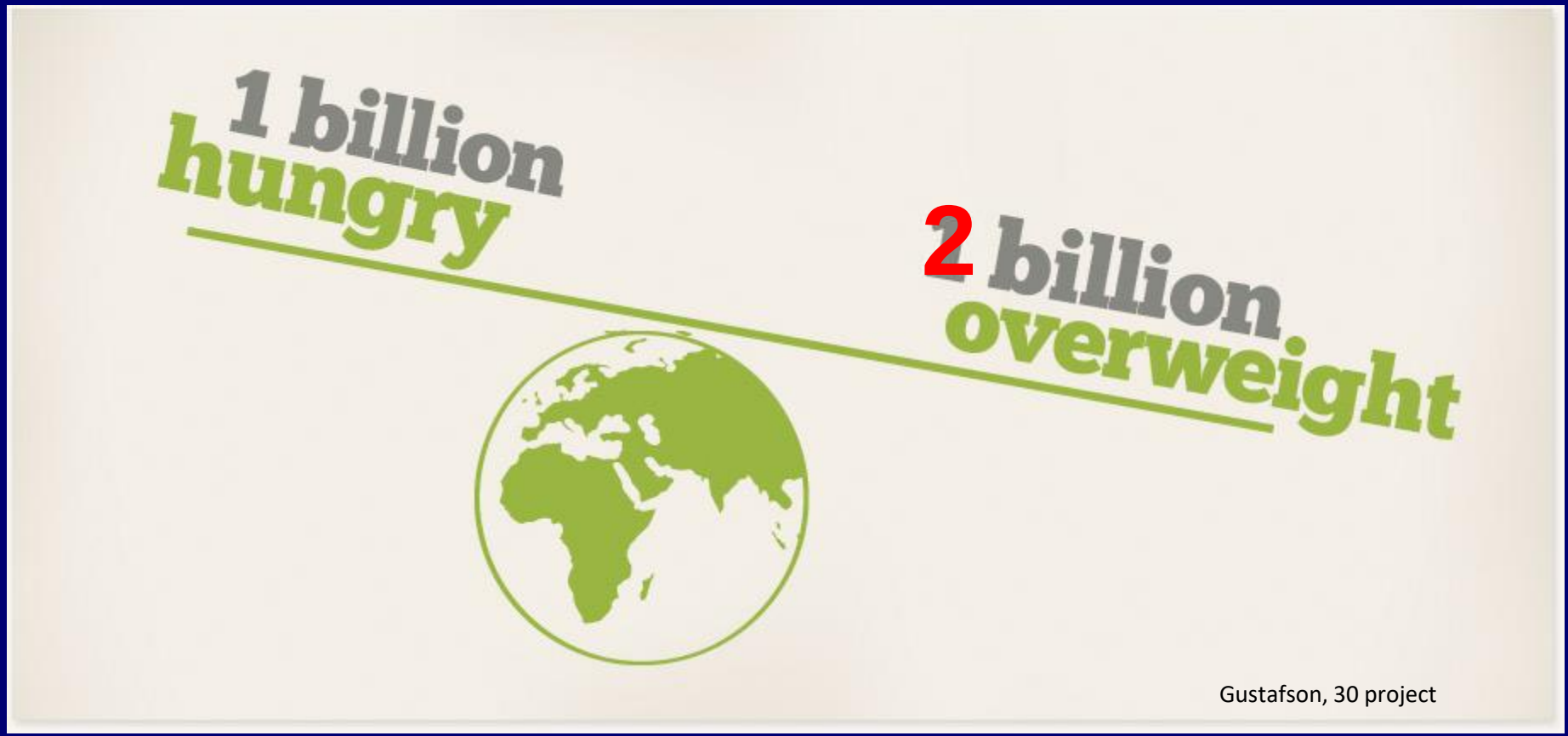
African Nutritional Sciences Research Consortium (ANSRC)

Strengthening Capacity for Science and Innovation in Africa

- Build local capacity for science – linking health with nutrition, agriculture, and “biotechnology”
- Use graduates for TOT –trainers of trainers,…and students
- Economic development with scientific development
- Diminish “brain drain”
- Bring African universities into the respected group of top science training institutions

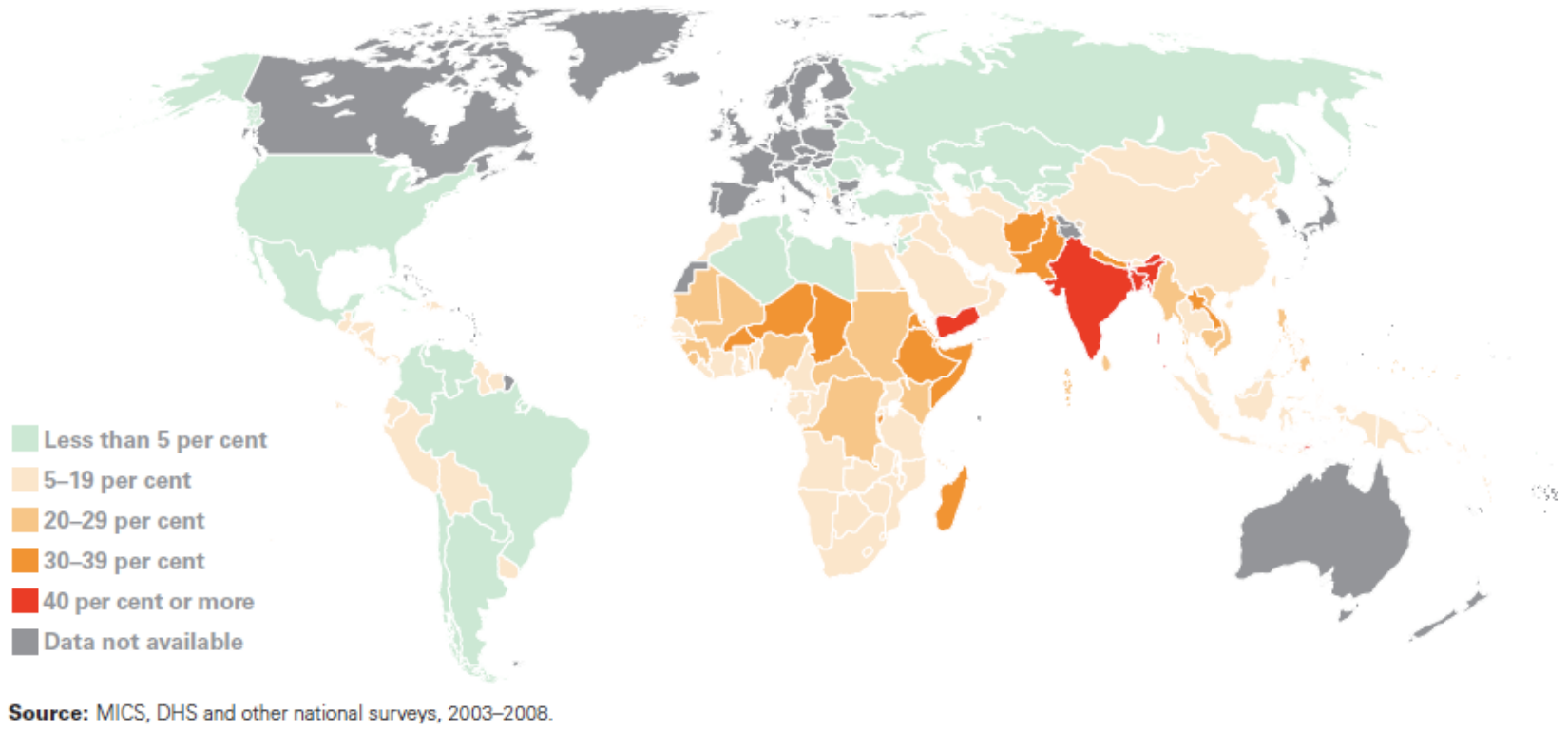
The "Double Burden"



