



CAFNR

College of Agriculture, Food and Natural Resources

Dr. Willi Meyers

Howard Cowden Professor of Agricultural and
Applied Economics

Director, CAFNR International Programs (CIP)



CAFNR

College of Agriculture, Food and Natural Resources

CAFNR institutional engagement (Training Grants, Technical Assistance)

Building Partnerships:

One Person at a Time



CAFNR

College of Agriculture, Food and Natural Resources

Borlaug Fellows and Global Alliance





CAFNR

College of Agriculture, Food and Natural Resources

Faculty Exchange Program





CAFNR

College of Agriculture, Food and Natural Resources

Borlaug Fellows and FEP in Des Moines





CAFNR

College of Agriculture, Food and Natural Resources

Visiting Danforth Center –FEP and Borlaug





CAFNR

College of Agriculture, Food and Natural Resources

Cochran and Scientific Exchange





CAFNR

College of Agriculture, Food and Natural Resources

Templeton Foundation– Kenya





CAFNR

College of Agriculture, Food and Natural Resources

Templeton–Kwa Zulu Natal, South Africa





CAFNR

College of Agriculture, Food and Natural Resources

Dr. Marc Linit

Associate Dean of Research and Extension

CAFNR



CAFNR

College of Agriculture, Food and Natural Resources

CAFNR International Involvement

Institutional

Technical Assistance

Training Grants

Faculty Initiated

Research

Demonstration

Training



CAFNR

College of Agriculture, Food and Natural Resources

Faculty Engagement: 2012 Faculty Reporting System

49 faculty reported international engagement

- 33 research activities
- 18 outreach activities
- 9 research / outreach activities
- 10 training activities
- 15 unclassified



CAFNR

College of Agriculture, Food and Natural Resources

Faculty-Initiated International Research

Four Examples From the MU

College of Agriculture, Food, and Natural Resources



CAFNR

College of Agriculture, Food and Natural Resources

Mengshi Lin, Associate Professor, Food Science

Enhanced International Collaboration in Food Safety Research and Education to Combat Food Contamination through the Global Food Chain: USDA-NIFA

Collaborating Institutions: Jiangnan University, Wuxi, China

To develop an collaborative international program in food safety in order to meet the changing demands of a global economy on our food supply, specifically to combat the transmission of contaminated foods through the global food chain.

Nations Impacted: US & China



CAFNR

College of Agriculture, Food and Natural Resources

Francisco Aguilar, Assistant Professor, Forestry

Establishment Of Low-cost Bio-digesters And Integrated Agroforestry Systems To Improve Livelihoods Of Mali And Senegal's Rural Population: USDA Foreign Agricultural Service, USDA Norman Borlaug Fellowship Program

University of Missouri, Mali's Institute for Rural Economy, Ecole Polytechnique de Thiès (Senegal), Programme National de Biogaz Domestique du Sénégal (Senegal), Universidad EARTH (Costa Rica)

Western Africa is a region with numerous natural resource challenges one of each is the utilization -and replacement- of firewood with alternative sources of energy for cooking. This project demonstrates the use of bio-digestion to produce methane for cooking and organic fertilizer as a soil amendment.

Nations Impacted: Mali, Senegal, other West African Nations through the regional Domestic Biogas Network



CAFNR

College of Agriculture, Food and Natural Resources

Bill Folk, Professor, Biochemistry

The International Center for Indigenous Phytotherapy Studies (TICIPS):
National Center for Complementary and Alternative Medicine and the
Fogarty International Center (within NIH)

Collaborating Institutions:

RSA: University of the Western Cape and University of KwaZulu
Natal and Edendale Hospital

US: MU, UM-Kansas City, Missouri Botanical Garden.

To study the traditional, complementary and alternative medicines used by Africans to manage symptoms of HIV/AIDS and secondary infections and chronic diseases. Has pioneered the development of clinical trials of African traditional medicines used by a majority of the public under ethical and regulatory norms of the South African Government and the US/NIH.

