InCIP NEWSLETTER

Smallholder Indigenous Chicken Improvement Programme

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Principal investigator's desk

This half year adds credit to the previous one we have had. We have made great strides yet each step can only be described with a success story. We continue to produce solutions but at the same time we also keep on learning. Programmes of this magnitude are never without challenges, but that has not stopped us. We have been brave enough to seek solutions and where we got stuck we sought the help or opinion of our partners. InCIP Kenya and Malawi has made a mark as can be shown by what we have accomplished so far. Our research has taken shape covering all the facets of IC be it social economics, breeding, nutrition, etc. All in all we have accommodated the consumer, the farmer and the environment. In essence we are ensuring food security, we are equipping the farmer to remain with money in his pocket and we produced IC using environmentally sound production methods.

Nevertheless we believe that what we have achieved this half year makes a milestone in IC research. Indeed the completion of the IC handbook will be crucial in IC production growth. The handbook we believe will be an all stop shop for an IC farmer and researchers and extension functionaries. The preparation is made in an easy to read and understand language appropriate for the target audience. The expertise used in its compilation meets what we believe of essence to the targeted audience. This newsletter also covers our commitment to environmentally sound animal production practices. The installation of biogas plant will set up a stage for appropriate IC waste handling strategies. I specifically mention this for intensive production systems where waste disposal is normally a big problem. We hope too that IC producers will learn from this development and set the pace for adoption of this strategy. I applaud our efforts to spread training between the partner countries. The recent training on Artificial Insemination of IC in Malawi is an achievement worth a pat on our backs. In addition to this, I applaud our post graduate students for the commencing of their data collection exercise. This we know is not an exercise in futility as it will contribute to the growth of IC in the partner countries.

PI preparing for farmer outreach session

In brief, I applaud us for our efforts as we continue to accomplish our tasks. We continue to make a mark in agricultural research and our steps have grown from baby steps from the inception meeting to giant steps given where we are in the project. Please take some time to read this issue of the newsletter to get a grasp of what we have up to this quarter. We hope our newsletter gets a wider readership to enhance adoption of our outputs. You can also get a copy of the newsletter on line and help us circulate it widely.

Thank you

InCIP annual team meeting held in Malawi

The InCIP Annual General Meeting was held in Malawi at Crown Hotel, Lilongwe from 16th to 21st March 2014. The meeting was attended by 33 members from Kenya, Malawi and Europe under the due coordination and chairmanship of Prof. A.K. Kahi and Dr. T. Gondwe. The meeting happened to be one of its kind because, all the MSc. and BSc. students under the project were able to present their research topics and the far they have gone in their research work to the members in the meeting. Some presented their research project through a video link. Corrections were made and the students were to work on them with immediate effect.

The meeting also took into account the discussion on the IC handbook. The IC handbook which is intended to be used in the Sub-Saharan Africa is being developed by Dr. M. Ambula from Egerton University, while different topics to be featured in the book were distributed amongst the different members from both chapters. Compilation of scientific papers and case studies will be done by Prof A.K. Kahi and Dr. T. Gondwe from Egerton University and Lilongwe University of Agriculture and Natural Resources,respectively.

Participants during the annual teams meeting in Malawi

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

Biogas plant at InCIP consortia

A biogas plant was recently installed at the consortia grounds. The plant which is already operational will make use of chickens' droppings from the consortia which were initially being disposed to nearby farms as manure. This new development goes a long way in curbing the problem of waste disposal and ensure the project demonstrate environmental friendly animal production. The gas being produced is useful for brooding purposes and later for incubation.

A biogas works as an anaerobic digester that produces biogas from animal wastes or energy crops. The plant is composed of an airtight container commonly known as the digester, in which the waste is dumped and decomposed, and a tank that harnesses the gases emitted by the slurry commonly known as the gas holder.

Biogas is increasingly preferred to fossil fuels or fuels made from ancient organic matter such as oil and coal. Carbon in small amounts is a vital component of a healthy atmosphere, but becomes problematic when too much of it is added into circulation. However, when it is released through burning of fossil fuels, it raises the carbon concentration. Biogas however, comes from live or recently dead organisms whose carbon content is still within the

Biogas production and consumption

cycle, so burning these fuels does less to upset the carbon concentration in the atmosphere.