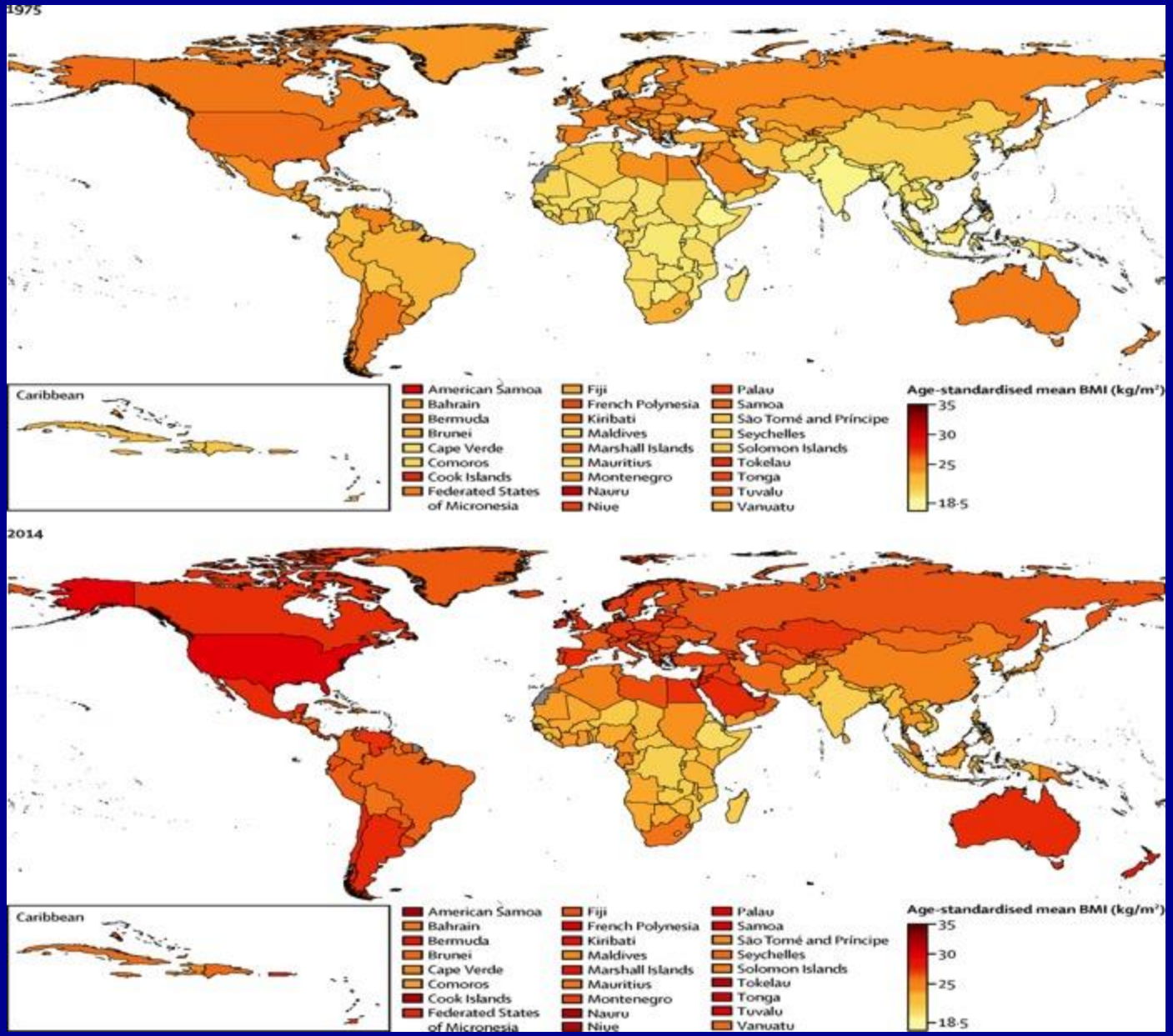
ONE GLOBAL ISSUE!

AfDB High 5s and ANSRC

Many children are still undernourished



Age-standardized BMI in men by country in 1975 and 2014



The Lancet 2016 387, 1377-1396DOI: (10.1016/S0140-6736(16)30054-X)

Stunting – Different Solutions Needed

Does one size fit all?

- *Prepregnancy*
- *Intrauterine – SGA/LBW*
- *Postnatal*

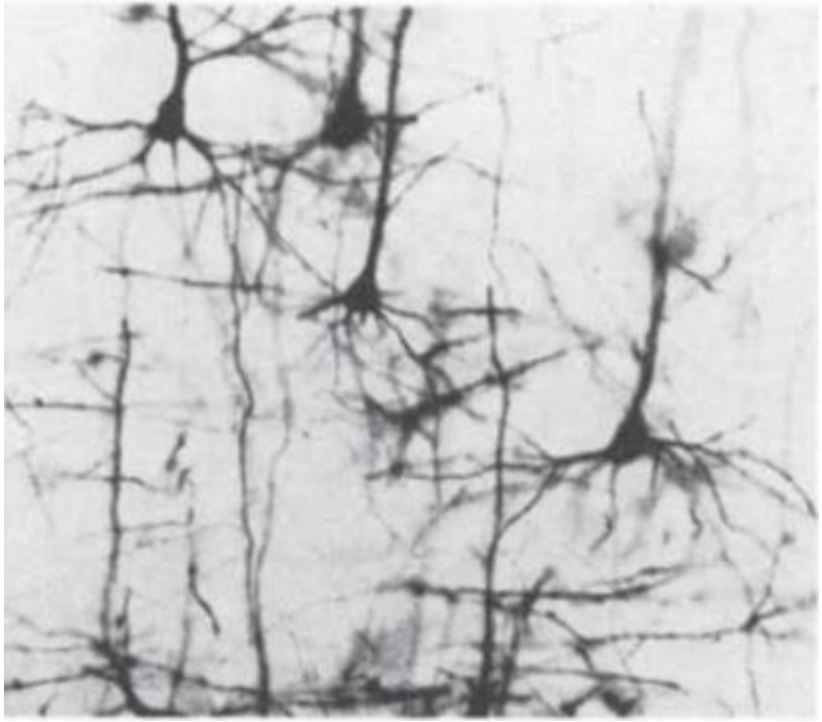
  - infancy

  - childhood

  - adolescence

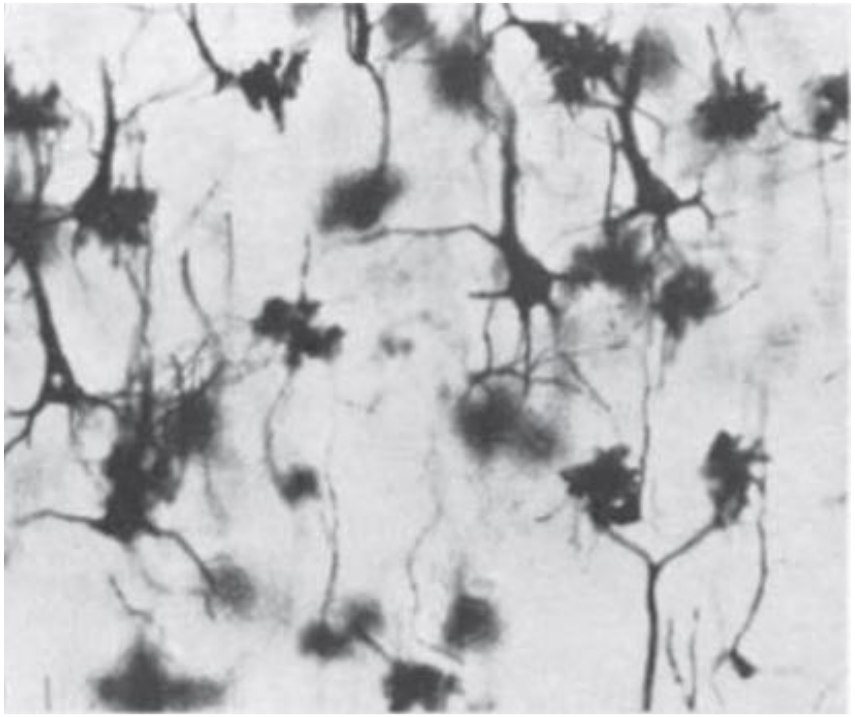
Stunting and brain development

Normal



Typical brain cells
Extensive branching

Stunted



Impaired brain cells
Limited branching
Abnormal, shorter branches

Source: Cordero E et al, 1993

How much does undernutrition cost?

