

# **Pullet production and supply business development by women's groups in selected *kebeles* of Dale pilot learning *district (PLW)*: Experiences from IPMS**

Kettema Yilma,<sup>1</sup> Azage Tegegne,<sup>1</sup> Dirk Hoekstra<sup>1</sup> and Mulugeta Yizgaw<sup>2</sup>

<sup>1</sup>Improving Productivity and Market Success (IPMS) of Ethiopian Farmers Project, International Livestock Research Institute (ILRI), Addis Ababa, Ethiopia

<sup>2</sup>Dale *District (District)* Office of Agriculture

Corresponding author: kettema\_yilma@yahoo.com

## **Abstract**

Shortage of pullet supply and high mortality of local chicks arising from diseases and inadequate feed were the main challenges identified through a rapid diagnostic survey on the poultry value chain in Dale. Accordingly, women group-based commercial pullet rearing as an input for smallholder poultry production was initiated by the Office of Agriculture and Rural Development (OoARD) and IPMS. To develop the program, a credit scheme was initiated using IPMS's credit innovation funds. With assistance of OoARD, eighty women subdivided into five (village) groups, collectively purchased 4000 day-old chicks (50/woman) and other inputs such as feed, vaccines, hay box brooder and watering equipment. The women were trained and developed their skills through their group structures. The required vaccinations were also given by the women themselves under the auspices of the group structures. After 4–5 months, 3470 pullets survived and were kept by the women or sold to others for egg producers. Empirical results show that: i) the group approach helped to improve linkages, communication, and access to knowledge, technology, finance, inputs (day-old chicks and feed), veterinary service, and market; ii) the groups were able to successfully produce and supply pullets thus making an additional income of Ethiopian birr (ETB) 833/hh; iii) the approach stimulates growing demand for the 5 months-old pullets, especially by government/donor financed programs. While being technically and economically viable, the system requires institutional upgrading so as to ensure sustainability of input supply (chicks, feed and vaccine/drugs). The commitment shown by WoARD to provide technical backstopping in all aspects of poultry production also leaves much to be desired. These are crucial at least for the first few cycles, while more emphasis should be given to promoting improved local birds. As the follow-up studies on subsequent egg production showed, considerable attention needs to be paid to building the capacity of poultry farmers to engage in semi-commercial egg production, since egg production was still far below its potential. The study also shows that a difference of as high as 35% existed between egg production level by households who had purchased the pullets privately and households who had received the pullets through food security funded projects in Dale area.

Key words: Dale, pullet production, women groups, value chain, cluster vaccination

## **Introduction**

The IPMS project, funded by the Canadian International Development Agency (CIDA), was established with the aim to assist the Ministry of Agriculture and Rural Development in transforming smallholder farmers from a predominantly subsistence-oriented agriculture to a more market-oriented (commercial) agriculture.

The project adopted a ‘participatory market-oriented commodity value chain’ approach which is based on innovation systems and value chain concepts. Crucial elements in the approach include the value chain instead of a production focused development, linking and capacitating of value chain partners and the assessment, synthesis and sharing of knowledge among the partners.

The project introduced this approach in 10 Project Learning *Districts* (PLD) in Ethiopia with the objective of testing/adopting the approach so that it can be promoted nationwide. An integral part of the approach is the identification of marketable commodities and value chain interventions. This was accomplished through a participatory process in all PLWs.

This case study focuses on *women group-based pullet production and supply business development in Dale district*. It has three major objectives: i) to document diagnostic results and value chain interventions, ii) to provide proof of concepts, and iii) to determine challenges and lessons learned. The paper is divided into seven sections which begin with the introduction. Section two deals with methods and approaches used in the study. Section three presents background information, including description of the PLW and the history and diagnosis of poultry development. Section four presents value chain interventions that include extension, production, input supply, and marketing and credit issues. Section five highlights the results of discussions held on production/income, input supply/marketing, gender/environment/labor use, organizational and institutional aspects. Sections six and seven deal with challenges and lessons learned, respectively.

