Eco Health–One Health Training

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Eco Health and One Health

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ILRI & CGIAR

- CGIAR system recently restructured towards more integrated work between different CGIAR’s centres, using across centre programs, CRP’s

- ILRI overall research topics around:
  - Animal Value Chains
  - Food safety & Zoonoses (including Public Health/Eco Health/One Health)
ILRI and where it works

Head quarter in Nairobi

ILRI reginal offices in South and SE Asia: Hanoi, Delhi, Los Banos

ILRI outposts

No. per Km²
0
1 - 2
3 - 5
6 - 20
> 20
Objectives

• Provide basics on EH and/or OH
• Discuss some case studies
• Give directions on EH “flavour” for the ACIAR proposal
Eco Health capacity building – 2 years ++

EcoHealth-OneHealth Resource center at Chiang Mai University (since Oct 2010)

EcoHealth Resource center at Universitas Gadja Mada (since Jan 2011)
Presentations overview

1. Setting up the scene & Eco Health/One Health - History
2. Emerging disease treats – are we prepared
3. Definitions
4. Case studies
6. Group work
Audience participation

• Undergraduates? Postgraduates?
  – Veterinary students?
  – Medical students?
  – Other life sciences?
• Other?
The vet’s role – animal health?

Clinician
- Companion Animal
- Farm Animal
- Vet school
- Animal Rescue
- Animal Welfare

Academic
- Teaching
- Research
- Laboratory
- Epidemiology

Government
- Quarantine
- Surveillance & Response
- Risk analysis
- Epidemiology
- VPH

Other
- Pharmaceutical
- Pet Nutrition
- Development (NGOs; UN)
- Natural: homeopathy, acupuncture

Modified after Gilbert
Interactions?

Animal Health

Human Health

Zoonoses; food safety; VPH

Modified after Gilbert
Emerging Disease Threats

Neglected Tropical Diseases (rabies, leptospirosis, brucellosis ...)

Zoonoses; food safety; VPH

Modified after Gilbert
- We should recognize that we are in a inter-connected world
- Anyhow, also to accept that we can't know/do everything!
- For broader consideration of health I believe DVMs better placed than MD – wider scope of duties ranging from animal health to VPH
- One Health & Ecosystem Health (EcoHealth): neither have ‘strict’ standardized definitions
Parallel Evolution of One Health & EcoHealth

19th Century

Proposed the term zoonoses and “between animal and human medicine there is no dividing line”.

Robert Virchow, German physician/pathologist (1821-1902)

20th Century

Proposed One Medicine as a unified approach to human and veterinary approach for zoonoses.

Calvin Schwabe (1927-2006): veterinary epidemiologist/parasitologist

1860's – Haeckel proposes ecology as the study of organism in their environment

Ernst Haeckel (German Biologist, 1834-1919).

Aldo Leopold, American ecologist, 1887-1948).

21st Century

Defined One Health as “the collaborative effort locally, nationally, and globally – to attain optimal health for people, animals and our environment.”

American Veterinary Medical Association One Health Initiative (2008-present)

EcoHealth was launched as forum for researchers and practitioners & specific research and development focus of IDRC

EcoHealth and Intn’t Assoication for Ecology & Health (2004-present)

Wilcox, 2013 modified
History of One Health

- Ancient times: experts often treated both animals & humans.
- 11th – 17th Century: Human medicine integrated into the medieval universities, whereas veterinary medicine focussed on horses and remained in the hands of equerries;
- 18th century: The first veterinary school in Lyon (1762) followed by Berlin
- 19th century:
  - Rudolf Virchow, father of cellular pathology, that, “Between animal and human medicine there are no dividing lines – nor should there be.”
- 20th century: both sciences specialised to an extent that their association was hardly visible
- 1976: Calvin Schwabes’ re-thinking of the concept of “one medicine” in, that fully recognized the close systemic interaction of humans and animals for nutrition, livelihood and health
History of EcoHealth

• Pioneer by the IDRC: The International Development Research Centre Canada over the last 2 decades

• Key case studies:
  – Amazon basin and Mercury Poisoning, 1994
  – Malaria control and use of DDT in Mexico, 2003
  – Other case studies in Nepal, Ethiopia, Goa & Kenya

• Eco Health Research in practice, Charon D.
Different traditions/background
- EcoHealth originated in biological ecology and land conservation practice.
- One Health originated in medicine, veterinary practice and parasitology.

