The 2nd National Nutrition and Food Industries Conference

"Capacity building, Employment and Job creation for Better Nutrition and Sustainable Development in Ethiopia"

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Book of Abstracts

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Welcome and Opening Speech to the National Nutrition and Food Industries Conference

Tesefy Abebe, (PhD),
V/President for Research and Technology Transfer, Hawassa University

Distinguished participants of the conference,

Ladies and gentlemen,

Welcome to Hawassa to participate in the 2nd national Nutrition and Food Industries Conference under the theme, “Capacity building, Employment and Job creation for better nutrition and sustainable development in Ethiopia” organized by Hawassa University’s Academic Center of Excellence for Human Nutrition in Ethiopia. I feel honored to stand in front of you to make this speech at the opening of the conference.

As you all know, agricultural production and productivity in Ethiopia has been generally low. However, recent advances made by research and development organizations in dissemination of improved agricultural technologies and practices, has resulted in improving productivity of agricultural crops. While scaling-up of these technologies is necessary to reach large majority of farmers in Ethiopia, it is equally important to engage in the nutritional aspect of the produce. This is particularly true to Ethiopia where malnutrition is widespread and crop production is predominantly subsistence oriented.

Obviously, institutions engaged in education, research and development of human nutrition and food science areas are expected to play crucial roles in mitigating nutrition related problems. Agricultural production should be oriented towards addressing nutritional needs of the people living in different localities. The local people should also be trained in the preparation of nutritionally balanced food from locally available resources. Hence, location-specific nutrition interventions should be designed and implemented to address the different segments of communities, especially children and women. This should be backed by strong research and capacity building of partners and stakeholders.

Therefore you are all entrusted with huge tasks of improving the nutritional status of Ethiopians, especially the rural poor, through active engagement in provision of training, research and development undertakings.

- Long-term trainings should be strengthened to produce competent educators and researchers in sufficient number;
- Short-term, tailor made trainings should be organized to enhance competence of the front-line extension staff;
- Problem-solving researches should be carried out and the results packaged and disseminated to users to address identified problems; and
- Strong awareness creation campaigns should be carried out to reach the wider public in nutrition education.
All these tasks should be handled through collaborative and integrated engagements with major stakeholders. Research conferences such as the one underway can serve as a platform to bring stakeholders together, share experiences and deliberate on critical issues. In addition to this, you might think of establishing regular forums of key stakeholders, by way of forming consortium or task force, to discuss on your plans, evaluate your progress, and also to create effective linkage between education, research and development actors in human nutrition and related fields.

Here, at Hawassa University, we are very happy to see that the school of Human Nutrition, Food Science and Technology evolved as an Academic Center of Excellence for Human Nutrition in Ethiopia, thanks to the efforts and commitment of the staff and the support of our partners. We are also delighted so see that the school is launching PhD program in Human Nutrition. Hawassa University will continue to support initiatives of the school to build its capacity and excel in nutrition education and research in Africa.

Finally, I would like to sincerely thank organizers of the conference and the sponsors for bringing us together in this very important conference. It is my sincere hope that you will have fruitful deliberations in the conference, and also enjoyable stay at Hawassa.

Thank you!
TefayeAbebe, PhD.
Vice president for Research and Technology Transfer
Hawassa University
Keynote Remarks

Dr Ephrem Tekle Lemango,
Director, Maternal and Child Health,
Federal Ministry of Health

Distinguished guests, Ladies and Gentlemen

On behalf of Federal Ministry of Health and myself, I welcome to the Second National Nutrition and Food industry.

Malnutrition in all its forms is a global burden that affects almost every country in the world, and leads to serious public health risks and high economic costs. On the other hand, improvements in nutrition will contribute significantly in reducing poverty and maximizing potential; specifically, mental and physical productivity. Cognizant of the problems of malnutrition, the government of Ethiopia has been undertaking several reforms that will realize the reduction of poverty and the debilitating consequence of malnutrition.

The government of Ethiopia has demonstrated policy commitment to mainstream nutrition by incorporating indicators into government five year Growth and Transformation Plan II (GTP II; 2016-20). Moreover it succeeded in establishing implementation platform; national nutrition coordination body (NNCB) and national nutrition technical committee (NNTC) through which nutrition interventions are mainstreamed into sectors, integrated and coordinated to bring about the changes sought. Sectoral strategies and programs created a good opportunity to mainstream nutrition into responsible sectors or legal frameworks to enforce some key nutrition interventions such as Nutrition Sensitive Agriculture Plan, National Food Security Strategy, the National Health Sector Transformation Plan, National Food Fortification, the National School Health and Nutrition Strategy and recently, the School health and Nutrition program is in draft stage.

In the past decade, since national nutrition strategy is developed, the government, implementers and nutrition development partners strived to create appropriate channels, capacity and resources through which the intergenerational cycle of malnutrition is halted. In those years policy landscapes and government commitment have been improved. NNP I focused on integration and coordination of nutrition specific and nutrition sensitive interventions that address the immediate and underlying causes of suboptimum growth, development and the potential effects of determinants of malnutrition. The program also tried to create enabling environment through which nutrition interventions are governed and supported by evidence and legal frameworks. One good measure of such action is the development of Food and Nutrition Policy which going to be soon presented to the parliament.

The other chronic problem in the implementation of the program is the effective and efficient use of available human resources in respective areas. Although our graduates in food nutritional sciences have been in market for the last ten years, still there is no suitable carrier structure that can accommodate them in all relevant sectors. In this regard I hope this conference will provide a solution to such professional problems that potentially has negative consequences in nutrition interventions.

On behalf of the Ministry of Health I would like to thank HU in organizing this conference in order to bring and discuss on our common problems and wish fruitful discussion and deliberations.

Thank you for your patience
Dear Guests,

Poverty and malnutrition are among the leading development challenges in Ethiopia. In this regard, the nation did achieve significant gross economic development and reduced maternal and child deaths during the past two decades. However, compared to the gross economic development, the progress made in reducing malnutrition in Ethiopia is not that much significant. Conventionally, among the Ethiopian scholars, Food security was seen as a sufficient condition to eradicate malnutrition. Even today, there are many scholars that find it hard to see nutrition as an urging development need. Production of lots of food sounded enough to eradicate malnutrition. Some of us might also think that malnutrition related problems can easily be cured in Healthcare Institutions. But, the practice of Nutrition is majorly about prevention than curing and it is also far more than food security. Yet, tackling the problem of malnutrition in Ethiopia was limited by shortage of highly educated manpower that advice national nutrition initiatives from policy to grass root level.

To address the shortage of nutritionists, In 2007 G.C, Hawassa University was the first higher education institution in Ethiopia that started Human Nutrition training. The first program was M.Sc. in Applied Human Nutrition which was opened through support from Oklahoma State University of USA, Otego University of New Zealand and University of Giessen in Germany. Hawassa University did also open the first B.Sc. program in Human Nutrition in 2009 G.C. So far, more than 500 students graduated with M.Sc. and B.Sc. in Nutrition. The University is also among the leading in Food Sciences and Post Harvest Technology training. So far, more than 700 students graduated with M.Sc. and B.Sc. in Food Sciences and Post Harvest Technology. We did also launch PhD in Human Nutrition this year and planning to start PhD in Food Sciences and M.Sc. in Food Safety and Quality Management during the coming academic year. We are also planning to open M.Sc. in Nutrition and Physical Exercise. We have many offers for collaboration.

Hawassa University did always make strong academic, research and community services related collaborations with Other Universities from home and abroad to ensure quality of the training programs. Thus, due to its capacity to lead Human Nutrition related academic issues in Ethiopia, in 2015, Hawassa University was selected to be an Academic Center of Excellence for Human Nutrition in Ethiopia after winning a competitive grant from USAID/FEED THE FUTURE Project among all Ethiopian Universities that offer Nutrition Training. One of the roles the center of excellence can play is facilitation of information exchange and discussions to advise policy makers related to human nutrition related training in Ethiopia. Hence, hosting National Conferences is one of the ways to bring all stakeholders together to discuss national issues related to Human Nutrition Training.

Among the burning challenges we face today related to Human Nutrition and Food Sciences Training is unemployment of our graduates. Even if unemployment is common among all the fields of study, the problem for nutrition graduates is the fact that there is no nutrition career position within the Ethiopian government employment system. The second National Conference is aimed to address this critical problem. There are so many opportunities: for example, the Seqota declaration, NNP2, National School Feeding plan, the support from NGOs and donors etc. Ethiopia also has so much
arable land and many rivers for production of food and about 100 million population and many University graduates. The opportunities for agroprocessing and value addition are also huge. There is also good policy environment and resources to be mobilized as an input for reduction of malnutrition. But, more work should be done by academic institutions, national nutrition implementing partners and donors specifically in making clear nutrition career structures for all the sectors within the government employment system. The major target of this conference is to reach consensus about nutrition career structures.

In addition, the Center of Excellence is expected to lead the way in advocating and promoting the profession of Human Nutrition in Ethiopia. In this regard, we are using online groups to bring together scholars from Agriculture, Nutrition, Health and related background targeting Ethiopia in collaboration with the global Agriculture Nutrition Community.

The first Conference was held from 16-17 February 2016. The major theme of the conference was Multi-sectoral Approach for Better Nutrition and sustainable Development in Ethiopia. The first conference was successful: we received more than 120 research abstracts and about 150 participants from academic, research and development community in Ethiopia. Building on the experience during the first conference, this second conference is planned to focus on key national problem: i.e problem of unemployment of Nutrition graduates due to absence of Human Nutrition career structure within the Government employment system. In addition, trends in nutrition and food sciences training in Ethiopia will be evaluated based on demands of different stakeholders. Short term training areas will also be proposed; professional association; multi-sector approach for nutrition; and Ethiopian Food Systems and Healthy Diets issues will be discussed about during the conference. We will also reflect on the draft Ethiopia Food and Nutrition Policy.

Overall, we believe that, we have lots of opportunities to make difference in the development of Ethiopia in general and specifically to tackle the problem of malnutrition. Still, all the actions we take demand joint action and learning from each other since all stakeholders have roles to play. Therefore, we are doing our best to meet the conference objectives and in the long run help our country realize sustainable development.

We thank you all for all your support and for attending the conference.

Wishing all the bests.

Fikadu Reta Alemayehu (Director)

Academic center of excellence for Human Nutrition

SNFST, Hawassa University, Ethiopia
Agriculture is the beginning and ending of intricate food nutrient chain upon which human nutrition depends for the health of people, vital in productive agricultural systems. Ethiopia is agrarian country with vast goods of biodiversity at diverse natural environment (126 mbsl - 4600 masl) inhabited with a variety of ethnic food sovereignty. Integrated nutrition sensitive (NS) agriculture and food system (FS) is the source and supply chain of nutrients for one health. One health comprises biotic (fauna and flora) and abiotic (earth and climate) surroundings that bring into being food sovereignty and dietary diversity. Review was made on NS agriculture and FS for health outcomes in the current context and prospects of Ethiopia. Ethiopia has policy with many initiatives: national nutrition program (NNP), food based multi-sectoral (9 ministries) approach to tackle malnutrition, community base nutrition (CBN) and behavioral change and communication (BCC) schemes; safety net, growth and transformation plan (GTP) with nutrition indicators; agricultural transformation to enhance productive agricultural systems, food security and agro-industry parks. Agricultural productivities (yield increment) and biofortification, postharvest loss reduction, fair trade in structured market, appropriate food processing technology, food quality and safety systems, improving nutrient retention and bioavailability during food preparation, dietary diversity and food consumption patterns are pathways of nutrient value chain for one health. Local produce of mixed agriculture and pastoralist systems have impact on dietary diversity in rural (>80%) and nearby urban households of Ethiopia. Most of the consumers are dependent on what is produced at nearby agro-ecological zones that partly dictate food sovereignty and nutritional diversity on the dining table. Vital dietary elements, molecules and compounds from farm produces need to be retained and transferred through safe food handling, processing, packaging, trading and food preparation into consumers’ body for healthy life. However, Ethiopian FS is less developed to fully exploit its potential of food sovereignty and diet diversity. After review, conceptual framework of nutrient value chain in FS where NS agriculture and health impact each other is developed in view of ecological health. It is recommended that Ethiopia needs to reinforce its multi-sectoral approach on the NNP implementation, NS agriculture and FS towards health outcome.

**Keywords:** Nutrition sensitive agriculture, nutrition value chain, nutrient-rich foods, food system
Association of Household Pond Fish Production with Fish Consumption, Dietary Diversity and Nutritional Status of Reproductive Age (15-49) Women in Three Selected Woreda's of Southern Nations, Nationalities and People's Region, Ethiopia

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In the Southern Nations, Nationalities and People's Region, Ethiopia, farmers started producing fish using household ponds through support of governmental institutions. However, studies identifying association of household pond fish production with fish consumption, dietary diversity and nutritional status of the women and proximate nutrient composition of fish from the pond has not been yet done in Dara, Dila Zuria and Wensho Woreda's. As step to fill the evidence gap, the researchers collected both quantitative and qualitative data using multi-stage sampling method. A total of 178 reproductive age women participated in the study (61 from fish producing and 117 from none fish producing households). Fish consumption frequency was measured using three consumption patterns (i.e. frequent eaters, occasional eaters and non-fish eaters). Women’s dietary diversity score was assessed by 9 food group with reference period of 24 hour. Nutritional status of the women was determined using body mass index. In addition, focus group discussion and key informant interview were done to obtain in depth information about pond fish production and consumption. Nile tilapia (Oreochromis niloticus) fish samples were collected in triplicate both from the farmer's pond and Hawassa Lake. Proximate composition was determined following the procedure of AOAC. Chi-square test was used to check the association between nominal explanatory and outcome variables. Independent sample t-test was used to see mean difference of height, weight and body mass index of the reproductive age women and proximate nutrient composition of fish fillet. Ordinal regression was used to see the association of household pond fish production fish and consumption frequency. Multivariate linear regression model was used to compare dietary diversity score. Respondents from none pond fish producing households were less likely to consume fish frequently (OR=0.044, p<0.001) than those pond fish producing households. The mean (±SD) women dietary diversity score among pond fish producing households was significantly higher than their counterparts (P<0.001). No difference (p>0.05) in mean height, weight and body mass index was noted between respondents of pond fish producing and none producing households. Mean difference (p<0.05) in Moisture, Crude Protein, Crude Fat and Ash percentages were noted between pond and Lake Hawassa Nile tilapia fish fillet. The finding suggests household pond fish production is associated to fish consumption frequency and women dietary diversity score, even if no difference was observed about its effect on nutritional status of women. Therefore, more nutrition sensitive fish production interventions are recommended to maximize impact of fish production on nutritional status of women and improve the proximate composition of the fish being produced.

Keywords: Dietary diversity, Fish fillet, Nile tilapia, Nutritional status, Pond fish, proximate composition, Women
Effect of climate change on health and nutrition from Gender inequality perspective: A literature review

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Background: Climate change affects every aspect of society, from the health of the global economy to the health of our children and women. Its health and nutrition effect is more severe in Women and children as compared with another group of people especially in developing countries. However, little attention has been given on the effects of climate change on public health from gender inequalities perspective. So this literature review was done to assess the effect of climate change on health and nutrition from a gender inequality perspective.

Methods: A traditional literature review was conducted from different sources using a Google scholar searching strategy that are written on the topic using the English language.

Findings: Most literatures indicate climate is changing through time and it has direct and indirect effects on health. Health consequences of climate change includes higher rates of malnutrition due to food shortages, increase in heat-related mortality and morbidity, increase in respiratory disease where air pollution worsens, work related illness due to work overload, and mental health problems due to stress from climate change. Climate change affects the household food security status and leads to malnutrition. For this, woman are among the vulnerable groups due to biological and cultural reasons. Also, women are responsible to feed the family as a whole which may lead to stress and mental illness during food shortages. Climate change can affect the health of family members and there is gender discrimination in the allocation of resources for health care which puts women and girls at greater risk than men and boys. Climate change leads to conflicts for resources and disasters and woman and girls are at a higher risk of sexual violence and extra work load as compared with men and boys which limits their movement to use income generating opportunities. Given the changing climate, inadequate access to water and sanitation services affects women as a family member and also they are responsible as primary family caregivers, and the health of their families’ which increases the overall amount of labor that is expended to collect, store, protect and distribute water. These all have direct or indirect impact on nutritional status of human beings particularly on females.

Conclusion: The effect of climate change on health is clearly visible and it is higher among women and girls due to gender based inequalities in the community. Therefore, in any kind climate change mitigation, adaptation, financing and technology development strategies, the decision making role of women should be considered and the projects should be gender sensitive.

Key words: Climate change, health, women, gender, inequality
An Evidence-Based Technology Brief

Improving Nutritional Status in Ethiopia by Consuming Quality Protein Maize (QPM).

QPM = Quality Protein Maize = Maize with improved protein quality through biofortification

- QPM is a promising strategy to combat under nutrition in developing countries

Key Messages

- Included:
  - Description of a health system problem
  - Viable option for addressing this problem
  - Policy contextualization
  - Barriers for QPM Adoption

Who is this technology brief for?
The industry, policymakers, and other stakeholders with an interest in the technology addressed by this technology brief.

Why was this technology brief prepared?
To inform deliberations about health policies and programs by summarizing the best available evidence about a technology of public health importance.

What is an evidence-based technology brief?
Evidence-based technology briefs bring together global research evidence (from systematic reviews*) and local evidence to inform deliberations about health policies and programmes.

*Systematic Review: A summary of studies addressing a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise the relevant research, and to collect and analyse data from this research.

Technology brief prepare by:
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Scaling-up Pulse Innovations for Food and Nutrition Security in Southern Ethiopia (SPIFoNS), Hawassa University

Abstract

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Background: Ethiopia has one of the highest prevalence of protein-calorie malnutrition and micronutrient deficiencies. The production of quality pulse crops with higher micronutrient content and improved production practices, together with nutrition education regarding processing and preparation of food products containing pulses can provide a cost-effective means for combating micronutrient deficiency. Accordingly, ‘Scaling-up Pulse Innovations for Food and Nutrition Security (SPIFoNS) in Southern Ethiopia’ a three year project envisaged wider-scale impact to curb the circumstance by improving the production, productivity and utilization of chickpea and common bean. The objective of the project is to catalyze large-scale positive change in food and nutrition security in Southern Ethiopia by scaling-up pulse-crop innovations, reaching 70,000 farm households.

Methodology: The project is implemented in 5 zones and 15 woredas of the Southern Nations Nationalities and People’s Regional State (SNNPRS). The project’s scaling-up conceptual framework was adapted from the IFAD scaling-up model and comprises four components: innovation, learning, scaling-up, and policy advocacy and innovation and learning components remain, the major part of the current project focuses on full-fledged scaling-up of pulse crop innovations, policy advocacy, and influencing activities. The scaling-up involves multiple actors and training for male and female smallholders implementing the innovations to bring a policy shift on pulse production and nutrition.

The major innovations that are on scale-up includes:

- High yielding haricot bean and chickpea varieties along with seed production and delivery systems.
- Promotion of rhizobium packages;
- Advanced site-specific production packages (agronomy and soil fertility) for chickpea and bean production;
- Pulse-based complementary food processing and preparation methods and food-products an
- Preparation methods for nutritionally adequate pulse-cereal complementary foods at low cost;
- Pulse crops focused nutrition education at household and community level

Results: The project has covered the one and half year since it is a three year project. ToT is given for all the fifteen woredas Development Agents (DAs), Subject Matter Specialists (SMS), nutrition focal persons, 2,040 farmers are formed as chickpea and common bean seed producers. Furthermore, 33,961 (14,358 female and 19,603 male) smallholder farmers were provided with 2 kg improved varieties of chickpea and common bean seeds. Additionally, 9,730 women farmers were reached through Nutrition Education program through mothers organized in 1-5 groups.
Fish post-harvest technologies as a mean of food and nutrition security

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Fish provide the main source of animal protein to about billion people globally. Fisheries are an important part of food security, particularly for many poor peoples in developing countries. In low income food deficiencies countries (LIFDCs) they make up 22% of animal protein consumption overall. The importance of small-scale fisheries in particular for food security is emphasized by FAO especially in coastal areas and around major rivers systems. Fish and fisheries contribute to food security through Subsistence and local consumption, income, accessible protein for the poor, reduces vulnerability etc. Fish plays an important role in a nutritionally rich diet for many Ethiopians. Eating habits have been shifting in favor of fish in the areas and communities where there is regular and significant supply. In those communities, annual fish consumption can exceed 10Kg/Person”. Among different solutions to maintain fisheries’ contribution to food security; reduction in fish post-harvest loss, improving the traditional processing, handling, and preservation method of fish and its gear system, developing new and value added products, etc through generating and adopting new technologies are crucial and the concern of this paper.; Different fish driers, processing kits, fertilizer, meal, smoking and marinating, retaining cage are among generated, adopted and scaled up technologies which contributes a vital role in food and nutrition security through availing preserved high quality protein and minerals, increasing production and its shelf life availing throughout the year at different places, generating income job opportunities to numerous householders(fish catch, net production, value addition, distribution, market processing).

Keywords: fish, food, nutrition, processing, technology.
Improving Dietary Diversity of School Adolescents through School based Nutrition Education and Home Gardening: Quasi-experimental design

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Background: A relatively lower rate of mortality compared to their younger counterparts led to the misconception that school children and adolescents are naturally healthy. Existing health information dissemination in schools mainly uses didactic approaches that lack a strong skills-building component. In the Ethiopia, although the revised National Nutrition Program has included school based nutrition and health program as one of its components, there is a limited practical experience and lack of evidence on the types of effective intervention strategies for improving the dietary diversity of adolescents in the country setting. This study compared the effect of school based nutrition and health education supported with enhancement of backyard gardening on the dietary diversity of school children.

Methods: A quasi-experimental design was employed to answer this objective. A total of 1000 school children from four schools were involved in the study using a simple random sampling technique. Five hundred students were from the intervention schools and the rest were from the control schools. The intervention involved peer-led behavior change communication and health promotion through school media, health clubs and linking the school events with parents. Data were collected at baseline, midline and end-line using structured questionnaires. To account for the effect of time trend, difference was measured using repeated measure analysis. Multivariable logistic regression analyses were used to determine the independent effect of intervention after adjusting for various variables.

Results: There was a significant increment of proportion school children consuming diversified diet among the intervention group from 34.8% at baseline to 74.7% at the end-line (p<0.001). Repeated measurement analysis showed there was a significant difference between midline to baseline (p<0.001) and end-line to baseline (p<0.001) among intervention group. There was also a significant difference between intervention and control groups in dietary diversity score (<0.001) at the end-line. On multivariable logistic regression analyses after controlling for potential confounders, being in the intervention school [OR=2.33, 95% (1.55, 3.50)], male-gender [OR=1.75, 95% (1.91, 2.56)] and having farmer mothers [OR=2.58, 95% (1.01, 6.87)] were independent positive predictors of a diversified diet consumption. Conversely, having mothers who had attended secondary school was negatively associated with having diversified diet [OR=0.25, 95% (0.06, 0.97)].

Conclusion: The study showed that there was a significant improvement in dietary diversity of adolescents in intervention schools. The results imply that school based nutrition education should be a part of comprehensive school health programs to reach both the students and their families.

Keywords: Effectiveness, School, Health, Nutrition, Jimma

Food Processing Training Centers: A Novel Concept For Rural Women Empowerment

The 2nd National Nutrition and Food Industries Conference, Hosted by Academic Center of Excellence in Human Nutrition, School of Nutrition, Food Science &Technology, Hawassa University
Ethiopia is essentially an agricultural country with agrarian based economy with 80% of total population depending on agriculture for employment and rehabilitation. Most of the exports are based on agriculture, chief of them is coffee. Principal crops include coffee, pulses (e.g., beans), oils seeds, cereals, potatoes, sugarcane, and vegetables. Exports are almost entirely agricultural commodities, and coffee is the largest foreign exchange earner. The cereals include teff, maize, sorghum, wheat, barley and rice; and their total annual production is 26.7 million tons. Ethiopia is also Africa's second biggest maize producer. Ethiopia's livestock population is believed to be the largest in Africa. The fruits production is of the order of 2.1million tons, out of which banana and mango are the most premier crops, and need processing facilities. Most of the people make living by selling these fruits in the local markets with virtually no processing done. Whatever is sold is sold, and the rest of them go as waste.

It is imperative that mere surge in agricultural production alone does not improve the economy, unless the agricultural produce is given value addition by processing them into value added shelf-stable products. It is needless to say that most of the agricultural produce is perishable, and hence viable technologies are to be applied for processing them. Processing is a post-harvest technological operation whereas agricultural farming is a pre-harvesting operation. Expertise in both areas is not always possible resulting in huge loss of agricultural produce during post-harvesting stage. The present concept of establishing “Food Processing Training Centers (FPTCs)” especially in the rural or semi-urban areas of Ethiopia is a novel concept to address this trivial issue of encouraging the producers to become the processors. FPTC has a dual role to play. It is basically a training center to impart training on various viable post-harvest technologies to young and needy entrepreneurs to ignite the entrepreneurial traits in them by practical training. The centers may be equipped with various processing equipment such as boiler, packaging unit, dryers, canning unit, baking unit, extrusion unit for food and feed, and QC (quality control) lab facilities. These facilities are all needed to process the agricultural commodities.

Training will be given to the needy and aspiring entrepreneurs on these gadgets using locally available raw materials. Some simple technologies that can be demonstrated in these centers are shown in Table 1. After the training, the participants will be provided with write-up materials. With this training, the participants who are all mostly rural women may use the center’s facilities to process their limited agricultural produce. If a participant has got about 100-500 kg of fruits, he or she may use the facilities and process to make pickles or ketch up or fruit juices or squashes or fruit toffees etc. Thus, the training in the centers would kindle the entrepreneurial talents in the participants, and allow them to sell their materials at a premium price rather than being in hurry to sell the raw materials at whatever price they fetch in the market. Two such centers were established by one of the authors in two district headquarters (Nizamabad and Anathapur) in Andhra Pradesh in South India with the assistance of Ministry of Food Processing Industries, Government of India. Even with the limited resources also, the centers have been effective. Women’s participation is shown in Figs 1 &2. Thus, these centers are purported to catalyze entrepreneurial talent and help process the agricultural produce which otherwise would have perished for want of processing facilities. This also would encourage the farmers to go for more agricultural production helping the nation boosts its agricultural production.
Effect of Processing Methods on Nutritional Composition and Functional Properties of Improved Chickpea (*Cicer arietinum* L.) Varieties Grown in Ethiopia

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Chickpea (*Cicer arietinum* L.) is an important and cheap source of legume protein which can be used as a substitute for animal protein that is limited in supply and expensive. However, the presence of certain antinutritional factors has become a hindrance to the availability of the protein during human consumption. It is hypothesized that some processing techniques could alleviate the problem and increases the benefits to be obtained from legumes. This study was, initiated with the objective of determining the effect of different processing methods on nutritional composition and functional properties of selected improved Chickpea Varieties (Natoli of Desi and Arerti of Kabuli) grown in Ethiopia. The experiment was carried out in a CRD with chickpea variety as the first factor of two levels (Natoli and Arerti) and processing method as a second factor of the five levels (dry roasting, dehulling, soaking, germinating and boiling). The result indicated that the ash, crude protein, crude fiber, crude fat, total carbohydrates and energy of the unprocessed chickpeas were 3.77%, 18.71%, 5.81%, 6.97%, 55.90%, and 361.13 kcal/100g, respectively. After processing the values of these same parameter ranged from 3.21 to 3.67%, 12.51 to 22.62%, 2.43 to 5.32%, 6.94 to 8.48%, 53.34 to 68.52%, and 360.20 to 392.86 kcal/100g, respectively. Zn, Fe and Ca contents of raw chickpeas were in range 7.06mg/kg, 10.68mg/kg and 1267.33mg/kg, respectively. After processing, the same mineral contents were between 4.48 to 5.85mg/kg, 8.52 to 10.17mg/kg and 536.56 to 1035mg/kg, for Zn, Fe and Ca respectively. The antinutritional factors, tannin and phytic acid, in the raw chickpeas were 0.16% and 88.28mg/100g, respectively. After processing, these parameter were reduced to 25 to 82.25% and 5.89 to 57.35%, respectively. Bulk density, water absorption capacity, oil absorption capacity, solubility and swelling power were 0.46g/cm³, 1.55 g/g, 2.02g/g, 28.49% and 16.08%, respectively while after processing the values remained between 0.40 to 0.58 g/cm³, 1.25 to 2.73 g/g, 1.91 to 2.30 g/g, 18.05 to 28.62% and 10.04 to 15.66%, respectively. The results clearly indicated that boiling was most effective and dry roasting the least in reducing ant-nutritional factors. Under different processing treatments, Arerti of Kabuli variety exhibited low ant-nutritional concentrations. Hence, it can be used as raw material in the food processing industries in production of quality food formulation.

**Key words:** Variety, nutritional composition, Antinutritional factor, processing methods, functional properties
Assessment of Nutrition-Sensitive Agriculture Competence of Mid-Level Agriculture Graduating Students in Ethiopia

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Introduction: More than one third of all stunted children under five lived in Africa. In Ethiopia 40% of under five children are stunted. As part of the country’s multi-sectoral approach, nutrition-sensitive agricultural practices are getting more attention to overcome malnutrition and improving nutritional status of women and children. Nutrition-sensitive interventions that invest extensively on human resources, especially on nutrition education, have a greater possibility of effecting positive nutritional change. Given the shortage of trained nutrition service providers in countries affected by high-burden of stunting, increasing the number of trained frontline agriculture and health extension workers is essential to implementing nutrition-sensitive and nutrition-specific interventions. However, there is no documented evidence on the current level of nutrition sensitive agriculture competencies of agriculture graduates in Ethiopia.