Shibu Jose, Professor & Director, Center for Agroforestry

US-India Consortium for Development of Sustainable Advanced Lignocellulosic Biofuel Systems: DOE (US) / Department of Science and Technology (India)

US Partners: MU, University of Florida, Texas A&M, Virginia Tech, Montclair State. There are two industrial partners, Show Me Energy Cooperative of Missouri and Green Technologies of Florida

Indian Partners: ICRISAT (International Crop Research Institute for the Semi-Arid Tropics) , Indian Institute of Chemical Technology, Indian Institute of Technology (IIT), Tamil Nadu Agriculture University, industry partners; Hindustan Petroleum Corporation and Abellon Energy

To develop and demonstrate commercially scalable and viable technologies to grow and convert lignocellulosic biomass to biofuels



CAFNR

College of Agriculture, Food and Natural Resources

Dr. Robert Sharp

Professor of Plant Sciences

Director, Interdisciplinary Plant Group (IPG)



Interdisciplinary
Plant Group
University of Missouri



<http://ipg.missouri.edu/>

“Food for the 21st Century” Program

Established in 1984 “To look 20 years into the future---to see what major problems and constraints will face food and agriculture at that time”.

Targeted investments in:

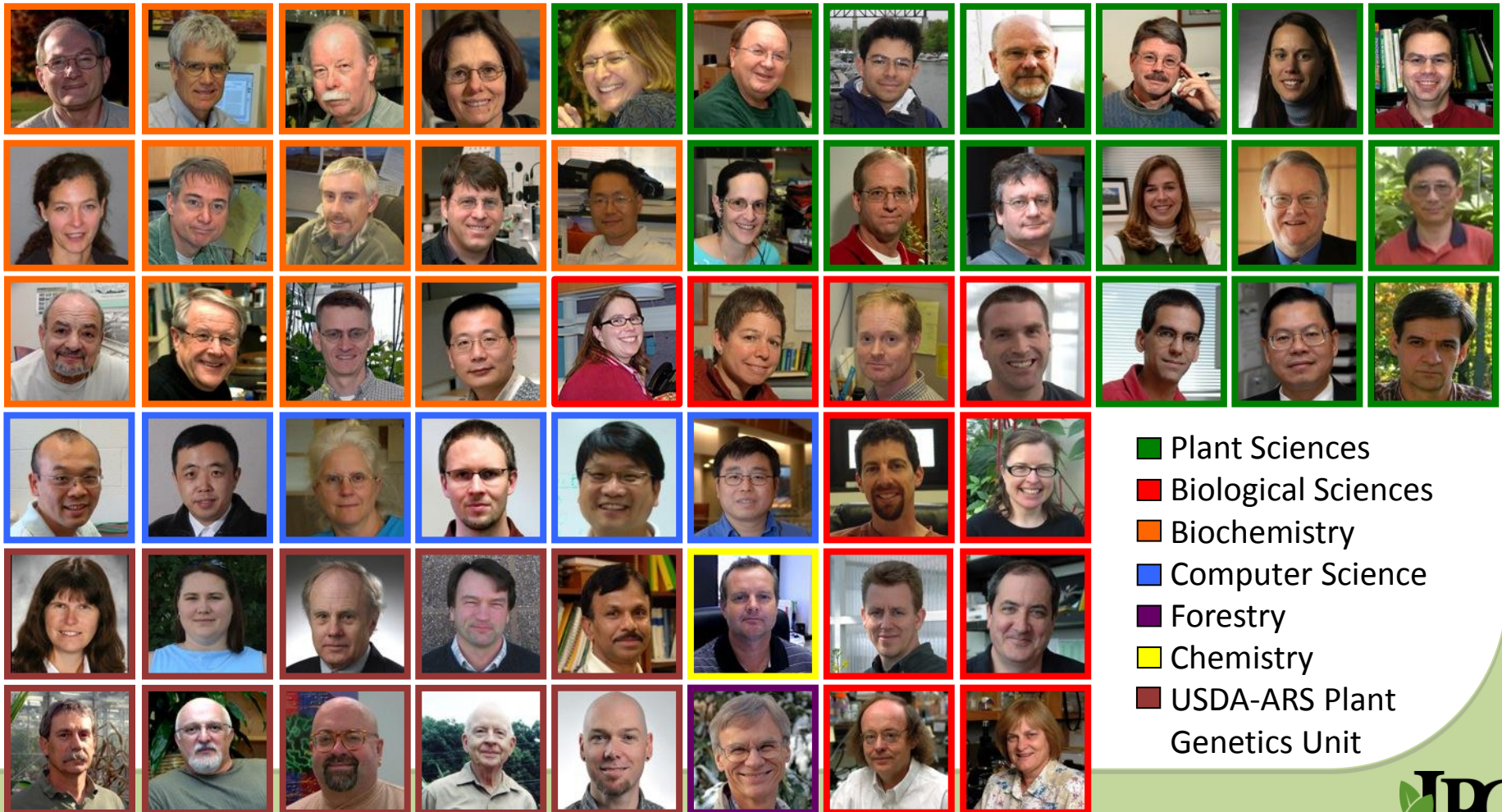
- **Interdisciplinary Plant Group (IPG)**
- Animal Reproductive Biology
- Food Systems and Bioengineering
- Nutritional Sciences