Many similarities
- Both arrived at the same conclusion: the global problem of disease emergence requires an integrated approach (scope is different)
OneHealth/EcoHealth in SE Asia

• One-Health
  – Various initiatives emerged in late 2000th in a response to HPAI International Ministerial Conference on Avian and Pandemic Influenza, New Delhi, Dec 2007, FAO, OIE, and WHO – to develop a joint strategic One World, One Health framework
    – IMCAPI, 2008 & 2010
    – Stone Mountain, 2010

• Eco-Health
  – Introduced by IDRC to SE Asia mid of the 2000
  – Initial approach through exiting informal researcher network
  – IDRC funded various projects: APAIR, EcoEID, FBLI, BECA and EcoZD
Exercise
Presentations overview

1. Setting up the scene &
   Eco Health - One Health History
2. Emerging disease treats – are we prepared
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Zoonotic Pathogens/Parasites: the mostly likely to emerge

- 1,415 - Number of known human pathogens
- 175 (12.4%) - Number causing emerging diseases
- 133 (76%) - Number causing emerging diseases which are zoonotic
  (Taylor et al., 2001, Cleveland et al., 2007)

Zoonoses – “diseases of man that are naturally transmitted between vertebrate hosts and humans”*

Challenges
towards Emerging Diseases Threats

Globalisation & international trade
  Intensified long distance travel
  Cross border trade (illegal/legal)

Forest habitat alteration/deforestation
  Human settlement

Urbanisation
  Increasing urban or peri-urban settlements

Agriculture intensification
  Concentration, mixing wild life/domestic species
  Waste management

Global Atmospheric Change (mainly increasing concentration of greenhouse gases)
Recognize the complexity of disease emergence

Wilcox, 2011
Ecosystem and EID

Vector-borne disease

Malaria, Rift Valley Fever, Bluetongue, Dengue…

**Eco System:** Temperature, humidity, flood/heavy rain influence seasonal activity, distribution/density of vector population

Parasites

Fascioliasis, Schistosoma, Cysticercosis…

**Eco System:** Temperature, humidity favour intermediate hosts or free living stages
Ecosystem and EID

Soil associated
• Anthrax, other clostridial disease…
  
  **Eco System:** Temperature and soil moisture affect spore germination. Heavy rainfall may stirs up dormant spores

Air associated
• Multi-factorial respiratory diseases… pig ACIAR
  
  **Eco System:** Dust, pollution, temperature exacerbating respiratory disease

Water associated
• Cyptosporidiosis, Leptospirosis...
  
  **Ecosystem:** Disasters. lack of sanitation, floods, higher water temperature may improve survival rate
Eco Health & One Health
Current Challenges

Emerging and Reemerging infections - 70% vector-borne or zoonotic
NEW 'MINDSETS'?
vs. REQUISITE ACTIONS'?
- Involved parties:
same mode of operations
- Agencies/institutions:
no new plans for coordination,
no engagement of the other side(s)
- Outbreaks:
H5N1, H1N1, EHEC(HU)
limited cooperation between
PH - animal health sector

Eco Health & One Health
Challenges – are we prepared

Zessin, 2011
Eco Health/One Health
PARADIGM SHIFT: TOOLS IN PLACE?

Zessin, 2011
INTEGRATIVE APPROACH

Human health

Animal health

Agroecosystem health

Vet Pub Health

Wildlife health

Plant health

Societies, Behaviour, Cultures, Political situation, Crisis/Disasters Education. Poverty, Economies, Regulations, Institutions, Governance & Policies
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Eco Health & One Health Definitions
EcoHealth & One Health Definitions

• In response to failures of purely system based solutions to current challenges
  – Emerging Diseases Threats
  – Globalisation & international trade, Urbanisation ect.

• Many similarities but different traditions/background
• Integrated approach (scope different)

• At present, the concepts of ecohealth and one health are still evolving.

