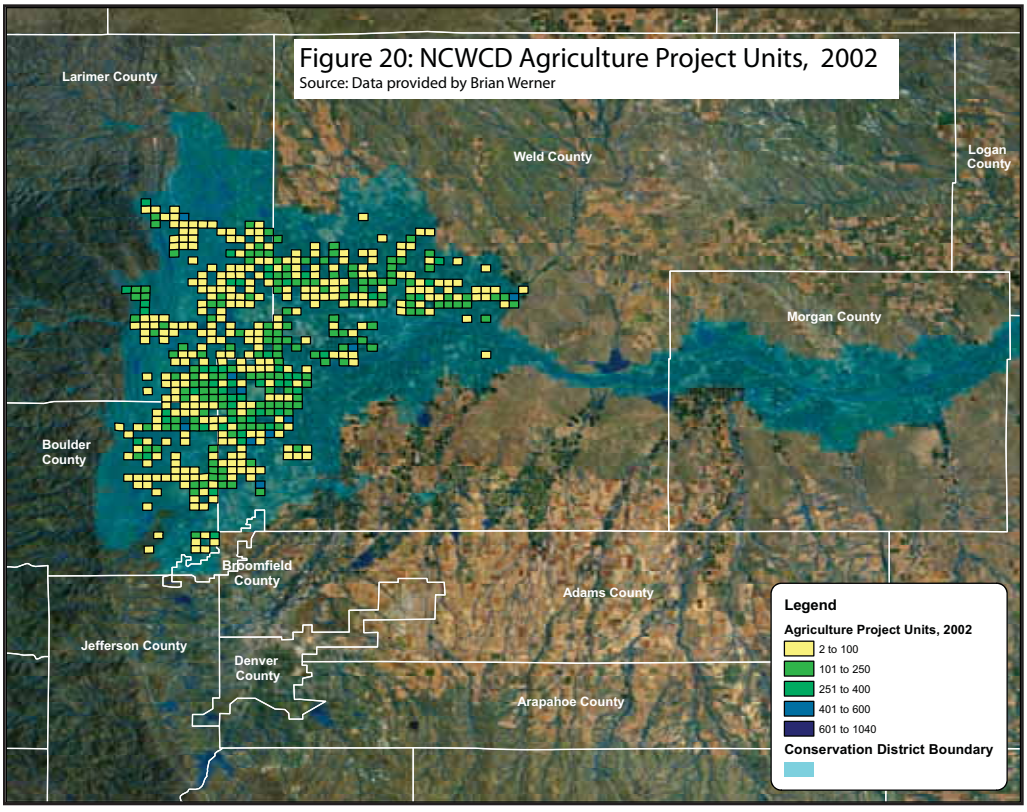


Figure 20: NCWCD Agriculture Project Units, 2002
Source: Data provided by Brian Werner

The Windy Gap Firming Project (WGFP)

Windy Gap is part of the Big Thompson Project water diversion from the Colorado River. Built in 1985, the Windy Gap project transports water to the Granby Reservoir, depending on available storage capacity. The WGFP would also build an additional reservoir to store water that cannot be contained in the Granby Reservoir during wet years. The goal of the project would be to deliver 30,000 acre feet of water by 2010 from the Windy Gap project. [26] The Windy Gap project would help meet the water demands of rising urban populations that are pulling resources away from the agriculture sector.

Although the project would supply additional water to the region, there are many drawbacks that arise from the potential environmental degradation. One of the main problems is that 50 percent of the Colorado River water is already being withdrawn by other projects, and the proposed Windy Gap Project, along with other new projects, would remove another 20 percent in certain years. The Environmental Impact Statement for the WGFP

does not address the cumulative impact of all previous and current projects. Another issue is that the project would only divert water during wet periods of the year. However, that could reduce flow, creating overall dryer conditions for downstream aquatic life and remove the "refuge" time between dry periods. The project could also have a negative impact on the part of the Colorado River with potential for designation as Wild and Scenic. Furthermore, if more water is withdrawn from the Colorado River, it is expected to reach temperatures that exceed the state's limit set by the Water Quality Control Commission. [27] Despite the growing need for more water in Front Range cities, new projects, after getting permitted, must also be adequately assessed for environmental impacts.

Conclusion

Water is the limiting resource in the Rockies. Without it, urban development and agriculture would not exist. This case study from the Front Range presents an example of issues faced by other Rockies states. With growing population, water is removed from agriculture and transferred for urban development, and new projects are developed to supply that water. The environmental impacts of decreasing agricultural land and drying up of rivers are very apparent, and must be assessed in conjunction with the demands of a growing population. Although water is generally shifting from agricultural to municipal/industrial use, the NCWCD's innovative water market has been very successful because it is not based upon the Prior Appropriations Doctrine. It is also beneficial for agriculture because it allows farmers to use and sell with flexible trading.

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Photo: Headwaters of the Big Thompson River. Wikipedia Commons

Overview Section: Demographics

The Changing Face of Agriculture in the Rockies

By Zoë Wick

THE 2010 COLORADO COLLEGE STATE OF THE ROCKIES REPORT CARD

Key Findings:

- Over the past 20 years, the average age of farm operators in the U.S. increased by 10 percent, from 52 to 57 years old.
- On average, women growers in the Rockies run farms that are less than half the size of the farms operated by men.
- Between one and six percent of farm operators earn 100 percent of their income from farming.
- In the Rockies, the number of female operators has increased by 257 percent since 1987.

Introduction

Surrounded by bountiful fields of vegetables in an idyllic valley, Beki Javernick is discussing challenges ranging from inexhaustible weeds, to the high cost of becoming certified organic, to debilitating inheritance taxes on her family's farmland. Mid-sentence, she swings her giggling toddler around her nine-months-pregnant belly and over her shoulders without missing a beat. A few decades ago, this would have been a rare sight. One would have been hardpressed to find a woman holding primary or equal responsibility for agricultural labor in most communities. That situation is changing, though, as farm operators become more diverse.

Farm operators in the Rockies are becoming increasingly diverse in terms of race and gender, and are significantly older than farm operators in the past. Furthermore, the 2007 Census of Agriculture depicts new interest in a small but growing agricultural sector characterized by high-quality production and local distribution (a movement described in detail in the section titled "New Food Economy"). These changes highlight the promising growth and challenges to agriculture in the Rockies region. While the number of farms in the Rockies steadily decreased from the mid-1930's to mid-1970's, in recent years the region has seen growth in farm numbers, as shown in Figure 1. As farm operators become increasingly

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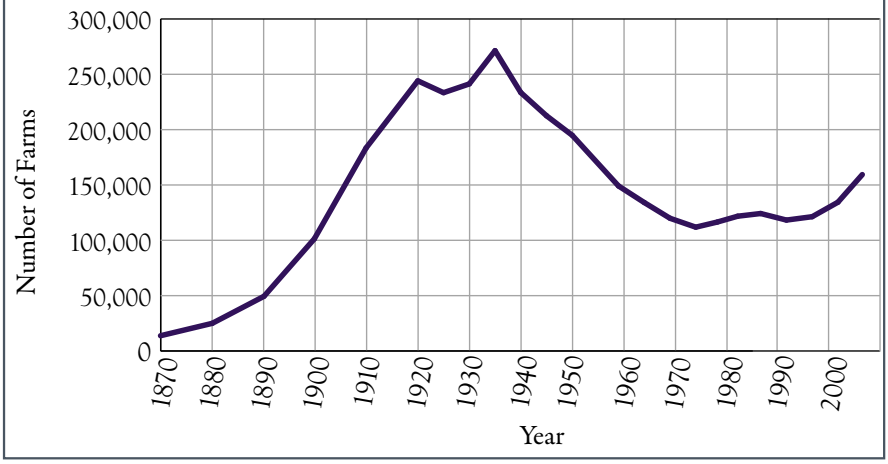
diverse in terms of race and gender, and as family farms are threatened by competition from larger farms and urban development, the face of agriculture is changing.

Agricultural Employment in the Rockies

Perhaps the most fundamental change in agriculture has nothing to do with people, but with machines. Advances in technology and the mechanization of production throughout the last century increased the efficiency of agricultural production, reducing labor requirements. Figure 2 shows the trend of decreasing farm employment. In 1969, approximately seven percent of the Rockies' workforce was involved in agriculture, compared to four percent nationwide.[1] Since then, the percentage of workers in agriculture has steadily decreased. Now, both in the U.S. and in the Rockies, agriculture accounts for approximately two to three percent of the workforce. All Rockies states showed a drop in agricultural employment from 2001 to 2007, although some states still have agricultural employment rates that are significantly higher than the national average.[2] The agricultural employment rate in Montana, for instance, decreased from six percent in 2001 to five percent in 2007, and in Idaho agricultural employment fell from five percent to four percent, but these states were still above the national average. Arizona and Nevada, on the other hand, were below the national average, relying on agriculture for less than one percent of employment.

In addition to declining employment in agriculture, farmers and ranchers are increasingly utilizing off-farm jobs as a second source of income. The 2007 Census of Agriculture reported that both nationally and in the Rockies, 65 percent of farm operators had engaged in off-farm employment at some point during the year.[3]

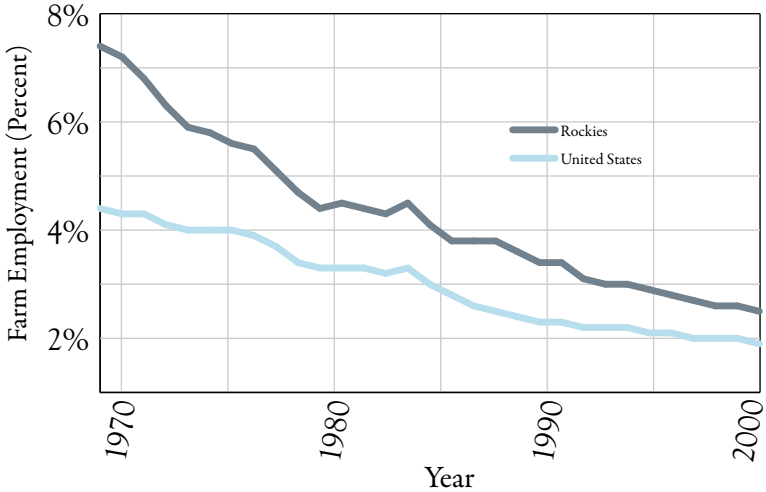
Figure 1:
Number of Farms, Rockies Region
Source: Census of Agriculture for the year specified, USDA-NASS, 1870 to 2007



In Colorado, 70 percent of farmers and ranchers reported working away from their farms. Experts attribute the rise in off-farm employment to the need for extra income to maintain a farm as well as to the need for employer-sponsored health care coverage.[4] Due to the prevalence of self-employment and employment by small businesses in rural areas, rural adults are less likely than adults in urban areas to have health insurance through their employers.[5] However, Paul Hubbard of the Missoula Community Food and Agriculture Coalition, considered profit to be the primary concern of growers seeking second jobs. Opportunities for off-farm employment, he said, along with direct access to markets, have led new farmers to establish farms near urban centers.[6]

Urban markets and second jobs help provide a cushion, but many farms are threatened by competition from larger farms that continue to consolidate and expand, producing huge quantities of goods at reduced prices. According to Hubbard, the message to farm operators is, "Get big or go home." This sentiment is supported by the 2007 Census of Agriculture data, which show that just four percent of Rockies farms account for 45 percent of agricultural sales.[7] Additionally, development threatens farms as the market price of land surpasses its agricultural value (as discussed in "Threats to Agricultural Land").

Figure 2:
Farm Employment, U.S. and Rockies Region, 1969 - 2000,
as a Percent of All Full-time and Part-time Employment
Source: Bureau of Economic Analysis, U. S. Department of Commerce, 2009



Increase in the Average Age of Farm Operators

Threats to the viability of family farming impact the average age of farmers. As younger generations watch their families' farms struggle in the face of urban development and competition from larger operations, many choose to forgo farming and pursue non-agricultural careers.[8] Without the next generation to take over the farm, aging growers dreaming of retirement must either sell their property or continue working into their later years. The result has been an increase in the average age of farmers (as shown in Figure 3), a trend that is especially pronounced in the Rockies. Figure 4 illustrates the changes in age

demographics from 1987 to 2007. Some analysts fear that this trend will lead to loss of agricultural land and increased dependence on foreign food sources.[9] Whether or not increasing farmer age has implications for food security, it is an important demographic change and illustrates the challenges facing the viability of family farms.

Over the past 20 years, the average age of farm operators in the U.S. increased by 10 percent, from 52 to 57 years old.[10] In the Rockies the average age at the 2007 census was 58 (See Figure 3). The Rockies region now has 114 percent more farmers over the age of 70 than it did in 1987 – a higher increase than in any other region and almost double the national increase of 64 percent. The number of farm operators over 70 grew by 401 percent in Arizona and 148 percent in New Mexico.

The Rockies, however, retained more young farmers than other U.S. regions, although the numbers vary among Rockies states between 1987 and 2007. For instance, while Arizona lost merely two percent of farmers between 25 and 34, Montana lost 63 percent and Nevada lost 61 percent. The Rockies also gained more farm operators between the ages of 45 and 69 than the nation as a whole did. Discrepancies between farmer aging in the Rockies and in the U.S. as a whole are largely due to the Rockies' accelerated population growth compared with the national rate.[11] While the Rockies gained more farmers over 70 than the rest of the country, it also gained more middle-aged farmers and lost fewer young farmers, and thus the average age of Rockies farmers remains only slightly higher than the national average.

Figure 3:
Weighted Average Operator Age, Rockies Region

Source: Census of Agriculture for the year specified, USDA-NASS, 1870 to 2007
Note: A regional average age was weighted according to the number of farms in each state.

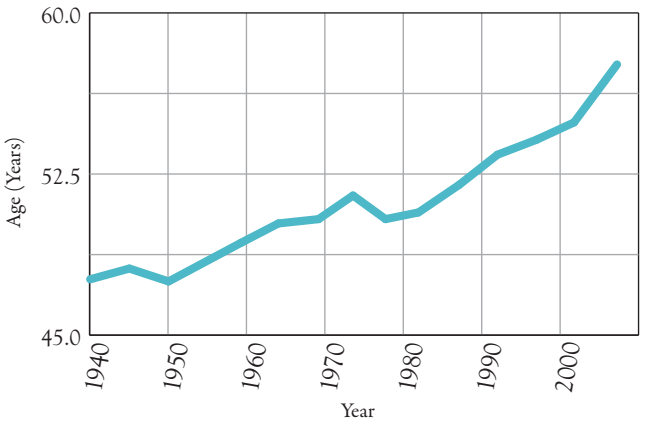


Figure 4:
Age of Rockies Farm Operators by Percent, 1987 and 2007

Source: United States Department of Agriculture, 2007 Census of Agriculture

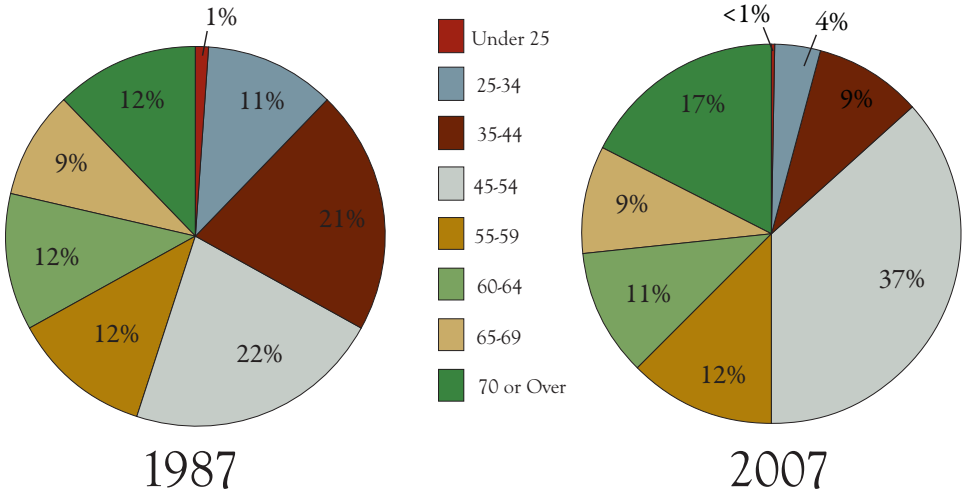


Table 1:
Farm Tenure, by Percent, 1945 and 2007

		United States	Rockies	Arizona	Colorado	Idaho	Montana	Nevada	New Mexico	Utah	Wyoming
1945	Five Years or Less	-	39%	44%	46%	43%	34%	41%	38%	29%	36%
	Between Five and Ten Years	-	18%	18%	17%	19%	18%	18%	16%	19%	19%
	Ten or More Years	-	43%	37%	36%	37%	48%	41%	46%	52%	46%
	Total Farms Reporting	-	208,309	12,815	46,652	40,623	36,973	3,368	29,162	25,899	12,817
2007	Four Years or Less	10%	11%	10%	11%	12%	9%	12%	10%	10%	12%
	Five to Nine Years	16%	17%	17%	18%	17%	15%	18%	15%	16%	17%
	Ten or More Years	74%	73%	73%	71%	71%	76%	70%	76%	74%	70%
	Total Farms Reporting	2,204,792	159,394	15,637	37,054	25,349	29,524	3,131	20,930	16,700	11,069

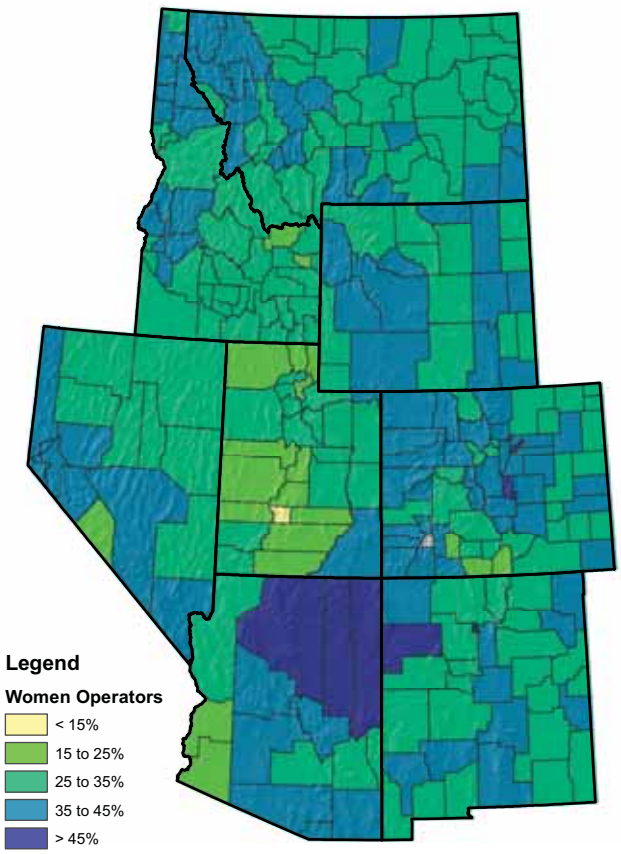
Source: USDA Census of Agriculture, 1945 and 2007
Note: Some totals may not equal 100% due to rounding. Rockies tenure reflects a weighted average of total farms reporting by state.

Increase in Longevity of Tenure

The length of time farm operators have been working on their current farm is considerably higher than it was 60 years ago. Although there has been recent growth in beginning farmers and new farms, the movement is still too small to make up for decades of declining numbers. The percentage of Rockies operators who had been on their farms for less than five years in 1945 (39%) was nearly four times that of new farmers in 2007 (11%), as shown in Table 1.[12] [13] These changes reflect both conditions in 1945 that made agriculture more attractive to new farmers and obstacles to starting new farms today.

The Rural Electrification Act of 1936 (REA) was a major incentive for renewed rural living. The REA greatly improved the quality of life in rural areas by providing

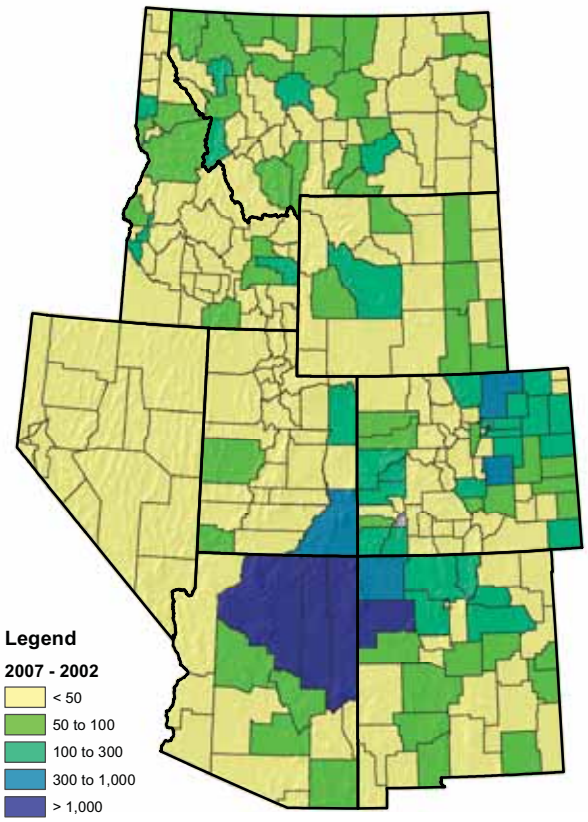
Figure 5: Percent Women Farm Operators, 2007



Note: percentages here reflect total farm operators, not principal operators.

Source: 2007 Census of Agriculture, National Agriculture Statistics Service, U. S. Department of Agriculture

Figure 6: Change in Women Farm Operators by County, 2002 to 2007



Source: 2007 Census of Agriculture, National Agriculture Statistics Service, U. S. Department of Agriculture

low-cost loans for rural groups to bring electricity to their communities.[14] For the first time, farmers and ranchers had access to better heating, sanitation, running water, and food storage. In addition, 1945 marked the beginning of a revolution in agricultural technology, when seed selection and pesticide use began making farms more productive and profitable. The REA and the revolution in agricultural technology were two factors that encouraged the establishment of new farms.

Changes in longevity not only reflect positive conditions in the 1940's, but also indicate current obstacles to beginning farm operators. These challenges, such as urban pressure to sub-divide land and competition from mammoth, consolidated farms, are the same factors that have led to the aging of farmers and the disappearance of midsize farms.

Female Operators on the Rise

The 2007 Census of Agriculture revealed a sizeable increase in the number of female farm operators, a trend that has been accelerating over the past two decades.[15] This movement is especially noteworthy in the Rockies, where the number of female growers has increased at nearly twice the national rate. This change indicates that women are responsible for a significant portion of growth in new farms, and also illustrates a shift in gender roles on farms as women increasingly share in agricultural labor rather than differentiating between agricultural and household tasks.[16]

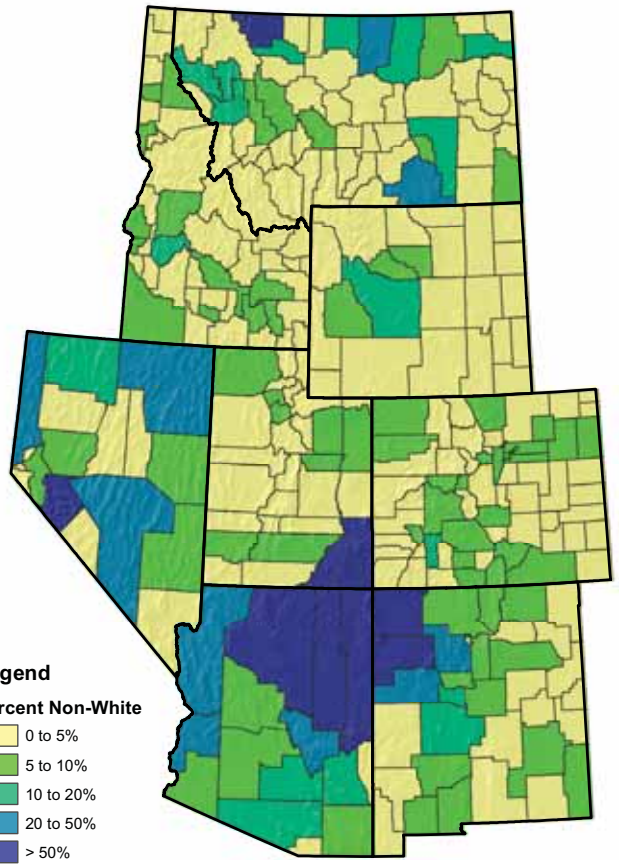
Between 1987 and 2007 the number of female operators in the U.S. increased by 133 percent, while the number of male operators decreased by three percent.[17] As shown in Figures 5 and 6, the areas with the most female operators and the greatest rate of increase in female operators were counties within the Navajo Nation, which spans northeastern Arizona and parts of Utah and New Mexico. In the Rockies, women have joined the ranks of farm operators at a much faster rate than in the U.S. as a whole, growing by 257 percent since 1987, as depicted in Figure 7.

The sex of farm operators is related to other characteristics of agriculture. Women operators in the Rockies less frequently grow grain, other crops (including hay, tobacco, cotton, and sugarcane), or raise beef cattle.[18] [19] They more often run other livestock and aquaculture operations. On average, women growers in the Rockies run farms that are less than half the size of the farms operated by men,[20] suggesting that women play a key role in the proliferation of new, small farms (see Figure 8).

Increasing Racial and Ethnic Diversity

While there is a long history of Latino and American Indian farm operators in the Rockies (discussed in Historical Portrait of Latinos in Southwest Agriculture and Historical Portrait of Native Americans in Southwest Agriculture),

Figure 9: Percent Non-White Farm Operators in the Rockies, 2007



Source: 2007 Census of Agriculture, National Agriculture Statistics Service, U. S. Department of Agriculture

Figure 7:
Number of Female Farm Operators in the Rockies, 1987 - 2007
Source: USDA Census of Agriculture, 2007

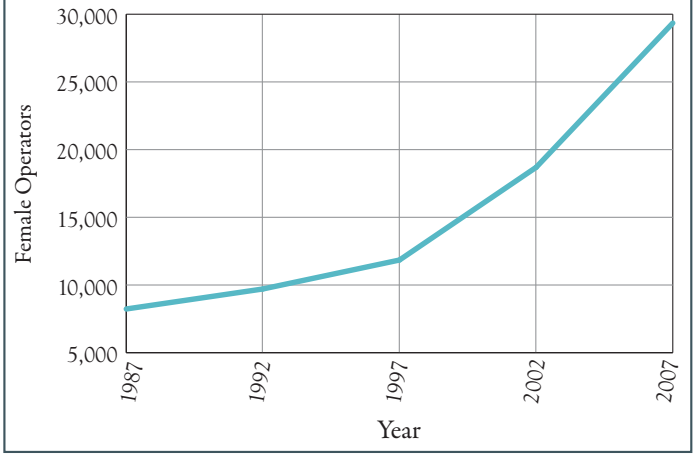
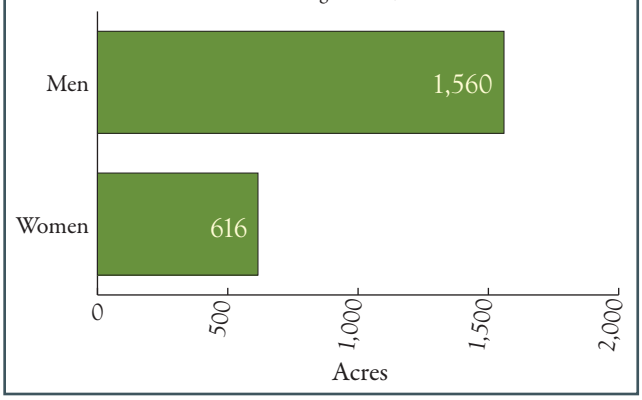


Figure 8:
Average Farm Size by Sex, Rockies Region, 2007
Source: USDA Census of Agriculture, 2007



racial and ethnic diversity among farmers both in the U.S. and in the Rockies has increased in recent years. Table 2 shows the percentage of non-White farm operators in the Rockies by State, while Figure 9 depicts the geographical disparity in proportion of non-White farm operators by county. The number of Latino farm operators (who may be of any race) increased more than any other group, but American Indian, Asian, African American, and operators of more than one race also increased.[21] Especially in New Mexico, Colorado, and Arizona, much of the increase in numbers of Latino operators may be attributed to a rise in Latino immigration.[22] The 2007 Census of Agriculture suggests that aspects of agriculture such as location, farm size, organization, farm type, and percent of income earned from agriculture vary by race.

The demographics of race and ethnicity vary by state in the Rockies. Colorado, Montana, and Idaho have the highest numbers of White and Asian American farm operators, while New Mexico, Colorado, and Arizona are home to the most Latino and African American operators.[23] Arizona, New Mexico, and Montana have the most growers of American Indian descent.

Similarly, race and ethnicity are related to farm size (see Figure 10). Farm operators in most racial and ethnic minority categories often farm between 10 and 49 acres, but American Indians overwhelmingly operate between one and nine acres, and there are more Whites who farm over 500 acres than who farm 10 to 49 acres.[24] Farms between 180 and 499 acres were least prevalent, consistent with the "loss of the middle" (farms between 50 and 500 acres) trend in farm organization.

Analysis of farm income categories in Figure 11 reveals a similar pattern. Roughly half of American Indians, 40 percent of African Americans, a third of Latinos and Pacific Islanders, and a quarter of White and Asian American operators make less than $1,000 annually from farm income.[25] Farms with incomes of $50,000 or more include 27 percent of farms run by Asian Americans and 23 percent of farms operated by White farmers. Farms that make between $25,000 and $49,000 are the least common for all groups except African American operators, for whom farms making $5,000 to $9,999 are the least common.[26]

The proportion of income derived directly from farming varies somewhat by race as well, although differences

Table 2:
Number of Farms by Race or Ethnicity, 2007

	United States	Rockies	Arizona	Colorado	Idaho	Montana	Nevada	New Mexico	Utah	Wyoming
White	2,114,325	143,306	7,187	36,677	25,121	28,203	2,760	16,452	16,034	10,872
Latino	55,570	11,987	1,006	2,182	788	297	222	6,861	409	222
American Indian	34,706	18,300	8,545	934	445	1,993	438	4,854	753	338
Asian American	11,214	650	73	205	121	90	16	48	70	27
African American	30,599	270	49	79	21	18	5	82	10	6
Pacific Islander	1,356	193	17	72	36	21	7	28	1	11

Source: USDA Census of Agriculture, 2007

Figure 10:
Farm Size by Race or Ethnicity, Rockies Region, 2007

Source: USDA Census of Agriculture, 2007
Note: Some charts do not equal 100% due to rounding

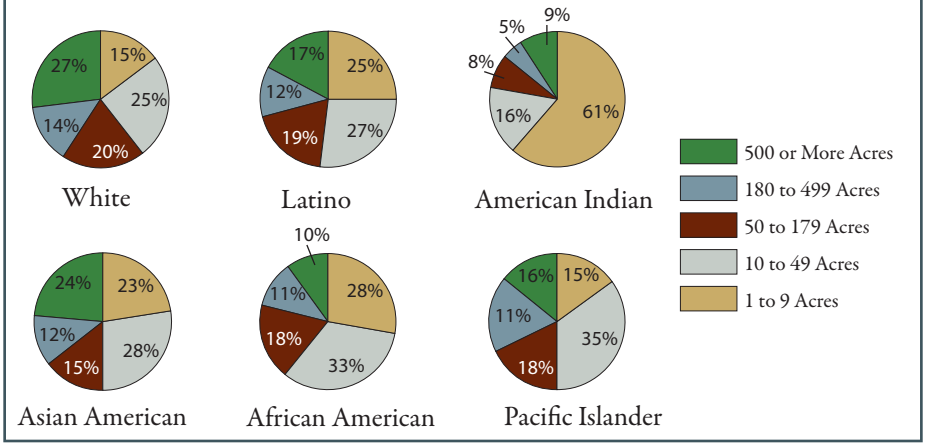


Figure 11:
Farm Income Categories by Race or Ethnicity, Rockies Region, 2007

Source: USDA Census of Agriculture, 2007

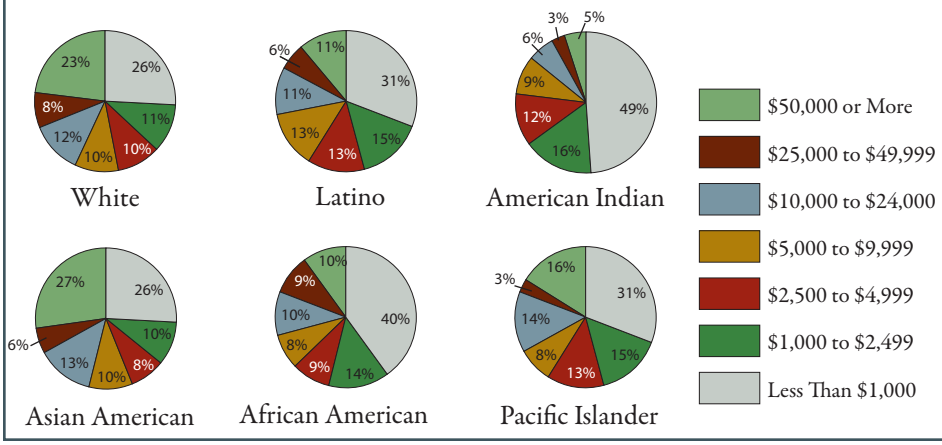


Figure 12:

Percent of Income from Farming Operations by Race or Ethnicity, Rockies Region, 2007

Source: USDA Census of Agriculture, 2007
Note: Some charts do not equal 100% due to rounding

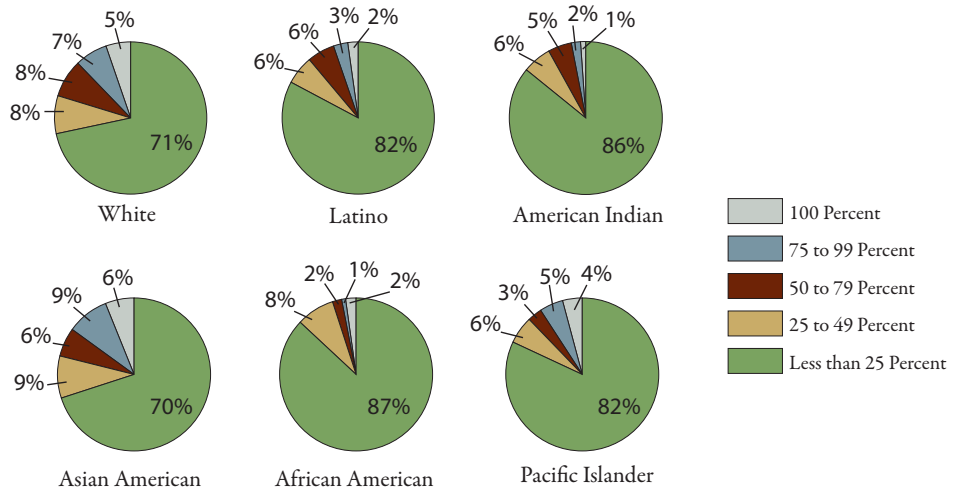


Figure 13:

Farm Ownership Status by Race or Ethnicity, Rockies Region, 2007

Source: USDA Census of Agriculture, 2007
Note: Some charts do not equal 100% due to rounding

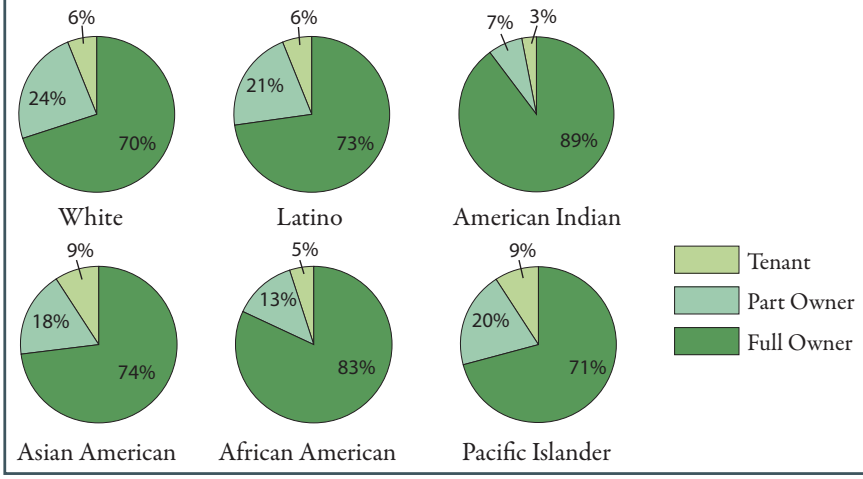
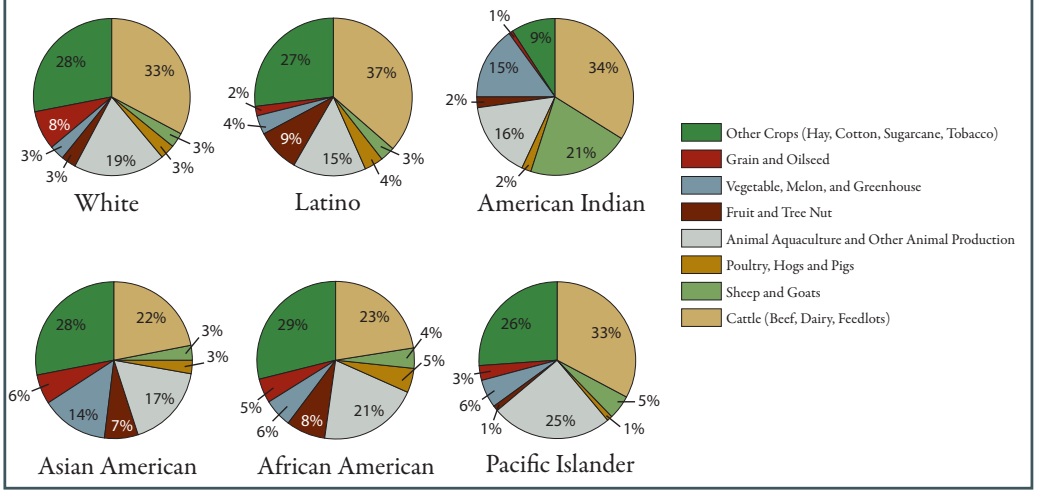


Figure 14:

Production Trends by Race or Ethnicity, Rockies Region, 2007

Source: USDA Census of Agriculture
Note: Some charts may not equal 100% due to rounding



between racial and ethnic groups are less pronounced in this category than in other farm categories (see Figure 12) As a whole, farm operators overwhelmingly earn less than 25 percent of their income from agriculture.[27] This category describes 70 percent of Asian American operators, 71 percent of White operators, 82 percent of Latino and Pacific Islander operators, 86 percent of American Indian operators, and 87% of African American operators. Varying slightly by racial or ethnic group, between one and six percent of farm operators earn 100 percent of their income from farming.

Most farmers and ranchers in the Rockies are full owners of their farmland, although, again as shown in Figure 13, there is some variation by race.[28] American Indian operators top the list, with 89 percent full owners. Asian American and Pacific Islander operators have the highest rates of tenancy.

In the Rockies, three production categories dominate agriculture: beef cattle, other crops (which includes hay, cotton, tobacco, and sugarcane), and animal aquaculture and other livestock. Some production categories can be differentiated by race, however.[29] For instance Figure 14 shows American Indian operators raise more sheep and goats and grow more vegetables, while White farmers tend to grow more grain. Latino, African American, and Asian American farmers share the bulk of fruit and nut production.

An examination of race and ethnicity among farm operators reveals differences between groups on various farm qualities. The growing diversity of farm operators reflects shifts in the population as a whole, as well as changing circumstances in the industry of agriculture.

Conclusion

The growing numbers of non-White and female operators illustrate a broadened interest in agriculture. This interest is also reflected in the increasing prevalence of new, small farms near urban centers. Simultaneously,

the increased average age of farmers suggests that many farms have not, and perhaps will not, be passed on to the younger generation. Changes in the demographics of farm operators reveal new opportunities and potential obstacles to agriculture in the Rockies.

Case Study: Hired Farm Workers

By Zoë Wick

Introduction

In the hot New Mexico sun, dozens of workers kneel in an onion field clipping bulbs with a precise blur of motion, moving down the rows at an impressive pace. Many have worked at this farm with their families every summer since they were children. As a result, they work quickly and skillfully, and are indispensable to onion production at Chile River Farm.