Methods: A cross sectional study design was employed to assess nutrition-sensitive agriculture competences of graduating animal and plant sciences students from Agriculture Technical Vocational Education and Training Colleges in Ethiopia. Data collection was conducted in June 2015 before the beginning of final examination period. Stratified random sampling technique was employed to select 156 study participants from a population of 808 students. Structured skills observation checklists and objectively written assessment questions were used to assess graduating students’ nutrition sensitive agriculture skills and knowledge competencies respectively. Bivariate and multivariable statistical analysis were performed using SPSS version 23. Modified Angoff method was used to set a criterion-referenced passing point.

Results: Descriptive analysis of the assessment result revealed that 51.5% and 93% of the students passed the knowledge and skills assessments respectively. Students’ knowledge scores were lowest in promotion of safe post-harvest handling of agricultural food products. Nearly one out of 10 students recognized the impact of proper post-harvest handling of agricultural products on nutritional outcome. The combined knowledge and skills competence score showed that only 49% of the students demonstrated the required nutrition sensitive agriculture competencies. The regression analysis showed that sex and institutional ownership were the factor associated with the performance of students (P<0.001) where male students and federally owned institution were performing better. This level of competence is not satisfactory if these graduates are expected to assist and promote nutrition-sensitive agriculture practices in farming communities and reduce malnutrition in Ethiopia. The graduates’ low levels of competence could be due to a lack of adequate nutrition-sensitive agriculture content in the curriculum, as perceived by 97.2% of the students.

Conclusion and Recommendation: The agriculture sector is among the key actors to reduce the burden of malnutrition. However lack of essential nutrition sensitive agriculture competencies of graduating agricultural development agents would hamper the multi-sectoral effort to tackle the problem. Therefore, essential nutrition sensitive agriculture competencies like diversified agricultural food production, promotion of safe post-harvest handling, nutrition behavioral change and communication need to be integrated into the agriculture curriculum and tutors need to be trained on those competencies. Improvements should also be made in the learning environment, including increasing the availability of nutrition learning resources by adequately equipping library and practical teaching sites. Moreover, competency areas like post-harvest handling, processing, and preservation need due emphasis as they affect both nutrition outcomes and livelihoods.

Key words: Agriculture, Curriculum, Nutrition Assessment, Malnutrition, Vocational Education
Theme 2: Maternal, Infant, Child and Adolescent Nutrition

Prevalence of Zinc Deficiency and its Association with Dietary, Serum Albumin and Intestinal Parasitic Infection among Pregnant Women Attending Antenatal Care at the University of Gondar Hospital, Gondar, Northwest Ethiopia

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Background: zinc deficiency during pregnancy has far-reaching consequences on both mother and fetus and subsequent child survival. However, data on the prevalence and determinants of zinc deficiency among pregnant women are scanty and inconclusive. The aim of this study was to assess the prevalence of zinc deficiency and associated factors among pregnant women attending antenatal care at the University of Gondar Hospital, Northwest Ethiopia.

Methods: Institution based cross-sectional study was conducted at the University of Gondar Hospital from March to May, 2014. A total of 377 pregnant women were selected by systematic sampling technique. Data on socio-demographic factors, reproductive history and nutrition related factors were collected using a structured questionnaire. Blood sample were collected to analyze biochemical indicators. Statistical analysis was done using logistic regression analysis method. P-value < 0.05 at 95% confidence interval was considered as statistically significance.

Results: The prevalence of zinc deficiency among pregnant women was 57.4% (95% CI: 52.2%–62.9%). Living in rural area [AOR = 1.92; 95% CI (1.04, 3.56)], too close birth [AOR=3.97;95% (1.30, 12.13)], low intakes of diet of animal origin [AOR = 2.29; 95% CI (1.35, 3.89)], inadequate dietary diversity [AOR = 2.09; 95% CI (1.24,3.51)], lack of nutrition education [AOR =1.78; 95% CI (1.10,2.86)], low serum albumin [AOR = 2.55; 95% CI (1.40,4.63)] and intestinal parasitic infection [AOR = 2.60; 95% CI (1.49,4.54)] were significantly associated with zinc deficiency.

Conclusion and Recommendation: Zinc deficiency is of public health concern in the study area. To combat the problems, nutrition education to increase knowledge as well as practices concerning the consumption of zinc rich foods and optimal dietary diversity, use of home based phytate reduction techniques and agricultural based approaches should be considered.

Key words: Zinc deficiency, pregnant women, Gondar
Exclusive breastfeeding and associated factors among mothers in Debre Markos, Northwest Ethiopia: a cross-sectional study

Getnet Mekuria and Professor Melkie Edris

Background: Exclusive breastfeeding is the most widely known and effective intervention for preventing early-childhood deaths. Optimum breastfeeding practices can prevent 1.4 million deaths worldwide among children under five every year. The aim of this study was to assess the prevalence of exclusive breastfeeding and associated factors among mothers who have an infant less than six months old in Debre Markos, Northwest Ethiopia.

Methods: A community based cross-sectional study was conducted from April 1 to 30, 2013. A simple random sampling technique was used from a list of all mothers who had an infant less than six months old obtained from the health extension workers (HEWs) registration book in all kebeles (neighbourhoods) of the city. A total of 423 mothers with infants less than six months old were included in this study. Data were collected using questionnaires administered at interview. Both bivariate and multivariate logistic regression analyses were carried out to identify factors associated with exclusive breastfeeding.

Results: The prevalence of exclusive breastfeeding during the seven days before the survey was 60.8% (95% CI: 55.8%, 65.8%). Those mothers who were unemployed [AOR = 1.98 (1.21, 3.22)], received breastfeeding counseling during antenatal care (ANC) [AOR = 2.44 (1.53, 3.91)], received infant feeding counseling during postnatal care (PNC) [AOR = 5.03 (3.04, 8.31)], didn’t give prelacteal feeding [AOR = 3.44 (1.88, 6.33)] and had adequate knowledge about breastfeeding [AOR = 2.57 (1.57, 4.19)] were more likely to practice EBF than their counterparts.

Conclusions: Although the prevalence of exclusive breastfeeding was lower in the study area than international recommendations, rates were higher than found in other studies. Recommendations for improving exclusive breastfeeding include better support for working mothers through extending maternal leave and establishing work-site day care centers for infants, expanding the urban health extension program so that more pregnant women and mothers can be taught about appropriate infant and young child feeding practices and how to express their milk, thereby increasing their breastfeeding knowledge.
Predictors of Early Breastfeeding Initiation Among Mothers Of Children Under 24 Months Of Age In Rural Part Of West Ethiopia.

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Background: The World Health Organization recommends initiation of breastfeeding within the first hour after childbirth. In developing countries alone, early initiation of breastfeeding could save as many as 1.45 million lives each year by reducing deaths mainly due to diarrheal disorders and lower respiratory tract infections in children.

Objective: The objective of this study was to determine the rate and the predictors of breastfeeding initiation in East Wollega Zone of West Ethiopia.

Methods: A community-based, cross-sectional study was conducted from April to May 2014 among 594 mothers who had children less than 24 months. Multi stage cluster sampling method was used to select the study population. Eligible mothers were invited to interview using pretested questionnaires to gather data regarding sociodemographic, health-related variables, breastfeeding initiation, and current breastfeeding practices. A multivariable logistic regression analysis was used to identify independent predictors of early initiation of breastfeeding after controlling for confounding variables.

Results: A sample of 593 mothers was included in the study. Breastfeeding was initiated by 83.1 % of mothers within the first hour of childbirth. Being a housewife (AOR (95% CI) = 2.48 (1.54-3.99)) and infant received colostrum (AOR (95% CI) =2.22 (1.08-4.55)) were significant positive predictors for early breastfeeding initiation as revealed by logistic regression. The multivariable logistic regression analysis showed that the mothers who had no radio and/or television in the household (AOR (95% CI = 0.55 (0.35-0.88)), were not exposure to health information (AOR (95% CI) = 0.44(0.25-0.75)), and infants were provided with prelacteal feeds (AOR (95% CI) =0.30 (0.14-0.65)) were less likely to initiate breastfeeding.

Conclusion & Recommendation: The rate of timely initiation of breastfeeding was high. Breastfeeding promotion program is essential to encourage the practice of timely initiation of breastfeeding, and reduce the practice of providing prelacteal feeds within three days of life. Thus appropriate health information is vital to boost early initiation of breastfeeding.

Keywords: Breastfeeding, Breastfeeding initiation, Predictors, West Ethiopia
Background: Malnutrition in children is one of the most serious public health problem in Ethiopia and the highest in the world. Therefore, the objective of the study was to measure the prevalence of underweight and to study the selected factors associated with underweight among children under two years of age residing in a rural area of Western Ethiopia.

Methods: A community based cross sectional study was employed from March to April 2014. A total of 593 mothers of under two children using a pre-tested, structured, interviewer administered questionnaire consisting of socio-demographic factors, maternal characteristics, feeding practices and anthropometric measurement was used to gather data. WHO Anthro software version 2.02, SPSS software version 20 was used to perform descriptive statistics, bivariate and multivariable logistic regression analyses.

Results: The prevalence of underweight among under two children was 8.9%. The prevalence of underweight among children under the age of one year was 15.1%. Males (9.7%) were more malnourished than females (8.2%). As compared with children in the age group less than six months, the risk of underweight was about 2.6 times higher for children in age groups over one year (AOR=2.62; 95%CI=1.09, 6.33).

Conclusion: The burden of underweight was low and some important determinant factors for underweight were age of child, birth weight, frequency of breastfeeding, health information after delivery and vitamin A-rich fruits/vegetables. Thus, efforts should be made to improve the antenatal care services, emphasis on maternal nutrition and the importance of proper infant and young child feeding practices for reducing malnutrition among under-two children.

Key words: Children, Determinant factors, Prevalence, Underweight, West Ethiopia

Child Feeding Practices, Nutritional Status and Associated Factors among Pastoralist Children Aged 6-23 Months in Benna Tsemay Woreda, South Omo Zone, Southern Ethiopia
Feeding practices of children under two years directly affect their nutritional status, impacting survival. Many observational studies showed that maternal knowledge of optimal child feeding practices is basic to keep health of a child. However, maternal knowledge, attitude and practices towards child feeding, nutritional status and associated factors of pastoralist children were not well documented in Benna Tsemay Woreda, South Omo Zone, Southern Ethiopia. Therefore, this study was designed to assess child feeding practices, nutritional status and associated factors among pastoralist children aged 6-23 months in Benna Tsemay Woreda, South Omo Zone, Southern Ethiopia. A community-based cross-sectional study was conducted among 645 pastoralist children aged 6-23 months from February-March 2016. A two stage cluster sampling technique was used to select kebeles and children. Out of thirty-two kebeles, six were randomly selected. Quantitative and qualitative data were collected. SPSS for windows version 20.0 was used for data analysis. Anthropometric indices were computed using WHO Anthro 2011 software (version 3.2.2). Bivariate and multivariable logistic regression analyses were conducted. Crude odds ratio (COR) and adjusted odds ratio (AOR) with 95% confidence interval were reported. Prevalence of stunting and underweight were higher in under two children in Benna Tsemay than the national average. About 45.7% of the mothers didn’t have adequate knowledge about IYCF practices with 54.3% showing poor child feeding. It was found that, 65.6% of the study participated children consumed <4 food groups in the last 24-hrs preceding the survey with mean dietary diversity score (DDS) being 3.7±1.48. However, only 11.5% of the children consumed <3 meals/day with mean meal frequency of 1.88±0.31. This study showed, being older child (12-23 months) (AOR= 3.29, 95% CI, 2.03-5.32), being from agro-pastoralist (AOR= 0.46, 95% CI, 0.24-0.88), middle wealth quantile household (AOR=0.40, 95% CI, 0.20-0.77), use of treated water (AOR= 0.60, 95% CI, 0.37-0.96), being second birth order (AOR=2.17, 95% CI, 1.11-4.24), being female child (AOR=0.55, 95% CI, 0.37-0.82) and good child feeding practice of mothers (AOR=0.47, 95% CI, 0.28-0.78) were significantly associated with stunting of pastoralist children in Benna Tsemay Woreda (p<0.05). Having large family size (≥6 individuals) (AOR=30.93, 95% CI, 4.91-194.7), polygamous marriage (AOR=2.46, 95% CI, 1.07-5.61), being from agro-pastoralist (AOR=0.19, 95% CI, 0.05-0.66) and farming as maternal occupation (AOR=3.00, 95% CI, 1.36-6.62) were significantly affected with thinness of children (p<0.05). Being from pastoralist (AOR=3.18, 95% CI, 1.74-5.81) and being female child (AOR=0.35, 95% CI, 0.14-0.89) were significantly predicted underweight in children (p<0.05). In conclusion, high numbers of pastoralist children are suffering from chronic malnutrition with low DDS. Large numbers of mothers have inadequate knowledge about IYCF practices. Being from pastoralist and poor family, elder and male child, and inadequate maternal knowledge, polygamous marriage, and poor health service are factors for child under nutrition. Therefore, the authors recommend interventions targeting on community-based nutrition education on IYCF, dietary diversity, cultural food taboos, and family planning in Benna Tsemay pastoralist community.

Key words: Child feeding practice, anthropometric status, associated factors, and pastoralist area
Introduction: Ethiopia Productive Safety Net Program (PSNP) is a social protection programme meant to achieve resilience for seasonal food insecurity. However, little is known whether PSNP protect against nutritional vulnerability.

Objectives: To determine differences in coping strategy and childhood wasting among PSNP beneficiary and non-beneficiary households of eastern Ethiopia.

Design, setting and participants: Community based cross-sectional study was conducted in Kombolcha district of Eastern Ethiopia from July 8 to 28, 2015. Children aged 6-59 months from PSNP (n=657) and Non-PSNP (n=654) households were assessed.

Exposure: PSNP beneficiary state, Asset based wealth index, gender of head of household, family size, coping strategy.

Main outcomes and measures: The primary outcome was childhood wasting. Difference in mean and prevalence of wasting was calculated. Multiple linear regression model was used to determine predictors.

Results: There was significant differences in the meansWFH Z score with small (cohen’s d 0.22) effect and RCSI with medium effect (cohen’s d 0.733) among PSNP and non-PSNP households. The overall wasting prevalence was 16.6% (95% CI, 14.57% to 18.67%). The prevalence was significantly higher among PSNP households 21.5% (95%CI, 18.4% to 24.8%) compared to non-PSNP households 11.6% (95%CI, 9.2% to 14.3 %). PSNP makes the strongest contribution to explain child wasting ($\beta = -0.145$), followed by being in the low wealth index ($\beta = -0.121$).

Conclusions and relevance: The levels of coping and childhood wasting indicates PSNP shortcomings to adequately prevent households from short-term adverse nutrition outcomes. This suggest transfer is important but not sufficient to favorable nutritional outcome.

Implications of Ethiopia Productive Safety Net Program on Household Dietary Diversity and women Body Mass Index: a Cross-Sectional Study

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The 2nd National Nutrition and Food Industries Conference, Hosted by Academic Center of Excellence in Human Nutrition, School of Nutrition, Food Science &Technology, Hawassa University
Introduction: Poor nutritional status of women remained central problem in Ethiopia through increasing vulnerability to adverse health and reproductive outcomes that perpetuate across life course. Women nutrition matters not only for Public health relevance of breaking intergenerational cycle of malnutrition but also for its high return. Ethiopia Productive safety net programme meant to protect chronically food insecure households against shocks through cash or food transfer scheme. Unfortunately, its effect on food access and women BMI remained unexplored in drought hot spot area of eastern Ethiopia.

Objective: This study was intended to assess the difference in household dietary diversity and women BMI among PSNP and non-PSNP households and factors associated with it.

Methods: Community based cross-sectional study design was carried out in Kombolcha district of Eastern Ethiopia from July 1 to 28, 2015 (Following failed Spring rain). Household Dietary Diversity and women BMI were compared. Ordinal regression was used to identify factors associated with women BMI.

Result: The prevalence of under nutrition was 27.3 percent and 20.2 percent for women PSNP and non-PSNP households respectively. PSNP membership had large effect on HDD and small effect on women BMI. Ordinal regression yielded significant association for wealth index, better health care service compared to previous year with an OR of 0.647 (95% CI, 0.429 to 0.974) and reducing selling assets for the sake of buying foods with an OR of 1.575 (95% CI, 1.057 to 2.349).

Conclusions and recommendation: Among PSNP and non-PSNP households the prevalence of severe chronic energy deficiency was 3.4 percent and 1.8 percent respectively and associated with economic status and health care utilization that suggest considering income generating activity and minimum health care as a condition for transfer.
Background: Food insecurity continues to be the most remarkable challenges of developing countries even though progress achieved in reduction of hunger in some countries, yet an unacceptably large number of people still lack the food they need for an active and healthy life. In Ethiopia, household food insecurity and stunting in under-five children were high prevalent problems. There is paucity of research evidences on the effect of household food insecurity on child stunting together with other predictors in the most critical period of child growth and development in the study area. Therefore, the aim of the study was to assess household food insecurity status and its determinants in Silti Woreda, SNNPR Ethiopia.

Methods: A community based cross-sectional study was conducted with stratified sampling technique and interviewer administered structured questionnaires was used to collect data. The data was entered using EPI INFO version 3.5.3, 2011. Analysis was done by SPSS version 20 and ENA for SMART, 2011 software. Significant association of variables was identified using bivariate and multivariate logistic regression analysis.

Results: Household Food insecurity status was 47.6% in the silti district. Stunted children were more likely live in food insecure household than non-stunted counterpart (AOR=1.90;95% CI:1.16,3.13). Those household mothers with farmer (AOR=0.19;95% CI:0.05,0.81) and merchant occupation (AOR=0.22;95% CI:0.09,0.47) and household with merchant father (AOR= 0.10;95% CI:0.04,0.25) and self-employee (AOR= 0.29;95% CI: 0.11,0.75) were less likely became food insecure. Mother headed household (AOR=8.26; 95% CI:1.97, 34.67), household who had no agricultural land (AOR=8.29; 95%CI: 1.29,53.2) and no livestock (AOR=2.77;95%CI:1.23,6.24) were more likely food insecure.

Conclusion: This study revealed that nearly half of the households were food insecure in the study area. Household food insecurity is the main correlates of childhood stunting in the most critical period of child growth and development. An integrated nutrition intervention which addresses job opportunities creation to generate income and expanding social protection to rural and urban areas together with designing programs which increases crops and animal production to enhance child feeding of mothers in the food insecure households to halt childhood stunting among children aged 6-23months.

Keywords: Household Food Insecurity; Childhood Stunting; Silti Woreda; SNNPR Ethiopia

Knowledge and Practices of Complementary Feeding among Mothers/Care givers of Children (Aged 6 to 23 Months) In Horo Woreda, Horo Guduru Wollega Zone, Oromia Region, Ethiopia

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The 2nd National Nutrition and Food Industries Conference, Hosted by Academic Center of Excellence in Human Nutrition, School of Nutrition, Food Science &Technology, Hawassa University
An appropriate diet is a critical component for proper growth and development of children. Complementary feeding for children is not commonly well practiced in developing countries like Ethiopia, especially for the rural communities. Therefore, this study was designed to assess knowledge and practices of complementary feeding among mothers/care givers of children age 6 to 23 months in Horo Woreda. A community-based cross-sectional study design was conducted on total 260 mothers/caregivers from May to July, 2015. A semi structured interview and questionnaires was used to collect information in the areas of socio-demographic, knowledge, and practices towards complementary feeding from mothers/caregivers. Dietary diversity score was assessed using a 24 hrs recall method. Statistical Package for Social Sciences (SPSS) version 20.0 was used to perform descriptive statistics. Binary logistic regression was carried out to see the variables that associated with complementary feeding practices. A P value <0.05 was considered as statistically significant. About 40% of mothers/care givers initiated timely complementary feeding while 60% mothers/caregivers did not. Additionally, high proportion (65.80%) of the study participants had low dietary diversity score and 34.20% had minimum dietary diversity score. Mothers who had education status of primary school were 66.7% less likely to initiate complementary feeding compared to those mothers/care givers who had educational status of high school and above (COR=0.333(95%CI=0.56 up to 0.712). In addition to these mothers/caregivers who had one children were 1.73 more likely to initiate complementary feeding compared to who had two and above (COR=1.73;95CF=1.02-2.974). The results clearly indicated that more than half the caregivers or mothers in the study area not timely initiated complementary feeding. High percentage of children also didn’t get minimum dietary diversity score. Therefore, nutrition education should be given for communities to improve the knowledge, attitude and practices of mothers/caregivers towards complementary feeding and dietary diversity score.

**Key words:** Knowledge, Practices, Complementary feeding.

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**Complementary Feeding practices among children 6-23 months of age in Wolaita Sodo town, Southern Ethiopia:**

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Background: Child feeding practices are multidimensional and they change rapidly within short age-intervals. Suboptimal complementary feeding practices contribute to a rapid increase in the prevalence of undernutrition in children in the age of 6-23 months. The aim was to measure complementary feeding practices and associated factors among children 6-23 months of age in Wolaita Sodo, Ethiopia.

Method: community based cross-sectional study was carried out to select 623 mothers/caregivers with 6-23 months of children reside in Wolaita Sodo town using systematic sampling from March 02-20, 2015. Interviewer administered questionnaire was used to gathered information on socio-demographic, child feeding practices and health related characteristics. Data were entered to Epi-Data version 3.02 and transported to SPSS version 21 for further analysis. Binary logistic regression was used to see the association between the outcome variables and explanatory variables.

Result: the study revealed that the percentage of 6-23 months of children who meet the recommended level of minimum dietary diversity, meal frequency and acceptable diet with their 95% of CI were 27.3% (23.7%-30.8%), 68.9% (65.2%-72.6%) and 21.1% (17.8%-24.3%) respectively. Household head occupation and child age were identified as statistically significant predictors of dietary diversity. Government employee, maternal illiteracy and age of 9-11 months of children were showed negative statistical association with minimum meal frequency but girls were more likely to fulfil the requirement of meal frequency. Additionally, being housewife, government employee, middle economic class and child age of 6-8 months were found to be independent predictors and positively associated with minimum acceptable diet.

Conclusion and recommendation: even though the study showed better progress as compared to the national and regional figures, child feeding practices were not adequate and not achieving WHO IYCF recommendations. Strengthening the available strategies and creating new intervention measures to improve socio-economic status, maternal literacy and increasing awareness of community for better practices of child feedings is compulsory action for the government and policy makers.

Key words: dietary diversity, meal frequency, acceptable diet, 6-23 months of children.

Feeding Practices and Nutritional Status among Children in Food Secure and Insecure Households in Kuyu Woreda, North Shewa Zone, Oromia Region, Ethiopia

Tamiru Yazew¹, Dejene Hailu² and Addisalem Mesfin³

Malnutrition, poor child feeding practices and low dietary diversity are very high among children in low income households where livelihood depends on Productivity Safety Net Program (PSNP and...
food insecurity is prevalent. Therefore, this study was designed to assess and compare nutritional status, feeding practices and dietary diversity scores of children (aged 24-59 months) in food secure and insecure households of Kuyu Woreda. A community based comparative, cross sectional study was conducted in March, 2016. Two stages sampling methods were employed to select 612 children (304 children from food secure and 308 from insecure households). Dietary diversity score (DDS) was assessed using a 24 hrs recall method. Anthropometric measurements of children were taken and nutritional status was generated using WHO Anthro v.3.2.2. Statistical Package for Social Sciences (SPSS) version 20.0 was used to perform descriptive statistics, independent samples T test and chi-square test analyses. P value <0.05 was considered as statistically significant. The prevalence of stunting, underweight and wasting was 48.7%, 36.7% and 20.5% respectively for children in food insecure households. While the prevalence of stunting was 43%, underweight was 30.9% and wasting was 16.8% for children in food secure households. This finding showed that children's daily meal frequency, breakfast, midmorning, afternoon and bedtime snack were more among children in food secure households than insecure households (p<0.05). In addition, children restriction and pressure during meal were significantly (p<0.05) higher in food insecure households compared to food secure households. Moreover, this study found that food secure and insecure households were significantly different in children's dietary diversity scores ($x^2=13.1, p<0.001$), child feeding practices ($x^2=11.2, p=0.001$), consumption of dairy products ($x^2=15.44, p<0.001$) and other vitamin A rich fruits and vegetables ($x^2=8.37, p=0.004$). The finding revealed that nutritional status, child feeding practices and dietary diversity scores of children from food secure households were higher compared to those from food insecure households. Therefore, Productivity Safety Net Program with all responsible bodies should be intensified to improve the nutritional status, child feeding practices and dietary diversity scores of children under five years old.

Key words: Nutritional status, child feeding practices, food security

Malnutrition and Associated Factors among School Adolescents in Wolaita Sodo Town, Southern Ethiopia

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Objective: This study aimed to assess the prevalence of malnutrition and associated factors among school adolescents in Wolaita Sodo town, Southern Ethiopia.
Methods: Institution based cross-sectional study was conducted from May 18- June 10, 2015. A multistage sampling was used to select a random sample of 655 adolescents from selected schools. Data on socio-demographic information collected by using interviewer administered questionnaire, and anthropometric measurements were made by using digital Seca scale and height measuring board by trained data collectors. Data were entered in to Epidata version 3.1 software and exported to SPSS version 20. World Health Organizations (WHO) Anthroplus software was used to analyze anthropometric data. Bivariate and multivariable logistic regression analyses were done to identify factors associated with the malnutrition of adolescents. The level of statistical significance was declared at p value less than 0.05.

Result: The overall prevalence of thinness, stunting, overweight/obesity among school adolescents was 4.7% (95% CI; 3%, 6.4%), 5.2% (95% CI; 3.4%, 7%) and 5.0% (95%CI 3.4%, 6.7%) respectively. Being male [AOR=5.173 95%CI 2.005-13.347], learning at private school [AOR=3.563 95%CI 1.327-9.565], mothers with no formal education [AOR= 4.287 95%CI 1.122-16.374], owning no cattle [AOR= 4.163 95%CI 1.026-16.91], living in rental house [AOR=3.959 95%CI 1.235-12.688] and illness in 2 weeks prior to survey [AOR= 2.95 95% CI 1.125- 7.735] were significantly associated with thinness. Maternal education of secondary school [AOR= 0.214 95% CI 0.054-0.846] was significantly associated with the stunting.

Conclusion and recommendation: The study showed that there was double burden of malnutrition where undernutrition and over nutrition were found to be co-existed among school adolescents in the study area. There needs to implement evidence based school nutrition education and health policies and programs to improve nutritional status of adolescents.

Key words: Malnutrition, adolescents, School Students, Wolaita Sodo
Theme 3: Nutrition and Non Communicable Disease

Vitamin D Deficiency is Associated with Overweight and/or Obesity among Schoolchildren in Central Ethiopia: A Cross-Sectional Study

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Childhood and adolescent obesity is an international public health problem leading to an increased risk of adulthood obesity, mortality and morbidity. Its prevalence is increasing in low-income populations, and we hypothesized it may be associated with vitamin D deficiency. Low vitamin D status is a worldwide public health issue including in Ethiopia; however, no one has examined overweight/obesity in Ethiopian schoolchildren with regard to vitamin D status. The analyses of a data set from a school-based cross-sectional study conducted in Adama Town (n = 89) and in rural Adama Woreda (n = 85) was carried out to determine vitamin D deficiency and its association with overweight and/or obesity. Data on a total of 174 schoolchildren aged 11–18 years was used for these analyses. The overall prevalence of overweight and/or obesity was 10.3%, with 8.5% overweight and 2.3% obese; the prevalence of underweight was 19%. In the multivariable logistic regression model, vitamin D deficiency, being in the higher age group, female sex and urban residence of students, their mothers’ occupation of being employed and their households’ high and middle socioeconomic status were significantly associated with overweight and/or obesity. We concluded that vitamin D deficiency is an independent predictor significantly associated with overweight and/or obesity among schoolchildren from rural and urban settings in Ethiopia. The results imply the need for behavior change communications on the importance of exposure to sunlight to produce adequate vitamin D to curb this emerging health problem of overweight/obesity following economic growth and globalization in Ethiopia. As this study only highlighted the association, prospective studies and randomized controlled trials are required to establish causality.