• There is no single universally accepted definition of either “One Health” or “EcoHealth.” (Even the spelling of the terms is not yet standardized: some prefer to write ecohealth without any capitalization.)
The Ecohealth approach focuses above all on the place of human beings within their environment. It recognizes that there are inextricable links between humans and their biophysical, social, and economic environments, and that these links are reflected in a population's state of health. International Development Research Centre (IDRC)

EcoHealth is an emerging field of study researching how changes in the earth’s ecosystems affect human health. It has many prospects. EcoHealth examines changes in the biological, physical, social and economic environments and relates these changes to human health. Wikipedia.
One Health

• One Health is the collaborative effort of multiple disciplines working locally, nationally, and globally, to address critical challenges and attain optimal health for people, domestic animals, wildlife, and our environment. One Health Commission (http://www.onehealthcommission.org/)

• The One Health concept is a worldwide strategy for expanding interdisciplinary collaborations and communications in all aspects of health care for humans and animals. One Health Initiative (http://onehealthinitiative.com/)

• One Health' is a cost-effective, sustainable, and practical approach to find solutions for problems which need holistic, multidisciplinary approaches, particularly in resource-constrained countries. Curr Top Microbiol Immunol 2013;366:113-22.
**Eco Health**
- Complexity focus
- System thinking
- Pioneered from IDRC

‘Bottom Up’
- Vets, Medicals, epidemiologists, ecologists, social scientists, philosophers, indigenous perspectives, etc.

**One Health**
- Schwabe’s One Medicine
- One world/One Medicine (Zinsstag)

More quantitative
- Vets, medicals, some ecologist

Currently institutionalized (FAO, OIE)

**Integrated approach**
Definitions open to debate: range from quite rigid to very flexible!

**One-Health**
- biomedical focus: human + animal + wildlife
- focus on communicable diseases
- Operationalized/ institutionalized

**EcoHealth:**
- environment & socio-economic aspects – pioneered outside ‘traditional’ health
- communicable & non-communicable diseases (dioxin; heavy metal toxicity
- academic / research / complexity
The vet’s role – more ‘One/Eco’ health?

Clinician
- Companion Animal
- Farm Animal
- Referral hospital
- Vet school
- Animal Rescue
- Natural remedies?

Academic
- Teaching
- Research
- Laboratory
- Epidemiology

Government
- Quarantine
- Surveillance & Response
- Risk analysis
- Epidemiology
- VPH

Other
- Pharmaceutical
- Pet Nutrition
- Development (NGOs; UN)
- Natural: homeopathy, acupuncture

Postgraduate multi-faculty courses
Joint Research
Joint Lab training
FETP(V)
NTD Integrated control eg Mass Drug Admin
Joint training: sharing experience
Joint Risk Analyses
Sharing surveillance data
Joint Response Teams
Joint technical working groups

Modified after Gilbert
Presentations overview

1. Setting up the scene &
   Eco Health - One Health History
2. Emerging disease treats – are we prepared
3. Definitions EH and OH
4. EH - Theory
5. EH Case studies and experiences
6. Group work
Theory
Introduction Ecohealth Theory

- Ecohealth framework assumes human, livestock, wildlife, and environmental health are integrally related.
Introduction Ecohealth Theory

- Factors affecting health and wellbeing are connected in a multi-dimensional, complex web.
Introduction: Ecohealth Theory

• IDRC’s Ecohealth Program Initiative is based on three methodological pillars (Lebel, 1994):
  – transdisciplinarity, participation, and equity.

• More recently, Charron (2012) expanded on the three pillars of Lebel, introducing six Key Principles of EcoHealth. Three of Charron’s principles are substantially similar to one of the pillars introduced by Lebel:
  – Systems thinking, Knowledge to action, Transdisciplinary, Participation, Equity, Sustainability

Ecohealth Research in Practice: Innovative applications of an ecosystem approach to health
Introduction: Ecohealth Theory

- Based on three methodological pillars
- 4 interacting subsystems influence health

An approach to understand complex systems (socio-economic, socio-ecological etc)
Group exercise

Kindly provide your thoughts on the following terms (1 - 2 key words):

- Transdisciplinary
- Participation
- Equity
The 3 pillars are defined as follows:

**Transdisciplinarity** implies an inclusive vision of health problems by scientists from multiple disciplines, community and policy actors.

