

Farm chemicals, food production, environmental sustainability and human health

Lorann Stallones, MPH, PhD

Director, Institute of Applied Prevention
Research

Colorado State University



Conceptual approach to agricultural safety and health

- Sustainable agriculture requires an agricultural system that can meet demands for food, fiber and fuel at a socially acceptable economic and environmental cost.
- The agro-ecosystem system approach incorporates:
 - Human well-being
 - Economic performance
 - Ecological conditions



Conceptual approach to agricultural safety and health

- Agri-food systems are needed that are economically viable, meet society's need for safe and nutritious food while conserving natural resources and also the quality of the environment for future generations.
- Inherent in this approach is the health and safety of the human population including workers involved in food, fiber, and fuel production.
- Increased attention to the human health effects of the food production system is critical.
 - Included in this consideration is the health and safety of agricultural workers as a primary concern for public health professionals since the health and safety of all people are dependent on this working population.

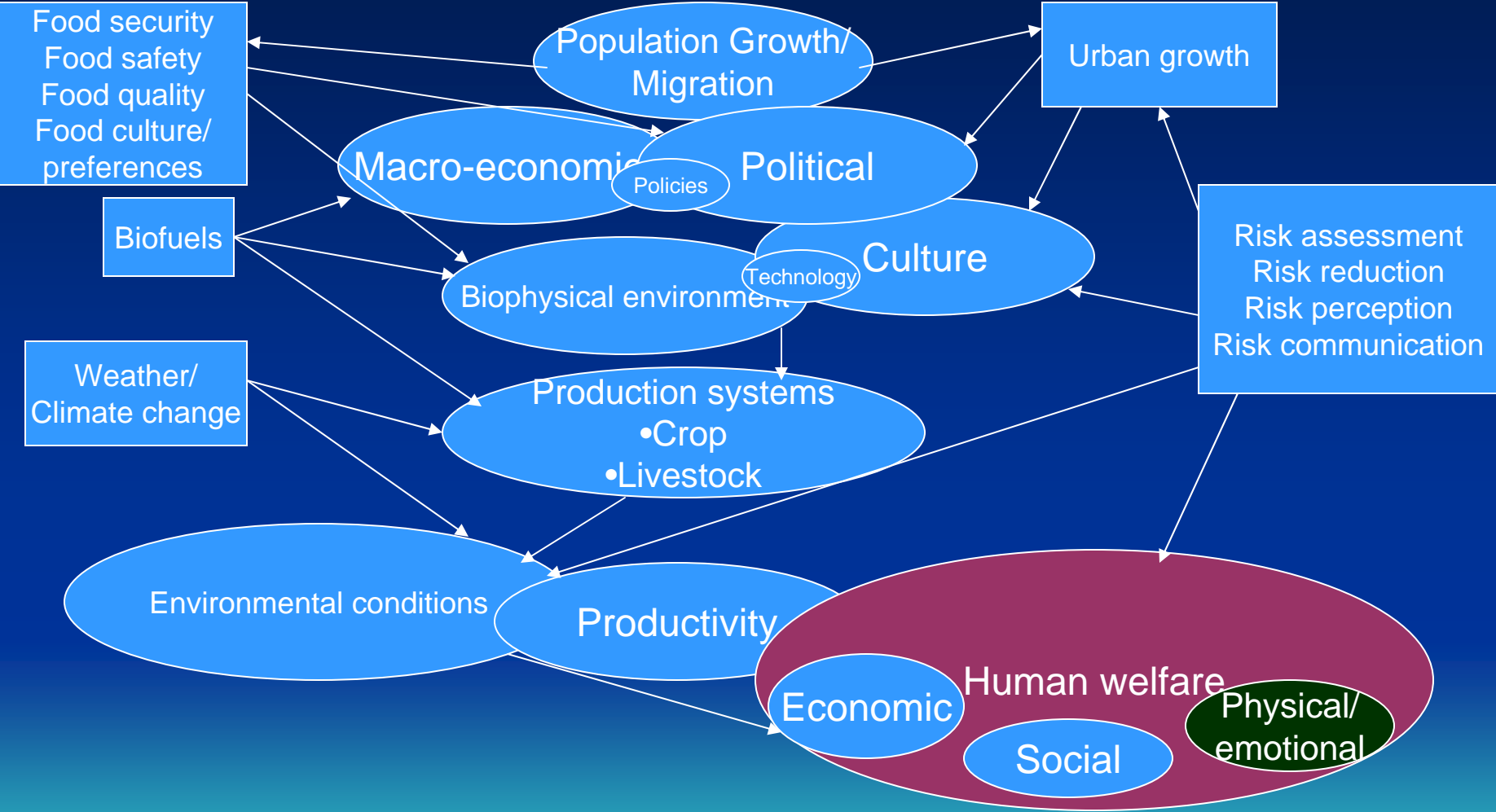


Conceptual approach to agricultural safety and health

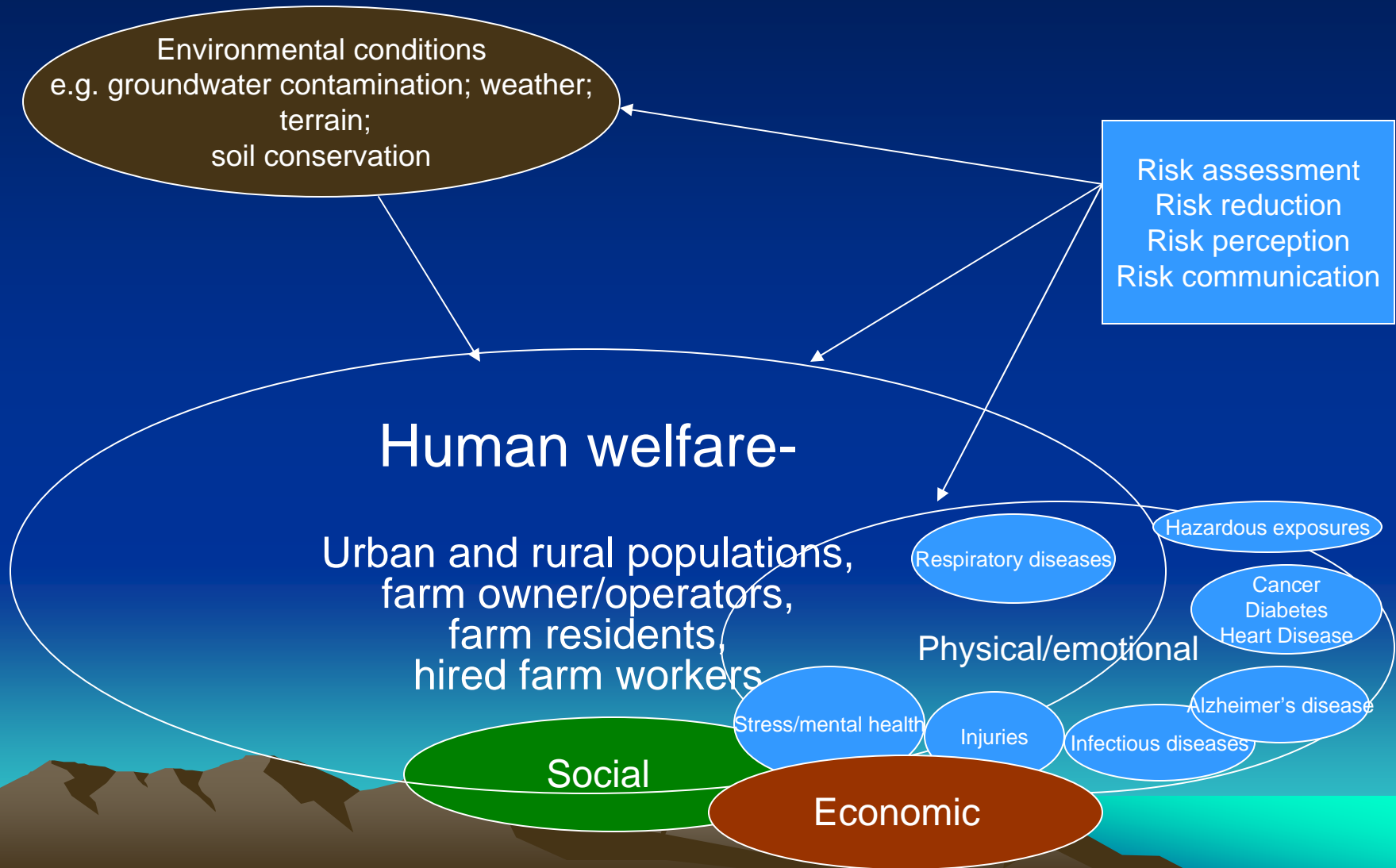
- Linking an understanding the relationships between the agro-ecosystem and human health is complex and more work needs to be done to understand the dynamic relationships involved.
- In order to do this, groups who have not traditionally worked together need to become more familiar with each other.
- The next slide represents an attempt to characterize the complex systems involved.