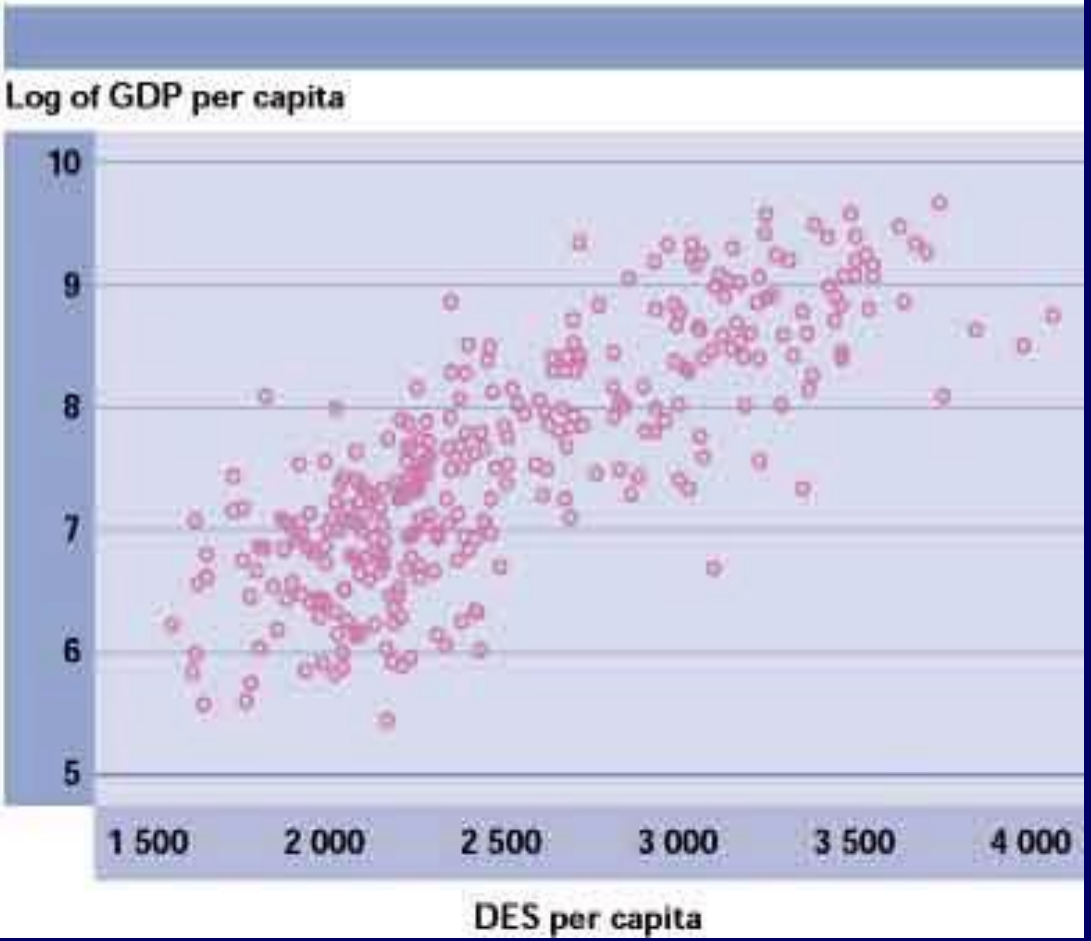
A 1% loss in adult height as a result of childhood stunting is associated with a 1.4% loss in productivity

(JM Hunt, 2005)

Percentile	Male	Female	Δ
50th	177 cm	164 cm	8%
3rd	163 cm	151 cm	8%

8% ↓height = ↓11.2%productivity!!

GDP per Capita and Dietary Energy Supply (DES)*

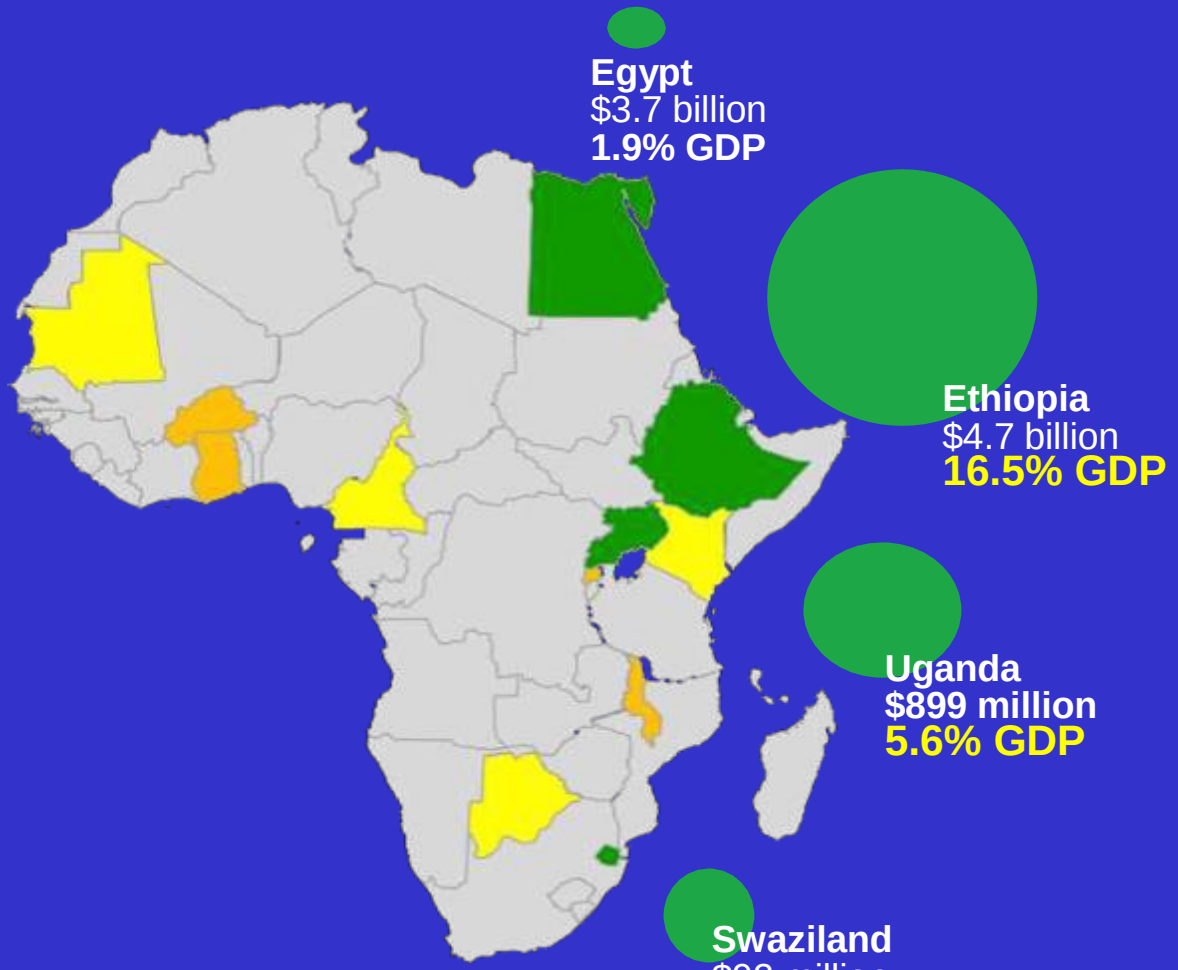


* kcal per day

Source: FAO. 2000. *Undernourishment and economic growth: the efficiency cost of hunger*. By J. Arcand. FAO Economic and Social Development Paper No. 147. Rome