**Participation** aims to achieve consensus and cooperation within the community and the scientific and decision-making groups;

**Equity** involves analyzing the respective roles of men and women, and various social groups;

![Diagram showing the three pillars of Ecohealth Theory: Social, Political, Economic, Ecological]
Introduction: Ecohealth Theory

- Based on 6 principles:
  - Systems thinking
  - Knowledge to action
  - Transdisciplinary
  - Participation
  - Equity
  - Sustainability

- 4 interacting sub-systems influence health

An approach to understand complex systems (socio-economic, socio-ecological etc.)
6 principles of EH

• **System thinking:** System thinking suggests that the way to understand a system is to examining the linkages and interactions between the elements that make up the system
  – In contrast to reductism which looks more in details of its parts.

• **Knowledge to action:** Knowledge to action refers to the idea that knowledge generated by research is then used to improve health and well-being through an improved environment
  – What are different groups are interested to change
  – Approaches are different, community versus policies
6 principles of EH

• **Transdisciplinarity**  inclusive vision of health problems by scientists from multiple disciplines, community and policy actors
  – From the first idea until dissemination/publication

• **Participation** aims to achieve consensus and cooperation within community and scientific and decision-making groups
  – Define on who should participate and will be there role
  – Mapping of potential actors, stakeholders or groups
6 principles of EH

• **Equity** involves analyzing the respective roles of men and women, and various social groups;
  – Social cultural
  – Ethnic minorities
  – Marginalised groups
  – Gender

• **Sustainability**: ecohealth research should aim to make ethical, and lasting changes which are environmentally sound & socially acceptable.
  – What will remain after the project
Presentations overview

1. Setting up the scene &
   Eco Health - One Health History
2. Definitions EH and OH
3. Emerging disease treats – are we prepared
4. EH in detail
5. EH in practice - case studies and experiences
6. Group work
Classical EH case study I

• IDRC/International Development Research Centre Canada
• Pioneer case-study: Amazon basin and Mercury Poisoning
  – Minimata disease - possible mercury poisoning (MD)
  – Expected to be linked to mining; Mercury used to extract Gold
  – In depth research showed this was not the case
  – Researchers stayed under the same condition as villagers
  – Instead if was released from soil – link farming practices, slash and burning practice (ecology), mechanism was leaching of mercury – into rivers
  – Bacteria converted to methyl mercury (highly toxic)
  – Eaten by fish -> larger fish -> humans (receives highest concentration, Toxicology)
Classical EH case study I

Pioneer case-study: Amazon basin and Mercury Poisoning

• Solution
  – Diet & behaviour change (sociology, anthropology)
    • Eat fish that don’t eat other fish…
    • More fruits in diet
    • Identify hot spots in river where transformation is more likely
    • Special trees
  – Role of woman was crucial in changing behaviors
  – Trust and committed relationship between villagers & researchers

Other case studies in Mexico, Nepal, Ethiopia, Goa & Kenya
Classical EH case study II

- Malaria control and use of DDT in Mexico
- Pool of specialist from epidemiology, computer science, entomology, social sciences, government and Academia background.

- Participatory (Bottom up approach from community level)
- Transdiciplinary (several expertise)
- Equity (role of woman and man, behavior related to Malaria risks differed between gender, e.g. due to differences in mosquito exposure)
Ecosystem Approaches to the Better Management of Zoonotic Emerging Infectious Diseases in Southeast Asia (EcoZD)
**Thailand/Viet Nam:**
The Model of Hygienic Small Scale Poultry Slaughter House for Various institutions, Livestock Services, MoH, Universities

**Cambodia:**
Prevention and Control of Zoonotic Causes of Acute Bloody Diarrhoea in rural Cambodia through an Eco Health Approach
Centre for Livestock Development, Department of Animal Health and Production, CDC, Ministry of Health

**Vietnam:**
Zoonoses priority ranking at Provinces in Southern Vietnam (Lepto in pigs and humans), 3 Institutes (*PH and livestock*)
ILRI EcoZD – country teams & case studies

**China**
Prevention and Control of Zoonoses (Brucellosis and Toxopasmosis) through an EH approach, Yunnan Province (focus on ethnic minorities)
- 4 Institutions/Universities involved

**Indonesia**
Study on Rabies Control in Bali (dog ecology and behavior) - An Ecohealth Approach.
MoA, MoH, NGO’s, University

**Laos:**
A participatory EcoHealth study of smallholder pig system in lowland and upland of Lao PDR’ (zoonoses & production diseases), 3 institutions (e.g. DLF/MAF, PH) & 1 University
Specific experiences from EcoZD

- **Start up issues**
  - Allocation of time of partners
  - Level of counterparts (junior/senior)
  - “Lost in translation”
    - e.g. EH (Bahasa Indonesia)
    - English skills varied widely between countries but also between team members
  - Identification of EH mentors/champions, considerable mentoring required to ensure an EH approach
Specific experiences from EcoZD

Start up issues cont.