Hired farm workers are only a small segment of the population, but are invaluable to crop production and the U.S. food economy. Recent controversy over immigration reform has drawn new attention to farm workers, both because agriculture is one of the main industries where recent immigrants seek employment and because agricultural employers rely on migrant labor for 42 percent of their workforce.[30]

Hired farm workers differ from the general U.S. workforce in terms of the challenges they face and their demographics. As shown in Table 3, compared to the U.S. workforce as a whole, hired farm workers are more likely to be Latino, foreign born, young, living in poverty, and impacted by health problems.[31]

Table 3:
Farm Worker Demographics, United States, 2006

	Farm Workers	All Wage and Salary Workers
Percent Male	81%	52%
Median Age	34	40
Percent Latino	43%	14%
Percent Foreign- Born	42%	16%
Percent with U.S. Citizenship	62%	91%
Percent With Less Than 9th Grade Education	30%	4%
Percent with Some College Education	21%	58%

Source: USDA-ERS using data from the U.S. Census Bureau, 2006 Current Population Survey Earnings File
Note: Farm Workers are defined here as hired farm laborers. These data include full-time and part-time workers.

Figure 15:
Hired Farm Labor as a Percent of Total Farm Expenses, 2007

Source: USDA Census of Agriculture, 2007

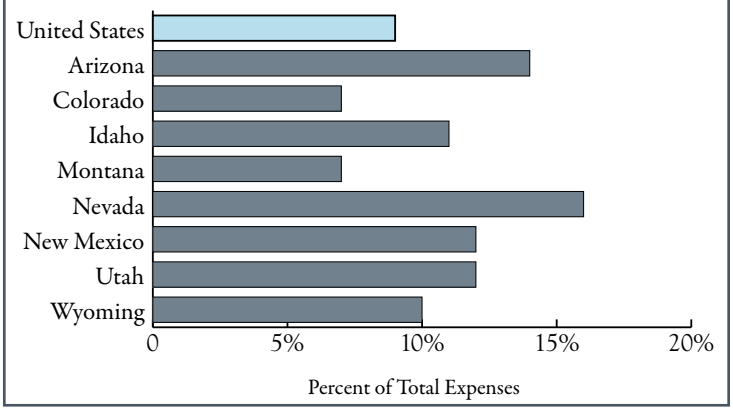
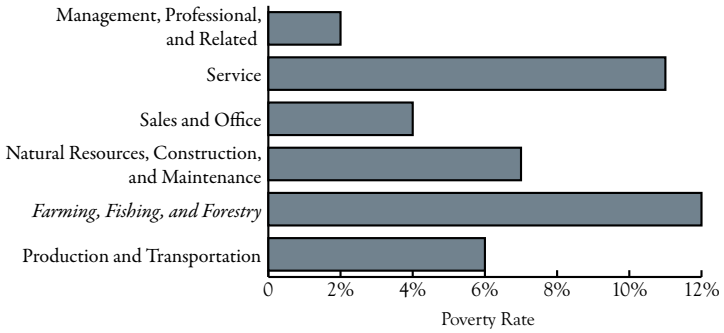


Figure 16:
Percent of Workforce in Poverty by Occupation, 2007

Source: Bureau of Labor Statistics: Profile of the Working Poor, 2007



Prevalence

Hired farm workers account for less than one percent of all U.S. wage and salary workers, but make up 30 percent of farm workers (the remaining 70 percent are paid or unpaid family members).[32] Farms growing labor-intensive products such as vegetables, horticultural products, fruits, and nuts are the most likely to hire workers, and the associated labor costs make up 30 to 40 percent of total farm expenses.[33] When all agricultural sectors are included, hired farm labor accounts for only nine percent of farm expenses nationwide.[34] In six Rockies states, the percentage is two to seven percent higher than the national average (see Figure 15). Considering magnitudes among Rockies states (see Table 4), Idaho, Colorado, and Arizona utilize the most hired farm workers in the region.[35] Maricopa County, Arizona, employs the highest number of hired farm workers in the Rockies, although this partially reflects the county's large total population. Of the top 10 Rockies counties for hired farm workers, Gooding County, Idaho, has the highest number of hired farm workers per capita (see Table 5).

Foreign-Born and Unauthorized Farm Workers

Statistics on place of birth for agriculturalworkers (see Table 6) show foreign-born individuals are twice as likely as those born in the U.S. to be employed in agriculture, forestry, fishing, or hunting.[36] This difference is largely due to Mexican-born workers, who are six times more likely than all other groups to work in agriculture.

Foreign-Born Farm Workers: Filling Employer Need?

Since the agriculture industry employs so many migrants, farm labor has become a major topic in immigration law debates. Employers argue that they rely on migrant labor because there are not enough Americans willing to do the hard physical work, and because cheap labor is necessary in order to compete in global markets.[40] However, some economists, such as George Borjas, have contended that immigrant workers are hurting the job prospects and wages of Americans, especially poor Americans without high school degrees.[41] In recent years, there have been heightened efforts to enforce caps on worker visas and raid companies suspected of hiring unauthorized individuals, prompting outcries from employers as well as immigrants' rights groups.

In 2004 the federal government began enforcing an annual cap of 66,000 H-2B seasonal work visas, a limit which was already in place but had been consistently exceeded.[42] H-2B visas allow employers legally to bring in temporary workers from outside the U.S. once they have attempted to recruit American workers.[43] Colorado alone generally uses more than a quarter of the 66,000 H-2B visas.[44]

Growers contend that with the strict enforcement, they cannot find enough workers to harvest their crops. Jon Post, an Arizona cotton farmer, wanted to hire several hundred people to harvest his field when one of his machines broke down, but could not find more than 50 workers even after vigorous recruitment efforts.[45] He explained,

> *We as Americans, we don't feel like that's work that we should have to be doing anymore…You can't just say, 'I want them to close the border because they're gonna compete with me for my job.' Honestly, they're not competing for your job! I need them to produce things for you. If I don't have available workers to produce things, then the cost goes up. It's a real serious issue.*

© Zoë Wick '10. Marana, Arizona.

In fact, many growers warn that the labor shortage could force them to downsize or go out of business.[46] Groups such as Colorado Employers for Immigration Reform and the Arizona Farm Bureau[47] are pushing Congress for immigration laws that would allow them to bring more workers into the country legally.[48]

However, the framework recommended by two major labor organizations diverges considerably from growers' requests. In April 2009, the AFL-CIO and Change to Win released a unified framework for immigration reform. Their proposal supports a path for current unauthorized workers to become legal, recommends strict enforcement of the border, and opposes any major program to bring more workers into the country.[49] This policy, they say, would give currently unauthorized workers more bargaining power and increase their ability to switch jobs, ultimately raising the wages of all farm workers.

According to the United States Department of Agriculture, however, both granting legal status to workers currently here and imposing strict limits on numbers of new immigrants could contribute to a shortage of agricultural workers.[50]

Table 4:
Number of Hired Farmworkers, 2007

Division or State	Number of Workers
United States	2,636,509
Rockies	193,978
Arizona	28,754
Colorado	39,915
Idaho	46,934
Montana	22,377
Nevada	4,428
New Mexico	22,996
Utah	19,748
Wyoming	9,826

Source: USDA Census of Agriculture, 2007

Table 5:
Number of Hired Farmworkers, Top Ten Rockies Counties, 2007

County	Number of Farm-workers	Ratio of Hired Farmworkers to County Residents
Maricopa AZ	10,628	1/365
Weld CO	6,915	1/35
Dona Ana NM	4,867	1/47
Yuma AZ	4,737	1/40
Canyon ID	4,685	1/49
Bingham ID	4,264	1/10
Pinal AZ	3,675	1/82
Cassia ID	3,377	1/6
Utah UT	3,243	1/158
Gooding ID	2,836	1/5

Source: USDA Census of Agriculture, 2007

The foreign-born population is quickly increasing in the Rockies. Table 7 shows that from 2000 to 2007, growth in the foreign-born population ranged from 26 to 58 percent in every Rockies state except Montana, which saw a nine percent decrease.[37]

The Pew Hispanic Center has estimated that 11.9 million foreign-born people in the United States are unauthorized.[38] According to this estimate, unauthorized immigrants account for four percent of the population and five percent of the workforce. In Arizona and Nevada, it is estimated that over 10 percent of the workforce is unauthorized. For the agricultural workforce, the percentage of unauthorized workers is much higher than in any other industry in the U.S. The National Agricultural Workers Survey found that half of crop workers in the U.S. are unauthorized.[39] (See p. 64 on Foreign-born workers).

Table 6:
Employment in Agriculture, Forestry, Fishing, and Hunting, by Place of Birth, United States, 2007

Place of Birth	Population Employed in Agriculture	Percent of Each Total Population
United States (Native Born)	1,976,894	1%
Foreign Born	644,796	2%
- Mexico	546,945	6%
- Southeast Asia	27,208	<1%
- Caribbean	7,617	<1%
- Central America	30,733	1%
- South America	6,306	<1%
- Middle East	1,339	<1%
- Other	24,648	<1%

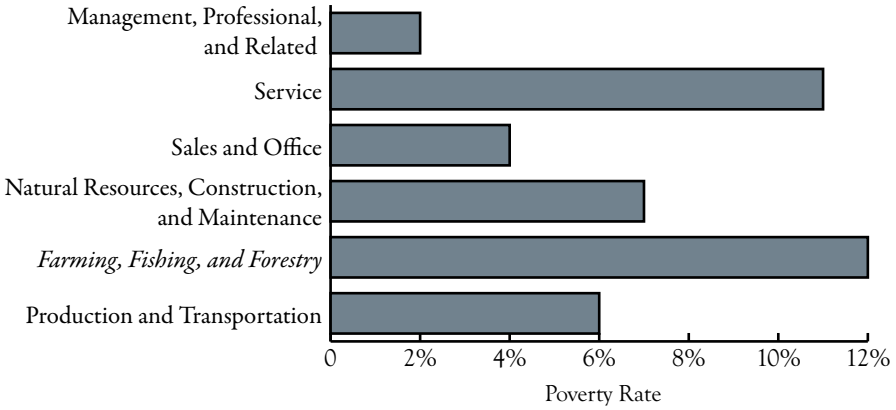
Source: Pew Hispanic Center, 2008

Table 7: Foreign-Born Population in Rockies States, 2007

	Rockies	Arizona	Colorado	Idaho	Montana	Nevada	New Mexico	Utah	Wyoming
Foreign-Born Population, 2007	2,501,597	997,387	485,922	82,366	15,027	501,248	188,354	214,733	16,560
Percent Change from 2000-2007	41%	51%	31%	29%	- 9%	58%	26%	36%	34%

Source: Pew Hispanic Center, 2008

Figure 16:
Percent of Workforce in Poverty by Occupation, 2007
Source: Bureau of Labor Statistics: Profile of the Working Poor, 2007



Wages

Farm workers, especially those tending crops, are paid less than employees in other low-skill jobs, as shown in Table 8. Including the wages of managers and supervisors, who make up 28 percent of all hired farm workers, the average agricultural wage in 2006 was $9.87 per hour.[51] The median for non-supervisory wages was considerably less, at $6.25 per hour. According to the USDA Economic Research Service, the relatively low wages of farm workers can be partially explained by a lack of alternative employment options for unauthorized workers. Hired farm workers who migrate to work sites from U.S. and foreign homes earn even less than workers who are settled in the U.S.[52] In addition to having lower wages, migrant workers are also less likely to have health insurance and to have fewer work weeks compared to settled workers.[53]

Poverty, Unemployment, and Use of Social Services

Farm workers are also at a higher risk of poverty than workers in any other occupation. As shown in Figure 16, in 2007, 12 percent of people working in farming, fishing, and forestry occupations were in poverty.[54] Unemployment is a major concern for hired farm workers as well, as their unemployment rate is double the average for all occupation categories except the "other farming, fishing, and forestry" category.[55] (See Figure 17). The risk of unemployment is especially pertinent to crop farm workers due to the seasonal nature of their work.

Given their higher rates of poverty, it is not surprising that farm workers use some social services (such as WIC, food stamps, Medicaid, and free school lunch) at a higher rate than the average for all wage and salary workers.[56] As depicted in Figure 18, use of social services by farm workers differs by legal status. Authorized workers use social services more than unauthorized workers, who tend to avoid contact with government agencies. Among authorized workers, non-citizens, who have higher rates of poverty, use more social services than citizens do.

Health Issues

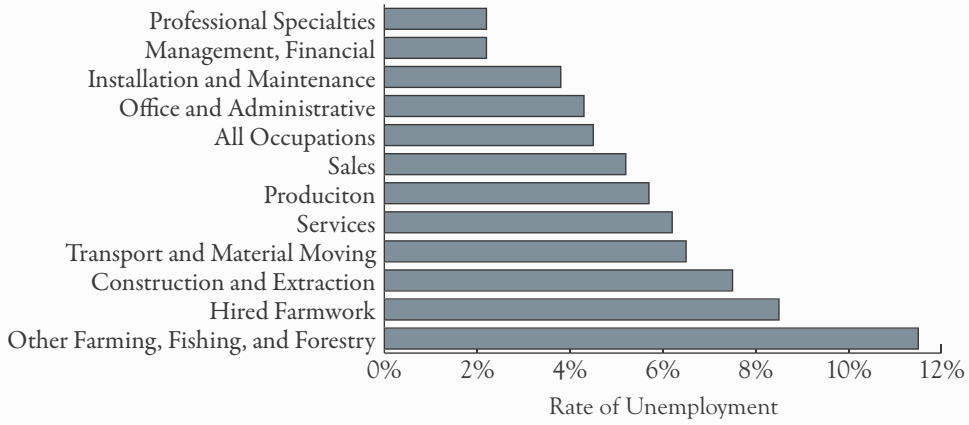
Contact with chemicals, exposure to harsh weather conditions, and use of dangerous tools and machinery render farm labor among the most hazardous occupations. Agriculture, forestry, fishing, and hunting occupations had

higher rates of fatal occupational injuries than any other industry in 2006, at 30 fatal injuries per 100,000 workers.[57] The rate for farmers and ranchers was 37 deaths per 100,000 workers, while the rate for miscellaneous agricultural workers was 22 deaths. (See Figure 19) Agriculture, forestry, fishing, and hunting occupations also had higher rates of nonfatal injuries than all other industries except construction, transportation, and warehousing.[58]

Obstacles to receiving health care heighten the health concerns for farm workers and differ by the legal status of workers.[59] As depicted in Figure 20, 14 percent of workers who are U.S. citizens reported facing obstacles to health care, while the rate is three times higher among unauthorized workers.

Figure 17:
Unemployment Rates by Occupation

Source: USDA-ERS using data from the U.S. Census Bureau, 2006 Current Population Survey Earnings File



Conclusion

Hired farm workers face low wages, high unemployment, poverty, and obstacles to health care. Additionally, because 42 percent of hired farm workers are foreign born, the industry is at the center of immigration policy debates and will be among the first industries to experience the impact of policy change.

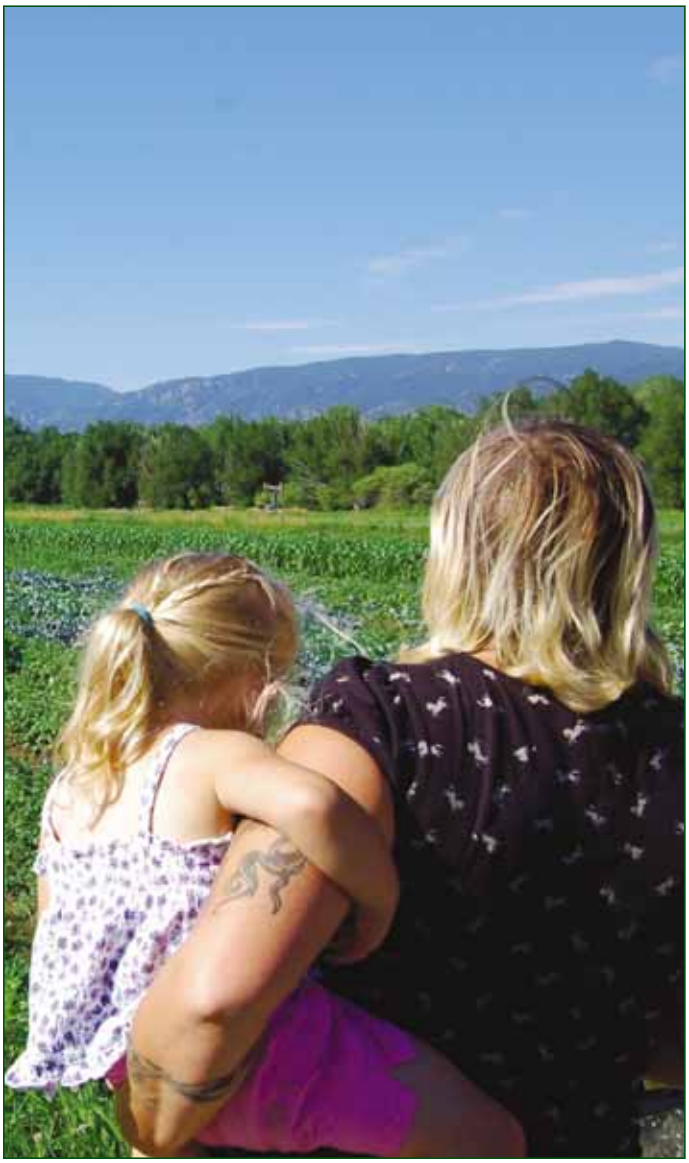


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Figure 18:
Use of Social Services Among Farm Workers, by Legal Status

Source: USDA - ERS using combined National Agriculture Worker Survey data, 2004-2006.
The survey asks if farmworkers or anyone in their family received benefits within the past two years.
NAWS does not survey hired livestock farmworkers.

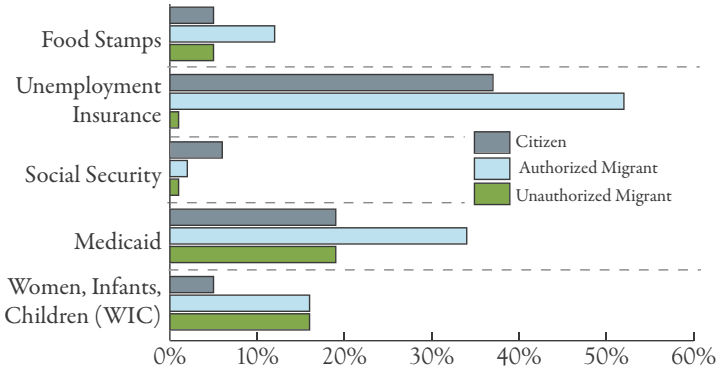

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Figure 19:

Fatal Occupational Injury Rate per 100,000 Workers, United States, 2007

Source: United States Department of Labor, Bureau of Labor Statistics, 2007 Census of Fatal Occupational Injuries, 2009.
Note: Categories in italics are subcategories of Agriculture, Forestry, Fishing, and Hunting.

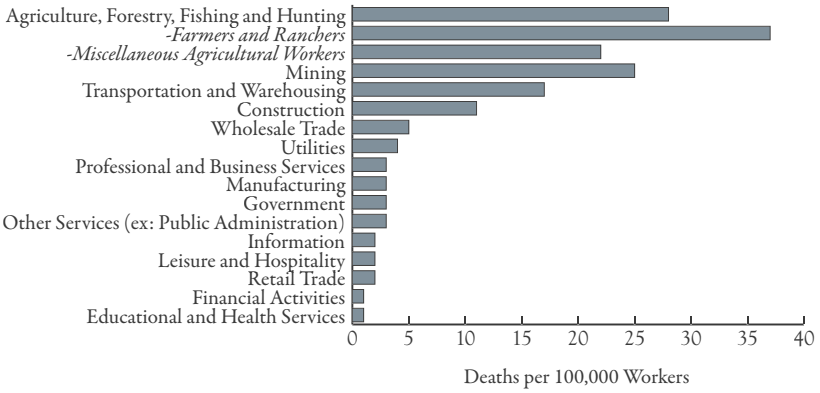


Figure 20:

Crop Farmworkers Reporting Obstacles to Health Care by Legal Status

Source: National Agricultural Workers Survey, United States Department of Labor, 2006

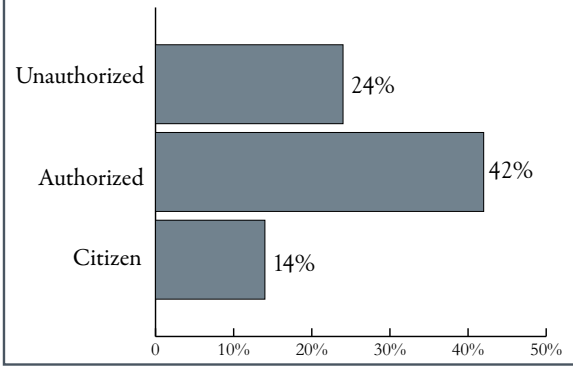
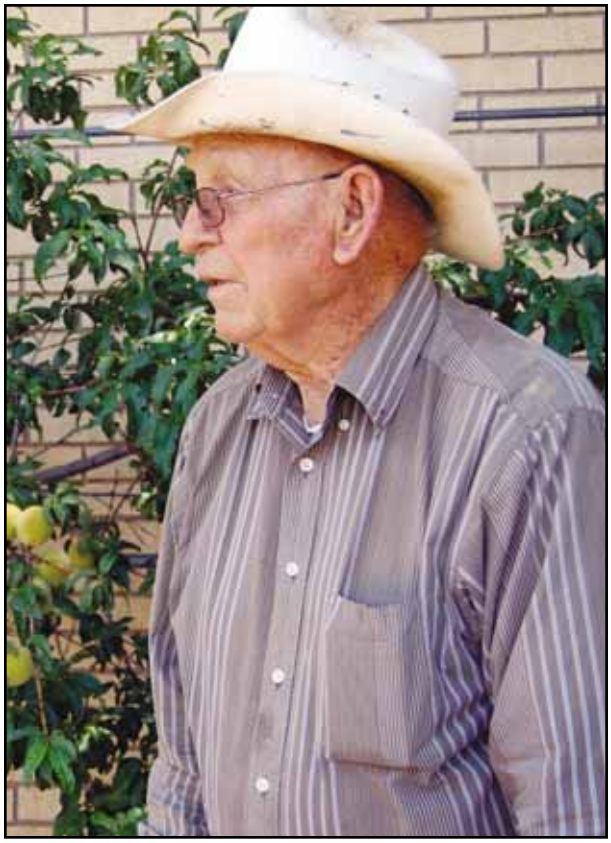


Table 8:
Median Weekly Earnings, Select Low-Skill Occupations, 2006

Occupation	Median weekly earnings (dollars)
Dishwasher	$320
Crop Farmworker	$350
Maid	$360
Groundskeeper	$400
Janitor	$420
Livestock Farmworker	$425
All Low-Skilled	$480
Security Guard	$480
Material Mover	$480
Construction Worker	$520

Note: Weekly earnings include wages, bonuses, overtime pay, tips, and other forms of monetary compensation.
Source: ERS analysis of annual averages from 2006 Current Population Survey Earnings File

© Liz Kolbe. Westcliffe, Colorado.



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Historical Portrait of American Indians and Latinos in Southwest Agriculture

By Zoë Wick

Introduction

Though the number of American Indian farm operations has recently increased, American Indian agriculture in the Rockies is by no means a new phenomenon. On the contrary, native peoples have been cultivating land in the Southwest for as many as 4,000 years.[60] Historically, the Pueblo and Navajo, two major American Indian groups in the region, practiced drastically different forms of agriculture. These agricultural differences largely defined how they were viewed and treated by colonizing powers. While impacted to varying degrees, both the Pueblo and Navajo faced threats to agriculture due to European colonization of the Southwest. Native population numbers and the viability of American Indian agriculture diminished due to foreign disease, slavery, genocide, internal warfare, and intermarriage, and from displacement from their lands by Spain, Mexico, and the U.S.

Table 9:
Pueblo Agricultural Statistics, 1900 and 1936

	Population	Acres Farmed	Acres Per Person
1900	7,883	18,379	2.3
1936	12,005	15,645	1.3

Source; Vlasich, James. Pueblo Indian Agriculture. University of New Mexico Press. 2005.
Using data from county-level surveys of Pueblos.

Curtis, Edward. Library of Congress. Pueblo winnowing wheat.

Pueblo Agriculture

The Pueblo are composed of numerous tribes, but are generally considered to be sedentary and peaceful people whose subsistence, culture, and religion have been intertwined with agriculture for thousands of years. The Ancient Pueblo Peoples (often referred to as the Anasazi, although this term is no longer preferred) began cultivating land in the Four Corners region where Colorado, New Mexico, Arizona, and Utah now intersect.[61] Although they hunted and gathered to supplement their diets, agriculture was their main form of subsistence. Pueblo crops included corn, which they grew by 1,500 BC, and squash and beans, which they added by 500 BC. Approximately 200 years later, cotton came to the Southwest via Mexico.[62] Tribes in the Southwest employed sophisticated farming methods prior to contact with Europeans.[63] Archaeologists have dated irrigation canals in the Southwest to as early as 130 AD. By 1,000 AD, Pueblo people were building terraces to create more level and fertile soil, and check dams to slow and spread water runoff. Advanced and dependable water sources, along with greater security offered by larger villages, encouraged farmers to experiment with new varieties of crops.[64] By the middle of the sixteenth century, Pueblo people were also growing tobacco and raising domesticated turkeys.

When Spanish conquistadors came to the Southwest in the late 1500's, they were impressed by the Pueblo's sophisticated agricultural practices and sedentary society, which in their eyes differentiated the Pueblo from other native tribes.[65] The Spanish, as well as the Mexicans and Americans who followed, equated agriculture with "civilization" and generally crafted policies that were friendlier to Pueblo people than to other American Indians. For instance, the Spanish Laws of Settlement of 1573 prohibited harming of the homes or land improvements of natives, and the *Recopilación di Leyes de los Reynos de las Indias*, passed in 1681, attempted to prevent settlers from encroaching on Pueblo land. However, despite the Spanish government's stated intent to protect native peoples, the northern frontier was remote and policies were not enforced. There were violent conflicts between the Spanish and

the Pueblo, including one occasion in which Juan de Onate led a group of Spaniards in brutally defeating the Acoma Pueblo, killing 800 and mutilating hundreds more. It was also common for Spaniards to force tribe members into slavery.[66] In addition, Spanish settlers frequently squatted on Pueblo land or diverted water resources away from Pueblo farms, threatening the Pueblo's ability to feed themselves and leading to seemingly endless conflicts over land and water rights.

When Mexico won independence in 1821, settlement in the Southwest continued to create land and water disputes. In response to the Pueblo's agricultural lifestyle and willingness to help settlers fend off attacks from other tribes (such as Apache, Ute, Navajo, and Comanche), the Mexican government granted the Pueblo citizenship but excluded other native peoples.[67] However, even the rights of citizenship could not protect the Pueblo from encroachment.

Since the Pueblo were citizens of Mexico at the time of the Mexican-American War and were therefore protected under the Treaty of Guadalupe Hidalgo, they were exempt from U.S. programs such as Indian Removal and General Allotment (explained below) that proved disastrous for other tribes.[68] However, U.S. annexation of the Southwest led to further Anglo and Latino settlement along the Rio Grande and an increase in land and water conflicts. To resolve conflicts and make room for new settlers, the U.S. government aimed to modernize Pueblo agriculture so that land was used more efficiently. The U.S. also hoped to push the Pueblo beyond subsistence farming, encouraging them to assimilate to American capitalist society. However, the Pueblo had long resisted new agricultural practices that conflicted with their cultural traditions. Their form of agriculture had changed little since contact with Europeans, save the introduction of a few new crops. Only after increased pressures due to overcrowding, the Great Depression, and World War II did the Pueblo agree to participate in New Deal modernization programs. While New Deal programs helped the Pueblo use their shrinking land and water resources more efficiently, these programs also led to the decline of agriculture as the major occupation of the tribes, just as modern techniques requiring less manpower led to the decline of agricultural employment in America as a whole. (See Table 9)

While the Pueblo endured land and water scarcity as well as violent attacks due to European colonization, their sedentary customs and agricultural accomplishments allowed them to evade some of the harshest European actions.

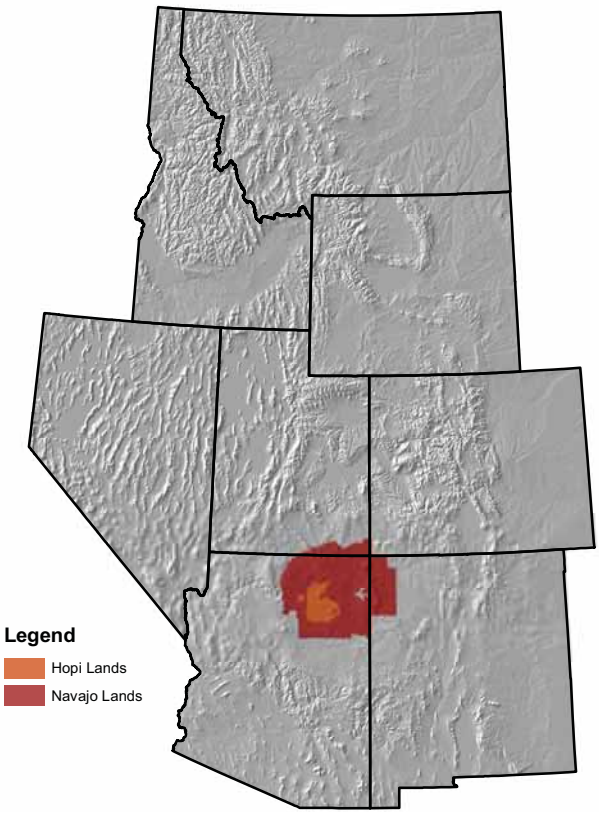
Navajo Agriculture

The Navajo Nation covers 27,000 square miles in northeast Arizona, southeast Utah, and northwest New Mexico, and with a population of 250,000 is the largest tribe in the U.S. today[69] (See Figure 21). In comparison to the Pueblo, the Navajo were historically much more nomadic and obtained more of their food from hunting and gathering. They also, however, grew some crops and, once the Spanish introduced new livestock to the Southwest, raised animals as well. European perceptions of Navajo people as non-agricultural contributed to colonizers' dismissal of the tribe as "uncivilized." Spanish, Mexican, and American governments tended to view the tribe as a nuisance, raiding nearby farms and taking up valuable land that could be better utilized by new settlers. This perception was largely unfounded, as Navajo were often accomplished farmers and ranchers, but nevertheless was used to justify harsh and violent policies.

Navajo people are descendants of Apacheans, who migrated to the Southwest sometime between 1100 AD and 1400 AD.[70] Navajo society emerged as a distinct culture during the 1400's, and tribe members grew corn, fruit, and other crops. When the Spanish came to the area in the sixteenth century, they introduced horses, sheep, cattle, and goats to the region. The Navajo adopted these livestock into their culture, relying on sheep for meat and wool and becoming accomplished equestrians. Successful grazing of livestock, however, required that they expand into new territories, often putting them in conflict with other American Indians as well as with Spanish, Mexican, and American settlers.

Navajo were targeted more than any other native group for the Spanish slave trade.[71] Tribe members frequently retaliated for kidnappings by raiding Spanish communities, taking livestock and other valuable items. These raids earned the Navajo a reputation as troublesome, and the Spanish launched numerous military campaigns against the tribe throughout the seventeenth and eighteenth

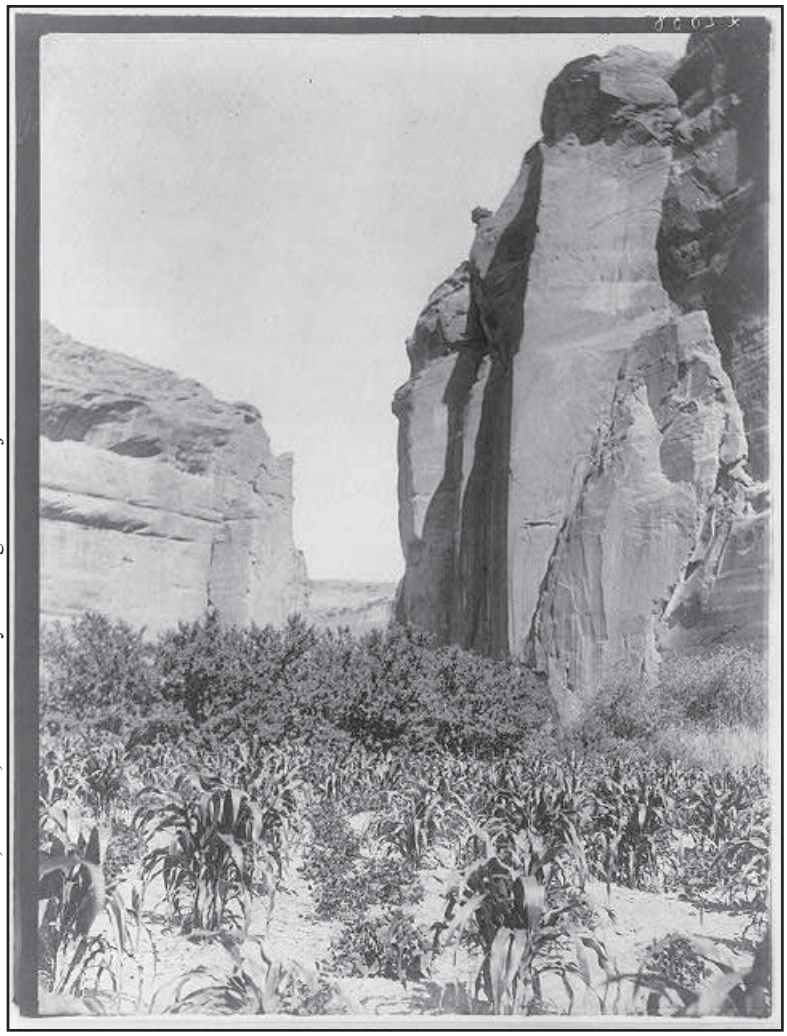
Figure 21: Navajo and Hopi Tribal Lands



Source: National Atlas of the United States, U. S. Geological Survey, 2006

centuries. Many Navajo were killed and captured, and their crops were often destroyed.

Although Navajo came into conflict with Spanish and Mexican forces on numerous occasions, their way of life was impacted far more by American forces.[72] As American colonization pushed westward and fertile land no longer seemed infinite, settlers increasingly felt that native peoples wasted land and stood in the way of progress. The rhetoric of government officials often omitted the agricultural accomplishments of Navajo and other tribes, portraying the groups as uncivilized and in need of government intervention. Josiah Gregg, 1840's author of *Commerce of the Prairie*, observed that Navajo "cultivate all the different grains and vegetables to be found in New Mexico," and also noted their "extensive herds of horses, mules, cattle, sheep, and goats of their own raising which are generally celebrated as being much superior to those of the Mexicans."[73] However, others such as Colonel John Macrae Washington insisted that native peoples needed to be pushed off their land and onto smaller reservations in order to "change from their present roving habits to the pursuit of agriculture, from the savage state to that of civilization."[74] The more self-serving motives behind Indian removal may be better portrayed by another government official who proclaimed, "By the subjugation and colonization of the Navajo tribe we gain for civilization their whole country, which is much larger than the state of Ohio, and, besides being the best pastoral region between the two oceans, is said to abound in the precious as well as the useful metals."[75]



Curtis, Edward, 1906. Library of Congress. Navajo corn.

Starting in the 1830's, the Jackson administration passed a series of Indian Removal Acts, relocating eastern tribes to areas west of the Mississippi River and pushing western tribes onto smaller, less fertile tracts of land.[76] While this program was theoretically voluntary, there was a great deal of corruption and harassment among government officials and settlers who ruthlessly pressured tribes to comply.[77] For the Navajo, removal took the form of the Long Walk, in which U.S. officials forced the tribe to march hundreds of miles southeast to barren Fort Sumner and murdered the weak, elderly, and pregnant who fell behind.[78] The Long Walk was not only devastating to Navajo people, but was also an attack on Navajo agriculture. While the tribe was taken to a barren land, U.S. soldiers destroyed Navajo farms, demolishing wells, burning corn fields, and decimating peach orchards. Finally in 1868, Navajo leaders were triumphant in negotiating a treaty allowing them to return to a portion of their previous territory, although their land was greatly reduced.

Navajo agriculture under went another transformation with the General Allotment Act of 1887, which gave the government power to divide communal reservation lands into individual plots.[79] The government's stated goal was to encourage private farming among American Indians as a more efficient and dependable alternative to hunting, and while this goal appeared to be sincere among some, there were also numerous land speculators who hoped to personally benefit from the legislation.[80] The results were disastrous for most tribes. Reservations were divided into plots of 160 acres that were given to each household, along with an additional communal plot. However, this left the vast majority of reservation land remaining, and this "surplus land" was open for settlers to buy at cheap prices.

In addition, 160 acres proved to be inadequate for herding livestock, preventing Navajo from practicing their traditional form of agriculture. The government held the land tracts in trust for 25 years to prevent American Indians from selling land and encourage them to adopt new forms of agriculture, but the program failed to provide sufficient resources and education.[81] Many Navajo chose to lease and eventually sell their land to non-Indians, further diminishing Navajo territory.[82] Ultimately, the General Allotment Act resulted in the transfer of large tracts of land to White farmers and a considerable decline in American Indian agriculture by 1930.[83]

Modern Times

Today, the majority of reservation land in the U.S. is utilized by non-Indians. With the decline of agricultural trading economies and the onset of capitalist economies on reservations, many tribes found themselves without traditional safety nets and with scarce employment opportunities.[84] These pressures left them vulnerable to exploitation by outside forces. In addition to the sale of land

tracts to White farmers, reservations have become targets for power plants and toxic waste sites. This is especially true of Southwest reservations, where arid conditions are attractive to owners of hazardous and nuclear waste.

In response to these obstacles, many Pueblo and Navajo individuals have become involved in activist movements that started during the 1960's and have achieved notable successes. For instance, Navajo and Hopi peoples demonstrated against coal mining and power plants, and in 1970 the Taos Pueblo became the first tribe to successfully recover traditional lands.[85] Their recovery of 48,000 acres inspired other tribes to work toward land recovery as well. Consequently, tribal landholdings in the U.S. increased from 51 million acres in the 1960's to 58 million acres in 2005, an increase of 15 percent. In addition, Southwest American Indians such as Terrol Johnson have started programs to restore tribal health and nutrition by returning reservation land to agricultural uses.[86] Similar programs may be responsible for some of the recent growth in the number of American Indian farm operators.

Agricultural practices contributed to outside perceptions of the Pueblo as civilized and the Navajo as uncivilized, impacting the severity of policies directed at the two groups. Both tribes, however, experienced extreme hardships as a result of European colonization of the Southwest. One of the most significant ways in which European colonization negatively impacted the tribes was through the reduction of tribal land and the corresponding demise of American Indian agriculture. The restoration of American Indian agriculture may prove to be an effective method of tribal revitalization.

Lee, Russell, 1940. Library of Congress. Spanish-American Farmer, NM

Latinos

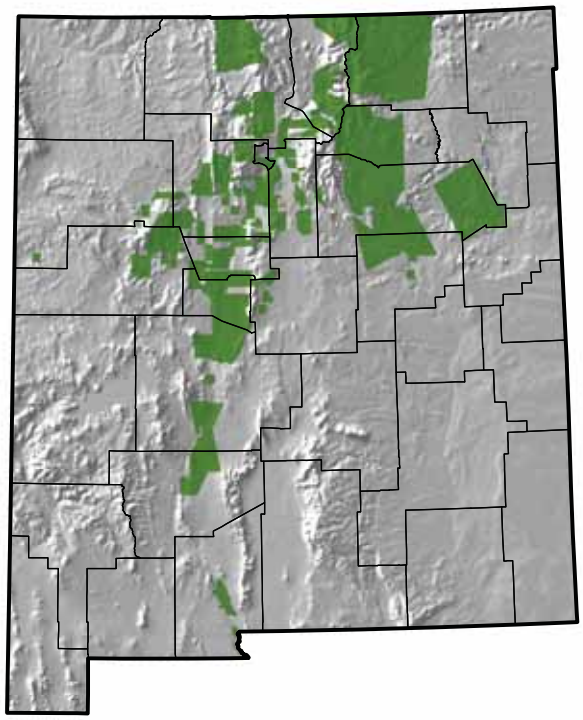
Although Latinos are found at the core of this country's rural life, they remain marginal to the nostalgic imagery and historical narratives of rural America. When their presence is noted, there is a tendency to downplay its continuity and to portray Latinos as 'aliens,' 'transients,' 'illegals,' and otherwise peripheral to the communities where they have settled.
-Lourdes Gouveia, 2005 [87]

Every week, journalists report increased immigration and rapid growth in the U.S. Latino population, especially in the Southwest. These reports sometimes convey Latino culture as a new influence in the region. In reality, though, Latinos were farming and ranching in the Southwest long before Anglos arrived, and many Latino families have centuries-old histories in the Southwest.