Keywords: vitamin D deficiency; overweight/obesity; schoolchildren; Ethiopia
Risk Factors for Overweight and Obesity in Private High School Adolescents in Hawassa City, Southern Ethiopia: a Case-control Study

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³School of Nutrition, Food Science and Technology, Hawassa University, P.O. Box: 05, Hawassa

This study was designed to identify risk factors of overweight and obesity among private high school adolescents in Hawassa city, Southern Ethiopia. A case-control study was conducted on 324 private high school adolescents in Hawassa from February to March 2016. The cases were overweight and obese adolescents, while controls were the normal ones. Height and weight were measured following standard procedures. Pretested structured questionnaire was used to collect data on socioeconomic and demographic factors. Dietary practice was assessed using food frequency questionnaire (FFQ). Global physical activity questionnaire (GPAQ) was employed to examine physical activity level. Females accounted 48% of control, and 60% from case groups. The mean (SD) age of control adolescents was 17.18(1.32), and that of cases was 16.93(1.25). Being female (AOR= 1.66; 95% CI: 1.001-2.75), increased monthly income, ≥20,000 Birr, (AOR= 2.88; 95% CI: 1.14-7.29), and higher level of maternal education were found to be risk factors for overweight and obesity among study participated adolescents. Compared to the ones who consumed ≥7 times/week, adolescents who ate fruits for 1-4 times/week were 2.16 times more likely to be overweight and obese. Those who consumed vegetables less than 1 time in a week had odds of 6.0 to be overweight and obese. Adolescents having ≤3 meals/day were almost two times more exposed for overweight and obesity (AOR: 1.95; 95% CI: 1.09-3.48). The results were consistent with the previous findings of other scholars.

Keywords Overweight and obesity, risk factors, adolescents, private high schools, Hawassa City
Theme 4: Food Safety and Quality

Physicochemical and nutritional profile of commonly consumed edible oils in Addis Ababa and their health implications.

Kifle Habte*1, Aweke Kebede,1 Masresha Tessema,1 Dilnesaw Zerfu,1 Tibebu Moges,1 Binyam Tesfaye,1 Kirubel Tesfaye,1 Mekonen Tadesse1 and Tesfaye Hailu1.

1. Ethiopian Public Health Institute

Introduction: Keeping food safety and quality are some of the major components for food and nutrition security and protecting human welfare. Directly or indirectly edible oils are involved in every day dish and due to this, long time preference to the type of edible oil quality and safety should bring either positive or negative impact on overall health. The objective of this research is to make physicochemical and nutritional profile analysis on the edible oils and based on the finding to write a recommendation for policy makers, inspection and controlling bodies and oil processing industries.

Material and methods: Sixteen different types of edible oils are collected from shops and supermarkets found in Addis Ababa in 2015. And in this study almost all types of edible oils found in Addis Ababa were included. Following the sample collection, the physicochemical and nutritional profiles were analyzed according to AOAC standard method of fat and oil analysis.

Results and discussion: Among total of sixteen oil brands analyzed, seven were produced in Ethiopia. And all these were poor in labeling. However those imported (9 brands) oils from different countries had the necessary labeling requirements. From the seven local oils analyzed, six were contain acid value higher than the standard. Again from these seven local oils, five were not refined; look deep yellow or brown-yellow and three of them had settable matter. Being solid or hydrogenated has brought significant difference in iodine value, saturated, monounsatured, omega 3, omega 6, cis and trans fatty acids of the edible oil at p<0.05. Generally, imported oils have good labeling in terms of expire date, nutrition facts and fortification as compared to local ones. Conclusion and recommendation: Even though locally produced edible oils have their own quality in terms of having good PUFAs content and low saturated FAs, but they need to pass through all the necessary oil processing steps in the factory; including decreasing the acidity, protect from oxidation, bleaching, refining and deodorizing in order to remove impurities and hazardous substances so that to make safe for consumption and to improve nutritional quality. The inspection and control mechanism should also be strong to conform to standard in labeling the product and decreasing acidity. Compared to liquid vegetable oils, palm oils have high Trans, saturated, mono unsaturated and omega 9 fatty acids with low omega 3, omega 6 and cis fatty acids. Due to this, substituting high conjugated fatty acids (PUFAs) in the place of low conjugated is recommended for their many health benefits.

Key words: Polly unsaturated, Trans, omega 3 and omega 6 fatty acids, physicochemical analysis and cardiovascular disease.
Characterization and Determination of Phytochemical Contents, Processing Methods, Nutritional Composition And Sensory Attributes Of Green Tea Brewed By Infusions Of Matured Coffee Leaves (Coffee Arabica, Rubiaca) Based on Indigenous Knowledge Of Sidama, Kambata and Harar Communities, Ethiopia

Authors: Addisu Woldesenebet, Tarekegn Birhanu (PHD), Kelbesa Urga (Mr.) and Mekuria Tadese (PHD)
Addis Ababa, Ethiopia
Mob: 0913568866

Coffee leaf tea is a traditional drink for which many consumers in the rural area of Ethiopia are familiar since time in memorials. Nowadays its popularity has been spreading in different parts of the country, ranging from the small towns and to the big cities. In the present study determination and characterization of proximate variables and trace metal composition, selected phytochemical screening, sensory attribute and antioxidant level were investigated from six composite coffee leaf samples harvested from different localities of Ethiopia. Proximate composition in the studied samples ranged from (14.43±0.12)% to (18.98±0.55) for protein, (8.821±0.31)% to (12.41±0.23)% for ash, (4.5±0.7 to 12.5±2.12)% for crude fat, (17.15±0.69 to 20.01±0.70)% for fiber contents. The trace element of coffee leaves ranged from (124.16±4.47 to 174.5±2.58) mg/100g for calcium, (2.76±0.24 to 93.42±3.41) mg/100g for iron and (9.5±0.5 to 79.98±0.94) mg/100g for that of magnesium. The total phenolic content yielded were ranged from (642.74±7.95) mg GAE/g to (301.72±11.32) mg GAE/g of dry weight of extracted samples. Antioxidant activity of extracts was expressed as percentage of DPPH free radicals inhibition levels in percentage ranged from (78.55±0.55 to 98.27±0.028) %. Ant nutritional factor detected from the studied samples were ranged from 63.39±9.70 to 125.70±20.68 mg/g for tannin and 29.71±1.77 to 36.02±0.50 mg/g for phytate respectively. Caffeine content in coffee leaf samples was ranged from (691.26 to 1443) ppm. Methanolic extracts of coffee leaf samples from different sites have showed that the highest phenolic contents with owing strong antioxidant activity. The high contents of phenolic compounds indicated that these compounds contribute to the antioxidant activity and this indicates that Coffee leaves can be regarded as promising candidates for natural antioxidants.

**Key words**: Coffee tree leaves, antioxidant, proximate analysis, methanolic extract.

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**Eco-friendly Management of Aspergillus flavus in Groundnut (Arachis hypogaea L.)**

*The 2nd National Nutrition and Food Industries Conference, Hosted by Academic Center of Excellence in Human Nutrition, School of Nutrition, Food Science & Technology, Hawassa University*
Groundnut is an important crop economically and nutritionally in many tropical and subtropical areas of the world. It is also one of the most susceptible host crops to *Aspergillus flavus* resulting in aflatoxin (AFs) contamination. AFs have been associated with several toxic effects in animal and human health including carcinogenic, mutagenic, teratogenic and immunosuppressive activity. The international agency for research on cancer acknowledges that there is sufficient evidence in humans for the liver cancer due to aflatoxin B1. These fungi invade groundnut kernels before harvest, during post-harvest drying/curing and in storage. Hence pre-harvest elimination of *A. flavus* is considered as the most rational and economic approach to control aflatoxin contamination in groundnut. In this study, an antagonistic *Bacillus subtilis* strain G1 was tested for its ability to inhibit the growth of various isolates of *A. flavus* in vitro. *B. subtilis* strain G1 was further tested to control *A. flavus* infection and aflatoxin B1 contamination in groundnut under greenhouse condition. A sensitive high performance liquid chromatography coupled to a fluorescence detector (HPLC-FLD) method after post-column derivatisation was applied for the presence of AFs in groundnut samples collected from greenhouse. The *B. subtilis* strain G1 inhibited the growth of all isolates of *A. flavus* in vitro and the inhibition zone ranged from 93-100%. The results of the present study indicate that *B. subtilis* G1 when applied through seed and soil reduced the aflatoxin contamination up to 92% besides increasing the pod yield. The present study clearly indicates the usefulness of a talc-based powder formulation of *B. subtilis* G1 for control of *A. flavus* infection and aflatoxin contamination in groundnut. Application of *B. subtilis* strain G1 through seed or soil resulted in high colonization of *B. subtilis* strain G1 in rhizosphere soil, and the rhizosphere population increased with increase in the age of the crop. The endophytic movement of *B. subtilis* strain G1 in the stem, roots and leaves of groundnut was confirmed through PCR using *Bacillus* sp. specific primers which resulted in the amplification of a 547 bp product.

**Keywords:** Aflatoxin, *Aspergillus flavus*, *Bacillus subtilis*, groundnut, HPLC-FLD, PCR

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**Food safety and quality regulation system in Ethiopia: A Review**

*The 2nd National Nutrition and Food Industries Conference, Hosted by Academic Center of Excellence in Human Nutrition, School of Nutrition, Food Science & Technology, Hawassa University*
It is worth recalling that regulation in the area of food quality and safety protection was emerged with the objectives of safeguarding consumers from both economic and health risks and to ensure the functioning of food markets in an orderly manner by prohibiting the production and sale of unsafe food products and fraudulent acts committed on foods. Ensuring the quality and safety of domestically produced, exported and imported food and food products constitutes one of the areas of food quality and safety protection. This is with an assumption that maintaining the quality of these foods is essential to protect public health, to satisfy the expectation of consumers, and to enhance foreign earnings and to maintain the confidence of food trading partners. Hence, governments assure the quality and safety of domestically produced, imported and exported food and food products. It has been noted that foods related laws in Ethiopia also do not meet what the supplying of safe and of good quality food so demands. In the first place, the existing laws are outdated and they focus only on the inspection of final products by overlooking the need to take proactive measures which are required by the current food quality and safety system; this proactive measure includes the need to conduct inspection from the sources, even beginning from the selection of farm lands. Secondly the existing law itself is not comprehensive and adequate in that it is scattered in different codes and legislations. As far as street foods are concerned they are becoming major dish for many persons, particularly for middle and low income persons. Similarly in Ethiopia preparing and selling of street food become the sources of employment for producers and sellers. This clearly shows that there must be key action for the promotion and improvement of food safety and regulation system in Ethiopia. With this context, in this review the statues and overview of food safety and regulation in Ethiopia presented in details.

Keywords: Ethiopia , street food, safety and regulation
"Multi-sectoral Approach for Better Nutrition and sustainable Development in Ethiopia"

Hosted by Academic Centre of Excellence for Human Nutrition, School of Nutrition, Food Science and Technology, Hawassa University

25th-26th February, 2016
Haile Resort, Hawassa, Ethiopia
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Welcoming and Opening Speech to the National Nutrition Conference

Professor Yosef Mamo
President of Hawassa University,

Dear distinguished researchers who came from near and far to attend and share your extensive research findings in the area ladies and gentlemen,

It gives me a great pleasure as I attend and make this opening speech on the first National Nutrition Conference prepared by the Academic Center of Excellence for Human Nutrition in our University, which is at the School of Human Nutrition, Food Sciences and Technology in Collaboration with National and International partners.

After its establishment in 2000 G.C. as Debub University by a merger of the then three Colleges: ACA, WGCF and DCTEHS Hawassa University witnessed tremendous growth in infrastructure, staff and student population, academic programs as well as research and community service which was recognized in many ways including the FMoE rating which put HU second twice in 2005 & 2006 E.C. and first in 2007 E.C. I strongly believe our mission to be the best in Ethiopia has been practically achieved and will surely be maintained and our main focus shall be on working to achieve to become competent in Africa and internationally recognized.

This is in fact a joint achievement of HU community and especially people from the Senior areas like the College of Agriculture, the government our community and also sister Universities we collaborated in different areas with.

When it comes to the Nutrition program, Hawassa University was the first Higher Education Institution in the country to engage in extensive nutrition researches that lead to the conception of the Applied Human Nutrition graduate program. The program was launched in 2007 and was the only nutrition program in the country at the time. One of the biggest impacts of the Program is that, the Alumni of the Program are working in newly opened Nutrition programs in several Ethiopian Universities and in other Governmental and Non- governmental organizations. Furthermore SNFST launched B.Sc. Program in Human Nutrition in 2009. Since its establishment, a total of 257 students have graduated with the B.Sc. And 185 students are currently enrolled. Before 4 years, following a call for application by USAID/FFED the Future project implemented by JHPIEGO Ethiopia, all Ethiopian Universities who had Human Nutrition Programs did apply and compete for the funding aimed at upgrading one of those Universities to the level of Academic center of Excellence for Human Nutrition in Ethiopia. For its staff capacity, available laboratory facilities and international collaboration, the School of Nutrition Food Sciences and Technology of Hawassa University was chosen to be the Academic center of Excellence for Human Nutrition in Ethiopia and the center was inaugurated on 2 April 2015.

After being chosen to be the Academic Center of Excellence, One of the planned activities of the Center is hosting National Nutrition Conferences. Therefore, this conference was organized to bring together both Governmental, Nongovernmental organizations working on Nutrition projects and programs in
Ethiopia to discuss past achievements in addressing the issues of malnutrition in Ethiopia though collaboration and multisector approach. Since addressing the problem of malnutrition and ensuring sustainable development demand availability of competent manpower, More emphasis will be given to roles of different stakeholders in strengthen nutrition training in Ethiopia. In this regard, Hawassa University will present the ongoing and planned academic, research and community service initiatives related to Human Nutrition and Food Sciences that our stakeholders can support.

**Future Plan of the school**

- Launching of PhD in Nutrition
- Launching PhD in Food Sciences Launching of M.Sc. in Dietetics
- Laboratory accreditation and provision of laboratory facilities
- Assist job creation for small and medium enterprises with product development are among others.

It is well known that the issue of Food security as well as Nutrition is a serious issue for Ethiopia. According to the 2011 report globally, about one in four children under 5 years old are stunted and an estimated 80 per cent of the world’s 165 million stunted children live in just 14 countries Ethiopia being 7th in the list. I strongly believe the concerted effort of the government, academic community and all stakeholders would change this scenario shortly and make Ethiopia a bright home to it children and people of all age groups.

With due appreciation to all who made this conference reality especially the College of Agriculture and School of Human Nutrition, Food Sciences and Technology I would like to wish you fruitful deliberations and declare the conference is officially opened.

Thank you,

Professor Yosef Mamo
## Day One_ Thursday_ 25 February

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ORAL PRESENTATIONS

Theme 1: Agriculture, Food and Nutrition Security
Moderator: Dr Girma Abera

Physical and Proximate Characterization and Mineral Analysis of Anchote (Coecinia Abyssinica) Accessions Grown Under Hawassa and Wondo Genet Conditions, Southern Ethiopia

Beruk Berhanu1*, Tadesse Fikre1 and Dereje Haile2
School of Nutrition, Food Science and Technology1, School of Plant and Horticulture2
*E-mail: beruhanbernik@gmail.com

This research was undertaken to investigate the effects of anchote accessions and growing areas on the physical characters, proximate composition and mineral contents of the roots. The physical properties were measured using standard measurements. The major and minor diameters as well as the root peel thickness were measured using a digital caliper. The proximate and mineral analyses were assessed using standard methods. Both the physical properties (major and minor diameters, aspect ratio, root peel thickness, peel proportion to root and root density) and proximate compositions of anchote roots were significantly influenced by accession type and growing sites. Additionally, mineral contents of anchote were significantly (p<0.05) influenced by accession differences. Over all, better quality, in terms root peel thickness and peel to root ratio, were observed for the accessions grown at Hawassa. The anchote accessions grown at Wondo Genetsite were observed to have higher levels of crude protein, crude fiber and gross energy than those grown at Hawassa. Higher ash content was associated to the accessions grown at Hawassa site. Likewise, higher amount of iron, zinc and calcium were recorded in ago, alekawusa and dicho, cholimichael, and jirrata accessions respectively.

Keywords: Anchote, aspect ratio, root peel thickness, root density, proximate composition
Formulation of Nutritionally Improved Mashed Food from Orange-Fleshed Sweet Potato (*Ipomea batatus*) and Haricot Bean (*Phaseolus vulgaris*) for Pre-School Children: The Case of Dale Woreda, Southern Ethiopia

BY: DEREJE GETAHUN (BSC.), ABEBE HAILE (PHD), HENOK KURABACHEW (PHD)

Protein-energy malnutrition and vitamin A deficiencies are among the public health problems in Ethiopia. To address the problems, food based strategies are necessary. The objective of this study was to assess the consumption of orange-fleshed sweet potato (OFSP) and haricot bean and to formulate mashed food from OFSP and haricot bean in 70:30, 80:20, 90:10 and 100:00 proportions. Cross-sectional survey and experimental study designs and purposive sampling technique were employed. Structured questionnaires were used to collect survey data. Standard methods were used to evaluate the proximate composition, mineral contents (Ca, Zn and Fe), anti-nutrients (phytate and tannin), mineral bio-availability, β-carotene and microbial loads (yeast and mould counts, and enterobactericeae) of formulated mashed foods. Sensory evaluation was carried out using five-point hedonic scales with 17 consumer oriented panelists in triplicate. Data from the survey and experiments were analyzed using SPSS version 16.0 and SAS version 9.0 softwares respectively. Completely randomized design was used to see the effect of different proportion on proximate composition, minerals, anti-nutrients, bio-availability and β-carotene contents. Likewise, the factorial (CRD and RCBD) experimental design was employed for microbial load and sensory analysis respectively. The results showed that preschool children were not consuming protein and vitamin A rich foods frequently to meet their RDA of protein and vitamin A. All the formulated foods were accepted by mothers and preschool children for sensory attributes of color, taste, flavor, mouth feel and overall acceptability. As the proportion of haricot bean increased, only moisture and carbohydrate contents decreased from the proximate composition. On the contrary, Ca, Fe, Zn, phytate and tannin were increased as the proportion of haricot bean increased. All phytate to minerals molar ratios were below the critical limits. There was no significant difference (p<0.05) between the formulated foods in total yeast and mold as well as enterobacteriaceae count for the same storage time. The formulated foods were safe to be consumed within 24 hours of formulations. It was concluded that formulation of mashed food from OFSP and haricot bean can be used for improvement of preschool children’s RDA of protein and vitamin A. As recommendation, nutritionally improved and acceptable mashed foods can be prepared from OFSP and haricot bean at 70:30 proportion respectively. Nutrition education using food-based interventions were also recommended in the study area to improve the nutritional status of preschool children.

**Key words:** Haricot bean, OFSP, protein, vitamin A, preschool, children, mashed food
Difference in levels and predictors of food insecurity among urban and rural households of Kombolcha district of East Harerge zone, 2014

By: Asnake Ararsa

Introduction: Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food for a healthy and active life. In Ethiopia over 12,000,000 people are chronically or sporadically food insecure. This study can help to inform policy makers the level and predictors of household food security status in urban and rural areas.

Objective: to assess levels and predictors of food insecurity among urban and rural households in Kombolcha District, Eastern Harerge zone, Eastern Ethiopia 2014.

Methodology: Cross sectional study was conducted. One urban and five rural Kebeles were included in the study. Using stratified sampling 144 urban and 570 rural, a total of 714 households were selected. Standardized food security assessment tools were used. Descriptive summary using frequencies, proportions, graphs and cross tabs was used to present study results. Cross tabulations using Analysis of Variance, independent sample t-test, were performed. Finally, hierarchical linear regression was performed after assumptions were satisfied.

Findings: The Proportion of households that fall in food insecurity category was accounted for 74.6 percent (81.5 percent rural and 47.9 percent urban residents). Using household dietary diversity score, 61.7% rural households and 26.4% urban households had poor dietary diversity hence, food insecure. The most important adjusted predictor of food insecurity for rural residents as measured by both tools was socioeconomic status and livelihood zones. Using household dietary diversity and household food insecurity access scale the most important predictor of food insecurity among urban households was vegetable garden ownership and women occupation respectively.

Conclusion and recommendation: food insecurity was greater among rural and the district should work on better agricultural extension services and training at household level, intensifying income generating activities at local level, and increasing education and reducing attrition rate.

Key words: food insecurity, urban, rural, livelihood zone
Theme 2: Maternal, Infant and Child Nutrition

Moderator: Dr. Dejene Hailu


By: Taddese A. Zerfu, Melaku Umeta, and Kaleab Baye

Background: Maternal nutrition has been strongly linked to birth outcomes. Nevertheless, there is paucity of evidence on how much maternal dietary diversity is associated with adverse pregnancy outcomes.

Objective: We aimed to assess whether poor dietary diversity and maternal nutritional status during pregnancy were associated with increased risk of adverse pregnancy outcomes: preterm birth, low birth weight and still birth in rural Ethiopia.

Design: We employed a multi-center prospective cohort study design to recruit a total of 432 eligible pregnant women between August 2014 to March, 2015. The individual dietary diversity status of mothers was used as key exposure variable to select, enroll and follow the mothers. Epi-data, SPSS and STATA software are used to enter and analyze the data. Odds ratios and 95% confidence intervals for each outcome were estimated by logistic regression models

Findings: A total 374 pregnant women were retained at the end of the study. Amongst of which 74 (19.8%) experienced at least one of the adverse outcomes: 34 (9.1%) gave birth to low birth weight babies, 51 (13.6%) had preterm birth and 17 (4.5%) still birth babies. Dietary diversity status was significantly associated with low birth weight (AoR: 0.09; 95% CI, 0.01, 0.98) and preterm birth (AoR: 0.18; 95% CI, 0.04, 0.73), but not still birth (AoR: 4.61, 95% CI 0.38, 55.4). Consumption of fruits and vegetables, anemia near term of pregnancy and gaining at least 9 kg of weight were other independent predictors of the occurrence of adverse pregnancy outcomes among the study participants.

Conclusions and discussion: The risk of adverse outcomes of pregnancy is associated with nutritional and dietary diversity status of the pregnant women and the intake of fruits and vegetables. Therefore, special attention to maternal dietary status, emphasizing the consumption of adequate fruits and vegetables during pregnancy is recommended.

Key words: Adverse Pregnancy Outcome, Dietary Diversity, Low Birth Weight, Preterm Birth, Still Birth.
Randomized Controlled Trial of Nutrition Education on Promoting Grain Legumes in Complementary Feeding in Wolayita, Southern Ethiopia

By: Demmelash Mulualem, CarolJ. Henry, Getenesh Berhanu, Susan J. Whiting

Undernutrition can occur during the crucial transitional phase of a child's life when complementary foods (CFs) are needed, as 6 to 24 months. In Ethiopia, CFs are cereal-based lacking in many nutrients. Locally grown legume grains (beans, peas) would provide protein, iron and zinc, but they are rarely incorporated into CFs. Nutrition education interventions are limited in demonstrating improved CF practices and none have been targeted specifically at legumes. Evidence suggests messages should be structured to promote behavior change. The aim of the study was to assess the effects of nutrition education based on the Health Belief Model constructs in promoting grain legumes in complementary feeding practices. A randomized controlled trial with quasi-experimental study design was used, with 80 mother-child pairs at the intervention site and 80 at the control site. A comprehensive nutrition education intervention involving discussions, recipe demonstrations was given twice monthly for 6 months only to the intervention group. Knowledge, attitude and practice (KAP) questions were given to the mothers at baseline, mid-line and end-line; and anthropometric measurements of the children were made at the same time. At baseline there were no significant differences in KAP score of mothers about legume-incorporated complementary feeding and anthropometric measurements and indices of young children between the intervention and control group. After 3 and 6 months of intervention mean KAP scores of mothers were significantly (p<0.05) increased in the intervention group but not for controls. Significant (p<0.05) improvements in children's mean weight, which was seen in better weight for height (WHZ, wasting), and weight for age (WAZ, underweight) indices after intervention compared to control children. In conclusion, the KAP of mothers on legume-incorporated complementary feeding and the nutritional status of their children were improved through a nutrition education based on HBM constructs, suggesting innovated strategies are needed to improve diet diversity of complementary foods in Ethiopia.

Key words: Undernutrition, grain legumes, pulses, nutrition education, complementary feeding, young children.
Optimizing infant nutrition though food based dietary recommendations: The use of linear programming to design a feeding recommendations

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Background: Ensuring optimal Infant and Young Child Feeding (IYCF) practices has been identified as one of the most effective public health interventions to improve child survival in developing countries. Appropriate complementary feeding should start at six months of age with a focus on local foods, while maintaining breast feeding until at least 24 months of age (PAHO/WHO). There are no standard dietary recommendations for appropriate complementary feeding practices in Ethiopia.

Objective:
• To determine nutrient adequacy of young children’s diet.
• To formulate realistic, optimised food-based complementary feeding recommendations (CFR) in the four regions.

Methods: Linear goal programming (Optifood developed by LSHTM in collaboration with WHO) was used to identify critical nutrients for which the local diet cannot fulfil requirements. Data of the 24 hr dietary recall of the Ethiopian National Food Consumption Survey of 2503 children of 6-23 m of age in four regions of Ethiopia namely Amhara, Tigray Oromiya and South Nations Nationalities and Peoples (SNNPR) were used. Average breast milk intake was considered while determining the nutrient adequacy. Frequently consumed foods, average portion sizes, minimum and maximum serving, dairy milk consumption and breast feeding status were described in each region. Problem nutrients were identified. Promising locally consumed foods to contribute to micronutrient intake are identified.

Results: Portion sizes were small: 62-73% of consumed foods were eaten in daily portion size of <15 grams. Dairy milk was consumed in large quantities in each region (in 6-8m, 8% consumed >52 g in Tigray to 5% consumed >220g in Amhara); (in 9-11m 9% consumed 137g 49% in Oromiya consumed >260g); (in 12-23 m age group, 10% consumed >126 grams in Tigray to 32% consumed >422 grams in Oromiya). Wheat was consumed in all regions but in moderate quantities (25 grams per day in SNNP to >100 grams in Tigray, in 12-23m of age groups). Iron and zinc are common problem nutrients for 6-8 m of infants whereas zinc is a problem nutrient for all age groups and all regions.

Conclusion: Food based dietary guidelines can be developed using Optifood analysis. Findings revealed that the local diet can fulfil iron requirements in older age groups (12-23m) in all regions but cannot fulfil zinc requirements in all regions, and calcium, niacin, and vitamin A requirements in some of the regions. Improved local food-based complementary food recommendations can meet some of the nutrient requirements of Ethiopian young children but should be field-tested. However, even under the best circumstances, the local diet cannot fulfil all nutrient requirements and additional interventions are required to fill the gaps.

Key words: Complementary food, Option food analysis, linear programming, food based dietary recommendations, problem nutrients
Theme 3: Nutrition and Non-Communicable Disease

Moderator: Dr Eskindir Loha

The Emerging Nutritional Problems of School Adolescents: Overweight/Obesity and Associated Factors in Jimma Town, Ethiopia

By: Nurezeman Gali, MSc; Dessalegn Tamiru, MSc; Mesesret Tamrat*, MSc

Background: Obesity is becoming a major serious public health problem and a big challenge to human health. It accounts about 2.8 million deaths and 35.8 million DALYs in the world. In addition, 44% of the diabetes burden, 23% of the ischemic heart disease burden and between 7% and 41% of certain cancer burdens are attributed to obesity. Obesity in early life hood is likely to follow through into adulthood. In the longer term; it causes serious medical problems, lower educational attainment and higher rates of poverty.

Objective: To determine predictors of overweight and obesity among school adolescents in Jimma town.

Methods: Institution based cross-sectional study design was employed from March/2015 to April/2015. Five hundred forty six school adolescents were selected using multi stage stratified sampling technique. The data were collected using an interviewer administered questionnaire and anthropometric measurements. All anthropometric measurements were performed by using calibrated equipment’s and standardized techniques. The data were checked for missing values and outliers, and analysed using SPSS (Version 20.0) and Anthro Plus version (1.0.4.0.) Logistic regression analyses were used to see the strength of association between dependent and independent variable using odds ratios and 95% of confidence intervals. Variables that have \( p \leq 0.2 \) were entered in a multivariable logistic regression analyses to control for associations among the independent variables.

Results: The prevalence of overweight/obesity among Jimma town school adolescents was 13.3% (11.8% were overweight and 1.6% was obese). The present study found that there were a statistically significant association between sex, paternal education level, HH wealth status, frequency of fruit, vegetables and animal source food consumption, physical activity and time spent watching TV/using computer and overweight/obesity.

Conclusion and recommendation: Prevalence of overweight/obesity among Jimma town adolescents is considerably high. This study also revealed a significant proportion of adolescent to be underweight (11.1%) and early interventions directed towards both ends of malnutrition has to be established to halt vicious cycle of intergenerational malnutrition.

Keywords: Overweight; Obesity; adolescents; Jimma town.
Prevalence Of Overweight And Obesity And Associated Factors Among High School Students In Hawassa City, Southern Ethiopia

By: Sinkenesh Tekalign

**Background:** Overweight and obesity refer to abnormal or excessive fat accumulation in humans. The effect of overweight and obesity in adolescence predict a broad range of adverse health effects in later adulthood including hypertension, type II diabetes, insulin resistance, metabolic syndrome, menstrual irregularity, in addition to psychological disturbances such as low self-esteem and depression. Prevalence of overweight and obesity in adolescents are increasing worldwide. This study explores data on the prevalence of overweight and obesity and associated factors in southern Ethiopian.

**Objectives:** To assess the prevalence of overweight and obesity and associated factors among high school students in Hawassa City, Southern Ethiopia.

**Methods:** Institution based cross-sectional study was conducted from February 23 to March 5/2015 among 1109 high school students aged 15 to 19 years old. The study participants were included by using stratified sampling technique. The data was collected using self-administered structured questionnaire. Data entry and cleaning were done by using Epi-info version 3.2.2. Height and weight measurements were collected using standard anthropometric techniques by trained nurses. WHO Anthro plus software was used to determine the BMI z scores. Univariate, bivariate and multivariable logistic regression analysis was done using SPSS software Version 16.0. P-values of less than 0.05 were taken as cut off point to declare that the association is statistically significant.