- Identification of a common research interest (e.g. 4 different institutions involved in China)
- Social science vs. biometric science background, focus of teams was on the latter
  - Social science involvement remained a constant challenge
- Qualitative vs. quantitative research
- Two-dimensional capacity-building requirement
  - Technical (proposal writing/implementation/methodological)
  - EHRC concept
Eco ZD case study: Brucellosis in Yunnan
Problem:
• Brucellosis is emerging in southern China
• Some information on prevalence's
• Little or no information on perception of involved groups and stakeholders

Classical vet approach:
• Prevalence study in cattle and small ruminants

One Health
• Adding human component (e.g. review of cases in hospitals)
Case studies: added value of Eco health
Brucellosis in Yunnan

Adding an Eco Health perspective:

Involving of all relevant groups or stakeholders from the begin and throughout the project (participation)

- **Farmers:** perception (importance of Brucellosis compared to other diseases)
- Involvement of **other risk groups** (butchers, ...)
- **Stakeholders:** e.g. policy makers (local, national)
- **Policy** (regulations & enforcement)
- **Ecological aspects** (management of aborted fetus ...)
- **Gender** aspects (who sells milk, who slaughters, who responsible for goat or cattle)
- **Socio economic** drivers (Introduction & control)
  - Willingness to pay for control or basic bio security
Mapping of stakeholders, partners & groups involved

- Public health authorities (central/local officers, local hospitals)
- Local administration officers
- Donors, international organizations & universities
- Outpatients
- LS officers (central/local)
- Policy makers
- Socio economic experts
- Farmers/herders
- Communities
- Animal husbandry expert
- Butchers, meat vendors
- Milk vendors, butchers
- Associations (if any or to be established)
The problem: Brucellosis & Toxoplasmosis is in Yunnan

**Public health** authorities (hospitals and local) (IDI)
- Review of existing information
- General Z knowledge
- Specific action B & T patients
- Collaboration with PH

**Vet officers/stations** (IDI)
- Review of existing information
  - General Z knowledge
  - Specific action B & T
  - Control
  - Collaboration with PH

**Past unit, milk vendors** (FGD):
- Zoonoses knowledge
- Quality control
- Sanitation
- Inspection by authorities

**Survey:**
- Dairy farms (milk)
- People at risk (serum)

**Farmers** (QX)
- Production data
- AH and disease prevention
- Reproductive disorders
- Zoonoses and OH

**Villagers** (with/without livestock) (FGD)
- Animal husbandry
- Zoonoses
- Risk factors
- AH services
- PH services
- Source of information

**Butchers** (IDI)
- General Z knowledge
- Specific knowledge B & Toxo
- Health check and status
- Hygiene and training
- Waste management

**Hospital case review:**
- Clinical cases
  - Literature review

**Survey:**
- Dairy farms (milk)
- People at risk (serum)
‘Combining the total societal benefits, the intervention in the animal sector saves cost, provides the economic argument and thus opens new approaches for the control of zoonoses in developing countries through cost contributions from multiple sectors.’

Roth et al. 2003, Bulletin WHO
Case studies: added value of Eco health
Model of Hygienic Small Scale Poultry Slaughter House
Case studies: added value of Eco health
Model of Hygienic Small Scale Poultry Slaughter House

The problem:
Poor hygienic practices in Small scale poultry SH

Objective:
To elucidate the status of small scale poultry slaughterhouses and their affect to ecological and health in the community

Hypothesis:
“Systemic approach might improve and sustain the slaughterhouses more hygienic and viable”.