## **2 Backgrounds**

### **2.1 Brief description of the Project Learning District (District)**

Dale *District* is one of the 134 districts in Southern Ethiopian Regional State with a total land area of (1411 km). The *district* town, Yirgalem, is situated at about 320 km south of Addis Ababa and 45 km away from Hawassa, the regional capital. Dale *district* is currently subdivided into 36 PAs with an estimated human population of 222,000. Crop and livestock production systems are mainly based on traditional technologies and the average holding size per household is small ranging from 0.25 to 1.5 ha.

The altitude of the *district* ranges from 1626 in the west and 2423 masl in the eastern part; The temperature ranges from 11°C to 22°C and the mean temperature is 19°C. The mean annual rainfall is 1314 mm. There are two cropping seasons in the area, Belg (short rainy season) from March to April and Meher (main rainy season) from June to September.

Livestock play a major role in crop production providing draft power in addition to meat and milk mainly for household consumption and sale. Poultry population in Dale *district* was about 218,923. Poultry production system in the *district* is traditional, which is based on local free ranging birds with annual production of 30–50 eggs/bird.

## **2.2 Background to poultry development in the PLW and diagnostic results**

In Dale *district*, which is characterized by high level of food insecurity, unemployment and increasing population pressure on agricultural land, small-scale and semi-commercial poultry production represent a viable option for increasing income and supporting livelihoods.

In rural areas, poultry (eggs/meat) were produced by backyard production with local chicken under scavenging management system. To improve rural poultry production, the Ministry of Agriculture initiated a regular extension package and a comprehensive pilot package that included credit for housing, feeding, and health management. However, both programs were constrained by shortage of improved pullets while the comprehensive package failed to take off due to shortage of credit facility and unaffordable down payment requirements.

On the basis of the Participatory Rural Appraisal (PRA) results and a participatory stakeholder planning workshop held in 2006 in the *district*, *shortage of improved pullets* was identified as a key bottleneck for semi-commercial poultry production. In addition, productivity of local chickens with small holder management is low. This was mainly due to lack of improved chickens (in this case exotic and commercial type) and limited use of other inputs like feed, drugs and vaccines. A subsequent and more detailed diagnostic study showed that managing chicken mortality (up to the age of 2 months, mortality is 55–65%) should be given major emphasis by improving housing and sheltering services from predation (Mekonnen GebreEgziabher 2007).

The input supply system both at public and private sector level for feed, drug, as well as vaccine were almost non-existent. Furthermore, various studies made in the *district* indicated that the extension service reach is inadequate in bringing or introducing better poultry management. Farmers follow the traditional management practice that was gained through life-long experience and social peer group (Innes 2010).

Market demand for poultry (egg and meat) is high due to the *district's* proximity to main consumption centres who are served through the private market actors.

In summary, shortage of improved pullets, poor input supply and veterinary service, weak poultry extension, unavailability of credit, and poor market incentives are the major constraints identified in the poultry value chain development. Accordingly, interventions were designed and implemented with farmers and key partners to address these challenges.

## **3. Commodity value chain interventions**

The project proposed to address the key value chain bottleneck identified during the PRA exercise, i.e. the supply of pullets for the various poultry production packages that are proposed by the Ministry.

The project demonstrated a new approach in the pullet input system in which women groups played a major role in raising day-old chickens to 5 months-old pullets to be sold to egg producers. The approach was developed in 2007 in consultation with stakeholders. It was meant to complement the efforts made by government multiplication centres.

### **3.1 Extension/capacity building/knowledge management**

#### ***Site selection and group formation***

IPMS in collaboration with Dale WoARD supported and facilitated women group-based pullet out-growing scheme in selected villages. The criteria for selection include: suitable biophysical environment, including sufficient space for scavenging, road access to the villages and access to markets as well as willingness of the selected women to be involved in the new enterprise. In addition, their commitment and credit worthiness were considered in the selection.

