



# Poultry based livelihoods of rural poor: Case of Kuroiler in West Bengal

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## Research Report

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**SOUTH ASIA**  
**Pro Poor Livestock Policy Programme**  
A joint initiative of NDDB and FAO

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**South Asia Pro-Poor Livestock Policy Programme**

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## **Disclaimer**

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# 1. The Setting

In recent years there has been increasing recognition among the development community of the role of backyard poultry production in sustaining and enhancing poor peoples' livelihoods in developing countries. Market oriented backyard poultry enterprises are being recognized as a stepping stone for the poorest households enabling them to take the first step towards breaking out of the vicious circle of poverty and deprivation. There is also growing evidence to demonstrate the role of rural family poultry in enhancing the food and nutrition security of the poorest households, reducing the livelihood vulnerability and insecurity, and promotion of gender equity (Dolberg, 2004; Ahuja, 2004; Ahuja and Sen, 2007; Otte, 2006).

At the same time, the market and production context of poultry production has been changing rapidly over the last two decades. Rapid economic growth and urbanization has resulted in fast expansion of industrial large scale, vertically integrated, poultry production units. Opportunities have also expanded for small scale poultry enterprises due to improved market access infrastructure and a preference structure that might still favour free range *desi*<sup>1</sup> birds and eggs. As a result, there has been increased market orientation even among small scale poultry enterprises. These changes have brought large and small production systems in overlapping competitive space which has created both challenges and opportunities.

Despite the potential offered by backyard poultry production in reaching out to the poorest, there has been little public support for backyard poultry production in India. Recently, however, the Government of India and a number of State governments have become sensitive to the potential offered by this activity and have begun to

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<sup>1</sup> 'Desi' refers to indigenous poultry species.

promote backyard poultry through various schemes. Similarly, there is growing realization among the private sector players of the ‘business potential’ offered by this sector. This opens up new possibilities of nurturing synergistic partnerships between public, private and civil society organizations with the common objective of enhancing poor peoples’ livelihoods.

One example of private sector promoted backyard poultry in India pertains to the ‘Kuroiler’ introduced by Keggfarms Private Ltd. Kuroiler – “Kegg + Broiler” is a dual purpose hardy bird with significantly higher productivity than indigenous birds while retaining many desirable features of indigenous birds, such as the feather colors for camouflage, agility to escape from predators and resistance to diseases<sup>2</sup>.

Kuroiler was introduced by Keggfarms in 1993. In the first year itself the company sold more than a million day old Kuroiler chicks. By 2005-06, the number had already reached the figure of 14 million—a phenomenal annual growth rate of almost 22 percent sustained for more than a decade (Figure 1.1). The introduction of ‘Kuroiler’ completely transformed the company in terms of its geographical presence (Figure 1.2), clientele, and distribution channel. It shifted its operations from agriculturally prosperous regions to areas with high incidence of poverty and vulnerable livelihoods.

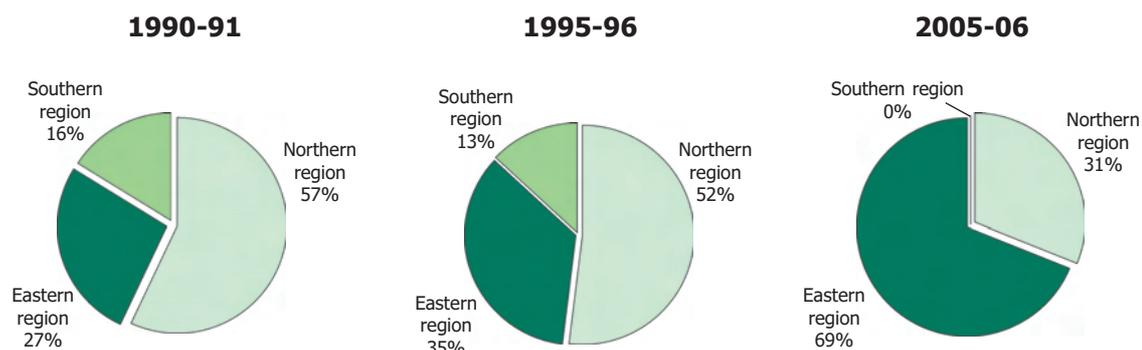
**Figure 1.1: Sale of day old chicks in Keggfarm: 1990-91 to 2005-06**



