InCIP NEWSLETTER
Smallholder Indigenous Chicken Improvement Programme
September 2014 - April 2015 *LAST ISSUE*

Principal investigator's desk

The Smallholder Indigenous Chicken Improvement Programme (InCIP) was launched in March 2012 with the objective of contributing to poverty alleviation, increased income and food security of smallholders and disadvantaged actors in the Indigenous Chicken(IC) sub-sector in Kenya and Malawi. This has been achieved through harnessing of intra-regional scientific research collaboration and cooperation which led to productivity, promotion, utilization and conservation of IC in the face of climate change.

InCIP is a collaborative programme between Egerton University- Kenya, Lilongwe University of Agriculture and Natural Resources- Malawi and Wageningen University- The Netherlands. It is funded by the European Union through the African Union. Its associated partners are Kenya Agricultural and Livestock Research Organisation (KALRO); International Livestock Research Institute (ILRI), Kenya; State Department of Livestock, Kenya; Department of Agricultural Research Services and Department of Animal Health and Livestock Development, both in Malawi.

Through its work, the programme addressed four main areas of development namely; empowering people, environmental protection, policy support and economic empowerment. The programme has five major activities namely; project management, development of IC technologies, validation of IC technologies, promotion of partnerships and agribusiness development and visibility and multiplication. We are glad that all the activities have been realized.

This 6th issue of the newsletter which is the final issue generally covers the progress and achievements of the programme since its inception. You can also get a copy of the newsletter online and help us circulate it widely.

InCIP participates in the Animal Production Society of Kenya, and, 9th Egerton University Conferences

InCIP with the support of Egerton University facilitated Dr. T.Muasya, Mr. J. Khobondo, Ms. S. Miyumo and Mr. K. Ngeno who are all InCIP beneficiaries and members of the Animal Breeding and Genomics Group of Egerton University, to participate in the Animal Production Society of Kenya (APSK) conference in Kenya from 21st -23rd April, 2015. The conference theme was ***"Kenya's Animal Agriculture: Macro- trends and future Prospects."*** The conference had six sub-themes namely; *Dairy Production, Alternative Feed Development, Animal Genetics Resources, Pastoral Systems: Options for Tomorrow, Application of Technology to Animal Production Issues and Policy Value Chains and Markets.*

InCIP team presented five papers under the Animal Genetics and Resources sub-theme namely; "Improving Indigenous Chicken Productivity for Enhanced Livelihood and Food Security in Sub-Saharan Africa", "Preliminary Selection Results for Body Weight in Indigenous Chicken in Kenya", "Genetic Diversity and Population Structuring of Kenyan Indigenous Chicken Populations", "Genetic Variation and Signatures of Selection in the Genomes of Kenyan Indigenous Chicken and Commercial Layers" and "Effects of Age on Natural(auto) Antibodies Profiles and Repertoire in Calves"

The APSK conference is held annually and is designed to provide a forum for scientists, extension agents and other stakeholders to share scientific findings and experiences in the livestock sector.

InCIP facilitated the presentation of six papers in the 9th Egerton University International Conference which was held at Egerton University, Njoro campus from 25th-27th March, 2015. The conference was dubbed ***"Innovative Research and Technology for Global Development".*** *Agriculture and food security, Education, Science and Technology, Health, Governance, Culture and Socio-Economic and Environment, Natural Resources and Climate Change* were the different sub-themes under which the participants made their oral presentations, posters and exhibitions.The purpose of the conference was to share and disseminate research and innovation outputs with potential

Dr. Ngeno Kiplangat making his presentation on "Assessment of the Vulnerability to Climate Variability and Change of the gallus gallus domesticus in Kenya"

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benefits to humanity. The conference attracted scientists, exhibitors and students from Africa and Western Europe.

InCIP team which comprised of Mr. J.K Gakige, Mr. J.O Khobondo, Mr. G.O Lihare, Ms. S. Miyumo and Mr. K.Ngeno presented six papers under the Agriculture and Food Security sub-theme namely; "Genetic Variation and Signatures of Selection in the Genomes of Kenyan Indigenous Chicken and Commercial Layers", "Genetic Diversity and Population Structuring of Kenyan Indigenous Chicken Population", "Effects of Targeted Phase Supplementary Feeding on Performance of Scavenging Ecotypes of Indigenous Chickens in Kenya", "Exploitation of Variation of Indigenous Chicken Genetic Resources in Kenya", "Genetic Analysis of Growth Patterns of Kuchi Indigenous Chicken in Kenya", and "Environmental Factors that Influence Growth and Feed Efficiency in Indigenous Chicken"

This forum forms an excellent platform for exchange of knowledge and encourages collaborations among researchers with a goal of contributing to growth and transformation in Sub-Saharan Africa.

Regional Conference on Sustainable Improvement of Indigenous Chicken Productivity

The conference which was facilitated by the Smallholder Indigenous Chicken Programme (InCIP) was held on 9th-10th September, 2015 at Egerton University, Njoro Campus. More than 60 participants drawn from Kenya, Malawi and Nigeria attended. The conference which was themed "Improving Indigenous Chicken Productivity for Health and Wealth" was categorized into four sub-themes namely; Feeding Nutrition and Food Safety, Genetics and Genomics, Innovative Technologies and Social Economics and Production of Indigenous Chicken. The Conference was basically a presentation of the different studies carried under the different InCIP activities.

Particpants of the Regional Conference on Sustainable Improvement of Indigenous Chicken Productivity

Feeding Nutrition and Food Safety

1. **Estimating of Age Introducing Different Breeds of Chicks to Scavenging System on Growth Survival and Adaptation Traits(Susan Chikagwa Malunga, LUANAR)**
   - The study mainly evaluated the effect of age of introducing different breeds of chicks to scavenging system on growth, survival and adaptation traits. It focused on determining the growth potential of different breeds (Hyline, Black Australop and the Local Chicken) of chicks under scavenging in Malawi. The finding of the study was that there is need to create an optimal breed; a local breed which can be kept under scavenging.

2. **Prevalence of E.Coli, Salmonella and Staphylococcus Aureus in a Poultry Slaughter House in Nakuru County (Bernard Oloo, Egerton University)**
   - The study determined the prevalence of E.coli, S.aureus and Salmonella from swabs rinse and process water of a slaughter house in Nakuru County. The findings were that the pathogenic microorganisms in the slaughter house were beyond the hygienically acceptable standards.