Based on these criteria, five *kebeles* were identified and eighty (80) women volunteered to participate in the scheme. Loose groups of five were formed to facilitate linkage, internal and external communication, and access to knowledge, inputs and services. The groups elected peer leaders who also liaised between the group and the extension service.

During the selection process, the DAs made sure that these women were located within a walking distance of 15–20 minutes from each other or the centre of the village. This was necessary to collect and eventually deliver the vaccine without losing its efficacy/effectiveness. Such clustering was also proposed to facilitate peer (group) learning and mutual help.

Women were involved in every aspect of the enterprise including acquainting themselves to sources of day-old chicks, feed and drug/vaccine. This was important to expand the enterprise and help women groups to gradually become self-reliant for sourcing inputs after three cycles, with minimum support from WoARD.

#### **Training for vaccination**

With regard to poultry health, New Castel Disease (NCD), next to other poultry diseases (like fowl cholera, fowl typhoid and infectious bronchitis), was identified as the major killer of birds of all age and type. Assistant veterinarians (2 female and 5 men) from WoARD attended practical training conducted by veterinarians from the Regional Poultry Farm in Hawassa. The training mainly focused on keeping the vaccine under proper temperature in cold chain, scheduling vaccination and vaccine delivery to control NCD. The assistant veterinarians, in turn, conducted practical training for the women groups to enable them to administer vaccination by themselves under supervision of a veterinarian.

#### **Training for pullet production**

Training was also conducted for the women to impart knowledge and develop skills in handling and raising day-old chicks, including appropriate feeding, housing, hygiene and proper administration of NCD vaccine.

New and innovative approaches were used in training the women, including:

Trainings were organized in consultation with the women. The women themselves identified the place, time and duration of training as convenient. This was done not to interfere with their daily chorus and other productive activities.

Training mainly focused on imparting knowledge and developing skills in a participatory manner whereby the trainees were encouraged to share their life-long

knowledge and experience and comparing it with the improved management required to raise improved breeds. This sort of interactive sessions helped to build confidence and trust between the women and the experts. The training also created an environment in which the women felt that their knowledge, views and experience are recognized and valued. These feelings enhanced women's active participation in the trainings and build their confidence in the operation.

Parallel to the introduction of the technology and enterprise, women along with DAs were given hands-on practical training in important aspects of managing day-old chicks, and using the hay-box brooder, feeding, watering, ranging and health management in the production of day-old chicks and 90 to 150 days old pullets.

Each training session was also used to learn lessons, share experiences and discuss emerging problems.

### **Training for egg production**

In addition, Dale WoARD livestock specialists and IPMS staff offered training to 34 urban and peri-urban backyard egg producers (those who bought 10 and more pullets) in Yirgalem town. The training mainly emphasized poultry management in feeding, housing, hygiene and egg production and marketing. Apart from introducing the ration for egg producers, they were given information in feed formulation using locally available ingredients. This was important because of the absence of feed suppliers nearby and the soaring price of complete feed produced elsewhere in the country.

### **Knowledge generation through student research**

Two MSc theses were carried out in Dale in 2007 and another one in 2009/10. The first research entitled 'Characterization of Smallholder Poultry Production and Marketing System of Dale, Wensho and Lokka Abaya Districts of Southern Ethiopia'. The study was conducted in November 2007 by Mekonnen GebreEgziabher. Recommendations from this thesis were incorporated in the design for pullet production. The results of the second one entitled 'Human Capital vs. Social Capital—Influences on Egg Productivity in Southern Ethiopia', by Guy Innes in May 2010, were used to analyze some of the results.