<sup>2</sup> The ‘K’ in the Kuroiler also derives from ‘Curry’, the generic term for spice mix and the style of Indian cooking. Due to the hardy character of Kuroiler meat, it takes a little longer to cook, allowing the ‘curry’ to permeate deep inside the meat, giving it a distinct taste and aroma specially suited to the Indian palette.

The company which had been in the commercial broiler business for more than three decades, completely phased out broilers and layers by 2005-06. Most important of all, however, Kuroiler emerged as the 'Bird of hope' for hundreds of thousands of extremely poor families. Keggfarms was recently awarded the "Business India Innovation Award" in the social entrepreneurship category.

**Figure 1.2: Geographical distribution of Keggfarm sales**



Although 'Kuroiler' has been receiving increased attention over the last few years, no systematic study has analyzed its livelihood impact at the village level. To examine its impact in improving poor peoples' livelihoods and to identify areas of policy support for promoting household poultry systems as a means of grass-root empowerment, SA PPLPP (South Asia Pro-Poor Livestock Policy Program) initiated a field study in West Bengal in September 2007. Specific objectives of the study were to

1. examine the impact of 'Kuroiler' in improving and sustaining poor peoples' livelihoods;
2. understand the threats and opportunities for Kuroiler in the wake of expanding large scale industrial poultry systems and emerging public perception of backyard poultry as reservoir of diseases; and
3. identify needs for policy support / space to promote market based household poultry systems as a means of grass-root empowerment and livelihood support.

Nearly 250 households and about 100 other agents were interviewed as part of this study. The research methodology combined traditional survey based techniques with qualitative tools such as intensive personal interviews, focus group discussions, and

a unique participatory research tool — the ‘nine square mandala’. Conceptualized by Hogger (1994), this framework is useful to relate development interventions with livelihoods and identify the gaps. The tool provided the trigger points relating to all aspects of rural livelihood system and helped in understanding human behavior in its setting—society, resources, politics, traditions etc. The information gathered helped in bringing out patterns and links between these aspects and provided insights about inner realities that lead to decision making. More details about this framework are given in Annex 2.

The organization of this report is as follows. Section 2 lays out a brief history of Keggfarms and Kuroiler as a background to the results presented in subsequent sections. Section 3 presents the design of surveys and the elements of methodology followed in this study. The results of the study are presented in Section 4. Finally, Section 5 brings together the findings and presents a synthesis of key lessons.

## 2. A Brief History of Keggfarms and Kuroiler

Keggfarms was established on a 23 acre compound in 1967 in Gurgaon, then a small township about 25 Kms from Delhi<sup>3</sup>. The company was in the business of producing both broiler and layer chick lines and supplying these to urban markets. That was the standard model in poultry industry—to import the grand parent stock, multiply them and market the off-springs.

Keggfarms pioneered genetic poultry breeding in India. The idea was to breed high yielding stock that would be suited to Indian environmental conditions. Initial years were difficult but fairly quickly the company could show that it was not necessary for India to go on importing the grand parent stock. With modest resources, and high spirited determination, Keggfarms proved that it was possible for India to develop its own stock that would be as, and perhaps more, productive under Indian conditions than the imported stock. That earned the Keggfarms substantial reputation and respect in the industry, even though the size of the company continued to be small. The consequence was that other companies also persuaded their foreign collaborators to provide them the 'pure line' stock to begin breeding in India and developing birds for Indian production and market conditions. As a result, by 1980s India had become completely self-sufficient in poultry breeding stock. By 1991, Keggfarms was selling more than 9.5 million broiler and layer chicks. A significant proportion—close to 60 percent—of their sale was in North Indian states (Punjab, Haryana, Chandigarh, Delhi, Western Uttar Pradesh, and Rajasthan).