In 2010, MU was ranked **14th in the world** among universities for plant science research (*Times Higher Education*)

The IPG --- who we are...

- **Established in 1981** to develop a program of excellence in plant science
- 57 faculty teams; recognized for interactive research and education **community**
- **19 Fellows** of the American Association for the Advancement of Science (AAAS)



Plants For Changing Environments

Genetic Diversity



Missouri Maize
Center



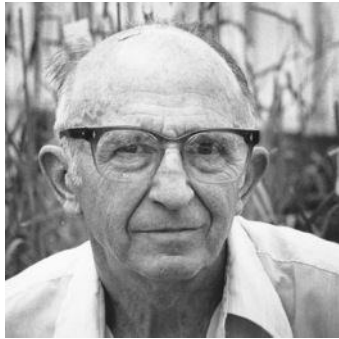
National Center
for Soybean
Biotechnology



*Developmental
Mechanisms*

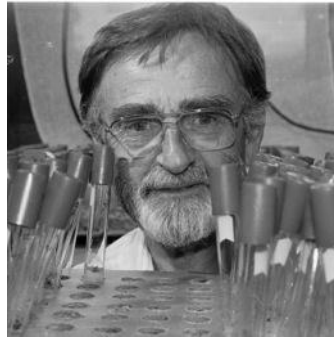
Abiotic & Biotic Interactions

Plant Genetics at MU: Building on a History of Discovery



Ernie Sears

Hoblizelle Award (1958) and
Wolf Prize (1986) for research
in wheat genetics



George Redei

Hungarian Academy of Science
(1990) for work with *Arabidopsis*
(*Columbia* ecotype)



Edward Coe

Thomas Hunt Morgan Medal
(1992) for lifelong contributions
to maize genetics



James Birchler

National Academy of Sciences
(2011) for contributions to
maize cytogenetics



**Mike McMullen and
Sherry Flint-Garcia**

USDA Secretary's Honor Award
(2012) for Maize Genetic
Diversity Research Group



Perry Gustafson

University of Nottingham (UK)
greenhouse named in his
honor for advances in wheat
production (2013)

Developmental Mechanisms

- *Root biology: “The Hidden Half”*



Corn rootworm damage
(Bruce Hibbard, MU)



Abiotic & Biotic Stress

- *Drought*
- *Nematode, insect and pathogen interactions*

Drought is the most important factor limiting crop productivity worldwide

(Boyer JS, 1982, *Science*)



- Annual losses due to drought are **\$4-5 billion** in the US and **\$13 billion worldwide**
- The **growing world population** increasingly competes for water resources, and will require greater productivity per unit water and land
- Major impact of drought on **global food security**