Latino settlement in the Southwest began in 1598 when Don Juan de Onate led 400 settlers of Spanish, Mexican, and Mestizo (Spanish and American Indian) heritage to New Mexico.[88] Their journey established the first European-made trail in North America, *El Camino Real de Tierra Adentro*, or the Royal Road to the Interior Lands, connecting Mexico City and Santa Fe. *El Camino Real* became an important route for colonization, trade, and connection with the Spanish Empire.[89]

Once in the New Mexico region, the settlers grazed livestock and grew corn, wheat, and other grains on land granted to them by the Spanish (and later, Mexican)

Figure 22: Spanish and Mexican Land Grants Confirmed by the U. S. Congress, New Mexico



Source: Bureau of Land Management, New Mexico State Office, 2000

government.[90] While wealthy settlers generally applied for individual land grants, farmers often petitioned as groups and were awarded small private titles alongside a large communal parcel of land. Within these group settlements, approximately 90 percent of land was community-owned and was used by town members for grazing livestock, fishing, hunting, gathering fruit, and collecting firewood and building materials.[91] Communal land was especially important in the arid climates of New Mexico and southern Colorado because it enabled cooperation among families, making it possible for them to maintain complex irrigation systems.[92] In addition, the settlers cooperated to defend their land from American Indian tribes. In providing enough land for successful livestock grazing and encouraging cooperation among settlers, communal land was essential to the survival of small farmers.

When Mexico won its independence from Spain in 1821, the government encouraged further settling in its northern border territories in an attempt to secure the border against encroachment by the U.S. and France. By the middle of the nineteenth century, nearly 80,000 people of Mexican descent lived in the Southwest.[93]

From 1846 to 1848 the U.S. and Mexico fought in the Mexican-American War, which ended when Mexico ceded New Mexico, Colorado, California, Utah, Arizona, and Nevada to the United States in the Treaty of Guadalupe Hidalgo. The treaty guaranteed that people living in the transferred territories would retain their property rights.[94] Communal land, however, did not easily fit into the framework of U.S. law. The land grant approval process was excruciatingly slow. By 1886, 205 land title claims had been filed in New Mexico, but Congress had approved only 46, and 146 had not been acted on.[95] (See Figure 22). Through both misunderstanding and manipulation on the part of government officials and land speculators, ownership of much communal land was transferred to individuals rather than preserved for community use.[96] Even when land titles were granted to the rightful heirs, the communal land area was often dramatically reduced.[97] This greatly diminished the viability of agriculture for the Latino community in the Southwest, especially for the poor, who were disproportionately impacted by the loss of communal land. Even today, historic and current landowners are disputing land rights in areas of the Southwest such as Tierra Amarilla, New Mexico, and La Sierra, Colorado.[98]

From 2002 to 2007 there was a 10 percent increase in the number of Latino farm operators in the U.S., a trend that was especially pronounced in the Southwest. However, this growth is just one chapter in the long and rich history of Latino farmers in the Southwest.

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Photo: USDA-NRCS

Overview Section: Production

From Cows to Corn, Agricultural Production in the Rockies

By Russell Clarke

The 2010 Colorado College State of the Rockies Report Card

Key Findings:

- Cattle and calves are the highest grossing product in the Rockies region, bringing in $8.5 billion in 2007.
- Dairy is the top product in three Rockies states, who together comprise 12 percent of the nation's dairy production.
- Arizona produces 20 percent of the nation's lettuce, New Mexico produces 22 percent of the nation's pecans.
- Idaho is also the only Rockies state in the top 50 percent (ranked 23rd) of agricultural exporting states in the U.S.

Introduction

The eight-state Rockies region has long been viewed as a frontier. Old photos and countless movies show settlers, ranchers, and cowboys dealing with the mountainous region and hardships, including conflicts with American Indians, cattle rustling, and crippling droughts. This sensationalized view of the Rockies' history has a true foundation in the early days of cattle production, but what is the Rockies' current role in U.S. agricultural production? Today, is the Rockies region producing more than beef? This versatile region is capable of producing a great number of livestock and crop products, some of which are traditional to the region and others that might surprise Rockies' urbanites.

Given the wide-open spaces and rural areas that remain nationwide, the significance of agriculture, as shown in Figure 1, is surprising. Agriculture accounted for only one percent of the U.S. gross domestic product (GDP) in 2008, a dramatic drop from four percent in 1975.[1] Comparatively, industrial activity accounted for almost 20 percent, while the services sector accounted for some four-fifths of GDP.[2] When considered in purely economic terms, this very small agricultural percentage vastly understates the importance of agriculture to the United States.

Although agriculture has a comparatively small economic footprint, it has a large land footprint. Today, 40 percent of private land in the United States is

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used for agriculture. While 24 percent of that land is in the Rockies,[3] the region produces only eight percent of the total agricultural commodities in the United States.[4] This implies that agricultural land in the Rockies might be less productive compared with that in other regions, possibly due to the arid climate, high elevations, and water limitations. Still, 66 of 281 counties in the Rockies are categorized by the USDA as agriculturally dependent, as shown in Figure 2.[5]

The map of the Rockies in Figure 3, with counties identified by the most important economic sector (called sector dependency), depicts a fascinating patchwork of varying economic dependency. Many counties that are not categorized as agriculturally dependent also have large agricultural production. For example, although not agriculturally dependent, Weld County in Colorado is the only county outside of California ranked in the top ten agricultural producing counties in the United States. In 2007, Weld produced $1.54 billion of agricultural products, of which the vast majority came from livestock.[6] Like Weld, many counties in the Rockies have large product receipts from their agriculture, but other sectors, like services or mining, are more important to the local economy

As food markets globalize, production becomes more specialized and less regionally diverse. The discussion below provides an overview of food production nationwide and in the Rockies region. To analyze the different statistics for various agricultural products, all comparisons of products in the Rockies are made in terms of dollar value.

When compared in dollar value, the Rockies region is just as reliant on dairy production as it is on beef, despite commonly held notions. Half of the Rockies states have dairy as their top product; Idaho is equally a dairy and potato hub. The largest export in all Rockies states (except New Mexico) is a crop or grain, not a livestock product. This is slightly different from the average view of agriculture in the Rockies, but fairly accurate when compared with the United States as a whole.

The United States

Many agricultural products are important to the U.S. economy; Figure 4 identifies crops where U.S. production is ranked at the top of global use. However, U.S. cattle products rank high among the top 20 products in global sales, depicted in Figure 5. Globally, the United States is the number one beef and milk producer (in dollar value). Out of the top five global agricultural products, the United States is the number one producer of three: cow milk, beef, and chicken meat.[7]

Agricultural production in the United States is globally important, even though it only accounts for a small percentage of the national GDP. Although the U.S. imports large quantities of food, mostly due to the large demand for food diversity, the nation is a net food exporter, leading the world in overall food exports. From September 2008 to September 2009, the United States exported $9.1 billion of food and imported $7.6 billion worth.[8] The top U.S. exports differ from the top five commodities produced, as shown in Table 1. While livestock products dominate the top five commodities produced, grains and crops dominate the top five exports, reflecting the importance of domestic vs. international markets and the associated trade barriers such as tariffs, transportation, and health-related restrictions. This pattern is also apparent in the Rockies region.

Historical Agricultural Production in the Rockies

By comparing data for the Rockies region in 1910, 1950, and 2007, we can assess how agricultural production has changed over time. In 1910 corn ranked first in national

Figure 1:
Composition of Gross Domestic Product, United States, 2008
Source: CIA World Factbook, 2009

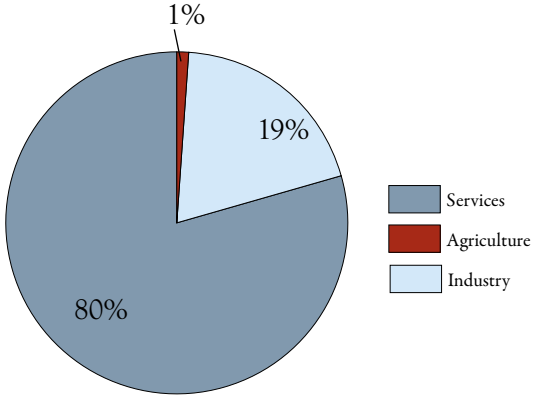
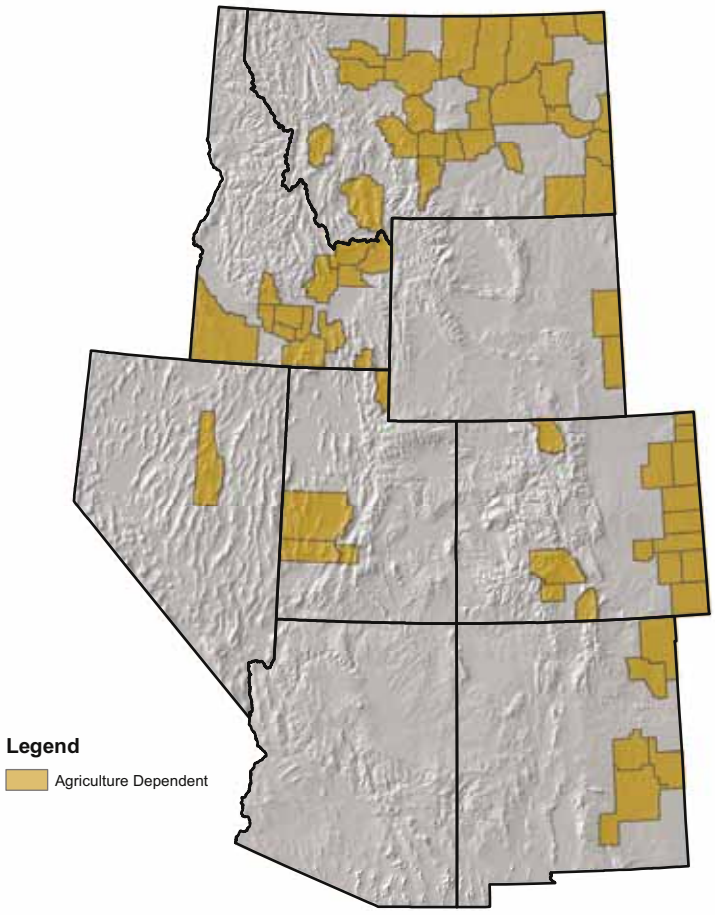


Figure 2: Agriculture Dependent Counties in the Rockies, 2004



Source: Economic Research Service, U.S. Department of Agriculture, 2004

production, but did not even make the top ten in the Rockies (see Table 2), where hay dominated.[9] Much of the Rockies region has historically been devoted to grazing cattle because dry conditions and sparse prime farmland made row crop production difficult. Often, the crops that were grown were feed for beef cattle such as hay, silage, and alfalfa. Cereals ranked second in the Rockies region in 1910, followed by cattle. Although hay was used for livestock production, it outranked livestock in value. Large stocks of forage crops such as hay were needed as additional feed for cattle, and sheep and swine, which were also prevalent in the Rockies region in the early 1900's.

With cheaper beef production, sheep and swine eventually lost their economic standing in the Rockies region. While some wool and sheep operations still exist in the Rockies, they have been dwarfed by other livestock operations. This trend is nationwide: today the United States does not even rank in the top 20 nations for wool production, but ranks number two in pork production, behind China.[10] Globally today, the production of these commodities is on a much smaller scale than that of beef and cattle products. This national shift is reflected in the Rockies by the downward movement of wool, sheep, and swine in the top ten commodities of the region. In the Rockies, the beginning of the twentieth century was notable for its great diversity of agricultural products.

As shown in Table 2, by 1950 cattle had become the number one commodity in the Rockies and was followed upward by small grains and cotton. In 1910, cotton was not even in the Rockies' top ten products, but by 1950 it ranked third in value. Sheep and sheep products moved to number four, and dairy made a jump to number five (and remains important in the Rockies today – see *Dairy case study,* p. 81).[11]

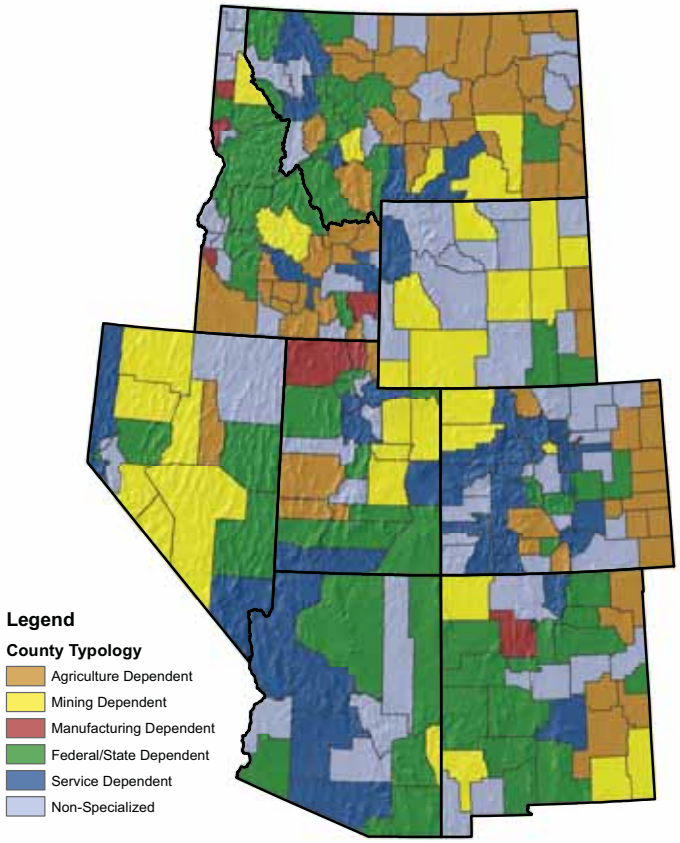
From 1910 to 1950 vegetables and grain crops became increasingly important in the Rockies, as the development and expansion of irrigation systems made more land available to support the production of water-intensive crops. This rise in human food products also played an important role in feeding growing urban populations. The growth in cotton can also be attributed to the growing population and the growth of large-scale industries that demand cotton, such as the textile, paper, and food oil industries.

What are the top products of the Rockies now? Today, cattle production is still the most valuable commodity in the Rockies, with dairy a close second.[12] Over the decades, dairy developed from a very small regional product to a huge source of income. For several states in the Rockies, dairy is the

Figure 4:
Global Production Rank of the United States, by Value, 2007

Source: Food and Agriculture Organization of the United Nations
Notes: nes: not elsewhere specified or included; Indigenous meats include the meat equivalent of exported live animals and exclude the meat equivalent of imported live animals.

Figure 3: Economic Typology of the Rockies, 2004



Source: Economic Research Service, U. S. Department of Agriculture, 2004

Figure 5:
Top 20 Products, Global Production (Int. $ Billions), 2007

Source: Food and Agriculture Organization of the United Nations, 2009
Note: Indigenous meats include the meat equivalent of exported live animals and exclude the meat equivalent of imported live animals.

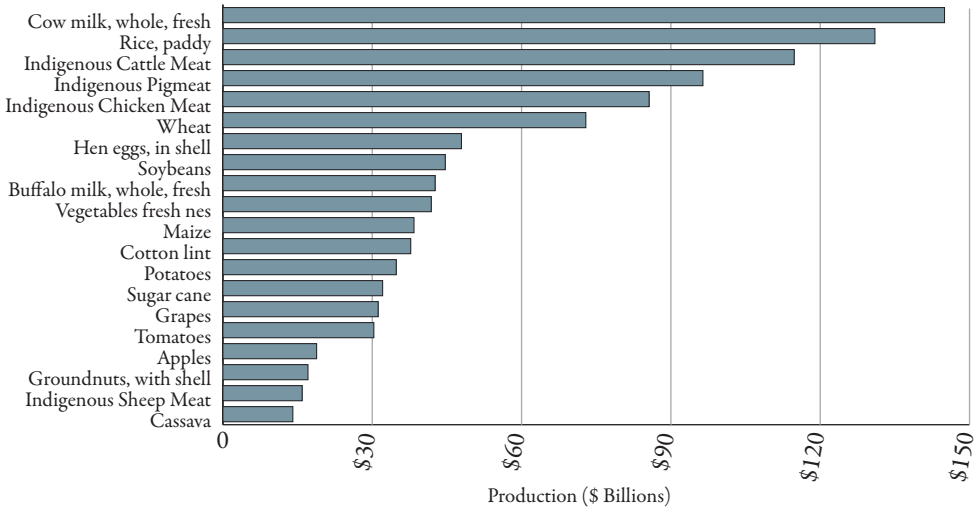


Table 1:
Top 5 Agricultural Exports, United States, Estimated, FY 2008

Product	Value (Millions of Dollars)
Soybeans and Products	$19,332
Feed Grains and Products	$18,148
Wheat and Products	$14,836
Other	$12,681
Live Animals and Meat	$9,455

Source: USDA, Economic Research Service, 2009

number one agricultural product. Today, cattle and their input products are closely followed by crop production for human consumption, with vegetables ranking in the top five products.[13] Many of these crops, specifically grains, make up large shares of exports from the region. Over time, production has consolidated to several large-scale commodities seen in the Rockies region today. The strong hold by cow products may have unfavorable economic health implications for the Rockies. As the beef and dairy markets fluctuate, so too will the economic well-being of those involved in Rockies agriculture.

Future

What can the Rockies region expect for the future? In recent years, crop prices have reached historically high levels due to high oil prices, increased demand, and new uses. For the Rockies region of the future, prices of important export and domestic products such as wheat, beef, milk, and cotton will likely influence the rural economic health and product diversification of the region. While the U.S. recovers from the current economic crisis more slowly than some other countries, the percentage of major products produced in the Rockies that are bound for the export market could increase as demand grows in areas with high economic growth such as Asia but could decrease in the domestic market. The declining U.S. dollar will also make Rockies products cheaper for other countries to purchase, thus stimulating exports. The USDA's projections for the next nine years indicate a slow increase in U.S. wheat exports with increasing population and food use of wheat but decreasing feed use of wheat.[14] This is consistent with the forecasted drop in beef demand.

With a drop in demand, meat production is forecasted to decline through 2011.[15] Domestic per capita consumption is predicted to decline as well, but the export sector may be boosted as Asian markets increase their demand for beef products. The overall livestock production in the next two years is forecasted to decline due to higher feed prices. Higher feed prices will result in cattle remaining on pasture and rangeland for longer time before going to feedlots, which might be easier in the Rockies due to the large amount of land available for grazing.[16] (This could also have negative impacts due to overgrazing.) Longer time on pasture will also increase the weight of cattle going to slaughter, bringing a higher price per head. However, the additional resources needed to raise the cattle could erode any extra profits for ranchers[17].

Since the Rockies region has a largely livestock-based production base, the economic health of agriculture in the Rockies depends greatly on the prices and demand for livestock as well as the international demand for grains which currently lead the Rockies exports. The recent plunge of global milk demand has led to financial problems for U.S. dairy farmers,[18]

Table 2:
Top 10 Agricultural Products for Selected Years, Rockies Region

Rank	1910	1950	2007
1	Hay and Forage	Cattle and Calves	Cattle and Calves
2	Cereals	Small Grains	Dairy Products
3	Cattle and Calves	Cotton Harvested	Grains, Oilseeds
4	Sheep and Lambs	Sheep and Lambs	Vegetables
5	Wool Shorn	Dairy Products	Other crops and Hay
6	Other Grains	Irish Potatoes	Wheat
7	Swine	Poultry and Products	Greenhouse/Nursery Products
8	Dairy Products	Vegetables	Corn
9	Sugar Beets	Sugar Beets	Hogs and Pigs
10	Berries/Fruits/Nuts	Legumes	Poultry and Eggs

Source: USDA Census of Agriculture, 1910, 1950, and 2007
Note: "Other Grains" in 1910 column includes dry edible beans, peanuts, and sorghum.

and many dairies in the Rockies could go out of business. As the recession lifts and disposable incomes again increase, so too should beef demand; however, the overall percentage of income spent on meat products will continue to decline in the future.[19]

The shifts in consumer spending affect each state differently due to the unique basket of goods each state produces. Though many Rockies states produce similar products, the receipts for each product can vary greatly. Furthermore, certain states are well known for specialty products that have little importance in the other Rockies states, as described in the next section.

Table 3: Top 5 Agricultural Products by State, 2007

State	Product	Percent of State Farm Receipts	Percent of U.S. Value
Arizona	Dairy products	23%	2%
	Cattle and calves	20%	1%
	Lettuce	16%	20%
	Hay	6%	3%
	Cotton	5%	3%
Colorado	Cattle and calves	51%	6%
	Dairy products	8%	2%
	Wheat	7%	4%
	Corn	6%	1%
	Hay	6%	6%
Idaho	Dairy products	36%	6%
	Cattle and calves	19%	2%
	Potatoes	13%	24%
	Hay	8%	7%
	Wheat	8%	4%
Montana	Cattle and calves	41%	2%
	Wheat	34%	8%
	Barley	4%	16%
	Hay	4%	2%
	Dairy products	3%	<1%
Nevada	Cattle and calves	39%	<1%
	Hay	26%	2%
	Dairy products	19%	<1%
	Onions	6%	3%
	Potatoes	3%	1%
New Mexico	Dairy products	44%	4%
	Cattle and calves	31%	2%
	Hay	6%	3%
	Pecans	3%	22%
	Onions	2%	5%
Utah	Dairy products	24%	1%
	Cattle and calves	21%	1%
	Hay	15%	3%
	Hogs	11%	1%
	Greenhouse/nursery	5%	<1%
Wyoming	Cattle and calves	70%	2%
	Hay	6%	1%
	Hogs	4%	<1%
	Sheep and lambs	4%	8%
	Sugar beets	3%	2%

Source: USDA Census of Agriculture, 2007

State by State Agriculture in the Rockies

While national and Rockies regional agriculture illuminate much about the importance of agriculture, as discussed above, each of the eight states in the Rockies has its own particular agricultural character. The sections below summarize how agriculture varies throughout the region (See Tables 3 and 4).

Arizona

Arizona, unlike most of the other Rockies states, obtains over half of its agricultural receipts from vegetables and crops rather than livestock. Many parts of the state have a full-year growing season, allowing for increased production and yields.[20] In recent years, dairy has become more prevalent, now accounting for 23 percent of Arizona's agricultural value. This new market is influencing the types of crops produced; fields that were traditionally cotton are being converted to alfalfa and forage crops.[21] Although crops make up a greater percentage of production in Arizona, beef cattle still account for 18 percent of Arizona's production value.

Idaho

Idaho, the potato state, does indeed produce the most potatoes in the U.S. However, potatoes are not the state's most valuable agricultural product.[22] Dairy takes top place (accounting for 36 percent of Idaho's production value), and Idaho ranks fourth in the country for milk production.[23] Livestock products (dairy as well as cattle and calves) account for 55 percent of Idaho's production.[24] Although Idaho ranks third nationally for vegetable production, all vegetables and potatoes combined only account for 14 percent of Idaho's production.[25] Idaho is also the only Rockies state to be in the top 50 percent (ranked 23rd) of agricultural exporting states in the U.S. The greater diversification of major products and exports compared to other Rockies states helps insulate Idaho from downturns in any one of the major commodity markets.

Utah and Nevada

Utah's production is based on livestock: dairy is the number one product, followed by cattle, and then hogs. Utah does not rank highly nationwide among dairy-producing states, but dairy products make up 21 percent of Utah's agricultural production.[26] Utah is also one of two Rockies states to have sizeable hog production. Although three of Utah's top five commodities are livestock, its number one export is wheat products,[27] following the general trend of domestic livestock consumption and grain exports.

As in other parts of the West, cattle are important to Nevada, providing 39 percent of Nevada's farm receipts.[28] Overall Nevada ranks 47th in the U.S. for agricultural production and is the least productive Rockies state. The low production reflects the limited availability of private land, water for

agriculture, and exceptionally limited prime farmland compared to other states. Surprisingly, Nevada ranks tenth among seed producers in the United States. It exports a very small dollar value of animal products and livestock, relying rather on crops for its agricultural income.

Table 4: Top 5 International Agricultural Exports by State, 2007

State	Product	Value (millions)	Rank among States
Arizona	Cotton and linters	$114	10
	Vegetables and preparations	$93	10
	Wheat and products	$47	32
	Fruits and preparations	$47	8
	Other	$44	27
Colorado	Wheat and products	$337	8
	Live animals and meat	$193	12
	Feed grains and products	$146	15
	Hides and skins	$134	5
	Other	$83	21
Idaho	Vegetables and preparations	$362	3
	Wheat and products	$268	12
	Other	$171	15
	Dairy products	$147	4
	Feeds and fodders	$88	8
Montana	Wheat and products	$526	4
	Feeds and fodders	$60	14
	Vegetables and preparations	$54	14
	Feed grains and products	$38	27
	Seeds	$17	13
Nevada	Seeds	$19	10
	Vegetables and preparations	$13	25
	Wheat and products	$4	43
	Feeds and fodders	$3	41
	Live animals and meat	$2	41
New Mexico	Dairy products	$112	6
	Tree Nuts	$38	4
	Wheat and products	$35	35
	Cotton and linters	$22	16
	Vegetables and preparations	$18	21
Utah	Wheat and products	$116	21
	Hides and skins	$81	7
	Live animals and meat	$52	22
	Dairy products	$25	12
	Other	$24	32
Wyoming	Feeds and fodders	$14	34
	Feed grains and products	$11	35
	Wheat and products	$11	42
	Live animals and meat	$9	35
	Seeds	$7	30

Source: USDA, Economic Research Service, 2007

Montana

Although cattle accounts for 41 percent of Montana's farm receipts, no livestock product is in its top five exports (which instead include feed grains and fodders for livestock).[29] Montana produces 16 percent of the barley and eight percent of the wheat in the U.S., compared to only two percent of the cattle.[30]

Colorado and Wyoming

Ranching and beef production continue to play important roles in Colorado and Wyoming agriculture. With over 50 percent of farm receipts coming from cattle, no other agricultural product matches cattle's economic importance. In Colorado, dairy products are the second most important, providing eight percent of Colorado's farm receipts. Wyoming is even more reliant on livestock, with almost 70 percent of farm receipts coming from cattle. Colorado's largest export is wheat, and the state ranks eighth in wheat production and twelfth in animal and meat production in the U.S.[31] Due to the lack of agricultural market diversity in Colorado and Wyoming, the volatility in the beef market determines the stability of their industry. Wyoming, in addition to beef, produces eight percent of the sheep and lambs in the country, but this high percentage of production only accounts for a very small percentage of Wyoming's farm receipts.

New Mexico

New Mexico is very dependent on the dairy industry, which provides almost half of the state's farm receipts (New Mexico ranks sixth nationwide in dairy production). The projected average milk price for 2009 was approximately $12 per hundred weight compared with $18 in 2008.[32] As global dairy demand and prices plummet, the dairy industry of New Mexico will suffer along with those of other large dairy states.

Although chile peppers only account for a very small portion of New Mexico's agricultural value, the state is world famous for Hatch chiles. Small value-added projects, such as the promotion of Hatch chiles as a sought-after brand, have helped independent sectors of agriculture command higher prices and generate larger profits. New Mexico ranks high among the U.S. states in exports of dairy products and tree nuts (mainly pecans). As seen in Table 4, New Mexico does not have large cattle exports; vegetables, cotton, and wheat along with dairy and tree nuts represent the most important exports to the state.

Agriculturally Dependent Counties

There are 66 counties in the Rockies region that qualify as agriculturally dependent, meaning that they rely on their agricultural income for 15 percent or more of their annual labor and proprietors' receipts (see Figure 2 and Figure 3). These counties are more heavily dependent on agriculture than other counties which rely on services, manufacturing, mining, or other industries for a large portion of their local economy. Often these counties are quite rural, located away from major cities and large populations. Agriculturally dependent counties are not the only important counties for agriculture in

the region, however. Weld County, Colorado, for example has the highest production value in the Rockies, but is not agriculturally dependent (see Table 5).

Of the 66 agriculturally dependent counties in the Rockies, only nine have a fairly even split between value from crops and value from livestock. The rest rely heavily on one or the other. Crowley County, Colorado, for example, gets 99 percent of its agricultural sales from livestock, while Sheridan County, Montana, gets 87 percent of its receipts from crop production. This huge segregation of production between the two categories leaves such counties vulnerable to market fluctuations for their respective commodities.

From the entire United States to specific counties in the Rockies, the massive array of agricultural production can be compiled into two large categories: livestock and crops. As global trends shift, so too has the array of production in the Rockies region. Still, since the early days as a frontier region, livestock has held a firm place in Rockies' production and has largely served domestic consumption. Livestock production involves the participation and skills of many different agricultural sectors. The close links and ties between these sectors subject the employees and industry to market and input price fluctuations. The cattle and bison case studies further explore the livestock industry in the Rockies, while the cotton section reports on a little known Rockies commodity.

Table 5:
Top Agricultural Sales, County by State, 2007

State	Rank, County	Percent of State Total Receipts	Thousands of Dollars
Arizona	1. Yuma	30%	$959,968
	2. Maricopa	25%	$813,491
	3. Pinal	25%	$799,811
	4. La Paz	4%	$136,593
	5. Cochise	4%	$117,130
Colorado	1. Weld	25%	$1,539,072
	2. Yuma	12%	$711,391
	3. Morgan	8%	$493,863
	4. Logan	7%	$442,107
	5. Kit Carson	6%	$336,986
Idaho	1. Cassia	11%	$626,721
	2. Gooding	11%	$624,420
	3. Twin Falls	8%	$471,860
	4. Jerome	8%	$461,599
	5. Canyon	7%	$420,928
Montana	1. Yellowstone	6%	$164,647
	2. Chouteau	5%	$147,243
	3. Richland	4%	$106,957
	4. Fergus	4%	$101,167
	5. Teton	4%	$97,705
Nevada	1. Lyon	18%	$91,108
	2. Humboldt	15%	$74,355
	3. Churchill	13%	$66,921
	4. Nye	11%	$58,238
	5. Elko	10%	$53,599
New Mexico	1. Dona Ana	18%	$388,787
	2. Curry	16%	$347,323
	3. Chaves	16%	$339,088
	4. Roosevelt	12%	$253,950
	5. Union	6%	$136,971
Utah	1. Beaver	15%	$210,636
	2. Utah	13%	$181,729
	3. Box Elder	10%	$141,243
	4. Millard	10%	$137,805
	5. Cache	10%	$136,064
Wyoming	1. Goshen	14%	$157,512
	2. Laramie	11%	$124,094
	3. Platte	8%	$97,071
	4. Fremont	8%	$86,701
	5. Park	7%	$81,775

Source: USDA Census of Agriculture, 2007
Note: Sales represent the current market value of all agricultural products sold.

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Case Study: "More than Burgers and Milk - the Cattle Industry in the Rockies"

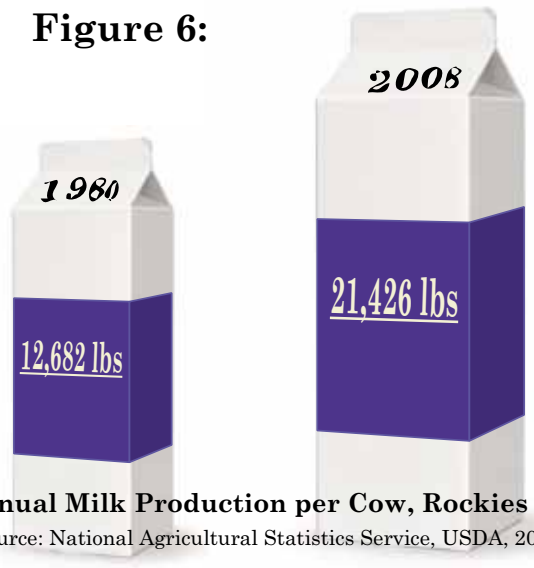
By Russell Clarke

Introduction

The presence of the cattle industry is evident on any drive around the Rockies. Miles of fencing, large herds, and expansive hay fields are all part of the regional landscape. This domesticated animal has become the foundation of agriculture in the Rockies region. Whether cattle are used for beef production, dairy products, or breeding, they have large impacts on the environment, community, and economy. Classic ranching, an often romanticized and challenging profession, is just one part of the trip from pasture to plate. The entire process requires many inputs and is influenced by numerous factors such as feed prices, government regulation, and market conditions. The cattle industry is increasingly interconnected; driven up and down by myriad factors.

Analyzing farm receipts by state in Table 3, beef cattle and calves range from just under 20 percent to 70 percent of total farm sales in the Rockies. No state in the region has less than 19 percent agricultural income from cattle. Livestock plays a large economic role to the region. As shown in Table 3, the number one product by value in every Rockies state is either cattle and calves or dairy products. However, the ranchers and farmers who have spent their lives and effort building and maintaining their operations have not seen the end of tough times. The cattle industry has taken a hit, amplified by the economic recession. Today the dairy and beef industries are just as vulnerable as ever, leaving agriculture in the Rockies region fighting to protect itself from an uncertain future.

Figure 6:



Annual Milk Production per Cow, Rockies Region

Source: National Agricultural Statistics Service, USDA, 2009.

Dairy

Although often considered a beef region, the Rockies produces a great deal of dairy products and contains 14 percent of the dairy cows in the United States.[1] The emergence of the dairy industry, producing what is now the region's second most valuable commodity, is fairly recent, due to the availability of cheap labor, energy, and land. Idaho has a large dairy sector in part due to the cheap energy costs associated with its hydroelectric facilities, which lower costs by about one third compared to dairy costs in California, the nation's largest dairy producer.[2] When asked why dairy was New Mexico's number one commodity, Loren Horton of Las Uvas Dairy[3] responded, "About ten years ago the state asked the dairies from other states to come here, telling them they had lots of feed crops, land, and water resources. Now the water is a problem."

Currently the U.S. dairy industry is struggling. By summer of 2009, more than 100,000 milk cows had been sent to slaughterhouses after historically low milk prices in the earlier part of the year.[4] The projected average milk price for 2009 was between $11.85–12.15 per hundredweight compared with $18.34 in 2008.[5] Dean Horton, who sent over nine percent of his cows to slaughter as a result of the low prices, said "In 60 years, we've never had a downturn like this."[6] Many in the industry believe the spring culling of dairy cows did little to help the milk price. Another cull was announced on July 10, 2009, to further reduce the milk supply and boost prices.[7] The culls are a result of many dairy associations working together to implement price increasing strategies to mitigate the large imbalance between the milk supply and demand. Though the first round of culling did not achieve price goals, the second cull is expected to help.

For a quantity of milk that costs $15 to produce, Dean Horton is only getting $9. This massive drop in farm receipts for milk has not been mirrored in store prices. Retail prices fell 13 percent between January and July 2009, while the price per hundredweight of milk has fallen nearly 50 percent during the same time period.[8]

From 2007 to 2008 there was a 16 percent increase in the global demand for U.S. dairy. Since 2008 sales have dropped by half.[9] At Las Uvas dairy, Dean Horton estimated they are currently losing $50-60 thousand per day. When asked if Las Uvas can weather the low prices Loren Horton said, "I believe we will make it through this, but it's going to be a lot tougher for many of the smaller dairies."

The government has established several programs to help the dairy industry during this historic slump. The Milk Income Loss Contract (MILC) program compensates U.S. dairy farmers when the average milk price falls below a specific level. This program is part of the 2008 farm bill with an extension through 2012, and benefits dairies that produce both for the domestic and international market. Eligible dairies can apply for the monthly payments when milk prices fall below $16.94 per hundredweight.

Eligible dairies must be in compliance with the Highly Erodible Land and Wetland conservation provisions and not make more than $500,000 in off-farm income. By

using a baseline price of $16.94, the MILC payments equal 45 percent of the difference between the current milk price and the baseline. The baseline price is adjusted monthly according to feed costs.

MILC payments are very expensive, with over $1 billion spent in 2009 alone.[10] In addition to keeping farmers afloat, this minimum price system can influence overproduction, causing more milk to flood the domestic market and contributing to further price drops; the same price drops the culling was supposed to alleviate.

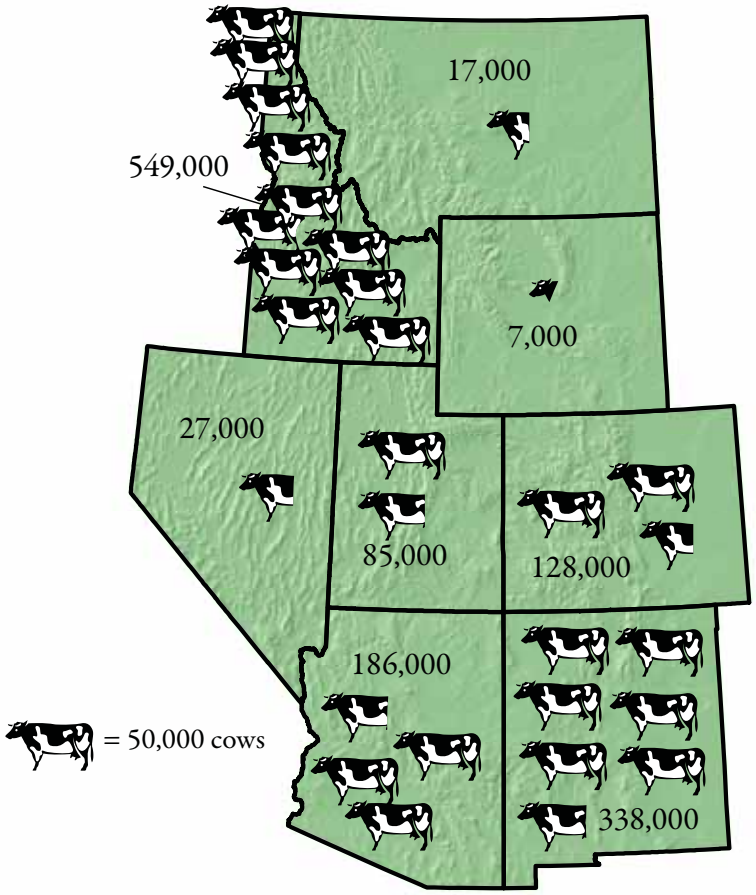
The organic milk market has added value to a struggling product. Aurora Dairy[11] produces organic milk for private labels. Their classification as a producer-handler (they operate their own state-of-the-art processing plant) excludes them from applying for MILC payments. One advantage they do have over conventional and other organic producers is the ability to ultra-pasteurize their milk, giving it a shelf life of over 60 days (well past conventional pasteurized dairy products). Sona Tuitele, vice president of public relations and communications at Aurora Dairy says, "90 percent of our clients choose ultra-pasteurization over conventional pasteurization."[12] Even with the added value of organic milk and ultra-pasteurization, Aurora Dairy is still impacted by the conventional milk market. According to Sona Tuitele there has never before been a shortage of demand for organic milk.[13]

The Dairy Export Incentive Program (DEIP) aims to help U.S. dairy exporters gain access to overseas markets. Tom Vilsack, Secretary of the U.S. Department of Agriculture, re-authorized the DEIP in May 2009, a move commended by many dairy organizations.[14] Programs like the DEIP and MILC that allow American dairies to sell products below costs have been criticized in many other countries as protectionist measures that help push foreign competitors out of business.[15] Secretary Vilsack's announcement for the allowance of maximum subsidies for dairy exports came after the European Union (the world's largest dairy exporter) reinstated dairy subsidies.[16]

Figure 7:

Number of Milk Cows, Rockies Region, 2008

Source: USDA, National Agricultural Statistics Service, 2009



Rockies dairy productivity has undergone a dramatic increase since 1980, as shown in Figure 6. Meanwhile the distribution of dairy activity in the Rockies is clustered in several states, as shown in Figure 7. States where large dairies bring in huge shares of the farms receipts (Idaho and New Mexico) could see harder times than states such as Wyoming, with its smaller dairy industry. The future output per cow is predicted to increase while the number of dairy cows falls.[17] If prices finally rise and dairies again become profitable, the dairy landscape could be filled with fewer cows, fewer dairy farmers, and a different impact on the Rockies region.

© Russell Clarke '10. Las Uvas Valley Dairy.