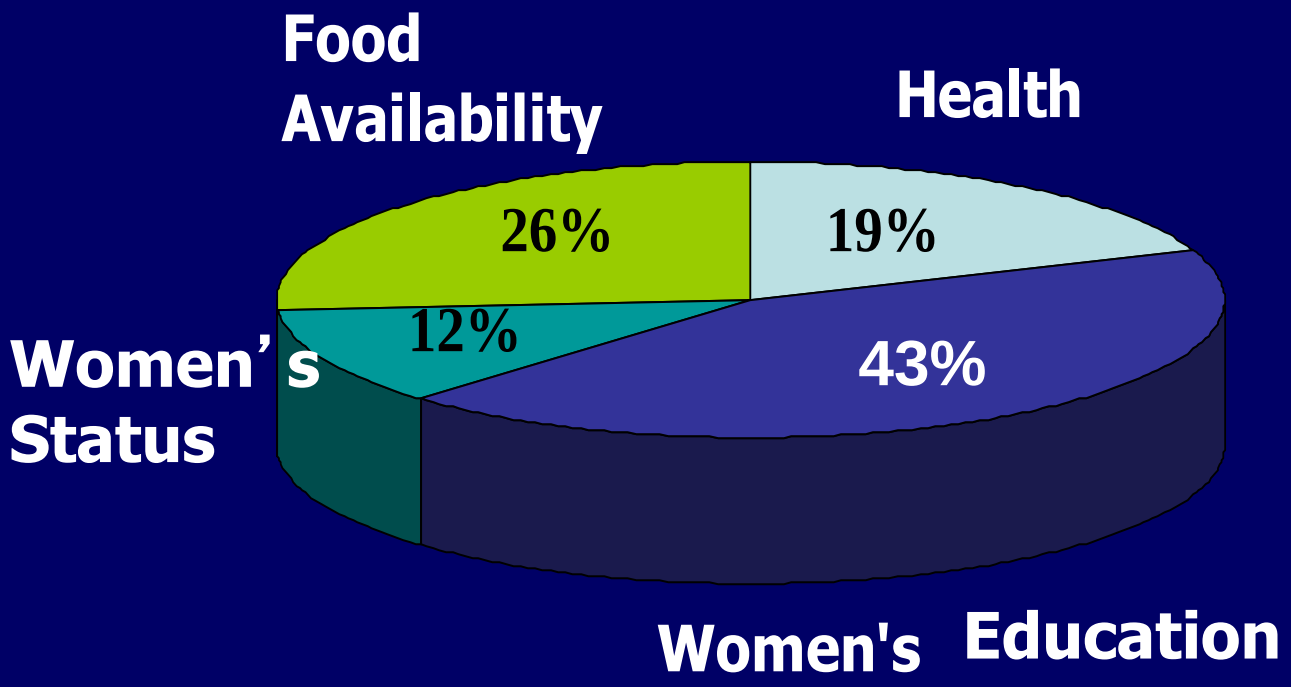
Social and Economic Impact of Child Undernutrition

(Annual Losses)



COHA Study, WFP, 2014

Estimated % Contribution Underlying Determinants to Underweight



4th WNR,SCN

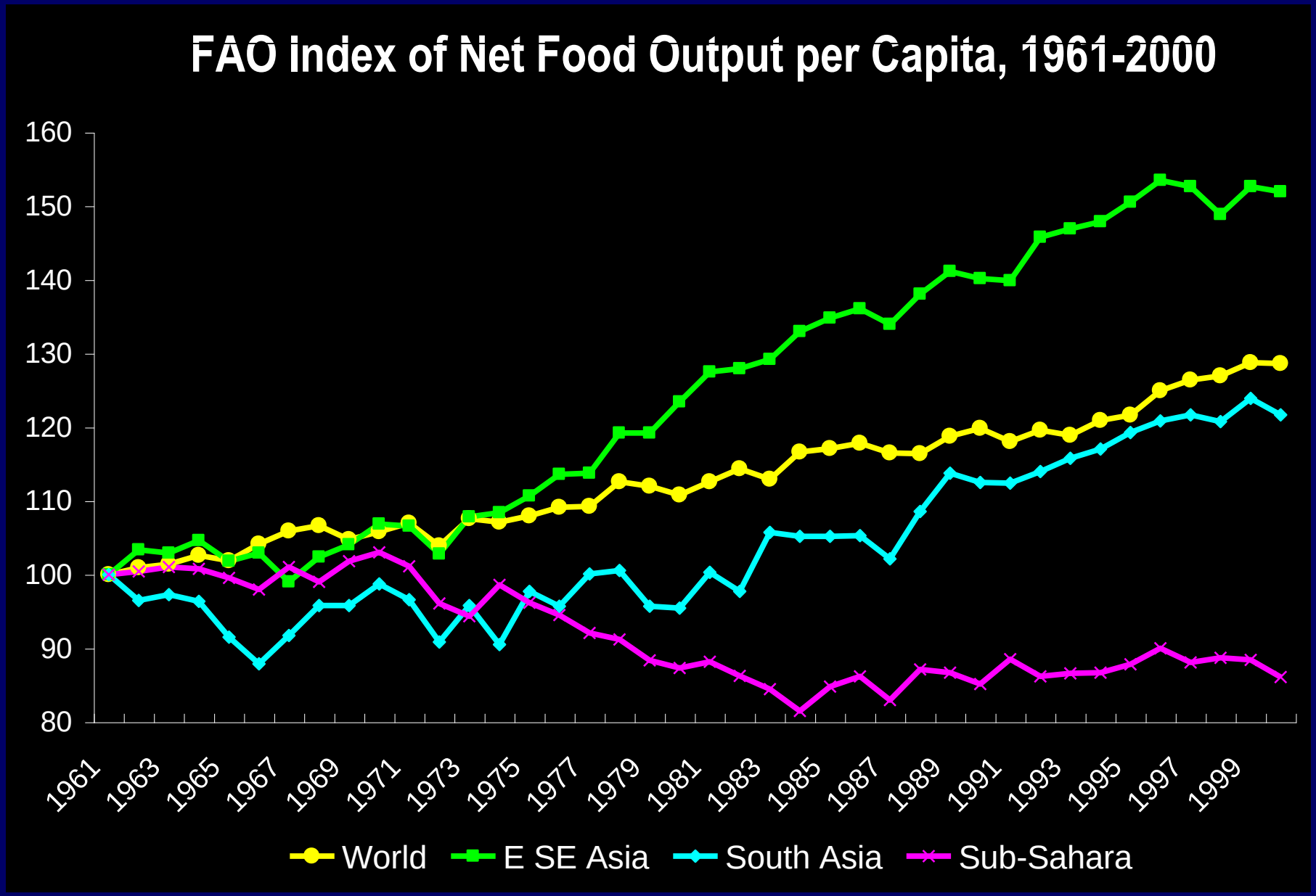
Soil Fertility Depletion

N 132 million tons
P 15 million tons
K 90 million tons

worth $11 billion/year!