Biogas has a multitude of utilization option and is furthermore storable. As a result, biogas is far superior to other renewable energies. Biogas plants can generate power continuously and this is independent of sun, wind and water. In addition, biogas fuel is often preferred to fossil fuels because of its low cost, is a renewable source of energy and uses otherwise wasted materials. Biogas is a real all rounder and with its multitude of utilization options, it is the only renewable energy source that is flexibly utilizable.

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

A comparative analysis of transaction costs in collective and individual marketing of indigenous chicken in Kakamega County, Kenya

Market institutional support in majority of the Sub Saharan Africa has been poor, leading to thin, imperfect markets coupled with high transaction costs. For majority of actors in the food markets, transaction costs are high in factor and output markets and hence market perfomance is poor. It has been observed that high transaction costs have undermined the exchange process by cutting down the returns to farmer investments giving rise to atomized rural markets with little rural urban linkage. A lack of rural urban linkage has in turn led to withdrawal of the farmers from the markets and ultimately result to subsistence production which is a low risk investment. Additionally, at times tapping into new commercial opportunities created by market liberalization.

Use of collective action by farmer marketing groups is seen as institutional innovation that reduce transaction costs and enhance market coordination. Realizing the potential of farmer marketing groups in mitigating the effects of imperfect markets by promoting economic coordination in liberalized markets depends on their ability to reduce transaction costs and improve competitiveness. This is achieved by effectively conveying market information, defining and enforcing property rights and mobilizing producers to improve their participation in the markets.

IC rearing has played a major role in the livelihoods of close to 90% of smallholder farmers in Kenya and therefore, overcoming transaction costs may result in higher farm household incomes and ultimately improved livelihoods.With this regard, InCIP conducted a study in Kakamega County of Western Kenya to analyze the sources of transaction costs in market development within the framework of group marketing of indigenous chicken and the contribution of famer marketing groups in reducing these costs. The study was conducted by Mr. Simon Gicheha an MSc student at Egerton University.

From this study we find out that transaction costs are closely related to the choice for a market arrangement where farmers choose the most rewarding arrangement in terms of expected transaction costs. The transaction costs observed in this study were more of the resultant of the choice made to either participate in IC marketing through farmer marketing groups or at an individual level. A comparative approach was adopted where analysis of variance was used to explain the partial difference between individual and collective marketing of Indigenous Chicken.

Different elements of transaction costs were compared between the two marketing arrangements. Transaction costs considered were transport costs, costs of information from different sources and costs of bargain. The costs of bargain was calculated in terms of minutes spent before a transaction was executed and then converted to wage rate per hour. Results showed that group marketing generally incurred lower *Cont. on p. 3*

Cont. from p.2

transaction costs compared to individual marketing. The mean difference between the two marketing arrangements was significant for costs of bargain, transport costs, cost of information from government sources, non-governemnetal organizations and newspapers.

Collective marketing incurred lower bargaining costs compared to individual marketing. IC groups have reservation prices at which they sell their chicken based on the information they harbour regarding the prevailing market prices and therefore leave little room for bargaining. This saves on time they spend before reaching an agreement with the buyers. Individual farmers however are relatively flexible and may take more time bargaining with buyers.

Farmers selling their IC in groups faced lower transport costs compared to individual farmers measured in terms of distance to the nearest livestock market. Marketing groups were observed to cover an average distance of 2.4 km compared to individual farmers who covered an average distance of 4.8 km. They also reduce the transport costs further by pooling their chicken together and transport to the market as one batch.

Further, farmers marketing in groups were better able to access the market information from government sources. The same applies to private sector support through NGO's which prefer to work with groups to individuals. Collective action has been described as taking various forms including the development of institutions, resource mobilization, coordination of activities and most importantly information sharing. There is realisation among the extension service practice that information channeled through groups has more impact in terms of reaching and benefiting a larger number of farmers.