Beef Cattle

The dairy industry can cull cows and sell them to the meat market as a tool to increase prices. Unlike the dairy industry, the beef industry does not have the option of another market

for their product and must also compete with chicken and pork. However, "beef is still for dinner"; Americans spent over $76 billion on beef in 2008, representing over half the money spent on retail meat.[18] The average American eats nearly 60 pounds of beef per year, about half a pound more than chicken.[19] Eight out of ten people in the United States consume beef on a "regular" basis, according to U.S. NPD Group's National Eating Trends Service, a food and beverage consulting firm. The large demand is reflected in the amount of beef produced: in 2008 over 26 billion pounds, harvested from an average of 660,000 cattle sent to slaughter each week.[20]

© Samuel Landsman '12

Even with high demand, ranchers are making less per pound of beef than they were six years ago, while retail outlets are making more. The wholesale price of beef per pound was $2.22 in 2003, while in June 2009 it was $2.16.[21] Comparatively, the retail price during the same period went from $3.74 per pound to $4.29.[22] Producers' share of the income per pound dropped from 48% in 2003 to 42% in April 2009.[23] By volume, beef production was 26.24 billion pounds in 2003 and 26.56 billion in 2008, only a slight increase compared to the retail price.[24]

The beef industry, like the dairy and pork industries, is in a historic slump, and all are connected through the commodity markets. Beef prices dropped by 19 percent between 2008 and 2009,[25] and beef exports are predicted to drop by nearly 8 percent by the end of 2009.[26] Texas, the nation's largest beef producing state, is also having its worst drought in recent history.[27] The intense drought is drying up pastureland, forcing ranchers to sell cattle at reduced prices because they cannot feed them. This impacts ranching operations in the Rockies where drought conditions have not occurred on a regional scale. Feed is one of the major costs in beef production, and in 2009 feed prices were expected to be $3.00 to $4.50 for a bushel of corn,[28] lower than in 2008, but higher than prices for most of the last 30 years. These lower prices are due to a good crop. Whether this will inflate the herd size, hurting the industry in the future, or come as a relief for the time being is yet to be seen.[29]

Today's traditional trip from pasture to plate requires the services of many different sectors. No longer is the calf born, raised on the ranch's pasture, and slaughtered on the ranch or nearby butcher. The typical method is now to raise calves on pastures for a little less than a year and then sell them at auction following the weaning period. The animals are bought by stockers, many times family ranches, who then feed the cow either grass and/or grain. Once the cows are 12 to 18 months old they are brought to a feedlot, where they are given antibiotics and growth hormones to quickly build muscle. The resulting productivity gains in beef production are depicted in Figure 8. During their four to six month stay at the feedlot, the cows are given a 70 to 90 percent grain diet (unlike their natural grass diet), then transported to slaughterhouses where they are killed and processed under the watch of USDA inspectors.[30] The economic consequences of falling beef demand and prices are affecting not just the rancher, but all of the entities involved in the trip from pasture to plate.

But consumer demand is changing as fast as is productivity. Table 6 identifies the growing array of beef types, each appealing to segments of a changing consumer base. Buyers want organic, natural grass-fed, and/or grass-finished beef. These new consumer demands have created a niche market for some operations, depending on how they raise and market

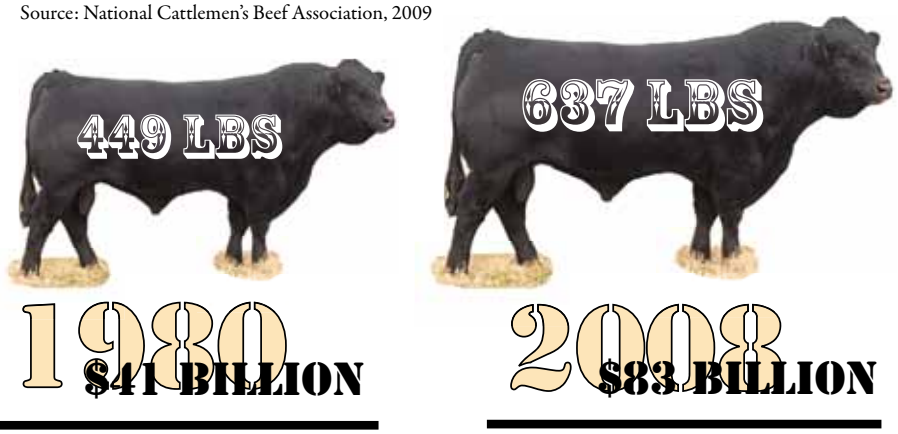
Table 6: Beef Type Definitions

Traditional	JBS Swift Fed feed grain, which consists of mostly corn, spend much of their life in Confined Animal Feeding Operations (CAFO). This allows them to be fattened with less time and money.
Natural	Cattle are fed natural, certified grain. They can still be finished in feedlots. Colorado's Best Beef Company
Organic	Cattle are fed only certified organic feed and grass. Often they are confined in feedlots and fed "organic" feed. Rocky Mountain Organic Meats
Grass-Fed	Cattle are fed only grass and forage until 90 to 160 days before slaughter, at which time they are finished with grain. Pecos Valley Grass-fed Beef
Grass-Finished	Cattle only eat grass and forage. Lasater Grasslands Beef
Free-Range	Cattle are free to roam the pasture and grasslands and not confined to feedlots. Most grass-fed and finished are free range.

their beef. The USDA has yet to publish official definitions for beef production methods, which has led to questionable labeling on consumer products. Typically, grass-finished beef means that the cow is raised on grass pasture its entire life and never receives grain supplements or ends up in a feedlot. This requires a large amount of pastureland as grazing areas must be rotated to avoid overgrazing. Organic beef typically means that the cow cannot be given antibiotics or growth hormones and must be fed organically grown feed. An operation can keep a cow confined and just feed them grass and organic feed. Often organic and natural beef is finished in a feedlot. To be considered organic, beef cows must be raised organically from birth, whereas dairy cows can transition from conventional to organic over a 12 month period. Given the higher cost of feed and land associated with grass-fed and grass-finished beef, these niche beef operations are not the industry norm, and organic and natural beef make up less than two percent of the beef market.[31]

Figure 8: Change in Pounds of Beef per Steer, and Annual Retail Value of Beef Consumed, 1980 - 2008

Source: National Cattlemen's Beef Association, 2009



Cattle do have economic value beyond just their meat component. The dollar amount given to the byproduct after the slaughter of cattle is dubbed "drop credit." The drop credit ranged from $150 to $200 during 2008, but had dropped to $80 to $85 in summer 2009.[32] This is largely due to reduced consumer demand for leather products (e.g., in fashion, automobiles, or furniture), which in turn impacts the producer. The shoe and automobile industries are two of the leading purchasers of cow hides. Both have seen a heavy fall in consumer demand, allowing high inventories and low prices. As the dairy industry culls cows, it impacts both beef and hide prices. With more culls expected from the dairy industry, hide prices can only rise in the long term as cattle stocks are minimized and consumer demand rebounds from the global recession. With Asian markets already showing signs of recovery, it is possible that their increased demand can compensate for some of the faltering domestic demand.

© Russell Clarke '10. Aurora Organic Dairy, Colorado.

Cattle Issues

Before the plummeting milk demand and the subsequent price drop, Loren Horton at Las Uvas Dairy cited EPA projects and requirements as the largest financial obstacle to his dairy operations.[33] One major expenditure he listed was the replacement of perfectly operating confinement tanks and ponds to comply with new regulations. Livestock operations, however, can be a significant source of water quality problems. The runoff from large-scale confined animal feeding operations (CAFOs) is the only livestock runoff controlled under the Clean Water Act. The involvement of the EPA and other government organizations in livestock industries can create tension given the high cost of compliance and potential impact on local watersheds.

A proposed amendment to the current Clean Water Act, known as the Clean Water Restoration Act, would give the U.S. Army Corps of Engineers and the Environmental Protection Agency control over all watersheds and "all activity affecting these watersheds." This proposal would allow these government entities to have greater control over operations on farm and ranchland.[34] Currently these lands are not under the jurisdiction of the Clean Water Act. In an industry where the EPA is often viewed as the enemy, additional regulation by a federal agency could create an even larger rift between the operators and government.

A related concern is the new climate legislation before Congress, possibly resulting in a cap and trade system for greenhouse gas emissions. Enteric fermentation, caused by ruminant digestion, is the largest current producer of methane, a greenhouse gas 20 times more potent than carbon dioxide. Though methane is more heat trapping than carbon dioxide, it stays in the atmosphere for a much shorter time. The current proposed greenhouse gas legislation (The Waxman-Markley bill) would not restrict methane emissions from cattle. However, many livestock producers are not enthusiastic about carbon legislation because their business has little room for carbon sequestration projects compared to farming. This has caused a rift between sectors which might be able to participate in offset programs (crop producers), and those which cannot participate as easily (livestock producers).[35] As debate over climate legislation continues, it could shed light on the carbon footprint of the livestock industry, as well as provide alternative income possibilities to certain agricultural sectors in the Rockies.

Many livestock operations, especially dairy farms, have potential for value-added activities that could help offset methane emissions and produce added income, mitigating their association with commodity price fluctuations. The large numbers of dairies in the Rockies and the stringent renewable energy portfolios required by many Rockies states make the potential for biogas electricity production from cow manure a favorable value-added activity. The methane emissions from manure can be collected and used to create natural gas using biogas reactors. Once refined, this gas can power already existing natural gas plants or new electricity production facilities on the dairy premises. In Vermont, some dairies are using electricity production to make upwards of $200,000 a year.[36] In the Rockies, one dairy in Idaho (the number four dairy-producing state in the U.S.) has a 2.25 megawatt biogas digester and sells the power to Idaho Power Company.[37] The upfront costs for the required facilities and digesters can be prohibitively expensive, but the recent implementation of tax credits reduces these capital costs. Senators from Idaho and Nebraska are proposing a tax package for promoting manure uses such as electricity production and garden compost production.[38]

Colorado Pork in Lamar, Colorado, already uses its manure to produce electricity with a biogas reactor, cutting its electricity costs significantly. Financial help from the state enabled the farm to purchase the gas reactors. In Weld County, Colorado, Xcel Energy has agreed to buy manure gas for its natural gas plant in Platteville. This proposed biogas facility, being developed by Environmental Power Corp., will be the largest in the country, able to power 17,000 homes.[39] The majority of this manure will come from dairy and cattle operations. With the current movement toward energy

security and reducing carbon emissions, some livestock operations could profit from the proposed carbon legislation. Biogas is one more innovative value added project to help diversity the agricultural economy of the Rockies.

The use of growth hormones and antibiotics in livestock and the subsequent development of antibiotic-resistant bacteria have garnered strong opponents and been hotly debated. The government has made several attempts to restrict antibiotics in livestock, including a recent proposal by Congresswoman Louise M. Slaughter of New York that would ban seven types of antibiotics important to humans from being administered to livestock.[40]

Use of recombinant bovine somatotropin (rBST), a growth hormone that increases milk production in dairy cows, is now banned in many dairy operations. Consumer concerns about the safety of rBST caused most dairies to stop using the product, finding it otherwise hard to sell their milk.[41] The hormone has been known to cause disease in cattle, although adverse health effects in humans have not yet been demonstrated. Monsanto, the only FDA-approved vendor of rBST (in Posilac), cites consumer demand as the reason why dairy producers have moved away from Posilac.[42] The FDA has not banned the product; rather consumers have demanded rBST-free milk. Though increasingly rare in dairy production, hormones are still widely used in feedlots and CAFOs for beef cattle throughout the United States; about 80 percent of cattle raised in feedlots receive hormones.[43]

Antibiotics are often distributed to livestock entering feedlots to prevent disease. This preventative application of antibiotics can result in bacterial resistance to common antibiotics. The Obama administration announced that it would aim to ban antibiotic use on farm animals that are not sick. Seventy percent of antibiotics used in the United States are for healthy livestock.[44] The powerful farm lobby will challenge any measure against the preventative use of antibiotics on livestock,[45] but the issue has attracted public attention, and increased demand for antibiotic-free beef could affect the livestock industry.

The widespread effects of the recession have been felt hard by the cattle industry. Due to the close connections among the different livestock industries and related sectors, many factors impact the Rockies' cattle producers. With falling milk prices, low pork prices, and culled dairy cattle, the industry hopes to see the business environment improve. During this setback, entrepreneurial and value-added projects are sure to increase, creating new markets and ideas within the Rockies cattle industry.

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© Emil Dimantchev '11. Las Uvas Valley Dairy, New Mexico.

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Case Study: Bison: Back Home on the Range.

By Russell Clarke

Historically the buffalo had more influence on man than all other Plains animals combined. It was life, food, raiment, and shelter to the Indians. The buffalo and the Plains Indians lived together, and together passed away. The year 1876 marks practically the end of both. . . .

Walter Prescott Webb, The Great Plains (Ginn and Company, 1931).

The physical and mythological strength of the American Bison is unparalleled by any other land mammal in the Americas. It is the icon of the changing American West. A full-grown bison, weighing well over one ton, can hardly be considered in the realm of classic livestock. However, the emergence of a market for bison meat has started to turn this historic symbol of the Wild West into a farm-raised commodity. Today, its presence and numbers in the Rockies tell a story not of Western lore, but of an increasingly important agricultural product.

History

Massive bison herds once roamed the North American plains. Before 1600, bison numbered between 30 and 70 million.[1] As Europeans arrived and westward expansion ensued, bison were slaughtered for their meat, hides, and range. Bison competed with cattle for grazing, prompting cattle ranchers to cull large bison herds. Some historians have suggested that bison were slaughtered to starve the Native Americans during the earlier years of their oppression. Additionally, a cold spell that froze the plains during the 1840's, limited the bison's access to winter grass.[2] Bison were slaughtered by the millions for their hides on newly extended rail lines, their massacre aided by a rifle specially named for their destruction, the Sharps "Buffalo Rifle."

In 1889 William F. Hornaday surveyed the bison population in North America and estimated that just over 1,000 remained. Following his survey, he devoted much of his time and effort to bison conservation.[3] Since 1889 the bison population has rebounded from near extinction, but their presence today covers only a small portion of their historic range on the American plains. The current abundance of bison has resulted from both consumer demand and conservation efforts, resulting in an improved bison meat industry and rangeland ecosystem.

Bison Today

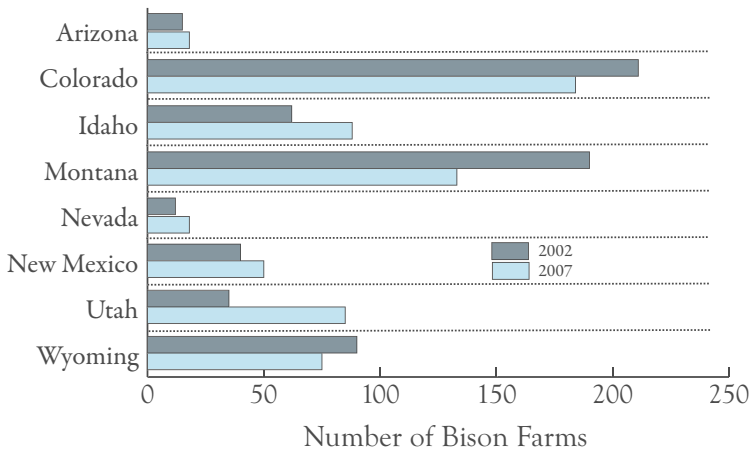
Today, almost 200,000 bison reside on private farms and ranches in the U.S.,[4] while approximately 25,000 bison roam free on public lands. In some areas, bison numbers are now considered healthy enough to institute legal hunts. Montana, for example, set a quota for 144 bison to be taken in 2009.[5] Approximately 4,500 farms and ranches are raising bison in the U.S. The addition of bison statistics to the 2002 USDA Census of Agriculture indicates the growing importance of the bison industry, which has expanded by at least 10 percent each year for the past three years.[6] In 2008 more than 75,000 bison were slaughtered under federal and state regulated programs, more than a 50 percent increase since 2002. However, this new demand has not produced a large increase in the overall number of bison in the Rockies over the past seven years. This could indicate that bison are being taken to slaughter at earlier ages, perhaps due to the increasing use of feed and grain finishing in bison operations.

© Elizabeth Kolbe '08. Vermejo Park Ranch, New Mexico.

The Rockies region as a whole has experienced a slight decrease in the number of ranches raising bison since 2002, as shown in Figure 9. Currently the Rockies region contains about 15 percent of the nation's bison farms. Colorado, Montana, and Wyoming, the states with the largest number of bison ranches have seen a decrease in ranch numbers. In contrast, Arizona, Idaho, Nevada, New Mexico, and Utah have all seen an increase in the number of bison ranches since 2002, with the largest increases in Idaho and Utah. This movement toward a similar number of bison ranches in the different Rockies states could be a result of the niche market.

Despite the overall decrease in the number of bison in the Rockies since 2002, the region still has the second

Figure 9:
Number of Bison Farms by State, 2002 and 2007
Source: USDA Census of Agriculture, 2007

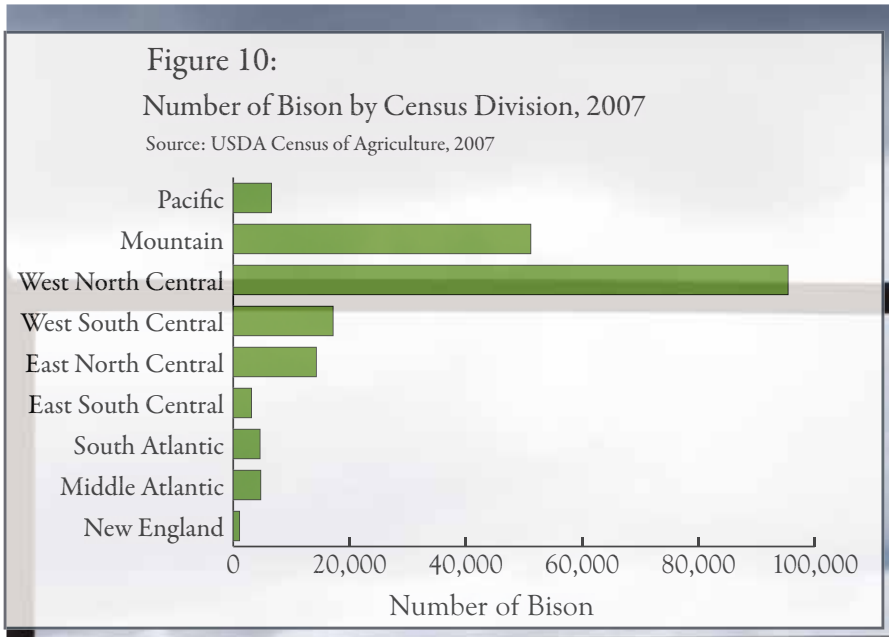


largest inventory of bison in the U.S., as shown in Figure 10. As Figure 11 shows, farm-raised bison inventories decreased in some Rockies states, such as Montana and New Mexico, between 2002 and 2007. The mitigating increase occurred in Colorado, which had far more bison than any other state, making it the bison capital of the region.

As mentioned above, the number of bison farms in Colorado decreased, so the increase in inventory indicates larger bison operations, or smaller operations consolidating. Idaho and New Mexico showed decreases in bison inventory, but increases in the number of farms. This suggests that farms with bison in these states were tending toward smaller herds of bison, the opposite trend of Colorado.

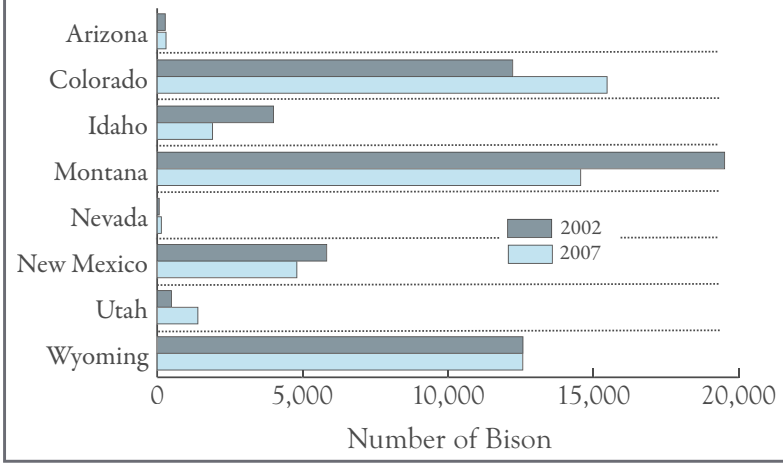
Although the total inventory of bison has dropped, more bison meat continues to go to market than ever before, possibly due to more efficient operations, bison of younger ages going to market, and larger numbers of older herds being put on the market. This declining inventory provides an idea of where bison production is more important to the niche economy in the Rockies.

Figure 10:
Number of Bison by Census Division, 2007
Source: USDA Census of Agriculture, 2007



©Julia Head '09. Vermejo Park Ranch, New Mexico.

Figure 11:
Number of Bison by State, 2002 and 2007
Source: USDA Census of Agriculture, 2007



Bison Meat

Bison tastes similar to traditional beef but has far less fat and more protein. In addition, as shown in a comparison with other meat characteristics in Table 7, bison contains higher amounts of vitamin B and iron and also fewer calories and less cholesterol than beef. These qualities have helped develop a niche market for bison as a healthy alternative to beef. Though traditionally more expensive than beef due to the lack of supply and more expensive breeding stock, the growing bison meat industry has reduced prices and can now compete with beef. In many parts of the country, bison is readily available in health food and grocery stores and increasingly available on menus in mainstream restaurants.

In 2003 the USDA estimated that Americans consumed one million pounds of bison each month. Many bison raised for meat are actually a cross breed between cattle and bison (approximately 3/8 bison and 5/8 cattle), often referred to as "beefalo." Only 12,000 to 15,000 bison are currently considered "pure."[7] While bison are no longer in danger of going extinct, their genetic make-up is threatened.

Table 7:
Nutritional Comparisons of Select Meat Types, 100 Gram Serving

Species	Fat (g)	Protein (g)	Calories (g)	Cholesterol (mg)	Iron (mg)	Vitamin B-12 (mg)
Bison	2.4	28.4	143	82	3.4	2.9
Beef (Choice)	18.5	27.2	283	87	2.7	2.5
Beef (Select)	8.1	29.9	201	86	3.0	2.6
Pork	9.7	29.3	212	86	1.1	0.6
Chicken (Skinless)	7.4	28.9	190	89	1.2	0.3
Sockeye Salmon	11.0	27.3	216	87	0.6	5.8

Source: National Bison Association
Per 100 Gram (3.5 oz.) Serving - Cooked Meat - Updated March 2007
Note: Bison, separable lean only, cooked, roasted. USDA ND6 No. 17157
Beef, composite of trimmed retail cuts, separable lean only trimmed to 0" fat, choice, cooked USDA ND6 No. 13362
Beef, composite of trimmed retail cuts, separable lean only trimmed to 0" fat, select, cooked USDA ND6 No. 13366
Pork, fresh, composite of trimmed retail cuts (leg, loin, and shoulder), separable lean only, cooked USDA ND6 No. 10093
Chicken, broilers or fryers, meat only, roasted USDA ND6 No. 05013
Salmon, sockeye, cooked, dry heat USDA No. 15086

Bison Commons

Bison prior to westward expansion in America were an American Plains' keystone species, influencing the entire ecosystem. After their near extinction, they returned to a very different environment, segmented and developed by farms and ranches for agricultural production. In 1987 Frank and Deborah Popper published an essay in which they promoted the hypothesis that many areas of the Great Plains, made empty by depopulation, be returned to native prairie. They used the term "Buffalo Commons" to describe their proposed nature reserve. Though largely rejected at the time, the idea of the Buffalo Commons has since been considered in future plans for some of the plains states.[8] This idea of returning the plains to bison herds for natural management of native grasses and ecosystems highlights the bison's importance to the prairie landscape. The presence of bison rather, to some people, is preferable to the presence of cattle, following the argument that traditional bison grazing can increase the biodiversity of the grasslands with less management.[9] Bison eat a greater variety of grassland plants and travel farther distances, churning the soil and spreading seeds.

Recently, the Missouri Breaks region of Montana reignited discussion on bison and ecosystem restoration when the region was cited in a report titled, *Ocean of Grass* as the best location for a working ecosystem involving bison.[10] Biologists in the report pinpointed the Missouri Breaks as the best area in the historic Great Plains for a new preserve.[11] The goal of 3.5 million acres, which might take 20 years to obtain, could contain enough genetically pure bison to support a population of wolves.[12] In 2005, 16 genetically pure bison were introduced as the first step in the long process of building the proposed preserve. The idea behind the preserve is to combine, rather than separate, nature and economy, creating a "working landscape."[13] Instead of exploiting the land, this venture would stimulate the economy through restoration. This idea of bringing nature and economics together for a common goal is becoming more prevalent in ranching operations and communities in some locations around the Rocky Mountain West.

As more private entities start to raise bison, the establishment of assistance programs from banks and associations for bison operations is increasing. This, combined with increasing consumer demand for bison as well as open space, may allow the buffalo commons to become a reality in the future.

Bison Ranching

Bison, like cows, are ruminants, but naturally eat prairie grasses that cattle may not. Unlike modern cattle, almost all bison are raised on grass, although certain

© Elizabeth Kolbe '08. Vermejo Park Rnach, New Mexico.

operations will finish their bison with grain (for 90 to 120 days before they are sold for slaughter).[14] Unlike many cattle in feedlots, bison are rarely given antibiotics or growth hormones. The lack of antibiotics is often a trigger point for intense debate over cattle-bison diseases such as brucellosis.[15]

The historical presence of bison in the Rocky Mountain region renders them resilient in the face of local diseases and harsh weather conditions. Paul Robertson, director of the San Luis Valley Program of the Nature Conservancy, noted the lack of care required by bison: "we don't do anything; if they get sick, they die."[16] By allowing the sick to die, the herd becomes stronger in the future. This minimized care for bison is typical throughout the industry. Bison do well in the freezing cold and searing heat of the plains, requiring less work for the rancher.

Bison also calve easier than cattle. No human aid is needed for bison calving, whereas cattle often require assistance. However, because ranched bison are not domesticated like cattle, bison operations often need higher and more secure fencing, as a male bison can easily jump six feet high. Oftentimes even intensified fencing cannot contain the bison. Full-grown males commonly weigh over 1,200 pounds, sometimes over 2,000. These wild and powerful qualities, and the different training and handling methods required, deter many ranchers from entering the bison industry. This historical symbol of the Rockies is not just an ornamental figure on the plains, but an increasingly important industry to the eight-state Rockies region.

Medano-Zapata Ranch

The Nature Conservancy's Medano-Zapata Ranch is home to one of the few conservation bison herds in the country, meaning they are never branded, weaned, or provided with supplemental feed.[17] They run over 2,000 bison and around 1,000 cattle on 103,000 acres in the San Luis Valley in Colorado.[18] The bison are raised as closely to their natural life cycle as possible. The ranch has year-round water, and its location in the largest alpine valley in the world makes it an exception rather than the industry norm.

The ranch is also a premiere example of collaboration among different, and often competing, entities. Paul Robertson describes the Zapata Ranch as "one of the greatest successes in the Rocky Mountain West."[19] Owned by the Nature Conservancy, it provides bison, beef, and ranch vacations. The ranch has value-added projects and additional non-traditional ranch incomes such as guest services to mitigate economic losses associated with commodity cycles. Duke Phillips, an area rancher well known for his unique style of holistic range management, manages the bison and cattle herds. The ranch preserves open space and provides beef and bison for the market. It brings nature and economic goals together, and is a working collaboration among area ranchers, the Nature Conservancy, the National Park Service, and Colorado Fish and Wildlife, whose land borders the ranch.

In 2008, the Medano-Zapata Ranch culled 400 two year-old bison for sale on the market. The bison are allowed to roam freely over 44,000 acres of the ranch. Unlike the bison, the cattle raised on the ranch are highly managed on a day to day basis and rotated often to avoid overgrazing of the grasslands. Once a year the bison are gathered and tagged, and a certain number are taken to market. After they are bought on the market, they are usually finished in a feedlot. The ranch would prefer to sell whole animals to private buyers rather than send them to market, ensuring the buyer a grass-finished product and eliminating middlemen. The lack of direct marketing is one of the largest obstacles facing the bison industry. The Medano-Zapata Ranch has considered raising only bison but this would require "timing and money we just don't have," according to Jeff Gossage, the ranch manager.[20]

© Stephen G. Weaver. Medano-Zapata Ranch, near Alamosa, Colorado.

Bison's Future

Recently, other livestock industries such as beef, pork, and dairy have taken huge hits as demand and prices decrease. With the current global economic recession, many higher priced and non-traditional food products have suffered a reduced demand, but

the bison industry has remained strong through the crisis.[21] Dave Cater, president of the National Bison Association reported that "the U.S. bison business ended 2008 in its healthiest fiscal position in more than a decade."[22] However, Paul Robertson of the Zapata Ranch stated that "the bison meat market has been much more volatile than beef in recent years."[23] The durability of bison during difficult times fuels industry leaders' optimistic outlook. Although industry leaders acknowledge that bison are unlikely to become a mainstream commodity, they believe that bison can continue to gain recognition and growth in a niche market.

Whether consumers will be willing to pay for a healthier meat, or if greater understanding of food choices can support the bison industry, is unknown. As the current trend moves toward healthier foods, industry leaders expect the future of the bison industry to be strong.[24] Additional marketing and promotion of bison meat will help spread the knowledge of bison's benefits and could substantially increase demand. Due to the bison's historical importance in the Rockies and the large regional inventory, this region is sure to play an important role in the future of the industry and the species. The iconic symbol of the American West once again grazes in increasing parts of the Rockies, and tourists continue to be awestruck to see active herds of bison as operational parts of "real" agriculture, not just "native" herds on public lands.

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Case Study: Cotton - Fabric of the Rockies

By Russell Clarke

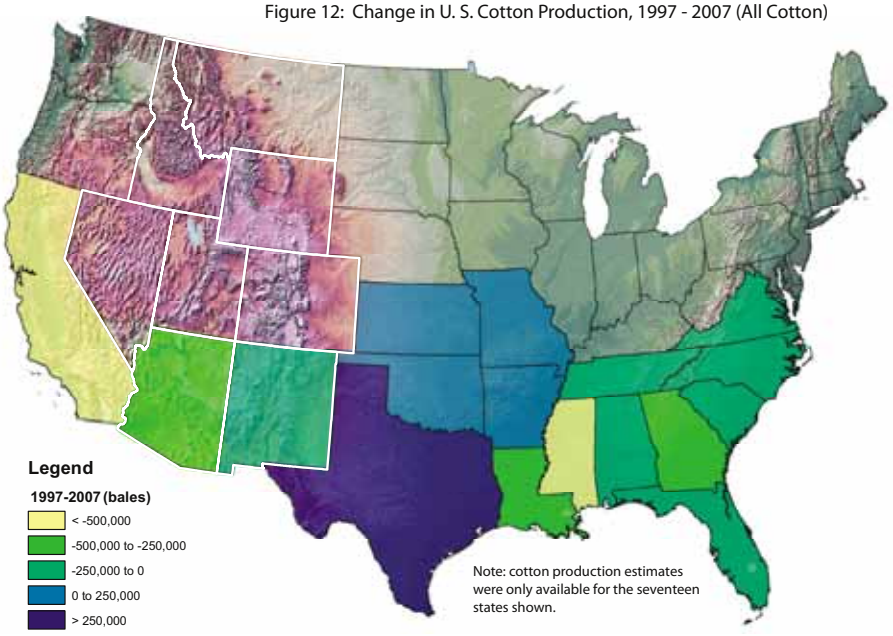
While the shirt on your back may be manufactured in China, the cotton could be grown in the field bordering your back yard. Although not typically associated with the Rockies, cotton is widely grown in Arizona and New Mexico. Cotton differs from many of the other agricultural products produced in the Rockies. Unlike vegetables and many grains, cotton can be stored for long periods of time before being sold. This allows cotton farmers to mitigate losses due to short-term price fluctuations, improving producers' chance for profit.[1] Vegetable farmers do not have this luxury; generally, they must accept the market price at the time of harvest.

Arizona has a set amount of water rights. To use these rights so that they will not be re-apportioned to other states, Arizona sells water at a discounted rate to farmers, including the cotton farmers of south central Arizona.[2] Farmers in the region welcome this discounted water ($30 per acre foot), which costs much less than groundwater pumped to the surface using a natural gas-powered water pump ($80 an acre foot), a common method of extracting groundwater in the Rockies.[3] Though cotton may not be the most water efficient crop in the Rockies, it uses far less water than both alfalfa and sugarbeets (both crops grown on large scales in the Rockies region) and is uniquely suited to Arizona's climate.[4]

With food security and health becoming increasingly important issues, there is much debate over the use of genetically modified (GM) crops. In recent years, cotton has greatly benefited from GM crop development. Arizona cotton farmer Jon Post praised his new Bullworm-resistant cotton: "I hardly use any pesticides anymore; I might only spray once or twice a year."[5] The reduced costs of pesticides and water for cotton make it a somewhat easier crop to produce, but its profitability is in the hands of the market. As Post stated, "A five percent return is great."[6]

Arizona has long been known for its cotton production. The state has the highest cotton production in the Rockies region and is tenth in the United States.[7] Cotton production makes up about five percent of Arizona's agricultural receipts, but is the state's number one export.[8] Recently, however, as shown in Figure 12, Arizona has had a large decline in cotton production.[9] Part of this decline is due to decreased mill use. The reduction in domestic cotton apparel production will lower the demand for domestic cotton in the United States.[10] Cotton stocks are also declining in the Rockies due to the shift toward feed crops to support the growing dairy industry. Arizona's cotton production in 2008 was 26 percent lower than the previous year. Similarly, the acreage of upland cotton in Arizona was 24 percent less in 2008 than in 2007, and the acreage planted in Pima cotton was less than half of the previous year.[11] These different types of cotton grow at different times of the year, allowing for different harvest seasons. After the forecasted increase in cotton prices, cotton stocks are predicted to increase after a few coming years of decline.[12] In 2009 Texas, the nation's largest cotton producer, experienced its worst drought in 50 years.[13] This could lower the cotton supply, possibly providing better prices for Rockies cotton growers.

Figure 12: Change in U. S. Cotton Production, 1997 - 2007 (All Cotton)



Source: 2007 Census of Agriculture, National Agriculture Statistics Service, U. S. Department of Agriculture

[1] Post, Jon. Interview by author. Marana, Arizona, July 10, 2009.
[2] *Ibid.*
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Overview Section: Finance

The Economic Stability of Farms and Ranches in the Rockies

By Emil Dimantchev

The 2010 Colorado College State of the Rockies Report Card

Key Findings:

- In 2007, the average net farm income in the Rockies was $2,500 higher than the U.S.
- Total employee compensation for farm workers in the Rockies was 41 percent higher than the U.S. in 2007.
- Yuma and La Paz Counties in Arizona boast the highest net farm cash income in the region.
- Sales of livestock products in the Rockies rose by 28 percent between 2002 and 2007, crops sales showed a 13 percent increase.

Introduction

During the Colonial period, American agriculture served local needs as well as international commerce. Agricultural products were locally exchanged for tools, housewares, exotic foods, and clothing, giving shape to the domestic economy. Tobacco, a highly demanded crop in Europe at the time, largely contributed to the survival and prosperity of English settlers.[1] Technological advances and increased specialization throughout the 19th century expanded domestic and international markets. By the first half of the 20th century, business opportunities in agriculture were growing as were the number of farms and farmers. Today, however, agriculture's share of U.S. economic activity has drastically declined even as its critical contributions remain at the local, regional, national, and international levels.

Since the 1930's, the number of farms and farmers has decreased. Today, the agricultural sector contributes around one percent to the GDP of the nation and the Rockies.[2] Farm employment has likewise declined. Both in the Rockies and the U.S. as a whole, the small percentage of workers in agriculture indicates the profound movement toward high-efficiency and away from labor-intensive farming production. As shown in Table 1, by 2007 farm contributions to GDP stood at one percent and the proportion of national employment was two percent;

About the author: Emil Dimantchev (Colorado College class of 2011) is a 2000-10 Student Researcher for the State of the Rockies Project

within the Rockies states, agriculture represented somewhat larger shares, with Montana's agriculture approaching five percent of GDP and employment. In the 1930's one farmer supplied food to 9.8 other people in the U.S. and abroad.[3] By comparison, in 2002, one farmer supplied food to 144 people in the U.S. and abroad.[4]

Growing demand for agricultural products caused by increases in world population and economic development exposes the importance of the agricultural sector in the Rockies and across the nation. Concerns for food security, availability, and safety coexist with a desire for the preservation of traditional rural American lifestyles, raising questions about the long-term viability of farming in today's economy. According to data from the 2007 Census of the United States Department of Agriculture (USDA), the average net farm income in the U.S. and the Rockies grew by 112 percent and 45 percent, respectively, from 2002 to 2007, partially due to rising food prices. High food prices affect farms in the Rockies and other regions of the U.S. differently due to the agricultural characteristics of the Rockies. Farms in the Rockies have higher average sales of livestock and lower average sales of soybeans and corn, compared to the average farm in the U.S. Despite the growth in net farm income, volatility in commodity prices since 2007 and the lack of credit associated with the deep financial recession have put pressure on farms. Increasing input prices have additionally narrowed the profit margins for farm operators. Many farmers are also concerned with increased investments in the commodity markets. According to a report on commodities market speculation, such investment activity drives food prices up.[5] Domestically, high prices put pressure on consumers, food processors, and livestock producers. According to the same report, increases in commodity investment funds and speculation have induced volatility in the market and created obstacles for farmers to use futures contracts. National Farmers Union President Tom Buis commented on futures markets, warning, "Without a properly functioning and regulated futures market, a train wreck is headed straight for rural America that will jeopardize our ability to continue providing a safe, affordable and abundant food supply for this nation."[6]

Historical Trends

Historical trends in the net cash income per acre, as shown in Figure 1, indicate the varying profitability of the agricultural sector. Between 1950 and 2007, three main periods stand out in the U.S. and the Rockies states. The increased farm incomes in the 1970's, 1990's, and 2007 correlate with periods of high commodity prices.[7] In the 1970's and 1990's, the rise in world agricultural trade, the depreciation of the U.S. dollar, and government policies to support commodity prices were among the major causes of high commodity prices. The spike in 2007 shared many of its causes with the previous two periods such as high worldwide demand for agricultural products and U.S. dollar depreciation. Another factor in 2007 was the growing domestic and international markets for biofuels. In 2007, ethanol production accounted for 23 percent of U.S. corn use. Biodiesel demand increased in Europe and caused a spike in global prices for vegetable oil,[8] thus pushing soybean prices upward. While the previous two periods were followed by large drops in food prices, today many factors contribute to the continued rise in commodity prices, despite the financial recession. Apart from growing worldwide demand for farm products, biofuels seem to be a major driver of commodity prices today. Under the

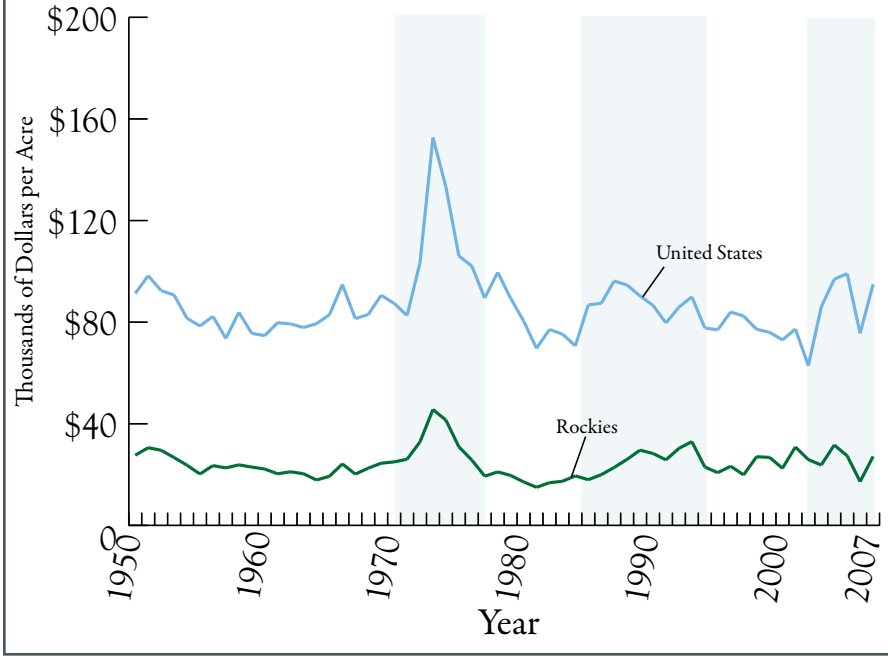
Table 1:
Gross Domestic Product and Farm Employment, U.S. and Rockies States, 2007

	GDP from crop and animal production (Millions of Dollars)	Total GDP (Millions of Dollars)	Percent of Total GDP	Farm Employment 2007	Farm Employment as a Percent of Total Employment
United States	$137,251	$13,715,741	1%	2,841,000	2%
Rockies	$10,925	$909,800	1%	196,398	3%
Arizona	$1,958	$245,952	1%	23,968	1%
Colorado	$2,473	$235,848	1%	43,488	1%
Idaho	$2,726	$52,110	5%	37,876	4%
Montana	$1,332	$34,266	4%	31,348	5%
Nevada	$229	$129,314	0%	4,835	<1%
New Mexico	$1,295	$75,192	2%	24,508	2%
Utah	$573	$105,574	1%	18,903	1%
Wyoming	$339	$31,544	1%	11,472	3%

Source: Bureau of Economic Analysis and USDA Census of Agriculture, 2007

Figure 1:
Net Farm Cash Income Per Acre, U.S. and Rockies States, 1950 - 2007

Source: USDA Economic Research Service, 2009
(adjusted for inflation)



Energy Independence and Security Act of 2007, the U.S. Federal Government mandates the production of biofuels, guaranteeing increasing demands for ethanol and corn. A gradually rising biofuel production is supposed to be 36 billion gallons in 2022, of which 21 billion have to be other than ethanol derived from corn starch. Figure 2 shows the recent increases in commodity prices from their lows in the beginning of 2009. Rising commodity prices have varied implications for agriculture in the U.S. and the Rockies.