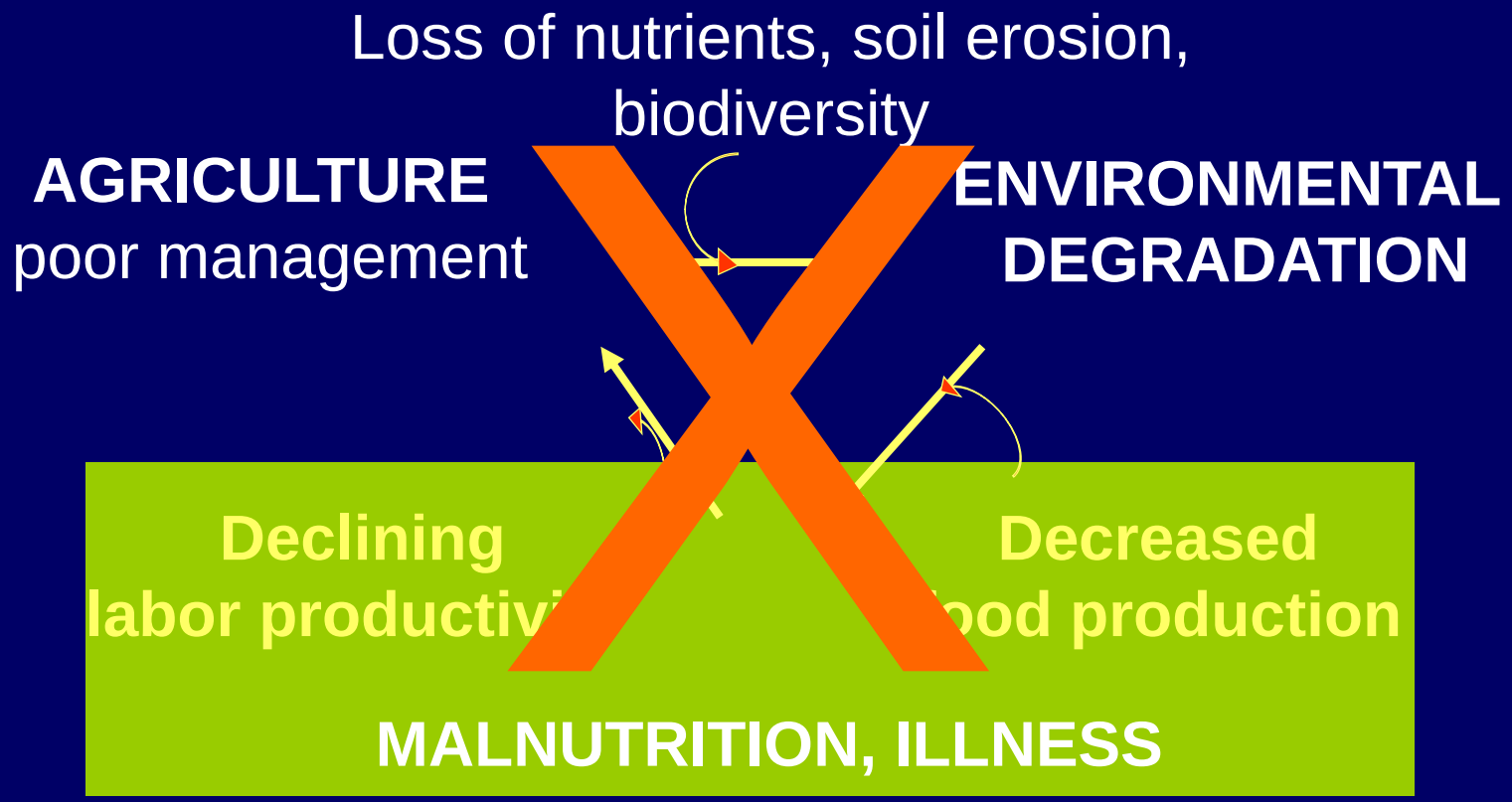
LOST from cultivated land in 37 African countries during the last 30 years

Smaling, 1993
Sanchez, 2002


FAO Index of Net Food Output per Capita, 1961-2000
160
150
140
130
120
110
100
90
80
1961
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
World
E SE Asia
South Asia
Sub-Sahara