Cost of market information from newspapers was also lower in IC farmer marketing groups incurring an average of Ksh 1 less than individual farmers. Market information obtained from a newspaper by one farmer is relayed to all the group members as opposed to an individual farmer who has to incur the cost of buying the newspaper alone. Contracts in marketing of indigenous chicken among the smallholder farmers do not exist and therefore related costs such as contract enforcement and monitoring could not be captured.

The results generally indictate that farmers marketing chicken in groups incurred lower transaction costs than individuals in marketing of IC. This emphasizes the important role played by groups in promoting marketing of IC. Group marketing was effective in relaying *Cont. on p.4*

Proper care for chicks

Good egg layers begin with proper care when they are still chicks. There are a number of a must have equipments for the proper care of chicks. A brooder is a key equipment or facility which could be as simple as a cardboard box. One must ensure that there is enough space for the chick movement. One should never forget to include a water container and a feeder in the brooder.

Day old chick in the brooder

A thermometer is also critical for the proper care of chicks. It should be kept inside the brooder in order to control the temperature of the brooder. If the chicks stand while spreading out their wings, then the brooder is too warm, on the other hand, if they are all clumped together then the brooder is too cold. Proper temperatures in the brooder make the chicks to get off a good start. A source of heat is crucial as the chicks need to be kept pretty hot. During the first week they require an air temperature of 35°c doing down by 5°c per week until the day that they will be ready to be removed from the brooder. An infrared bulb is placed right in the middle of their living area and suspended off the ground. The height of the light will depend on the target temperature.

Feed is key in success of chick production. Different suppliers have formulated special feed chicks need normally known as starter feed and which can either be crumbles or mash. This feed is called starter feed and it can either be crumbles or mash.

Health management is also an important factor that must be considered to ensure high survival rates of chicks. Vaccination of chicks against common diseases that can eradicate the whole must be followed as per the recommended program. Proper attention must be paid to manure management in the brooder. This is because manure unattended to undergoes decomposition process which produces harmful microbes that make chicks vulnerable to diseases likely to cause death. Therefore, manure must be removed from the brooder at least once a week. Proper hygiene and adequate ventilation in the brooder are also important as they promote good health in the chicks since they discourage the spread of pests and diseases.

Selection of male chicken in the consortia

During the initiation of the InCIP programme, the starting flock was sourced from different parts of the country to form base population. These birds were placed in a deep-litter caging system for breeding in order to produce the first generation within one year. Birds in the first generation have complete pedigree and growth performance records. Using this information, selection of the first generation has been carried out based on each individual's records on growth performance. Birds with high growth rates from hatch to sexual maturity have been selected for use as parents of the 2nd generation. At the same time, genetic values of sires (cocks) from the base population have been estimated using growth performance records of their offspring. Sires of high genetic merit have been retained for further use while those of low genetic merit have been disposed off. The purpose of carrying out selection on both the starting population and the first generation is to ensure that future populations of birds in the research unit have a high genetic merit for growth performance.

Proven cock of high genetic merit for growth

Cont. from p. 3

market information from majority of information sources to farmers. However, there was no significant differences in the cost of accesing information from radio, phones, research institutions and magazines. This is because, these are the most widely used and accesible sources of information by farmers. The study recommends the need to improve interactions between research and extension by involving farmers in mechanism through which they gather, obtain and synthesise the available market information to make informed marketing decisions.

One way in which this could be done is through establishment of farmer call centres where farmers can call to enquire a wide range of information on IC. These call centres should be localised to address issues related to a particular agro-ecological situation for example prevalent poultry diseases in a particular area and mitigation mechanisms.

This will create sustainability and also greatly reduce the related costs. Reduced transaction costs reflect a higher margin by chicken farmers which is key to livelihood improvement.

LUANAR technical staff trained in artificial insemination in chicken

University students and technical staff from the Lilongwe University of Agriculture and Natural Resources (LUANAR) appreciated and gained skills on how to successfully inseminate an IC. The training which was conducted from 3rd -7th February, 2014 was an exciting exercise for both the trainer and trainees. "I didn't expect to enjoy to this level, the participants were so cooperative and interested to learn during the practical sessions" said the trainer Mr. Kiplangat Ngeno who is also a PhD candidate at Wageningen University.