In all of the Rockies states except Idaho, net cash income per acre has been below the average for the U.S. since 1950. This can be attributed to the higher expenses born by Rockies farms compared to the rest of the U.S. As presented in Figure 3, data for 2007 show that expenses per value of agricultural product are generally higher in the Rockies states than in the U.S. as a whole. Compared to other regions, the Rockies region is drier, often requiring more fertilizer and chemicals to produce the same amount of output per acre of farmland. Another reason is the large amount of farmland devoted to rangeland and pasture land, which are less profitable than concentrated cropland. In the Rockies, 74 percent of all farm acres were devoted to permanent pasture and rangeland, which did not include cropland and woodland pastured, compared to 44 percent in the U.S.[9]

Livestock Dependency in the Rockies

Fluctuations in net farm cash income since 1950, as shown in Figure 1, have been less pronounced in the Rockies region than in the U.S. Global trends in agriculture affect Rockies farms differently than the average U.S. farm partially due to the Rockies' focus on livestock production. As shown in Table 2 livestock products represent almost two thirds of the sales of an average farm in the Rockies. Between 2002 and 2007, livestock production grew in the U.S. and the Rockies. Sales of livestock products in the Rockies rose by 28 percent between 2002 and 2007, as shown in Table 3, compared to crops sales with a 13 percent increase. Meat animal, or beef sales represented the largest category of livestock production in the U.S. and almost all Rockies' states, except Idaho and New Mexico where dairy prevailed. Although poultry represented a small portion of total livestock sales, sales of poultry in the Rockies increased by around 42 percent while beef sales were stagnant. Sales of dairy products have also increased in the Rockies, increasing by 76% between 2002 and 2007.

Disparity between crops and livestock sales in the Rockies is seen across most of the eight states. While Arizona and Montana have diverse sales, Colorado, New

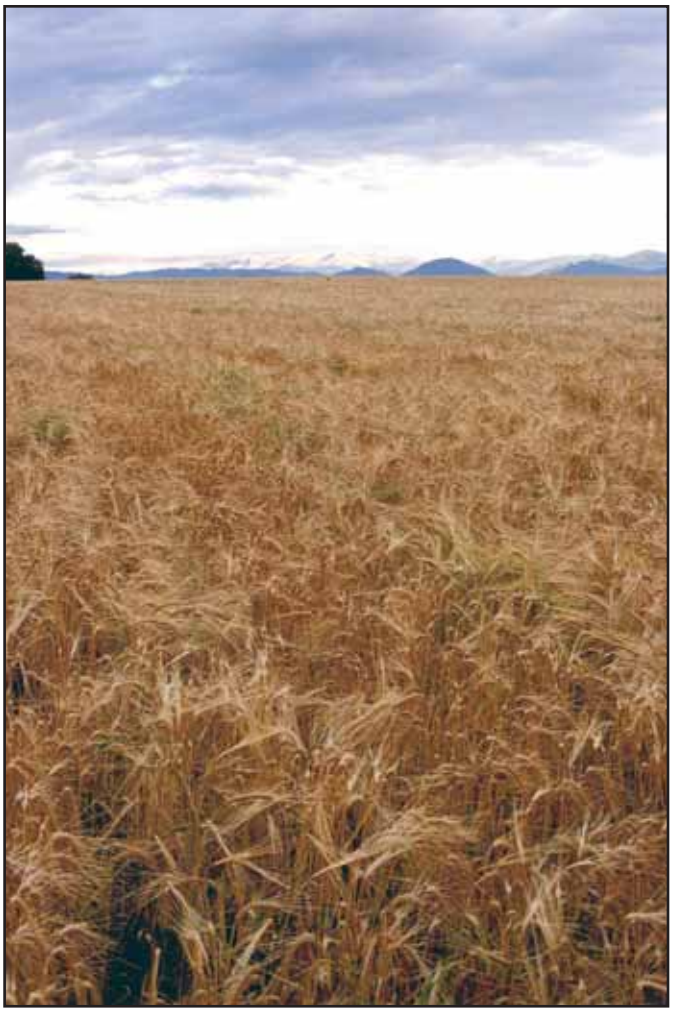


Photo: USDA-NRCS

Figure 2:
Selected Commodity Prices, U.S.,1999 - 2009
Source: CIA World Factbook, 2009
(Adjusted for Inflation)

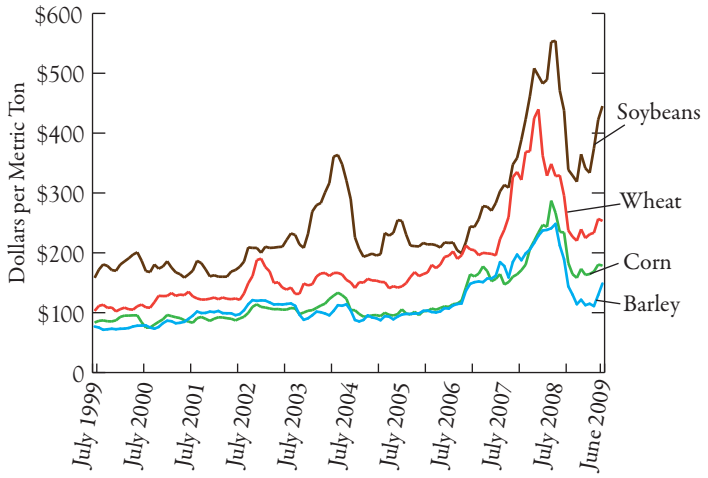
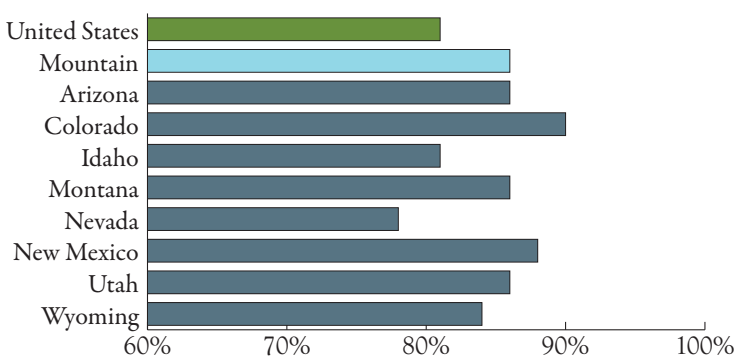


Figure 3:
Production Expenses per Value of Product Sold, 2007
Source: USDA Census of Agriculture, 2007



Mexico, Utah, and Wyoming have sales in livestock that are almost two times higher than their crop receipts (Table 2). Meat animal sales decreased between 2002 and 2007 in Arizona, Colorado, Utah, and Wyoming. For their livestock sales, these states relied on poultry, eggs, and dairy which increased in sales between 2002 and 2007 (Table 3). The large proportion of livestock sales in total agricultural production in the Rockies indicates the increasing economic significance of livestock in the region. Such dependency on livestock raises concerns for agriculture in the Rockies today.

Increased commodity prices (Figure 2) translate into higher feed expenses for livestock producers, putting pressure on livestock farmers. To purchase grain, Dean Horton, owner of the fifth largest dairy farm in the U.S. located near Hatch, New Mexico, contends with the global movement toward biofuels.[10] In addition, weak demand for dairy since 2008 has depressed prices for milk products. The USDA projected a 35 percent decline in dairy cash receipts in 2009.[11] American meat producers were compelled to reduce the size of their herds by the rising feed prices in 2008. While domestic demand for beef has plummeted, exports of American beef remained strong in 2008, driven by the weak U.S. dollar. International markets provide some support for beef prices, which have risen since the beginning of 2009 (Figure 4).[12] Despite the increased expenses for beef producers, low demand for beef resulted in only a 24 percent increase in beef prices between 2007 and 2008. By comparison, prices for corn rose by around 100 percent in the same period. The faster growth rate of input prices compared to output prices for beef producers will continue to erode their profits. The Economic Research Service predicts sales of cattle and calves in 2009 to be lower than the ones in 2008 by $5.5 billion in the U.S. [13] Poultry producers face more favorable economic conditions. One pound of dry chicken requires five pounds of dry feed material compared to beef which requires three times as much. [14] Thus, increases in feed expenses will have a lower impact on poultry producers. However, reduced demand associated with the financial recession is keeping prices down (Figure 4). The projected sales of poultry in 2009 are expected to decrease from 2008 levels by around $4 billion.[15]

Table 2:
Average Income by Source, in Dollars per Farm, 2007

		United States	Rockies	Arizona	Colorado	Idaho	Montana	Nevada	New Mexico	Utah	Wyoming
Value of crop production		$68,411	$57,809	$117,492	$58,446	$95,309	$43,434	$68,379	$33,586	$23,634	$18,141
Percent of Total Crop Sales	Food grains	8%	20%	2%	19%	19%	64%	3%	5%	9%	10%
	Feed crops	28%	28%	12%	38%	26%	17%	67%	32%	53%	50%
	Vegetables	13%	29%	64%	14%	36%	7%	24%	20%	4%	8%
	Oil crops	15%	0%	0%	1%	0%	1%	0%	1%	1%	0%
	Other crops, home consumption and value of inventory adjustment	35%	23%	22%	28%	18%	12%	6%	41%	33%	32%
Value of livestock production		$62,646	$94,204	$103,522	$117,395	$131,162	$46,668	$92,753	$109,843	$58,670	$69,841
Percent of Total Livestock Sales	Meat animals	47%	59%	45%	80%	34%	76%	76%	42%	45%	107%
	Dairy products	26%	35%	50%	12%	62%	4%	36%	59%	33%	3%
	Poultry and eggs	24%	3%	2%	5%	0%	1%	0%	1%	14%	0%
	Miscellaneous livestock, home consumption and value of inventory adjustment	4%	2%	2%	1%	3%	4%	6%	1%	5%	5%
Other Farm-related income		$18,264	$24,491	$39,134	$22,698	$23,375	$24,199	$40,229	$13,436	$27,320	$25,474
Total value of agricultural sector production		$149,321	$176,504	$260,148	$198,539	$249,846	$114,301	$201,361	$156,865	$109,624	$113,457

Source: USDA Census of Agriculture, 2007
Note: Totals may not equal 100% because farmers have sold more or less than what they have actually produced during the year. "Meat animals" for example represents the sales of beef. Whereas the total category "value of livestock production" represents the annual production.

In the Rockies, high prices of feed and lower livestock sales will predominantly affect New Mexico, Utah, and Wyoming where livestock represents the largest portion of agricultural sales compared to other states in the Rockies.

Crops Sales and Other Income

On the other hand, rising commodity prices have a positive effect on crops sales, which have risen by 49 percent in the U.S. since 2002 (Table 3). By comparison, crops sales increased by 13 percent in the Rockies region. Rockies' farms grow less oil crops (primarily less soybeans) and more vegetables than the average American farm (Table 2). Soybean prices grew by around 170 percent from 2006 to the middle of 2008 (Figure 2) and contributed to a 46 percent increase in oil crop sales in the U.S. between 2002 and 2007 (Table 3). The lack of soybean sales in the Rockies, however, prevents farms in the region from capturing the rise in prices. Rockies' farms also sell less corn. In 2007, a farm in the Rockies sold $5,000 worth of corn on average compared to $18,000 for an average farm in the U.S.[16] Lower levels of corn production in the Rockies explain why

feed crop sales increased by only 26 percent in the Rockies compared to 71 percent in the U.S. between 2002 and 2007. Nevada, Utah, and Wyoming largely rely on feed crop sales for their crop income. However, the average farm in these states sells from $800 to $2,300 in corn, below the averages for the U.S. and the Rockies. [17] Such underrepresentation of corn will make it hard for these states to capture the growth in corn prices. Vegetables, the fourth largest product group in sales in the Rockies (Tables 2 and 3), underwent an overall decline in the region while the number of vegetable acres harvested increased by 180 percent from 2002 to 2007.[18] This spike in supply has not met a reciprocal rise in demand except in Montana where, despite a high rise in the acres harvested, sales more than doubled. Arizona is the only state that suffered a decrease in both crops and livestock sales. The drop in crops sales was mostly due to a decrease in the sales of vegetables, which make up a large portion of Arizona's crops receipts. In Arizona, the number of farms which harvested vegetables increased by 860 percent between 2002 and 2007 while acres harvested rose by two percent. [19] This phenomenon most likely occurred due to existing farms trying to diversify their products and small new farms entering vegetable production.

Farm-related income, other than income from the production of crops and livestock, has increased by more than income from sales, indicating the growing importance of alternative sources of income for farmers (Table 3). This category includes income from agricultural recreation, sale of forestry products, machine hire, custom work, and rental value of farm dwellings. While Arizona farms suffered losses in conventional farm income, the state ranked second in farm-related income. Rental value of farm dwellings, which represented the largest portion of farm-related income in the U.S. and the Rockies, rose considerably. The growing rental value is reflected in rising demand for agricultural land, driven by farmers seeking to expand their operations, the increased efficiency of agricultural production, and development possibilities of the land.[20]

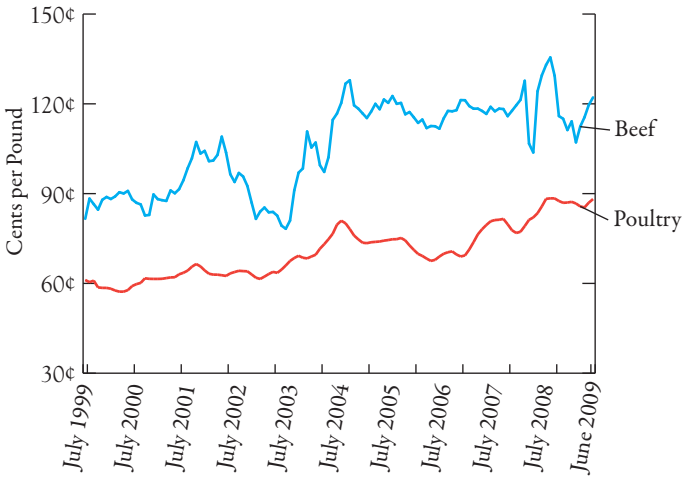
Table 3:
Average Income by Source, Percent Change 2002 - 2007

	United States	Rockies	Arizona	Colorado	Idaho	Montana	Nevada	New Mexico	Utah	Wyoming
Total value of agricultural sector production	45%	24%	-20%	20%	40%	48%	38%	31%	34%	11%
Value of crop production	49%	13%	-38%	39%	15%	59%	36%	8%	52%	40%
Food grains	82%	65%	-8%	100%	46%	84%	431%	109%	114%	85%
Feed crops	71%	26%	17%	29%	45%	1%	54%	1%	44%	15%
Vegetables	13%	-18%	-46%	-26%	5%	124%	21%	-18%	-20%	17%
Oil Crops	46%	-4%	-79%	22%	-2%	-2%	0%	-43%	151%	-16%
Value of livestock production	43%	28%	-1%	15%	63%	35%	26%	41%	15%	1%
Meat animals	31%	1%	-28%	-4%	10%	8%	44%	31%	-15%	-4%
Dairy products	67%	76%	32%	75%	120%	40%	90%	53%	53%	188%
Poultry and Eggs	49%	42%	25%	70%	14%	76%	-6%	-2%	19%	15%
Other Farm-related income	37%	35%	14%	5%	55%	54%	81%	24%	81%	23%

Source: USDA Census of Agriculture, 2007

Figure 4:
Selected Commodity Prices, U.S.,1999 - 2009

Source: CIA World Factbook, 2009
(Adjusted for Inflation)
Note: This table was created in before July 2009 data were available.



Rising Expenses

Farm expenses have in recent years risen due to dramatic increases in input prices, especially of fuel and fertilizer (Figure 5). The impact of this increase is mostly felt by crop farms, which require more of these inputs compared to livestock farms. Increases in input prices have encouraged many American farmers to employ cost-saving strategies. In 2007, around 34 percent of all farms in the U.S. reduced fuel expenses by regularly servicing engines, while 24 percent reduced trips over a field, and 20 percent reduced quantity used. [21] To reduce fertilizer expenses, 30 percent of all farms reduced the quantity used, and 23 percent conducted soil tests to ensure fertilizer efficiency. Others negotiated price discounts and used more precise technologies.[22]

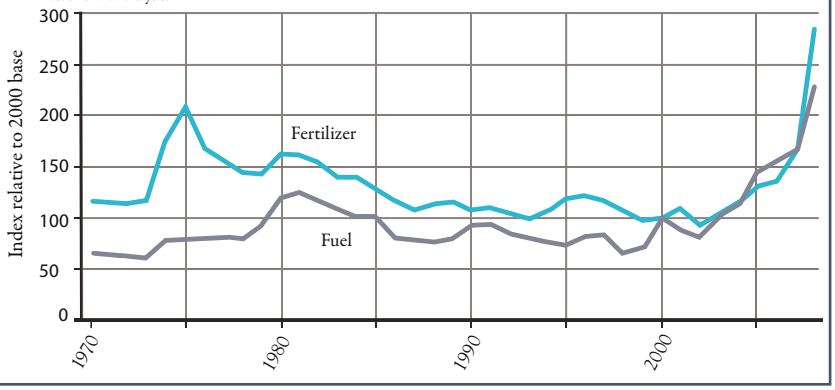
The average farm in the U.S. as well as in the Rockies faced increases in expenses over the last five years for which data are available, mostly for feed, fuel, and contract labor (Table 4). Purchases of livestock and poultry decreased between 2002 and 2007 in Arizona and Idaho, a sign of pressure on livestock producers in these states. Rockies' farms also spent less on seeds. Combined with rising seed prices, this indicates a reduction in the number of seeds purchased, which is likely to result in a decrease in crops sales in the long-term. Despite increased total spending, Table 5 shows net farm income grew both in the U.S. and the Rockies between 2002 and 2007. In 2007, the average net farm income was higher by around $2,500 in the Rockies than the U.S., indicating comparatively favorable economic conditions. Farm income, however, rose by only

Figure 5:

Prices Paid Indices for Fuels and Fertilizers, 1970-2008

Note: 2008 forecast. Fuel index reflects annual average of real prices paid for diesel, gasoline/gasahol, and LP gas. Fertilizer index relects annual average of real prices paid for mixed fertilizers, nitrogen, potash, and phosphate. Real prices calculated using implicit GDP price deflator with 2000 as base year (2000 = 100).

Sources: J. Michael Harris, et al., Agricultural Income and Finance Outlook (Economic Research Service, USDA, 2008). USDA, National Agricultural Statistics Service and U.S. Department of Commerce, Bureau of Economic Analysis.



45 percent in the Rockies compared to 112 percent for the U.S. The focus on livestock and the low amounts of corn and soybean sales in the Rockies could drive the net income below average American levels as feed and oil crop prices continue to increase.

Additional Factors Affecting Farmers' Net Income

Farms operate in many ways similar to other businesses. They require production inputs of land, labor, seeds, fertilizer, and other expenses, all of which must be subtracted from gross receipts in order to calculate the "bottom line" of net farm income. Table 6 depicts the process of measuring net farm income and compares the average farm's operation for the entire U.S. against the average for each of the Rockies states.

An often controversial dimension to agriculture is the role of government payments in helping farms operate and continue production. Direct government payments, or farm subsidies, were lower in the Rockies region in 2007. Subsidies represented around three percent of gross farm income in the U.S. and the Rockies.[23] Farm subsidies decreased between 2002 and 2007 (as shown in Table 5) due to a large drop in payments since 2006, when food prices started heading upwards.

An increase in average property taxes has followed the increase in land values. The share of property taxes is almost the same in the U.S. and the Rockies, but they increased by around 40 percent for both regions between 2002 and 2007 (Table 5), indicating increased obstacles for beginning operators. Capital consumption in 2007 was higher in the Rockies due to the larger average farm size in the Rockies of 1,500 acres, compared to the U.S with 400 acres per farm.[24] Farms in the Rockies contributed a higher net value added to the national economy than the average American farm in 2007 despite having seen a smaller increase in this value since 2002 (Table 5). Arizona and Wyoming are the only Rockies states where the net value added declined. In Arizona, drops in agricultural production caused the observed trend. Wyoming's low profit margins, which were the lowest across the Rockies, affected its value added.

Employee compensation (Table 6) was also higher in the Rockies where vegetables, which are more labor intensive than other crops, made up a higher portion of crops sales. Employee compensation increased in all Rockies' states except Arizona (Table 5), indicating expansion of agricultural practices and production of more labor-intensive products such as vegetables. Landlords received lower payments on average in the Rockies than in the U.S. Payments to landlords decreased between 2002 and 2007 both in the

Table 4:
Average Farm Input Expenses, Dollar Percent Change 2002 - 2007

	United States	Rockies	Arizona	Colorado	Idaho	Montana	Nevada	New Mexico	Utah	Wyoming
Purchased inputs	35%	19%	-11%	10%	32%	23%	34%	32%	25%	14%
Feed purchased	48%	42%	18%	28%	79%	5%	50%	51%	33%	20%
Livestock and poultry purchased	26%	7%	-21%	1%	-24%	39%	49%	32%	25%	23%
Seed purchased	29%	-11%	-33%	-14%	-1%	-5%	-2%	-15%	-8%	-16%
Fertilizers and lime	68%	25%	-2%	14%	46%	27%	43%	22%	36%	13%
Petroleum fuel and oils	90%	66%	25%	61%	82%	81%	83%	60%	74%	60%
Contract labor	35%	53%	5%	46%	86%	79%	83%	60%	73%	58%
Other expenses	17%	5%	-28%	1%	20%	16%	17%	11%	14%	0%

Source: USDA Census of Agriculture, 2007

Table 5:
Selected Financial Variables, Percent Change 2002 - 2007

	United States	Rockies	Arizona	Colorado	Idaho	Montana	Nevada	New Mexico	Utah	Wyoming
Net farm income	112%	45%	-39%	84%	71%	275%	63%	48%	69%	-22%
Net rent received by nonoperator landlords	-11%	-45%	-37%	-81%	-23%	-24%	25%	-25%	-26%	-146%
Net value added	58%	26%	-33%	41%	44%	83%	39%	28%	38%	-15%
Property taxes	40%	42%	7%	38%	59%	53%	56%	36%	48%	35%
Direct Government payments	-7%	-21%	-14%	-20%	-28%	-7%	-12%	-23%	-37%	-56%
Employee compensation (total hired labor)	11%	7%	-17%	4%	19%	14%	17%	2%	11%	1%

Source: USDA Census of Agriculture, 2007

U.S. and the Rockies despite rising land prices. Farmers in the U.S. and the Rockies own an increasing portion of the land they operate on. The overall increases in net farm income in 2007 show the expansion of the average farm both in the U.S. and the Rockies.

Farm Net Cash Income in the Rockies: A Closer Look

Despite the expansion of farming operations, there is variability in farms' financial health across the region. Figure 6 shows that on average around eight percent of all counties in the Rockies region suffered negative farm cash income in 2007, largely clustered in the Four Corners region in the southwest. Net cash income is a measure of the funds available to a farm operator to meet family living expenses, purchase farm assets, and pay off debt. The number of farms having net losses rose by 23 percent in the Rockies region between 2002 and 2007, more than in any other region. By comparison, the number of farms with net losses in the U.S. rose by three percent in the same period.[25]

Table 7 focuses on the top and bottom five counties in the Rockies regarding net cash income per farm. Highest losses were observed in Santa Cruz, Arizona, and the Colorado counties of Summit, Teller, Ouray, and Park, where the losses amounted to more than $10,000. Highest positive net cash income was found in Yuma, Arizona, with around $650,000, followed by La Paz, Arizona, and the Idaho counties Gooding, Cassia, and Lincoln. Table 7 describes these counties by the distribution of their farmland, economic dependency, and county population growth rate. According to this sample of 10 counties, farmland dominated by rangeland affects net income negatively. Counties specializing in crops, on the other hand, were among the most profitable. County population growth rate maintains a negative relationship with farm net cash income. As a county's population grows, land prices increase, more irrigation water is demanded for municipal uses, and demand for land from development projects puts pressure on farmers.

The Challenge of Credit

Apart from rising expenses, the lack of credit to finance farm operations is another challenge that farmers in the U.S. and the Rockies face today. In 2009, farmers, especially dairy operations in Colorado, were hard hit by the closure of the New Frontier Bank in Greely, Colorado. Dairy farmer Les Hardesty said that the bank financed 30 percent of the purchase of dairy cows in the state.[26] In June 2009, Colorado Senators Mark Udall and Michael Bennet urged the House and Senate Appropriations Committees to help American farmers by making more loans available through the Farm Service Agency, a lender of last resort. Secretary of Agriculture Tom Vilsack announced in July 2009 the implementation of the Dairy Export Incentive Program.[27] Through this program, exporters of dairy products will receive direct cash support.

Table 6:
Financial Operation of the Average Farm, Dollars Per Farm, 2007

Equation	Variable	United States	Rockies	Arizona	Colorado	Idaho	Montana	Nevada	New Mexico	Utah	Wyoming
	Value of crop production	$68,411	$57,809	$117,492	$58,446	$95,309	$43,434	$68,379	$33,586	$23,634	$18,141
+	Value of livestock production	$62,646	$94,204	$103,522	$117,395	$131,162	$46,668	$92,753	$109,843	$58,670	$69,841
+	Other Farm-related income	$18,264	$24,491	$39,134	$22,698	$23,375	$24,199	$40,229	$13,436	$27,320	$25,474
=	Value of agricultural sector production	$149,321	$176,504	$260,148	$198,539	$249,846	$114,301	$201,361	$156,865	$109,624	$113,457
-	Purchased inputs	$77,726	$98,148	$137,054	$122,541	$128,257	$57,316	$103,625	$92,374	$57,260	$72,680
+	Direct Government payments	$5,398	$5,139	$5,940	$5,351	$4,765	$8,747	$3,322	$3,188	$2,218	$3,154
-	Motorvehicle registration and licensing fees	$275	$351	$243	$353	$414	$428	$388	$275	$289	$369
-	Property taxes	$4,449	$4,672	$4,470	$4,668	$5,729	$7,016	$5,407	$1,945	$2,110	$5,134
=	Gross value added	$72,269	$78,473	$124,322	$76,328	$120,211	$58,289	$95,263	$65,459	$52,183	$38,428
-	Capital consumption	$12,197	$13,823	$17,242	$12,671	$15,816	$15,450	$22,192	$7,684	$13,876	$13,148
=	Net value added	$60,072	$64,650	$107,079	$63,657	$104,395	$42,839	$73,070	$57,775	$38,307	$25,280
-	Employee compensation (total hired labor)	$9,895	$13,954	$30,605	$13,334	$19,358	$6,278	$23,070	$11,544	$9,129	$9,885
-	Net rent received by nonoperator landlords *	$3,994	$1,198	-$5,388	$245	$4,996	$3,304	$1,478	$1,329	$955	-$646
-	Real estate and non real estate interest	$6,827	$7,550	$7,601	$8,469	$9,780	$7,473	$7,330	$5,771	$4,286	$7,858
=	Net farm income	$39,356	$41,949	$74,261	$41,609	$70,261	$25,783	$41,193	$39,131	$23,936	$8,183

Source: USDA Census of Agriculture, 2007
* Negative values indicate rent payments to operator.

The Impact of Commodity Index Funds

Among other reasons for the commodity price spikes in 1970 and 2007 was futures market speculation.[28] The futures market allows farmers to sell a contract for the future delivery of an agricultural product. Such trading has existed since the mid 19th century and has been central to the economic stability of farmers in the U.S. Before futures contracts were introduced, when farmers traded their products on the spot, the seasonality of grain production brought risk and lowered farmers' gains. Their products would enter the market all at once shortly after the time of harvest and depress prices. Trading futures thus guarantees grain producers a stable and higher price for their products throughout the year and stabilized feed price for livestock producers. Financial institutions and individual investors trade agricultural products through commodity index funds. These are investment instruments which bundle agricultural and non-agricultural commodities together. They are favorable to investors and mutual funds because the various commodities diversify risk. Recently the activity in such futures markets has increased.[29]

According to the Institute for Agriculture and Trade Policy, large financial institutions now dominate the futures market in agricultural products. Commodity index funds controlled around 4.5 billion bushels of corn, wheat, and soybeans in 2008.[30] On the Chicago Mercantile Exchange these funds made up 47 percent of futures contracts in live hog, 40 percent in wheat, 36 percent in live cattle and 21 percent in corn in 2007.[31]According to a report on commodity market speculation, investment in these funds drives food prices up. On the other hand, when the holders of such funds decide to sell them to take their profits, prices decline. Such cycles of buying and selling commodity funds create volatility in the market and present risk for food producers and food processors. Increased demand for futures contracts on agricultural products by the index funds artificially increases their prices compared to prices on the spot. As a result, food processors will accept fewer futures contracts from farmers and buy on the spot instead. Thus, farmers experience increased risk associated with higher commodity prices because they cannot fully capture the increase in prices or use futures contracts and hedge the risk. Cotton farmer Jon Post in Marana, Arizona, said in an interview that commodity index funds have been a big problem for agriculture.[32] On April 17, 2009, farmers and activists protested in front of Chicago Mercantile Exchange demanding more regulation on investment banks. Kevin McNew, president of Cash Grain Bids Inc., a resource for grain market information, in Bozeman, Montana, noted that it is hard for grain businesses to operate when the spot prices are so far below the futures price.[33]

Size of Farms and Polarization

The number of farms in the U.S. rose by almost four percent between 2002 and 2007 while in the Rockies region the number of farms rose by 19 percent.[34] A separation of farms by categories of size (Figure 7) shows that in the U.S. and the Rockies this rise is largely due to an increase in the number of large-scale operations with annual sales over $500,000. The number of small farms (having sales of less than $2,500 per year) also rose in the U.S. and most states in the Rockies region. Middle-sized farms (these with annual sales between $50,000 and $100,000), however, seem to be following a different trend. In the U.S. and several Rockies' states the number of these operations decreased between 2002 and 2007. In other states, the number of middle-sized farms rose by noticeably less than the numbers of large- and small-scale operations. A report on the disappearing middle argued that middle-sized operations are at risk.[35]

A polarization in the agricultural sector occurs naturally under the current trends. The movement toward eating healthy and local food, preserving the land, and reducing water pollution has resulted in the occurrence of direct producer-to-consumer markets for value-added products such as local foods, organics, and natural foods. Small farm operations have successfully adapted to this market.[36] Small operations are flexible and innovative in terms of production and can meet highly diversified demands. Such markets allow farms to receive the full retail price of their products. Middle-sized farms have a harder time adapting to such markets because of the high labor requirements, as noted by Arizona cotton farmer Jon Post.[37] On the other hand, large operations, which produce the highest portion of agricultural products, have expanded and become more specialized. They have gained significant buyer and seller power and taken advantage of the latest technological changes. Frederick Kirschenmann, director of the Leopold Center for Sustainable Agriculture, suggested that large commodity buyers, in an effort to reduce transaction

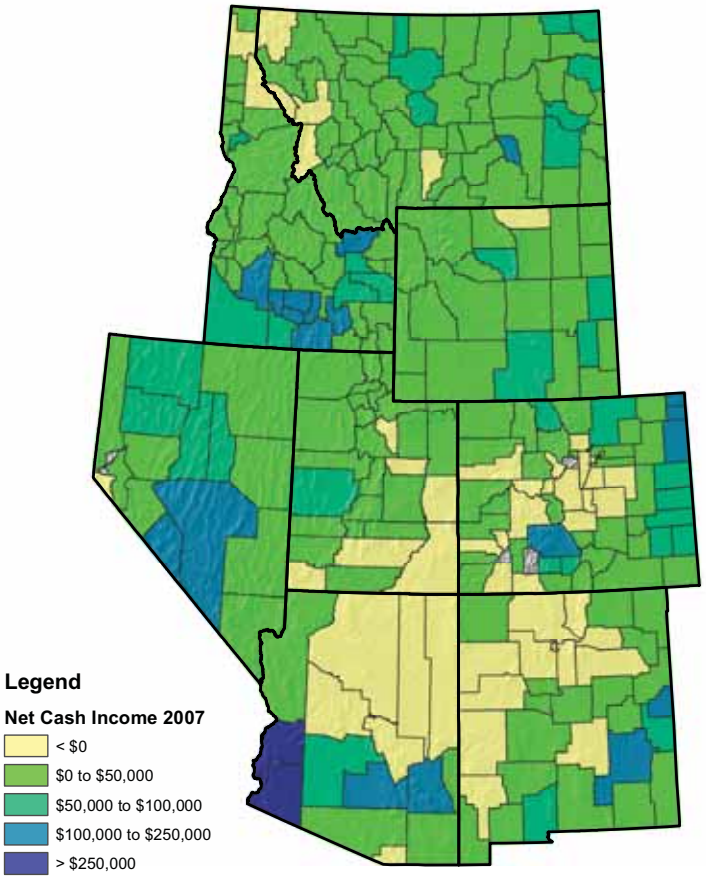
Table 7:
Top Five and Bottom Five Counties According to Net Cash Income Per Farm, 2007

County	Net cash income per farm (dollars)	Cropland, percent of total farm acres	Pastureland, percent of total farm acres	Economic dependence code*	County population growth rate (2002 - 2007)	Average population growth rate (2002 - 2007)
Top 5						
Yuma AZ	$653,151	92%	(D)	4	14%	
La Paz AZ	$308,532	(D)**	(D)	6	6%	
Gooding ID	$231,687	60%	31%	1	0%	1.6%
Cassia ID	$224,870	58%	37%	1	-4%	
Lincoln ID	$165,862	58%	35%	1	-8%	
Bottom 5						
Santa Cruz AZ	-$16,927	6%	92%	4	9%	
Teller CO	-$13,102	12%	(D)	5	4%	
Summit CO	-$12,148	15%	74%	5	1%	7.4%
Ouray CO	-$11,740	11%	57%	5	15%	
Park CO	-$10,310	17%	59%	6	8%	

Source: USDA Census of Agriculture, 2007
*Economic-dependence county indicator. 1=farming-dependent 2=Mining-dependent 3=Manufacturing-dependent 4=Federal/State government-dependent 5=Services-dependent 6=Nonspecialized
** Data not available due to disclosure restrictions of the Agricultural Census

costs, tend to prefer larger producers.[38] Lower capital and flexibility in purchasing inputs and selling outputs are some of the challenges middle-sized operations face in competing with large farms.

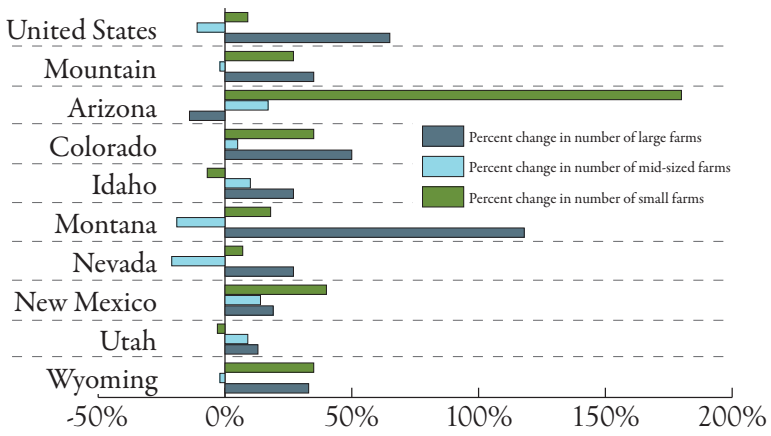
Figure 6: Average Farm Net Cash Income, 2007



Source: 2007 Census of Agriculture, National Agriculture Statistics Service, U. S. Department of Agriculture

Figure 7:
Change in Farm Size by Percent, 2002 - 2007

Source: USDA Census of Agriculture, 2007



Conclusion

The general perception that farmers are becoming increasingly wealthier due to rising commodity prices is highly questionable, especially in the Rockies region where livestock production prevails. While the profile of the average farm both in the U.S. and the Rockies shows increasing net farm income, a closer look reveals variability of farms' financial health. Livestock producers are threatened by increasing feed crop prices and low demand. Agricultural producers endure increasing risk caused by rising activity in the futures markets by big financial institutions. Rising input prices narrow farmers' profit margins, especially for middle-sized operations. Despite these alarming trends, rapidly changing consumer preferences for natural, organic, and local products provide new opportunities for small producers and new entrants to agriculture. New policies can be drafted to assist beginning farmers and small-scale producers in buying land to develop these new business opportunities. Immigration laws can be restructured so they help provide labor for middle-sized farms in their endeavors to capture the new organic and local markets.

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Case Study: Planting Subsidies - Impact of U.S. Government Policies on Farmers' Decisions

By Emil Dimantchev

Introduction

Farm subsidy policy is among the most hotly debated issues on Capitol Hill and in diners across America. Critics argue that subsidies concentrate on a few crops such as corn, wheat, and cotton and negatively impact food production and diversity. Author of "Omnivore's Dilemma," Michael Pollan, states that subsidies artificially drive food prices down for chosen crops like corn, impact people's diets, and even cause obesity.[1] Recent developments in farm policy have decreased subsidies' impacts on food production and prices but perhaps have not eliminated them altogether. The distribution of subsidies affects the competitiveness of small and beginning farms as well as farms which do not produce major subsidized crops such as corn or wheat. Aside from production, growing concerns for the environmental impact of farming have prompted the United States Department of Agriculture (USDA) to enact conservation subsidies which provide payments to farmers to retire and restore the land. With its focus on livestock production, the Rockies region receives less agricultural subsidy assistance from the government than other divisions in the U.S.

American agricultural income support policies were established in the 1930's to help farmers in a period of drought and the Great Depression.[2] Since then, income support policies have never ceased to exist. Analysis by the Environmental Working Group, summarized in Table 8, shows that between 1995 and 2006, $177.6 billion were spent on agricultural subsidies in the U.S., of which almost $8 billion were appropriated to the Rockies region. According to a publication of the USDA Economic Research Service (ERS), farm income is more variable than the income from other sectors in the U.S. economy. Thus, one of the major goals of subsidies is to provide income stability for farmers.

Total subsidies represent around three percent of gross farm income in the U.S. (Figure 8). In seven of the eight Rockies states, the contribution of subsidies to gross income is even smaller. The amount of subsidies that farms receive is most likely insufficient to cushion major shocks to the agricultural economy, but subsidies do provide benefits to farmers. Farm households which received subsidies in 2001 consumed more than households which did not receive payments.[3] Among the lowest income farm households, recipients' median consumption expenditures exceeded non-recipients' by roughly $2,500. For medium income households, the difference was larger, at around $9,000, while for farms in the highest income category there was no difference in household consumption. Government payments also have a positive effect on farm business survival, especially for large farms.[4] This effect of farm subsidies was reported to be small but statistically significant.[5]

Total agricultural subsidies are divided into three main categories: commodity subsidies, conservation payments, and disaster payments (Table 8). Commodity subsidies represent the largest portion of agricultural subsidies in the U.S. Such subsidies are targeted at farmers

Table 8:
Distribution of Subsidy Payments by Major Type, 1995 - 2006

	United States	Rockies
Total Subsidies ($) 1995-2006	$177.6 billion	$7.9 billion
Commodity Programs (percent of total)	79%	61%
Conservation Programs (percent of total)	13%	24%
Disaster Payments (percent of total)	9%	14%

Source: Environmental Working Group, 2009
Note: Some totals may not equal 100% due to rounding

who produce specific agricultural products or commodities. Commodity payments are meant to ensure a high price for farmer's products, directly support farm income through lump sum payments, and give American farmers an edge in international competition. By assisting domestic farmers, subsidies provide a degree of food independency and security. The preservation of rural landscapes and traditional American farming lifestyles are other benefits that these subsidies are meant to provide the public.