Classical vet approach:
Determination of prevalence for Salmonella in Small Scale Poultry Slaughter House
Adding an Eco Health approach:

Hypothesis “Systemic approach might improve and sustain the slaughterhouses more hygienic and viable”

- **Transdisciplinarity (pillar 1)**
  - Human health, Animal health, Socio Economics, Private sector (associations), environmental experts …

- **Participation (pillar 2)**
  - Community, policy makers (local, national, other relevant stakeholders), SH management, traders, consumers …

- **Equity (pillar 3)**
  - Role of woman and man (e.g. Who buys and prepares food)
**Case studies: added value of Eco health**

**Model of Hygienic Small Scale Poultry Slaughter House**

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**Eco Health Framework**

- **Socio-economics**
  - Investment
  - Sustainability
  - Work

- **Political perspectives**
  - Law and regulation

- **Value chain actors**:
  - Trader, retailer

- **Consumer**:
  - WTP

- **Community**
  - Acceptance
  - Disturbance

- **Environments**
  - Contamination of bacteria on environment
  - Waste problems
  - Pest problems

- **Human health**
  - Food-borne disease

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**Poor hygienic practices in Small scale poultry slaughterhouse**
Case studies: added value of Eco health
Optimizing Rabies Control in Bali: An Ecohealth Approach.”
The problem:
- Rabies is an emerging zoonoses since its recent introduction
- Conventional control measures show limited success

Objective:
To help the government of Bali in controlling rabies in dogs through better understanding of the dog population, dog demography in Bali and its relationship with the local community.

Classical vet approach:
Vaccination
Eco Health perspective:

- Dog population in Bali and its dynamics.
- Dog ecology in Bali and measure its contact intensity with other animals and human.
- Social cultural relationship between dogs and the Balinese community.
- To develop a model for sustainable Rabies prevention, control, and eradication at banjar level through community empowerment and behavior change.
Case studies: EH Framework
Optimizing Rabies Control in Bali

- **Socio-science**
  - Social cultural believes

- **Media**
  - Social acceptance

- **Private sector**
  - Vaccines

- **Control of Rabies in Bali**

- **Tourism**
  - Major source of income

- **Community**
  - Acceptance
  - Feasibility

- **Environments**
  - Waste problems
  - Monkeys

- **Political perspectives**
  - Law and regulation
  - Enforcement

- **Vet Science**
  - Epidemiologist
  - Practionaires
  - Capacity

- **Human health**
  - Capacity
  - Acceptance
Ecohealth Approach

Review
Dog ecology Study (Behavior, Fecundity and Demography of Dog)
Social Culture Study
Dissemination: Pilot Village (A community-based approach) + Awareness in Elementary School

Knowledge to Action (EP #2)
Trans-disciplinary Approach (EP #3)
Participation (EP #4)
Equity (EP #5)
Sustainability (EP #6)

System Thinking (ecohealth principle (EP) #1)
Presentations overview

1. Setting up the scene & Eco Health - One Health History
2. Definitions EH and OH
3. Emerging disease treats – are we prepared
4. EH in detail
5. EH Case studies and experiences
6. Way forward - ACIAR proposal
ACIAR project objectives 2 & 3

2. To identify, document and address constraints to the use of good disease prevention practices by smallholder pig farmers in Region –
   • Conduct training workshop in the principles of ecohealth research and participatory epidemiology for field staff
   Focus: Field staff? Re-consider the target group
   • Stakeholder mapping
   • EH framework

3. Objective 3: To estimate the incidence and economic impact of two disease syndromes of importance to smallholder farmers
   This objective will combine the general principles and approach of ecohealth style research with capacity building in diagnosis of disease and management and use of animal health data.
Steps for an EH approach

Conceptualisation phase, ideally in the design phase of the proposal

• How was the problem being identified
• Who should be involved to address the problem
• Have all potential groups/stakeholders being consulted in a participatory way from the beginning and all the along
• Rather bottom up than top down
• Define objectives, outputs, outcomes and system boundaries
• Have you followed the six principles of EH

Draw a connectional framework of the proposed project, discuss it and reframe it if needed.
1. Make integration part of the project from the beginning.
2. Identify a clear research question, boundaries and project goal.
3. Identify and include relevant disciplines
4. Agree on an integrative concept or approach
5. Manage for operational efficacy.
6. Insure the institutional environment is conducive to cross-disciplinary collaboration
7. Plan and assess progress & monitoring e.g. Outcome mapping