Mr. Kiplangat Ngeno being introduced to students during AI training

The training aimed at equipping the trainees with the ability to stimulate and extract adequate amount of semen from cocks, correctly inseminate hens and differentiate fertile and infertile eggs after insemination using break out analysis.

A total of 15 trainees successfully completed the training and were awarded certificates. In his closing remarks, Mr. Ngeno challenged the trainees to transfer the skills to at-least two people to demonstrate that they have gained the skills.

Maintenance and control of egg quality

When eggs are being produced for human consumption it is important that they are suitable for this purpose. Therefore, maintenance and control of egg quality should be considered since they affect the marketing of the eggs.

Egg quality is influenced by a number of production factors. A major factor is the feeding aspect of production. Sufficient nutrients must be supplied to intensively housed chicken in order for the layers to produce eggs with strong shells and have yolk colour. Consumers prefer yellow yolk colour which can be obtained by providing greens in the layers diet by either mixing them in their rations or feeding them wholly.

Secondly diseases tend to cause hens to lay eggs with misshapen shells and poor quality thick white. Such diseases include Infectious Bronchitis commonly known as IB and Newcastle disease. The breed and age of the hens also affects egg quality. The effects of breed on the eggs are inherent with reference to the colour, thickness and texture of the shell. After the first season of egg production, hens tend to produce eggs of poorer shell quality and white thickness no matter how large the egg maybe. It is therefore advisable to replace the flock between their 84th to 96th weeks of lay.

Temperatures also play a key role. The most effective way to preserve egg quality is to store the eggs between 10°c and 15°c during all handling, transportation and marketing stages. During hot weather and in the absence of a cooling storage system, eggs should be transported to the market at least every 3rd day. In situations where fans or air conditioning are not available, well ventilated rooms or underground cellars can be used.

Proper way to handle of eggs

A step by step guide on how to carry out artificial insemination in chicken

Artificial insemination is the most widely used reproductive technology in the livestock industry. Its adoption in poultry species has increased in popularity, especially in the western countries for research and commercial purposes. In Kenya, this technique is mostly used by poultry research and breeding centres. However, there are scenarios in which commercial poultry farmers may benefit from artificial insemination in poultry:

Handling and abdominal massage of the cock

- In broilers, the males have extreme body conformation, broad bodies and short legs, which hinder natural mating. Also, as the selection for faster growth rates in broilers is intensified, fertility in males is likely to decline due to the negative relationship between growth and fertility. Application of AI in such scenarios is cost effective in broiler breeding management.
- AI allows for incompatible individuals to mate; incompatibility arises when males are heavier than females and under natural mating this may result to injury of the females.
- AI allows for better use of the cage feeding system in hatchery operations, especially when dealing with large number of females that are required to lay fertilized eggs.
- AI allows for one male of high genetic merit for a particular trait of interest to serve more females therefore, increases the number of offspring per cock compared to natural mating which is limited to a mating ratio of 1male:10 females.

Artificial insemination in chicken requires one to understand the basic anatomy and physiology of the hen's and the cock's reproductive tract. In addition to this, one must be technically competent with the semen collection and deposition procedures in order to achieve effectiveness in producing fertilized eggs.

Semen collection procedures

Squeezing of the cloacal surrounding to milk semen from the copulatory duct

Prior to semen collection, cocks need to be trained and this is achieved through abdominal and back massage for about a minute for 3 days, consecutively. The abdominal massage method is the most commonly used since it is non-invasive and has minimal stress on the cock. The procedure involves restraining the male, followed by gentle but rapid stroking of the abdomen and back region (testes are located in this region) towards the tail. This stimulates the copulatory organ causing it to protrude. At this point, the handler quickly pushes the tail forward with one hand and, at the same time, using the thumb and forefinger of the same hand to gently squeeze the region surrounding the sides of the cloaca to "milk" semen from the ducts of the copulatory organ. Semen may then be collected in a small tube or any cup-like container. This procedure is repeated twice, once a day; an additional round may cause damage to the testes and cloacal region.