**Results:** The overall prevalence of overweight and obesity was 20.1%. The proportion of overweight and obesity in adolescents was 18.2% and 1.9%, respectively. Learning in private school (AOR=1.80% CI: 1.316,2.486), female students (AOR=2.59,95%CI: 1.881, 3.586), age of 15 years old (AOR 2.049,95%CI: 1.041, 4.030), father’s education level greater than 12 grade (AOR=3.11,95%CI: 1.077,9.014), intake of eggs every other day and two times per week (AOR 2.695,95%CI: 1.144, 6.347) and(AOR= 2.268 95%CI:1.063, 4.840) respectively, taking oil, fat or butter (AOR 2.092,95%CI: 1.113, 3.932), mother’s body size fatty (AOR 1.877,95%CI: 1.340, 2.628) and use of transportation mechanism (AOR 2.533,95%CI: 1.452, 4.418)were significant predictors of overweight and obesity in high school students from Hawassa city.

**Conclusion and Recommendation:** The prevalence of overweight and obesity was relatively high in high school adolescents from Hawassa City. Hence decreasing consumption of egg and fat, oil and butter and doing physical activity at school and at home regularly, especially in private school and female students could reduce risk of overweight and obesity is recommended.
Comparison of Body Mass Index, Waist Circumference, Waist to Height Ration and Waist Hip Ratio, in Predicting Metabolic Syndrome among Diabetic Patients in Ayder Referral Hospital, Mekelle city, Ethiopia.

By: Mengesha Dirar Berhe

Background: In most people with glucose intolerance or type 2 diabetes mellitus (DM), there is a multiple set of risk factors that commonly appear together forming what is now known as the ‘Metabolic Syndrome’ (MetS).

Objective: To compare the body mass index, waist to height ratio, waist circumference and waist hip ratio in predicting metabolic syndrome, estimating the prevalence of metabolic syndrome and identify factors associated with the development of metabolic syndrome in diabetic patients.

Methods: Cross-sectional study was conducted from January to April, 2014. Samples of 401 diabetic patients were taken from the Ayder Referral Hospital. Pearson chi square for categorical variables and Student’s t-test for continuous scale variables were used for data analysis. Spearman’s rank correlation, receiver operating characteristic curves, and logistic regression were employed to determine the association and predictive ability (with respect to metabolic syndrome) of the four measures of adiposity namely body mass index, waist circumference, waist-to-hip ratio, and waist-to-height ratio. P< 0.05 was considered to be significant. Prevalence of MetS was based on International Diabetic Federation & Adult Treatment Panel 3.

Results: Of 423 subjects selected, 401 (207 male and 194 female) participated, with an overall response rate of 95%. Age (mean ± SD) was 43±15.6 years. Prevalence of metabolic syndrome among study participants was 45.1% and 47.6% according to International Diabetic Federation & Adult Treatment Panel 3 criteria respectively. Triglyceride was strongly associated with waist-to-height ratio among men (r= 0.448) and among women with waist circumference (r= 0.235). HDL cholesterol was strongly associated with WC (r= -0.674) and waist-to-height ratio (r = -0.647) among men respectively. HDL was also strongly associated with waist circumference (r= -0.647) and waist-to-height ratio (r= -0.631) among women.

Conclusion: waist circumference and waist-to-height ratio indices were the best predictors of metabolic syndrome among diabetic patients. While waist hip ratio was the least to predict metabolic syndrome.

Key words: Metabolic syndrome, Diabetic, Mekelle Ayder, Ethiopia.
Theme 4: Food Safety and Quality

Effect of Container Smoking with Olive (Olea africana) and Addition of Koserot (Lippia adoensis) on the Physico-chemical, Microbial and Sensory Properties of Raw Cow Milk

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Ethiopia is believed to have the largest livestock-keeping country in Africa. Dairy production is an important part of the livestock production systems in Ethiopia. Milk is perishable commodity which needs special attention in handling and storage. Milk handling pots smoking and addition of leaves in to raw milk is common traditional practice in most parts of Ethiopia. However, the effects of Olive (Olea africana) and Koserot (Lippia adoensis) on the properties of raw milk are not examined specifically according to the tradition. The aim of this study is to evaluate the effect of smoking milk handling pots with smoking chips of Olea africana and addition of leaves of Lippia adoensis on the physico-chemical, microbial and sensory properties of raw cow milk. Raw milk sample were collected from Hawassa city local dairy farmers and treated in the laboratory. This experiment has four treatments: T1- milk sample kept in neither smoked nor leaves added pot1(control); T2- milk sample kept in smoked pot2; T3- milk sample with added leaves kept in pot 3; and T4- milk sample with added leaves and kept in smoked pot4. pH, titratable acidity, alcohol test and specific gravity test were taken as indicators for physico-chemical parameters; standard plate count (SPC), total coliform count (TCC) and methylene blue reduction test (MBRT) were considered as indicators for microbial counts; and taste, mouth feel, aroma, appearance and over all acceptability were used as indicators for sensory properties. The results indicated that the pH and specific gravity; SPC, TCC and MBRT; and mouth feel, aroma and overall acceptability were significantly (p ≤ 0.05) affected by all treatments. The highest value of pH and specific gravity was for T2 (6.80 ± 0.01) and (6.324 ± 0.0001), respectively. Maximum count of SPC and TCC was for T1 ((2.47 log10 cfu/ml and 3.5 cfu/ml), respectively. The longest time of MBRT was for T3 (7.15 hours). The best score of mouth feel, aroma and overall acceptability was for T3 (4.20 ± 0.71), T2 (3.90 ± 0.76) and T2 (4.20 ± 0.71), respectively. However, the treatments had no effect on titratable acidity, alcohol test, taste and appearance. From the study we concluded that the communities traditional practices of raw milk handling methods improved: some physico-chemical properties, prevented lactose fermentation and preserved the level of solids of milk; improved microbial quality and not affected the sanitary quality of milk; and improved sensory characteristics of milk to some extent and the entire treated samples were overall more accepted than control sample. Further study is recommended on identification and characterization of microorganisms; evaluation of active phyto nutrients play role in quality improvement; and all possible measures must be made to modernize the community’s traditional practices of raw milk handling.

Keywords: Lippia adoensis, microbial property, raw milk, Olea africana, physico-chemical property and sensory property.
Safety and Quality of Raw Cow Milk Collected from Producers and Consumers in Hawassa and Yirgalem areas, Southern Ethiopia

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The objective of this study was to understand the hygienic milk handling practice and determine the safety and quality of raw milk collected from producers and consumers in Hawassa and Yirgalem areas. A total of 60 producers and 40 consumers were randomly selected and interviewed for the survey in the selected districts of Hawasa Zuria and Dale. A total of 120 raw milk samples were also aseptically collected and tested for microbial analysis and chemical composition (60 samples each from producers and consumers). General Linear Model (GLM) and other statistical tools were adopted to analyze the data and summarize the information. The result showed that clay pot is the major milk storing device for producers although it is inconvenient for hygienic cleaning, harbors bacteria which causes milk spoilage and consequently imposes risk of quality deterioration. The Cooling method of raw milk for 28% of producers was using of refrigerator while for 33% of the consumers; it was by boiling and then cooling system. Fumigation was a common traditional practice in the studied districts which is mainly used for flavoring and extending the shelf life, thereby reducing spoilage. It is one of the traditional hygienic measures used on milking utensils. In the raw milk samples, the mean total bacterial count for producers and consumers was 6.73 cfu mL\textsuperscript{-1} and 7.15 cfu mL\textsuperscript{-1}, respectively. The higher total bacterial count of consumers was due to poor sanitary conditions practiced during milking and hygiene of milking utensils. The coliform count for the raw milk collected from producers was 4.00 cfu mL\textsuperscript{-1} while it was 4.29 cfu mL\textsuperscript{-1} for consumers. The higher coliform count of the consumers was due to contamination of the milk collected from different value chain actors, unhygienic milk utensils and unsafe ways of management. There was no significant difference observed in the mean values of fat, solids-not-fat (SNF), protein, lactose, density and water percent in the two study locations. Significantly lower values for fat, SNF and water percent were observed for the milk samples collected from consumers than producers. The poor handling practice, higher bacterial count and substandard quality of composition could be due to limited knowledge of producers and consumers on the improved hygienic handling practices. Therefore, regular awareness creation about quality milk production and good handling practices should be provided for producers as well as consumers to improve the quality and the safety of the milk and also minimize consequent health risks especially on children, the sick and elderly. Keywords: Milk handling, quality, safety, composition, producers, consumers.
Comparison of the Nutritional and Microbial composition of Kocho from Wild and Cultivated Enset from Bonga, Ethiopia.

By: Meseret Haile

There are two types of Enset (Ensete ventricosum) plant in Ethiopia. The first one is cultivated enset and the second is wild enset which is seed propagated. Kocho prepared from wild enset was not used as food like kocho prepared from cultivated enset except during severe drought time without any investigation about the nutritional composition. The aim of this study is to evaluate and determine the nutritional, microbial composition and toxicity of kocho prepared from wild and cultivated enset. Three variety of kocho one from wild enset and two from cultivated enset were analyzed for their proximate, mineral, microbial composition and sub acute toxicity parameter using animal model. Microbial analysis for LAB, yeast and mold, Aerobic mesophilic bacteria, coliform and staphylococcus was made in 0, 10, 20 and 30th days of fermentation. Kocho sample from wild enset showed higher concentration of crude fat, crude fiber and Ash also the mineral concentration (K, Ca, Mg, Cu and Na) are higher as compared to the cultivated enset kocho. LAB were the dominant flora in all variety of kocho with total count of 12.4 log cfu/ml, 12.1 log cfu/ml and 13.2log cfu/ml for White Bocho, Red Bocho and Epo, respectively at 30th days of fermentation. Yeast also showed an increase in number from initial count of 2.6log cfu/ml to 8.9 log cfu/ml, 2.1log cfu/ml to 11.2 log cfu/ml and 3.4log cfu/ml to 10.3log cfu/ml for White Bocho, Red Bocho and Epo, respectively. Aerobic mesophilic bacteria and coliform decrease to the end of fermentation and staphylococcus are not detected in the course of fermentation. Sub-acute toxicity test showed that there is no sign of toxicity in skin and fur, eyes and mucous membranes, tremors, convulsions, salivation, diarrhea, lethargy, sleep and coma of mice after administration of kocho prepared from wild Enset but there is an increase in mean weight of mice after the administration of test sample. Kocho prepared from wild enset can be used as a food and many other purposes. More ethno botanical investigations on wild Enset were recommended.

**Key words:** Cultivated Enset, Wild Enset, Kocho, Nutritional Composition, Microbial composition, Toxicity
Pregnancy is a critical reproductive period characterized by dramatic physical, emotional, hormonal and psychological changes in women. Pregnancy outcome is influenced by variety of physiological, behavioral characteristics, and other factors ranging from genetic to environmental differences. Food insecurity, recognized recently as a global public health concern, stands among the most important environmental factors posing multidimensional health and nutritional challenges to women during pregnancy and pregnancy outcomes. Such association is dependent to a great extent on severity, duration and frequency of the exposure. Although food insecurity is a common phenomenon in Ethiopia to date, the extents of its effect on maternal nutrition during pregnancy and pregnancy outcomes is not explored. Additionally, the causal link and direction of relationship, which may exist between household food insecurity, dietary intake adequacy and nutritional status among pregnant women and pregnancy outcomes is still unanswered. Having such background, we hypothesized that pregnant women living in a food insecure household would be more likely to be at risk of having poor nutritional status and higher adverse pregnancy outcomes compared to their food secure peers. The purpose of this study is, therefore, to explore level and determinants of household food insecurity and the causal relationship, which may exist between household food insecurity, dietary intake adequacy, nutritional status and pregnancy outcomes among pregnant women. The study protocols are approved by human ethics committee of Jimma University. The study is a population-based, observational prospective cohort, which was conducted in three districts (Woliso, Tiro Afeta & Gomma) in Oromia region, southwest Ethiopia between January 2014 to March 2016. It involved 4680 representative samples of 15–49 years old pregnant women. Sample accounts for 30% loss and attrition, allow to estimate a difference of 0.14 change in LAZ-score (1Sd) at 80% power and 0.05 significance level. Recruitment was made using multi-stage probability sampling techniques (combining systematic, simple random and cluster sampling) and subjects were followed from their 1st trimester until 3 months after delivery. Interview contacts were made at 3 months intervals for a total of four rounds. All statistical analysis will be performed using STATA, ver. 12 (STATA Corporation LP, College Station, TX, USA). The main analyses will be conducted using structural equation modeling (SEM), where by household food insecurity theoretical models will be developed and tested in order to disentangle the potential causal link and direction of relationship which may exist between household food insecurity, dietary adequacy and nutritional status of women during pregnancy, and pregnancy outcomes. If successful, to the author’s best knowledge, this finding will be the first to prove such causal link and direction of relationship and help to fill the knowledge gap about the health and nutrition risk of pregnant women living in food insecure households. It also anticipated to provide deeper understanding, better inform policymakers and program designers/implementers on ways how to create more effective and integrated food security, health and nutrition policies and programming, which will address food insecurity problems specific to pregnant women,
promote improved pregnancy nutrition and healthy pregnancy outcomes, support global effort to reduce maternal and neonatal mortality, and further advance child survival in the developing countries.

The Causes and Coping Mechanisms of Food Insecurity in Rural Ethiopia

By: Yenesew Sewnet (M.Sc. in Rural Development)

Agriculture is the backbone of Ethiopian economy and it is dominated by smallholder farmers. More surprisingly, the smallholders’ agriculture suffers from lack of technological know-how, soil degradation, recurrent drought and famine; and unfavorable external terms of trade. This agricultural crisis has resulted in the country depend on food aid for a long time. Thus the main objectives of this review are to assess the causes of household food insecurity in rural Ethiopia; and to review the coping strategies pursued by rural households. The methods employed to achieve the objectives were reviewing and discussed secondary data. According to the reviewed literature natural disasters such as drought and climate change, shortage of farm land, lack of functional multi-party democratic systems, lack of appropriate policies and institutions, lack of rural infrastructures(schools, roads, markets and health), population growth and lack of education are the major causes of food insecurity in rural Ethiopia. The coping strategies pursued by rural households in Ethiopia include minimizing number and quantity of meals in a day, diversifying livelihood income sources, migration, and wage labor.

Key words: Food insecurity, Causes, Ethiopia.
Determinants and Constraints of Pulse Production and Consumption among Farming Households of Ethiopia

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\textbf{Introduction}: In low income countries the agricultural sector is essential to growth, poverty reduction, and food security. Pulse crops are important components of crop production in Ethiopia's smallholders agriculture, providing an economic advantage to small farm holders as an alternative source of protein and other nutrients, cash income, that seeks to address food security. This study subjected to gain an understanding of determinants and constraints to production and usage of pulse crops.

\textbf{Method}: a total of of 256 households were surveyed in Hurufalole Kebele, Oromia region of Ethiopia. Determinants of production and consumption were identified using logistic regression.

\textbf{Result}: The result showed that Haricot bean was produced, but not widely consumed. Lentil was widely consumed but not produced. Production of haricot bean was hampered by problems related to weed control, disease, pests, yield and soil quality, a seasonal market, and a shortage of farmland. Consumption of haricot bean was low due to perceived gastrointestinal distress after eating and the culture of it being a taboo food. Logistic regression showed household head educational status and age, land size and household size statistically significantly (p-value<0.05) affected household pulse (haricot bean and lentil) consumption frequency.

\textbf{Conclusion and Recommendation}: Agronomic, market, culture and household characteristics related determinants and constraints were identified. Also a mismatch of production and consumption was observed in the study. It is recommended that agronomic and market concerns related to production of haricot bean and other pulses be addressed and that household food preparation techniques for pulses that reduce gastrointestinal symptoms be promoted and evaluated.

\textbf{Keywords}: Pulse Production, Pulse Consumption, Gastrointestinal Distress, Haricot Bean, Lentil

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Locally grown cassava cultivars were subjected to study the effect of boiling, sun-drying and fermentation processing methods on removal of anti-nutritional factors. The root product flours were analyzed for anti-nutritional factors using standard methods. The data generated were statistically analyzed using statistical package for social scientists (SPSS). Out of the three processing techniques, fermentation of grated cassava roots for 72 hours sufficiently reduced HCN content to safe level (<10 ppm, WHO) of human consumption. The unprocessed cassava root of Gamo cultivar (48.00 ppm) belonged to the category of sweet or non-toxic. Whereas, cultivars of Hayik (78.07 ppm), 28 (83.70 ppm), 44/72-NW (129.20 ppm) and Koree (159.00 ppm) were found to be moderately toxic. Cultivars of 192 (211.17 ppm) and 5538-19 (247.20 ppm) belonged to highly bitter (highly toxic) cultivar too. Reduction in phytate and tannin levels were highest for sun-dried followed by fermented and boiled flours. However, reduction in oxalate contents were highest for fermented followed by boiled and sun-dried flours. The study reveals that the effect of processing methods found to be significant (P<0.05) on removing anti-nutritional factors.

Keywords: Cassava, cyanide, phytate, processing methods


By: Tigist Fekadu, Esayas Kinfe and Pragya Singh*

Physicochemical and functional properties of two desi and one kabuli chickpea cultivars grown in Bodity, Ethiopia were evaluated and sensory quality of the boiled and roasted products were investigated. Significant differences were found among the cultivars in the parameters analyzed except in case of oil absorption and foaming capacity. Results revealed that Habru (kabuli) had the highest amount of protein, zinc, iron, and phosphorous; Mastewal (desi) had the highest amount of copper and tannin while local (desi) cultivar had highest value for ash, fiber, calcium and phytate. The results showed that all three cultivars contain bio-available zinc and calcium. Habru contain zinc higher in amount and bioavailability while the local cultivar contains calcium higher in amount and bioavailability. Of the three cultivars Habru contains bio-available iron. The overall acceptability of boiled forms of the three chickpea cultivars scored from 6.66 to 7.44 while roasted forms scored from 6.14 to 7.17. Habru cultivar is preferable to be used based on nutritional and functional characteristics.

Keywords: Anti-nutrient, Bioavailability, Chickpea, Cicer arietinum, Functional characteristics.
Development of Potential Food Products in Achieving Food and Nutrition Security of Households at Hawassa Zuria Woreda

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Food insecurity and malnutrition are major public health problems in Ethiopia. Promoting consumption of locally available vitamin -A rich foods that can be prepared from cereals in combination with fruit and root crops can reduce the problem of vitamin- A deficiency. Therefore the major aim of this study was to develop flatbread from maize, orange fleshed sweet potato (OFSP) and pineapple flours and thin porridge from maize flour, OFSP flour and avocado pulp. Composite flours in a blending proportion of maize, OFSP and pineapple flours: 100:0:0, 80:15:5, 70:20:10 and 60:30:10 respectively were used to develop flatbread. Thin porridge was prepared from maize flour, OFSP flour and avocado pulp in the proportion of 100:0:0, 80:15:5, 70:20:10 and 60:30:10 respectively. Completely Randomized Design (CRD) was used to determine the blending effect on the proximate composition of flatbread, functional properties of thin porridge and beta carotene content. Randomized Complete Block Design (RCBD) was used to investigate the organoleptic characteristics of flatbread and thin porridge. Supplementation of OFSP and pineapple flours to locally available products like flatbread increased vitamin A content. Flatbread prepared from 80% maize, 15% OFSP and 5% pineapple flours was preferred in overall acceptability. Addition of OFSP flour and avocado pulp for thin porridge development increased retention of beta carotene content. The beta carotene content was increased when the amount of OFSP flour and avocado pulp incorporation increased. It is recommended to use 80% maize flour, 15% OFSP flour and 5% avocado pulp for thin porridge development with better consumer acceptability.

**Key words:** Flatbread; Thin porridge; Beta carotene; Proximate; Functional; Malnutrition; Food insecurity
Theme 2: Maternal, Infant and Child Nutrition

Development of Maize Based Orange – Flesched Sweet Potato Flat Bread for Lactating Mothers at Hawassa ZuriaWoreda, SNNPRS, Ethiopia

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Vitamin A deficiency continues to be a major public health problem in Ethiopia in spite of the various intervention measures since 1989. Food based strategies are cost effective, easy, long-term and sustainable for the prevention of vitamin A deficiency both in rural and urban settings. To improve the vitamin A content of traditional (staple) flat bread prepared from maize, three formulations of maize-based breads were prepared by incorporating Orange Flesched Sweet Potato (OFSP) flour at 25%, 30% and 35%. Traditional maize-based flat bread served as control. Sensory evaluation was carried-out using a 9-point hedonic rating scale by panelists at the laboratory level. While, community level sensory evaluation (acceptability trial) was done by lactating mothers using a 5-point hedonic rating scale. The proximate composition values of flours and the four flat bread samples were determined using AOAC (2000) methods and open column chromatography method was used to determine the values of β-carotene. All the formulations were accepted both at laboratory and community levels. The proximate composition results showed an increase in the values of crude fiber and ash for OFSP incorporated flat breads compared to the control. The vitamin A contents (g RAE) of maize and OFSP flours were found to be 0 and 888.01 g RAE per 100 gm respectively. The vitamin A (g RAE) content of the control bread was observed to be 0. Among the flat breads samples in which OFSP flour was incorporated, the vitamin A content was highest (269.63 μg RAE) for the sample supplemented with 35% of orange fleshed sweet potato flour. OFSP flour up till 35% can be successfully incorporated in traditional maize based flat bread which can be used as a potential food source of vitamin A for lactating mothers residing in the study area.

Keywords Orange fleshed sweet potato, Retinol activity equivalent, Flat bread, Vitamin A
Effect of Breakfast Eating Patterns and Anthropometric Measurements on Cognitive function of Early Adolescents in Rural Area Of Sidama Zone SOuthern Ethiopia

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Background: Poor growth and breakfast eating patterns are associated with delayed mental development and that there is a relationship between impaired growth status and both poor performance and reduced intellectual achievements. The objective of this study was to assess the effects of breakfast eating patterns and anthropometric measurements on cognitive function among early adolescents in the Rural Sidama, Southern Ethiopia. A cross-sectional study was conducted from June to July 2012. Structured questionnaire was used to capture breakfast eating patterns, socio-economic and demographic factors. Anthropometric status was measured using the UNICEF SECA weighing scale and shorr measuring board. Kaufman Assessment Battery for Children-II tests was used for cognitive function measurement. A representative sample size of 211 participants was selected randomly from 4 kebeles. The data was analyzed with SPSS version 16.0 software and WHO anthroplus version 1.04. Results: Of the 208 interviewed, 52% were girls while 48% were boys with mean (±SD) age of 12.01±0.82 years. Breakfast skipping prevalence was 42.3%. Breakfast eating patterns and height-for-age Z score were significant predictors of Pattern Reasoning cognitive test scores (P<0.001). Body mass index for age Z score was a significant predictor (P<0.001) of a combined Simultaneous scale. Regular breakfast pattern, height for age and body mass index for age Z score were significantly (P<0.001) associated with Pattern Reasoning explaining 28.8% variation. Conclusion: Adolescents who were stunted and underweight had lower cognitive test scores compared to those who were normal as well as those who consume breakfast irregularly. Anthropometric status and breakfast eating patterns was significant predictor of cognitive function of adolescents in the study area. We recommended that, parents and adolescents should be educated and trained on healthy breakfast eating patterns and good nutrition practices for healthy cognitive development.

Keywords: Breakfast, Anthropometric Measurements, Cognitive Function, Adolescents, Southern Ethiopia
Household Food Processing Methods To Enhance Iron And Zinc Bioavailability In Formulated Haricot Bean And Maize Complementary Food

By: Addisalem Mesfin, Getenesh Berhanu, Afework Kebebu, Carol Henery and Susan Whiting

Household Food Processing Methods to Enhance Iron and Zinc Bioavailability in Formulated Haricot Bean and Maize Complementary Food. Objectives: This study aimed to test the nutritional quality of white haricot bean-maize complementary food needing household food processing to decrease phytate content and enhance the bioavailability of iron and zinc. Methods: Community consultation was conducted with mothers to find out traditional processing practices and preference for incorporation of pulse product to infant and young children diets. Germination and roasting methods of household processing and preparation methods were selected and used to process the white haricot beans and soaking was selected to process maize. Proximate nutrient analysis was done for treated and untreated samples at Saskatchewan Food Industry Development Center, and University of Saskatchewan, Canada and Ethiopian Health and Nutrition Research Institute. Community acceptability test was done on 36 mother-child pair. Means and standard deviations were calculated for proximate lab results and acceptability. ANOVA and Duncan’s multiple significant tests were conducted to determine significantly different means. Differences were considered significant at p significant mean differences among porridge samples for sensory attributes. Conclusions: This study showed that processing such as soaking and germination of pulse is necessary for improved bioavailability of iron and zinc, and that pulse-cereal porridge is suitable as a complementary food.

Key words: phytate, Iron, Zinc, Porridge, Maize flour, Haricot bean four, germination, roasting
Anemia and associated factors among pregnant women attending antenatal care services in public health centers of Kembata Tembaro Zone, southern Ethiopia

By: Semalign Samuel

Background: Anemia is a global public health problem affecting both developing and developed countries with major consequences for human health as well as social and economic development. Still this basic problem has not been solved but continues to exist affecting the health, quality of life and working capacity in billions of people around the world.

Objective: The objective of this study was to assess the prevalence of anemia and factors associated with anemia among pregnant women attending antenatal care services in public health centers of Kembata Tembaro zone, Southern Ethiopia.

Methodology: Institution based cross sectional study was held in public health centers of Kembata Tembaro zone, SNNPR Ethiopia from August to September 2014. Study institutions were randomly selected. Data was collected from 423 pregnant women. The World Health Organization standard (Hb <11g/dl) was used to determine anemia status in pregnancy. Hemocue was used for determining the hemoglobin levels of the study groups. A pretested interviewer-administered close ended questionnaire was used to collect the data. The data was entered and cleaned using Epi info version 3.5.1 and analysis was done using SPSS for windows version 20. Frequencies, percentage, mean and standard deviation were used for the descriptive analysis. Multivariable logistic regression was employed to control potential confounders and to explore association between dependent and independent variables.

Results: The present study revealed that an overall prevalence of anemia was 18%. About 43.3, 27.2, 16.3 and 13.2% of the pregnant women visited the health centers for ANC follow up for the first, second, third and for four and above times, respectively during the current pregnancy. About 119 (28.1%) of women consumed <3 food groups, 219 (51.8%) consumed 4-5 food groups and the rest 85 (20.1%) consumed more than five food groups during the last 24-hours preceding the data collection. Only 59.3% of the pregnant women were taking iron supplements during the data collection period. Anemia was significantly associated with the lowest wealth index (AOR=5.03, 95%CI=1.07-23.7), formal education (AOR=6.26, 95%CI=3.11-12.57), women’s occupation (AOR =3.17, 95%CI=1.1-9.14), husband occupation (AOR=3.1, 95%CI= 1.25-7.64), dietary diversity (COR = 3.66, 95%CI= 1.71-7.84), inadequate intake of iron rich foods (AOR=4.3, 95%CI=1.75-10.53), history of malaria infection (AOR=7.86, 95%CI=2.67-23.11), maternal age (AOR=3.56, 95%CI=1.04-12.1) and parity (AOR=3.9157-9.69).

Conclusion and recommendation: Anemia was of mild public health concern in the study area. The uptake of ANC service for the recommended number of visits and IFA supplementation and the diet diversity was low in the pregnant ladies from the study area. Thus, community mobilization and health education to improve the uptake of the ANC and family planning services available in the health centers, increase micronutrient intake through food based and economic approaches and control of infections are recommended.

Key words: anemia, pregnant women, Hemoglobin, Dietary diversity
Theme 3: Nutrition and Non-communicable Disease

Prevalence and Associated Risk Factors for type 2 Diabetes Mellitus Adult (>=40)

By: Abdulahi Haji

Diabetes mellitus (DM) is a common metabolic disorder resulting from defects in insulin action, production, or both. There are mainly two types of diabetes; Type 1 diabetes is immune-mediated and requires daily administration of insulin. The other common type is type 2 diabetes and characterized by insulin resistance or relative insulin deficiency. Type 2 diabetes is the most common form and comprises of 90% of people with diabetes around the world. Ethiopia is a developing country that has been facing rapid urbanization. The country is also in a stage of demographic transition with an increasing proportion of older population. National data on prevalence and incidence of diabetes are rising. The situation of diabetes in the study area is not well documented, but report from health institutions indicated that, the presence of increased diabetic cases in the study areas.Main objective of this study is to assess the prevalence and associated risk factors for type 2 diabetes mellitus among adults (>=40 years of age) in Jigjiga town. A cross-sectional community based quantitative study was conducted from February to March in 2013, using structured questionnaire and glucose and anthropometric measurement. Data were entered in to a computer using Epi-data, transferred to SPSS version 16 software packages for analysis using export data step in Epi-data software package. A total of 525 respondents were recruited in the study with a response rate of 100%. Overall study participants, 175 (31.5%) had abnormally elevated blood sugar level, of whom 45 (8.57%) were diabetic and 130 (22.48%) had high blood glucose level but do not define diabetes. There was a statistically significant association between diabetes mellitus and positive family history (AOR: 2.90 (CI: 1.37, 6.11), older age group (AOR: 3.41 (CI: 1.05, 11.05), dietary preference (AOR: 3.51 (CI: 1.43, 8.63)) and hypertension (AOR: 5.62 (CI: 2.60, 11.76)). Prevalence of diabetes is higher among older age, those with positive family history, those whom their dietary preference is sweet test and whole fat dairy products and hypertensive respondents. In our study the prevalence of type 2 diabetes mellitus is high compared to report from Ethiopia. Behavioral Change Communication and Information Education Communication should be recommended in the study area regarding to preventable and modifyable risk factor for type 2 diabetes mellitus, such central obesity, physical inactivity, and unhealthy diets by life style modifications (regular physical exercise, reduction of central obesity, health diets regular monitoring of blood pressure and continuous checking of blood glucose).
**Pre-ART nutritional status and its association with mortality in adult patients enrolled on ART at Fiche Hospital in North Shoa, Oromia Region, Ethiopia: a five year retrospective cohort study (2006-2013).**

By: Kokeb Tesfamariam

**Background:** HIV compromises the nutritional status of infected individuals and in turn, malnutrition worsens the effects of the infection itself by weakening the immune system consequently accelerating disease progression and death. However, few studies have examined the association between nutritional status at ART initiation and early mortality.