3. **Effects of Targeted Phase Supplementary Feeding on Performance of Scavenging Ecotypes of Indigenous Chicken in Kenya (Jesse Gakige, Egerton University)**
   - The study focused on developing a feeding strategy to support increased productivity of IC by determining the effect of supplementary feeding at exponential growth phase on mature body weight of IC ecotypes and evaluating the effect of feed intake, FCE and ecotypes

Hunger & starvation in Africa have lasted too long. But Africans are not consigned to a lifetime of food insecurity"- UNDP African Human Development Report 2012

on weight gain of IC ecotypes. The finding was that targeted supplementation in IC improves productivity which translates into more income to the farmers.

4. **Effects of Soybean and Maize Bran Supplementation on Production, Fertility and Carcass Yield of Local Chickens under Scavenging Condition in Lilongwe , Malawi (Jonathan Tanganyika, LUANAR)**
   - The study evaluated the effect of different supplement feeding on egg production of local birds under scavenging conditions. It was found out that supplementing the local the local chicken with simple ration (protein and energy) significantly improved egg production.

Genetics and Genomics

Characterization of IC among Smallholder Farmers using FAO AnGR Guidelines (Liveness Banda, LUANAR)

Prof. Timothy Gondwe Chairing the Gentics and Genomics sub-theme

- The study focused on describing the phenotype of IC available in the Mkwinda EPA and to determine the productive performance of the different IC phenotypes. It was found out that hens and pullets dominate, phenotypic diversity exists and the weight of different classes varies with phenotype with Yofiira having the highest weight between classes. It recommended that interventions aimed at improving the rural poultry should also aim to maintain diversity and optimize attributes of IC phenotypes.

Preliminary Selection Results for Body Weight in Indigenous Chicken in Kenya (Thomas Muasya, Egerton University)

- The study estimated preliminary genetic trend of BW12 for IC in Kenya. The results of the study indicated that body weight can be improved through selection. It also suggested that further research in response to selection after a number of generations and correlated response in subsequent body weight and egg production be carried out.

Profile of Production System and Indigenous Chicken Ecotypes in Malawi (Wilson Kaumbata, LUANAR)

- The study determined IC production profile and IC ecotypes in Malawi. The results were that most IC producers are rural households keeping at least 1 bird but not exceeding 7 birds, birds are kept as a emergency kit, few birds are enough to provide short term security and production seems to be negatively affected by effects of climate change and variability. The study recommended that any efforts to increase IC production should consider introducing adaptation and mitigation measures to the negative effects of climate change on IC production.

Mr. Wilson Kaumbata from LUANAR presenting during the conference

Natural Antibodies against Keyhole Limpet Hemocyanin in Indigenous Chicken: Variability among and Repeatability within Indigenous Chicken Sampled within Three Weeks (Joel Khobondo, Egerton University)

- The study aimed at improving the productivity of indigenous chicken through sustainable breeding for disease resistance. The results of the study were; Nabs binding KLH were detected for IgA, IgG and IgM isotypes in IC serum, the analysis of the variance showed significant difference with type of isotypes and time of sampling being the main source of variation, IgM concentration value had the highest means but with minimal standard deviation and IgG had the highest standard deviation with moderate means. The

Participants during the conference

study concluded that all isotypes can be used for further studies to explore association with disease resistance and give genetic basis to disease resistance. IgM might be the isotype of choice given the role in isotype switching. The study lays ground for further studies on genetic basis of disease resistance using natural abs as parameter.

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Early Growth Patterns of Kuchi Described by Various Mathematical Growth Functions (George Lihare, Egerton University)

- The study determined the growth patterns of the Kuchi using different mathematical functions. The study concluded that early growth of Kuchi is monomorphic and slowly becomes dimorphic with age where males have superior growth compared to females. Kuchi was found to have a slower early growth compared to the other Kenyan IC ecotypes. In addition, BW4 was found to be highly and positively correlated to and a good selection age for BW6-12.

Genetic Improvement is Vital for Commercialization of Indigenous Chicken (Tobias Okeno, Aarhus University)

- The study focused on characterization of IC chicken production systems and their economic analysis and breeding program for genetic and economic improvement of IC. The study found out that genetic improvement of IC is vital for its economic viability and that indigenous chicken improvement should focus on meat production for profit maximization.

Indigenous Chicken Genetic Resources of Nigeria (Saidu Oseni, OAU)

- The study covered on genetic resources of IC in Nigeria. The reflections of the study were; evolving clear, robust and coherent structure for sustainable improvement of IC productivity and strengthening capacities for sustainable improvement of IC production.

Innovative Technologies

InCIP Poultry Manual (Mary Ambula, Egerton University)

- The manual is divided into eight modules which covers widely on IC production systems, nutrition and feeding, IC breeding and reproduction, health and diseases management, IC and cross cutting issues, Marketing and processing and business planning and financial management. The manual will play a big role in training actors within the IC value chain.

Distribution Model used to Link Farmers to InCIP Breeding Unit and Associated Impact in Malawi (Timothy Gondwe, LUANAR)

- InCIP breeding unit at Bunda was linked to household communities around Bunda as commitment to develop community flocks from where the parent stock was originally outsourced and testing the ecotypes on-farm during the development and validation process. Two models were used. Model 1 was distributing BA cocks to cluster of household and Model 2 was distribution of fertile eggs from the breeding unit. 50% of the chicks that hatched were given back to the breeding unit and their growth is compared to peers in the village.

Mr. Richard Otwori from Egerton University presenting on M-FUGO

Ukulima Frontline Platform (Munyala Mwalo, Egerton University)

- This platform aims at providing timely, relevant and reliable agricultural information by different actors along the agricultural value chain.

M-FUGO; an SMS Based System (Richard Otwori, Egerton University)

- This is an SMS marketing and information system for the different actors in the Indigenous Chicken Production Value Chain developed as part of InCIP activities. The main aim of this system is to provide reliable, effective and timely information to IC farmers and other actors in Indigenous Chicken Production Value Chain.

Use of Artificial Insemination in Indigenous Chicken Production in Malawi: Capacity Building and Improvement (Jonathan Tanganyika, LUANAR)

- The study compared natural mating and artificial insemination in indigenous Malawian chicken, evaluated the effect of mating method on fertility of eggs in Malawian IC, evaluated the effect of mating method on hatchability of eggs in Malawian IC and evaluated the effect of mating method on embryo mortality in Malawian IC. With regards to capacity building, members of staff and student of the Animal Sciences Department were trained in A.I and A.I has also been included as one of the topic in farm practical work. The results of the study were that fertility was high in natural mating than A.I; however A.I resulted in higher hatchability of fertile eggs than natural mating.

Token: An Innovative Platform Linking Farmers to Research Organisations (David Mwangi, Egerton University)

- This is an online platform that creates a link between a research organisation and its actual beneficiaries. The main aim of this platform is to link farmers and research institutions. This platform will therefore provide flow of information on research from research organisations to farmers, accessibility of improved and superior products at a subsidized price.