Agro-ecosystem model for approaching agricultural safety and health



Food-related health programs



Consumer food preferences

- Factors influencing consumer food choices
 - Budget
 - Volume/quantity
 - Categories of food consumed
 - Home or out-of-home consumption
 - Homemade or ready prepared meals
 - Quality of food
- Recent influences on food choices
 - Growing incomes
 - Reduction in household size
 - Increased number of working women
 - Changes in lifestyles (time pressure)
 - Food scares
 - Health concerns (increased interest in organic foods)
 - Ethics
 - Animal welfare
 - Environmental concerns



Per capita consumption (kg/year) of selected food categories, European Union

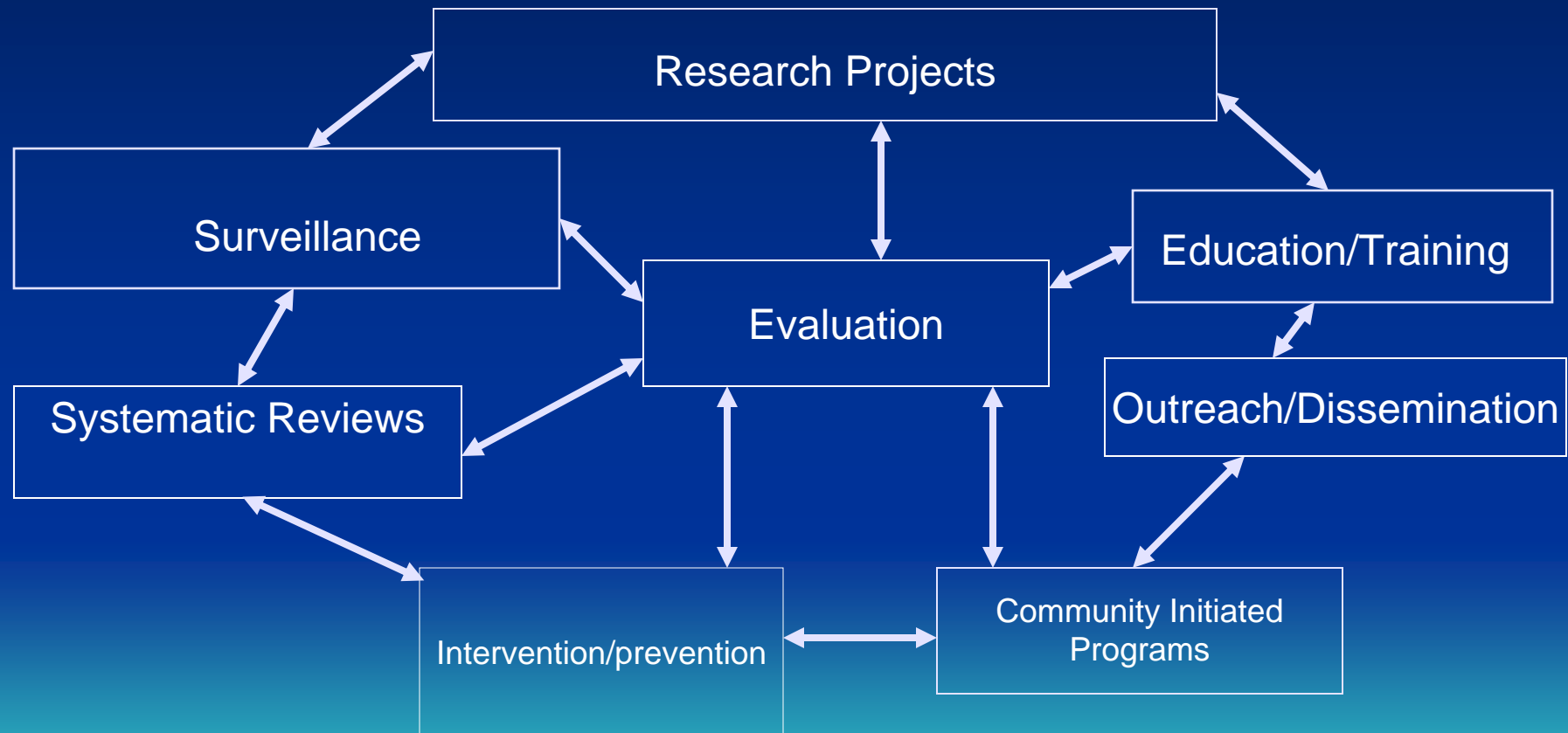
	1990	2003
Cereals	109.0	121.3
Potatoes	82.0	76.5
Vegetables	123.0	125.6
Fruits	107.3	117.4
Meat	87.0	91.5
Butter	4.8	4.5
Cream	3.0	3.9
Milk	236.6	255.1
Fish and seafood	24.3	26.2