IPG Drought Team

“Roots Under Drought --- Model Systems to the Field”

- One of the most important yet most under-studied questions
- Interactions of drought with soil (temperature, physical impedance, nutrition, insect- and microbe-plant relations)
- Graduate training in interdisciplinary drought research (*Mizzou Advantage workshop, April 2012*)



- Div. Plant Sciences
- Div. Biochemistry
- Div. Biol. Sciences
- Dept. Computer Science
- Dept. Soil, Atmos. & Environ. Sciences
- USDA Plant Genetics

Field drought research facility

- Three automated “rainout shelters”
- Future objective: addition of rhizotron (underground root lab.) facility

“International Food Security Alliance” (IFSA)

- led by Dr. Bill Davies (CBE), Lancaster University, UK
- MU-IPG and China Agricultural University are lead partners



MU

- IPG
- Food and Agricultural Policy Institute (FAPRI)
- Interdisciplinary Ctr. for Food Security

Focus areas of the IFSA

Education:

Develop an international PhD program in ***“Food and Water Safety and Security”***

Research:

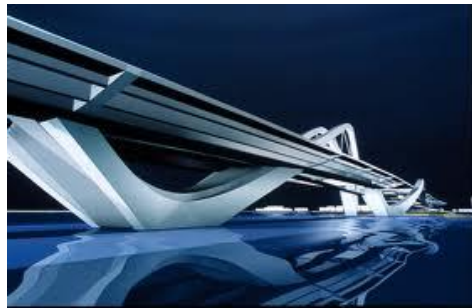
Focus on ***“Below-ground systems” (root biology: drought, nutrition)***

Our vision: Bridges to sustainable agriculture



- 1. Integrating university research strengths with end-user expertise to collaboratively define current agricultural limitations**

- 2. Building synergistic partnerships to translate existing knowledge into meaningful outcomes that address current limitations to sustainability**



- 3. Enacting novel, visionary solutions to remove current and emerging obstacles to sustainability**
 - Future solutions must take advantage of strategies that span basic research and field application strengths**



CAFNR

College of Agriculture, Food and Natural Resources

Dr. Jill Findeis

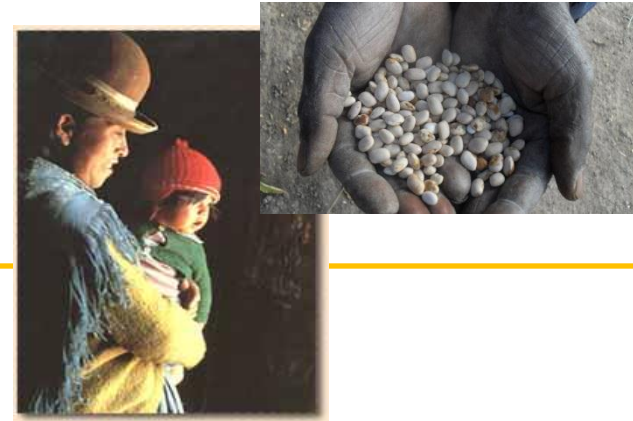
Professor of Agricultural and Applied Economics