**Objective:** General objective of the study is to assess pre-ART nutritional status and its association with mortality in adult patients enrolled in ART between August 01, 2006 to September 30, 2013 at Fiche Hospital in North Shoa, Ethiopia.

**Methods:** A retrospective cohort study was conducted among 489 ART enrolled adult patients between August 01, 2006 to September 30, 2013 in Fiche Hospital. The most recent laboratory results before starting ART were used as a baseline value. Study participants were selected by using systematic random sampling method by which one random number in the Patient’s ART unique identification numbers as a starting point. Actuarial table was used to estimate survival of patients after ART initiation and log rank test was used to compare the survival curves. Cox proportional-hazard regression was used to calculate the bivariate and adjusted hazard rate (AHR) and then determine independent predictors of time to death. A p-value of <0.05 was considered.

**Results:** Most of the study subjects were females 254(51.9%). The overall mean(±SD) age at ART initiation was 34.36 ± 9.24 years. A total of 489 patients were included in the analysis, of whom 87 died during a median study follow-up of 22 months. The estimated mortality among malnourished was 21%, 28%, 33%, and 38% at 5, 10, 15, and 25 months respectively with mortality incidence density of 5.63 deaths per 100 person years. The independent predictors of mortality were: BMI <18 kg/m² (AHR=5.495% CI: 3.03–9.58), baseline ambulatory functional status (AHR=3.84; 95% CI: 2.19, 6.74), bedridden functional status (AHR=4.78; 95% CI: 2.14, 10.65), WHO clinical stage III (AHR 2.21; 95% CI: 1.16 – 4.21), WHO clinical stage IV (AHR 4.05; 95% CI: 1.50, 10.97) and CD4 count less than 200 cells/ l (AHR=2.95, 95% CI: 1.48, 5.88), two and more opportunistic infections (AHR: 2.30; 95% CI: 1.11, 4.75).

**Conclusions:** Malnutrition at the time of starting ART was significantly associated with decreased survival. Provision of nutritional support in conjunction with an early start of ART and the food by prescription initiative should be further strengthen.
Theme 4: Food Safety and Quality

Nutritional, Microbial and Sensory Properties of Flat-Bread Prepared from Maize (Zea mays L.) and Orange-fleshed Sweet Potato (Ipomoea batatas L.) Flour blends: The case of Shebedino, SNNPRs.

By: Gezahegn Nigusse (M.Sc), Henok Kurabachew (PhD), Tadesse Fikre (M.Sc.)

Vitamin-A deficiency is a major public health problem in developing countries including Ethiopia; with children and pregnant/lactating women the most vulnerable. Promoting consumption of locally available vitamin-A rich foods that can be grown in home gardens can reduce the problem of vitamin-A deficiency, and can be technically feasible and cost effectiveness. The main objective of this study was to determine nutritional, microbial and sensory properties of flat-bread prepared from maize (Zea mays L.) and Orange-fleshed Sweet Potato (OFSP) (Ipomoea batatas L.) Flour blends. Survey based on purposive sampling was conducted on 64 households with mothers/caregivers of children aged 2-5 years, producing maize and OFSP were selected from Remeda and Teremessa kebele in shebedino woreda, SNNPRs, Ethiopia. Flat-bread was developed with different proportion of OFSP to maize flour: 25%:75%, 30%:70%, 35%:65% and 0%:100% (control). Thenutritional analysis of flat-bread and flour was done in EPHI Addis Ababa by using AOAC 2000. The total plate, mold and yeast analysis was conducted in Hawassa University and the sensory acceptability of flat-bread was carried out in shebedino woreda by mothers and children in pairs using five point hedonic scale and preference test was done by children’s. The result of this study showed that 96.9% of the participants gave flat-bread made from maize flour to their children and all of the respondents responded that they do not prepare flat-bread by mixing maize flour with OFSP flour. Based on proximate and Vitamin A analysis result the OFSP incorporated flat-bread were rich in Vitamin-A and full fills 61-86% of RDA for pre-school children for 2-5 years children according to FAO/WHO recommendations. The microbial analysis result showed that all of the OFSP incorporated flat-bread was within the limit of microbiologically acceptable according to the International Commission for Microbiological Specification for Foods. The sensory acceptability result showed that all OFSP incorporated maize flat-bread were liked/accepted in all sensory attributes by mothers/caregivers of pre-school children. Majority of pre-school children were preferred OFSP incorporated flat-bread than the control. Thus, based on the result of this study mother/caregivers should feed their pre-school children OFSP incorporated flat-bread. Furthermore, health officials of the study area and CIP (International potato center) Hawassa branch should teach mothers/caregivers on the importance of OFSP incorporated flat-bread as alternative Vitamin A source.

**Key words:** Pre-school children, OFSP incorporated maize-flat bread, Nutritional value, Microbial load, Sensory acceptability.
Evaluation of Phenolic Profiles and Antioxidant Activity of Endemic Dietary Herbs from Ethiopia

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*Lippia adoensis* var. koseret, *Lippia adoensis* var. adoensis, and *Thymus schimperi* are endemic herbs to Ethiopia and have been used as important food flavoring agents and are also claimed to have various health benefits. The aim of this work was to carry out a chemical analyses focusing on secondary metabolites, particularly phenolic compounds and antioxidant activity of these herbs. The quantity of total phenolic ranged from 67.66-95.92 mg gallic acid equivalent per gram of dried extract (mg GAE/g dw), while the total flavonoid varied between 15.65 - 26.77 mg quercetin equivalent per dried extract (QE/g dw). Five flavan-3-ols, seven phenolic acids, six flavonols, two dihydrochalcones, and two aliphatic organic acids were identified and quantified using LC-MS. Highest concentrations of total flavonols, phenolic acids, and aliphatic acids were found in *Thymus schimperi*. Highest flavan-3-ols were found in *Lippia adoensis* var. adoensis. Quercetin-3-O-rutinoside (81.50 ± 7.60 µg/g), 3-hydroxybenzoic acid (548.84 ±28.10 µg/g), and succinic acid (1036.16 ± 97.73 µg/g) were the most abundant in *Thymus schimperi*. The aqueous methanol extract of *Lippia adoensis* var. adoensis showed the highest DPPH scavenging ability (IC₅₀ = 7.96 ± 0.60 µg/mL) and iron reducing power (IC₅₀ = 85.93 ± 3.10 µg/mL). Similarly, the methanol extract of *Lippia adoensis* var. adoensis showed the highest percentage of inhibition of the decomposition of linoleic acid and flaxseed oil with the values of 77.80 ± 5.41% and 53.65 ± 7.13%, respectively. Ferrous chelating activity was the highest for *Lippia adoensis* var. koseret (92.79 ± 4.63 µg/mL). This is the first study on the phenolic composition and the rancidity inhibition potential of these dietary herbs from Ethiopia, highlighting the importance of dietary herbs as a source of natural antioxidants in preventing various oxidative stresses and as food preservatives.

**Keywords:** antioxidant; LC-MS; *Lippia adoensis*; phenolic compounds; *Thymus schimperi*
Studies indicated that orange-fleshed sweet potato (OFSP) root is a versatile food item with good nutritional importance. However this root is not utilized well in most developing countries. Developing and characterizing a new value added food product of OFSP could improve the utilization and Vitamin A intake. In the present study different OFSP-based juice products were developed through blending with ginger and mango juice: product-1 (100% OFSP), product-2 (99% OFSP & 1% ginger), product-3 (90% OFSP & 10% mango juice), product-4 (80% OFSP & 20% mango juice), product-5 (89% OFSP, 10% juice and 1% ginger), product-6 (79% OFSP, 20% mango juice & 1% ginger) and product-7 (commercial mango juice). Analysis of physico-chemical (pH, titratable acidity, total soluble solids and viscosity), nutritional (β-carotene, vitamin-C, iron, zinc, phytate, bio-availability of iron and zinc) and sensory (appearance, aroma, color, taste, mouth feel and over acceptability) properties of the products was conducted. It was shown that soluble solids, viscosity and β-carotene increased with increasing percentage of OFSP. Products flavored with ginger had lower pH, higher acidity and ash, enhanced taste aroma. Moreover, products flavored with mango juice had lower soluble solid and viscosity, better vitamin-c, taste, aroma, mouth feel, color and appearance. The phytate and bioavailability of iron and zinc was at acceptable range in ginger containing products. Generally, products contained both ginger and mango juice had better physico-chemical, nutritional sensory acceptability. In development of orange-fleshed sweet potato juice combinations of ingredients should be considered to improve overall quality and stability of the products.

**Keywords** Orange-fleshed Sweet Potato, Juice, Blending ratio, Physico-chemical, Nutritional content, Sensory property
Hygienic and sanitary practices of street food vendors in the city of Addis Ababa, Ethiopia

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In Ethiopia, like other developing countries, street food vending is one of means of income generation and women play a dominant role for this sector. The quality of raw materials, food handling and storing activities are major factors that affect the safety of street food. The aim of this study is to investigate the hygiene of street vendors and sanitary conditions of vending sites on the streets of Addis Ababa. A total of 140 street food vendors in two sub-cities (Gulele and Arada Sub-cities) were investigated from September 2014 to March 2015. A structured questionnaire, interviews and extensive observation were used in the study. Most of street vendors (78.6%) were women. The majority of the vendors (68.5%) had either primary or no education. Among the vendors 88.6% didn’t have apron and 95% were not covered their hair during cooking process. In the two sub-cities jerry cans were commonly used for water storage. 35% of street food vendors were changed the cleaned utensil water when only it is dirty. Largest number of street vendors (90.7%) was used recycled paper to serve the consumers. All the vendors (100%) handled money with bare hands while serving food. Regarding to use of cooking oil 38% of the vendors were changed cooking oil monthly and 43.6% of street food vendors were changed weakly. There is no significant difference (p = 0.679) between the sub-cities on using cooking oil. All of the vendors had no health certificate from authorized dignitary. 78.6% of the vendors prepared their food along the roadside. In most of the vending site vehicles were passed which released dust and gaseous pollutants. Moreover in some areas wastewater drainage tunnels were found in the vicinity of vending site. Although street vended food is a means of income generation at the household level but the way food prepared and sold is in unsanitary environment. Awareness creation plays a key role for food safety and handling so that the concerned bodies should commit for providing food safety training to street vendors.

Key words: street food vendors, health certificate, unsanitary environment, food safety
Physicochemical and nutritional profile of commonly consumed edible oils in Addis Ababa and their health implications.

By: Kifle Habte, Aweke Kebede, Masresha Tessema, Dilnesaw Zerfu, Tibebu Moges, Binyam Tesfaye, Kirubel Tesfaye, Mekonen Tadesse and Tesfaye Hailu

Introduction: Keeping food safety and quality are some of the major components for food and nutrition security and protecting human welfare. Directly or indirectly edible oils are involved in every day dish and due to this, long time preference to the type of edible oil quality and safety should bring either positive or negative impact on overall health. The objective of this research is to make physicochemical and nutritional profile analysis on the edible oils and based on the finding to write a recommendation for policy makers, inspection and controlling bodies and oil processing industries.

Material and methods: Sixteen different types of edible oils are collected from shops and supermarkets found in Addis Ababa in 2015. And in this study almost all types of edible oils found in Addis Ababa were included. Following the sample collection, the physicochemical and nutritional profiles were analyzed according to AOAC standard method of fat and oil analysis.

Results and discussion: Among total of sixteen oil brands analyzed, seven were produced in Ethiopia. And all these were poor in labeling. However those imported (9 brands) oils from different countries had the necessary labeling requirements. From the seven local oils analyzed, six were contain acid value higher than the standard. Again from these seven local oils, five were not refined; look deep yellow or brown-yellow and three of them had settleable matter. Being solid or hydrogenated has brought significant difference in iodine value, saturated, monounsaturated, omega 3, omega 6, cis and trans fatty acids of the edible oil at p<0.05. Generally, imported oils have good labeling internms of expire date, nutrition facts and fortification as compared to local ones.

Conclusion and recommendation: Even though locally produced edible oils have their own quality in terms of having good PUFAs content and low saturated FAs, but they need to pass through all the necessary oil processing steps in the factory; including decreasing the acidity, protect from oxidation, bleaching, refining and deodorizing in order to remove impurities and hazardous substances so that to make safe for consumption and to improve nutritional quality. The inspection and control mechanism should also be strong to conform to standard in labeling the product and decreasing acidity. Compared to liquid vegetable oils, palm oils have high Trans, saturated, mono unsaturated and omega 9 fatty acids with low omega 3, omega 6 and cis fatty acids. Due to this, substituting high conjugated fatty acids (PUFAs) in the place of low conjugated is recommended for their many health benefits.

Key words: Polly unsaturated, Trans, omega 3 and omega 6 fatty acids, physicochemical analysis and cardiovascular disease.
Escherichia Coli O157:H7 In Raw Meat in Addis Ababa, Ethiopia: Prevalence at an Abattoir and Retailers and Antimicrobial Susceptibility

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Although raw meat and its products are commonly consumed in traditional Ethiopian diets, E. coli O157: H7 is rarely studied compared to other countries. Thus the present study has been designed to determine the prevalence and assess the antimicrobial susceptibility of E. coli O157: H7 isolated from beef, sheep meat and goat meat at one abattoir and in 48 selected raw meat retail shops in Addis Ababa. Out of 384 meat samples examined, 10.2% (39/384) were positive to E. coli O157:H7. Among these samples examined, beef was the most frequently contaminated with E. coli O157:H7 with an overall prevalence of 13.3% (17/128) followed by 9.4% (12/128) sheep meat and 7.8% (10/128) goat meat. With regard to meat source, the prevalence rates of E. coli O157:H7 at the abattoir and the selected retail shops were 5.7% (11/192) and 14.6% (28/192), respectively. Significant differences in prevalence was observed among sample sources (p < 0.05). The antimicrobial susceptibility investigation of 39 E. coli O157:H7 isolates using 10 commercially available antimicrobial discs revealed that the isolates were susceptible to nine antimicrobials from 69.3% to 100% except streptomycin which showed susceptibility of 48.7%. An overall resistance of 33.4% and 30.9% was recorded to streptomycin and amikacin, whereas 5.1%, 5.1%, 7.7%, 12.8% and 17.9% resistance rates were recorded against nalidixic acid, tetracycline, amoxacillin-clavulanic acid, cephalothin and ciprofloxacin, respectively. Multidrug resistance was observed among amikacin, amoxycillin-clavulanic acid, cephalothin, ciprofloxacin, streptomycin and tetracycline antimicrobials drugs. The isolation of E. coli O157:H7 in raw meat and the existence of antimicrobial resistant isolates highlight the potential threat to public health. Hence implementation of E. coli O157:H7 prevention and control strategies from farm production to consumption of meat and meat products are crucial.

**Keywords:** Abattoir, Addis Ababa, Antimicrobials, Escherichia coli O157:H7, Prevalence, Retail shops, Raw meat
SUBMITTED ABSTRACTS FOR THE CONFERENCE BUT NOT SELECTED
Formulation of improved complementary foods for Infant and Young Children (6-23 mo) of pastoralist communities of Ethiopia.

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Background: Inadequate nutrition during the complementary feeding period results in frequent infection during early childhood, deficit in growth, poor psychosocial development, reduced learning capacity and productivity and also substantially increases the risk of mortality. However, little efforts have been made so far in developing complementary foods that suits the pastoralist community.

Objective: The objective of the present study is to formulate improved complementary foods meeting nutrient requirements for infants and young children (IYC) and adapted for pastoralist communities in Ethiopia.

Method: A cross-sectional study investigated the portion size of meals per day of IYC (n = 896), frequency of cereals and legumes consumed by IYC. Using linear programming, three alternative formulations were developed by choosing ingredients based on their nutritional composition, price per Kg, and the consumption pattern of the community. The sensory acceptability of the formulated complementary foods was evaluated by semi-trained panelists (n= 26), using a 9-point hedonic scale.

Result and discussion: Wheat, maize, sorghum, white and red teff, peas and chickpea were the ingredients selected. The average portion size (g) of meals was about 35 g and was low compared to previous estimates. The sensory evaluation of the formulated products was acceptable. The present study indicates that through the application of linear programming, it is possible to formulate nutrient-dense complementary foods using locally available cereals and legumes.

Conclusion: Although the developed complementary foods provide adequate amount of energy, protein, calcium, and iron (91% to 97%). Strategies to improve children’s zinc and vitamin A intake through complementary consumption of animals source foods or whenever appropriate, through fortification is advised.

Keywords: Complementary foods, infant and young children, linear programming, pastoralists, sensory evaluation.
Taking a Deeper Look at Nutrition within Agriculture: The Case of Mung Bean Promotion

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Agriculture underpins Ethiopia’s economy and over 80% of the country’s population depend upon agriculture for their livelihoods. Agriculture plays a key role for achieving food security in producing food, generates an important source of income to purchase food, and provides foods with high nutritional status. Nevertheless, agricultural production projects seldom recognize that attaining nutrition security requires an action beyond the food production. It should also include post-production activities such as processing, storage and consumption. This departure often affects the significant contribution of agriculture to eradication of malnutrition. To address such challenges, Self Help Africa (SHA) is promoting a nutrition-sensitive agricultural development approaches to achieving both food and nutrition security as part of Mung Bean Production and Market Linkage Project. Mung bean (Vigna radiate) is a short duration crop that can perform well under conditions of low soil moisture. However, its production is very limited in Ethiopia. Moreover, in places where it has been growing, it is only produced for export market. Hence, its food value is almost negligible by the producers due to lack of adequate knowledge of preparing the different recipient out of mung bean. Accordingly, SHA has promoted both the mung bean agricultural production as well as its nutritional value. The nutrition education and demonstration sessions conducted for mung bean resulted in significant change in diversification of diet with this nutritious leguminous crop. As a result mung bean eating habit has improved from 0.8% to 67% during the three years project implementation period. This has been considered as great lessons for SHA to promote the nutritional value as well as in measuring the impact of agricultural project interventions towards achieving the nutrition security.
Effect of Moringa Leaf Powder Blending Ratios With Bulla on Quality of Bulla Based Weaning Food

Tedefaye Geremew, Solomon Adera, Negussie Bussa

In Ethiopia about 45% of the children were stunted and about 42% were underweight, in association with protein-energy malnutrition and vitamin A, iodine, zinc, and iron deficiencies. To reduce the incidence of malnutrition, through formulation and development of nutritious complementary weaning food from locally available crops such as bulla flour and moringa leaf powder are important. The study was conducted on blending ratios (90:10, 85:15, 80:20, 75:25 and 70:30) of bulla to moringa leaf powder with control 100% bulla flour using completely randomized design with three replications. Assessment was made on nutritional value, anti-nutritional, functional and sensory attribute of weaning food in the form of gruel. Increase in crude protein, crude fat, ash and crude fiber were recorded with values ranging from 1.53 to 10.17, 0.39 to 2.67, 1.04 to 5.46 and 0.32 to 3.03%, respectively. Similarly improvements were achieved in terms of calcium, zinc, iron, phosphorus and β-Carotene contents by increasing from 101.96 to 887.30, 0.69 to 1.84, 4.53 to 12.86, 40.88 to 175.86 and 0.02 to 4.48 mg/100g, respectively. The values of water absorption and water solubility indices also showed increment from 2.54 to 3.52 g/g and 6.87 to 9.44%, respectively, as the ratio of moringa leaf powder increased from 0 to 30%. The tannin, phytic acid and total phenolic contents of weaning food increased as well from 0.31 to 3.08, 4.44 to 11.46 and 0.02 to 13.55 mg/100g, respectively. The sensory acceptability of the products decreased with increasing level of Moringa leaf powder supplementation. However, it also showed that the leaf powder can actually be mixed with bulla up to ratio of 20% and still be accepted. It is concluded that moringa leaf powder can be used up to 20% blending proportion to formulate bulla-moringa complementary weaning food with increased health benefits and acceptability.

**Keywords:** β-Carotene; Blending ratios; Bulla flour; Weaning food; Malnutrition; Moringa leaf powder
Immunological Response of Adult HIV/AIDS Patients Treated with Tenofovir versus Zidovudine Based Highly Active Anti-Retroviral Therapy in Eastern Ethiopia, retrospective cohort study

Wubante Taye (MPH) and Ermiyas Mulu (MPH)

Background: Ethiopia is among countries most affected by HIV/AIDS pandemic. Highly Active Anti-Retroviral Therapy is being given for people living with HIV/AIDS across all of hospitals and majority of health centers in the country. The two approved nucleoside reverse transcriptase inhibitor antiretroviral drugs; named as Tenofovir (TDF) and Zidovudine (AZT) are used as backbone of the treatment. Studies in different part of the world show mixture of evidence about the difference in immunological response among patients receiving on Tenofovir (TDF) and Zidovudine based HAART.

Method: Retrospective cohort study design was used to compare immunological responses rate of TDF and AZT based HAART regimen in Harar and Dire Dawa. A cohort of 416 Highly Active Anti-Retroviral Therapy patients that start HAART from December, 2010 to May, 2015 were included and followed for two years retrospectively from June 1, 2011 to May 31, 2013. The data for primary outcome were retrieved from medical records of patients. Rate of immunologic response was examined at 6, 12, 18, and 24 months of follow up period. The time required to get immunological response was analyzed by Kaplan-Meier survival curve. Adjusted hazard ratio was calculated with a 95% confidence interval by Cox proportional hazards model to determine rate of immunological response. To ascertain the association; bivariate and multi variable Cox regression model was used. Statistical significance was considered with two sides P-value of 0.05.

Result: out of the cohort at baseline 337 (81%) complete follow up and 281(83.38%) patients’ had immunological response within 24months of follow up period. The median age of the study participants was 34 year (IQR, 10.75). Majority 298(71.6%) of the study subjects were females. The mean CD4 count had risen from 147.6cell/μl at baseline to 389.3cell/μl at the end of follow up periodand it was higher in the TDF than AZT group. The crude rate of immunological response show significant difference within cohort groups (OR 8.36(3.74-21.2), P-value 0.000). There was no difference in mean month to get immunological response TDF 17.23 (95%CI of 16.36-18.12) and AZT (17.45(95%CI 16.56-18.33) groups. The TDF cohort had better BMI, adherence and CD4 count than AZT counterparts. The baseline WHO stage, baseline CD4 count, sex and INH preventive therapy were predictors of immune response.

Conclusion: There was no significant difference in immune response between TDF and AZT treatment regimes. Time of initiation of ART had affected the immune response among study subjects. Initiating at earlier WHO stage and higher CD4 count could advantage PLWHIV. The reason why females had better immune response is unclear and need further research.
Evaluation of coagulants on soy cheese making efficiency.(Unpublished)

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The unavailability of nutritious food and the high cost of animal protein are the main causes of protein-energy malnutrition in Ethiopia. Malnutrition is predominantly seen among the rural population since the food of the population is based on crops. Promoting consumption of locally available protein-rich crops can reduce the problem of protein-energy malnutrition. The objective of this study was undertaken to investigate the effects of three coagulating agents (Lemon juice extract, Vinegar and CaCl₂) on the yield percentage, nutritional composition, Sensory and microbial properties of cheese samples produced was studied. The percentage yield ranged from 88.64% for cheese coagulated with CaCl₂ to 122.23% for cheese coagulated with Lemon juice extract; and were significantly different (p<0.05). The cheese samples proximate compositions had varies from (53.50-58.5276% protein,11.70442-12.93227% fat, 2.05764-3.80641% ash and 17.5826-25.0768% carbohydrate), on dry weight basis. Results indicated that the three coagulants significantly (p<0.05) modulated the various proximate parameters evaluated, The cheese coagulated by CaCl₂ the highest contents of protein and ash but the protein content were not significant with cheese coagulated by lemon Juice extract. Further studies revealed to sensorial attributes. The sensory acceptability of soy cheese was carried out by Melkassa Agricultural Research Center staff member and the preference test was done using nine point hedonic scales. The highest score was achieved by the lemon juice coagulated cheese was more preferred in terms of flavor, color and overall acceptability, but there were no significant differences between sensory characteristics of soy cheese coagulated by these three coagulants on overall acceptability. The Standard plate count, total coliform, mold and yeast counts result showed that all of the cheese samples were microbiologically acceptable.

Key words: Soy cheese, Coagulant, CaCl₂, Lemon Juice Extract, Vinegar,
Complementary Feeding practices among children 6-23 months of age in Wolaita Sodo town, Southern Ethiopia:

Tefera Chane, Shimelash Bitew, Tesfa Mekonen and Wubalem Fekadu.

**Background:** Child feeding practices are multidimensional and they change rapidly within short age-intervals. Suboptimal complementary feeding practices contribute to a rapid increase in the prevalence of undernutrition in children in the age of 6-23 months. The aim was to measure complementary feeding practices and associated factors among children 6-23 months of age in Wolaita Sodo, Ethiopia.

**Method:** community based cross-sectional study was carried out to select 623 mothers/caregivers with 6-23 months of children reside in Wolaita Sodo town using systematic sampling from March 02-20, 2015. Interviewer administered questionnaire was used to gathered information on socio-demographic, child feeding practices and health related characteristics. Data were entered to Epi-Data version 3.02 and transported to SPSS version 21 for further analysis. Binary logistic regression was used to see the association between the outcome variables and explanatory variables.

**Result:** the study revealed that the percentage of 6-23 months of children who meet the recommended level of minimum dietary diversity, meal frequency and acceptable diet with their 95% of CI were 27.3% (23.7%-30.8%), 68.9% (65.2%-72.6%) and 21.1% (17.8%-24.3 %) respectively. Household head occupation and child age were identified as statistically significant predictors of dietary diversity. Government employee, maternal illiteracy and age of 9-11 months of children were showed negative statistical association with minimum meal frequency but girls were more likely to fulfil the requirement of meal frequency. Additionally, being housewife, government employee, middle economic class and child age of 6-8 months were found to be independent predictors and positively associated with minimum acceptable diet.

**Conclusion and recommendation:** even though the study showed better progress as compared to the national and regional figures, child feeding practices were not adequate and not achieving WHO IYCF recommendations. Strengthening the available strategies and creating new intervention measures to improve socio-economic status, maternal literacy and increasing awareness of community for better practices of child feedings is compulsory action for the government and policy makers.

**Key words:** dietary diversity, meal frequency, acceptable diet, 6-23 months of children.
Education for Promoting Household Utilization of Pulses among Women of Reproductive Age in Hawassa Zuria Woreda, Sidama Zone, Southern Ethiopia

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In Ethiopia and many other Sub-Saharan African countries, chronic energy deficiency, poor weight gain in pregnancy, anemia, and other micronutrient deficiencies are common among women. Nutrition education about locally available, but nutritionally rich crops, such as, pulses is one of the promising strategies to reduce the burden of malnutrition among women in rural communities. Thus, the objective of the current study was to examine the effectiveness of nutrition education intervention based on Health Belief Model (HBM) on the Knowledge, Attitude and Practice (KAP) of women at reproductive age (15-49 Yrs) towards household utilization of pulses. A pre-test post-test control group design was conducted on 200 randomly selected women from Hawassa Zuria Woreda Kebeles in two groups as intervention (n=100) and control (n=100). Nutrition education intervention was given only to the intervention group every 15 days for consecutive six months whereas the control group got the same information in a summarized form at the end of the study. Women in both groups completed KAP and food frequency questionnaire at baseline and after six months of intervention. Data were entered into SPSS and analyzed with independent and paired sample t-tests to find out the effect of nutrition education intervention by comparing the pre and post test data between the two groups and within each group. P-value of less than 0.05 was considered as significant. Moreover a descriptive statistics was used to describe the food frequency in both groups. A significant improvement in the mean (SD) knowledge (p<0.001), attitude (p<0.001), and practice score (p<0.001) was observed among women in the intervention group compared to control group. Improvement in the scores of HBM constructs: perceived susceptibility (p<0.001), perceived severity (p<0.001), perceived benefits (p<0.001), perceived barriers (p<0.001), self-efficacy (p<0.001) and taking health action (p<0.001) demonstrated in the intervention group was also significant compared to the control group. Thus, based on results of this study it is possible to conclude that nutrition education based on HBM can be effective in bringing positive change on the KAP of women of reproductive age towards household utilization of pulses.