Additional data from the Environmental Working Group, presented in Table 9, show the major types of commodity subsidy programs by the amounts spent on each between 1995 and 2006. Fixed payments represent the largest portion of commodity payments in the U.S. and the Rockies region. These payments represent direct annual subsidies to producers of specific crops. The eligible commodities are barley, corn, grain sorghum, oats, other oilseeds, peanuts, rice, soybeans, upland cotton, and wheat. Fixed subsidies are based on the acreage and past yield. Thus, they are not based on current production, which is a way to decrease the impact of subsidies on farmers' production decisions. The counter-cyclical program provides payments to farmers whenever commodity prices fall below a predetermined level. Eligibility is based on historical production as it is for fixed payments. Counter-cyclical subsidies cover wheat, corn, grain sorghum, barley, oats, upland cotton, long- and medium-grain rice, soybeans, other oilseeds, dry peas, lentils, small and large chickpeas, and peanuts.[6]

The marketing loan assistance program is the second largest subsidy program in the U.S. Enrollment in this program allows farmers to take a loan while pledging their harvest as collateral. The loan amount is based on a loan rate defined in the legislation and the amount of commodity pledged. Before taking the loan, farmers have the option to take a loan deficiency direct payment instead, if current commodity prices are lower than the loan rate. When the loan is due, if food prices are below the loan rate for the commodity pledged, the producer has the option of repaying the loan by handing over the commodity, thus realizing a loan gain. The loan rates are determined according to current production unlike direct and counter-cyclical payments. This program covers wheat, corn, grain sorghum, barley, oats, upland cotton, extra-long staple (ELS) cotton, long- and medium-grain rice, soybeans, other oilseeds, peanuts, wool, mohair, honey, dry peas, lentils, and small and large chickpeas.[7]

The dairy program includes fixed and counter-cyclical payments for dairy producers. The graze-out payment program is the only commodity subsidy for livestock producers. Under this program, producers can receive a payment for grazing their cattle on wheat, barley, oats, or triticale instead of harvesting the crop. Dairy and livestock subsidies represent a small portion of total subsidies both in the U.S. and the Rockies. The significance of crops in commodity subsidy programs is not a positive

Figure 8:
Percent of Farm Gross Income from Subsidies, 2007

Source: Economic Research Service, 2009

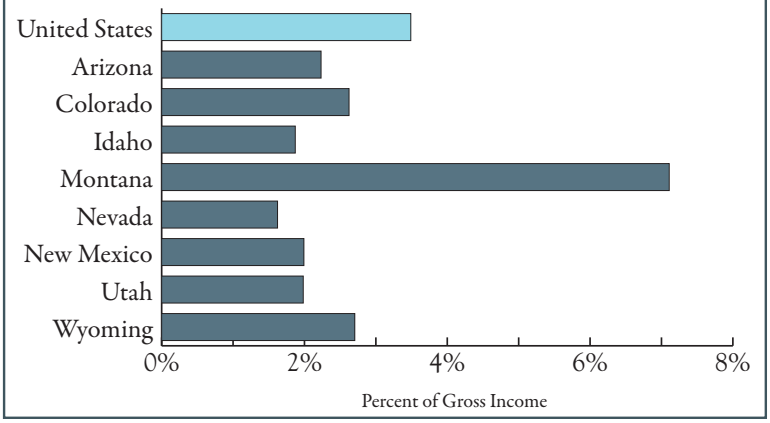


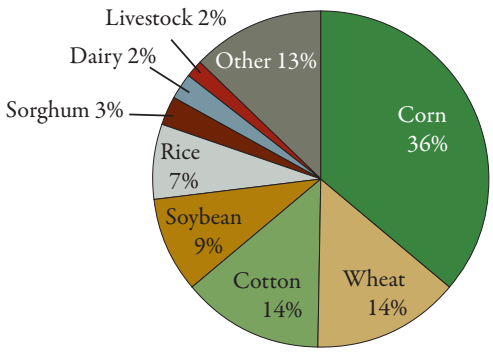
Table 9:
Distribution of Subsidy Payments by Type, 1995 - 2006

	Total commodity payments (millions of dollars)	Fixed payments	Counter-cyclical payments	Marketing loan assistance	Dairy program	Graze-out payment program	Other payments
United States	$140,219	41%	8%	29%	2%	< 0.1%	19%
Rockies	$6,908	53%	6%	16%	2%	< 0.1%	22%
Arizona	$907	47%	26%	9%	1%	< 0.1%	16%
Colorado	$1,781	52%	5%	21%	1%	< 0.1%	22%
Idaho	$1,354	52%	2%	18%	4%	< 0.1%	25%
Montana	$2,062	62%	1%	14%	0%	< 0.1%	23%
Nevada	$22	44%	2%	7%	14%	< 0.1%	33%
New Mexico	$435	46%	12%	15%	5%	< 0.1%	23%
Utah	$178	42%	2%	13%	13%	< 0.1%	30%
Wyoming	$167	46%	2%	16%	1%	< 0.1%	35%

Source: Environmental Working Group, 2009

Figure 9:
Subsidy Distribution, United States, by Commodity, 1995 - 2008

Source: Environmental Working Group, 2009



Note: "Other" includes: apricot, cane sugar, cotton seed, crambe, peach, pear, poultry, rice, rye, sesame, tobacco, tomato, triticale, mustard seed, flax, tree, rapeseed, saffower, soybean, honey, mohair, canola, apple, oat, potato, sunflower, sheep meat, peanut, and wool subsidies

aspect for livestock producers in the Rockies who produce two thirds of the total agricultural products of the Rockies region.[8]

Public Criticism of Agricultural Subsidies

Subsidy programs in the U.S. have been most highly criticized for distorting agricultural markets by altering the flow of information upon which producers and consumers make decisions. Producers decide to grow crops based on the amount of subsidies rather than expected market demand or production efficiency. According to standard economic theory, subsidies also encourage farmers to grow higher quantities than the market demands and, thus, lead to overproduction as well as fluctuating food prices. By increasing production for crops which are included in the program, subsidies encourage farmers to grow only specific crops. Therefore, prices for certain food products fall and draw consumers toward them. Other agricultural products are produced less domestically and increase the need for imports, which might raise their prices.

The Federal Agriculture Improvement and Reform (FAIR) Act of 1996[9] addressed these issues by "decoupling" subsidies, or basing them on historical production. Examples of such subsidies are fixed and counter-cyclical payments. The Organization for Economic Cooperation and Development (OECD) defines fully decoupled subsidies as payments that do not influence the production decisions of famers who receive them. If farmers' production decisions are not influenced, prices and the diets of consumers are also not going to change. Some scholars, however, argue decoupled payments influence farmers indirectly, by reducing or eliminating economic risk.[10] One study estimated that by reducing a farmer's risk, every dollar in decoupled payments increases corn acreage by 0.012 acres.[11] Another study estimated the cumulative effect of decoupled payments on production through risk aversion, credit constraints, and wealth effect. Corn, soybean, and wheat production increase by 0.034, 0.024, and 0.033 acres, respectively, with each dollar given out as decoupled subsidies.[12] The study also found that each dollar in fixed payments reduces land retirement by 0.33 acres. Another study,[13] however, focused on the risk attitude of farmers and the effects of decoupled fixed payments and reported that the effects are very small in magnitude and statistically insignificant. Another paper also reported no impact, arguing that such subsidies, which represent 50 percent of all subsidies in the U.S., most likely have little or no impact on farmers' production decisions and, thus, do not distort the market and do not provide false incentives for consumers.[14]

Another major source of subsidies, marketing assistance loans, remains linked to current production. These subsidies encourage farmers to grow more and increase

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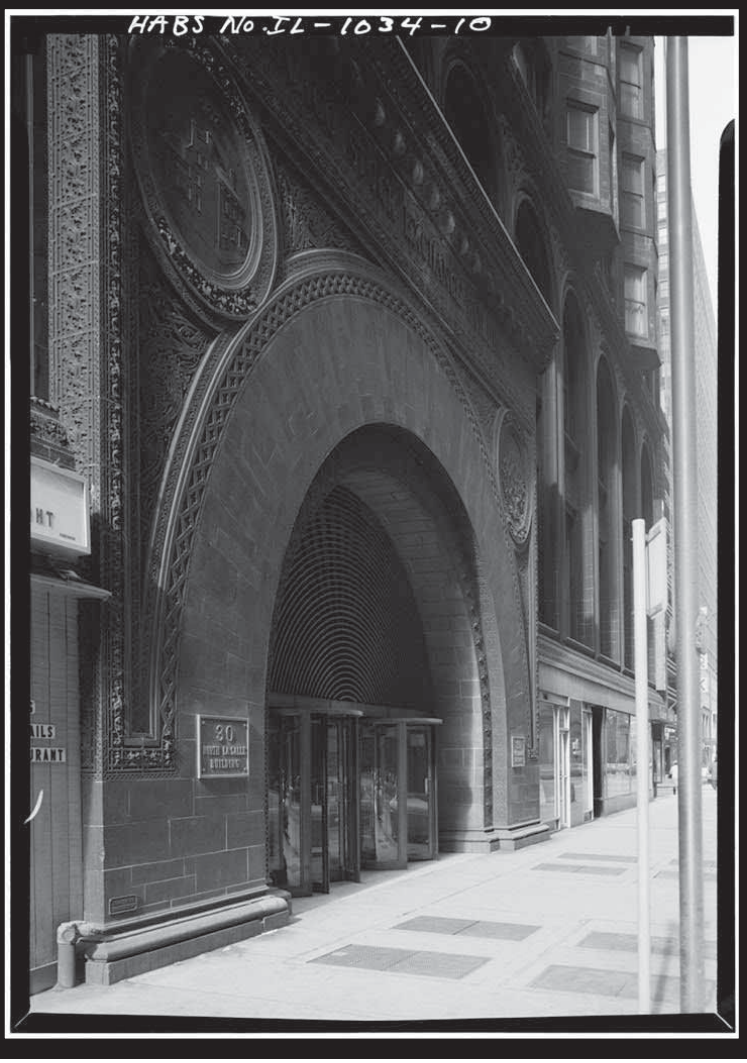


Photo by Cervin Robinson, 1963

Above: The Chicago Mercantile Exchange today, the site of commodities trading.
Right: The original Chicago Stock Exchange Building at 30 N. La Salle St., 1963.
Below: The grand crossing of railroads in Chicago, 1902.

supply.[15] Between 1999 and 2001 the program increased acreage for eight major field crops including corn, soybeans, rice, wheat, and upland cotton by two to four million acres.[16] By increasing production, the marketing assistance program also lowers the price of the food products it covers. To make space for increased field crops, crops which receive low or no marketing benefits see reduced acreage, lowering domestic use and exports while raising the prices of these products.[17] These effects occur mostly when food prices are below the program's loan rate because then farmers receive direct loan deficiency payments. The marketing assistance program accounted for almost 30 percent of all commodity subsidies in the U.S. for the period from 1995 to 2006. In the Rockies, money given out to farmers through this program amounted to 16 percent of all subsidies.

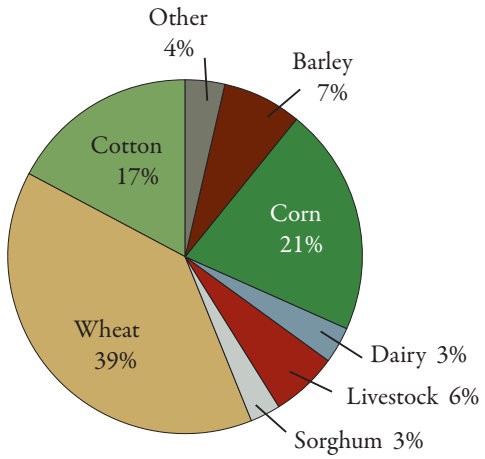
Land Values

Subsidies affect land values as they are reflected in the future expectations for returns from the land. A report on decoupled payments estimated that such subsidies account for an eight percent increase in land values.[18] Such an increase in land prices poses challenges to beginning farmers as well as smaller operations trying to expand.

Figure 10:

Subsidy Distribution, Rockies Region, by Commodity, 1995 - 2008

Source: Environmental Working Group, 2009

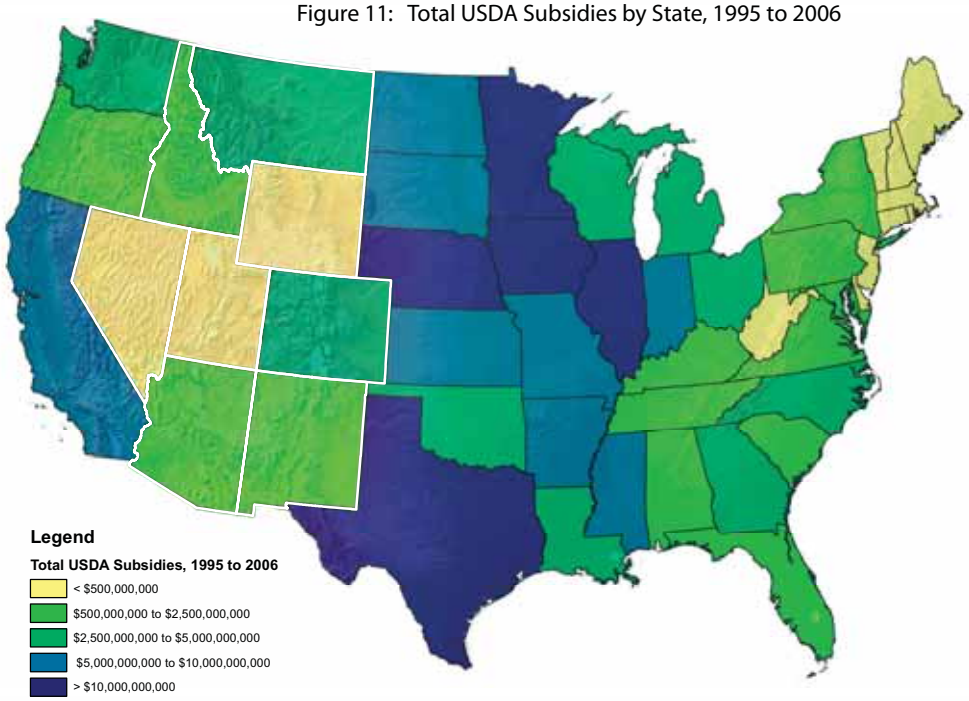


Note: "Other" includes: apple, canola, flax, honey, mohair, mustard seed, oat, peanut, potato, rapeseed, safflower, sheep meat, soybean, sunflower, triticale, and wool subsidies.
The following commodities were eligible for subsidies, but did not recieve payments during 1995 - 2008: apricot, cane sugar, cotton seed, crambe seed, peach, pear, poultry, rice, rye, sesame, tobacco, and tomato.

Consolidation – Larger Farms

Concerns about the economic competition of farms are also raised because of the distribution of subsidy payments to the largest farms. In the U.S. 10 percent of all farms received 74 percent of all subsidies given out between 1995 and 2006. The top 10 percent of recipients received $130 billion in total or roughly $400,000 per farm.[19] In 2007, 56 percent of all government subsidies, excluding those oriented toward conservation programs, went to the category of largest farms (those with annual sales of more than $250,000). These farms represented nine percent of all farms which received these subsidies in 2007.[20] In comparison, farms with sales less than $5,000 represented 60 percent of all recipients and received around 10 percent of the subsidies. While the 1996 FAIR act sought to address this issue by placing limits on the subsidies that an individual may receive per farm and per property, some observers argue that loopholes in the legislation have allowed large farms to continue receiving the largest portion of the subsidies.[21] Farm owners have taken advantage of legislative weaknesses by dividing their farms into separate properties and having their employees gather subsidies for each separate property. Such concentration of subsidies in larger farms might prompt concentration of production as well. The Economic Research Service reported that higher subsidies in 1987 were associated with the higher concentration of crops in larger farms between 1987 and 2002.[22] An association does not demonstrate causality, however, and the ERS was uncertain as to whether

Figure 11: Total USDA Subsidies by State, 1995 to 2006



Source: Environmental Working Group, 2009

subsidies caused the concentration of food production in larger farms.

A Subsidy Diet

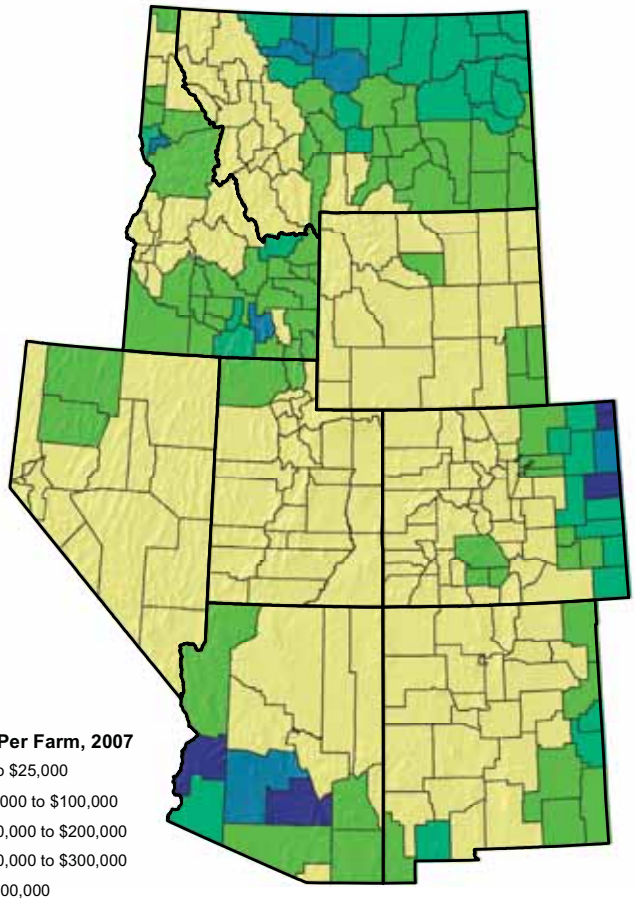
Commodity subsidies are not only concentrated in larger farms but also in certain crops according to research by the Environmental Working Group (Figure 9). In the U.S. corn producers have been the major recipients of commodity subsidies, receiving $56 million between 1995 and 2006. Other major categories in the U.S. include wheat and cotton. In the Rockies, as shown in Figure 10, the picture is not much different. Wheat, corn, and cotton producers are the major recipients of subsidies. Agriculture in the Rockies, however, is different than agriculture in other regions of the U.S., with its focus on livestock as well as vegetables. The subsidies for these products are eclipsed by the amount of subsidy that goes toward other crops. Although wheat is among the top five commodities in sales in the Rockies, the states of Arizona, Nevada, New Mexico, Utah and Wyoming rely mostly on other agricultural products.[23] Farms specializing in livestock, hay, and vegetables are economically important to these states, but might be facing more challenges compared to farms producing major subsidized crops such as wheat. Corn is among the top five commodities in sales only in Colorado but represents the second largest subsidized commodity in the region (See Figure 10). If marketing assistance loans encourage farmers to produce the products that receive the highest amount of subsidies, the current agricultural model of the Rockies might be threatened, transforming agricultural activity into a model based on national production trends. Federal agricultural subsidies are a "blunt" tool when assessed at the regional and state levels, often sending conflicting and contradictory signals which work against the best interests of the land and financial conditions of farm operation. In addition, as production moves towards commodities under the marketing assistance loan program, it makes them cheaper. All other products will have to be imported to satisfy domestic demand and will, thus, have higher prices. Such changes might affect consumer choice.

Table 10:
Top Five Subsidy Programs by Amount of Payments, 1995 - 2008

	1	2	3	4	5
United States	Corn Subsidies	Wheat Subsidies	Cotton Subsidies	CRP	Disaster Payments
Arizona	Cotton Subsidies	Wheat Subsidies	Disaster Payments	Corn Subsidies	Livestock Subsidies
Colorado	CRP	Wheat Subsidies	Corn Subsidies	Disaster Payments	Livestock Subsidies
Idaho	Wheat Subsidies	CRP	Barley Subsidies	Disaster Payments	Corn Subsidies
Montana	Wheat Subsidies	CRP	Disaster Payments	Barley Subsidies	Livestock Subsidies
Nevada	Disaster Payments	Wheat Subsidies	Livestock Subsidies	EQIP	Dairy Subsidies
New Mexico	CRP	Disaster Payments	Wheat Subsidies	Cotton Subsidies	Corn Subsidies
Utah	Disaster Payments	CRP	Wheat Subsidies	Livestock Subsidies	Dairy Subsidies
Wyoming	Disaster Payments	CRP	Wheat Subsidies	Livestock Subsidies	Corn Subsidies

Source: Environmental Working Group, 2009
Note: CRP: Conservation Reserve Program; EQIP: Environmental Quality Incentives Program

Figure 12: Total Farming Subsidies Per Farm by County, 2007



Source: Environmental Working Group, 2009

Total Subsidies in the U.S.

States in the Rockies region on average receive lower levels of subsidies compared to other divisions (Figure 11). Reasons include the fact that the Rockies region produces less of the major subsidized crops such as corn and wheat. An interesting differential pattern becomes clear when the top five types of agricultural subsidy programs from 1995 through 2008 are arrayed for the U.S. and each of the eight Rockies States (Table 10). The primary recipients of USDA crop subsidies are states in the Corn Belt as corn subsidies rank first in all agricultural payments in the U.S. Other main recipients are Texas and California for cotton subsidies. Focusing on the Rockies states a different pattern emerges. Disaster payments, Conservation Reserve Program payments, and wheat and corn subsidies rank first in one or more of the region's states. Several forces are at work in driving the types of subsidies ranking high in the various states. In the Rockies region, the largest subsidies were appropriated to Colorado and Montana between 1995 and 2006. Colorado and Montana had the largest numbers of

farms in 2007 with 37,000 and 30,000 farms, respectively. Average wheat bushels produced per farm in Colorado and Montana were the largest by state in the region with around 2,300 and 4,000 bushels harvested per farm, respectively.

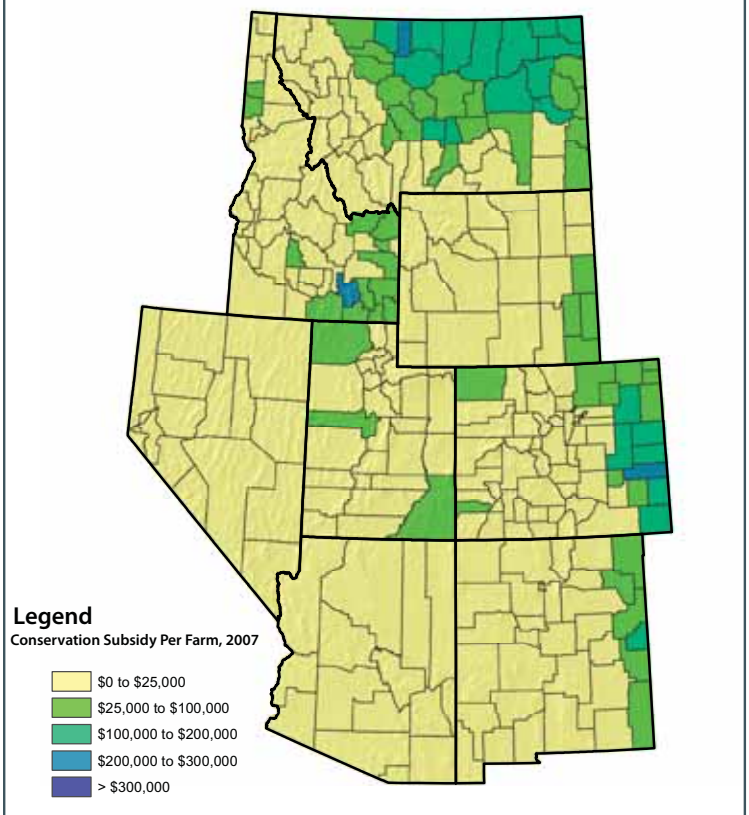
Total Commodity Payments per Farm in the Rockies

Analysis of agricultural subsidies among the 281 counties in the Rockies reveals an interesting pattern (Figure 12). Average commodity payments per farm were largest in northern Montana, the eastern plains of Colorado, southern Arizona, and eastern New Mexico. These regions contain a large number of agriculture-dependent counties. Counties are considered to be agriculture dependent if 15 percent or more of proprietors' annual receipts come from farming. Agriculture-dependent counties have larger farms than other counties. Of all farms in agriculture-dependent counties, 35 percent have 1,000 acres or more, compared to 17 percent of all farms in the Rockies region. Average net farm income in these counties is around $65,000, compared to the $30,000 average in the Rockies, and most counties in the eastern Rockies and Montana have 75 or more percent of their land in farmland.[24]

Conservation and Disaster

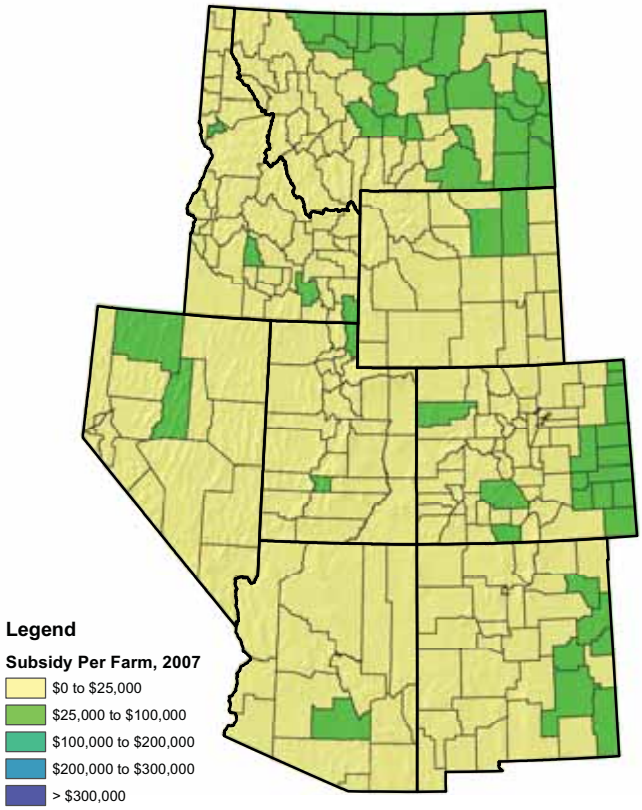
The Conservation Reserve Program (CRP) was established in 1985 to combat soil erosion on highly erodible land. Previous land retirement policies had been mainly based on concerns for productivity and supply management.[25] Today concerns for water and air quality, soil erosion's impact on river ecosystems, and wildlife habitat and open space preservation drive conservation programs. Through the CRP, farmers are paid to retire land and receive assistance of up the 50 percent of the cost incurred to establish conservation practices such as converting the land to native grasses, wild plants, and trees. Conservation payments have turned into an alternative source of income for farmers. In addition, open land preservation creates opportunities for farm tourism. Wildlife numbers were reported to have increased on CRP land, primarily for upland bird, waterfowl, and big game, which create further opportunities for hunting and additional farm income. The CRP program also reduces the loss of agricultural land to development projects by 50 percent.[26] Apart from these positive impacts on rural economies, a USDA report [27] suggested that land forgone for conservation and reduced agricultural production could have negative impacts on farm input suppliers and food processors. The same report also indicated that high enrollment in CRP was associated with net losses of jobs between 1986 and 1992 in some counties. These findings are inconclusive, however, as businesses involved in agriculture continued to contract throughout the 1990's and the trend of job losses did not persist after 1992, as noted in the report. The pattern of average CRP subsidies per farm in the Rockies counties is mapped in Figure 13. Conservation payments per farm have been largest in eastern plains counties in Colorado and New Mexico, as well as northern areas of Montana, all with high

Figure 13: Total Conservation Subsidies Per Farm by County, 2007



Source: Environmental Working Group, 2009

Figure 14: Total Disaster Subsidies Per Farm by County, 2007



Source: Environmental Working Group, 2009

concentrations of agriculture-dependent counties These counties have 75 percent or more of their land in farms and, thus, can most likely have significant environmental impacts.

Disaster Payments

Disaster programs assist farmers who encounter natural disasters from drought, flood, freeze, tornadoes, and other natural calamities. Livestock producers receive government assistance mostly through disaster payments. Under the Livestock Indemnity Program, the USDA appropriates payments to livestock producers in cases of livestock deaths due to adverse weather events. The Livestock Compensation Program compensates livestock producers who suffer from feed losses or incur additional feed costs due to adverse weather. *The Washington Post* reported that the USDA encourages disaster declarations for counties which have not had disasters.[28] According to the article, livestock disaster payments were given out without assessment of actual damages but only based on the number of livestock owned by the farmer. When sweet potatoes became eligible for crop insurance, planting quadrupled, and crop failures surged. Farmers were said to be purposely growing sweet potato crops on unsuited land and skimping on all crop production costs simply to collect generous crop insurance and disaster aid, a practice referred to as "farming your insurance." [29] In the Rockies average disaster payments are concentrated in eastern Colorado, eastern New Mexico, and Montana, where, as noted above, most counties are dependent on agriculture and have 75 percent of their land in farms (Figure 14). Eastern Colorado, eastern New Mexico, and southern Arizona are prone to wildfires, while blizzards and severe winter storms in Montana are a threat to livestock and crop producers.

Conclusion

Subsidies are among the most controversial topics of political discussion today. The federal deficit is increasing by unprecedented rates and in such times each element of government spending should be examined and scrutinized even more closely to eliminate inefficiencies. While agricultural subsidies positively impact a farm's wealth and consumption, they can distort agricultural markets and encourage farmers to produce more of what is being subsidized and less of other agricultural products. But farm policy is always changing. Most notably, in 1996 most agricultural subsidies were redefined to be based on historical production, and in February 2009 President Obama called for an end to payments to the largest and wealthiest farms.[30] The Rockies are not immune from the "political" influence of agricultural subsidies and should come together to identify a logical set of government payments that promote agriculture appropriate to the region's land and environment, while assisting small and medium-size farms to continue an essential aspect of the region's uniqueness: healthy rural land and communities.

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Overview Section: Organization

Size, Type, and Classification of Farms and Ranches in the Rockies

By Jayash Paudel

The 2010 Colorado College State of the Rockies Report Card

Key Findings:

- Only seven percent of the nation's family farms are in the Rockies region.
- The Rockies contains 70 percent of the total cooperative, institutional, and trust farm acres in the U.S.
- Since 1987, the Rockies has experienced a 30 percent growth in the number of individual or family farms, but a 13 percent decline in acreage.
- Family farms represent 92 percent of the total farms and 68 percent of the total farm acreage in the Rockies region.

Introduction

Farms in the U.S. cover a wide spectrum of production, ranging from subsistence farmers growing food for their families to commercial farmers trying to maximize profit as they serve large numbers of people. According to United States Department of Agriculture (USDA), a farm is defined as any place from which $1,000 or more of agricultural products is produced and sold, or normally would have been sold, during the year under consideration.[1] Historically, most farms in the U.S. have been household-based operations, usually organized as an individual or family (sole) proprietorship or partnership. The number of corporate-owned production operations has in recent decades increased, however, prompting many to question the future make-up of agriculture in the United States. This section of the Report Card outlines the types of farms in the U.S. and trends in farm organization over the last 20 years. Furthermore, it touches upon the broad definition of a family farm in the U.S. and how this may restrict financial support for beginning farms.

Farm Organization

The USDA 2007 Census of Agriculture classifies farms into four different types according to their business organization: individual or family (sole proprietorship), partnership, corporation (family-held

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and nonfamily-held), and other (cooperative, estate or trust, and institutional).[2] Historically, family farms predominated and remain a nostalgic image in the public's mind of a "typical" farm or ranch; the actual characteristics that define this form of agriculture are given in Table 1.

A family farm is one in which ownership and control of the farm business is held by a family of individuals related by blood, marriage, or adoption. Family ties can and often do extend across households and generations. Historically, a family farm would supply labor for the farm and own all of the land and capital of the farm. Today, the extent to which individual farms hire nonfamily labor or rent their land varies greatly across farms. According to the USDA Economic Research Service (ERS), family farms may be organized as sole or family proprietorships, partnerships, or family corporations, but they may not hire any managers to operate the business.[3] For instance, two family members may establish a partnership, or siblings can start a family corporation as stockholders with distantly related siblings retaining an interest in the farm. Alternatively, nonfamily farms include farms organized as nonfamily corporations, cooperatives, estates, trusts, and grazing associations, and hire general managers to run the business.[4]

Table 1: What is a Family Farm?

No specific, formal definition for family farms exists; Congress and researchers use different definitions, some of which are summarized below.

* Person-year = One whole year, or fraction thereof, worked by an employee. Expressed as a quotient (to two decimal places) of the time units worked during a year (hours, weeks, or months) divided by the like total time units in a year. For example: 80 hours worked is 0.04 of a person-year, 4 weeks worked is 0.08 of a person-year.

◦ All farms except large, nonfamily corporations; farms using less than 1.5 person-years of hired labor; no hired manager (U.S. Congress, 1985)

◦ Farms with no hired manager; no nonfamily corporations or cooperatives (Salant et al., 1986; Hoppe et al., 1996). Economic Research Service uses this definition.

◦ Farms with less than 3.0 person-years* of labor; family supplying at least half of labor (Irwin, 1973)

◦ Farms with less than 1.5 to 2.0 family workers and the same or fewer number of hired workers; buying and selling in the market; self-managed; tenancy not extremely high (Breimyer, 1991)

◦ Farms where agricultural production is either the primary occupation of the operator (or is an important contributor to family income). Provides at least half-time employment for an operator, family member, or a hired laborer. Operated by no more than three extended families (Sumner, 1985).

Significance of Farm Organization

Over the last century, farming has progressively contributed a smaller share of gross domestic product (GDP) and employed a smaller share of the labor force (See the Overviews by Russell Clarke and Zoë Wick in this Report Card). The percentage of the U.S. labor force in agriculture decreased from 41 percent in 1930 to 1.9 percent in 2002, and the contribution of agriculture to total U.S. gross domestic product (GDP) fell from 7.7 percent in 1930 to 0.7 percent in 2002.[5] Yet the food and agriculture sector continues to play a strong role in the national economy. Though fewer than one million Americans are farmers—considerably less than 1 percent of the workforce—understanding farm organization is important.[6]

Farm organization is significant for a number of reasons including food security, agricultural heritage, and land management control. As E-coli and other contaminant outbreaks occur in products from spinach to beef, consumers increasingly want to know who produces their food, how it is produced, and how these factors impact product safety and price as well as the land and communities.[7]

Photo by Fair & Thompson, 1904. Lewiston Valley, ID. Library of Congress.

Gunnarson Farmstead, Bonneville County, ID. Library of Congress.

Table 2a: Farm Organization Statistics, Number and Acres of Farms by Farm Type, 2007

	Number of Farms					Acres in Farms				
	Individual or family (sole proprietorship)	Partnership	Corporation: Family held	Corporation: Other than family held	Other - cooperative, estate or trust, institutional, etc.	Individual or family (sole proprietorship)	Partnership	Corporation: Family held	Corporation: Other than family held	Other - cooperative, estate or trust, institutional, etc.
United States	1,906,335	174,247	85,837	10,237	28,136	572,524,175	161,416,999	113,882,525	10,819,589	60,838,445
Rockies	130,943	14,096	10,338	877	3,140	94,335,656	36,022,515	43,237,534	3,145,418	44,235,199
Arizona	13,721	962	612	117	225	1,597,797	1,378,550	1,714,673	146,596	21,280,283
Colorado	30,164	3,762	2,103	239	786	19,125,603	6,527,619	3,751,760	521,327	1,678,602
Idaho	21,308	2,124	1,434	99	384	5,874,172	2,343,151	2,196,738	129,515	953,807
Montana	22,625	2,839	3,353	156	551	29,645,852	10,263,436	16,982,934	585,392	3,910,848
Nevada	2,542	284	207	23	75	1,416,997	616,765	1,609,413	956,143	1,266,074
New Mexico	18,185	1,456	780	59	450	20,116,491	7,274,300	7,345,325	178,657	8,323,276
Utah	13,614	1,645	917	97	427	3,429,156	1,810,957	1,348,312	109,737	4,396,538
Wyoming	8,784	1,024	932	87	242	13,129,588	5,807,737	8,288,379	518,051	2,425,771

Source: USDA Census of Agriculture, 2007

Table 2b: Farm Organization Statistics, Number and Acres of Farms by Farm Type, by Percent, 2007

	Number of Farms					Acres in Farms				
	Individual or family (sole proprietorship)	Partnership	Corporation: Family held	Corporation: Other than family held	Other - cooperative, estate or trust, institutional, etc.	Individual or family (sole proprietorship)	Partnership	Corporation: Family held	Corporation: Other than family held	Other - cooperative, estate or trust, institutional, etc.
Rockies percent of U.S. total	7%	8%	12%	9%	11%	16%	22%	38%	29%	73%
Rockies States' percents derived from Rockies total										
Arizona	10%	7%	6%	13%	7%	2%	4%	4%	5%	48%
Colorado	23%	27%	20%	27%	25%	20%	18%	9%	17%	4%
Idaho	16%	15%	14%	11%	12%	6%	7%	5%	4%	2%
Montana	17%	20%	32%	18%	18%	31%	28%	39%	19%	9%
Nevada	2%	2%	2%	3%	2%	2%	2%	4%	30%	3%
New Mexico	14%	10%	8%	7%	14%	21%	20%	17%	6%	19%
Utah	10%	12%	9%	11%	14%	4%	5%	3%	3%	10%
Wyoming	7%	7%	9%	10%	8%	14%	16%	19%	16%	5%

Source: USDA Census of Agriculture, 2007

Significance in the Rockies Region

With a rapidly growing population and expanding cities, the Rockies region is home to dynamic and distinctive farm organization. The 2007 Census of Agriculture reported that only seven percent of the U.S. family farms lie in the Rockies region (Tables 2a and 2b). Statistics for acreage of family farms, however, paint a different and more meaningful picture. The same Census of Agriculture reported that the Rockies region contains 16 percent of total family farm acres in the U.S. This is comparable to the acreage of the family farms in the West North Central Division (34 percent) and the West South Central Division (21 percent).[8]

Comparing farm data for the census Mountain Division (the same eight states as the Rockies region) against other census divisions highlights some interesting regional conditions (see Table 2b). Similarly, the Rockies region possesses only eight percent of the total number of partnership farms in the U.S., but includes 22 percent of the total partnership farm acreage. The percentages are even higher in the case of corporation farms. The Rockies region is home to 38 percent of the total family-owned corporate farm acres, 33 percent of the total non-family corporation farm acres, and 70 percent of the total cooperative, institutional, and trust farm acres in the U.S.[9] Although the number of farms in the Rockies may be relatively small, the region ranks second out of the nine census divisions in the number of acres devoted to agriculture.[10]

Trends over the Past 20 Years

In recent years, public discussion has focused on the seemingly rapid expansion of corporate agriculture at the expense of traditional, family farms. Historically, family farms were the weft and warp of the Midwest.[11] But can family farms survive as corporate farms continue to grow and increase?

Although present trends indicate that the family farm is losing its place as the nucleus of U.S. agriculture,[12] data from the USDA show the family farm enterprise holding steady. In the past 20 years, the U.S. has seen five percent growth in the number of individual or family farms. As shown in Figure 1, the Rockies region (Census Mountain Division) experienced the highest growth rate of any division, with 30 percent growth in the number of individual farms. In terms of acreage, however, the U.S has seen a nine percent decline in the total area of individual farms. The Rockies experienced a 13 percent decline in the total acreage of these farms between 1987 and 2007. Although individual or family farms have increased in number, their total area has decreased. This implies that individual or family farms are on average becoming smaller.