Social Economics and Production Systems of Indigenous Chicken

Estimating Farmers Preference and Selection of Indigenous Chicken Genetic Resources using Non-Market Attributes (Hillary Bett, Egerton University)

- The study determined the socio-economic factors and the farm characteristics that influence the economic

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InCIP Facilitates an Entrepreneurship Training on Indigenous Chicken Value Chain

The training was held at Egerton University in September, 2015 which had a total of 58 participants. Entrepreneurship is integral and key in ensuring economic development of the beneficiaries of the InCIP project, especially the students. This made us design a 2-day entrepreneurship training to equip Egerton University student entrepreneurs with adequate start-up entrepreneurship skills. This was a deliberate move to develop skill and competence of upcoming entrepreneurs by creating an entrepreneurial mind-set and awareness.

To ensure success of this 2-day activity, InCIP involved student entrepreneurs behind *AgriFresh Supplies* and *Prima Gallus* both of which are agribusinesses. These students, Mr. Otieno Dickson Ouma and Mr. Okello Dickson Otieno are MSc Agrientreprise Development Students and hence are professionals in entrepreneurship matters, also having a background in Bachelor of Agribusiness Management.

Mr. Dickson Otieno presenting during the training

"Business Opportunity Identification" was presented by Mr. Dickson Okello which aimed at establishing prime areas in business that entrepreneurs need to focus on. He emphasized the fact that innovative entrepreneurship comes from the common things that surround us and that great ideas come from establishing challenges/problems that intended market faces then solving that problem while making profits at the same time.

"Market Identification Process for Entrepreneurs" was presented by Mr. Wallace Thoya. It involved guiding entrepreneurs, especially those in production to establish a ready market even before engaging in the production process. He emphasized the fact that most enterprises do not live to see their 5th year because of market issues.

"Opportunities Available in IC Value Chain" This presentation targeted students with special interest in IC. This is because InCIP Project has specific interest in empowering actors in this value chain. Mr. Otieno made it clear that opportunities are available in this sector and that Prima Gallus is started on this basis.

"Innovative Entrepreneurship" was facilitated by Dr. J.K. Lang'at. He emphasized the need to establish businesses with special focus on making a difference i.e. innovation. He said that entrepreneurship without innovation is dead after which he added that innovation may not necessarily mean invention but it is a process of improving on what is available to make money out of such an improvement.

"Entrepreneurial Mind-set and Design Thinking" This topic focused on developing an entrepreneurial spirit among upcoming entrepreneurs. The main aim of this section was to turn participants from job-seeking graduates to employers.

"Business Plan Writing and Accounting for Entrepreneurs" was presented by Mr. Okello. Participants were trained on proper writing of a business plan. This document is vital for any entrepreneur as it guides operations and decisions made in a business. It is a vital tool to seek funding as well.

The participants were divided into 3 groups. Case studies were issued to each and every group. Thereafter each group presented their work, points were awarded and the winning group was rewarded. All entrepreneurs who attended felt motivated and with a stronger desire to expand their operations or to start enterprises of their own.

InCIP facilitates farmer based trainings

InCIP conducted four farmer based trainings on Best Practices in Indigenous Chicken management. The

Participants during farmers based training in Webuye, Kenya

trainings were held in Njoro, Webuye, Siaya and Kakamega respectively in September, 2015.

Nine presentations were made. These included, "introduction to poultry industry" by Dr. T. Muasya. This presentation gave an overview of InCIP and it aimed at creating the know-how in participants about the past, the current and the future of the IC industry in Kenya. Mr.

Mr. Khobondo (standing) presenting during farmer based training in Siaya, Kenya

Khobondo presented on "poultry production systems" which covered on characteristics of different poultry production systems and housing structures, sustainable poultry production systems applicable in Njoro, Nyanza and Western parts of Kenya, poultry breeds for different production systems and traits of economic importance for different production systems.

Dr. T. Muasya (standing) presenting during the training in Kakamega

"Poultry nutrition and feeding systems" was presented by Dr. T. Muasya. The presentation aimed at teaching the participants on the essence of proper poultry nutrition and the feeding systems applicable. It covered widely on the digestive system of IC, classification of feeds and nutrient, requirements for different classes of IC and conventional and improved feeding systems. In the same line Mr. Khobondo covered on home-made feed using locally available materials and optimizing production by manipulating feeding systems.

Ms. Sophie Miyumo presented on "hatchery and incubation management" which covered widely on breeding stock management, selection, storage and

Participants during farmers based training in Webuye, Kenya

preparation requirements of eggs for incubation, incubator operation and management, sexing of chicks and selection of quality chicks and packaging and marketing of day old chicks. "Breeding management" was presented by Dr. T. Muasya which mainly focused on the essence of artificially brooding, basics of brooding, design of artificial brooders, temperature requirements and regulation, feeding regime and growers' management.

"Stock management producing IC for egg production and meat production" was presented by Ms. Sophie Miyumo which mainly covered egg formation process and composition ,laying cycle, light management to improve egg production, culling procedures of unproductive birds, feeding regime of layers, growth cycle and feeding to meet market weight. Mr. Khobondo presented on "Biosecurity measures in the poultry house" with a main focus on vaccination program, control measures of flock infected with common diseases and hygiene measures necessary for disease control. Mr. R. Otwori presented on "ICT

Mr. Richard Otwori (standing) presenting during the training in Siaya

technologies to enhance extension". He demonstrated on M-FUGO which is an SMS marketing and information system for the different actors in the Indigenous Chicken Production Value Chain developed as part of InCIP activities.

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values of non-market attributes. The study found out that mothering ability, the egg yield and disease resistance were important for keeping breeding hens. Body weight and sexual maturity, resistance to diseases and growth rate were the highly preferred traits preferred for cocks. The study brought forth the need to consider farmers preferences in introducing improvement programs.

The Role of Farmers Affiliation Networks on Information Acquisition and Exchange of Indigenous Chicken Breeds in Nakuru County, Kenya (Edmond Majoni, Egerton University)

- The study aimed at characterizing and visualizing farmers breed exchange affiliation networks and to determine the role played by affiliation networks in acquisition of genetic materials by smallholder IC farmers. The study concluded that social network factors, greatly affect farmers acquisition and exchange of genetic materials, strong ties are more pronounced than weak ties in information and breed exchange and farmer groups play a great role in influencing farmer knowledge of IC breeds. It recommended that farmer groups need to be strengthened and trained on new IC technologies and extension services to farmers should be improved through more creative interactions between experts and farmers.