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<sup>3</sup> After India's liberalization drive initiated in 1991, Gurgaon has emerged as the BPO (Business Process Outsourcing) and mall capital of India and boasts of housing a number of high tech powerhouses including Nokia, Microsoft, Ericsson, Canon, Sapient and so on. The physical landscape of the town has completely transformed from a dusty little village to one that dots swanky glass buildings, wide highways and magnificent malls.

## Free range bird in freed-up India—the birth of Kuroiler

The year 1991 marked an important turning point for Indian economy. A highly protected regime was thrown open to domestic and international players with significant liberalization of industrial and foreign trade policies. At that time, the company faced three choices. One, scale up the operations and compete with the multinationals with much deeper pockets. Two, join hands with them. And three, somehow differentiate the product where the company will have sustained demand for foreseeable future. At that time, the company management thought of rural poultry.

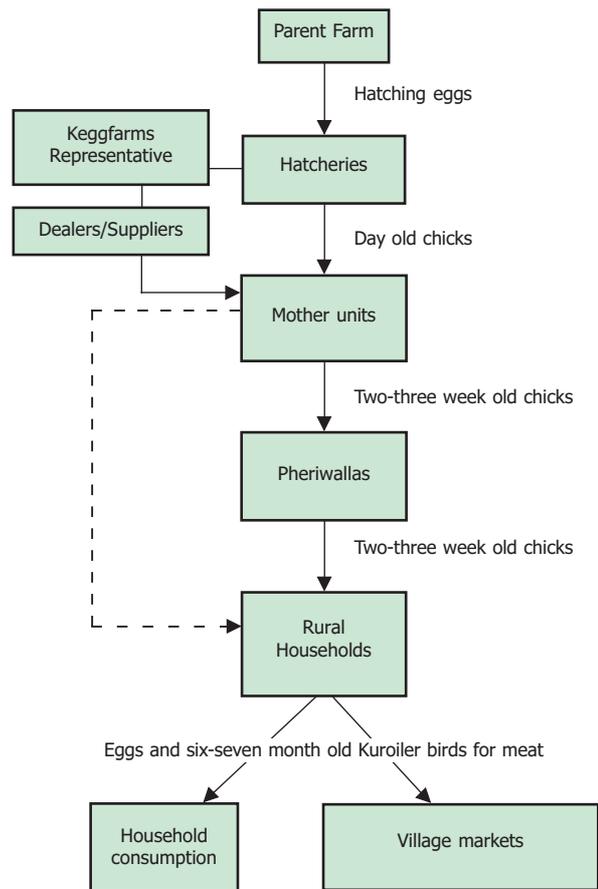
The company took some time to study poultry production practices in villages. The idea was to develop a bird that will be significantly more productive in the given sanitary conditions and husbandry practices. After a careful study, the company decided to breed a dual purpose bird which would be as hardy as a local village bird but would still produce many more eggs and grow much faster than *desi* bird. In addition, it must retain the feather colors, be agile to run away from predators and must be as disease resistant. With relatively well developed in-house breeding capacities, it did not take the company too long to produce a bird with the desired traits. 'Kuroiler' was born in 1993 and distributed in selected villages. As noted earlier, the sale of Kuroiler day old chicks touched one million in the first year itself. Estimates of how far has the Kuroiler traveled are imprecise at best. Recent reports suggest that the Kuroiler has already touched the lives of about a million households in some of India's poorest regions. Keggfarms supplies its 'day old chicks' to 1,500 Mother Units across the states where it operates directly or through its appointed dealers/suppliers. The Mother Units are operated by local entrepreneurs and keep anywhere between 50 to 2,000 birds at one time. They rear day old chicks up to about 3 weeks age, vaccinate them if necessary, and then sell them to *pheriwallas*<sup>4</sup> who travel to villages and sell these chicks to rural households. Typically, the Mother Unit entrepreneur and the *pheriwallas* make a profit of approximately Rs 3 per bird. The households rear the birds in their backyard and generate supplementary income by trading in the eggs and adult birds (see Figure 2.1 for a schematic representation of Keggfarms's distribution channel).