### **3.2 Production intervention**

Based on the recommendations from the student thesis (Mekonnen GebreEgziabher) and general knowledge on poultry production, project partners introduced several production interventions to raise pullets from day-old chicks, including:

- i) Use of improved breeds, i.e. Brown Bovan, which is known for its high production of eggs (in terms of egg number and weight)
- ii) Introduction of semi-commercial scale of production, i.e. 50-day-old chicks/farmer. In addition, the grouping of women into cluster of 10–20 women created critical flock size to deliver the vaccines at reasonable cost and effort.
- iii) Promotion of the use of hay-box brooder that serves as a mother hen as well as sheltering baby chicks from predation. Experience elsewhere in the country shows that hay box brooder is effective in raising day-old chicks with low rate of mortality. The hay box brooder requires moving 3–4 locations within the compound throughout the day to enable chicken feed on green grass and avoid building up of manure at one site.
- iv) Improved feeding rations for different ages were introduced as a major input to rear chicks to the desired level, i.e. i) starter feed up to 28<sup>th</sup> day (22 gr/day/chick), ii) growers ration up to 127 days (up to 33 gr/day/chick) and then iii) layers ration. v) Use of locally made

feeders and drinkers. vi) Introduction of recommended vaccine regime, including delivery of HB 1 vaccine 3–7 days after hatching through the eye and then after, delivering Lasota vaccine through drinking water on the 3rd, 7th and the 14th weeks.

### **3.3 Input supply/services/credit interventions**

The project partners tried to build on the district’s package approach through the following actions which were believed to ensure sustainability and ownership:

- Establishing a revolving fund/loan aimed at purchasing the necessary inputs for the semi-commercial production of pullets (from day-old chicks).
- Regional Rural Finance Fund Administration (RFFA) joined as partner serving as financial institution to channel the “innovation fund” to the women through a registered local dairy cooperative
- The rate of interest was fixed at 7.5%, of which the cooperative would keep 1.5%, and the Rural Finance Fund Administration would receive 6% to cover their respective administrative cost and risk. Furthermore, it was agreed with the women groups that they would cover 10% of the initial investment cost in lieu of down payment.
- Hay box brooders and feeders were produced by local carpenters. The boxes were produced from locally available materials, and operated easily with little demonstration or training. Similarly, the watering materials were made locally by pot makers, which is easy to clean and move along with the hay box brooder.

Collective purchase of other inputs such as day-old chicks, feed and vaccines (with the help of credit) were arranged by group representatives with the help of WoA/IPMS.

- Day-old chicks were purchased from Genesis Farm in Debre Zeit. Vaccines were purchased from National Veterinary Institute (NVI) in Debre Zeit. One of the major problems of delivering veterinary service, particularly of vaccines, for poultry is lack of adequate number of chickens of the same age group at one place or village (minimum vial size is 500 doses). To overcome the challenge, cluster approach was used to administer vaccines by trained local women in all the project sites.
- Different feed rations for different age groups were purchased from a commercial feed producer in Debre Zeit. Feed was delivered in bulk initially to last for one month and later on for three months and an additional one month before pullets were sold at age of 90–150 days old.
- The egg producers arranged for feed through group and bulk purchase and also improvise and use supplement feed by mixing locally available feed ingredients like grains and oil seed cakes from the local market. In addition, the chickens were under semi-intensive management and had free access to scavenging to fulfill their requirement.

### **3.4 Outputs and market intervention**

District office of agriculture and IPMS facilitated group marketing of pullets by assisting the women to sell in bulk. This involved *district* office of agriculture who registered people who wanted to buy pullets until they reached critical number and then organized and facilitated delivery of pullets at central place.

In addition, market promotion was conducted through microphone announcements in the

streets of the district town Yirgalem. Local FM radio also broadcasted a program of interviews with women in the villages and district office of agriculture staff. Announcements were also made in big towns like Awassa and some interested people and NGOs came forward to buy the pullets and learn about the scheme and the innovative approaches tested in designing and implementation of the scheme.

## 4 Results

### 4.1 Pullet producers' women groups

A total of 4000 day-old chicks of the Brown Bovan layer breed were purchased for the scheme. Out of the total number of pullets of about 5 months of age, 3470 (mortality rate 13.3%) had a market value of ETB 173,500(ETB 50/pullet). Chicken death occurred in only few participating households and was caused by suffocation and predation. Such mishaps happened when family members left the flock unattended or in situation where the flock is exposed to predators during night—mainly mongoose. Average net return per member was ETB833 and about 26 women (or family) earned ETB900 to 1160, while the remaining ones earned ETB350–850 per cycle (Table 1).