Mr. Bernard Oloo from Egerton University presenting on "Prevalence of E.Coli, Salmonella and Staphylococcus Aureus in a Poultry Slaughter House in Nakuru County"

Farmer Marketing Outlet Choice, Decision, Collective Marketing and Intensity of Participation in IC Markets in Kenya (Simon Gicheha, Egerton University)

- The study determined socio-economic and transaction costs factors influencing the choice of a marketing outlet choice among smallholder indigenous chicken farmers, evaluated the determinants of smallholder farmers participation in indigenous chicken farmer marketing groups and determined the intensity of farmer participation in IC markets. The findings of the study were; the choice of market outlet is linked to its characteristics and that of the farmer; farmers participating in informal market outlets are likely to participate in organized formal outlets if their capacity to access credit, market information and the capacity to synthesize this information is enhanced; infrastructure development is an impetus for improved efficiency in IC marketing; inadequate diversity in market information sources leaves the farmers vulnerable to exploitation by other actors; efforts to realize gains from collective marketing are overshadowed by poor organisation and coordination. Promotion and provision of technologies that increase the level of production, management systems and value addition to achieve competitiveness, strengthening of research extension farmer linkage were recommended.

Analysis of Resource use Efficiency in Indigenous Chicken Production in Bomet County, Kenya (George Gitau, Egerton University)

- The study determined resource use efficiency in indigenous chicken production systems in Bomet County, Kenya. The results of the study among others were; breeding eggs, hens and cocks had their sum of elasticity being 0.679 signifying breeding stocks had a great contributory role in egg production, farmers opted to breed with improved hybrids that were crossbreds that cannot replace themselves and land had been fenced off for other agricultural activities leading to limited feed resource base. The study realized there is need to improve on IC breeds, feed and nutrition and health care.

Efficiency of the Marketing Systems for Local Chicken in Lilongwe District (Joseph Dzanja, LUANAR)

- The study aimed at analyzing the efficiency of the marketing system of local chicken and establishing the distribution of financial benefits among the various players. It was realized that the marketing efficiency of local chicken can be achieved if farmers increase the number of birds reared. This can be achieved through improved production systems, investing in modern technology, collective marketing and sound business practices.

Assessment of the Vulnerability to Climate Variability and Chang of the *Gallus gallus* domesticus in Kenya (Kiplang'at Ngeno, Egerton University)

- The study focused on ranking the impacts of CCV based on farming experience, identification of preferred genotypes to stresses of CCV and identification of adaptation strategies used by farmers to mitigate effects of CCV. The study found out that farmers perceived IC as vulnerable to impacts of CCV, different response strategies have been adopted and used by farmers to mitigate the impacts of CCV and therefore attaining sustainable IC productivity requires identification and utilization of adaptive genotypes to the variable and changing climate.

Improving Indigenous Chicken Productivity for Enhanced Livelihood and Food Security in Sub-Saharan Africa

Indigenous Chicken vendors cash in more than farmers in Malingunde, Malawi

Indigenous chickens (IC) are on high demand in local markets in Lilongwe and a lot of farmers from the rural and peri-urban areas sell IC as a livelihood strategy. Malingunde is one of the areas in Lilongwe with a well established market for IC in Lilongwe. A study under INCIP sought to understand the IC marketing and value chain in this area.

The farmers in the area own about 16 chickens on average and these are sold through several market channels. Most of the chickens (61%) are sold to vendors

An indigenous chicken vendor in Malingunde, Malawi

that often go round the villages to buy. Some farmers (31%) take the chickens to the market where they sell directly to urban consumers or restaurant owners. A few (8%) sell the chickens to fellow farmers within their locality. Vendors mostly sell to urban consumers and restaurant owners.

When profits and costs of marketing IC across the value chain were checked it was found that there are some disparities in the distribution of financial benefits to smallholder farmers and traders. Smallholder farmers were realizing losses of up toMK4, 710 (i.e. -18%) per batch. The vendors made profits of about 40%. What this means is that the marketing of local chicken in Malingunde is not competitive, vendors monopolize the market and they negotiate for prices to their advantage. Farmers mostly have little say as they sell the chickens when they are in need of cash. The farmers faced challenges such as limited extension services, low prices, unreliable markets, diseases, theft and predation from wild animals.

To help the farmers there is need to explore other ways to strengthen farmer bargaining power such as collective marketing through the establishment of farmers association and/or cooperatives. This will increase their social capital not only by strengthening their bargaining power but also market search and more business oriented production. An improvement in access to extension services can help improve management practices and in turn reduce challenges that are mostly associated with inappropriate management practices such as diseases, predation and theft.

InCIP Facilitates the operations of the Centre of Excellence for Livestock Innovation and Business (CoELIB)

This centre is located at the Department of Animal Sciences, Egerton University, Njoro Campus. The purpose of the Centre is to strengthen research and other capacities: Build on existing STI capacity and learning, fostering innovations and agribusiness development; Support respective African Governments to address knowledge gaps and build on existing STI capacity for management of livestock and learning; engage with local decision makers on STI and opportunities and Support and incubate agribusiness.

The Center of Excellence for Livestock Innovation and Business

As a multipurpose Centre, it hosts a number of centres. One of the Centres is the CoELIB Incubar which InCIP has played a role of facilitating its operations. The CoELIB Incubar is an agribusiness incubator in the livestock value chain with different subsidiaries for different livestock species and products. The Incubar facilitates the development of agribusiness enterprises in the livestock value chain and support growing businesses in a conducive environment linking universities, research institutions and the private sector. In addition it supports curriculum reform and improved delivery mechanism to enhance production of agribusiness entrepreneurs and innovators in the livestock value chain and beyond. The businesses and companies that have been incubated within this centre include; Prima Gallus, Milele Feeds, Mazao Millers, Token Network, Ukulima Frontline, M-FUGO and AgriFresh.

Ukulima Frontline Platform

This platform aims at providing timely, relevant and reliable agricultural information by different actors along the agricultural value chain. Ukulima Frontline offers a one of a kind extension experience to farmers, where the farmers are connected to extension agents to assist them in any query or challenge they may encounter. A personal profile is created for the farmers when they utilise the system and is updated with every farmer-system interaction. This gives the extension agents *Cont. on p 9*

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better understanding of the context and history of the farmer which improves the efficiency and effectiveness of extension service delivery

CoELIB incubatees in Ukulima Frontline. From left: Mr. Godfrey Obonyo, Mr. Munyala Mwalo, Mr. Felix Akatch and Mr. Martin Kimani

Mazao Miller

Due to the poor quality of feeds and supply, Mazao Millers is dedicated in the production of quality animal feeds such as layers mash, growers mash, chick mash and dairymeal among others for the domesticated animals.