Food scares

- Vegetables
 - E.coli OH157:H7
 - Salmonella
 - Pesticides
- Meat
 - Bovine spongiform encephalopathy (virus or prion?)
 - Scrapie in sheep
 - Sarcoma in chickens
- Processed foods
 - Peanut butter (salmonella)
 - Pet food (melamine-industrial chemical contaminant)
 - Milk products (melamine)



Proposed components of a model program in food related health and safety



Developmental goal: Enhance surveillance activities

Surveillance is:

- the ongoing, systematic collection, analysis, and interpretation of health data essential to planning, implementation, and evaluation of public health practice, closely integrated with timely dissemination of these data to those who need to know.
- Hazard surveillance is the assessment of the occurrence of, distribution of, and secular trends in levels of hazards (toxic chemical agents, physical agents, biochemical stressors as well as biologic agents) responsible for disease and injury through use of existing records (e.g. sales records).
- Environmental surveillance may also provide information of particular relevance for agro-ecosystem approaches to agricultural safety and health including monitoring of the food supply, farm chemicals in groundwater, surface water and migration in soils and policies which influence production agriculture.



Developmental goal: Enhance surveillance activities

- In public health, there are several potential benefits gained from hazard and environmental surveillance that expand on or complement those of disease surveillance. These include: ease of measurement of the condition under surveillance, attention to the proper target of control, higher frequency of events, and avoidance of difficult issues of privacy.
- The final link of the surveillance chain is the application of these data to prevention and control. A surveillance system includes a functional capacity for data collection, analysis, and dissemination linked to public health programs.



To enhance environmental surveillance: Topics and disciplines

- Environmental focus

- Climate
- Soil conditions
- Water
- Air
- Economic and social policies
- Food distribution system

- Disciplines

- Ecologists
- Environmental Scientists
- Hydrologists
- Soil scientists
- Crop scientists
- Economists
- Social scientists
- Food safety specialists



To enhance hazards surveillance: Topics and disciplines

- Hazards
 - Farm chemicals
 - Equipment
 - Animal health
 - Food contamination
 - Weather (heat or cold)
 - Workplace organization
 - Behavioral risk factors
- Disciplines
 - Industrial hygienists
 - Engineers
 - Toxicologists
 - Animal behavior specialists
 - Climatologists
 - Veterinarians/livestock specialists
 - Occupational health psychologists
 - Sociologists
 - Anthropologists
 - Food safety specialists



To expand disease/injury surveillance: Topics and disciplines

- Disease/injuries

- Infectious diseases
- Respiratory diseases
- Cancer
- Diabetes
- Cardiovascular disease
- Traumatic injuries
- Adverse reproductive outcomes
- Neurological disorders
- Mental disorders/stress

- Disciplines

- Occupational physicians and nurses
- Public health professionals
- Nosologists
- Toxicologists
- Epidemiologists
- Psychologists



Goal: To continue to conduct high quality evidence-based intervention/prevention

- Develop expertise at conducting systematic reviews to identify programs which should be implemented in the general population and in agricultural communities to reduce illnesses and injuries.
- Enhance capacity to integrate input from communities in urban, rural and agricultural areas to identify areas of concern among community residents.



Goal: To continue to conduct high quality evidence-based intervention/prevention through systematic reviews.

- Systematic review training could be provided to enhance capacity to identify promising interventions.
- Systematic reviews also provide information about gaps in research and evaluation of effectiveness and efficiency of existing intervention programs.
- Systematic review results could be posted on websites and disseminated to other groups involved in food related safety and health research.



Goal: To continue to conduct high quality evidence-based intervention/prevention through systematic reviews.

- Systematic reviews related to agricultural safety and health have been conducted on:
 - Child farm injury prevention
 - Multiple myeloma and farming (animals or pesticides?)
 - Farm safety interventions
 - Preventing agricultural injuries
 - Agri-food safety (zoonotic diseases and human health)
 - Treatment of organophosphate pesticide poisoning
 - Schistosomiasis among residents near irrigation and large dams in Africa
 - Effectiveness of school programs to increase fruit and vegetable consumption used to inform European agricultural policy



Goal: To continue to conduct high quality evidence-based intervention/prevention through enhancing community input

- Communities vary greatly in their interest and willingness to try new prevention strategies (Aniskiewicz and Wysong, 1990; Bukaski and Amsel, 1994; Israel et al.,1998; Margolis & Runyan, 1998; Nixon et al.,2004).
- The adoption of programs is often independent of the rate of illness/injury in the community; rather it is based on perceived risk or on the presence of an active advocacy group.
- This is in marked contrast to the scientific research model which would suggest that the rates of disease/conditions will be the driving force in developing prevention programs, a view which tends to ignore the social and political environment and competing concerns which may be more pressing for community leaders.
- An understanding of the social, cultural and political environments in which programs take place must be incorporated for programs to continue and to grow.