Figure 1:
Change in Individual or Family Farms, by Percent, 1987 - 2007
Source: USDA Census of Agriculture, 1987 and 2007
Note: Change calculated using the difference between 1987 and 2007 values

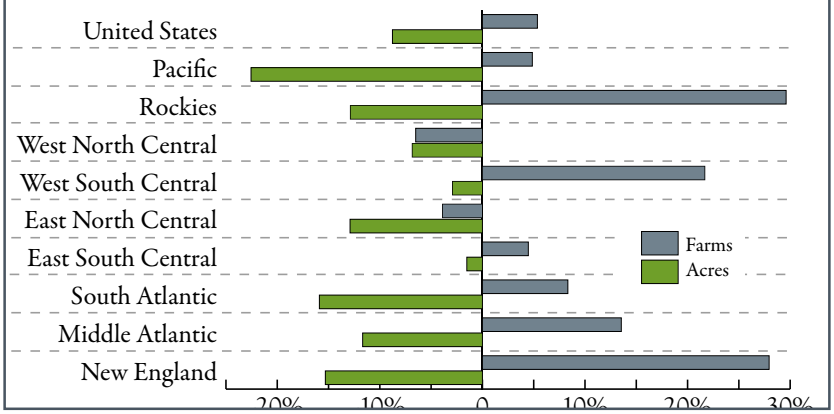


Figure 2:
Number and Total Acres of Farms,
by Type of Organization, United States, 2007
Source: USDA Census of Agriculture, 2007

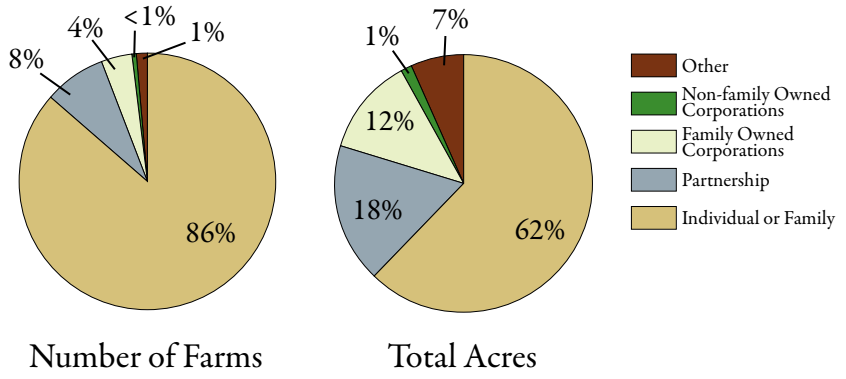
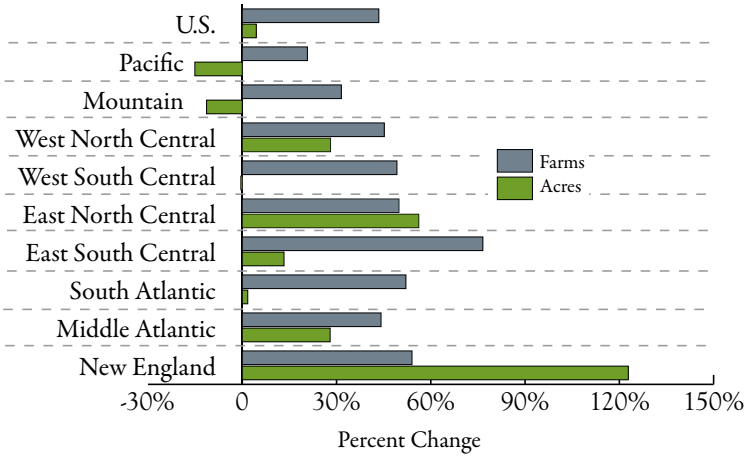


Figure 3:
Change in Corporate Farms (Family Held and Other than Family Held),
by Percent, 1987 - 2007
Source: USDA Census of Agriculture, 1987 and 2007
Note: Change calculated using the percent difference between 1987 and 2007 values



The comparative size of family farms as of 2007 is shown in Figure 2. Individual or family farms account for 86 percent of the total number of farms and 62 percent of the total farm acreage in the U.S. While family farms currently make up the majority of the U.S. farms, corporate farms are growing at a much faster rate in terms of number and acreage. Census data suggest that corporate farms (both family-owned and non-family owned) represent almost five percent of the total number of farms and share 13 percent of the total agricultural acreage in the U.S. Although this is only one-fifth of the land covered by individual or family farms, corporation farms are growing at a faster rate than other types of farms. Corporation farms (both family-owned and non family owned) at the national level, as shown in Figure 3, underwent net positive growth, increasing 43 percent in number and 4 percent in acreage in the U.S. For the Mountain Census Division the number of corporate farms increased by approximately 25 percent while the acres farmed by corporate entities decreased approximately 5 percent.

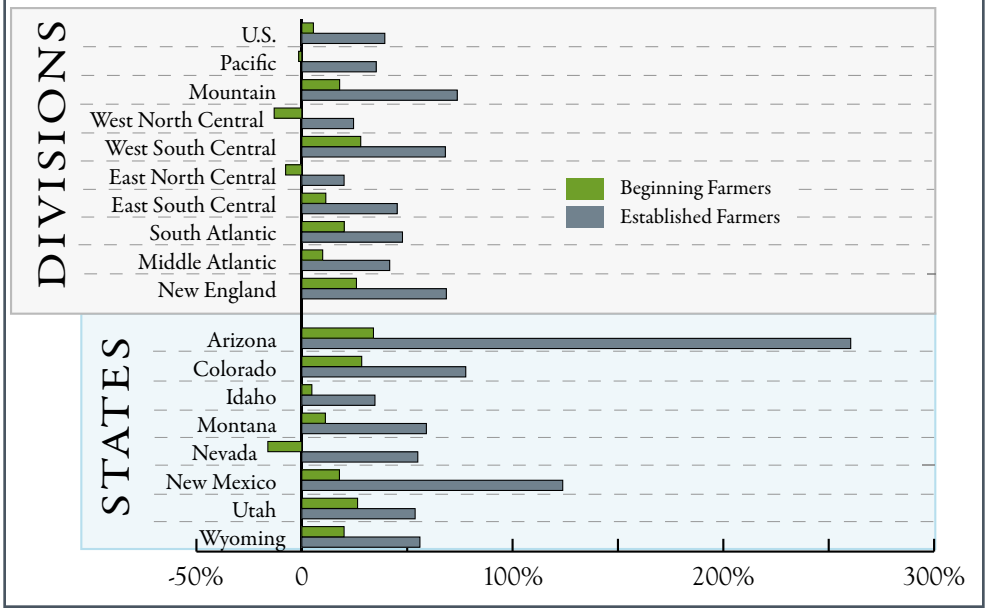
Figure 4:

Change in Beginning and Established Farmers, by Percent, 1987 - 2007

Source: USDA Census of Agriculture, 1987 and 2007

Note: Change calculated using the percent difference between 1987 and 2007 values

The USDA defines a beginning farm as one operated by a farmer who has operated a farm or ranch for 10 years or less either as a sole operator or with others who have operated a farm or ranch for 10 years or less.



Issues for Family Farms

The dominance of family farms in U.S. agriculture has been enabled, in part, by USDA programs designed to encourage the growth of family farms, such as Emergency Farm Loans and Direct Operating Loans.[13] Legislators, however, have not formally defined family farms, and various organizations and researchers have employed different definitions of a family farm. Many definitions equate family farms with small, limited production farms, while associating the larger farms that generate the bulk of production with corporate, non-family interests. Even the abovementioned ERS definition of a family farm captures a broad range of farms. The ERS's definition of family farms includes sole proprietorships, partnerships, and even corporations, as long as the principal operator's family owns more than half of the farm business. An operator whose family owns 51 percent of the farm business and chooses to find investors still qualifies as a family farmer, even if they no longer own the land or any production inputs.[14] Because the USDA's definition of a family farm includes such a wide variety of farms, policymakers have trouble targeting federal assistance at farms actively engaged in agricultural production. This has serious repercussions for beginning farmers and hinders efficient subsidy allocation (See Case Study on Family Farms).

Beginning Farmers

The USDA defines a beginning farm as one operated by a farmer who has operated a farm or ranch for 10 years or less either as a sole operator or with others who have operated a farm or ranch for 10 years or less.[15] This broad definition can adversely affect the efficient allocation of federal subsidies.

Farm subsidies are intended to alleviate farm poverty and help struggling family farmers (See Case Study on Farm Subsidies), but they may have an unintended effect of preventing young people from entering farming. The cap for federal subsidies is very high; the larger the farm becomes, the more subsidies they receive,[16] and economists estimate that subsidies inflate the value of farmland by 30 percent.[17] Larger commercial farms tend to bid up the prices, making it more difficult for new farmers to enter the business. The result is that beginning farmers need substantial financial assistance to run their business successfully.

Support programs designed for beginning farmers are also affected by the amount of money the USDA allocates for federal farm programs in general. According to a report prepared by the U.S. Government Accountability Office (GAO), the USDA does not have adequate controls in place to prevent payments to individuals who exceed income eligibility limits. The USDA has previously relied on individuals' one-time self-certifications that they meet income eligibility requirements and their promise to notify the USDA if they no longer meet these requirements.[18] These self-certifications are not viewed by critics as reliable, and furthermore, the report claims, the USDA has not always withheld payments from ineligible individuals.

Although broad family farm definitions inhibit support to beginning farmers, USDA data (Figure 4) show that there has been an increase in the number of beginning farmers in the U.S. In the Rockies region an even stronger

Figure 5:
Distribution of Corporation Farms (Number of Farms) by Division, 2007
Source: USDA Census of Agriculture, 2007

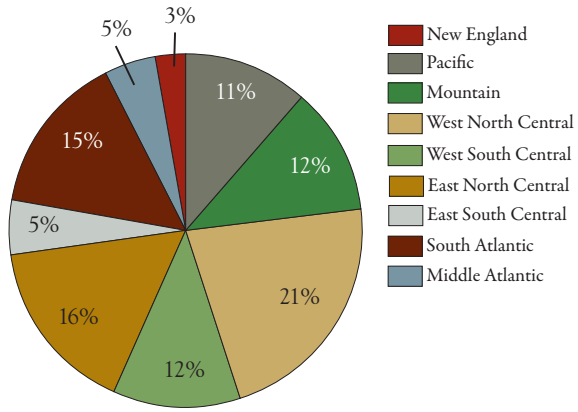
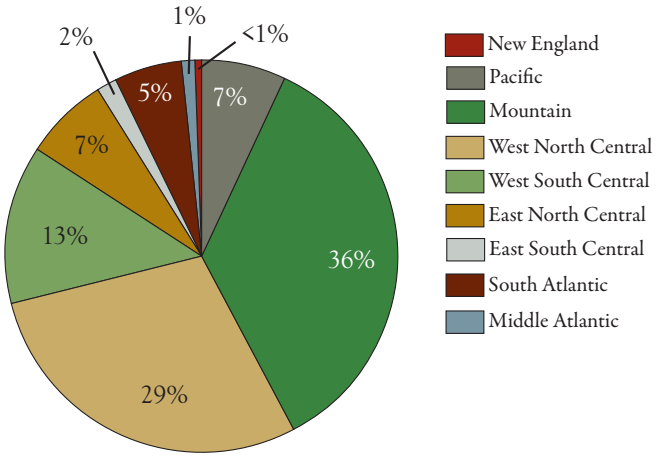


Figure 6:
Distribution of Corporation Farms Acres by Division, 2007
Source: USDA Census of Agriculture, 2007



growth has occured; seven of the eight states have shown a positive growth rate in the number of beginning farmers.

The USDA is increasingly targeting its programs to address the potential financial challenges faced by beginning farmers. Most of the current assistance comes in the form of loans from the USDA's Farm Service Agency (FSA) and from the independent Farm Credit System (FCS).[19] From fiscal years 2000 through 2006, FSA loans to beginning farmers rose from $716 million to $1.1 billion annually, representing 35 percent of the total amount of USDA loans to all farmers.[20] According to a study conducted by the GAO, however, the USDA should outline the goals of beginning farmer assistance programs and demonstrate program effectiveness, rather than simply recording the number of farmers assisted and the amount of money provided.[21]

Conclusion

Patterns across the U.S. of corporate farms by number and size depict one important dimension to farming (See Figure 5 and Figure 6). Family farms are important in the region, not only in terms of their size and number, but also in terms of the implications of their broad definitions. The Rockies region contains more farm acreage than any other U.S. region, but only seven percent of U.S. farms, indicating unique farm organization patterns. Because the definitions of a family farm are so broad, caution is needed when interpreting aggregate farm organization statistics. Narrower definitions can help policymakers achieve goals such as providing support to beginning farmers to meet the needs of future generations and preserve our natural resources.

[1] United States Department of Agriculture. http://www.ers.usda.gov/briefing/FarmStructure/Questions/Closeup.htm (Accessed July 16, 2009).
[2] *Ibid.*
[3] United States Department of Agriculture. http://www.ers.usda.gov/Briefing/FarmStructure/Questions/familyfarms.htm (Accessed July 16, 2009).
[4] *Ibid.*
[5] Dimitri, Carolyn, Anne Effland, and Neilson Conklin. "The 20th Century Transformation of U.S. Agriculture and Farm Policy." United States Department of Agriculture Economic Information Bulletin. Number 3, June 2005. http://www.ers.usda.gov/publications/eib3/eib3.htm (Accessed July 16, 2009).
[6] America's Census Bureau, referenced in "Filling the hoppers." *The Economist*. November 1, 2007.
[7] Ikerd, John. "Farm Economy State of the Union Address." http://newfarm.rodaleinstitute.org/features/1102/ikerd_address/index.shtml (Accessed July 6, 2009).
[8] United States Department of Agriculture. *2007 Census of Agriculture.* 2009.
[9] *Ibid.*
[10] *Ibid.*
[11] "True Grit." *The Economist*. http://www.economist.com/world/unitedstates/displaystory.cfm?story_id=E1_NPQGST (Accessed June 28, 2009).
[12] Breimyer, Harold F. and A.L. (Roy) Frederick. "Does the Family Farm Really Matter?" University of Missouri Extension G820. Reviewed October 1993. http://extension.missouri.edu/publications/DisplayPub.aspx?P=G820 (Accessed July 12, 2009).
[13] "Beginning Farmers: Additional Steps Needed to Demonstrate the Effectiveness of USDA Assistance." United States Government Accountability Office Report to the Chairman. Committee on Agriculture, Nutrition, and Forestry, and U.S. Senate, September 2007.
[14] O'Donoghue, Erik J., Robert A. Hoppe, et al. "Exploring Alternative Farm Definitions: Implications for Agricultural Statistics and Program Eligibility." United States Department of Agriculture. Economic Information Bulletin Number 49, March 2009.
[15] Ahearn, Mary, and Doris Newton. "Beginning Farmers and Ranchers." United States Department of Agriculture, Economic Information Bulletin Number 53, May 2009.
[16] "In The Great American Desert." *The Economist*. December 13, 2001.
[17] Riedl, Brian. "How Farm Subsidies Harm Taxpayers, Consumers, and Farmers, Too." The Heritage Foundation. http://www.heritage.org/research/agriculture/bg2043.cfm (Accessed July 10, 2009).
[18] "Federal Farm Programs: USDA Needs to Strengthen Controls to Prevent Payments to Individuals Who Exceed Income Eligibility Limits." United States Government Accountability Office Report to the Chairman. Committee on Agriculture, Nutrition, and Forestry, U.S. Senate, September 2007.
[19] Aheard and Newton, 2009.
[20] United States Government Accountability Office. "Beginning Farmers: Additional Steps needed to Demonstrate the Effectiveness of USDA Assistance." September, 2007.
[21] *Ibid.*

Case Study: Small Family Farms

By Jayash Paudel

Introduction

Farming in the United States is diverse, ranging from very small family and retirement farms to large corporations with millions of dollars in sales. Because the USDA's definition of family farms (refer to the Overview on Farm Organization) is very broad, the USDA Economic Research Service (ERS) has grouped farms into categories based on gross sales in a given year and the principal occupation of the farmer.[1] This section outlines the types of family farms in the Rockies region, focusing on the significance of small family farms, as categorized by the ERS, and the prevalence of bankruptcy among small family farmers.

Farm Types

Based on annual gross sales and the principal occupation of the farm operator, the ERS classifies farms into three types: small family farms, large-scale family farms, and non-family farms. The characteristics of these types of farms are summarized in Table 3. Small family farms have gross sales less than $250,000, large-scale farms exceed sales of $250,000, and nonfamily farms are nonfamily corporations, cooperatives, or farms that hire a general manager. By this system, gross farm sales determines the "size" of a farm independent from the legal definition of ownership. Gross sales is calculated as the farm's crop and livestock sales plus the shares of production received by any landlords and production contractors.[2] The measure also includes all

Table 3: Classifications and Definitions of Farm Types

Farm Type	Classification	Definition
Small family farms	Limited-resource farms	Farms with gross sales less than $100,000 in 2003 and less than $105,000 in 2004. Operators must also receive low household income in both 2003 and 2004. Household income is considered low in a given year if it is less than the poverty level for a family of four, or it is less than half the county median household income. Operators may report any major occupation except hired manager.
	Retirement farms	Farms whose operators report they are retired.
	Residential/lifestyle farms	Farms whose operators report a major occupation other than farming.*
	Farming-occupation farms	Farms whose operators report farming as their major occupation. These farms may be either low-sales farms (gross sales less than $100,000) or medium-sales farms (gross sales between $100,000 and $249,999).
Large family farms	Large family farms	Farms with gross sales between $250,000 and $499,999.
	Very Large family farms	Farms with gross sales of $500,000 or more.
Nonfamily farms	This is discussed in the Overview section on farm organization.	Farms organized as nonfamily corporations or cooperatives, as well as farms operated by hired managers. Also include farms held in estates or trusts.

Source: Robert A. Hoppe, Penni Korb, Erik J. O'Donoghue, and David E. Banker, "Structure and Finances of U.S. Farms Family Farm Report, 2007 Edition," Economic Information Bulletin Number 24, June 27, http://www.ers.usda.gov/Publications/EIB24/. Accessed August 4, 2009.

* Note: Excludes Limited-resource farms whose operators report this occupation.

The definition of Small Family Farms: Family farms with gross sales less than $250,000. Four types of small family farms are discussed in this table.

government payments received by the farm and its landlords. Table 3 sub-divides small family farms and large-scale family farms into sub-classifications.[3]

Significance of Family Farms in the Rockies

Family farmers are important to the Rockies region. They pass down among generations farming traditions and cultural values. Data from the 2007 Census of Agriculture show the overwhelming prevalence of family farms in the Rockies. According to the Census of Agriculture, family farms (including small family farms and large-scale family farms) represent 92 percent of the total farms and 68 percent of the total farm acreage in the Rockies region.[4]

The total acreage of family farms[5] is, perhaps, more interesting than the number of family farms in the Rockies region. For instance, the 2007 Census of Agriculture reported that the Rockies region contains only seven percent of the nationwide total number of small family farms, five percent of the total number of large-scale family farms, and nine percent of the total number of nonfamily farms.[6] Statistics on farm acreage shown in Figure 7 give us a different picture. Census data suggest that the Rockies region has 20 percent of the total small family farm acres in the U.S. Though the Rockies region has only a low *number* of small family farms, its has comparatively more *acres*.

Data on the Rockies region illuminate the importance of small family farms (see Table 4). By number of farms, small family farms account for the highest percentage of total farms in each state in the Rockies region. Nevada has the lowest percentage of small family farms (84 percent of the total number of farms). While Arizona has the highest percentage (91 percent of total number of farms), its small family farms make up the lowest percentage of total farm acreage (7 percent). Colorado has the largest percentage of acres in small family farms in the Rockies region (52 percent of total farm acreage).

Based on the principal occupation of the farm operator, the small family farm is further classified into occupation farms and residential/lifestyle farms (Illustrated in Table 3.).[7] Among the total number of farms in the Rockies region, only 18 percent fall under farming occupation farms, and approximately 35 percent fall under residential/lifestyle farms (See Table 5). This suggests that the Rockies region might have a large number of farmers who are involved with

Figure 7:
Total Acres of Small Family Farms, by Census Division, 2007
Source: USDA Census of Agriculture, 2007

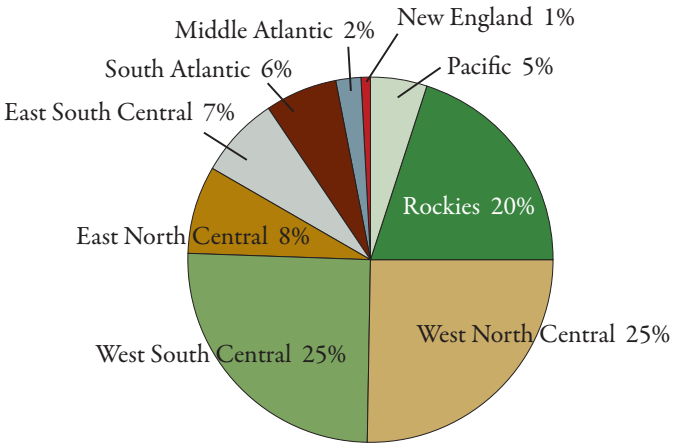


Table 4: Small Family Farms, Number and Acreage by Percent, Rockies States, 2007

	Small family farms (number)	Total number of farms [1]	Small family farms as percent of total number of farms	Small family farms (acres)	Total acres of farms [2]	Small family farms as percentage of total farms acreage
Arizona	14,201	15,637	91%	1,916,476	26,117,899	7%
Colorado	32,659	37,054	88%	16,415,785	31,604,911	52%
Idaho	21,821	25,349	86%	4,618,245	11,497,383	40%
Montana	25,706	29,524	87%	29,263,664	61,388,462	48%
Nevada	2,633	3,131	84%	916,138	5,865,392	16%
New Mexico	18,938	20,930	90%	19,087,442	43,238,049	44%
Utah	15,082	16,700	90%	3,883,345	11,094,700	35%
Wyoming	9,547	11,069	86%	12,602,608	30,169,526	42%

Source: USDA Census of Agriculture, 2007
Note: [1] Total number of farms is the sum of small family farms, large family farms, and nonfamily farms.
[2] Total acres of farms is the sum of acres of small family farms, large family farms, and nonfamily farms.

either full-time off-farm jobs or alternative farm enterprises to generate supplemental income. (See Case Study on alternative farm enterprises).

Policymakers are attempting to refine the broad definitions of a farmer to include a narrower, more measurable sense of "active engagement."[8] One goal is to target farm program payments more effectively. To do this, it is important to determine whether farm operators in the Rockies region rely on farming for a living or farm mainly as a hobby. Small family farmers may be involved with recreational agricultural acitivity to generate additional income, balance the flucations in agricultural income, fully utilize their resources, or provide employment for family members.[9]

Among the eight states in the Rockies region, Montana has the highest number of farming occupation farms. Both Utah and Colorado have the highest number of residential/lifestyle farms (almost 42 percent of the total number of farms) (See Table 5). This implies that Utah and Colorado might have substantial alternative agricultural enterprises. These enterprises conduct either farm-related services or off-farm activities. Today's small family farms must struggle to keep up with economic and technological changes that have affected the U.S. agricultural industry over the last several decades.[10] The competitive world in which small farms operate has created business uncertainty and added more risk to farm operations.

Financial Status of Small Family Farms

The fiancial status of farms can be measured through several ratios. Table 6 lists the principal financial ratios used by the ERS to determine the financial performance of farms.[11] Profitability measures are strongly associated with farm size. Data suggest that the average operating profit margin and average rates of return on assets and equity are negative for small farms, but positive for large-scale and nonfamily farms.[12] Since large farms have large sales, the profitability ratios are higher for large farms. Although nearly half or more of the farms in each small farm type had a negative operating profit margin in 2004, 15–28 percent of each small farm type had an operating profit margin of at least 20 percent.[13] Furthermore, a number of small family farms generated positive net farm income. However, the average net farm income of small family farmers was lower than that of large family farmers. Overall, net farm income for all the farms averaged $25,000 per farm in 2004 (See Table 7).[14]

Table 5: Number and Percent of Small Family Farm Types, 2007

	Total Number of Farms [1]	Small Family Occupation-farms (number)	Small Family Occupation-farms, Percent of Total Farms	Small Family Residential/ lifestyle Farms (Number)	Small Family Residential/ Lifestyle-farms, Percent of Total Farms
United States	2,204,792	359,025	16%	801,844	36%
Rockies Region	159,394	28,688	18%	55,445	35%
Arizona	15,637	2,709	17%	3,639	23%
Colorado	37,054	6,199	17%	15,498	42%
Idaho	25,349	4,175	16%	9,494	37%
Montana	29,524	7,336	25%	9,016	31%
Nevada	3,131	577	18%	1,074	34%
New Mexico	20,930	3,028	14%	5,914	28%
Utah	16,700	2,151	13%	6,986	42%
Wyoming	11,069	2,513	23%	3,824	35%

Source: USDA Census of Agriculture, 2007
Note: Total number of farms is the sum of small family farms, large family farms, and nonfamily farms.

Table 6: Principal Financial Ratios Used by the ERS to Determine the Financial Performance of Farms

Ratio	Definition
Return on assets	= 100% * (net farm income + interest paid - charge for unpaid operators' labor and management) / total assets[1]
Return on equity	=100% * (net farm income - charge for unpaid operators' labor and management) / net worth.
Operating profit margin	= 100% * (net farm income + interest paid - charge for unpaid operators' labor and management) / gross farm income.
Operating expense ratio	= 100% * total cash operating expenses / gross cash farm income.
Debt/asset ratio	= 100% * total liabilities/total assets.

Source: Robert A. Hoppe, Penni Korb, Erik J. O'Donoghue, and David E. Banker, "Structure and Finances of U.S. Farms Family Farm Report, 2007 Edition," Economic Information Bulletin Number 24, June 27, http://www.ers.usda.gov/Publications/EIB24/. Accessed August 4, 2009
[1]Assets include: Farm real estate assets, machinery and equipment, value of crops stored, livestock and poultry inventories, purchased inputs on hand, investments in cooperatives, and other financial assets.

Given their low profit margin and farm income, small family farms often have to rely on off-farm income. Average off-farm income in 2004 ranged from $13,600 for limited-resource households to $96,900 for households operating residential/lifestyle farms (See Table 3 for classification of small family farms).[15] Most off-farm income is generated from earned sources, either a wage-and-salary job or self-employment. However, households operating limited-resource or retirement farms receive well over half their off-farm income from sources such as Social Security, pensions, dividends, interest, and rent.

Small Family Farms and Bankruptcy

Because small family farmers are usually financially dependent on off-farm income, small farm households are

Photos from the Library of Congress. Aurora and Denver, Colorado.

Table 7: Selected Performance Measures, by U.S. Farm Type, 2004

Item		Small Family Farms					Large-scale Family Farms		Non-family Farms	All Farms
		Limited Resource	Retirement	Residential or Lifestyle	Farming - Occupation					
					Low Sales	Medium Sales	Large	Very Large		
Total Farms		197,793	338,671	837,542	395,781	133,299	86,087	71,708	47,103	2,107,925
Profitability Measures	Rate of return on assets [1]	-4.0%	-1.5%	-2.0%	-2.7%	-0.4%#	2.5%	6.8%	7.1%	0.5%**
	Rate of return on equity [2]	-4.4%	-1.7%	-2.8%	-3.2%	-1.3%**	1.8%*	6.7%	7.1%	-0.1%#
	Operating profit margin [3]	-86.7%	27.8%*	-35.5%	-36.1%	-2.4%#	10.8%	18.3%	23.8%	3.0%**
Income Measures: Net farm income		$1,812**	$9,655	$4,544	$9,098	$39,804	$87,499	$287,921	$175,795	$25,003
Farms with positive net farm income		66.7%	79.5%	62.8%	68.7%	76.9%	82.2%	83.8%	72.2%	69.6%

Source: Structure and Finance of U.S. Family Farms, Environmental Research Service, USDA. 2007.

[1] Return on assets = 100% X (net farm income + interest paid - charge for unpaid operators' labor and management) / total assets.

[2] Return on equity = 100% X (net farm income - charge for unpaid operators' labor and management) / net worth.

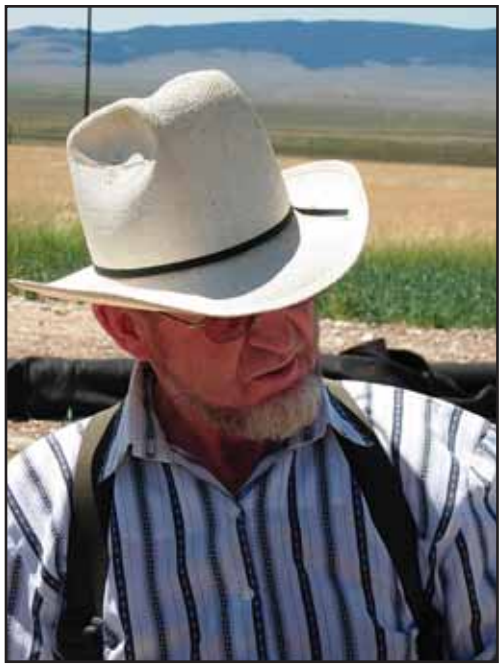
[3] Operating profit margin = 100% X (net farm income + interest paid - charge for unpaid operators' labor and management) / gross farm income.

* = Standard error is between 25 percent and 50 percent of the estimate.

** = Standard error is between 51 percent and 75 percent of the estimate.

= Standard error is greater than 75 percent of the estimate.

significantly affected by the nonfarm economy.[16] Since the Rockies region consists of many small family farms, it is important to examine whether this reliance renders small farmers more prone to high risk and bankruptcy. A study by the ERS and the University of Arkansas found only a weak link between declining farm numbers and farm bankruptcies.[17] However, the interaction of bankruptcy policy and farm policy is important because the lengthy biological production process necessary for farming generates considerable physical and financial risk.[18]



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Bankruptcy generally describes proceedings undertaken in a federal court when a debtor is unable to pay or to reach an agreement with creditors. There are two basic types of bankruptcy filings: liquidation under Chapter 7 of the bankruptcy code and rehabilitation or reorganization of the debtor under Chapters 11, 12, and 13 of the bankruptcy code.[19] Chapter 12 from the Bankruptcy Abuse Prevention and Consumer Protection Act was re-enacted in 2005 to help alleviate the farm financial crisis.

Chapter 12 bankruptcy code gives family farmers with regular income but financial burden an opportunity to reorganize debts while running the farm business and implementing a court-approved plan to repay all or part of their debts. Eligible family farming operations for this bankruptcy code can be individually owned, partnerships, or corporations.[20] The debt ceiling is $3.237 million, and farmers with more debt than the maximum limit lose eligibility for Chapter 12.[21] The maximum debt limit is high compared to the average debt of farms nationwide. According to a USDA report in 2007, average debt levels ranged from less than $100,000 for smaller family farms to nearly $600,000 for very large farms.[22] A debtor may qualify for Chapter 12 only if 50 percent (previously 80 percent) of his/her income originates from a farming operation. When determining income eligibility, either the prior year or each of the second and third years preceding bankruptcy filing can be considered.[23]

The Chapter 12 plan grants three different kinds of bankruptcy claims: priority, secured, and unsecured, and usually lasts three to five years. Table 8 defines each type of bankruptcy claim.[24] One of the characteristic features of Chapter 12 is that payments to secured creditors can sometimes last longer than the three-to-five year period of the plan.[25] The plan permits farmers to submit a reorganizational plan directly to the bankruptcy court, with no assessment by the creditors. Once the court approves the debt repayment plan, creditors cannot go against the law provided that they receive as much as under Chapter 7 liquidation. Consequently, creditors may be wary of granting credit to young, small farmers.[26] This has resulted in lenders adopting a tiered interest rate structure for loans and increasing the interest rate spread to riskier borrowers.

Conclusion

Small family farms are agriculturally significant in the Rockies region and are also becoming more involved with substantial off-farm activities. Because the majority of small family farmers are dual-career, federal fiscal programs and monetary policies regarding the interest rate both vitally affect the non-farm economy and thus are important in determining the well-being of the families and therefore the continuing viability of small family farms in Rockies agriculture.

Table 8: Definitions of Bankruptcy Claims under Chapter 12

Bankruptcy Claims	Definitions
Priority	Claims that are granted special status by the bankruptcy law, such as most taxes and the costs of bankruptcy proceeding.
Secured	Claims for which the creditor has the right to liquidate certain property if the debtor does not pay the underlying debt.
Unsecured	Claims for which the creditor has no special rights to collect against particular property owned by the debtor.

Source: "Chapter 12: Family Farmer or Family Fishermen Bankruptcy," U.S. Courts, http://www.uscourts.gov/bankruptcycourts/bankruptcybasics/chapter12.html. Accessed July 24, 2009.

[1] Hoppe, Robert A., Penni Korb, et al "Structure and Finances of U.S. Farms Family Farm Report, 2007 Edition." Economic Information Bulletin. Number 24, June 27. p. 2. http://www.ers.usda.gov/Publications/EIB24/. (Accessed August 4, 2009).

[2] *Ibid.*

[3] *Ibid.*

[4] United States Department of Agriculture. *2007 Census of Agriculture*. 2009.

[5] Classified in terms of organization (based on nature of organization, farms can be individual or family, partnerships, corporations, or other). Classifying family farms by gross sales yields a similar result.

[6] United States Department of Agriculture. *2007 Census of Agriculture*. 2009.

[7] *Ibid.*

[8] Erik O' Donoghue, Robert A. Hoppe, et al. "Exploring Alternative Farm Definitions: Implications for Agricultural Statistics and Program Eligibility." United States Department of Agriculture. Economic Information Bulletin Number 49, March 2009.

[9] Rita J. Black, Norma P. Nickerson, "The Business of Agritourism/recreation in Montana," Research Report 50 ,Institute for Tourism and Recreation Research School of Forestry The University of Montana Missoula, MT, July 1997

[10] Stephan Tubene and David Holder, Serving Small Farms in the 21st Century, College of Agriculture and Natural Resources, University of Maryland, http://extension.umd.edu/agriculture/smallFarms/files/csrees_report.pdf. (Accessed Aug. 7, 2009).

[11] Hoppe and Korb, et al. "Structure and Finances of U.S. Farms Family Farm Report, 2007 Edition." 2007.

[12] *Ibid.*

[13] *Ibid.*

[14] *Ibid.*

[15] *Ibid.*

[16] *Ibid.*

[17] Stam, Jerome. "Are Bankruptcies Behind the Drop in Farm Numbers?" *Amberwaves*. April 2004.

[18] "Are Farmer Bankruptcies A Good Indicator of Rural Financial Stress?" United States Department of Agriculture, December, 1996.

[19] Carroll, Stephen, Noreen Clancy, et al. "The Bankruptcy Abuse Prevention and Consumer Protection Act of 2005: Evaluation of the Effects of Using IRS Expense Standards to Calculate a Debtor's Monthly Disposable Income." Published by RAND Corporation, 2007.

[20] "Chapter 12: Family Farmer or Family Fishermen Bankruptcy." U.S. Courts. http://www.uscourts.gov/bankruptcycourts/bankruptcybasics/chapter12.html (Accessed July 24, 2009).

[21] Bennett, David, "New Chapter 12 rules friendlier to farmers." Delta Farm Press. http://deltafarmpress.com/mag/farming_new_chapter_rules/ (Accessed July 19, 2009).

[22] Hoppe and Korb, et al. "Structure and Finances of U.S. Farms Family Farm Report, 2007 Edition." 2007.

[23] Bennett, 2009.

[24] "Chapter 12: Family Farmer or Family Fishermen Bankruptcy," 2009.

[25] *Ibid.*

[26] *Ibid.*

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Alternative Agricultural Enterprises

By Emil Dimantchev and Jayash Paudel

Like any good business owners, farmers and ranchers are always looking for new ways to increase their earnings. While some simply plant rows or raise more steers, others are looking for different avenues and new markets. These are today's "alternative agricultural enterprises." This section provides a brief overview of types and examples of these pioneering ideas.

Income opportunities on the farm

Fee-based Outdoor recreation

Farms can offer recreation services on the farm to generate additional income through the following activities: archery, bird watching, swimming, rock climbing, canoeing, camping, ice-skating, sledding, hunting and fishing (among others).

Example: Half Moon Ranch, Lewiston, Montana: www.hmradventures.com.

Alternative Goods and Value Added Products

Many farms grow non-traditional crops or raise specialty livestock to generate supplemental income: Alternative livestock products include goats (milk, meat, cheese, soap) and bees, as well as Christmas tree, nursery products (shrubs, annuals, nursery stock), and others.

Example: Heritage Belle Farm, Calhan, Colorado: www.heritagebellefarms.com.

Alternative Marketing

Farmers can also market their crops differently in order to capture more value added. Options include: letting buyers pick and cut fruits, vegetables and Christmas trees; farmer's markets; direct sales to schools and restaurants, and others.

Example: Roadrunner Park Farmer's Market, Phoenix, Arizona: www.arizonafarmersmarkets.com/pageRoadrunner/roadrunner.htm.

Public Event and Participant Exercises

Farms can organize local fairs, and other interesting events in the farm field or the ranch: organize festivals and fair (music festival, harvests festival, cultural festivals), farm school for children and adults, tours of wildlife and fish habitat conservation projects, haying or harvesting exercise, tractor ride and others.

Example: Venetucci Farm, Colorado Springs, Colorado: www.ppcf.org/Venetucci.

Hospitality Services

Providing food and lodging on the farm.

Example: Anchorage Farm, A Bed and Breakfast Inn, Pine, Colorado: www.anchoragefarm.com/.

Tourism

Farmers can impose an entrance fee, and offer farm tours, food, crafts and souvenirs for sale. Tours can be offered of the farm/ranch buildings, food processing facilities, historic sites or buildings, bird/wildlife preserves, hydroponics operations (the cultivation of plants by placing the roots in liquid nutrient solutions rather than in soil) and others.

Example: Vermejo Park Ranch, Raton, New Mexico: www.vermejoparkranch.com.

Conservation Easements:

Another option for farmers is to transfer development rights to minimize tax through a conservation easement. A conservation easement is a legal, voluntary agreement between a landowner and a land trust or government agency that restricts the development or use of property. The United States Department of Agriculture provides funds for the purchase of conservation easements through the Farm and Ranch Lands Protection Program and the Forest Legacy Program. Such funds are used to pay the landowner for retiring the land and to share the cost of conservation practices on that land. In addition, a conservation easement brings significant property and income tax benefits for the landowner. It lowers property taxes by decreasing the assessed value of the land for which easement is granted. Conservation easements also are sometimes viewed as donations from the owner and, thus, qualify for federal tax income benefits. In 2007, the USDA budgeted $1.7 million in conservation payments to farmers, which amounts to $5,000 on average for each recipient farm.

Example: Vickers Complex, Basin Ranch, and McKee Ranch in Wyoming.

Carbon Offsets

Such policy instruments provide funding for farmers who, for instance, install methane capture systems over animal-waste lagoons, or use no-till farming techniques so that the land can absorb more carbon dioxide from the atmosphere. A study by the USDA estimates that, by selling carbon offsets farmers can generate $1 billion to $2 billion a year in income from 2012 to 2018.[1]

Example: National Carbon Offset Coalition, based in

About the Authors: Emil Dimantchev (Colorado College '11) and Jayash Paudel (Colorado College '10) are student researchers for the 2009-10 State of the Rockies Project

Montana helps farmers and ranchers sell their carbon offsets.[2]

Wind power generator projects

Farmers can lease land for power generation activity. Vast agricultural land is sometimes a viable site for wind or solar power projects. Ranchers in Wyoming, for instance, actively engage in associations to market their land to wind developers.[3] This new movement creates concerns for farmers as it raises farmland prices, increase property taxes, and may reduce land available for farming. During construction, each turbine disrupts three to four acres of farmland. After construction, a wind turbine occupies a quarter to a half of acre. Farmers and ranchers are additionally compensated for the disruption period of construction by developers.

Example: Bordeaux Wind Energy Association in Wyoming brings farmers and ranchers together to market their land and negotiate prices. Glenrock Wind Energy Project is a 99-megawatt wind project in Wyoming by Pacific Power.

Educational Activities

Farmers can charge fees to instruct and demonstrate how to make crafts, and some other traditional rural activities such as cattle roping, wine-making, cooking, cow or goat milking, gardening, identifying plants, sheep herding, and others.

Example: Wheeler Farm, Salt Lake City, Utah: www.wheelerfarm.com.

Equipment Rental

Offering rental services in areas where outdoor recreation is popular: Rent binoculars, boats, swimming, snow shoes, and cross-country skiing equipment.

Example: Wolff Farms, Circle, Montana: www.visitmt.com/categories/moreinfo .asp?IDRRecordID =12134&SiteID=1.

Patronage dividends and refunds from cooperatives

Farmers may deliver their crops to a cooperative for storage, milling, transportation, and marketing. They may also purchase fertilizer, seed, and fuel from a cooperative. Most cooperatives distribute profits by making patronage payments to those farmers who used the cooperative's facilities during the year. The remaining portion of the patronage distribution can be retained by the cooperative by issuing qualified notices of allocation, often called certificates of equity, to the farmer. Certificates may earn annual interest. This interest is taxable upon receipt. Current federal and state laws require farmers to pay income taxes on the value of the certificates during the year they are received. Therefore, farmers do not pay taxes on the cash received when certificates are redeemed at their face amount.

Example: The Rocky Mountain Farmers Union (RMFU) Cooperative and Economic Development Center: www.rmfu.org/co-op/.

Delivery Debentures

A delivery debenture is a funding instrument which cooperatives have used to raise money for facility expansions and to control deliveries. A farmer can purchase these registered notes as an investment and buy or sell them subject to approval of the boards of directors. The notes pay annual interest; they do not represent equity ownership of the cooperative, but are debt instruments that the cooperative must eventually retire.

Example: The RMFU Cooperative and Economic Development Center.

Custom farming

A farm operator agrees to work on another farmer's land in exchange for a fee. The farm operator also receives payment for all inputs.

Example: Hilltop Ranching And Custom Farming, Cody, Wyoming.

Income opportunities off the farm

Major occupation other than farming

Farms whose operators reported having a major occupation other than farming represented 36 percent of all farms in the U.S. in 2007 and 34 percent in the Rockies region.

Off-farm income:

Many farmers also depend on part time off-farm jobs to supplement their income.[4] The number of farm operators who worked for 200 days or more during 2007 off the farm was around 40% of all operators for both the U.S. and the Rockies region. This number increased by 23% in the Rockies region compared to one percent in the U.S. between 1997 and 2007.[5] According to the ERS, off-farm work is more prevalent among small scale farmers, who compensate for the scale disadvantages of their farm business.[6]

[1] Korosec, Kirsten. "Carbon Offsets: The Next Cash Crop for Farmers?" BNET Energy (July 23, 2009). http://industry.bnet.com/energy/10001735/carbon-offsets-the-next-cash-crop-for-farmers/ (Accessed August 13, 2009).