Health, Agriculture, Environment,Poverty

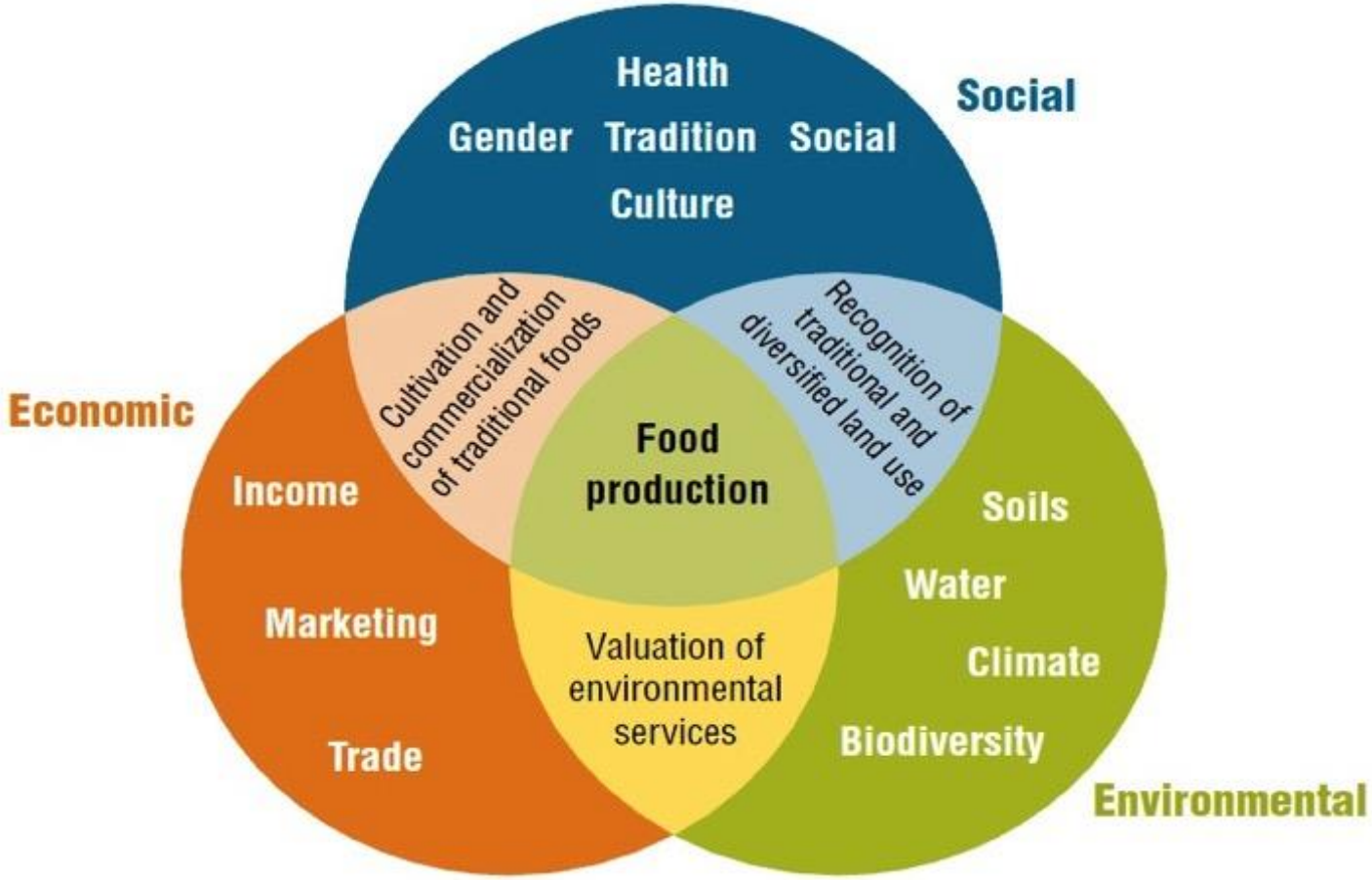
A need for econutrition programming



Deckelbaum RJ, Palm C et al, 2006

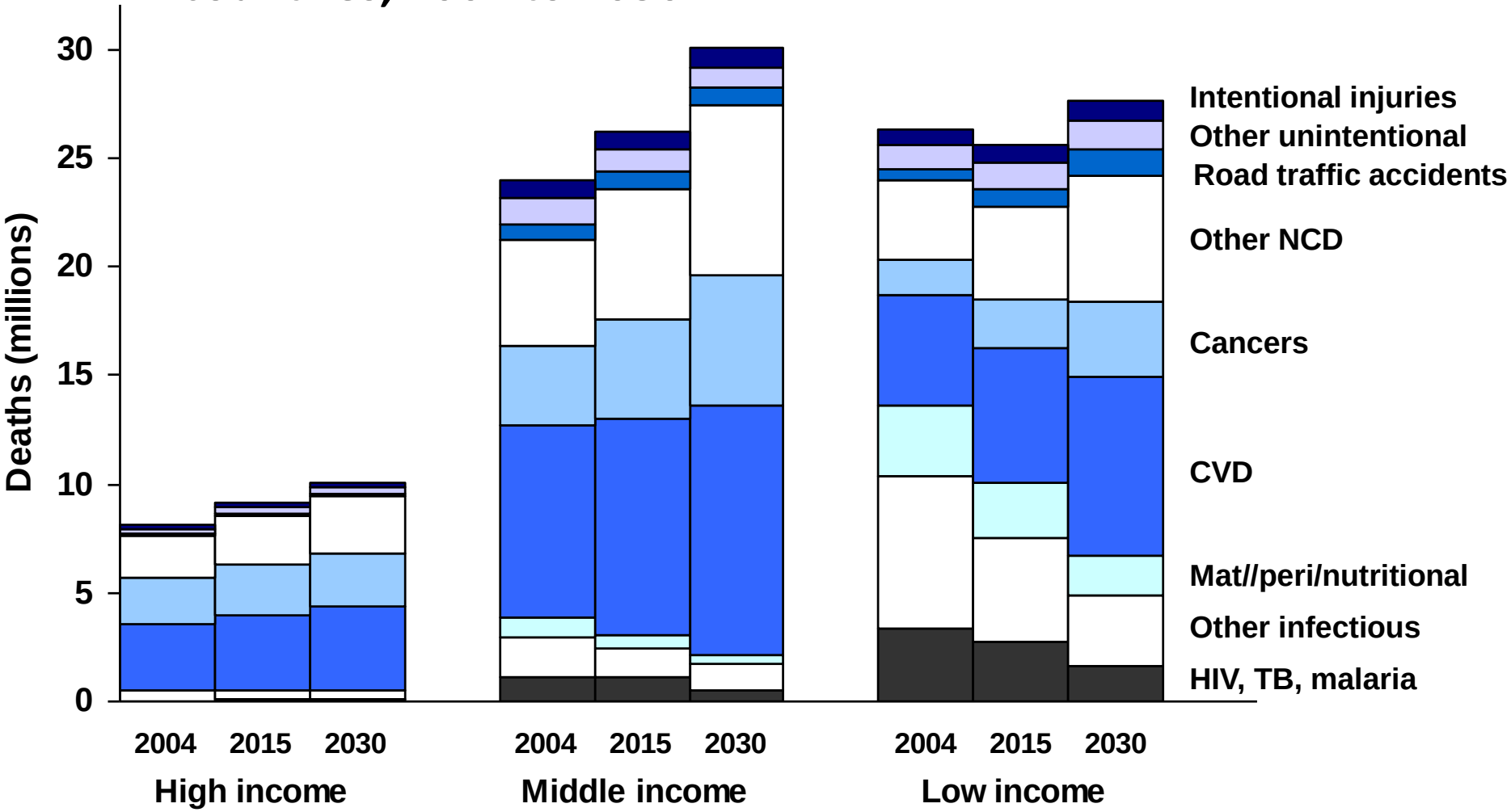
Agriculture's roles have benefits beyond just food production

"Soil to Seed to Plant to Fork to Health"



Source: Bread for the World 2010

Projected deaths by cause in high, middle, and low income countries, 2004 to 2030



Global Burden of Disease 2004 Update, WHO

The Bill, Please
(for 5 chronic diseases for 20 years)
N.B. These numbers are TRILLIONS

Table 14: The anticipated economic toll of NCDs is staggering

Economic burden of NCDs, 2011-2030 (trillions of US$ 2010), based on EPIC model 1[12]

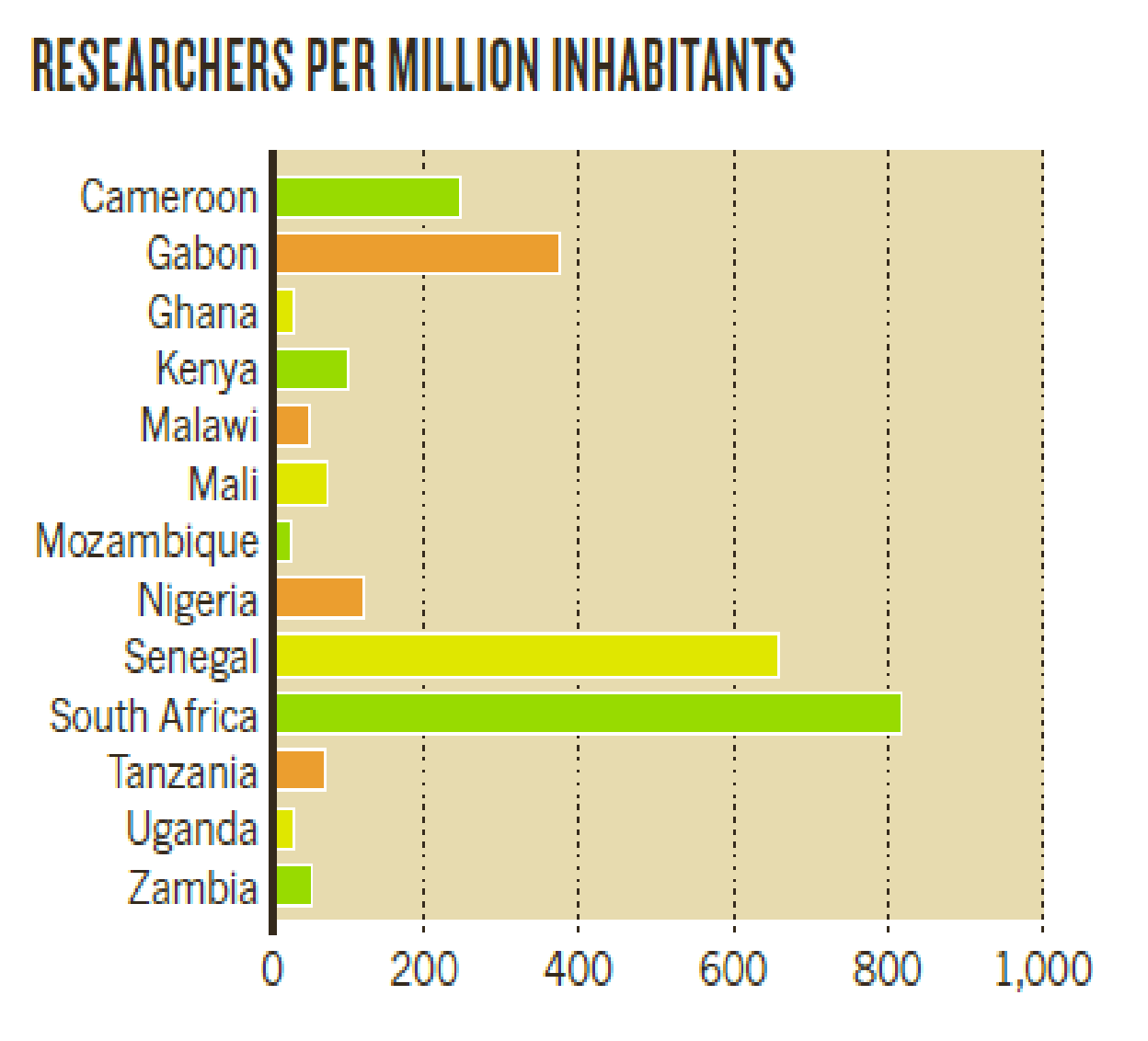
Country income group	Diabetes	Cardiovascular diseases	Chronic Respiratory diseases	Cancer	Mental Illness*	Total
High	0.9	8.5	1.6	5.4	9.0	25.5
Upper-middle	0.6	4.8	2.2	2.3	5.1	14.9
Lower-middle	0.2	2.0	0.9	0.5	1.9	5.5
Low	0.0	0.3	0.1	0.1	0.3	0.9
LMIC	**0.8**	**7.1**	**3.2**	**2.9**	**7.3**	**21.3**
World	**1.7**	**15.6**	**4.8**	**8.3**	**16.3**	**46.7**

*The numbers for mental illness were obtained by relating the economic burden of all other diseases to their associated number of DALYs. Then the burden for mental illness was projected using the relative size of the corresponding DALY numbers to all the other conditions.

The Global Economic Burden of NCDs:
WEF&HSPH-2011

Tackling under- and overnutrition in Africa requires strengthening capacity for quality higher education and integrated basic scientific training and research in nutrition and agriculture.

Fewer Researchers in Sub-Saharan African Countries



World Bank

Priorities for Higher Education in Africa

- Inadequately qualified staff/faculty to undertake teaching, supervision and mentorship of students;
- Limited laboratory infrastructure including shortage of skilled staff to undertake state-of-the-art research investigations;
- Poor translation of research findings into policy;
- Limited public and private funding portfolios for higher education and research to enable sustainability of science and innovation initiatives.