Research areas

- Tools to develop methods to enhance community involvement in research and program development.
 - Increased attention is being paid to the role of community involvement in the development of sustainable prevention programs in public health.
 - Use of research tools such as narrative data collection (e.g. ethnographic interviews) may assist in better integration of community perceptions and concerns and need development further.



Research areas

- Tools to develop methods to enhance community involvement in research and program development.
 - Community level variables are critical in understanding the difference between sustainable programs and those which do not get adopted.
 - A number of methods are being used. We have used one called the Community Readiness Model to develop injury prevention programs related to traumatic brain injury, booster car seats, school playground safety, violence, and suicide.
 - This approach might be useful in understanding barriers to changing food consumption patterns, to reducing pesticide use, to economic constraints related to food purchasing, and to adopting safer practices on farms



Research areas

- Use of narrative analysis as a research tool.
 - Ethnographic interviews were conducted among seasonal farm workers in Mexico and migrant farm workers in Colorado to obtain information about risk perceptions and safety concerns among workers.
 - Workers in Colorado discussed heat and sun exposures, long hours of work and back pain. Workers in Mexico talked about back pain as well.
 - Prevention and control strategies in Mexico and in Colorado included being careful, needing adequate protective equipment and tools and avoiding alcohol.
 - *“Look, it’s really a question of not preventing things that are avoidable. We do things sometimes with negligence or without thinking, and that’s when things go wrong.”*
 - *“The solution is not to drink.”*
 - *“I think that all work involves some risk, but it would be helpful if we were given more durable equipment and clothing.”*



Research areas

- Organophosphate pesticides and neuropsychiatric and mood disorders.
 - Suicidal behavior among farmers and farm workers may be related to acute and long term exposure to organophosphate pesticides.
 - Neuropsychological and neurobehavioral test batteries need to be developed to assess relationships between exposure and outcome in a more systematic manner.
 - Cohort studies are needed to evaluate the temporal relationship between pesticide exposures and suicidal behavior.



Research areas

Sleep patterns and injuries among farm residents.

- Natural sleep patterns have been reported to differ for adolescents compared with younger children and adults.
- Fatigue is likely to influence safety practices and injuries across the lifespan.
- Fatigue also reduces ability to cope with stressful events.
- Natural patterns of sleep during adolescence includes:
 - Biological sleep needs start later and end later;
 - Sleep needs may increase requiring 8.5-9.25 hours of sleep per night;
 - Daytime sleepiness increases even among youth who have had optimal hours of sleep; with concomitant increases in afternoon sleepiness.



Research areas

- Given the hazardous nature of agricultural work there is a need to identify modifiable injury-related risk factors.
- Injury risk associated with sleep patterns and fatigue have not been studied extensively among farm youth or adults.
- Some evidence exists that a history of acute organophosphate pesticide poisoning alters sleep patterns. Further work is needed on this relationship.



Research areas

- Integrating work of agronomists, biomedical scientists and public health specialists (e.g. biomedical agriculture) to identify genotypes of food crops that reduce chronic disease risk.
- Integrating work on meat safety with animal behavior and handling; and with human health from the nutrition view and from zoonotic diseases.
- Integrating investigations in the areas of pesticides, food inspection, water and soil quality with human health and the nutrient value of all food.



Summary

In 1997 the European Union Agricultural Council stated: “The European agriculture as an economic sector must be versatile, sustainable, competitive and spread throughout Europe (including the less favourable and mountainous areas regions). It must be capable of maintaining the countryside, conserving nature, and making a key contribution to the vitality of rural life, and must be able to respond to consumer concerns and demands regarding food quality and safety, environmental protection and the safeguarding of animal welfare.”



Summary

- There is significant need for more interaction among researchers in many disciplines.
- Policy makers and researchers need to communicate more about the agricultural and rural policies, food quality, environmental and human health.
- Public health professionals need to be more aware of issues related to agricultural policies and other food-related safety policies as they address chronic disease prevention including obesity, diabetes, cancer, and heart disease



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- Thank you and questions?