Key words: pulses, nutrition education, Health Belief Model, women at reproductive age, KAP
Body Composition Assessment by Air displacement Plethysmography using Predicted and Measured Thoracic Gas Volumes in People Living with HIV/AIDS in Southwest Ethiopia.

Subtheme of the research: Assessment of nutritional status and respiratory function of people living with HIV/AIDS using a reference method and validation of the method for body composition assessment.

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Background: Body composition assessment has become increasingly popular in clinical, nutrition, exercise, and research areas. Air displacement plethysmography (ADP) with a trade name known as BOD POD, is a reference method for the assessment of body composition in patients, disabled, athletes, and other people. But as a new method, the reliability and validity of ADP should be tested in different people in different areas.

Objectives: The first aim was to determine whether or not there is discrepancy between the predicted thoracic gas volume (Vtgpred) and measured thoracic gas volume (Vtgmeas) using the BOD POD in people living with HIV/AIDS (PLWHA) in Southwest Ethiopia. The second aim was to determine the effect of thoracic gas volume (Vtg) measurement ways (predicted and measured) on estimation of body fat and fat free mass using the BOD POD in PLWHA in Southwest Ethiopia.

Method: Cross-sectional study was conducted on 68 PLWHA who were enrolled at ART Clinic in Jimma University Specialized Hospital (JUSH). Subjects were collected using convenience sampling technique. Measurement of Vtg and body composition of the patients was carried out using a BOD POD at a research laboratory at JUSH. All the procedure that are indicated by the manufacturer company for using the BOD POD in the assessment of body composition were applied.

Agreement between the predicted and measured Vtg and body compositions were tested using paired t-test, Pearson’s correlation, linear regression, and Bland-Altman plot.

Result: It was found that the BMI of the study population ranged from 13.2kg/m² to 31.2kg/m². Vtg and percent body fat (%BF) did not differ significantly (p > 0.05) between the two modes of assessment (predicted and measured). Strong correlation was observed between predicted and measured Vtg (r = 0.82, p<0.001). Correlation between predicted %BF and measured %BF was strong(r = 0.92, p<0.001). Linear regression of measured Vtgmeas(Y) against Vtgpred(X) (Y = -0.369 + 1.140X, R² = 0.68, SEE = 0.015) did not significantly deviated from the line of identity. Similarly, the regression of measured %BF (Y) against predicted %BF(X) (Y = 1·70 +0.94X, R² = 0·96) did not significantly deviated from the line of identity. Bland–Altman plot of the differences against the mean of predicted and measured Vtgs and %BFs showed no systematic differences. Conclusion: The BOD POD is a reliable technique to predict Vtg and body composition in PLWHA in Southwest Ethiopia. Therefore, researchers and clinicians can confidently use the predicted Vtg and body fat in place of the measured ones in PLWHA in Southwest Ethiopia.

Key words: BOD POD, Body composition, Thoracic gas volume, people living with HIV/AIDS.
Comparative Study of the Nutritional Status of Preschool Children from Households with and Without Home Gardening in Wondogenet Woreda, Southern-Ethiopia

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Background: Because nutrition, agriculture and health are spiral in their relation nutrition interventions are focusing on nutrition sensitive agriculture. Poor nutrition perpetuates poverty and malnutrition through variety of routes. Among the high impact nutrition sensitive interventions improved home-garden is one of the sustainable agricultural focused work to improve undernourishment. Evidences assessing home-garden Vs nutritional status side by side are limited in Ethiopia this study was to compare the nutritional status of preschool children among households with and without home-gardening in Wondogenet woreda, South Ethiopia, 2015.

Methodology: A community based comparative cross-sectional study was conducted in Wondogenet woreda, Sidama Zone, Southern-Ethiopia. Computer generated random numbers were used to select study participants after census of eligible households. Data was collected quantitatively using structured questionnaire. Then the collected data was entered in to a spreadsheet and exported to SPSS and analyzed using SPSS software. WHO Anthro software was used to generate z-score for nutritional status of the preschool children. The statistical tests used for data analysis were t-test and logistic regression. Statistical significance was set at p<0.05.

Result: A total of 215 preschool children from the home-gardening and 215 from households without home-gardening were included in the study. In households with home-garden, about 41% of the children were stunted, 28% of them were under weight and 7.9% were wasted. The mean (SD) of height for age, weight for age and weight for height Z-scores were -1.55(1.17), -1.3(0.8) and -0.6(0.9), respectively. In households without home-gardening, nearly 44% of the children were stunted, 30% of them were under weight and 8.8% were wasted. The mean (SD) height for age, weight for age and weight for height Z-scores were -1.6(1.2), -0.98(0.93) and -0.14(1.2), respectively. Our results revealed that there were significant mean differences in weight for age (p<0.0001), height for age (p<0.026) and weight for height (p<0.0001) between households with and without home-gardening.

Conclusion: High prevalence of stunting and underweight was reported from both households with and without home-gardening. Proportion of undernourishment from households with home-garden was lower than households without. Promoting and intervening for home gardening is with green light to reduce the high prevalence of undernutrition among pre-school children. Further research better be conducted to evaluate the nutritional significance of home-gardening for pre-school children.

Key words: Pre-school children, Home-garden, Nutritional Status and Wondogenet
A Comparative study on serum level concentration of micronutrients (zinc, copper and chromium) status in type 2 diabetic patients in Diabetes & endocrinology unit, Tikur Anbessa Specialized Hospital, Ethiopia

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Introduction: Diabetes mellitus (DM) is a chronic metabolic disorder affecting carbohydrate, lipid, and protein metabolism. DM is a heterogeneous disease characterized by an absolute or relative deficiency of insulin and insulin resistance. Many studies have reported an association between DM and alterations in the metabolism of several micronutrients. In Ethiopia the study in the relationship between micronutrients (Zn, Cu and Cr) status and type 2 diabetes (T2DM) is scanty. The present study was aimed to assess and compare the concentration of the fasting serum zinc, copper and chromium status in T2DM and non diabetic subjects.

Materials and methods: The study design was cross sectional comparative, conducted on 108 human subjects divided in to two groups: 54 subjects’ age range between 20-76 years old with the diagnosis of T2DM. The other 54 subjects who are age and sex matched were grouped as the control. After demographic and anthropometric information gathered, the blood sample was collected for the biochemical analysis. Fasting serum glucose was measured using glucose oxidase methods. The serum concentration of micronutrients namely zinc, copper and chromium were determined by using atomic absorption spectrophotometer. The data obtained from study was processed statistically by using student’s t-test and Pearson’s correlation.

Results: Compared with control groups, T2DM patients had greater BMI (p<0.001); higher WHR (p<0.001); elevated SBP (p<0.001); and higher diastolic DBP (p<0.001). The fasting serum glucose level of T2DM (196.4 ± 86.77mg/dl) was significantly higher than control subjects (90 ± 14.39mg/dl). The mean serum levels of zinc in T2DM (0.744 ± 0.211mg/l ) was significantly(p<0.003) lower than control(1.099 ± 0.502mg/l), chromium (0.679 ± 0.413 mg/l)  was also significantly(p<0.0001)lower than control(1.064±0.483mg/l) and Cu(0.502±0.148mg/l) had significant(p<0.0001)ly higher concentration than control(0.340±0.137mg/l). In the present study, the fasting serum glucose were found negatively correlated with serum levels of Zn(r= -0.290, p=0.033), and Cr(r=-0.012, p=0.0001) of diabetic subjects. Non- significant positive relationship was observed between concentrations of serum glucose and Cu(r = 0.438, p =0.113). There was no association of serum concentration of these micronutrients with gender and blood pressure in T2DM patients (P>0.05).

Conclusion and recommendations: Findings of this study indicated a lower serum zinc and chromium concentrations and higher copper status were found in type 2 diabetics of Ethiopian subjects. The study suggests that another research should be conducted in the effect of the supplementation of micronutrients on controlling of type 2 diabetic mellitus.

Keywords: Type 2 diabetic, zinc, copper, chromium, serum glucose, atomic absorption spectrophotometer
The Status of Arbuscular Mycorrhizal Fungi (AMF) Under Different Plant Species Grown in Three Land Use Types

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AMF are important microbes forming symbiosis with more than 80% of the terrestrial plants. They have extensive hyphae that increase the root surface area to enhance water and mineral uptake. However, the density and diversity of AMF may be affected by land use changes. This requires evaluation of their status on different cropping systems. To this effect, investigation was made on culturally protected forest, agroforestry practices, and monocropping lands in Wensho and Shebedino Woredas (districts). Rhizosphere soils and root samples from different plant components of each land use type were collected and analyzed for spore density, diversity and AM-root colonization using standard methods. All plants surveyed in the three land-use types showed arbuscular mycorrhizal colonization ranging from 50 to 91%, except the non-mycorrhizal plant, Brassica integrifolia. A total of 29 AMF morphospecies, belonging to nine genera (Acaulospora, Glomus, Claroideoglomus, Funneliformis, Pacispora, Septoglomus, Rhizophagus, Scutellospora and Gigaspora), were found in the rhizospheres of selected plants in the three land use types. The dominant genera were Rhizophagus, Glomus, Funneliformis, and Acaulospora with high spore density, accounting for 36.22%, 19.39%, 17.54% and 11.74% of the total number of spores, respectively. One-way analysis of variance (ANOVA) showed that spore density and root colonization of different AM structures varied greatly among plant species both within and between different land-use types. Mean spore density was higher (752.91) in culturally protected forest and mean AM colonization was higher in the agroforests (71.53%). The lowest spore density and the lowest percentage of root colonization (427.4, 53.38%) respectively were recorded in cropland. When land use types were considered separately or together no significant correlation was found between spore densities and AM colonization. This study indicates that mono-cropping reduces spore density and AM colonization in comparison with the culturally protected forest and agroforestry practices.

Key words: Agroforestry, crop land, arbuscular mycorrhizal fungi, colonization, spore density
Factors Associated with Nutritional Status of Human Immunodeficiency Virus Infected Children in Hawassa University Referral Hospital, Hawassa, Southern Ethiopia

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Background: Nutritional problems and HIV infection are closely interlinked disorders. Immune impairment as a result of HIV infection leads to malnutrition, which in turn, can lead to reduce the immunity. This study aimed to assess nutritional status and associated factors among HIV positive children.

Method: Institution based cross sectional study was conducted on 455 HIV positive children aged 6week to 14 years. Weight and height/length measurements were taken. Data were collected from caretakers using a structured questionnaire and child medical record. Logistic regression analyses were used to determine the factors affecting nutritional status of the children.

Result: In this study, the proportions of stunting, underweight, and wasting were 60.2%, 41.2%, 21.4%, respectively. In 5-10 years children, underweight was associated with advanced HIV clinical stage [AOR=2.33 (1.47, 3.67)], low child meal pattern [AOR=7.49 (2.48, 22.65)], food variety >4 [AOR=0.46 (0.23, 0.95)], low average monthly income of the family [AOR=4.97(2.24, 11.05)] and dietary counseling to the care taker [AOR=0.46 (0.29, 0.75)]. Wasting was significantly associated with presence of acute disease [AOR=1.70 (1.01, 2.86)], dietary counseling to care taker [AOR=0.09 (0.35, 0.23)] and rural residential area [AOR=2.38 (1.01, 5.64)]. Stunting was significantly associated to low average monthly income [AOR=2.56 (1.14, 5.75)].

Conclusion: This study has shown the high prevalence of under nutrition among HIV positive children on follow up in Hawassa referral hospital. Hence, attention should be given to nutritional assessment, feeding habit and dietary counseling to the care giver.

Key wards: Nutritional status, HIV Infected Children, Hawassa, Ethiopia
Association of Intestinal Parasitic Infection and Nutritional Status of Pre-school Children Aged 24-59 months in Hawassa Zuria Woreda, Southern Ethiopia: a cross-sectional study

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Introduction: Childhood is an age in which children are expected to shape prenatal nutritional deficiencies and foster good health including nutritional status. Intestinal parasitosis is common among children from developing countries. Though a bunch of literatures well discuss intestinal parasitosis and nutritional deficits as problems to be focused on separately evidences examining association of the two issues are limited in Ethiopia. Therefore, this study was designed to investigate the relationship between intestinal parasitosis and anthropometric status of pre-school children aged 24-59 months old in Hawassa Zuria Woreda, Southern Ethiopia.

Method: A community based cross-sectional study design was employed. By using simple random sampling technique 597 child-mothers/caregiver pairs were selected and interviewed with semi-structured questionnaire. Anthropometric statuses were generated using WHO-Anthro. Data was analyzed using descriptive statistics and chi-square test.

Result: The prevalence of stunting, underweight and wasting were 245(41%), 134(22.4%) and 79(13.2%), respectively. Half (51.3%) of children were at least with one intestinal parasite and ascaris lumbricoids was the prevalent parasite (42.2%). Ascaris lumbricoid (X²=46.12 and p-value<0.001), gardia lambela (X²=8.23 and P-value<0.004) and hymenolopis Nana (X²=5.13 and p-value=0.02) were statistically significantly associated with nutritional status of pre-school children.

Conclusion: Both undernutrition and intestinal parasitosis are public health concerns of the study area. Ascaris lumbricoids, gardia lambela and hymenolopis nana were found associated with nutritional status of pre-school children. Per the finding, stakeholders and mothers/caregivers better focus on preventive and curative therapies of both undernutrition and intestinal parasitosis. Further studies can be done focusing cause-effect relationship and examining effect of intestinal parasitosis preventive and curative therapy on nutritional status of the children.

Keywords: Pre-school Children, Nutritional Status and Intestinal Parasitosis
Development of Complementary Food From Maize-Cowpea Blends

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The study was conducted with objective that product developments from maize cowpea blend. Maize (Melkassa 7) and two cowpea varieties (Asebot and Bole) were collected from Melkassa Agricultural Research Center. 100 seed weight, volume and density of two cowpea varieties were done. Sample preparations were done after cleaning, soaking, dehulling (cowpea), milling, and sieving. Proximate composition analyses were done for grains. Protein contents of (25.07%, 21.20 and 10.14) and ash content of (3.71%, 2.61% and 1.01%) were obtained for Asebot, Bole and Melkassa 7 (Maize) respectively which are significantly different (P<0.05). Based on this Asebot variety (cowpea) was selected and blends with maize (Melkassa 7) to 67:33 (maize-cowpea) ratios to achieve protein need in the production of complementary food. Further sample preparations were done by blending, fermenting for 0, 24 and 48 h, tray drying for 24 h, making flour. The prepared samples were subjected to different analyses. The increase in protein and ash were significant (P<0.05), while decreasing effects are observed in other parameters like carbohydrate, fat, fiber. Mineral content increment for Fe, Zn and P between blends with fermentation time was 6.395 to 7.245, 3.01 to 4.25 and 229.94 to 238.94 mg/100 g respectively. 54.50% and 34.12% decrease in phytate and tannins content respectively were seen with fermentation time increments. Except Fe, all minerals are bioavailable and effect of fermentation was observed. Fermentation had a significant (P<0.05) increasing effect on titratable acidity, dispersibility and whereas; decreasing effect on pH, bulk density, water absorption, & oil absorption. (ScMF)24 have scored highest sensory values 8.2, 7.7, 8.4 and 8.1 for color, aroma, taste and overall acceptability, respectively. Steam treatment, fermentation and utilization yellow maize significantly affects the product performance. Generally, Fermentation and steamed cowpea fortification caused an increase in protein, ash, TTA, and improved mineral bioavailability and decrease in fat, carbohydrate, crude fiber, antinutritional factors, and pH of blend flour.

Key word: anti-nutrient, complementary foods, cowpea fortification, Fermentation, functional properties, minerals, proximate compositions, steamed cowpeas.
Review on Community Based Municipal Solid Waste Management and its Implication for Climate Change Mitigation

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Most of the Towns in developing countries use traditional solid waste management system or damping in landfill, which results in environmental and health risks as well as losing economic opportunities in terms of the resource value of the waste. Therefore, this review is needed to compare and contrast the relationship between conventional solid waste management with that of participatory solid waste management (Integrated Solid Waste Management, ISWM). In order to minimize the hazardous effect of solid waste, active community participation is necessary in every level of solid waste management. The community participation plays a great role in Solid waste reduction by showing their willingness to use those materials with no/or little waste, which results in a significant reduction of the municipal budget for waste collection and transportation. And also, it plays the role in recycling, and conversion of solid waste in to compost as a mechanism to increase agricultural productivity and production. Moreover, community based solid waste management plays a great role in climate change mitigation by reducing green house gas emission to the atmosphere. This is possible by applying the ISWM, which gives attention to avoidance, reduce/minimize and reuse, even though they are integrated with recycle, recovery, treatment and disposal of solid wastes. Therefore, the effectiveness and efficiency of solid waste management depends on the willingness and active participation of community members, since the waste is generated mainly from local community.

Key words: Climate Change, Community Participation, Solid Waste Management
Intestinal α-glucosidase and some pancreatic enzymes inhibitory effect of hydroalcoholic extract of Moringa stenopetala leaves

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Background: Moringa stenopetala has been used in traditional health systems to treat diabetes mellitus. One of the successful methods to prevent the onset of diabetes is to control postprandial hyperglycemia by the inhibition of α-glucosidase and pancreatic α-amylase activities, resulting in the aggressive delay of the carbohydrate digestion of absorbable monosaccharides. The aim of the present study is to investigate the effect of the extract of the leaves of Moringa stenopetala on α-glucosidase, pancreatic α-amylase, pancreatic lipase, and pancreatic cholesterol esterase activities, and, therefore find out the relevance of the plant in controlling blood sugar and lipid levels.

Methods: The dried leaves of Moringa stenopetala were extracted with hydroalcoholic solvent and dried using rotary vapor under reduced pressure. The dried extracts were determined for the total phenolic compounds, flavonoid content and condensed tannins content by using Folin-Ciocateu’s reagent, AlCl3 and vanillin assay, respectively. The dried extract of plant-based food was further quantified with respect to intestinal α-glucosidase (maltase and sucrase) inhibition and pancreatic α-amylase inhibition by glucose oxidase method and dinitrosalicylic (DNS) reagent, respectively.

Results: The phytochemical analysis indicated that flavonoid, total phenolic, and condensed tannin contents in the extract were 71.73±2.48 mg quercetin equivalent/g of crude extract, 79.81±2.85 mg of gallic acid equivalent/ g of crude extract, 8.82±0.77 mg catechin equivalent/g of crude extract, respectively. The extract inhibited intestinal sucrase more than intestinal maltase with IC50 value of 1.47±0.19 mg/ml. It also slightly inhibited pancreatic α-amylase, pancreatic lipase and pancreatic cholesterol esterase.

Conclusion: The result demonstrated the beneficial biochemical effects of Moringa stenopetala by inhibiting intestinal α-glucosidase, pancreatic cholesterol esterase and pancreatic lipase activities. A daily supplement intake of the leaves of Moringa stenopetala may help in reducing hyperglycemia and hyperlipidemia.

Keywords: Moringa stenopetala, phytochemical analysis, α-glucosidase, pancreatic enzymes
Effect of Cooking Methods on Nutritional Composition and Anti-Nutritional Factors of Hyacinth Bean (Lablab Purpureus L.) Sweet Varieties, Ethiopia

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Hyacinth bean is very important grain legume, of the family Leguminosae, have been utilized as crop and staple food source. Characteristically, legumes, especially beans are considered an important and inexpensive protein and dietary fiber sources in human nutrition. To generate data about the hyacinth bean preliminary survey and analytical techniques were used and analyzed by two way ANOVA. The results were expressed mean ±SE of triplicates. The raw and processed hyacinth bean (Lablab purpureus L.) sweet varieties were studied and compared for their nutritional composition: moisture, crude protein, total ash, crude fiber, crude fat, carbohydrate; minerals: (Ca, Fe, Zn, and P) and ANFs: (phytate and tannin) based on different processing techniques. Sensory acceptability test of cooked hyacinth bean varieties were also reported. Boiling, autoclaving and soaking treatments significantly (p<0.05) decreases the moisture, crude fat and ash contents respectively whereas they significantly (p<0.05) increases the fiber and carbohydrate contents. Cooking and soaking treatments were non significant (P<0.05) on crude protein content on both hyacinth bean varieties. Boiling and autoclaving treatments increases the Ca, Fe, Zn and P contents of highworth variety while they significantly(p<0.05) increases Ca, Fe and P and decreases Zn contents of rongai variety. tannin content of both rongai and highworth varieties. The phytate: Zn, phytate: Fe and Ca:phytate molar ratios and phytate*Ca:Zn millimolar ratios were determined in order to estimate the bioavailability of these minerals. The molar ratio of phy:Fe and Ca:phy was >1 and >6 respectively indicating that Fe and Ca absorption could be impaired. This study also revealed that, the sensory acceptability test on the major sensory attributes of boiled and autoclaved hyacinth bean varieties were reported. And there was no a significant difference observed on the sensory attributes of (color, aroma, taste, texture and over all acceptability) of the hyacinth bean products.

Key words: Hyacinth bean, variety, boiling, autoclaving, nutritional composition, minerals, ANFs, phytate: mineral molar ratio, sensory acceptability test.
An In Vitro Estimation of Glycemic Index of White Bread and Improvement of the Dietary Fiber

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One of the major challenges to modern food industry is the demand by consumers of products that look appealing for longer periods of time and the preference for minimally processed products that do not contain chemical preservatives and maintain health benefit. This encourage the use of dietary fiber to combat some metabolic disorders like diabetes and other immunological compromising’s. To this regard, an in vitro estimation of Hydrolysis index (HI) and Glycemic index (GI) and improvement of dietary fiber in white bread is an indicator that minimizes the metabolic disorder. Dietary fibers (DF) sources were screened for the crude fiber composition. Selected fiber sources (Avocado and Baobab) pulps were as sources of pectin and were found to have 13%, 30% respectively. Analysis of total dietary fiber (TDF), insoluble dietary fiber (IDF) and soluble dietary fiber (SDF) were carried out according to the manufacturers total dietary fiber kit (Megazyme, Ireland) protocol and methods described in AOAC (2000). Improvements with DF were observed by enhancing on white breads (WB) based on the daily requirement of soluble fibers (pectin) composition, i.e. 6g/day [24] Samples of Avocado improved bread (AVB) and Baobab improved bread (ADB) were made by mixing in proportion of wheat flour to avocado / baobab pulps (97:3); (94:6); (88:12). Analysis of proximate composition and in vitro estimation of HI and GI were done for products to evaluate the quality and impact on blood glucose level. Significant differences were observed for predicted GI between improved bread and controls, 82.84±0.37b (WB), 80.63±0.21c (ADB), 78.50±0.30f (AVB). As a result, the reductions in glycemic index for the improved white breads indicate the delay in release of glucose from absorption by the cell due to the viscous nature of dietary fiber component. Thus, the improved white breads with appropriate soluble dietary fiber (pectin) content, reveals the potential for the reduction of blood glucose level and can be considered as functional foods (neutraceuticals) along with its moderate level degree of likeness or sensory acceptability.

Key words: Dietary fiber, in vitro, Hydrolysis index, Glycemic index, neutraceuticals
Determinants of acute malnutrition among children of age between 6 to 59 months in Dubti district, Afar Regional State, Ethiopia: A case control study.

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Background: In developing countries acute malnutrition continues to be the most important risk factor for illnesses and death especially among young children. In sub-Saharan Africa, nearly 1 in 10 children under the age of five (9 per cent) were acutely malnourished in 2011. Ethiopia is one of the countries with very high burden of acute malnutrition which is among the top ten most affected countries by acute malnutrition including 10 per cent of under five children were acutely malnourished. The objective of this study was to assess the determinants of acute malnutrition among children of age between 6 to 59 months in Dubti district, Afar Regional State Ethiopia.

Methods: A health facility based unmatched case-control study design was conducted. The cases were 140 acutely malnourished children of age between 6 to 59 months and the controls (n=280) were children of age between 6 to 59 months without acute malnutrition. The study was conducted from Jan 20 to Feb 2014 in two health centres and one hospital of Dubti district. A pre-tested structured questionnaire was used to collect data. Bivariate and multivariable logistic regression was used and statistical significance was determined through a 95% confidence level.

Results: Those children aged between 12-23 months were more likely to be acutely malnourished than those with in the category of 24 to 59 months (AOR=10.5, 95% CI = (4.935, 22.343)). Rural residence (AOR=2.42, 95% CI= (1.22, 4.798)), married and in union (AOR=0.366, 95% CI (0.163, 0.823)), paternal illiteracy (AOR= 2.468, 95% CI = (1.321, 4.611)) and household monthly income of less than 1000 birr (AOR=3.981, 95% CI (2.059, 7.698)) were positively associated with acute malnutrition. Regarding child characteristics and feeding practice; those children whose food prepared and served not separately from the family (AOR=2.185, 95% CI= (1.109, 4.304)), taking vitamin A supplementation (AOR=0.52, 95%CI= (0.286, 0.935)) and being first child (AOR=0.059, 95% CI= (0.015, 0.234)) were strongly associated with acute malnutrition. Mothers who were engaged in fetching water from walking a distance of less than or equal to 30 minute (to and from) are less likely to have acutely malnourished child than long distance fetchers.

Conclusion: The finding of this study confirms the association of acute malnutrition with socio economic and feeding practice of the child. As a recommendation improving practice of parents on appropriate feeding practices and creating awareness related to risk factors of acute malnutrition should be strengthened.
Association between maternal and child nutritional status in Hula, rural southern Ethiopia: A cross sectional study

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Background: Maternal and child under nutrition is highly prevalent in low-income and middle-income countries, resulting in substantial increases in mortality and overall disease burden. The aim of this baseline survey was to determine the association between selected maternal characteristics, maternal nutritional status and children’s nutritional status.

Methods and Findings: A survey with a cross sectional design was conducted between September and October 2012 in Hula, Ethiopia. The study subjects were 197 mothers of children between the ages of 6 and 23 months. Weight and height (mothers) or recumbent length (children) was measured using calibrated, standardized techniques. 6.8% of children were below -2 weight for height Z score (WHZ), 11.5% were below -2 height for age Z score (HAZ) and 9.9% were below -2 weight for age Z score (WAZ). Maternal anthropometrics were associated with child nutritional status in the bivariate analysis. Maternal BMI (r=0.16 P=0.02) and educational status (r=0.25 P=0.001) were correlated with WHZ of children while maternal height (r=0.2 P=0.007) was correlated with HAZ of children. After a multivariate analysis, children whose mothers had salary from an employment had a better WHZ score (P=0.001) and WAZ score (P<0.001). Both maternal BMI and maternal height were associated with WHZ (P=0.04) and HAZ (P=0.01) score of children.

Conclusion: Having a better nutritional status and salary from an employment will benefit the nutritional status of children. The interrelationship between maternal and child nutritional status stresses the value of improving maternal nutritional status as this should improve both maternal and child health outcomes. Therefore to implement better nutritional status of children, interventions should include improving the nutritional status of the mother and empowering her financially.

Key words: Maternal nutritional status, Children’s WHZ, HAZ and WAZ, Maternal employment
Nutrition education and introduction of broad bean-based complementary food improves knowledge and dietary practices of caregivers and nutritional status of their young children in Hula, Ethiopia

Canaan Negash, Tefera Belachew, Carol J. Henry, Afework Kebebu, Kebede Abegaz and Susan J. Whiting

**Background:** Nutritious complementary foods are needed in countries where undernutrition and stunting are major problems, but mothers may be reluctant to change from traditional gruels.

**Objective:** To test whether a recipe-based complementary feeding education intervention would improve knowledge and practice of mothers with young children in Hula, Ethiopia.

**Methods:** A baseline survey of 200 eligible, randomly selected mother-child pairs gathered data on sociodemographic characteristics, food security status, knowledge and practices concerning complementary feeding, food group intakes of children 6 to 23 months by 24-hour recalls, and children’s anthropometric measurements. Twice a month for 6 months, women in intervention group received an education session consisting of eight specific messages using Alive and Thrive posters and a demonstration and tasting of a local barley and maize porridge recipe containing 30% broad beans. The control group lived in a different area and had no intervention.

**Results:** At 6 months, knowledge and practice scores regarding complementary feeding were significantly improved (P<0.001) in the intervention group. The intervention resulted in improvement of children’s dietary diversity, as well as mean intake of energy and selected nutrients, compared with children in control group. Changes in height and weight did not differ between the two groups.

**Conclusion:** Community-based nutrition education over 6 months that included demonstration of a local porridge recipe with broadbeans added improved the complementary feeding practices of caregivers and the nutritional status of their young children.