Director, Division of Applied Social Sciences



CAFNR

College of Agriculture, Food and Natural Resources



MU Interdisciplinary Team Approach

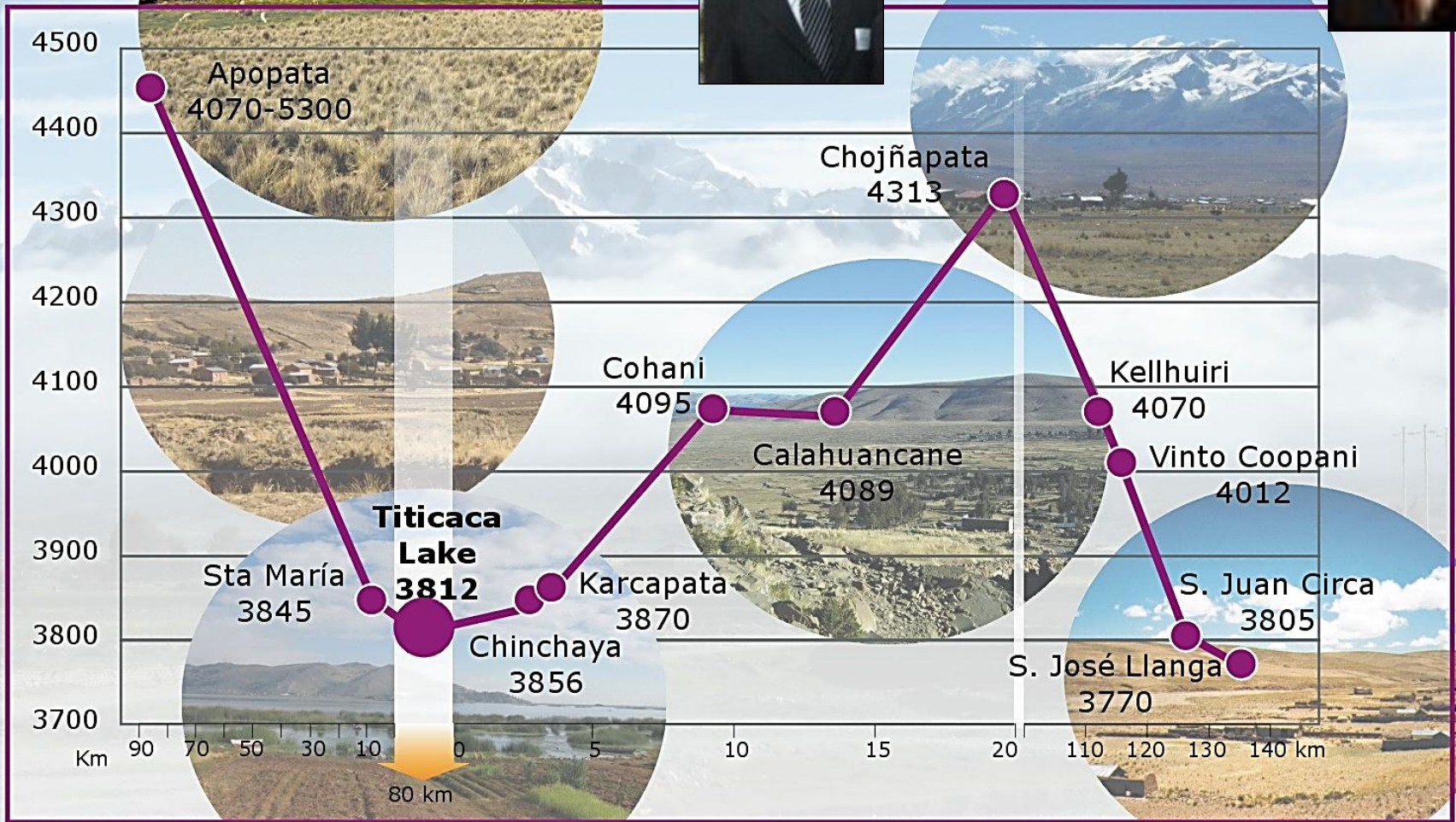
- Scientists and social scientists – team collaborations creating knowledge networks and development pipelines
- Engaged student population
 - Creation of on-the-ground learning laboratories
 - Engagement of students as partners in development
- Capacity building/human resource training – Borlaugs, etc. / FAPRI, McQuinn Center for Entrepreneurial Leadership, Graduate Institute of Cooperative Leadership, CARES, Cambio Center
- Innovation - digital technologies



Collaborating with people, learning & strengthening capacities to adapt to change in the Andes

- Title XII USAID Small Ruminant CRSP 1980-1996
Sustainable Agropastoral Systems in Peru and Bolivia
- NOAA Human Dimension 1998-2003
- International Potato Center & WB Environment 2005
- Title XII USAID SANREM CRSP 2005-2010
- McKnight Foundation 2009-2014