African Nutritional Sciences Research Consortium (ANSRC) responds to the training and research challenges faced by African institutions

ANSRC Goals

To strengthen regional capacity to conduct *PhD* and, further enhance opportunities for *post-doctoral training* and research in human nutritional sciences, agriculture and related fields in East Africa.

ANSRC is being implemented in a consortium model comprised of >12 academic and research institutions in East Africa.

The African Nutritional Sciences Research Consortium (ANSRC)

ANSRC Consultative Planning Workshop, Nairobi, January 2013

Health, Agriculture, and Biologic Areas of Relevance

Link to Local Public Health and Agricultural Problems

(Examples -1)

Under- and Overnutrition

– Molecular actions of nutrients in soil, plants, animals, humans

– NCDs: metabolic syndrome, Type 2 diabetes, CVD, cancer

– Reproductive health, stunting

Nutrition and Emerging Health Problems

Seasonal starvation and epigenetics,

- Resilient crop selection and genetics
- Food safety (aflatoxins, microbes, water)
- Provision of quality nutrients/foods
- Integrating with One Health

Seasonal hunger and public policy; intersectoral solutions needed

Deckelbaum RJ, Lancet Global Health, 2016

New approaches to climate change needed to prevent hunger and undernutrition

- Food production could shrink by as much as 50% by 2020 in some African countries, and by 30% in Central and South Asia - *high risk of hunger*
- If temperatures rise by more than 3° C, calorie availability in 2050 will decline back to the 2000 level - *increasing child malnutrition by 20%*

Health, Agriculture, and Biologic Areas of Relevance
Link to Local Public Health and Agricultural Problems
(Examples - 2)

Nutrition and Climate Change – Root Drivers

- Lipdomics and other "omics" in human/plant/livestock research
- Systems biology
- Agro-bioinformatics

Microbiome and the "double burden"

- In undernutrition
- In obesity, NCDs
- In soil health

Key Strategic Partners

Country (Headquarters)	Institutions	Nature of collaboration/partnership	Contact person(s)
Nigeria (Lagos) **Kenya, Tanzania, Uganda, Burundi**	Pan African University (PAU) AfDB Centers of Excellence in Health Sciences	Collaborates with ANSRC on graduate student training, training of academic staff, and joint research projects	Dr. Oluwole Abatan, Director
Italy (Trieste)	The World Academy of Sciences (TWAS)	Collaborates with TWAS on the following specific three aspects: Fellowships, research grants and visiting scholar exchange programs	Dr. Romain Murenzi, Executive Director
Kenya (Nairobi)	African Population and Health Research Center (APHRC)	APHRC implements CARTA Training program for post-graduate training in select African countries. ANSRC collaborates with CARTA on curriculum development, faculty training, training and progress monitoring of graduate students	Dr. Alex Ezeh, Director
Kenya (Nairobi)	African Economic Research Consortium (AERC)	AERC implements a number of masters and PhD training programs in agriculture and economics. ANSRC collaborates with AERC on curriculum development, faculty training, training and progress monitoring of graduate students	Dr. Lemma Senbet, Executive Director
Kenya, Uganda, Tanzania, Rwanda and Burundi	National Commissions of Education (CUEs) Academies of Science	Active engagement with CUEs in partner countries to facilitate ANSRC program and training curriculum approval/accreditation. Secondly, to collaborate in conducting regular assessments of doctoral programs in the partner institutions	Directors/Executive Secretaries of CUEs in Kenya, Rwanda, Uganda, Tanzania and Burundi
USA (Madison)	University of Wisconsin-Madison's Departments of Biochemistry and Nutritional Sciences (DBNS-UWM)	Collaborate on curriculum development, student and faculty exchange programs , and serve as a member of the ANSRC eternal scientific advisory committee (SAC)	Dr. James Ntambi, Chair, Department of Nutrition
USA (New York)	Institute of Human Nutrition-Columbia University (IHN-CU)	Collaborate on curriculum development, student and faculty exchange programs , and serve as a member of the ANSRC eternal scientific advisory committee (SAC)	Drs. Richard Deckelbaum and Debra Wolgemuth, Institute of Human Nutrition, Columbia University
Uganda	The Inter-University Council of East Africa (IUCEA)	Government body partnering with and overseeing ANSRC	Dr. Alexandre Lyambabaje
Tanzania	East African Community (EAC)	To facilitate regional uptake of ANSRC by the five EAC countries, and to enable successful	Dr. Richard Sezibera, Secretary General

Participating Institutions

Country	Institutions	Contact person(s)
Rwanda	National University of Rwanda	Dr. Antoine Nsabimana
Kenya	Egerton University	Dr. Elizabeth Kamau-Mbuthia
	Kenyatta University	Dr. Judith Kimiywe
	Technical University of Kenya	Dr. Fiona Mbai
	University of Nairobi	Drs. Bonnie Dunbar & Joel Ochieng
	Moi University	Dr. Simeon Mining
	Maseno University	Dr. Collins Ouma
	Masinde Muliro University	Dr. Gordon Nguka
Burundi	University of Burundi	Dr. Theodore Niyongabo
	Institut National de Sante Publique	Dr. Pierre Claver Kazihise
Tanzania	Sokoine University of Agriculture	Dr. John Msuya
	Nelson Mandela Inst. of Science and Technology	Dr. Martin Kimanya
Uganda	Makerere University	Dr. Archelio Kaaya
Regional (Africa)	The Biosciences Eastern and Central Africa (BecA)-ILRI Hub	Dr. Appolinaire Djikeng

ANSRC Working Groups

- Admissions
- Curriculum
- Research and Student Monitoring
- Human and Physical Infrastructure
- Coordination with development agencies and private sector