[2] Ogburn, Stephanie Paige. "Climate cash-in: Western farmers and ranchers use crops - and cows - to tap into the carbon market." *High Country News.* (May 26, 2008), http://www.hcn.org/issues/371/17713 (Accessed August 13, 2009).

[3] Goss, Addie. "Wind Farms Could Bring Wyoming Ranchers Windfall." National Public Radio, (December 26, 2008). http://www.npr.org/templates/story/story.php?storyId=98741271 (Accessed August 13, 2009).

[4] United States Department of Agriculture. Economic Research Service.

[5] United States Department of Agriculture. *2007 Census of Agriculture.* Geographic Area Series, Table 1. 2009.

[6] United States Department of Agriculture. Economic Research Service.

Agriculture's Ecological "Foodprint"

By Gregory Zimmerman

THE 2010 STATE OF THE ROCKIES REPORT CARD

Agriculture's ecological footprint, or "foodprint," is a measure of the natural resources expended to produce a human's dietary requirements. Each Calorie we consume, every bite of food we take, carries hidden environmental costs. The following charts illustrate the effect of our diet on landscapes, water resources, ecology and climate in the Rocky Mountain Region and beyond.

Landscapes

An aerial view of the Rockies reveals the indelible "foodprint" that years of agriculture have left on the landscape. From above, you can see wide open rangelands and perfectly circular cropland. The view is neither developed, nor pristine, but it is classically Western.

The Rocky Mountain Region possesses 547.9 million acres, roughly 24 percent of the total United States land area. Just over 8 percent of the Region is cropland, constituting 46.3 million acres. This represents 10.5 percent of total cropland in the United States. Grassland pasture and range comprises 302.8 million acres in the Rockies, representing over 55 percent of the total land in the Region. **See Figures 1 and 2.**

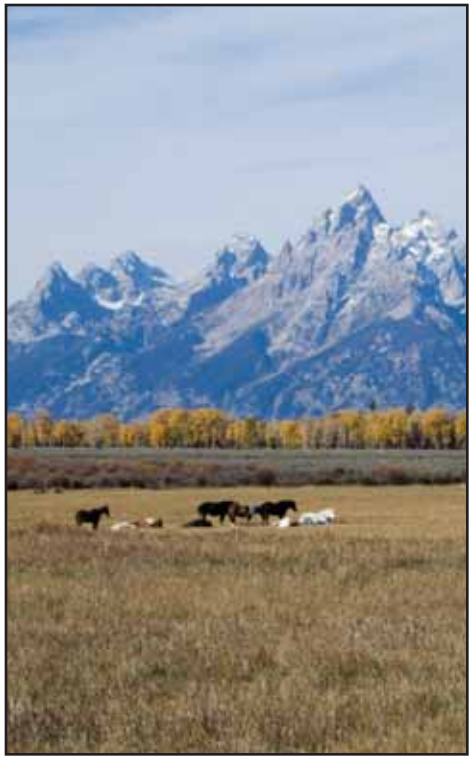

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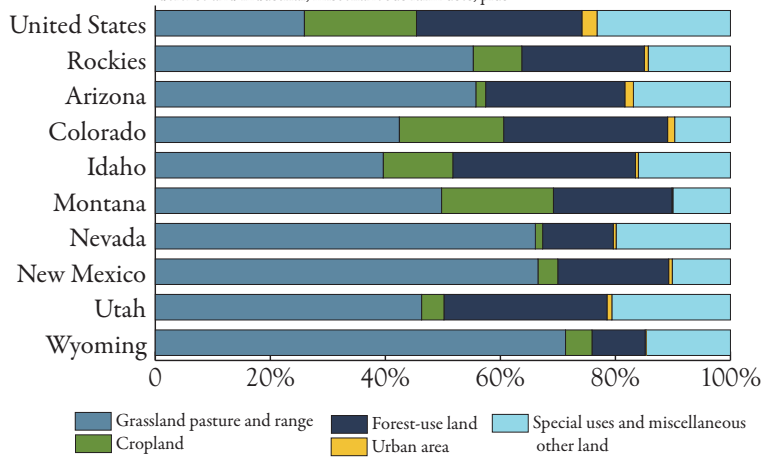
Figure 1:
Major Land Uses as a Percent of Total Land, 2002
Source: USDA, 2005
Note: Grassland, pasture and range: Grassland and other non-forested pasture and range in f
plus estimates of open or non forested grazing lands not in farms.
Cropland: Cropland used for crops, cropland idled, and cropland used for pasture.
Forest-use land: Forest-use land grazed and forest-use land not grazed.
Urban: Densely-population areas
Special use and other miscellaneous: Rural transportation, rural parks and wildlife, defense and industrial, miscellaneous farm uses, plus



Underlying Data Associated with Figure 1

	Grassland Pasture and Range	Cropland	Forest-use Land	Urban Area	Special Uses and Miscellaneous Other Land
United States	26%	20%	29%	3%	23%
Rockies	55%	8%	21%	1%	14%
Arizona	56%	2%	24%	1%	17%
Colorado	42%	18%	29%	1%	10%
Idaho	40%	12%	32%	0%	16%
Montana	50%	19%	21%	0%	10%
Nevada	66%	1%	12%	0%	20%
New Mexico	67%	3%	19%	1%	10%
Utah	46%	4%	28%	1%	21%
Wyoming	71%	5%	9%	0%	15%

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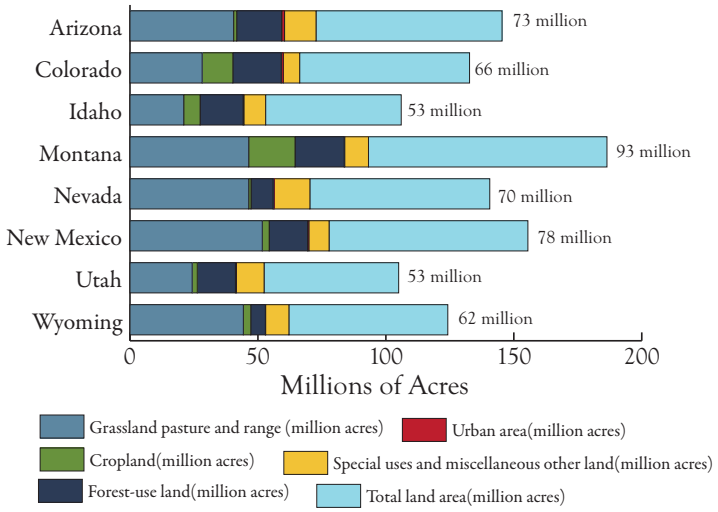
Figure 2:
Major Land Uses in the Rockies, by Millions of Acres, 2002
Source: USDA, 2005

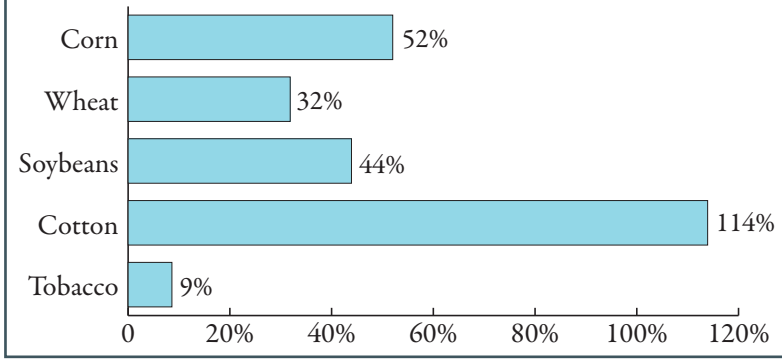


Underlying Data Associated with Figure 2

In Millions of Acres	Grassland Pasture and Range	Cropland	Forest-use Land	Urban Area	Special Uses and Miscellaneous Other Land	Total Land Area
United States	587	442	651	60	525	2,264
Rockies	303	46	117	4	78	548
Arizona	41	1	18	1	12	73
Colorado	28	12	19	1	6	66
Idaho	21	6	17	< 1	8	53
Montana	46	18	19	< 1	9	93
Nevada	46	1	9	< 1	14	70
New Mexico	52	3	15	< 1	8	78
Utah	24	2	15	< 1	11	53
Wyoming	44	3	6	< 1	9	62

Production efficiency on U.S. farms has increased substantially during the previous three decades, allowing farmers to grow more food on the same amount of land. Today, the same area of land can produce 44 percent more soybeans and 114 percent more cotton than it could in 1978. **See Figure 3.**

Figure 3:
Crop Yield Increases on U.S. Farms, 1978 - 2007
Source: USDA. *2007 Census of Agriculture*, 2009



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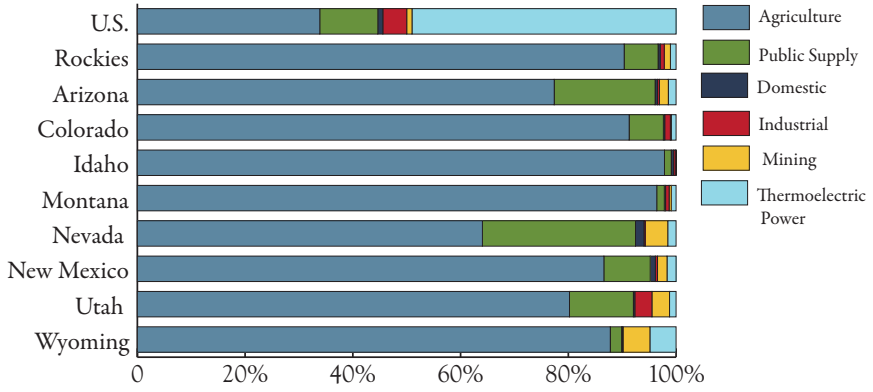
Water

When a farm receives less than 20 inches of precipitation annually, irrigation water is required to grow crops. Much of the Rockies Region falls well below the 20 inch threshold.[1] As a result, farmers depend upon irrigation water from rivers, lakes, reservoirs and aquifers to function.

In 2005, agriculture was responsible for over 90 percent of all water withdrawals in the Rocky Mountain Region. In comparison, agriculture accounted for only 34 percent of withdrawals in the United States. In Idaho agriculture uses 19.13 billion gallons of water each day, representing nearly 98% of the state's total withdrawals. Agriculture in Nevada withdraws only 1.52 billion gallons per day, which makes up 64% of the states daily water withdrawals – the lowest proportion in the Rockies. **See Figures 4 and 5.**

Figure 4:
Water Withdrawals by Category as a Percent of Total, 2005

Source: Kenny, J.F. et al. *Estimated Use of Water in the United States in 2005.* U.S. Geological Survey Circular 1344. 2009.
Note: Water withdrawals - nearly 95 percent - are attributed to irrigation.



Underlying Data Associated with Figure 4

	Agriculture	Public Supply	Domestic	Industrial	Mining	Thermoelectric Power
United States	34%	11%	1%	4%	1%	49%
Rockies	90%	6%	< 1%	1%	1%	1%
Arizona	77%	19%	< 1%	< 1%	2%	1%
Colorado	91%	6%	< 1%	1%	< 1%	1%
Idaho	98%	1%	< 1%	< 1%	< 1%	< 1%
Montana	96%	1%	< 1%	1%	< 1%	1%
Nevada	64%	28%	2%	< 1%	4%	2%
New Mexico	87%	9%	1%	< 1%	2%	2%
Utah	80%	12%	< 1%	3%	3%	1%
Wyoming	88%	2%	< 1%	< 1%	5%	5%

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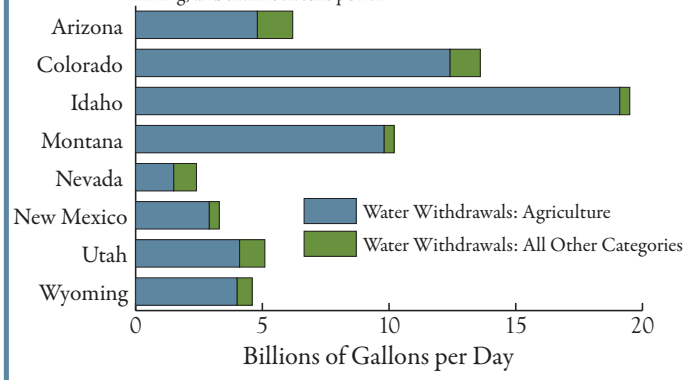
Figure 5:
Daily Water Withdrawals in the Rockies, in Billions of Gallons, 2005

Source: Kenny, J.F. et al. *Estimated Use of Water in the United States in 2005.* U.S. Geological Survey Circular 1344. 2009.
Note: Water withdrawals in "All Other Categories" includes: public supply, dometstic, industrial, mining, and thermoelectric power



Underlying Data Associated with Figure 5

	Agriculture (billion gallons per day)	Agriculture (percent of total)	All Other Categories (billion gallons per day)	All Other Categories (percent of total)
United States	139	34%	271	66%
Rockies	59	90%	6	10%
Arizona	5	77%	1	23%
Colorado	12	91%	1	9%
Idaho	19	98%	< 1	2%
Montana	10	96%	< 1	4%
Nevada	2	64%	1	36%
New Mexico	3	87%	< 1	13%
Utah	4	80%	1	20%
Wyoming	4	88%	1	12%

Water, continued.

Growing food requires large inputs of water. Globally, a pound of corn takes 168 gallons of water, while a pound of beef uses a whopping 1,857 gallons of water (including water to grow the feed, maintain forage, and water the cow). Beverage production is similarly water-intensive. A gallon of coffee requires an input of 1,120 gallons of water. **See Figures 6 and 7.**

Figure 6:
Water Foodprint, Food, 2009

Source: Gleick, P.H., et al. *The World's Water 2008 - 2009*. Washington: Island Press. 2009. and USDA. *2007 Census of Agriculture,* 2009.

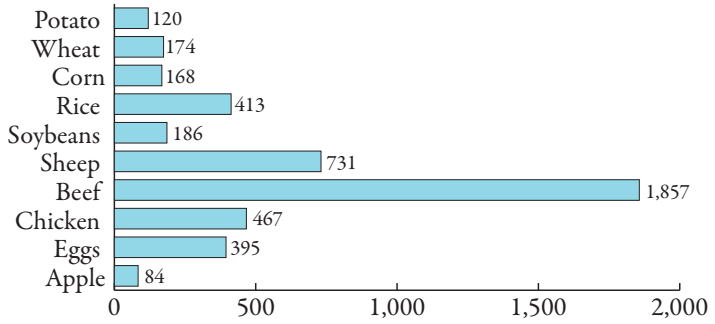
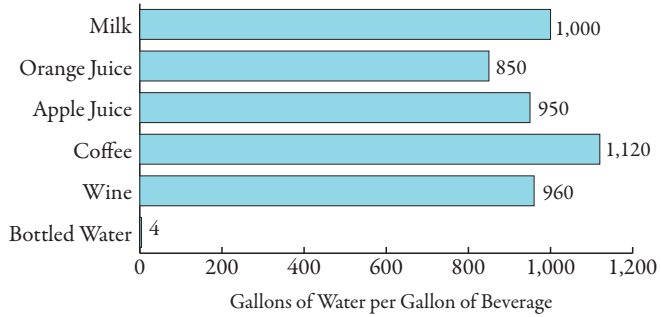


Figure 7:
Water Foodprint, Beverages, 2009

Source: Gleick, P.H., et al. *The World's Water 2008 - 2009*. Washington: Island Press. 2009.

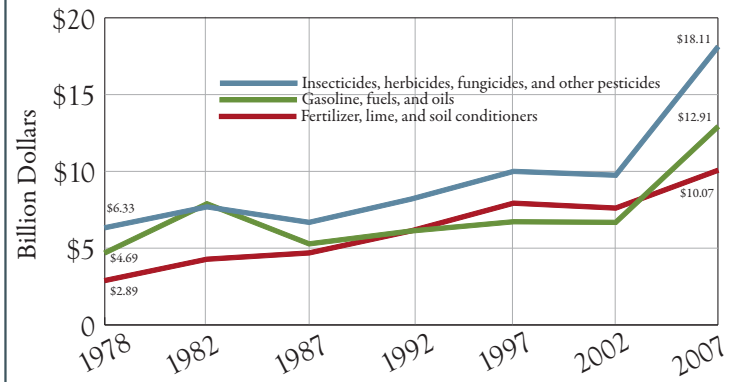


Ecology

Farmers use pesticides, fertilizers and other chemicals that, when released into the environment, impact local ecology. During the latter half of the 20th century, farms across the United States increased their reliance on pesticides, fertilizers and fossil fuels. Expenditures on fertilizers, along with gasoline and oil, have nearly tripled since 1978. At the same time, expenditures on pesticides have more than tripled. While chemicals, fertilizers and fossil fuels have boosted productivity on U.S. farms, they also pollute terrestrial and aquatic resources when released into the environment.[2] **See Figure 8.**

Figure 8:
Total Expenditures on Chemicals, Fuels, and Fertilizers on U.S. Farms, 1978 - 2007

Source: Kenny, J.F., et al. *Estimated Use of Water in the United States in 2005.* U.S. Geological Survey Circular 1344. 2009.



Croplands are the largest contributor of nitrogen and phosphorus to U.S. surface waters as nutrient-laden manure and fertilizers runoff into rivers and lakes.[3] While water bodies require some nitrogen and phosphorus to be healthy, excess concentrations cause algal blooms that consume dissolved oxygen. Without adequate dissolved oxygen in the water, plants and animals die off in large numbers. In the United States, croplands alone release 3,204 thousand metric tonnes of nitrogen each year to surface waters, accounting for nearly 40 percent of all aquatic nitrogen pollution. Croplands release 615 thousand metric tonnes of phosphorus to U.S. surface waters each year, representing about 31 percent of all aquatic phosphorus pollution. **See Figures 9 and 10.**

Figure 9:
Nitrogen Discharges to U.S. Surface Waters, 1998

Source: Carpenter, N.F. et al. "Nonpoint Pollution of Surface Waters with Phosphorus and Nitrogen," Ecologogical Applications. Vol. 8. No. 3. p. 559 - 568. August 1998.
Note: Point source pollution is pollution that originates from a single, discernible, source. For example, discharge from a sewage treatment facility is a point source of pollution. Nonpoint source pollution is pollution that originates from diffuse sources. A common nonpoint source pollution is runoff from agricultural lands that convey fertilizers, salts and other chemicals into nearby water bodies.

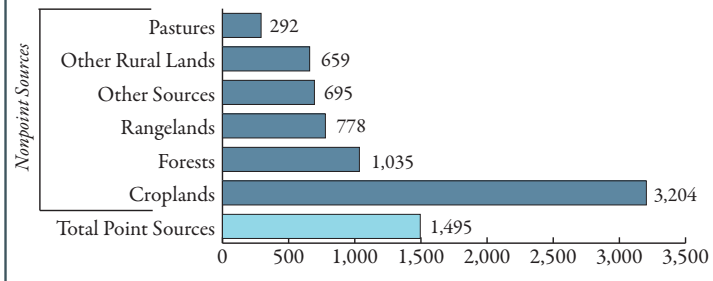
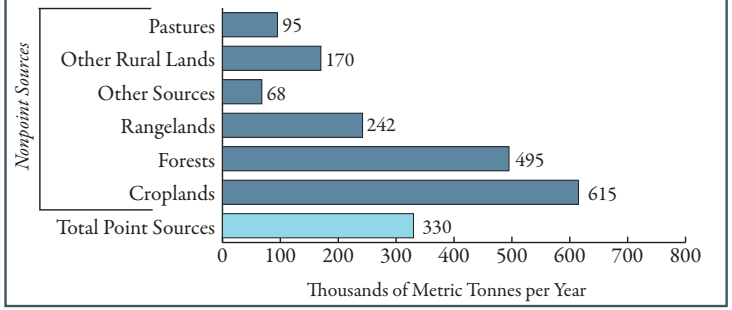


Figure 10:
Phosphorus Discharges to U.S. Surface Waters, 1998

Source: Carpenter, N.F. et al. "Nonpoint Pollution of Surface Waters with Phosphorus and Nitrogen," Ecologogical Applications. Vol. 8. No. 3. p. 559 - 568. August 1998.



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Climate

Climate foodprint is the summation of all greenhouse gases released from the farm to our dinner plate. Although calculating climate foodprint is relatively complex, one trend remains constant – animal products, especially red meat, are far more greenhouse gas intensive than vegetables. **Table 1** outlines the various sources of greenhouse gases in agriculture.

To demonstrate the difference between a meat and vegetable diet, compare equal Caloric portions of beef and vegetables with rice, and their respective CO_2e emissions. **See Table 2.** Both dishes have roughly 320 Calories. The beef steak requires 16 times more fossil energy to produce than the vegetables and rice. Overall, the six ounce steak generates 9.75 pounds CO_2e, which is 24 times greater than the vegetarian meal. The large difference in greenhouse gas emissions between the meals is explained by the additional fossil fuels burned in meat production, along with methane and nitrous oxide emitted in great quantities by cows and their manure.[4] [5] **See Figures 11 and 12.**

Table 1:
Sources of Common Greenhouse Gases in Agriculture

Carbon Dioxide	Nitrous Oxide	Methane
Fossil Fuel Consumption	Fertilizer Applications, Soil Management, Manure Management	Manure Management, Enteric Fermentation*

* Enteric fermentation is fermentation that occurs in the digestive system of cattle, sheep, pigs, and other ruminant animals. Methane is a byproduct of enteric fermentation.
Source: Weber, C.L. et al. "Food-Miles and the Relative Climate Impacts of Food Choices in the United States." *Environmental Science and Technology*. 42 (10), p. 3508 - 3513. 2008.

Figure 11:
Fossil Fuels Requred to Grow a Vegetarian Meal and a Steak Meal, 2008
Source: Bittman, Mark. "Rethinking the Meat Guzzler." *The New York Times*. January 27, 2008.

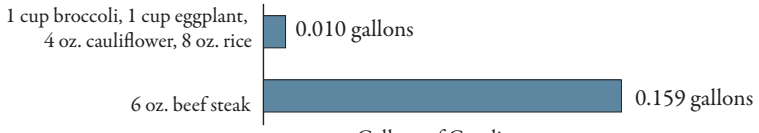

Figure 12:
Greenhouse Gases Emitted while Growing a Vegetarian Meal and a Steak Meal, 2008
Source: Bittman, Mark. "Rethinking the Meat Guzzler." *The New York Times*. January 27, 2008.

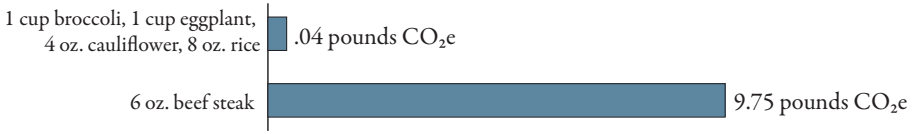

Table 2:
Global Warming Potential of Common Greenhouse Gases

Greenhouse Gas	Global Warming Potential (100 Years)	Carbon Dioxide Equivalent
Carbon Dioxide	1 ton of CO_2 is equivalent to 1 ton of CO_2	1 ton CO_2e
Methane	1 ton of methane is equivalent to 25 tons of CO_2	25 tons CO_2e
Nitrous Oxide	1 ton of nitrous oxide is equivalent to 298 tons of CO_2	298 tons CO_2e

Carbon Dioxide Equivalent
Carbon dioxide is the most prevalent greenhouse gas emitted by humans. Molecule-for-molecule, however, other common gases like methane and nitrous oxide are much more effective at trapping heat in the atmosphere and altering the earth's climate. A ton of methane traps 25 times more heat than a ton of carbon dioxide over a century. A ton of nitrous oxide traps 298 times more heat than a ton of carbon dioxide. In order to measure the global warming impact of human activity, scientist's measure carbon dioxide equivalent – or CO_2e – to account for the warming potential of each greenhouse gas. Table 2 provides the carbon dioxide equivalent for the most common greenhouse gases.

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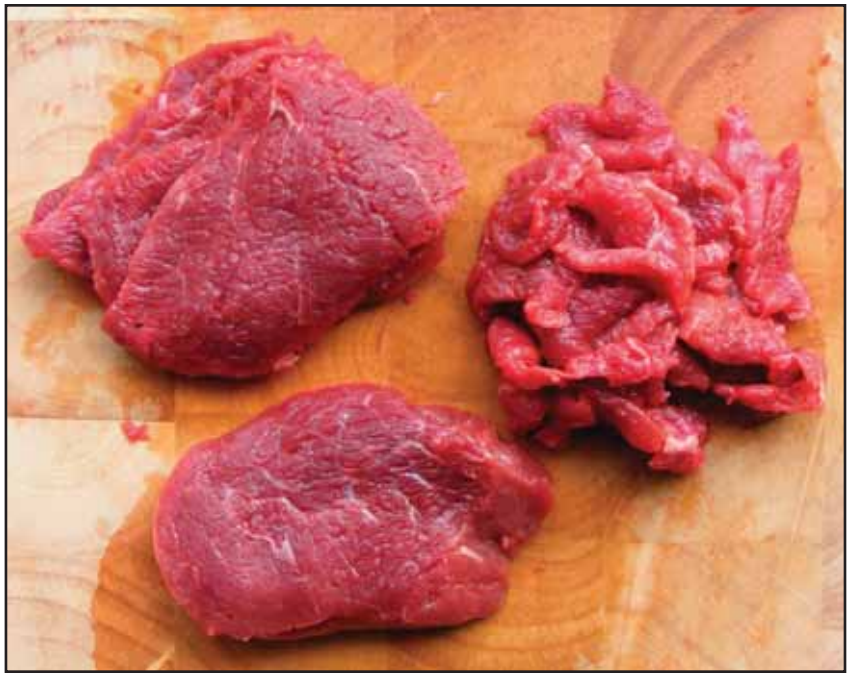

Climate, continued.

The climate impact of producing a half-pound of beef is similar to driving 9.81 miles. Producing a half-pound of potatoes is similar to driving 0.17 miles. **See Figure 13.**

Annually, global meat production is responsible for generating more greenhouse gases than transportation. Only energy production releases more atmospheric greenhouse gases than livestock production. **See Figure 14.**

Of the 11 pounds CO_2e generated in the production of a gallon of milk, 80 percent is released by growing feed and raising the cow. Preparation, transportation and sale of the gallon are responsible for the remaining 20 percent. **See Figure 15.**

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Figure 13:
Eating and Driving, Comparing the Climate Impact of Food Production and Driving, 2008

Source: Fiala, Nathan. "How Meat Contributes to Global Warming," *Scientific American*. Februray 2009.

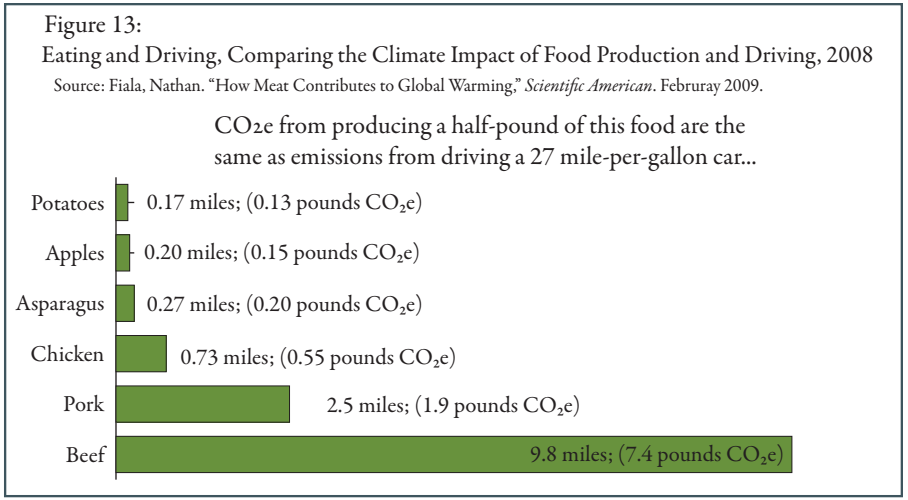


Figure 14:
Global Contribution of Greenhouse Gases by Sector, 2006

Source: Fiala, Nathan. "How Meat Contributes to Global Warming," *Scientific American*. Februray 2009.
Note: Total may exceed 100% due to rounding

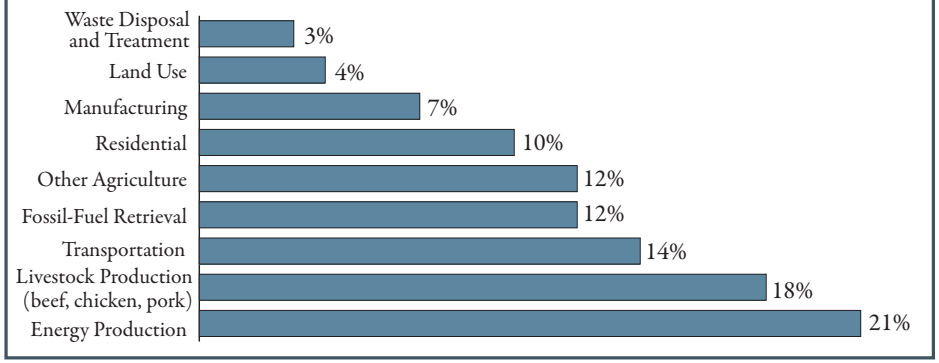
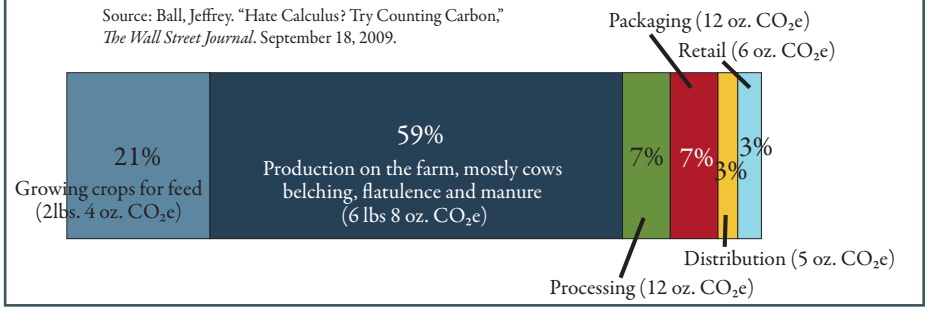


Figure 15:
Carbon Foodprint, A Gallon of U.S. Cow Milk

Source: Ball, Jeffrey. "Hate Calculus? Try Counting Carbon," *The Wall Street Journal*. September 18, 2009.



Climate, continued.

Geophysicist Gidon Eshel and Pamela Marten compared the climate impact of different American diets and relate those diet choices to the impact of various sized automobiles. Their research illustrates that the average American consumes 3,774 Calories every day: 1,047 Calories from animal products and 2,727 Calories from non-animal products. This average diet is responsible for 1.7 tons CO_2e annually, which is larger than the climate impact of driving a Toyota Prius for a year. The difference in greenhouse gas emissions between a vegan diet – one in which all 3,774 Calories are from non-animal sources – and the average American diet is 1.5 tons CO_2e annually. This is greater than the 1.0 ton CO_2e per year difference between driving a Camry and a Prius. **See Figures 16 and 17.**

Figure 16:
The Average American Diet, Caloric Composition, 2009

Source: Eshel, G. et al. "Diet, Energy, and Global Warming," *Earth Interaction*. Volume 10. Paper Number 9. 2006.

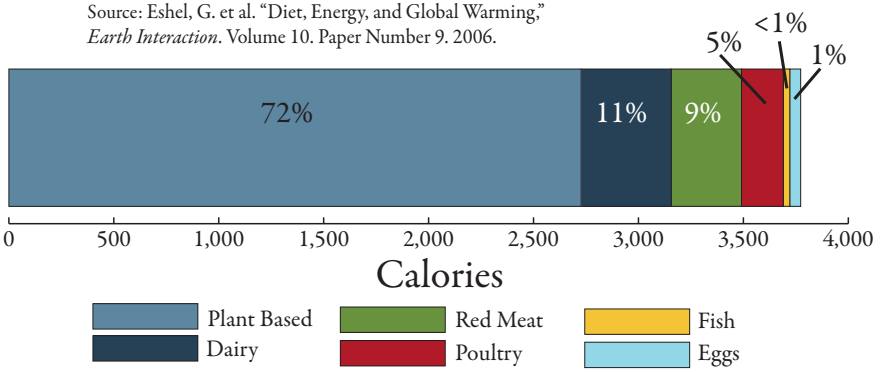
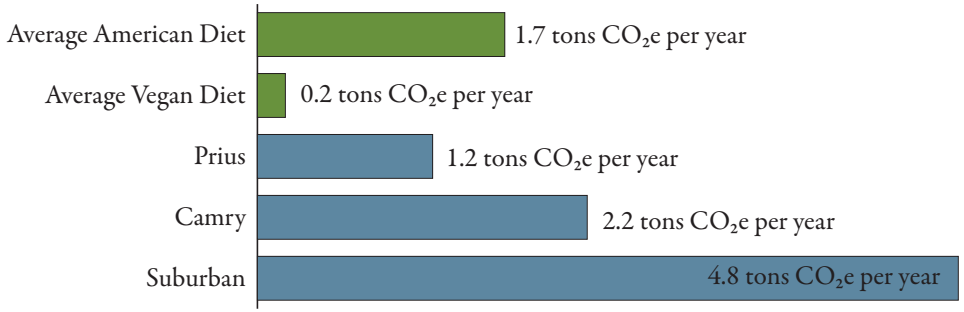


Figure 17:
Eating and Driving: Climate Impact of an Average Diet and a Vegan Diet versus Driving

Source: Eshel, G. et al. "Diet, Energy, and Global Warming," *Earth Interaction*. Volume 10. Paper Number 9. 2006.
Note: Assumes 8,332 per capita vehicle miles traveled, of which 65 percent are traveled on highways and the remainder are traveled in the city.



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Climate, continued.

A very common misperception is that "buying local" is the most effective method for reducing ones climate foodprint. Reducing food-miles – the distance food travels from farm-to-fork – does decrease greenhouse gas emissions. However, researcher Christopher Weber and Scott Matthews found that, of the 8.13 tonnes CO_2e released annually by American households, 83 percent of emissions occur at the farm, during production. As a result, the best technique for reducing climate foodprint is to reduce consumption of the most carbon intensive foods, namely red meat and dairy products. Weber and his colleague demonstrate that red meat and dairy are responsible for a combined 49 percent of an American household's annual foodprint: 2.48 tonnes CO_2e per year from red meat and 1.47 tonnes CO_2e from dairy products. **See Figures 18 and 19.**

Figure 18:
Annual Climate Impact of Foods Consumed in U.S. Households by Supply Chain Tier

Source: Weber, C.L. et al. "Food-Miles and the Relative Climate Impacts of Food Choices in the United States," *Environmental Science and Technology*. 42 (10), p. 3,508 - 3,513. 2008.

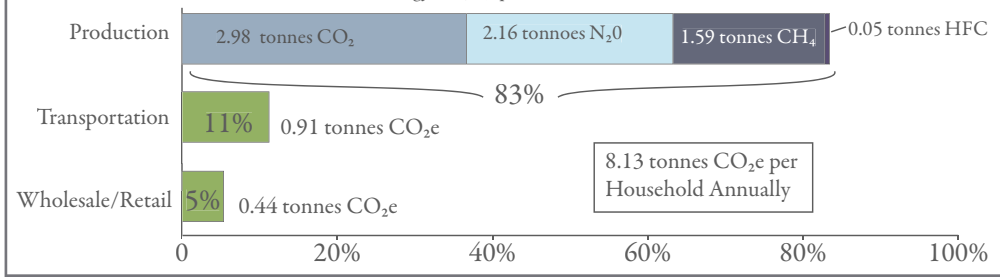

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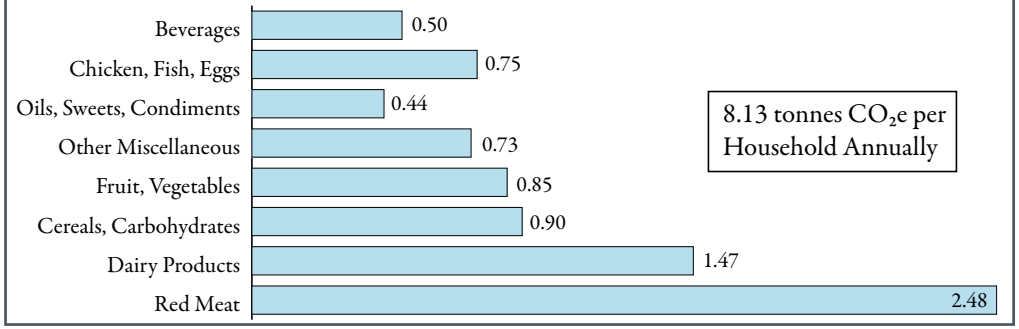
Figure 19:
Annual Climate Impact of Foods Consumed in U.S. Households by Food Group, in tonnes CO_2e per Year

Source: Weber, C.L. et al. "Food-Miles and the Relative Climate Impacts of Food Choices in the United States," *Environmental Science and Technology*. 42 (10), p. 3,508 - 3,513. 2008.



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[5] Greenhouse gas emissions are typically reported by the pound, the kilogram, the ton or the metric tonne (often just called the tonne). 1 ton is equivalent to 2000 pounds and 907 kilograms. 1 tonne is equivalent to 2205 pounds and 1000 kilograms.

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Photo contributions for this report are mostly from Colorado College students, faculty, and staff; other photos are credited to the photographer or acquired as public domain.

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Patrick Creeden is a student researcher for the 2009/10 State of The Rockies Project. From Colorado Springs, Colorado, Patrick's interest in environmental issues was cultivated during a summer he spent working on a cattle ranch in southeastern Colorado. He will graduate in May 2010 with a degree in anthropology, and is interested in cattle ranching as it pertains to the development of the Rocky Mountain West. After college he will be working for the National Outdoor Leadership School in Lander Wyoming. He enjoys sports, hiking, and coaches a high school basketball team in Colorado Springs.

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Elizabeth Kolbe is the 2009/10 program coordinator for the State of the Rockies Project, and the co-editor of the *2009* and *2010 State of the Rockies Report Cards*. This is her third year with the Rockies Project, and second year as program coordinator. When working as a student researcher for the 2007/08 State of the Rockies Project, she wrote a report on Renewable Energy in the Rockies. In May, 2008, she graduated cum laude from Colorado College with a B.A. degree in environmental science. Her senior thesis focused on the environmental, political, and economic climate and energy efficiency of ethanol production in Iowa, her home state. Liz is also a volunteer assistant coach for the Colorado College women's basketball team.

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Matthew K. Reuer served as the technical liaison for the 2009-10 State of the Rockies Project, overseeing tasks including data assimilation, GIS analysis, and logistics management; in addition he co-edited the *2007*, *2008*, and *2009 Report Cards*. He is also the technical director of the environmental program and the chemistry department at Colorado College. He received his doctorate degree from MIT in 2002 and was a Harry Hess postdoctoral research fellow at Princeton University from 2002 to 2004, focusing on global carbon cycle research. Matt's scientific interests in this region include the environmental chemistry of western rivers and watersheds and global change impacts on alpine biogeochemical cycles. He is also highly interested in western development issues and the creation of innovative energy policies in the Rocky Mountain West.

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Stephen G. Weaver is an award-winning photographer with over 30 years experience making images of the natural world and serves as technical director for the Colorado College geology department. Educated as a geologist, Steve combines his scientific knowledge with his photographic abilities to produce stunning images that illustrate the structure and composition of the earth and its natural systems. As an undergraduate geology student, he first visited the Rocky Mountains where he fell in love with the mountain environment and the grand landscapes of the West. Steve currently photographs throughout North America with a major emphasis on mountain and desert environments. His use of a 3x5 large format view camera allows him to capture images with amazing clarity and depth.

Zoë Wick is a student researcher for the 2009/10 State of the Rockies Project. From Seattle, Washington, she will graduate in May 2010 with a degree in sociology. While at Colorado College Zoë has enjoyed spending time in the Rockies and learning about agriculture, and has become especially interested in the ways government policies affect community life and the environment. After graduation she plans to teach English in Sao Paulo, Brazil. Her extra-curricular activities include working with middle school students on an environmental project, and she enjoys running, singing, and learning guitar.

Gregory Zimmerman is a guest contributor to the *2010 State of the Rockies Report Card.* Greg graduated from Colorado College in 2006 with a B.A. degree in environmental science, and was a student researcher for the 2005-06 State of the Rockies Project. Since Colorado College, Greg has worked with the Colorado Watershed Assembly. He now lives in Denver, Colorado.