Work of Valdivia, Gilles, et al. Project Team



Participatory research

Community Research Groups

Co-learning with farmers

Sharing new knowledge in

the context of local

knowledge

Building networks &

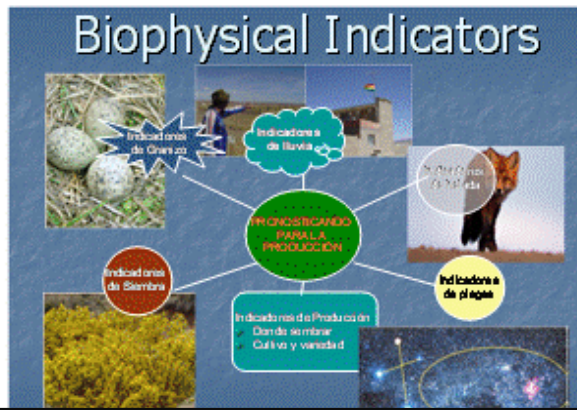
coalitions across scales



Biophysical Indicators



Mapping & discussing changes

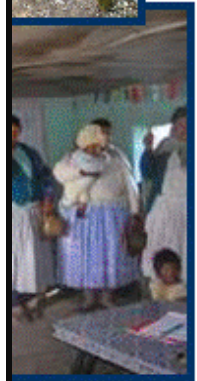
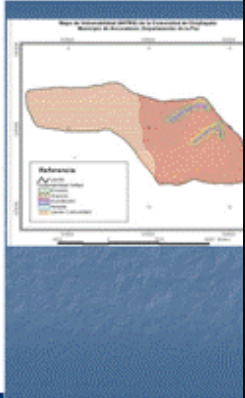


Co-Learning

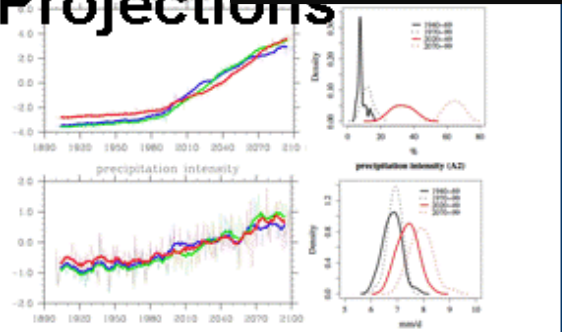


Participatory research to link knowledge systems for making decisions under uncertainty

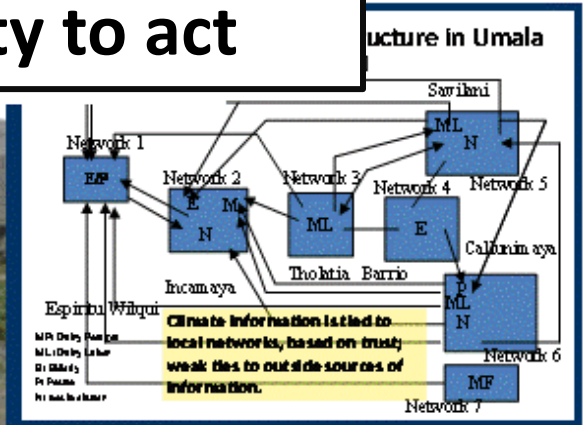
Research on participatory processes – institutions - that enable ability to act



Projections



Climate Change in the Alps: More Extremes and Shifts towards More Uncertainty



Networks of Information



CAFNR

College of Agriculture, Food and Natural Resources



MU Interdisciplinary Team Approach

- Science-social science collaborations for greater impact
- Utilization of rapidly developing communication technologies
- Capacity building – institutions & people
- Development of next generation of scientists



CAFNR CORPS

Discover where eight faculty members launched their international careers



CAFNR

College of Agriculture, Food and Natural Resources