CoELIB incubatees in Mazao Millers. From left: Mr. Christopher Karani, Mr. Churchill Arogo, Mr. Joseph Gachoki and Mr. Johnson Diyo

Prima Gallus

The main focus at Prima Gallus is to tap into the available opportunity in chicken business. This follows the shift from red meat to white meat as a result of health conscious awareness that has been created over time. Prima Gallus employs a 3 – point business model with the main area focusing on value-addition in chicken products. This involves connecting farmers with other actors in the value chain especially eateries. The other points Prima Gallus focuses on include AgPowered Entrepreneurship which is a mentorship program targeting the youth. This is done through trainings, seminars and organized events to enhance entrepreneurial skill among the youth. Agri-Consultancy on the other hand is when skill and experience is used to help farmers and business men run their enterprises properly through writing of business plans, organizing agribusiness clinics and forming business models for enterprises.

CoELIB incubatees in Prima Gallus. From left: Mr. Dickon Ouma Otieno and Mr. Dickson Okello Otieno

M-FUGO; An SMS Based System

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Token; An Innovative Platform Linking Farmers to Research Organisations

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CoELIB incubatees in Token. From left Mr. Geoffrey Hoseah and Mr. David Mwangi

Biosecurity Measures in Poultry Rearing *by Mildred Andisi*

Biosecurity refers to a set of management practices which reduce the potential for the introduction and spread of disease-causing organisms onto and between sites. Biosecurity procedures, particularly cleaning and disinfection, should be combined with vaccination and strategic treatments to either eradicate or reduce these pathogens to non-infectious levels. Some of the strategic measures that could be effected to enhance biosafety in poultry units include:

a) Location and construction of poultry establishments

- Suitably isolated geographical location. Consider direction of prevailing winds, location of other poultry establishments, and distance from roads.
- Adequate drainage away from the site.
- Avoid building sites near waterways, ponds or lakes utilized by migratory water fowl, and choose well drained areas to avoid standing water. Birds on range will be susceptible to contamination from wild birds and will attract vermin.
- Wherever possible, site poultry houses away from major roads that handle high volumes of poultry vehicles
- Use smooth impervious materials for effective cleaning and disinfection. Concrete pavements to facilitate cleaning and disinfection.
- Security fence all round to prevent entry of unwanted animals and people.
- Post a sign at the entrance of the farm to indicate restricted entry.
- The housing should used for single species with single purpose and with single age group at a time. If this is not feasible each should be managed as a separate epidemiological unit.
- Have separate store houses to store eggs and feeds to prevent entry of wild birds, rodents and insects.
- Use concrete or other impervious materials for poultry houses floors to facilitate cleaning and disinfection.
- Feed should be delivered into poultry farm outside the security fence.
- Traceability at all levels of the poultry production chain should be possible.
- Relevant records of production should be maintained per individual flock e.g. treatment, vaccination, flock history, mortality and disease surveillance data.
- Free from unwanted vegetation and debris.
- Controlled access to the farm to ensure only authorized persons and vehicles enter the site.

b) Hatcheries

- Enough work flow and space for air circulation. Allow one way flow movement of eggs and day old chicks, and one way air flow in the same direction.

InCIP Breeding and Research Unit at Egerton University

- Have physical separation of areas used for:

a) Personnel changing, showering and sanitary facilities
b) Receipt, storage and transfer of eggs
c) Incubation
d) Hatching
e) Sorting, sexing and placing of day-old birds in boxes
f) Storage of egg boxes and chick boxes, egg flats, box pads, chemicals and other items
g) Washing equipment
h) Waste disposal
i) Dining facilities for personnel
j) Office space

- Relevant records include fertility, hatchability, vaccination and treatment.
- Records should be readily available for inspection.
- Dead in shell embryos should be removed from hatcheries as soon as they are found and disposed of in a safe and effective manner.

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Hunger & starvation in Africa have lasted too long. But Africans are not consigned to a lifetime of food insecurity"- UNDP African Human Development Report 2012

Layer poultry Housing

by Mildred Andisi

There are 6 major systems used in housing of layers.

1. Free range system,
2. Semi-intensive,
3. Deep litter,
4. Slatted or wire floor,
5. Combination of slatted and deep litter;
6. Cage or battery system.

Free Range Systems

Birds have access to an outdoor area during the day. This area

Indegineouse Chicken under free range system

may be covered or uncovered. The farmer provides an indoor area where they come in at nights and are able to roost.

Hens which are free ranged have the greatest range of natural behavior and hence have better feather condition when compared to the other housing systems. The main disadvantage is hens are exposed to toxins, wild bird diseases, predators and extreme climatic conditions.

Semi-intensive poultry housing systems

They are commonly used by small scale producers .They are characterized by having one or more pens in which the birds can forage on natural vegetation and insects to supplement the feed supplied. The farmer should provide at least two runs for alternating use to avoid build up of disease and parasites. Each run should allow at least 10 to 15m2 per hen and be fenced. A free-range allowing 40 to 80m2 per hen is required where the hens are expected to obtain a substantial part of their diet by foraging.

Small simple poultry house

The house allows 0.3 to 0.4m2 per bird. It has thatched roof, a littered earth floor and slatted or chicken wire walls on at least three sides to provide protection from rough weather, from predators at night and offer shade in the day time. The shelter should be large enough to enter to collect eggs and be equipped with nest boxes, feeders, drinkers and perches. For convenience the house should be situated so that access to each of the runs can be provided with small outlet doors.

A shelter for roosting and lying can be used in combination with daytime foraging by the hens. The legs of this structure have rat guards (keeps off rats) and ant protection and may be equipped with skids or wheels to make the whole unit easily movable between runs. Feed and water are provided in troughs outside the house.

This system is low in cost, but growth of the birds and egg production are likely to be less than with systems offering closer confinement and better feed. Losses may be encountered by birds of prey and from failure to find eggs laid in bushy areas. The poultry run requires a considerable amount of fencing.

Fold unit

A fold unit is a house and run combined, having part of it covered with chicken wire and the remainder with solid walls. The unit should allow 0.5m2 per bird and must

A simple poultry house

be moved each day over an area of grassland. A unit 6 by 1.5m will take 16 to 18 birds. For larger flocks several such units are required.

Portable units are generally more expensive than permanent houses and may decay quickly because of contact with the ground. Hens have reasonable protection against bird of prey and rough weather and parasites if the unit is not returned to the same area within 30 days.