Table1. Costs and returns estimates (ETB) for one production cycle (6-months) of pullet production and supply by women group in Dale PLW, Ethiopia (2009 data)

Item	Quantity	Unit value (ETB)	Total value (ETB)
Pullets sold	3113	50	155,650
Pullets kept by members	357	50	17,850
<b>Total gross return</b>	3470		<b>173,500</b>
<b>Cost items</b>			
Day-old chick purchase	4000	1.5	60,000
Feed—starter ration(for one month)	28 qt	322.5	9030
Feed—growers ration ( for 3–4 months)*	80 qt	247.3	19,784
Transport			7280
Travel expenses			2400
Sales cost			750
Interest on loan ( $7.5\% \times \frac{1}{2}$ ) for 6 months	104,000 (loan)	( $0.075 \times 0.5$ ) for 6-months)	3900
Depreciation (hay box brooder)—5 years	80	231/hay box	3695
Total cost (production and marketing)			<b>106,839</b>
<b>Total net return</b>			<b>66,661</b>
Average net return per member	80 women		833
Average net return per day-old chick	4000		16.66

\*Towards the end most women started using a mixture of purchased, own feed and scavenging.

1. Ethiopian birr (ETB). On June 2012, USD 1 = ETB 17.7072.

## 4.2 Egg producing groups

According to Innes (2010), pullets were destined to three types of egg producers, i.e. i) pullet producers who kept some of their pullets, ii) urban and peri-urban egg producers and iii) farmers who received chickens through government/donor-funded food security projects.

The first group (pullet producers), who were trained by the extension service of the district for pullet production, kept 357 pullets for their own use (67 farmers). They fed their chickens with grain from home, table left-overs and relied heavily on scavenging.

The second group (urban, peri-urban) egg producers consisted of farmers who purposely bought the pullets for egg production (semi-commercial). Members of this group mix locally available feed ingredients using the ration formulation knowledge received during their training. Some also managed group purchase layers ration from commercial feed plants. They also allow their chickens to scavenge during most of the day. This group comprises of 112 people who bought 9 or less number of pullets and some 47 households that bought 10 and more pullets.

The food security group comprises some 300 farmers that received 1–4 chickens through the food security system. These were distributed over 9 or more *kebeles* (in rural areas) making follow-up and support very difficult.

A sample of farmers was taken from each of these groups to determine various characteristics and performance of the scheme, including number of eggs produced/hen during peak laying periods. Since many farmers had both local chickens and the Brown Bovan type, a subsample of the observations was analysed to determine egg production/Brown Bovan of farmers who predominantly had Brown Bovan chickens (bird flock ratio more than 0.75 in which 0 = all local and 1 = all exotic). The results (see Table 2 below) show statistically significant differences between the food security group and the pullet producers group 42.5% ( $t = 0.015$ ) and between the food security group and the urban–peri-urban group 30% ( $t = 0.0273$ ).

Table 2. Egg production by Brown Bovan layers by different producer groups and group characteristics in Dale PLW

Characteristics	Pullet producing group	Urban–semi urban group	Food security group
Sample	49	44	19
Subsample*	9	31	13
Bird flock ratio	0.98	0.97	0.98
Egg production/hen per week**	5.7	5.2	4
Education index***	2.11	3.32	1.54
Social capital index***	10.11	7.13	8.15

Based on Innes (2010)

\* Sample farmers who had more than 75% Bovan brown. \*\* Only for peak weeks in which chickens were laying. \*\*\* Computation of the indexes is explained in (Innes 2010).