**Key words:** Broad bean, complementary foods, Ethiopia, feeding practice, infants and young children, nutrient intake
Effects of Bradyrhizobia Inoculation on Growth, Yield, and Nutritional qualities of Cowpea Varieties (Vigna unguiculata (L.) Walp) at Hawassa, Ethiopia

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Declining soil fertility, especially deficiency of nitrogen is one of the major factors adversely affecting crop production in Ethiopia. Though the problem can be addressed through application of inorganic fertilizers, the unprecedented increase in the cost of fertilizer is increasingly limiting the use of this input. Increasing N-availability through Bradyrhizobium-legume symbiotic N-fixation process is a viable alternative for improving N-nutrition of crops. However, there is a need for identifying effective Bradyrhizobium strains compatible with specific varieties of leguminous crops. Therefore, this study was conducted to investigate the effect of Bradyrhizobium strains on growth, yield and yield components of Cowpea (Vigna unguiculata (L.) Walp) varieties at Hawassa. A factorial combinations of four treatments [three Bradyrhizobium strains GN100, GN102 and MB140] and a positive control, and five Cowpea varieties (Bole, Black eye bean, TVU, Assabot and Wonder) were laid out in RCBD with three replications. The plot size was a 2.2m x 3 m and cowpea seeds were planted with inter and intra row spacing of 50cm by 20cm respectively. Data on nodule number, nodule volume, nodule dry weight and agronomic parameters like shoot dry weight, leaf area index (LAI), plant height, number of branches, pods, seed per pod, grain yield, biomass yield, harvest index (HI), 100 seed weight, total plant N and some soil chemical parameters (OC%, P, N pH) were collected and subjected to ANOVA. Inoculation with Bradyrhizobium significantly increased the nodule parameters, Agronomic performance, yield and yield components. Nodule parameters yield and yield components of the five Cowpea varieties inoculated with strain GN102 were significantly superior followed by GN 100 and MB 140. On Black eye bean and Assabot varieties, Strain GN102 increased the grain yield by 14 and 9%, respectively relative to the positive control. Cowpea varieties also varied significantly in their performance with respect to nodule parameters, yield components and total protein content. Accordingly, Black eye bean variety performed best relative to the other four varieties. Bradyrhizobia by varieties interaction effects were also significant in terms of yield and yield components. Compared to before planting, strain GN100, GN 102 and MB140 increased soil N by 51.6, 46 and 40%, respectively after planting. Despite the commonly reported non responsiveness of Cowpea for inoculation, the result presented here indicated the potential that exists to increase the yield of the crop through selecting and inoculating with effective Bradyrhizobial strain.

Keywords: Biological N-fixation, Cowpea, inoculation, Nitrogen, nodulation and Soil fertility decline
The Role of Women Empowerment on Stunting Among Under Five Children in Gambella Town, South West Ethiopia

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Background: Worldwide, more than 3 million preventable child deaths annually is attributed to child undernutrition. Four-fifths of the world’s undernourished children are living in just 20 countries, mainly South Asia and sub-Saharan Africa. In addition to about 16.5% of annual GDP loss, child undernutrition in Ethiopia is responsible for 51% of deaths of under-five children. Women’s empowerment status has greater determining power of child nutritional status.

Objective: To assess the role of women empowerment on stunting among under-five children in Gambella town, Southwest Ethiopia.

Methods: A community based cross-sectional study was deployed and data was collected by trained interviewer. The height-for-age index was compared with new WHO standard. Data was entered into Epi-info version 3.5.4 and SPSS version 16.0 for analysis. Bivariate and multivariate logistic regression was fitted to identify the association between factors and stunting. Significance was obtained at adjusted odds ratio with 95% CI and p< 0.05. The questionnaire was pre-tested and confidentiality was maintained throughout the study.

Result: A total of 358 women were responded giving a response rate of 95%. The mean age of the participants was 26.5 (std. ± 4.9). More than half, 180(52.9%), were housewives whereas only 131 (38.5%) were employed. The overall prevalence of stunting among under-five children was 25.3%. Child’s age [AOR=6.78, 95%CI: 1.96-23.44], decision on mother’s income [AOR=1.96, 95%CI: 1.06-3.62], decision on daily purchase [AOR=2.49, 95%CI: 1.16-5.36], decision on family visit [AOR=3.47, 95%CI: 1.42-8.45] and wife beating justification [AOR=3.16, 95%CI: 1.69-5.90] were independently and significantly associated with under-five stunting.

Conclusion: The result showed that women empowerment is the important determinant factor of stunting.
The unresolved wonder on contaminant iron bioavailability: The way forward

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Human can ingest extrinsic iron either involuntarily or deliberately. Contaminant iron from different sources like soil, processing equipment etc. in foods may lead to overestimation of the satisfaction of iron requirement while iron deficiencies remain a widespread health problem. The principal objective of this article is to review the existing invitro and invivo studies on contaminant iron bioaccessibility and bioavailability. The majority of the research findings, in both cases invitro and invivo, that are reviewed under this article suggest that soil contamination/geophagy does not enhance iron status and may even lower it in some cases. However, the mechanisms and degree to which geophagic substances adsorb or inhibit iron absorption remain unclear and with these circumstances it would be difficult to conclude that geophagy interferes with iron absorption. Few articles suggest that contaminant iron from soil and processing equipment could be a good source of dietary iron and iron bioavailability could be possibly enhanced with the combined effect of contamination and processing more specifically fermentation. However, more invivo contaminant iron bioavailability studies using golden method “rat hemoglobin repletion efficiency” should be conducted before drawing any conclusion on contaminant iron bioavailability since it depends on multiple effects that could not be covered under any of invitro iron bioavailability/bioaccessibility tests.

Key words: bioaccessibility, bioavailability, contaminant iron, invitro, invivo,
Fish post-harvest technologies as a mean of food and nutrition security

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Fish provide the main source of animal protein to about billion people globally. Fisheries are an important part of food security, particularly for many poor peoples in developing countries. In low income food deficiencies countries (LIFDCs) they make up 22% of animal protein consumption overall. The importance of small-scale fisheries in particular for food security is emphasized by FAO especially in coastal areas and around major rivers systems. Fish and fisheries contribute to food security through subsistence and local consumption, income, accessible protein for the poor, reduces vulnerability etc. Fish plays an important role in a nutritionally rich diet for many Ethiopians. Eating habits have been shifting in favor of fish in the areas and communities where there is regular and significant supply. In those communities, annual fish consumption can exceed 10Kg/Person”. Among different solutions to maintain fisheries’ contribution to food security; reduction in fish post-harvest loss, improving the traditional processing, handling, and preservation method of fish and its gear system, developing new and value added products, etc through generating and adopting new technologies are crucial and the concern of this paper. Different fish driers, processing kits, fertilizer, meal, smoking and marinating, retaining cage are among generated, adopted and scaled up technologies which contributes a vital role in food and nutrition security through availing preserved high quality protein and minerals, increasing production and its shelf life availing throughout the year at different places, generating income job opportunities to numerous householders(fish catch, net production, value addition, distribution, market processing).

Keywords: fish, food, nutrition, processing, technology.
Sustainable Under Nutrition Reduction in Ethiopia (SURE); A Feasibility study examining SURE implementation in Basona Worana Woreda, Amhara region, Ethiopia

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Background: Under nutrition is still a public health problem and remains a concern to Ethiopia’s rapid economic development. Community Based Nutrition (CBN) is an important component of the national nutrition program to improve nutritional status of infants, young children and children under-five years as well as pregnant and lactating women. Despite implementation of CBN and other nutrition programs, IYCF practices remain very poor in Ethiopia, especially timely introduction of complementary food and dietary diversity.

Methods: This feasibility study tested the implementation of SURE programme design components in Basona Worena Woreda, Amhara region before the roll out of the main programme across four regions in Ethiopia. Study participants were households (mothers and fathers of under-2 children), health and agricultural extension workers, health and agricultural development armies, and men’s and women’s support groups (1-30 community network members). Qualitative study design was employed. Data was collected using pre and post test, observation, semi-structured interviews and focus group discussion. The analysis was carried out by Nvivo software version 10.

Result: Health and agriculture extension workers gained demonstrable knowledge about infant and young child feeding, nutrition-sensitive agriculture and gender after attending the training provided by master trainees using the SURE training manual. HEWs and AEWs largely failed to apply the 3 A’s process (assessment, analyze and act) while providing counseling to households on IYCF and dietary diversity. The seasonal food calendar was not used as intended in the SURE programme design, and inconsistent delivery of dietary diversity messages was observed. No household action plan was agreed and documented at the end of each household visits. Similarly, health and agricultural extension workers did not follow the steps outlined in the SURE training manual and apply the skills necessary to conduct men’s and women’s group dialogues. Pairs of mothers and fathers in each household visited were found to be supportive of the joint HEWs and AEWs visits. HEWs and AEWs regarded their joint household visits as innovative and felt that they can realistically continue to work together provided that there is a strong commitment to nutrition by the local political and administrative bodies, who routinely oversee performance of HEWs and AEWs.

Conclusion: The integrated delivery model is well-accepted by both frontline workers and mothers and fathers. However, the feasibility study results also suggest that additional programme supports and tools are required to support achievement of the intended quality of delivery, namely: individualized assessment, analysis and proposal of correct actions to mothers and fathers, and negotiation of specific, clear and actionable solutions to relevant community problems on complementary feeding and dietary diversity.

Key words: Under nutrition reduction, Complementary feeding, Dietary diversity, Ethiopia
Development of Orange-Fleshed Sweet Potato (Ipomoea batatas) Juice: Analysis of Physico-Chemical, Nutritional and Sensory Property

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Studies indicated that orange-fleshed sweet potato (OFSP) root is a versatile food item with good nutritional importance. However this root is not utilized well in most developing countries. Developing and characterizing a new of OFSP could improve the utilization and Vitamin A intake. In the present study different OFSP-based juice products were developed through blending with ginger and mango juice: product-1 (100% OFSP), product-2 (99% OFSP & 1% ginger), product-3 (90% OFSP & 10% mango juice), product-4 (80% OFSP & 20% mango juice), product-5 (89% OFSP, 10% juice and 1% ginger), product-6 (79% OFSP, 20% mango juice & 1% ginger) and product-7 (commercial mango juice). Analysis of physico-chemical (pH, titratable acidity, total soluble solids and viscosity), nutritional (β-carotene, vitamin-C, iron, zinc, phytate, bio-availability of iron and zinc) and sensory (appearance, aroma, color, taste, mouth feel and over acceptability) properties of the products was conducted. It was shown that soluble solids, viscosity and β-carotene increased with increasing percentage of OFSP. Products flavored with ginger had lower pH, higher acidity and ash, enhanced taste aroma. Moreover, products flavored with mango juice had lower soluble solid and viscosity, better vitamin-c, taste, aroma, mouth feel, color and appearance. The phytate and bioavailability of iron and zinc was at acceptable range in ginger containing products. Generally, products contained both ginger and mango juice had better physico-chemical, nutritional sensory acceptability. In development of orange-fleshed sweet potato juice combinations of ingredients should be considered to improve overall quality and stability of the products.

Keywords: Orange-fleshed Sweet Potato, Juice, Blending ratio, Physico-chemical, Nutritional content, Sensory property
Difference in levels and predictors of food insecurity among urban and rural households of Kombolcha district of East Harerge zone, 2014

Asnake Ararsa

Introduction: Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food for a healthy and active life. In Ethiopia over 12,000,000 people are chronically or sporadically food insecure. This study can help to inform policy makers the level and predictors of household food security status in urban and rural areas.

Objective: to assess levels and predictors of food insecurity among urban and rural households in Kombolcha District, Eastern Harerge zone, Eastern Ethiopia 2014.

Methodology: Cross sectional study was conducted. One urban and five rural Kebeles were included in the study. Using stratified sampling 144 urban and 570 rural, a total of 714 households were selected. Standardized food security assessment tools were used. Descriptive summary using frequencies, proportions, graphs and cross tabs was used to present study results. Cross tabulations using Analysis of Variance, independent sample t-test, were performed. Finally, hierarchical linear regression was performed after assumptions were satisfied.

Findings: The Proportion of households that fall in food insecurity category was accounted for 74.6 percent (81.5 percent rural and 47.9 percent urban residents). Using household dietary diversity score, 61.7% rural households and 26.4% urban households had poor dietary diversity hence, food insecure. The most important adjusted predictor of food insecurity for rural residents as measured by both tools was socioeconomic status and livelihood zones. Using household dietary diversity and household food insecurity access scale the most important predictor of food insecurity among urban households was vegetable garden ownership and women occupation respectively.

Conclusion and recommendation: food insecurity was greater among rural and the district should work on better agricultural extension services and training at household level, intensifying income generating activities at local level, and increasing education and reducing attrition rate.

Key words: food insecurity, urban, rural, livelihood zone
Relationships Between a Prenatal Nutrition Education Intervention and Maternal Nutrition in Ethiopia

By: Divya Lakshmi Selvakumar

In Ethiopia, 17% of pregnant women ages 18-49 are malnourished and have low awareness of prenatal nutrition, which may relate to increasingly high rates of maternal and infant mortality. The purpose of this mixed methods research study was to determine the effects of a community-based prenatal nutrition education intervention program on maternal nutrition knowledge and attitudes in the Alaje district of Ethiopia. The theoretical framework was Sen’s capability theory of poverty, in which opportunities can lead to well-being and promote economic development. Research questions focused on the relationships among 8 independent variables—age, income source, degree of program implementation, marital status, education, number of pregnancies, number of children, and occupation—with respect to maternal nutrition knowledge and attitudes. Health workers recruited 135 pregnant and non-pregnant women in each of 2 villages: Dejen (control village) and Takha (experimental village), totaling 270 participants. The community intervention program was an add-on to the Ethiopian government’s nutrition program and provided information on portion sizes, the importance of eating an extra meal each day, and obtaining adequate rest during pregnancy. Data from customized pretest and posttest focus groups and surveys were collected. Focus groups were analyzed manually and surveys were analyzed using 1-way ANOVAs and descriptive statistical analyses. The key findings were that the women in Takha had significantly greater knowledge of the importance of prenatal health requirements. The implications for positive social change include recommendations for policy makers about proper dietary practices in order to improve pregnancy outcomes related to maternal malnutrition.
Nutrition mainstreaming in IFAD investments

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Overview: International Fund for Agricultural Development (IFAD) is an international financial institution and a specialized agency of the United Nations committed to providing investments that create a route out of poverty for rural people in the developing world.
IFAD core business is to invest, empower, inspire the rural people, resource-poor, marginalized, ‘nutritionally at risk’ and the prime beneficiaries are the smallholder farmers.
In response to the changes in development landscape, the work of IFAD is rapidly evolving and its investment has a renewed focus on nutrition. This initiative involves mainstreaming nutrition-sensitive activities into projects that are supporting food production and productivity, income, food access for the increase consumption of nutritious, safe and adequate food.

IFAD operations in Ethiopia: IFAD has Country Office presence in Ethiopia and its operation is in collaboration with the Government of Ethiopia. IFAD portfolio in Ethiopia consists of five on-going programmes:
• Agricultural Marketing Improvement Programme
• Rural Financial Intermediation Programme
• Pastoral Community Development Project
• Participatory Small-Scale Irrigation Development Programme
• Community-Based Integrated Natural Resources Management Project

Rationale for Nutrition Mainstreaming in IFAD investment: Despite record of fast growing economy in developing countries such as Ethiopia, malnutrition remains high particularly in rural poor communities. Malnutrition poses one of the greatest threats to smallholder farming communities in spite of the fact that rural farming communities produce most of the world’s food. Studies have demonstrated that agricultural activities contribute to potential adverse influence on child feeding and nutritional status. Typical agriculture in Africa is highly labour-intensive and may take time away for childcare, food preparation and affects family food pattern.

Nutrition-Sensitive actions in IFAD-funded interventions include:
Assessment and tracking of food knowledge, attitude and practice and nutrition situation
Integration of nutrition education and behavioural change communication in programme actions
Value chain development for improved nutrition
Gender and climate smart initiatives with a nutrition lens
Integration of labour and time saving technologies
Integrated homestead food production
Strengthening capacity of extension services on nutrition-sensitive agriculture
Dietary Calcium Intake and Sunlight Exposure Among Children Aged 6-23 Months in Dale Woreda, Southern Ethiopia: A Cross Sectional Survey

BY: FEVEN TEZERA

Background: Nutritional rickets can be caused by both calcium and Vitamin D deficiency. In Ethiopia limited evidence exist regarding the calcium intake of children and their sunlight exposure practices. The purpose of this study is so, to assess information regarding dietary calcium intake and sunlight exposure practice, which are much related with nutritional rickets.

Methods: Community based cross sectional survey with both descriptive and analytic components was used. A total of 170 children were selected using multi-stage sampling technique. Structured questionnaire and an interactive 24 hour dietary assessment method was used to collect data on socio-demographic and economic information and to assess dietary calcium intake of participant children. Ethiopian food composition table and world food was used convert dietary intake into nutrient content.

Results: The mean (±SD) age of the study children was 14.4 (±4.7) months. The male to female ratio was 1.24. Median (IQR) calcium intake of participant children was 378.9 (370) mg/d. From the total participant children 45(26.5%) had low dietary calcium intake comparing with their age specific recommended nutrient intake (RNI) value. Regarding sunlight exposure, about 70 (41.1%) participant mothers exposed their child to sunlight within 1 month of birth and about 96 (56.5%) of participant children were exposed to sunlight for 20 to 30 minutes per day.

Conclusions: In conclusion, we investigated the major causes of nutritional rickets, calcium and vitamin D deficiency, in a group of very young children (6-24 months) and found that they have risk of dietary calcium inadequacy because of low intakes in some children, and the effect of phytate on prevailing foods in the locality such as fruit and maize based complementary food. But regarding sunlight exposure, the participant children are not at risk of inadequacy because they have good exposure practices and there was no sunlight avoidance practice for majority of participant children.

Keywords: Ethiopia, Calcium, Rickets, Sunlight exposure, Vitamin D, Phytate
Effect of Audio-Visual Aids in Building Knowledge Score on Nutritional Benefits of Pulses Among Women of Reproductive Age in Meskan Woreda, Southern Ethiopia

Frezer Abebe, Carol J. Henry, Debebe Moges, Berhan Meshesha

Nutrition education is an important component of any health service that seeks to promote and improve the health of a population. We need to develop nutrition education materials that are most effective in building the knowledge base of women. Cheap and easily accessible materials are also preferred. The aim of this study was to evaluate and compare the effect of nutrition education materials (audio and video) in building knowledge of women at reproductive age group (15-49yrs) on nutritional value and health benefits of pulses consumption. A comparative study was employed in two purposively selected KEBELES (lowest administrative unit in Ethiopia), Jole Andegna and Ele. Women aged (15-49yrs) were selected by simple random sampling from the prepared sampling frame. The nutrition education intervention was conducted by (audio and video) consisted of four repeated sessions of nutrition education offered once a week for one month. Knowledge questions were given for women at baseline/pre intervention, immediately after intervention and delayed posttest intervention period. Data were collected by structured close-ended questionnaires administered by data collectors. Using pre intervention mean knowledge score as a control, data were analyzed with SPSS version 16.0 computer software. Descriptive statistics, chi square test (χ2), binary logistic regression, repeated measure of ANOVA were applied to compare mean knowledge scores within the group and after differences between the pre intervention and delayed posttest score was obtained independent two samples t-test was used to compare the mean of differences of scores between the two groups. The level of significance was set at 5%. A total of 240 (120 in each group) women in the reproductive age group participated in this study. Women in audio group showed statically significant improvement of mean knowledge scores after nutrition education intervention when compared to pre intervention with mean score differences (SD) of 5.12 (1.04) immediately after intervention, and 3.69 (1.76) (p< 0.001) at delayed posttest intervention period. Women in video group also showed statically significant improvement of mean score after intervention when compared with pre intervention mean score differences (SD) of 5.85 (1.69) immediately after intervention and 4.19 (1.94) at delayed post-test intervention period (p< 0.001). The comparison between the two groups showed that there was slightly higher improvement of the mean of difference of knowledge score in the video than the audio group with mean difference of (0.50). From the result it was concluded that both audio and video-based nutrition education interventions can help in improving mean knowledge score of women with respect to nutritional value and health benefits of pulses consumption. Video-based nutrition education had offered only slightly higher changes in mean knowledge score of women when compared with audio based nutrition education. Relative to the cost of audio material production, video material production is higher, which is a point of concern.

**Key words/phrases:** - Audio, health education, knowledge score, pulses, video, women
Physicochemical and Sensory Evaluation of Cookies Developed from Blend of Moringa stenopetala Leaf Powder and Wheat Flour

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Moringa leaves powder (MLP) and wheat flour was blended in the ratio of 0:100, 5:95, 10:90, 15:85 and 20:80 by using mixture simplex lattice design. Cookies were prepared from each of the blend by adding ingredients. The proximate composition, gross energy, Fe, Zn, Ca, P, sensory acceptability of cookies and functional properties of composite flours were evaluated. The crude fiber, ash, crude protein, Fe, Zn, Ca, and P were significantly increased (P<0.05) while crude fat, moisture, carbohydrate and gross energy of the cookies were decreased (P<0.05) as the ratio of MLP increased in the blend ratio. The functional properties of the composite flours like water absorption and swelling power were significantly (P< 0.05) increased while oil absorption capacity is significantly decreased as blending ratio of MLP was increased. The sensory acceptability of cookies decreased significantly with increasing in MLP ratio. Hence, the overall acceptability results confirmed that the 5% MLP blended (T2) cookies was more accepted than the others. In general, the study indicated that T5 (20% MLP) was found to be the best in nutritional value whereas T2 (5% MLP) was more acceptable than the others in sensory evaluation.

Keywords: Proximate analysis, Functional property, Moringa Leaf Powder, Sensory acceptability, nutritional content.
Development and Characterization of Bread from Mushroom and Wheat Composite flour Using Mixture Design and Optimization Technique

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Currently, no information is available on nutritional characters of mushroom species that are native to Ethiopia. A balanced and sufficient diet is a problem for low-income people which results in protein malnutrition marasmus and kwashiorkor in the country. Therefore, the major aim of this study was focused on substituting a part of whole wheat flour (WWF) with mushroom flour (MF) to develop ideal mushroom bread for children, as an attempt to solve the problem in protein energy malnutrition of children from 1-5 years. The effect of mushroom supplementation on some physico-chemical and sensory properties of wheat bread was determined, as well as the dough rheology properties (farinograph) of the whole wheat flour with various portions of the protein rich flour mushroom were investigated. Examination of the functional properties of two different flours/breads were carried out. Analyses were made for different formulated bread and compared with the recommended daily allowance (RDA). The crude protein, crude fat, crude fiber, ash and energy of the composite bread loaves increased significantly ($p < 0.05$) from 10.21\% to 23.92\%, 1.72\% to 1.92\%, 1.59\% to 2.57\%, 0.88\% to 2.69\% and 275.4kcal to 276.45kcal respectively; while the moisture content and carbohydrate decreased with increased level of supplementation from 30.84\% to 28.02\%, and 54.76\% to 40.89\% respectively. There was also a decrease in bulk density and bread volume by 22.22\% and 44.86\% respectively, with progressive inclusion of the mushroom flour. The sensory analysis showed that there was no significant difference ($P \leq 0.05$) was observed in texture, taste, flavor and overall acceptability up to 12.5\% substitution with mushroom flour. It was concluded that a substitution of 12.5\% mushroom flour into wheat flour gave the bread with the best overall quality acceptability. Therefore, Mixture Design was used to investigate the effects of Whole Wheat Flour (WWF) and oyster mushroom flour (MF) on the bread. In this study, Mixture Design was employed to optimize the ingredient formulation and processing parameters of MF incorporated bread such as nutrient and sensory score responses. D-optimal design consisting of WWF and MF, with 13 formulations for the nutrient and sensory score of the MF incorporated bread. The result of the optimized acceptability of the MF incorporated bread containing WWF 80.86\%, MF 19.14\%, protein 34g, energy 455.78kcal and overall acceptability of 6.2 were suitable for children between the age groups of 1-5 years as compared to recommended dietary allowance for children. Hence it is concluded that Mixture Design was used successfully to optimize the level of WWF and MF for the development of bread.

\textbf{Keywords:} Development of bread, mushroom, wheat, optimization, characterization design mixture.
Study on Aspergillus Species and Aflatoxin Levels in Sorghum (sorghum bicolor L.) Stored For Different Period and Storage System in Kewet Districts, Northern Shewa, Ethiopia

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Sorghum serves as staple food for over 100 million people in Sub-Saharan African countries. It is the most important nutritional security crop and ranks third among major cereal crops in terms of area and production next to teff and maize in Ethiopia. However, sorghum is susceptible to contamination by molds that produces aflatoxins that cause hepatotoxic and carcinogenic effects on humans and animals. This study was conducted to assess Aspergillus species and aflatoxin level in sorghum (sorghum bicolor L.) stored under different storage systems for different storage period. Thirty samples were analyzed for aflatoxins contamination using HPLC equipped with fluorescent detector and Aspergillus species were isolated and identified using phenotypic features in a potato dextrose agar culture media. About 56.7%, 16.7%, and 23.3% of the sorghum samples were found to be contaminated with Aspergillus flavus, Aspergillus niger and Aspergillus parasiticus, respectively. The level of total aflatoxin, AFB1, AFB2, AFG1, and AFG2 were in the range of 11.44 to 344.26_µg/kg, 3.95 to 153.72µg/kg, 1.17 to 91.82_µg/kg, 9.87 to 139.64_µg/kg, and 3.22 to 52.02_µg/kg, respectively. The concentration of aflatoxins in all sorghum samples surpassed the maximum level set by the European commission and therefore, deserves attention to control them across the sorghum value-chain. **Keywords:** Sorghum, Aflatoxins, Aspergillus spp., Storage Period, Storage System
Chronic under-nutrition and the association with Malaria among children Aged 6-59 months in North-West Ethiopia: A facility based case control study

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Background: Malaria and under-nutrition are the two major causes of childhood morbidity and mortality in sub-Saharan Africa including Ethiopia despite several health and nutrition measures. The synergetic relationship of malnutrition and infection are widely documented though the relation with malaria is still non-conclusive and calls for more studies which could contribute towards improved prevention and control approach.

Methodology: A facility based case control study was employed to assess the relationship between malaria and chronic under-nutrition at Bahir-Dar special zone. A total of 621 children aged 6-59 months with 1:3 ratios of confirmed malaria cases and controls were enrolled for the assessment. Anthropometric measurements and clinical data were recorded by trained clinical nurses and blood film was done by senior laboratory technicians. All anthropometric data were converted into nutritional indices using the WHO Anthro software version 3.2.2 and transformed to SPSS version 21 for cleaning and analysis.

Result: The prevalence rates of stunting and underweight were 50.3% and 34.2% among cases, respectively. Stunting (AOR = 1.614; 95%CI=1.192 to 2.514) and underweight (AOR = 1.690; 95%CI=1.112 to 2.903) were significantly associated with confirmed cases of malaria after socio-demographic and other variables were controlled. Other important predictors were being rural residents (AOR = 1.546; 95%CI = 1.007 to 3.179), male sex (AOR = 1.681; 95%CI = 1.021 to 2.690), used Long lasting impregnated net (AOR = 0.31; 95%CI= 0.148 to 0.360) and used indoor residual spray (AOR = 0.337; 95%CI = 0.204 to 0.530).

Conclusion: The major contributory factors to malaria were being stunted, underweight, rural residence, male sex, LLIN use, indoor residual spray and low educational status of the mother/caregiver. Integrated actions targeting both undernutrition and malaria are necessary to lower the prevailing problem.

Key words: Malaria, Under-nutrition, Children, Case control, North-West Ethiopia,
Relationship between production diversity of Ethiopian smallholder farming households and anemia status of pregnant women in USAID-ENGINE project areas

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Introduction: Anemia among pregnant women is associated with higher risk of mortality and low birth weight of infants. The causes of anemia are multifaceted and the policymakers have recognized the role of multisectoral programs in correcting anemia among other nutritional problems. Evidence of the positive association between increased farm production diversity and improved diet quality justifies the implementation of multisectoral programs in countries like Ethiopia, which has a high prevalence of anemia with 22% of pregnant women and 17% of women of reproductive age being anemic. Cross cutting programs like ENGINE are implemented along with other agricultural programs to improve nutritional outcomes.

Objective: The objective of this study was to examine the association between household production diversity and the prevalence of anemia among pregnant women. The study explored the relationship of seasonal crop production and livestock production with anemia outcomes and examined the hypothesis that increased production diversity is positively associated with reduced anemia prevalence among pregnant women.

Methods: This cross-sectional study used survey data from 4680 pregnant women aged 14-50 years in Oromia region of Ethiopia, where ENGINE program was implemented. Two logistic regression models were used to examine the relationship between household production diversity and anemia. The first model used total production diversity for both seasons. The second model separated production diversity into crop production score by season and livestock production score. Anemia was defined as having hemoglobin levels below <11 mg/DL. Important variables such as education, age, number of antenatal care visits, iron supplementation, and weight status were covariates for in the model.

Results: Increased total production diversity was significantly negatively associated with anemia status during the second season (Belg), but not during season 1 (Meher). The results from the second model using disaggregated scores indicated that livestock production diversity score was significantly correlated with the decreased odds of anemia status. Other factors such as being underweight and multiple pregnancies also had significant association with increased odds of being anemic. Years of education seemed to have a positive effect on decreased odds of being anemic.