Deep litter housing system

In this system the birds are kept in litter floor. Feed, water and nest are provided inside the house. Fresh and suitable litter materials spread on the floor include: paddy husk, saw dust, ground nut hulls, chopped paddy straw or wood shavings .The litter material is of about 3to 5 inches depth.

A fold unit poultry house

Cont. on p 13

Cont. from p10

- All hatchery waste, garbage and discarded equipment should be contained or at least covered while on site and removed from the hatchery and its environs as soon as possible.
- After use, hatchery equipment, tables and surfaces should be promptly and thoroughly cleaned and disinfected with an approved disinfectant.
- Egg handlers, chick sexers and chick handlers should wash their hands with soap and water before commencing work and between working with batches of hatching eggs or day-old birds from different breeder flocks.
- Hatching eggs and day-old birds from different breeder flocks should be kept separate during incubation, hatching, sorting and transportation.
- Day-old birds should be delivered to the farm in new containers or in clean, disinfected containers.

c) Personnel and visitors

- Should have training in biosecurity relevant to poultry production and food safety.
- Visitors and personnel must shower and change into clean clothes and footwear provided by the establishment before carrying out any operatives. Where this is not practical, clean outer garments (coveralls or overalls, hats and footwear) should be provided.
- Should wash their hands with soap and water and use a properly maintained disinfectant footbath. The disinfectant solution in the footbath should be changed on a regular basis to ensure its efficacy, according to the manufacturer's instructions.
- Should not have had recent contact with other poultry, poultry waste, or poultry processing plant(s).
- All visitors should enter on foot. Use regularly refilled foot dips, charged with a suitable disinfectant
- Staff movements should be as limited as possible, particularly where the disease situation on a site has deteriorated.
- All visitors should observe standard operating procedures on vehicle cleansing and disinfection, and protective, farm only clothing should be provided to and used by drivers.
- All visitors should enter on foot. Use regularly refilled foot dips, charged with a suitable disinfectant
- A shower in, shower out facility should also be put in place wherever possible.
- Control site traffic. Keep it to a minimum and exclude all unauthorized persons.

d) Layer-breeder housing.

- Nest box litter and liners should be kept clean.
- Hatching eggs should be collected at frequent intervals, at least daily, and placed in a new or clean and disinfected packaging material.
- Grossly dirty, broken, cracked, or leaker eggs should be collected separately and should not be used as hatching eggs.
- Hatching eggs should be cleaned and sanitized as soon as possible after collection using an approved sanitizing agent, in accordance with the manufacturer's instructions.
- Hatching eggs or their packaging materials should be marked to assist traceability and veterinary investigations.
- The sanitized hatching eggs should be stored in a dedicated room as soon as possible after collection.
- Storage conditions should minimize the potential for microbial contamination and growth and ensure maximum hatchability. The room should be well ventilated, kept clean, and regularly disinfected using disinfectants approved for this purpose.

A layer breeder housing

Other key Biosecurity measures

1) Incoming poultry should be from high health status and with a well defined health monitoring and audit procedure for breeder supply flocks. This should extend to hatchery hygiene procedures with regular microbiological monitoring.
2) Have on-site incineration to avoid the potential spread of infection from diseased carcasses.
3) Effective cleaning and disinfection reduces pathogen numbers and the weight of disease challenge, and enhances any biosecurity programme. It can only be achieved with sufficient turnaround/down time to allow removal of all litter, and to satisfy required contact times for the disinfection products used prior to restocking. Cleaning and disinfection should include houses, equipment and surroundings.
4) Use potable drinking water with a low total viable count. Maintain a closed water system with lids on all header tanks. At turnaround, clean and disinfect the water system with a suitable product to remove the greasy biofilm that will harbour and protect pathogens.
5) Treat feed bins and feed delivery systems. Feed delivered to the site must be of high health status and vermin protected. Finished feed and stored raw materials should be sampled regularly for salmonella. "High risk" raw materials or sources should not be used.
6) Check biosecurity procedures regularly. Use only biosecurity products with independently proven broad spectrum efficacy against viral and bacterial pathogens, and use them according to manufacturers' instructions.
7) Maintain an effective, audited rodent and wild bird control programme, and prevent entry of poultry houses by vermin through good house design and repair.

Cont. from p 11

The litter saves labour involved in frequent cleaning of fecal matter (droppings), however it needs periodical stirring replacement. The litter is spread on the floor in layers of 2" height every fortnightly till the required drying is achieved. The birds are confined and well protected. Has low masonry walls set on a concrete floor and wire mesh on the upper part of the walls. The building excludes rats and birds.

Rough cast and other materials can be used for the walls. The house can be designed up to 9m in width and any length that is needed. The density of birds is approximately 4 to 5 birds/m2 of floor area.

As an advantage of this system, Vitamin B2 and Vitamin B12 are made available to birds from the litter material as

Chicken under the deep litter system

a result of the bacterial action. The deep litter is used for manure on disposal .There is lesser irritation from flies when compared to cage system.

Since there is direct contact between bird and litter, bacterial and parasitic disease may be a problem. Respiratory problems may arise due to dust from the litter. The cost of litter is an added expense on production cost. Error in ventilation can have more serious consequences than in the cage system.

Slatted or wire floor housing system

Wire mesh or wooden slatted floors are used instead of deep litter. The house can be built on treated wooden piers 0.8 to 1m above the ground. Ventilation and manure removal are both facilitated and bird density can be 6 to 8 per m2.

A thatch roof or corrugated iron roof may be used with the roof space about 1.5m above the floor. Some insulation under the roof is required.

The feed troughs should be equipped with hinged covers and rat guards should be installed at the top of each pier. The width of this type of building should be limited to about 2m to allow easy removal of manure and adequate wall space for feeders and nests.

The building should be oriented east and west and may be of any length. However, if it is more than 5m long, nests will need to be put on the sides and all remaining wall space on either side used for feeders in order to allow the required 100mm/bird.

If using a slatted floor made sufficiently strong for a person to walk on, then a wider building is possible as feeders can be placed completely inside where the chickens have access to both sides of the trough. The floor is sectioned for easy removal during cleaning out of manure.

This type of houses is cooler than other types, but the building cost is high and management is more complicated

Slated housing system

Combination of slatted floor and deep litter

A combination of deep litter and slatted floor house, offers some advantage over simple deep litter house, but with some increase in investment.

Approximately half of the floor area is covered with small gum pole boards or with wire mesh. This area is raised above the concrete floor 0.5m or more so that cleaning under the slatted portion may be done from the outside. Waterers and feeders are placed on the slatted area. This type of house is limited in width to 3 to 4m so that feeders and waterers can be handled from the litter area and manure beneath the slatted area can be easily removed from the outside without moving the slats or disturbing the birds. Although this system entails added expenses for materials and labour to install the boards/slats, the bird density can be increased to 5 to 7 per m2, so there is little difference in the cost per bird.