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<sup>4</sup> *Pheriwallas* are mobile vendors who sell these chicks door-to-door in villages. They typically travel on their bicycles with baskets containing day old chicks. Some *pheriwallas* also use public transport for traveling to villages or local markets.

Since the Kuroiler day old chicks are raised to 2-4 weeks of age at the Mother Units before being sent to village households, the husbandry, nutritional and health practices observed at Mother Units play an important role in the efficiency of these units and the performance of chicks down the chain. Thus operators of Mother Units need training in basic care and management of day-old chicks brooding, husbandry and health practices. Keggfarms provides these either through its field staff, most of who have prior husbandry exposure; or through structured courses in Mother Unit management. When necessary Keggfarms sends its experienced husbandry personnel from its units to guide the field staff on any specific problem that may have arisen. Additionally field staff and dealers/suppliers also provides commercial guidance to Mother Units when required with regard to sourcing, quality of feed, medicine, vaccine, market knowledge etc.

**Figure 2.1:Kuroiler Distribution Channel**



Because of the fragmented and remote nature of beneficiary households Keggfarms is unable to maintain any active contact or out-reach to village households that rear poultry from 3 weeks onwards. This remains a critical gap and provides an important avenue for public-private partnership for harnessing poverty reduction potential of household poultry. Despite such shortcomings, however, Kuroiler seems to be performing efficiently in the village conditions as demonstrated by the repeated and increasing demand for them. As a policy, Keggfarms does not supply day old chicks to villages as this will result in huge “infant” mortality. When birds are sent at 2-4 weeks of age the livability improves dramatically.

Sustainability of the Kuroiler model derives from the interdependence of livelihoods at all levels. Sustainability of *pheriwallas* depends on the sustainability at household level. Sustainability of Mother Units depends on *pheriwallas* and finally that of Keggfarms depends on the sustainability of all those in the chain. Unlike externally supported rural poultry projects, everyone in the Kuroiler chain is independent and yet their livelihoods are dependent on each other. This characteristic of the Keggfarms model prompted the jury of “Business India Innovation Awards” jury to note that “(The Business is) sustainable because it has created rural entrepreneurs. A great deal of scalability happens when such entrepreneurship is created” (<http://www.businessworld.in/content/view/729/784/>).

With regard to the threat of competition from larger players and other risks posed by public health and bio-security considerations, the company believes that given the very different nature and characteristics of large scale commercial and small scale household production systems, the two systems are likely to continue to operate in segmented markets. Currently, there are other companies selling synthetic birds for backyard rearing but they have not developed the door step delivery system as Keggfarms, while others imitate the Kuroiler by taking day-old male chicks (commercial layer variety), which are sold at a throw away price by the industrial hatcheries, through a color bath so that they apparently look like a Kuroiler. Despite such competition in the market, the sale of Kuroiler day old chicks has continued to grow very rapidly. The company also believes that the risks posed by large scale commercial systems are far greater than household based village poultry production due to inherent resistance to diseases, biodiversity provided by mixed gene pool in local birds and scattered nature of production thus lowering the risks of large scale outbreaks.

### 3. Methodology and Survey Design

Any study dealing with 'livelihoods' has to confront the issue of characterizing aspects of livelihoods it wishes to examine while maintaining broad consistency with generally understood notions of the term 'livelihood'. Although there are a number of different ways 'livelihoods' have been defined in the literature, nearly all of them look at 'livelihoods' as the means of making a living including access to a reliable and permanent sources of food, income, and employment which in turn depends on a system of capabilities and assets (resources, social networks, and skills). In order to understand the role and contribution of Kuroiler in sustaining poor people's livelihoods, this study focused on its contribution to income, household nutrition, women's empowerment, and development of entrepreneurial capacity. Towards that end, this study followed a traditional survey methodology and a qualitative approach. The formal methods were further supplemented by formal and informal focus group discussions at the community level. The sample and the sampling frame for both qualitative and quantitative components of the study were kept identical to ensure the two methodological components complemented each other. A quantitative survey collected information on measurable indicators such as income levels, socio-demographic characteristics, physical assets and natural resource base, nutritional levels, aspects of market access, and access to information. The qualitative component on the other hand focused more on aspects which could not be easily captured within the framework of quantitative measurement. These included aspects of livelihood systems such as intra-household nutritional allocation, decision making dynamics within the household, gender empowerment, and Kuroiler's contribution towards them.