The volume of semen that can be collected from a single cock ranges from about 0.7 to 1.0 ml, with a spermatozoon concentration of 3 to 4 billion/ml. However, the quantity of semen depends on genetics and environmental factors such as age, bodyweight, season and nutrition. The degree to which the male will respond to the abdominal massage technique and the pressure applied on the ejaculatory ducts will also influence the quantity of semen produced. Chicken semen begins to lose fertilizing ability when stored for more than 1 hour; therefore it must be deposited in the hen within the 1 hour of collection. In the case of short-term storage and transportation of the semen, it is necessary to use liquid cold (4^0c) storage to maintain spermatozoa viability for up to 24 hours.

Semen deposition procedure

Cloacal evertion (left) and semen deposition (right) in the female

Vaginal insemination is commonly used for semen deposition as there are less risks of injury to the hen. Preliminary stroking and massaging of the back and abdomen is required to stimulate the hen. This is followed by applying pressure to the left side of the hen's abdomen around the vent causing evertion of the cloaca hence protrusion of the vaginal orifice. *Cont. on p. 6*

Cont. from p. 5

An inseminator containing the semen is inserted 2.5 cm deep into this opening for semen to be deposited. As the semen is expelled by the inseminator, pressure around the vent is released, so that the oviduct can return to its normal position and draw the semen inwards to the utero-vaginal junction. Inseminators such as straws, syringes or plastic tubes may be used. During insemination, the volume of semen required per hen is about 0.1ml which contains about 100 to 200 million sperms. Timing of the insemination should be considered. It is best to inseminate hens in the late afternoon (2:00pm and 4:00pm), since in the morning hours hens may have an egg in the oviduct, making it difficult for the sperm to swim up to the ovary. A significant feature of the reproductive physiology of the hen is her ability to store fertile spermatozoa for up to 14 days in the sperm storage tubules located at the utero-vaginal junction. The tubules release the semen, slowly over time, which swim to the fertilization site and therefore allows for hens to be inseminated consecutively for two days

Trainees during a practical session on semen collection (inset) and semen handling (right)

for the first time, and thereafter at regular intervals of 14 days. Twenty-four hours after insemination, egg-breakout analysis is carried out to determine egg fertility.

Currently, the Smallholder Indigenous Chicken Improvement Programme (InCIP) – research unit at Egerton University offers training to interested farmers on the artificial insemination in poultry. The training does not require any background on poultry science, just an individual's interest. This is because the training covers the fundamentals of the reproductive anatomy and physiology of the male and female, at a theoretical and practical level. Thereafter, the trainees are taken through a practical lesson on semen collection and deposition techniques, and egg fertility analysis. The training takes a period of two weeks and the expectation at the end of it is that individuals have the capacity to carry out semen collection from males (abdominal massage, semen milking and semen handling), semen deposition in females (cloacalevertion, semen deposition) and differentiate fertile eggs from infertile eggs.

Benefits of poultry farming

Poultry production plays significant roles in ensuring food security and economic advancement for the Kenyan population. Therefore most farmers prefer to invest in poultry as a business to reap its numerous benefits. This has been attributed to an increase in the human population with a consequent increase in food demand as well as increase in health consciousness among the human population since their products are considered complete proteins because they contain essential amino acids

To begin with Commercial poultry farming business ensures high return of investment within a very short period of time. For instance broilers take a shorter duration of time to mature making them a faster means of generating revenue.

Secondly, poultry provide products (eggs and meat) that are highly nutritious resulting to a huge global demand for their products.

Thirdly, marketing poultry products is very easy. There is an already established market for poultry in almost all places. Therefore, one does not have to think about marketing their poultry products since they can easily sell the products in their nearest local market.

Finally poultry farming has over time created income and employment opportunities for most people. Unemployed youth/women can easily create a source of income and employment through poultry farming.

Dr. M. Ambula facilitates IC handbook preparation workshop

Dr. M Ambula from Egerton University facilitated IC module preparation exercise which was held in Malawi on 13th and 14th January, 2014. Dr. Ambula will lead the ongoing work which will produce a training module for IC farmers. The exercise is a task that contributes towards activities 3 and 4 of InCIP.