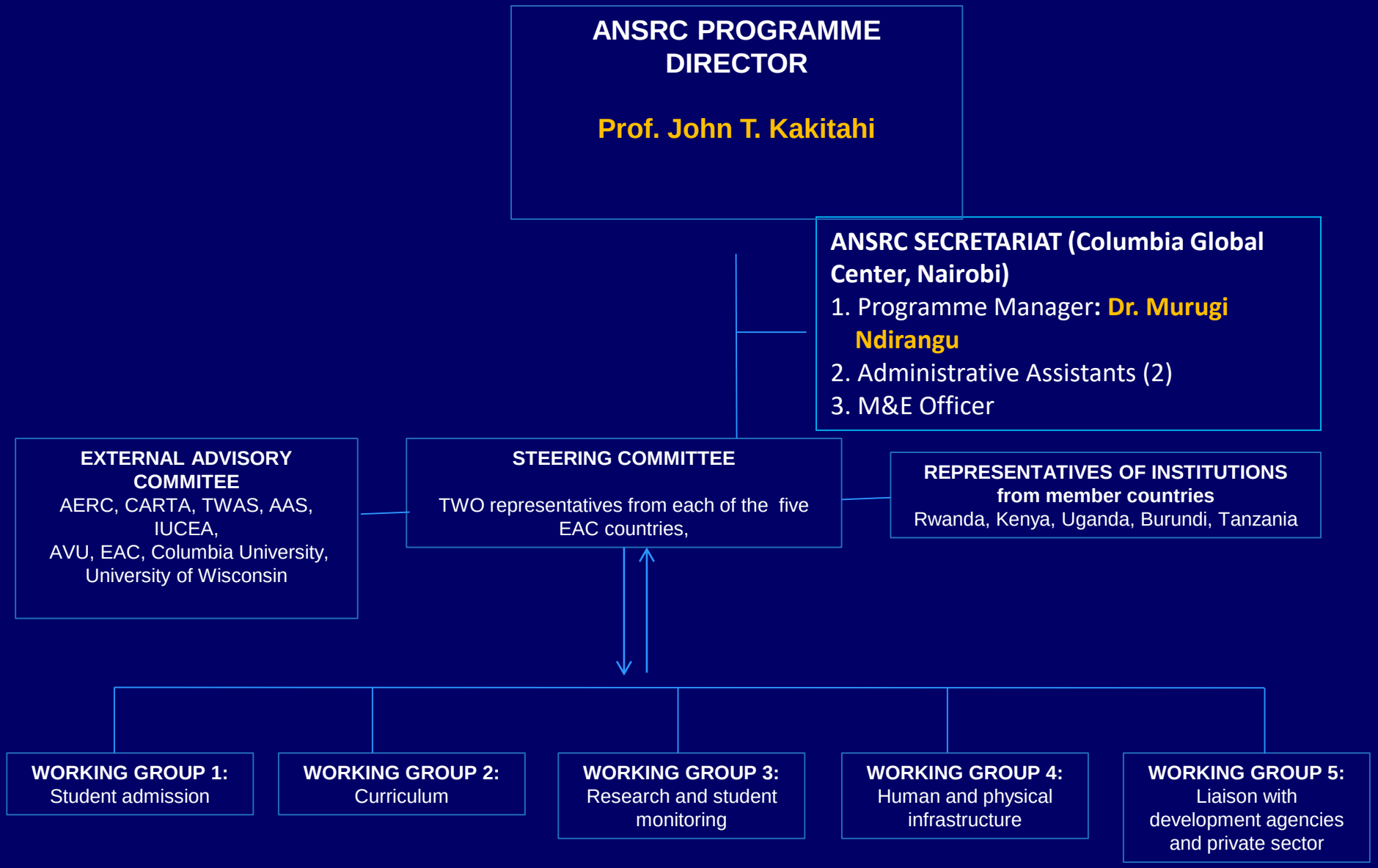
ANSRC Recent Progress

- ANSRC office continues at Naiorbi CGC
- ANSRC website, ANSRC at STI conferences (SSA, USA)
- Program Manager - Dr. Murugi Ndirangu
- ANSRC registration as a regional entity…done!
- Working group reports drafted
- Nairobi ANSRC/EAC meeting to plan Burundi CoE in Nutrition – funds allocated by ADB for 2017
- ADB Project Concept Note
- Meetings with World Bank, USAID, ADB
- Funding by CU's President's Global Innovation Fund

Implementation Infrastructure

- Columbia Global Centers/Africa (CGC) – Nairobi ANSRC offices
- Ministries of Health and Ministries of Higher Education in the partner EAC Countries
- EAC Secretariat and the IUCEA
- Partner academic and research institutions

ANSRC Organization Structure



Resource Mapping and Training of Trainers

Resource Mapping Survey (RMS)

1. Human Resources

- Available faculty
- Administrative and teaching commitment
- Research funding
- Publication records

2. Program resources

- Enrolment
- Research administration and oversight
- Student recruitment and admission
- Student financial aid and support services
- Thesis (preparation, monitoring, defense)
- Program evaluation

3. Laboratory Resources

- Document existing equipment inventory
- Establish usage pattern and maintenance of equipment
- Assess existing procurement procedure, supply chain and stock replacement
- Assess training adequacy and competence of lab personnel

Human Resources

- Identify needs for human resource/ICT/Infrastructure
- Training of program and grant administrators
- Workshops/online resources for training mentoring faculty - ToT
- Develop gender mainstreaming policy
- Protected mentor time
- Use US faculty on sabbatical to train in East Africa
- Develop incentives/attractive packages to retain trained faculty/bind trained faculty
- Develop “sandwich” collaborations for short term training in USA

Curriculum Development and Implementation

“The Single Class Room”

Entry Requirements

- Entry requirements: includes MSc. in nutritional sciences or related fields, e.g.,microbiology, immunology, biochemistry, genetics, molecular biology, and food science and technology.

- Selection of additional courses tailored to the individual graduate student's interests, relying on the advice of his/her advisor/research mentor and Dissertation Committee

- Course requirements: to meet institutional and ANSRC minimum course units for the PhD program

Laboratory Rotations and Credit Transfer

- Laboratory rotations – initiated in 1st year (3 months each)
- Draw from existing programs (AERC, APHRC) on pathways for credit transfer
- Examinations at the individual university to be moderated at the consortium level

Core Courses
(Potential examples)

Program Core Courses (minimum of 12 credits)

Genomics and Epigenetics –Lectures/workshops

Molecular and Cell Biology of Nutrients - Lectures

The Microbiome; Soil, Plants, Livestock, and Humans –Lectues/workshops

Biostatistics – Lectures

Biosafety in Research Laboratories (Workshops or Seminars)

Applied Research: Planning/Design/Analysis (Workshops or Seminars)

Communicating Science & Technology (Workshops or Seminars)

Introduction to Research Ethics (Workshops)

Centers of Excellence (CoEs)

CoE - Rationale

- Will enable EAC countries to have well trained leaders in nutrition, agriculture and biotechnology to define better policies and strategies to drive inclusive green growth

- Establish state-of-the art training and research centers

- One CoE already exists:
  - (BecA/ILRI, Nairobi)

CoEs – ANSRC Plans

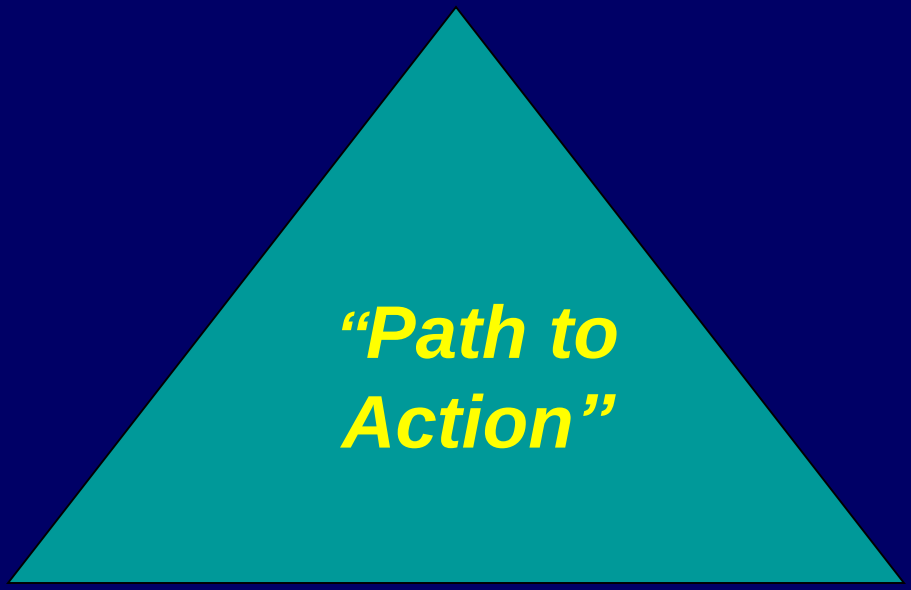
- Establish new CoEs to support basic research in nutritional and agricultural sciences (for core curriculum and for support of individual research projects)

- Potential CoEs – “Omics” (lipidomics, proteomics, metabolomics) in Uganda; Microbiome (Ethiopia or Tanzania)

- Proposals from universities and institutions to justify their capabilities to host CoEs

ANSRC - Integrating Biotechnology into Nutrition and Agricultural Sciences

Laboratory Based Education/Training



Public Health/Food Security

Building Human and Economic Capacity

Links to the private sector

Why PhD Training?

- Severe shortage of doctoral trained individuals to teach Masters level programs and lead research in East African universities
  - In Kenya less than 1% of university learners are enrolled in PhD programs
  - Situation worse in nutritional and agricultural sciences
- Quality of existing doctoral programs in the region has been questioned
  - Quality doctoral training imparts critical thinking skills, inculcate independence, enhances innovation and invention, and develops leadership skills.

Commission for University Education (Kenya)

- “For example, a student took 11 years to graduate with a PhD…”
- “...half of PhD students dropped out.”
- “A person with a doctoral degree with no quality is not important”

Daily Nation (Kenya); April 2, 2017

ANSRC – Higher Education for Africa

- Partnerships ongoing:

  - Pan African University
  - BECA COE in Health Sciences and Bioengineering
  - New Einstein Initiative
  - AERC, CARTA(APHRC), African Academies of Science, CU, UW (Madison), African universities

- *Political buy-ins established and in progress*

- *Ready to operationalize in 3-4 months*