The study was conducted in four districts of West Bengal, namely South 24 Parganas, East Midnapore, Murshidabad, and Jalpaiguri (see Figure 3.1 for location of these districts within West Bengal). Since the primary objective of the study was to understand the ‘livelihood’ impact of Kuroiler, it was necessary that the sample contained sufficient data points of Kuroiler and *desi* (indigenous) birds. Thus, the sample was drawn with two main considerations in mind—adequate representation of (i) areas with Kuroiler and *desi* poultry population and (ii) geographic and agro-climatic diversity. The fieldwork for this survey was done during September—October 2007.

**Figure 3.1: District Map of West Bengal**



The sample selection followed a two-stage process. In the first stage, four districts were selected to satisfy the sampling considerations. In the second stage, five villages per district were selected in consultation with Keggfarm dealers and other informed observers. Fifteen households, two Mother Units and two *pheriwallas* were included in the sample in each of the selected villages<sup>5</sup>.

Since no sampling frame existed at the village level, the selection of households, Mother Units and *pheriwallas* was done in consultation with dealers and other knowledgeable people in the village.

<sup>5</sup> Since Qualitative research investigates the why's and how's of decision making, it needs a smaller but focused samples rather than large random samples needed for Quantitative research. For this reason, in each district three villages were picked up for Qualitative component. Three to four households were selected for individual interviews in each village and a focus group discussion was carried out with 7-10 women poultry rearers. Thus 36 individual interviews and 12 focus group discussions were conducted in all.

During the household selection, it was ensured that various categories of households—landless, small and marginal, and large farmers—were adequately represented in the sample. Each household selected for the survey was administered a structured questionnaire. The quantitative questionnaire had three modules. A brief description of these modules is given below

**Poultry** -This module collected information on ownership of poultry and other livestock assets, access to and utilization of services, production and utilization of livestock products, input use, etc.

**Household characteristics** - This module obtained data on various household characteristics such as education, housing characteristics, and ownership of consumer durables.

**Agriculture** - This module included questions on the ownership of land and farm implements, cropping pattern, and production and utilization of agricultural output

Separate questionnaires with similar structure were prepared for Mother Unit owners and *pheriwallas* and administered during the study. In all, data were collected from 260 households, 37 Mother Units and 37 *pheriwallas* across 19 villages in four districts. Examination of livelihood patterns across income categories requires a robust measure of income. Due to substantial diversity in occupations and sources of income (both cash and kind) and the inevitability of relying on recall method in absence of any records, the task of measuring household income within reasonable degree of measurement error, is extremely difficult. In order to get around this problem, this survey collected information on a number of assets (land, livestock, housing and other consumer durables), created an index of assets using weights derived from principal component method and used this index as a measure for income and overall economic status. For the purpose of comparison across income groups, the households were ranked in ascending order of the index, and comparisons made across three categories—bottom 20 percent, middle 20 percent and top 20 percent. Detailed description of the index along with some statistics demonstrating its internal coherence is given in Annex 3.

## 4. Results and Discussion

### Sample Profile

Similar to most low income countries, household poultry in India finds special favor with the poor (landless, marginal and small farmers) and disadvantaged communities. Most of these households work as daily wage workers on construction sites or on other people's farms and the earnings are usually insufficient to finance even subsistence consumption throughout the year. These households rely on small scale low cost poultry production systems to supplement and enhance their livelihoods or engage in other livelihood support activities such as mat making or other petty household enterprises.

In the sample selected for this study, approximately half the households belonged to landless category. The proportion was as high as 70 percent in East Midnapore. Further, the size of holding was below one *acre* for nearly 70 percent of those who had some land. Thus, the sample households comprised mainly landless households or marginal farmers. Land ownership by income category is given in Table 4.1.