Chicken under a combined slated and deep litter housing system

This system saves on litter, increases litter life, reduces contact between birds and manure, and allows manure removal without disturbing the hens. Ventilation is improved due to the slatted floor. Possibly the biggest disadvantage is the limited width for convenient operation and the need for some litter.

Cont. on p. 15

Clean Egg Production *byJosephine Mwabili*

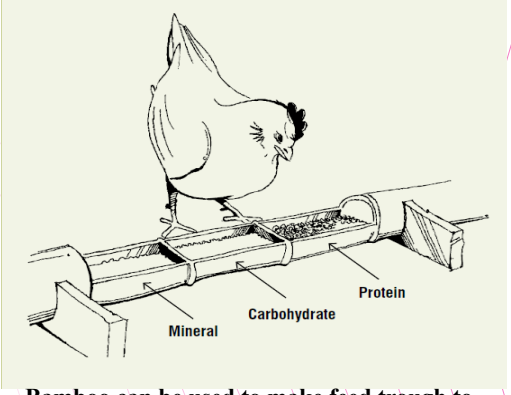
Clean egg production is much easier than physical cleaning of dirty eggs. It involves simple rules of good management of chickens and proper handling of eggs to prevent contamination and deterioration in the quality of eggs. This ensures safety of the consumers.

Egg weighing and cleaning before they are setup in the incubator

- Raise the flock in an enclosed area to protect the birds from disease causing micro-organisms and make egg collection easier.
- Keep the shed area clean and dry. Use clean hay or wood shavings as litter to ensure that the floors are not wet or muddy.
- Provide one nest for every 3 to 4 hens and ensure the nests are large enough for the hens. In the nest, keep a thick layer of clean hay or wood shavings to protect the eggs from cracking or breaking. Clean the nests every week and change the nesting material.
- Provide a perch or roosts that are higher than the nesting box and they should be placed away from the nesting box to prevent the chickens from sleeping in the nests.
- Control rats, rodents, insects and wild birds in the poultry house because they can transmit diseases to the flock.
- Collect the eggs often, at least twice daily. Eggs that stay in the nests for a long time have increased chance of becoming dirty, broken or cracked. Use a clean basket or plastic egg trays to collect eggs. Discard eggs with cracked shell.
- Eggs from hens that are under treatment should also be discarded because they are not suitable for sale or for human consumption until the recommended withholding period for the drug is over.
- Washing of dirty eggs is not recommended because it destroys the protective coating that prevents entry of microbes into the egg. A hand brush may be used to remove any debris on the eggs.
- In case you wish to wash dirty eggs, use water that is about 200F warmer than the eggs. Using cooler water will cause the egg contents to contract producing a vacuum that will pull water and contaminants through the shell into the egg. Cleaning detergents specifically designed for eggs may be used followed by rinsing in water which should be warmer than the cleaning detergent.
- Store dry eggs with the narrow ends facing down in egg trays. Keep the trays in a cool and dry place, avoid extreme temperature fluctuations. Do not store eggs near materials with strong odours such as fish because the eggs will absorb that odour.
- Because fertilized eggs have short shelf life, do not store them for more than 14 days.

Layer Poultry Feeding *by Mwabili*

Purchase feed from a reputable miller who can assure consistency in the quality and performance of the feed. Avoid mixing feeds from several millers, adding other protein sources like fish, meal and minerals salts (DCP)



Bamboo can be used to make feed trough to provide proteins, carbohydrates and minerals

as this changes the balance in the feed thereby affecting performance. Excess of some of these products also negatively affects the final products for instance fishy taint in eggs due to more than 5% fish meal in feed.

During the changes of the rations, mix the two rations so that the change is gradual. An abrupt change is stressful to the bird and can affect performance. Vitamins can be provided during this time to reduce the stress.

Layer chicks

From day 1 to 8 weeks they are feed on chick mash, after 8 weeks introduce growers mash gradually, then with layers mash after drop of first egg at around 23 weeks old. The starter feed should contain 18-20% CP and approximately

Chicks in their feeding unit

3,000 kcal ME/kg from 0 to 6 wk of age. The grower feed should contain 14-16% CP and about 3,000 kcal ME/kg from 6 to 12 wk of age.

To start a flock, feeder lids or plastic feeder trays (one per 50 chicks) should be used. Feed should also be spread on paper placed over the litter, covering 40% of the floor.

Gradually remove the feeder lids or trays, replacing them with the adult feeders. By the time the birds are two weeks (14) days old, all the lids and trays should have been removed. Raise the feeders gradually as the birds grow. Always ensure that the top lip of the feeder is at the same level with the birds' backs. Provide adequate feeder space as recommended below for proper growth of the birds.

Cont. from p. 13

Pullets

They should be fed on 12 to 14% CP & about 3,000 kcal ME/ kg from 8 wk of 20 wks. Heavy breeds have a tendency to deposit excess body fat. It is therefore important to restrict feed. Feed daily a controlled amount of a well-balanced diet. Provide adequate feeder space and a rapid even distribution of the diet. It is good practice to feeding once in a day to control fat deposition. Increase feed intake of pullets when they start laying eggs. It may be necessary to reduce the energy density at 18 to 19 week of age to increase feed intake. Place the birds on a pre-lay program, in which the diet contains about 2% or more Ca.

Pullets in their feeding unit

Layer hens

Higher concentrations of vitamins (A, D, E, riboflavin, pantothenic acid, niacin, and B12 and Mn & Zn is required if the eggs are to be used for hatching. The most limiting amino acid and economical to use are synthetic Met and its analogs. Ca, P, and Vitamin D are important in the diet for egg shell formation.Ca requirement varies with the age, ambient temperature, rate of lay, and egg size. A general recommendation is 3.4 g Ca day and 3.8 g Ca/day after 40 weeks of age. The phosphorus level should range of 0.3 to 0.4 %. Provide adequate vitamin D3 to aid in skeleton development.

Adding grits to the feed can improve feed efficiency slightly. Grits should not be given along finely ground feeds. The grits can be fed in special feeders every 3 weeks, mixed in a complete feed at 0.25% of the diet or sprinkled on top of the feed at a rate of 5 kg per 1,000 hens every week.