The module will incorporate all aspects of IC production from production to processing. This is particularly intended for the Sub-Saharan Africa region. The process is participatory in nature and involves IC practitioners, scientists and farmers who interacted through presentations and detailed discussion of case studies from Malawi and Kenya.

Dr. Ambula and the Malawi InCIP technical team observed several challenges facing IC but key among them was breeding strategies and this requires innovative interventions for improved performance of IC among smallholder farmers.

InCIP technical team working on IC handbook

The role of social networks in the exchange of genetic materials and productivity of smallholder indigenous chicken farmers: a case of Nakuru County, Kenya

An MSc. student of Egerton University Mr. Edmond Majoni is studying the role of social networks in exchange of genetic materials and productivity of smallholder IC farmer. The study is being carried out in Nakuru County Kenya.

IC production contributes greatly to the livelihood of majority of rural households in Kenya who are mostly of low income and lack access to proper nutrition. Studies have shown that the potential of IC is yet to be fully achieved and that if this is done most of the rural populace will be lifted out of poverty. One of the ways in which this can be achieved is through the rearing of improved IC breeds which mature faster, weigh more and are disease resistant. This will enable the farmers to improve their productivity and hence their incomes, as a result poverty will be alleviated.

There have been numerous attempts of equipping smallholder farmers with improved breeds but unfortunately the rate of adoption by farmers has been very low. Only a few elite farmers have adopted the rearing of these improved breeds despite efforts by research institutions. NGO's and the government to sensitize the farmers on the benefits of rearing improved breeds. It is not clearly understood why farmers are reluctant to adopt the improved breeds yet it has the potential of improving their production.

However, with the current trend it will be difficult to improve productivity through the improved breeds' policy unless we are able to clearly understand the behaviours of these farmers in terms of how they acquire their breeds and also where they acquire the breeds from. Unfortunately, there are few or no studies on the behaviour of farmers with regard to the exchange of indigenous chicken genetic materials in Kenya. This study therefore seeks to fill this information gap by analyzing the social networks that govern the behaviours of these farmers. This information will provide vital information that will help policy makers, research organizations as well as NGO's to come up with the best ways of providing improved breeds and other services to smallholder IC farmers.

The purpose of this study is to understand the role of social networks in assisting IC farmers in Nakuru to acquire information about new IC breeds and how these ties related to IC productivity. The specific objectives will comprise studying the role of affiliation networks in acquisition of genetic materials by smallholder indigenous chicken farmers, showing the relationship between farmers' affiliation networks and information acquisition about new indigenous chicken, examining farmers affiliation networks in relation to support for productivity with new breeds and demonstrating the role of social networks on farmers' associations with local groups.

The results from the study will benefit major stakeholders in the indigenous chicken sub sector in Kenya, by helping them fully understand the behaviour of farmers hence model technology transfer programs that will be adopted by a majority of the farmers. It will contribute empirically to the literature on social network theory and information exchange, group formation and adoption for increasing technology transfer, in relation to smallholder farmers in a developing country

Production of layers

Layers are birds raised and kept purposely for egg production. The birds generally start laying eggs at the age of 18-20 weeks. Regular egg laying begins at their 25th week of age and at this point their production peaks to about 70 - 80% of the total population. This lasts for a period of 52 weeks after which egg production begins to drop to about 40-50%. Farmers are usually advised to cull the layer flock at this point since their production is not cost effective. The culled flock can be sold for meat consumption and this also provides a source of income. Egg production is greatly influenced by genetic and environmental factors. In commercial situations, hybrid birds which are genetically improved for egg productivity are kept, therefore, environmental factors such feeding and health management must be considered in order to ensure high egg productivity from the flock.

There are different production systems which influence egg productivity differently. The most commonly used system for commercial egg production is intensive system in which birds are fully enclosed in housing structures and provided with balanced rations and proper health management. Under intensive system, a deep litter or battery cage housing sytem may be used. In deep litter, birds are reared on the floor covered with litter material such as wood shavings for insulation and moisture absorption. Such a system requires proper management of the litter material due to manure build up that may form favourable conditions for harmful bacteria growth that cause disease outbreaks.