Similar pattern is reflected in the ownership structure of other assets. For example, the poorest 20 percent households reported owning, on average, less than one goat and less than half a cow (Table 4.2)<sup>6</sup> and less than 10 percent households in the bottom 20 percent category reported owning a radio. No one in that category owned such assets as a watch, fan, television or sewing machine (Table 4.3)<sup>7</sup>. The essence of these

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<sup>6</sup> Meaning, of course that only a few households in this category owned a cow.

<sup>7</sup> To put these statistics in comparative perspective, it may be useful to compare this asset pattern with other similar surveys. Directly comparable surveys are not available but one such survey was carried out in Orissa — the poorest state of India in the year 2002. That survey covered those farmers who owned at least one dairy cow. By all reasonable accounts, Orissa livestock owners would be among the poorest in India. Even in that survey, about half the households from among the bottom 20 percent category reported owning a watch and about 8 percent reported owning an electric fan. Although, as indicated earlier, these are not directly comparable, they do help reinforce the point that the Kuroiler owning households in West Bengal are among the poorest in the country. For further details of Orissa survey, see Ahuja, Morenhoff and Sen (2003).

statistics is that the sample households belonged to the category of ‘very poor’. Such a pattern was observed despite conscious attempts to spread out the sample across income/asset space subject to them raising poultry.

**Table 4.1: Average size of land owned by sample households**

Land holding (acres)	Income group		
	Bottom 20 percent	Middle 20 percent	Top 20 percent
Irrigated	0.03	0.10	0.49
Non-irrigated	0.08	0.19	0.93

**Table 4.2: Average size of livestock holding in the sample households**

Herd size	Income group		
	Bottom 20 percent	Middle 20 percent	Top 20 percent
Goats	0.83	1.03	0.79
Cattle (desi)	0.41	0.77	1.09

**Table 4.3: Ownership of selected assets by sample households**

Name of Asset	Percent owning		
	Bottom 20%	Middle 20%	Top 20%
Radio	9.00	70.0	88.0
Cycle	30.0	85.0	94.0
Motor cycle	0.00	5.00	19.0
Fans	0.00	20.0	87.0
Watches	0.00	57.0	93.0
Television (B&W)	0.00	2.00	52.0
Television (Colour)	0.00	0.00	41.0
Sewing Machine	0.00	2.00	7.00
Pressure Cooker	0.00	0.00	63.0
Irrigation pump	0.00	0.00	17.0

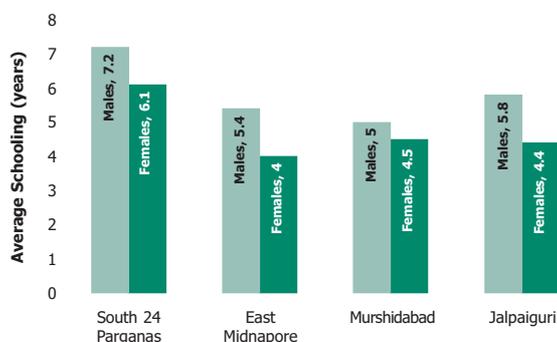
### **Education**

Overall education levels in rural West Bengal are quite low. Although we do not have representative attainment statistics at the state level, average schooling in the *sample households* was approximately 5 years. Across economic status, the poorest households reported education levels of approximately three years compared to about 7 years in the case of top 20 percent households.

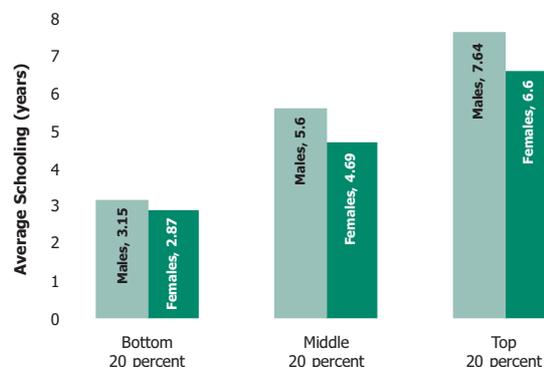
Interestingly, the gender gap among the poorest households was lower than the middle and top 20 percent households. Across districts, South 24 Parganas and Jalpaiguri

had the highest average years of schooling followed by Murshidabad and East Midnapore (Figures 4.1 and 4.2).