Discussion: While household production diversity during the Belg season and household animal production were associated with reduced odds of anemia among pregnant women, further evidence is needed before recommending intervention strategies to increase households’ production of animal source foods. On its own, animal production is likely insufficient to make significant reductions in anemia prevalence. Other factors, including maternal workload, presence of disease, market access, and utilization of health services must also be taken into consideration.
Dementia is a broad category of brain disease that causes a long term and often gradual decrease in the ability to think and remember such that a person’s daily function is affected. For many years this devastating disease has been associated with age, smoking, obesity, diabetes etc. The principal objective of this article is to review the effect of cobalamin deficiency on the occurrence of Dementia. Recently there are growing evidences concerning the possible role of dietary factors in the development of Dementia and the age-related cognitive decline. In particular, several epidemiological studies suggest that the risk of Dementia may be reduced in people with a high dietary or supplemental intake of antioxidant vitamins such as vitamin E, C and omejga-3 fatty acids. Similarly, low serum levels of cobalamin and folic acid have been associated with an increased risk of Dementia. Regeneration of the amino acid methionine and the synthesis of DNA and RNA depend on both folate and cobalamin. Therefore, a deficiency in cobalamin can impair DNA synthesis leading to impaired cognitive function. Although some studies show that once symptoms of deficiency are prominent treatment may not bring a complete cure but may bring about an improvement in sign, symptoms and easier day to day life, others suggest that early diagnosis and supplementation with cobalamin can bring about an even greater improvement. But therapeutic trials with pharmacological doses of cobalamin are suggested to establish its effect on reversing neurologic abnormalities.

**Key words**: Cobalamin deficiency, Dementia, neurologic
Under Nutrition and Associated Factors Among Under Five Age Children of Kunama Ethnic Groups in Tahtay Adiyabo Woreda, Tigray Regional State, Ethiopia: Community Based Study.

By – Mekides Wondemeneh Tamiru (Bsc)
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Introduction: Under nutrition among under-five age should be especially emphasized at all levels since children are the most nutrition sensitive sub-group of a population. In Ethiopia, child under nutrition is one of the most serious public health problems: EDHS 2011: 44% stunted, 29% underweight and 10% children were wasted nationally, which is the highest in the world. But, even though Kunama ethnic groups are less privileged and vulnerable to under nutrition, there is no data regarding nutritional status of these children and factors associated with their nutritional status in the study area.

Objective: To assess magnitude of under nutrition and associated factors with it among children under-five years age of Kunama ethnic group, Tahtay Adiyabo District, Tigray region, Ethiopia.

Methods: A community based cross sectional study was conducted among 219 under five age kunama children in Tahtay Adiyoabo District. Study participants were selected by simple random sampling. Data were collected using structured questionnaire by interviewing mothers of child and by taking anthropometric measurements (weight and heights) of each child. Data was entered using EPi-info software and analyzed by SPSS version 16. The anthropometric data were analyzed by ENA for SMART 2011 soft ware. Bivariate and multi variable logistic regression analysis was performed to identify associated factors and finally adjusted odds ratio and its 95% confidence interval and P-values of multivariable analysis were reported. P < 0.05 was considered as statistically significant for all tests.

Results: About 57.1%, 37.4% and 17.8% of children were stunted, underweight and wasted respectively. Stunting had association with family size [AOR=4.359; 95% CI; (1.179-16.114)] and family monthly income [AOR=0.028; 95% CI; (.006-.130)]. In addition, paternal education [AOR=0.170; 95% CI; (0.031-0.932)], parity [AOR=3.379; 95% CI; (1.083-10.548)] and modern family planning utilization [AOR=10.740; 95% CI; (2.734-32.188)] were found to be associated factors for underweight. The only predictor of wasting in this study was presence of diarrhea during last month [AOR= 9.737; 95%CI; (2.406-13.407)].

Conclusion and recommendation: Under nutrition is found to be highly prevalent in the area and it is an important public health problem among Kunama children aged 6-59 months. Therefore, special attention should be given on nutritional interventions and health related services by conducting continuous nutrition surveillance.

Keywords: Under nutrition, under-five children, Kunama.
Dietary diversity, meal frequency and associated factors among infant and young children aged 6-23 months in Dangila, Northwest Ethiopia, 2014.

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Background: Inappropriate feeding increases the risk of under nutrition, illness and mortality of children less than 2 years of age. Around 44% of under five children are stunted, 10% wasted and 29% underweight in Ethiopia, but the feeding practice shows only 4% of infant and young children have feed using minimum acceptable diet.

Objective: To assess minimum dietary diversity, meal frequency practices and associated factors among infant and young children aged 6-23 months in Dangila.

Methods: Community based cross sectional study was conducted from March to April in Dangila. A total of 925 children aged 6-23 months were included. Simple random sampling technique was used. Interviewer administered questionnaire were used. Bivariate and multivariable logistic regression analyses was employed to identify factors associated with minimum dietary diversity and meal frequency.

Results: A total of 920 children 06-23 months were included. Proportion of children who met the minimum dietary diversity and meal frequency was 12.6% and 50.4% respectively. Mothers education [AOR =2.516], Age of a child [AOR=2.047], Birth order of index child [AOR=2.077], Urban area [AOR=2.094], Home gardening [AOR=2.031] and Media exposure [AOR=2.738] has significant association with dietary diversity. Child age [AOR=3.025], Birth order of index child [AOR=1.580], Mother involve in decision making [AOR=1.512], Media exposure [AOR=2.620] and Postnatal

Conclusion and recommendation: children received minimum dietary diversity and meal frequency is low. Being Young age, first birth order and lack of media exposure affect both dietary diversity and meal frequency. Lack of education, live in rural area and lack of home gardening affect dietary diversity. Mother involvement in decision making and postnatal visit was protective for meal frequency. To increase dietary diversity and meal frequency increasing mother’s education, home gardening, mass media promotion and mother involvement in decision making are essential.

Key words: Dietary Diversity, Meal Frequency, infant and young child, Dangila.
Iodine status and associated factors among pregnant women in rural Bishoftu, Oromia region, Ethiopia

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Background: Maternal iodine deficiency (ID) during pregnancy has been recognized as a major cause of abortion, stillbirth, congenital anomalies and perinatal mortality. However, little is known about the iodine status of pregnant women in Ethiopia. Objective: To assess iodine status and associated factors among pregnant women in rural Bishoftu, Oromia region, Ethiopia.

Method: A community based, cross-sectional study was conducted in rural areas of Bishoftu in October and November, 2014. Data were collected from 356 pregnant women selected by two stage cluster sampling technique. Data on socio-demographics and knowledge of iodized salt and iodine deficiency disorder were gathered using a structured questionnaire. Presence of goiter was examined by palpation. Urinary iodine concentration was measured using inductively-coupled-plasma mass spectrometry. Salt samples were collected from participants' homes and iodine concentration was determined using a portable digital electronic iodine checker. Statistical analysis was done primarily using binary logistic regression.

Results: The median urinary iodine concentration (UIC) was 85.7 (IQR: 45.7-136) µg/L. Almost 78% (95% CI: 73-82%) of the study subjects had insufficient iodine intake (UIC below 150 µg/L). The goiter rate was 20.2% (95% CI: 16-24). The median iodine concentration of the household salt samples was 12.2 (IQR: 6.9-23.8) ppm. Only 39% (95% CI: 34-44%) of households were consuming adequately iodized salt (≥15 ppm). Compared to pregnant women aged 15-24 years, the prevalence of goiter was significantly higher among those aged 35-44 years with an AOR of 7.21 (95% CI: 1.80-28.73). The prevalence of goiter was significantly higher among illiterate women with an AOR of 2.29 (95% CI: 1.32-3.98) as compared to literate. Multiparous women were 8.71 (95% CI: 1.86-40.80) times more likely to present with goiter than nulliparous.

Conclusion: Iodine deficiency is a problem of public health significance in the study area. Iodine supplementation, increased access to adequately iodized salt and knowledge about iodized salt are required.

Keywords: Pregnant women, Urinary iodine, Goiter, Iodine deficiency, Iodized salt.
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Iron fractionation of cereals contaminated with different types of Ethiopian soils and its consequence on bioaccessibility

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Background: Iron is an essential micronutrient and widely found in soils. However, iron deficiency is one of the major health problems widespread worldwide. Diet in developing countries mainly comes from non-haem food sources often from soil contamination at the time of threshing. The potential bioaccessibility of different types of contaminant soil is unknown. This study was conducted to investigate the impact of different soil types on the total iron content of cereals as a result of contamination and its bioaccessibility potential.

Method: Two separate analysis were conducted, one for cereals (red teff, white teff, white wheat and white sorghum) and the other for the soil types (andisol, cambisol, nitisol and vertisol) to determine the total iron content and iron fractions (exchangeable, carbonate bound, oxide bound, organic bound and residual) fractions by using sequential extraction procedures.

Resultand Conclusion: The study result showed that the total iron content of the four soil types were significantly different (p<0.05) and clay rich nitisol had high amount of iron content (6972.63± 25.56 mg/100g DM). Alkaline soil andisol had low amount of iron content (3163.36± 22.33 mg/100g DM). Vertisol had total iron content of 4483.4± 52.93 mg/100g DM and cambisol had total iron content of 6390.49± 47.84 mg/100g DM. The iron content of non-contaminated cereals were significantly different (p<0.05) except red teff (6.48± 0.19 mg/100g DM) with white teff (6.52± 0.2 mg/100g DM). The iron content of white sorghum was lower (4.04± 0.13 mg/100g DM) followed by white wheat (4.49± 0.13 mg/100g DM). Very small amount of iron from cambisol (0.001%) and vertisol (0.004%) had potential bioaccessibility but not in nitisol and andisol when analyzed alone. Intentional contamination of white teff (50%) with equal amounts of the four soil types had highest exchangeable fraction than the non-contaminated one (increased by 2.6%) from the total iron in case of cambisol contamination and (increased by 0.3%) in case of nitisol contamination. A significant difference was observed on the fractionation profile of soils and cereals (p<0.05). Soil type variation had an impact on the potential bioaccessibility of cereals and soil with cereal combination had better bioaccessibility potential than cereal alone.

Recommendation: Further investigation should be conducted on contamination of teff with different soil types and contamination of cereals by soil at different dose of contaminant soil.

Key words: White teff, red teff, white sorghum, white wheat, andisol, cambisol, nitisol, vertisol, iron, sequential extraction scheme.
Home gardening is often advocated as a strategy for enhancing dietary diversity and vitamin A status. However, empirical evidences are scarce. The purpose of this study is to compare dietary diversity, vitamin A intake and nutritional status of children 6–23 months of age between households with and without home gardens, in Melga Woreda, Sidama Zone, SNNPR. A comparative, community-based, cross-sectional study was conducted in October 2014 with a purposive sample of 95 households with gardens and a random sample of 95 households without gardens selected from the woreda. Data collection involved a structured questionnaire including 24 hour recall for dietary diversity assessment and a seven-day Helen Keller international food frequency method to assess vitamin A intake. Data sets were analyzed using independent sample t-test and linear regression analyses. The sample groups were comparable in pertinent variables including parents’ educational status, husbands’ occupation and average family size, sex and age of the child. Children from households with gardens had a significantly higher dietary diversity score 3.25 and vitamin A intake 2.91 than children from households without gardens (p<0.001). Counterpart scores were respectively 2.45 and 2.09. However, there was no statistical nutritional status difference between the children in the two sample groups.
The prevalence of under nutrition and associated factors among children aged 6 to 59 months in the Afambo district, Northeast Ethiopia: A community based cross-sectional study

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Introduction: Under nutrition continues to be a major public health problem in developing countries, including Ethiopia, and is associated with more than half of all child mortality worldwide. This study aimed to investigate the magnitude of under nutrition and associated factors among children aged 6–59 months in the Afambo district of Northeast Ethiopia.

Methods: A community-based cross-sectional study was used and included 401 mother-child pairs. Anthropometric measurements were collected from children. Binary and multivariable logistic regression analyses were used to identify the factors associated with child under nutrition. Statistical association was declared significant at \( p \)-value < 0.05.

Results: In the Afambo district, 32.2\%, 23.5\% and 13.8\% of study children were stunted, underweight and wasted, respectively. The multivariable logistic regression model showed that being male (AOR: 1.88; 95\% CI (1.01, 3.49)), not attending antenatal care visit (AOR: 3.87; 95\% CI (1.87, 7.99)), severe (AOR: 6.49; 95\% CI (1.62, 26.01)) and moderate household hunger scale (AOR: 2.88; 95\% CI (1.27, 6.51)) were positive predictors of stunting. Colostrum avoidance (AOR: 2.34; 95\% CI (1.19, 4.61)), household hunger scale [severe hunger (AOR: 3.68; 95\% CI (1.13, 12.00)), moderate hunger AOR: (AOR: 3.47; 95\% CI (1.65, 7.29))] and not attending antenatal care visit (AOR = 9.14 (95\% CI: 4.35-19.23)) were associated with increased odds of underweight. Finally, not attending antenatal care visit (AOR: 2.87; 95\% CI (1.18, 6.96)), diarrhea in the last two weeks preceding the survey (AOR: 3.48; 95\% CI (1.66, 7.30)), mother-headed households (AOR: 0.37; 95\% CI (0.15, 0.92)) and bottle feeding (AOR: 2.95; 95\% CI (1.46, 5.97)) were associated with wasting.

Conclusion: Based on the WHO classification, there is high prevalence of under nutrition in the Afambo district is high. Hence, to raise the awareness of mothers regarding the value of colostrum feeding and the hazards of bottle feeding.

Keywords: Stunting, underweight, wasting, Afambo, Afar, Northeast Ethiopia
The nexus between agriculture, food security and climate change in Ethiopia

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This paper focuses mainly on assessing the food security agriculture-climate change nexus and provides multidisciplinary scientific assessment and recommendations for sustainable agro ecological solutions in the quest of humanity to sustainable development. While agriculture tend to support the overwhelming majority of the population in every part of Africa in general and in Ethiopia in particular, climate change in itself will very likely affect four key dimensions of the food security including availability, accessibility, utilization and sustainability of the food, due to close linkage between food and water security and climate change. The impacts of climate change and increases in climate variability on agricultural systems and natural-resource dependent households, as well as on food security and the future vulnerability of already hungry people in Ethiopia and of course in most of the developing countries in Africa, are highlighted in the paper. It is also worth mentioning that, the role of climate-smart agriculture can be used for mitigating and adapting the impacts of projected climate change. CSA brings together practices, policies and institutions that are not necessarily new but are used in the context of climatic changes. Furthermore, it addresses challenges faced by triple interplay of agriculture, food security and climate change simultaneously and holistically.

Key words: CSA(Climate Smart Agriculture), Food Security, Climate Change, Ethiopia
Rural Women Involvement in Natural Resources Management and Utilization in Ethiopia: The Case of Delanta Dawunt District, North Wollo Zone

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Natural resources provide any material from the natural environment that can be used by people for support and sustenance of life on earth with its ecological value and manifold resources. Currently, the rural communities in the study area are confronted with land, water, fuel-wood and proper utilization. The purpose of the study is to explore the role of rural women in natural resources management and utilizationin Ethiopia by taking Delanta Dawunt District as the case. The study was conducted by taking 160 women and 40 men in four sampled rural district. The interviewees were selected using stratified random sampling technique picking up 50 households from each district. The data have been analyzed using both descriptive and inferential statistical techniques. The results showed, women are good natural resources managers and the primary gatherers of fuel-wood (76%), fetching water (70.5%), agriculture participation (83%) and fodder to meet immediate household needs. However, women are culturally denied the right to register and control land resources. The main income sources crop production (91%) and large animals (89%) were controlled and decided by men, while the minor income sources small animals (poultry) and dairy products (84%); handicrafts (93%), and local liquors (100%) by women. Women have also limited access of technology, skill training, education, extension services and information. The depletion of natural resources directly impact on women with increasing workload and drudgery, and the overall livelihood of people who depend on natural resources. Henceforth, women’s role in natural resources exploitation and management cannot be undermined. To reinforce and build up their participation in resources management and sustainable uses, all concerned bodies should take appropriate measures to empower women in decision making, skill training, education, extension services and information.

Keywords: Agriculture; Decision-Making; Environment; Resource Utilization; Women’s Role
Bioactive phytochemical constituent and antioxidant potential of Anchote [Coccinia Abyssinica (lam.) Cogn]: The underutilized delicious cultural food of Oromo Nation, Ethiopia.

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Anchote is an indigenous tuberous crop that is commonly produced by Oromo nation in western and southwestern Oromia region in Ethiopia. It has nutritional, medicinal, economic and social importance. Of these, the medicinal value includes its utilization for the treatment of many ailments like cancer, malaria, tuberculosis, gonorrhea and diabetes by Oromo people. The purpose of the present study is to test the presence of phytochemical compounds and evaluate the antioxidant potential. The study was carried in 2015 after collecting the representative sample from Wollega zone where it grows. The samples were extracted using three solvents namely methanol, water and diethyl ether. The phytochemical screening of the three solvents soluble fraction showed that it contains bioactive compounds such as reducing sugar, terpenoids, alkaloids, steroids, tannins, saponins and coumarins are present in Anchote tuber while flavoids, anthocyanins, leucoanthocyanins and emodins are absent. The value of phytobased chemicals in water extract was the highest followed by that of methanol extract and diethyl ether extract respectively. In conclusion, the presence of bioactive compounds in anchote tuber can be the evidence for its use for medicinal and nutritional purposes. Therefore, its production in large scale, promotion and further study are recommended.
Effect of Nutrition Education on Attitude on Perceived Barriers of Pulse Processing and Consumption by Households at Hurufalole Kebele, South East Oromia, Ethiopia

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Background: Legumes/pulses have played an important role in the traditional diets of many regions throughout the world and their value has long been appreciated in many countries, also they have an important role in Ethiopian. Despite their high protein, mineral and fiber content as compared to other plant-based foods, pulses are considered a ‘poor man’s’ foods in developing countries. Views that consider pulses a taboo food, mainly because of limited knowledge on their nutritional values, overcome among certain households.

Objective: This study was undertaken to examine the attitudes of household women on processing and consumption of pulses.

Methods and Methodology: A key informant’s interview (HEW) and FGD with the aim to determine the perceptions of the study groups towards pulses and the FGD was carried out for two hours with ten household women at the age group of 15-49 years old. Data were analyzed through narration by separating as baseline and end line in term of six months.

Result: They know what pulses are, they include haricot bean, lentil, broad bean, chickpea and pea and further elaborated that pulses are nutritionally important, even though they have important health functions that they did not know before and that was the reason for not using them. “having these food items was considered being poor, later after they learn all of them gave value for it and they are utilizing in their day to day activity, they said by signing their hand “knowing is better”, “nowadays after getting knowledge about pulses preparation in the household, they are using germination process and cooking for their families. “they have been assured that using soaking and germination processes reduces flatulence formation and cooking time, in addition to these the foods prepared by using these processes are completely different from foods prepared without using these processes, such that the food became so delicious and has long shelf life”.

Conclusion: After the nutrition education there was a significant improvement on household attitude on pulse based household utilization when compared the baseline FGD response and end line. Nutrition intervention is necessary particularly for women, since they are in charge of food selection and vulnerable part of the community.

Key words/phrases: Household women, nutrition education, pulses, attitude change
Iodized salt consumption and goiter status of school age children (7-12 years) in Akaki-kality subcity of Addis Ababa, Ethiopia.

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Iodine is an essential micronutrient required for synthesis of thyroid hormones. Iodine deficiency is a major public health problem in Ethiopia. The aim of this study was to assess prevalence of goiter, urinary iodine status and to determine iodine content of salt consumed by school age children 7-12 years. A school based cross-sectional study of 270 children from five randomly selected primary schools in Akaki-kality subcity of Addis Ababa was conducted during April to July 2015. Questionnaire was used to collect information of socio-demographic, knowledge on iodine deficiency and practices of iodized salt consumption. Clinical examination of thyroid was assessed by standard palpation method. Causal urine samples were collected and analyzed by Sandell-Kolthoff reaction and iodine content of salt samples were determined by iodometric titration. Descriptive statistics, bivariate and multivariate logistic regression analysis were carried out. The overall prevalence of goiter was 23.3% with (Grade 1=22.2% and Grade 2=1.1%). Prevalence of goiter in females and males was 27.4% and 19.3% respectively. As the age increased the goiter prevalence also increased, in age group 10-12 years (AOR=2.6; 95% CI=1.4, 4.8) and school where children learned (AOR=3.8; 95%CI=1.4, 10.1) were factors highly associated with goiter. The median urinary iodine level of school age children was 85.7 μg/L. Inadequate Iodine status of children was high associated with age group 7-9 years (AOR=2.2; 95%CI=1.1, 4.3), educational status of family (AOR=4.1; 95%CI=1.4, 11.8) and children’s consumed coarse salt (AOR=308.4; 95%CI=39.2, 2429.2). Only 20% of the total salt samples were adequately iodized. The finding of this study revealed that iodine deficiency cause moderate public health problem and iodized salt consumption status is very low in the study area. Therefore, further strengthen the existing monitoring system for the quality of iodized salt and awareness creation activities on the benefits of iodine nutrition have to be intensified.

Keywords: Iodine deficiency, School age children, Urinary iodine excretion, Goiter, Iodized salt
Assessment of Heavy Metal Contamination in Vegetables Grown Using Paper Mill Wastewater in Wonji Gefersa, Ethiopia

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Heavy metals are among the major contaminants of vegetables. They are not biodegradable, have long biological half-lives and have the potential for accumulation in the different body organs leading to unwanted effects. The aim of this study is to evaluate heavy metal contamination of vegetables grown using paper wastewater. A study was conducted at Wonji Gefersa farms where paper wastewater used for cultivation of vegetable crops. Four vegetable samples, namely Swiss chard (Beta vulgaris L. var. cicla), carrot (Daucus carota L.), tomato (Lycopersicon esculentum) and green pepper (Capsicum annum), paper as well as ink effluent were examined for heavy metal (Pb, Cd, Cr, Zn, Cu, Fe and Co) contamination using atomic absorption spectroscopy. The concentration of heavy metal in paper effluent were in the following order of decreasing magnitude Fe > Cr > Pb > Zn > Cu > Cd. The level of Pb, Cd and Cu in paper wastewater were all above the safe limit for FAO standards for wastewater quality for irrigation. The result indicated that Pb concentration in Swiss chard and Green pepper exceeded the permissible limit and its level is 574.7 μg/L and 376.5 μg/L respectively. It was observed that Green pepper had generally the highest concentrations of Fe, Cu, Zn and Cr; while Swiss chard contained the highest concentrations of Cd and Pb. The matrix correlation showed that most of the metals were a significant positive correlation means metals came from the same sources. The result of the study revealed that Pb metal contamination in swiss chard and green pepper in the study area which poses health risk with time unless an urgent step is taken by relevant agencies to address this issues.

Key words: Vegetables, Contamination, wastewater, concentration, irrigation, health risk
Predictors of nutritional status in adolescent school girls in south west Ethiopia

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Background: Adolescence is the period of transition between childhood and adulthood which is characterized by the growth spurt. Because of physical and psychosocial development, the total nutrient needs are higher during adolescence than any other time in the Lifecycle. Any nutritional deficiency experienced during this critical period of life can have long lasting effect on the future health of the individual and also her offspring.

Objectives: To assess the predictors of nutritional status in school girls in south west Ethiopia.

Methods: A cross sectional study was conducted using a multistage sampling technique and eight hundred and twenty school going adolescent girls were selected from southwest zones of South west Ethiopia. Twelve schools were randomly selected and allocation of study participant was made proportional to number of student in the classes. The selected subjects were classified into three groups based on their grades such as primary junior and high school according to educational system of Ethiopia. By using sampling frame based on e schools roster, girls were selected according to the definitions of adolescent by World Health Organization (WHO). Interviewer administered pre-tested structured questionnaire was used to collect the data on anthropometric measurements. An UNICEF Seca Electronic weight Scale and portable plastic height measuring instrument was used for obtaining anthropometric data immediately after face-to-face interview). The data were cleaned and analyzed using SPSS version 20. An anthropometric measure was converted to the indices of nutritional status, Z-scores of height for age and BMI for age using WHO AnthroPlus version 1.0.3 software. Stepwise multivariable linear regression analysis was used to identify potential predictors of nutritional status (BMI- for age Z score and height for age Z score). All statistical significances were declared at p-value less than 0.05.

Result:

the mean (±sd) of height-for-age z scores (haz) and body mass index for age z-score (baz) of the participants were -0.62(±0.88) z-score, and -0.41(±0.99) respectively. Residence, regularity of breakfast, no episode of illness in the preceding one month to interview, fuels used for cooking in the household, hand-washing habit after toilet use, time spent on sedentary activities, consumption of sweet food items, consumption of cereal, mothers’ occupation were significant predictors (p<0.05).

Conclusions: Over nutrition is not the major problem of female adolescents in the study area. More attention needs to be given to the regular consumption of breakfast, washing hand after toilet use and preparing separate kitchen for cooking. In this community it is necessary to maintain healthy eating practices to achieve desired nutritional status of the adolescents.

Key words: Adolescent school girls, Nutritional status.
Bayesian Semi-Parametric Regression Analysis of Childhood Malnutrition in Gamo Gofa Zone:- The Social and Economic Impact of Child Under nutrition.

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Major progress has been made over the last decades in reducing the prevalence of malnutrition amongst children less than 5 years of age in developing countries. However, approximately 27% of children under the age of 5 in these countries are still malnourished. This work focuses on the childhood malnutrition in Gamo Gofa Zone, Ethiopia. This study examined the association between demographic and socioeconomic determinants and the malnutrition problem in children less than 5 years of age using Data obtained from both rural and urban sampled surveys conducted in both Dita and Mirab Abaya Weredas from December 1 to January 5, 2013. The study on the Child undernutrition and underweight prevalence in Gamo Gofa has allowed us to quantify the negative impacts of child undernutrition in both social and economic terms. Today, more than 4 out of every 7 children in Ethiopia are stunted. The result reveled that as many as 75% of all cases of child undernutrition and its related pathologies go untreated. It is also observed that about 35% of the health costs associated with undernutrition occur before the child turns 1 year-old. Generally, The results of the analysis show that place of residence, employment status of mother, employment status of partners, age of the child, educational status of mothers, diarrhea, household economic level and source of drinking water were found to be the most important determinants of health/nutritional status of children. The study revealed that socio-economic, demographic and health and environmental variables have significant effect on the nutritional and health status of children in Ethiopia. The study revealed that children from employed mothers are at a higher risk of health problem and malnutrition.

**Keyword:** Bayesian Models, Childhood Malnutrition, Gamo Gofa Zone, Ethiopia
Iodine Deficiency Disorder and its Association with Academic Performance Among Schoolchildren

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Background: Nutritional status is the major factor that can affect academic performance of school children. The main aim of this study was to determine the association between iodine deficiency disorder and academic performance among school age children.

Methods: A school based cross sectional survey was conducted in Jimma town from November 2013 to May, 2014. A total of 1254 students, aged 6 -12 years, were selected from five primary schools using systematic random sampling method. Academic records were reviewed from school documents. Goiter examinations and urine iodine test was done to diagnose goiter. Spot urine samples were collected to determine median urinary iodine level and anthropometric measurements were done.

Results: In this study, 1,254 children were included; 674 (53.7%) were males. Average academic score of students for both sexes was 71.13%. Majority of students 349(71.2%) who had goiter scored below average 125 (16.4%) (p=0.01). Absence of goiter [AOR=4.368;95%CI(2.974-6.414)]; high median urinary iodine level [AOR=0.38;95% CI(0.190,0.489)]; high height-for-age z-score [AOR=5.023;95% CI(3.317,7.607)]; and high weight-for-age z-score [AOR=3.214;95%CI(2.091,4.941)] were significantly associated with good school performance.

Conclusions: Iodine deficiency disorder is a significant health problem among schoolchildren in the study area. Strengthening salt iodization program is a preventive measure.

Key words: Goiter, Iodine Deficiency Disorder, Academic Performance
Relation Between Nutritional Status And Mental Development Of Children Between 12-60 Months Of Age In Wolaita Zone SNNPR, Ethiopia.

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Introduction: Malnutrition remains one of the most common causes of morbidity and mortality among children throughout the world particularly in developing countries and it is endemic in Ethiopia. It affects the both cognitive and physical development of children.

Objective: this study was aimed to assess mental development of children in relation to their nutritional status in Wolaita zone SNNPR, Ethiopia from April to May, 2015.

Methods: Community based cross sectional study design was conducted. A sample of 623 children was selected by using systematic sampling technique. Data were collected with pretested and interviewer administered structure questionnaire. Age and stage questionnaire version 3 was used to assess child mental development. Height, weight and MUAC was measured by trained data collector. Data was entered into Epi – info version 3.3.5 and was transported and analyzed using SPSS version 21. Anthropometric data was analyzed by WHO antro version 3.2.2. Data was presented by using descriptive statistics and correlation.

Result: Totally 605 were interviewed, makes the response rate was 96.8%. Around 50.7% were males and mean and median age was 33.87 and 34 months respectively with SD of 13.9. Nutritional status of children were stated as underweight, stunting, and wasting (11.9%, 33.9%, and 6.6%,) respectively. The risk of developmental problem in children were 19.0% and it is expressed as communication 5.8%, gross motor 6.1%, fine motor 4.0%, personal social 8.8% and problem solving 4.1% based on Z scores of children. Weight-for-age (WAZ) and height for- age (HAZ) positively correlated with all five domains of development i.e with communication, gross motor, fine motor, personal social and problem solving (r= 0.0.088 - 0.229; p<0.0004, and r=0.131-0.249; p<0.000, ) respectively.

Conclusion and Recommendation: Inadequate nutritional status and mental development of children are public health concern. Early intervention on under nutrition is very necessary to avoid mental development problem. Further assessment on mental development of children is necessary.