The impact study by Innes (2010) indicates that the extension system should appreciate the role of social capital in egg production and incorporate it in the extension system to enhance



egg production. In addition, formal education was recognized as a contributing factor. The study recommends that targeting women with some formal education be included in such projects. Some differences in these characteristics can also be observed between the subsamples of the three groups (see Table 2 above). Taking these findings into account, further research should be conducted to see how best to choose food security farmers for poultry production and how best to support them in order to achieve better results.

#### **4.3 Improvements in access to input/services and output markets**

All 5 women groups (80 women) received credit for the production of pullets (ETB 1300/women) and the collective loan (ETB 104,000) was repaid in full. It is noted that no cash was disbursed; instead, all inputs were received in kind. Loan recovery was virtually done by WoARD that subtract the loan plus interest while facilitating group sales.

The women were able to vaccinate the chickens by themselves with close supervision by *district* veterinarians. Clustering and grouping had been instrumental in effective delivery of vaccines and other services.

The public input supply system was able to deliver on average 540 pullets per annum over a period of 6 years (2004-9) for Dale. Whereas one can deduce that just in one cycle of 5 months engagement, the 80 women produced for sale a total of 3470 pullets. Of these, 3113 pullets were sold and 357 kept by the women.

#### **4.4 Other indirect benefits/side effects**

The conventional extension service generally focuses on men that mainly keep cattle and small ruminants. This project is the first of its kind in the *district* in terms of working entirely with women groups. It placed unprecedented focus on traditionally women-dominated enterprise and brought women to the centre stage as visible actors in development. The enterprise is run by women and their children, and as such it doesn't increase their drudgery. The women acquired new knowledge, developed new skills, received extension advice, loan, and service, and also owned the enterprise. This results in certain degree of improvement in women's level of self-esteem and status in their community.

#### **4.5 Institutional/organizational arrangements for pullet producers**

The women group approach helped to facilitate linkages and communication within group members, and between them and extension and input suppliers. Group leaders have also been instrumental in facilitating communication between the women and District office of agriculture and IPMS. The leaders often visited in person the District office of agriculture and communicated through mobile phones for arranging services, advices, and reporting progress. Amongst others, this resulted in 100% attendance of the members during vaccination and training programs. Further, the women group approach facilitated access to market and reduced transaction costs, particularly given the fact that rearing and selling improved pullets was new to the area and rural women groups are situated off the main road, making individual marketing less attractive.

Besides, the poultry project has initiated a new partnership linkage and evolved new roles and responsibilities for actors. The new arrangement has brought women to centre stage where they own relatively large number of flock and serve as input suppliers. In addition, District

office of agriculture tried to link women groups with input suppliers (source of day-old chicks, feed and vaccines) as well as facilitates marketing of pullets.

## 5. Lessons and challenges

Some of the positive experiences/lessons gained from pullet value chain development include:

- ✓ Adopting a value chain approach brought non-egg production constraints to the attention of the poultry stakeholders, including supply of pullets, credit and capacity of potential pullet/egg producers and the extension system.
- ✓ Using a participatory approach in the identification of potential interventions has led to the design and testing of a viable pullet production system by clustering women in groups which created learning and economics of scale in the supply of inputs and services, especially feed, vaccines, day-old chicks and credit.
- ✓ Village level training where women had the veto to decide the venue and time of the training had helped to ensure active participation and 100% attendance by the women. Hands-on practical training and skill in terms of managing the hay box brooder and vaccination by women has contribute for the success of the input supply system.
- ✓ Women have emerged as effective vaccinators of their flock of chickens, which usually thought to be the activity of professionals only. Vaccination by women had reduced the tasks of District office of agriculture.
- ✓ Credit can be used successfully to develop semi commercial packages for pullet production.