**Figure 4.1: Average schooling in the study area**



**Figure 4.2: Average schooling across income groups**

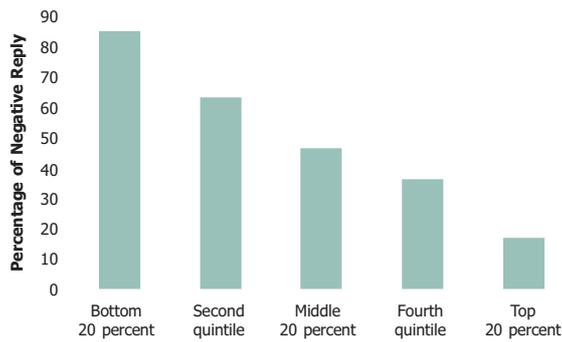


These statistics however only tell part of the story. A number of even very poor households send their male children to apprenticeships in Kolkata and nearby towns. These young boys learn embroidery work, leather work; blacksmiths work etc. for a year and those skills are not reflected in the statistics presented above. They get free boarding and lodging but do not get paid for the work they do. Wages are paid only after one year of training/working. Villagers expressed that formal education of the kind in government schools does not guarantee jobs and therefore it is better for young boys to learn some trade /craftsmanship.

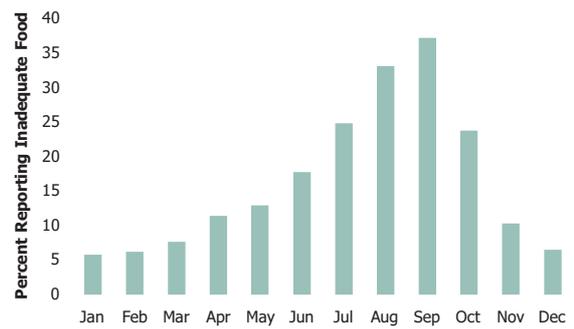
### ***Food and Nutrition***

Food security levels in the sample population are terribly low. Even among the top 20 percent sample households, approximately 16 percent did not have secure access to food all year round. The proportion was as high as 85 percent in the bottom 20 percent households (Figure 4.3). Typically, the monsoon months—July to October, were identified as the months of acute food scarcity (Figure 4.4). In terms of consumption, the differences between the income groups were most pronounced for pulses, vegetables and meat with consumption increasing steadily with income. However, for egg and fish, the difference was marginal across income groups (Figures 4.5 to 4.8).

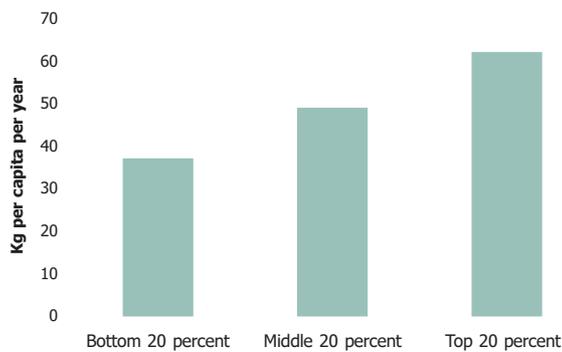
**Figure 4.3: Do you have sufficient food to eat all the year round?**