Layer hens feeding on green fodder

Pullets coming into egg production should be given 17 to 19% CP and reduce to 15 to 16% after 3 to 4 months of lay, or at attaining the adult weight. Feed intake decreases as the temperature increases. It may be necessary to increase CP to 18 or 20% when temperature exceeds room temperature over an extended period of time. Young pullet flocks may respond to additional feed when their production seems to be reaching a plateau. Increase the daily amount by 2kg per 100 birds. If the flock does not respond by the 4th day, return to the amount fed prior to the challenge. When the peak is over and laying curve showing a normal decrease (4 to 6%), reducing the daily feed by ½ kg per 100 birds for a period of 3-4 days. If this results in an abnormal drop in egg production, return immediately to the previous feeding

The purpose of feeding laying hens is to produce a dozen eggs of good quality at the lowest possible feed cost. For lightweight layers, a target should be a feed efficiency of 3.5 to 4.0 kg or less of feed per dozen eggs.

In medium to large scale houses of this type the slatted floor must be made removable in sections and at least part of it made strong to walk on. This will result into increased building cost and a more complicated management. The house shown has slats over 2/3 of the floor area. This is generally considered maximum for this type of house and allows for stocking density of up to 8 birds per m2. Automatic tube feeders are placed on the slatted floor. One such feeder, with a bottom diameter of 0.6m can serve for 60 to 75 birds, depending on size of breed.

The water troughs are suspended from the ceiling. The nest boxes are doubled by arranging them back to back and have one end resting on the slatted floor and the other suspended from the ceiling. Egg collection can be facilitated by use of a trolley, which is supported on a rail just below the ceiling. Cleaning out between batches can be done by a spade, if all furnishings and part of the end walls are made removable.

Cage or battery systems

In cage system poultry are reared on raised wire netting floor in smaller compartments, called cages, which could be fitted with stands on floor of house or hanged from the roof. It has been shown to be very efficient for laying operations, right from day-old to disposal. Currently, 75% of commercial layers in the world are kept in cages. They consist of rows of stairs-step cages in long narrow shelters. The thatch roof or insulated metal roof shelter can be completely open on the sides with perhaps some canvas curtains in areas where cold winds are experienced. The building should be oriented east and west and designed to provide shade for the cages near the ends.

A 3.4 metre length will allow for four cages without overlap and passageway of about 0.9m. While cleaning is easily achieved on a concrete floor, smooth hard soil is less expensive and quite satisfactory. A little loose sand or other litter spread on the soil before the manure collects will make manure removal easier. The building posts should be treated with wood preservative and well-built enough to support the cages. Rat guard should be installed on the posts at a height of 0.8 to 1m. A central passage, raised 20cm and cast of concrete is easily cleaned and keeps manure from encroaching on the work area. Feeding and egg collecting are easily done by hand or with an automatic system. Ensure that watering trough is carefully adjusted so that all birds

Chicken under the battery cage system

Cont. on p. 16

Cont. from p. 15

receive water. The simplest method of supplying water automatically or by hand at one end is to slope the entire building and row of cages 10mm/3m of length.

Feeders and waterers are attached to cages from outside except nipple waterers, for which pipeline is installed through or above cages. Auto-operated feeding trolleys and egg collection belts can also be used in this rearing system. The droppings are either collected in trays underneath cages or on belts or on the floor or deep pit under cages, depending on type of cages.

Cage types that are equipped with pans to catch the manure are not advocated because they restrict ventilation. Previously used cages should be considered only if they are of suitable design, and have been carefully inspected for condition prior to purchasing.

Cage system needs minimum floor space. It is possible to collect more number of eggs per hen. There is less feed wastage and better feed efficiency. The system provides protection from internal parasites and soil borne illnesses. Sick and unproductive birds can be easily identified and isolated. Clean eggs production. Vices of egg eating, pecking among others is minimal. Broodiness is also minimal. No need of litter material. Artificial Insemination (AI) can be adopted.

The system incurs high initial investment cost. Also handling of manure may be problem. Flies become a greater nuisance. The incidence of blood spots in egg is high. The poultry develop problem of cage layer fatigue. (Laying birds in cages develop lameness. It may be due to Ca and P deficiency but the exact reason is unknown).

InCIP Achievements

InCIP poultry Breeding and Research Unit (IPBRU)
Completion and operation of the InCIP Poultry Breeding and Research Unit has been a great milestone in poultry research in Kenya, Malawi and the region. The unit houses a state of the art setters and hatchery together with breeding pens. Establishment of these units at Egerton University and LUANAR came at an opportune time to counter the challenges in IC production. Through these units, opportunity packages for the growth of the IC sub-sector in the Sub-Saharan region has been developed.

Birth of InCIP-Hendrix Genetics partnership
InCIP brokered partnership with Hendrix Genetics a leading multispecies breeding company in the Netherlands. Hendrix Genetics has provided InCIP with expertise gathered over the years in poultry breeding. In addition, Hendrix Genetics supplied InCIP with male grandparents stock of the Rhode Island Red(RIR) from the Institute Selection Animale B.V. Villa „de Kover Spoorstraat, which have been used for experimental crossbreeding with the IC.

Feed formulation at InCIP Egerton University
InCIP initiated a feed processing and production facility so as to produce feed at Egerton University. The Facility produces feeds for chicks, growers and layers. The move has ensured consistent availability of high quality feeds for the IC.

...working to improve livelihoods and food security among the resource poor households in Sub-Saharan Africa

Improving Indigenous Chicken Productivity for Enhanced Livelihood and Food Security in Sub-Saharan Africa

InCIP patronized the Sustainable Animal Agriculture for Developing Countries (SAADC) conference
In July 2013, InCIP, Malawi chapter patronized the SAADC conference in China. Despite the huge number of presentations at the conference, LUANAR students shined when Yvonne.S. Kamanga was recognized among the top ten young scientists' participants.

M-FUGO; an SMS based marketing and information system
InCIP has developed an SMS based marketing and information system known as M-FUGO. This is a system for the different actors in the Indigenous Chicken Production Value Chain. M-FUGO provides reliable, effective and timely information to IC farmers and other actors in Indigenous Chicken Production Value Chain.

InCIP poultry manual
InCIP has come up with an IC manual that incorporates all aspects of IC from production to processing for improved performance of IC among smallholder farmers. This manual is particularly intended for the Sub-Saharan Africa Region.

Artificial Insemination
InCIP has been able to increase the popularity of this reproductive technology in poultry species in both Kenya and Malawi and the region. Farmers within Kenya and Malawi and technical staff in LUANAR and Egerton University have continuously been trained on this technique, in addition, a step by step guide to artificial insemination has been provided by InCIP.

Regional Conference on Sustainable Improvement of Indigenous Chicken Productivity
InCIP held this Conference at Egerton University. All the presentations made in the conference were studies carried out in the different InCIP activities.

The programme is funded by the European Union through the African Union