In battery cage system, small sized metal cages are used. The walls of the cages are generally made of wire mesh or solid metal and the floor is made of sloped wire mesh which allows the faeces to drop on the floor. When the hens lay eggs, all the eggs gather at a collecting conveyor belt of the cage. Food is provided in front of the cages opposite the egg collection point by a long bisected metal or plastic pipe and water is served to them using overhead nipple systems. The cages are arranged in long rows in one above the other. The advantage that this system has is that eggs are easily collected; the hens are easily taken care of and a huge number of hens can be housed in a specific space of the coop.

Analysis of farm level efficiency among smallholder indigenous chicken farmers: a case of Bomet County, Kenya

Indigenous chicken production has been advocated in alleviation of poverty as well as a source of food. There have been concerted efforts towards improving indigenous chicken production to make it more profitable and sustainable especially for smallholder farmers. Despite the improvement programs such as crossbreeding with commercial layers and broilers, formulation of feeds specifically meant for indigenous chicken, production has remained relatively low, and some farmers realize dismal profits if not losses. The production efficiency and/or inefficiency have not been empirically established with the influence of socioeconomic factors not well studied. Mr. George Kamau Gitau an MSc. student at Egerton University is analysing farm level efficiency among smallholder IC farmers. The study is being carried out in Bomet County, Kenya.

The overall objective of the study is to contribute to efficiency of IC production through determination of profitability, socioeconomic factors and marketing channels influencing production among smallholder farmers in Bomet County. The specific objective includes determining resource use efficiency, determining return to scale of indigenous chicken, determining the influence of socioeconomic factors on farm level efficiency and determining the influence of marketing channels on choice of indigenous chicken production system. The study employs a stochastic frontier model to determine the technical, economic and allocative efficiency of indigenous chicken production. A profit function is used to determine the cost and return to farmers.A linear Tobit regression model is used to analyze the effect of socio-economic factors on the technical efficiency of the farmer. Likert scaling is used to assess the perception of farmers on which marketing channel influences their choice of IC production system. The frequency of the responses is determined using descriptive statistics.

In the study, decision to choose a poultry production system is hypothesized to be influenced by farm characteristics, farmers' socioeconomic characteristics, institutional support services and marketing channels. The outcome of each of the decision is then expressed as a computed profitability of the chosen poultry production system. The profitability then describes the efficiency of a poultry production system and therefore the hypothesis, the more profitable a system is the more efficient it is and the more efficient it is the more profitable it is. The farmers' socioeconomic characteristics of interest will be age and gender of the household head, level of education, experience in poultry keeping and off farm income. The age of the farmer is hypothesized to negatively influence production efficiency. This is because older farmers are likened to be risk adverse making them late adopters of better technologies.

Gender is hypothesized to negatively influence production efficiency for female farmers due to challenges of accessing information and resources such as land. Years of schooling is expected to have mixed results. Educated farmers understand the benefits of improved technologies and are faster in adopting them, therefore, enhancing production efficiency. On the other hand, they may engage in other income generating activities paying less attention to farming activities, and therefore, reducing production efficiency. Experience in poultry farming is expected to have a positive influence on production efficiency. Experienced farmers are able to make rational decisions regarding production compared to the less experienced. Off-farm income is expected to have a positive influence on production efficiency this is because the farmer has a regular income to purchase inputs and take care of accidental expenses.

The farm characteristics will include the size of the land holding, hired and household labour expenditure. Land size is hypothesized to positively influence production efficiency due to the expected economies of scale. Household labour is expected to have a positive influence on production efficiency since the cost of labour will be saved while hired labour is expected to have a negative influence. The institutional support provided will include group membership, availability and access to extension services and access to credit. The institutional support provided is hypothesized to have a positive influence. Extension services will provide information on better methods and improved technologies. Access to credit will provide farmers with funds to purchase inputs and pay for services. Group membership will facilitate farmers to save, market their produce and cater for their social welfare. The preferred marketing channels are hypothesized to have mixed results. Local assemblers points are expected to contribute to efficiency. This market channel is consistent and the marketing costs are likely to be minimized and farmers are likely to intensify their production. Farm gate, open air markets and farmer sourced outlets are inconsistent and likely to increase the marketing costs and farmers are less likely to intensify their production.