Several challenges for the development of poultry production in Dale PLW are identified;

- Dale *District* is characterized by a food security mentality, which is fuelled by subsidies and government support. This can hamper farmers and input producers from fully acting as entrepreneurs. It is noted that a second round of pullet production by the same women took place after more than one year (2010). To create a sustainable and functioning pullet/egg production value chain, a reliable and functioning input supply system needs to be developed through a cooperative and/or private sector system.
- To further develop the value chain, production of day-old chicks with village-based incubators could be explored.
- While boosting egg production with exotic breeds, attention should also be paid to improved local chickens. Studies and observations indicate that the best choice of animals for smallholders in the rural community would be the selected and improved indigenous breed that shows highest productivity, efficiency and overall sustainability (Ishope 1995; Tadelle 1996; Sonaiya and Swan 2004; Mandal et al. 2006).
- Besides commercial production of eggs, producers may also consider production of broilers for meat.
- For semi-commercial pullet and/or egg producers, accidental losses of birds create financial losses, especially if loans have been used to finance the operation. Creating a community-based insurance scheme may be considered to compensate for such losses.
- As studies indicate, commercial pullet production requires careful selection of farmers and capacity development in order to develop economically feasible enterprises.

- Introduction of exotic/commercial breed and use should be encouraged only in the presence of favorable business development support services and market for the product (Tadelle 1996; Sonaiya and Swan 2004).

### **Acknowledgements**

IPMS facilitated the introduction of the participatory market-oriented value chain approach and assisted in the implementation of the various activities. The bulk of the activities were implemented by value chain actors and service providers in Dale. This case study is therefore based on the work of poultry farmers, staff of the Dale Office of Agriculture and Rural Development, the Cooperative Department, the Regional Rural Finance Fund Administration and IPMS—all of whom deserve compliments.

Assistance in data processing was obtained from Moti Jaleta, Tesfaye Lemma and Aklilu Bogale, while Yasin Getahun helped with the maps and Lemlem Aregu contributed by reading and commenting on the study. Tadelle Dessie reviewed the case study. Their contributions are worthy of appreciation.

### **References**

- Alders, R. and Spradow, P. 2001. Controlling Newcastle disease in village chickens. ACIAR Monograph No. 82. Canberra: Australian Centre for International Agricultural Research.
- Demeke, S. 2007. Suitability of hay-box brooding technology to rural household poultry production system. *Livestock research for rural development*. Volume 19, Article 3. (Available from <http://www.lrrd.org/lrrd19/1/deme19003.htm>) (Accessed on 24 April 2012).
- Fisseha Moges, Azage Tegegne and Tadelle Dessie. 2010. Indigenous chicken production and marketing system in Ethiopia: Characteristics and opportunities for market-oriented development. IPMS (Improving Productivity and Market Success) of Ethiopian Farmers Project Working Paper 24. Nairobi: ILRI.
- Innes, G. 2010. Human capital vs. social capital—Influences on egg productivity in southern Ethiopia. MSc thesis. California University. (Available from: [http://www.ipmsethiopia.org/content/files/Documents/publications/MscTheses/FinalThesis\\_GuyInnes.pdf](http://www.ipmsethiopia.org/content/files/Documents/publications/MscTheses/FinalThesis_GuyInnes.pdf)).
- Mandal, M.K., Khandekar, N. and Khandekar, P. 2006. An experimental study on model for sustainable rural poultry farming. *Livestock Research for Rural Development* 18(5).
- Mekonnen GebreEgziabher. 2007. Characteristics of smallholder poultry production and marketing system of Dale, Wensho and Lokka Abaya district of southern Ethiopia. MSc thesis. Hawassa: Hawassa University. (Available from: [http://www.ipms-ethiopia.org/content/files/Documents/publications/MscTheses/FinalThesis\\_MekonnenGebreEgziabher.pdf](http://www.ipms-ethiopia.org/content/files/Documents/publications/MscTheses/FinalThesis_MekonnenGebreEgziabher.pdf)).
- Shepherd, A.W. 2007. Approaches to linking producers to markets. A review of experience to date. Agricultural management, marketing and finance occasional paper. Rome: Food and Agriculture Organization of the United Nations.

Sonaiya, E.B. and Swan, S.E.J. 2004. Small-scale poultry production. Technical Guide.  
Rome: Food and Agriculture Organization of the United Nations.