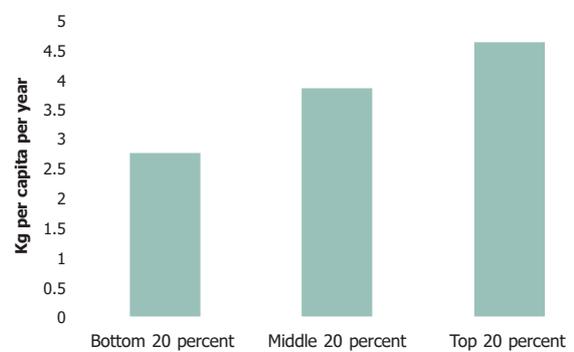
**Figure 4.4: Months of food shortage**



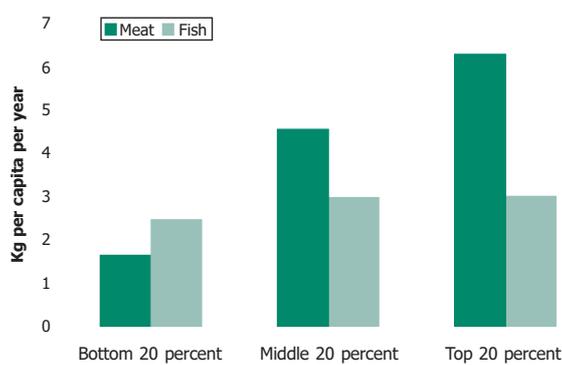
**Figure 4.5: Per capita consumption of vegetables**



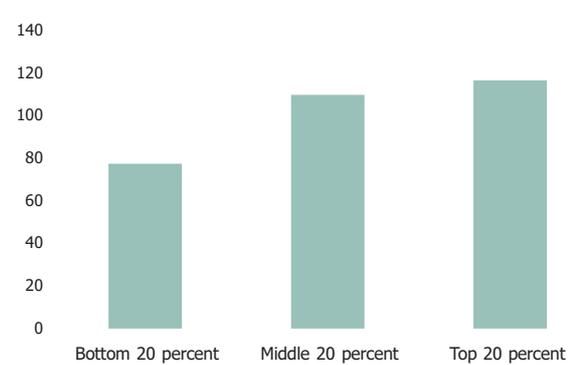
**Figure 4.6: Per capita consumption of pulses**



**Figure 4.7: Per capita consumption of fish and meat**



**Figure 4.8: Per capita consumption of Eggs**

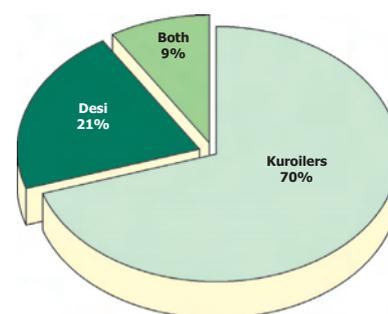


### Ownership of Kuroiler and Desi birds

About 70 percent of the sample households owned only Kuroiler birds, 21 percent owned only *desi* birds and the remaining households reported keeping both *desi* birds and Kuroilers (Figure 4.9). Across districts, the average flock size varied between 5 and 10 with highest average flock size of Kuroilers in South 24 Parganas followed by

East Midnapore and lowest in Jalpaiguri (Table 4.4). Across income groups, middle 20 percent had the highest average flock size for Kuroiler followed by the top 20 percent; for *desi*, top 20 percent had the highest flock size followed by bottom 20 percent (Table 4.5).

**Figure 4.9: Ownership of poultry by type of bird**



**Table 4.4: Average flock size of poultry holding in the sample households across districts**

	South 24 Parganas	East Midnapore	Murshidabad	Jalpaiguri
Kuroiler	9.8	8.6	6.7	5.1
<i>Desi</i>	7	6	9.4	4.7

**Table 4.5: Average flock size of poultry holding in the sample households across income groups**

Flock size	Income group		
	Bottom 20 percent	Middle 20 percent	Top 20 percent
Kuroiler	4.8	10.3	8.5
<i>Desi</i>	7.4	6.9	9.0

The age-weight relationship for Kuroiler and *desi* birds is reported in Table 4.6. As expected, on average Kuroiler birds exhibited significantly faster growth than the *desi* birds and by sixth month reached 2.5 kg body weight. This relationship was more or less similar across geographic areas and income groups. But, the selling age varied significantly across districts depending on the market linkages and cultural practices. In the coastal districts (East Midnapore and South 24 Parganas) the Kuroilers were generally sold at about six months age. In the other two districts the selling age often exceeded seven months (Table 4.7).

**Table 4.6: Age-weight (months-kg) relationship based on household level data**

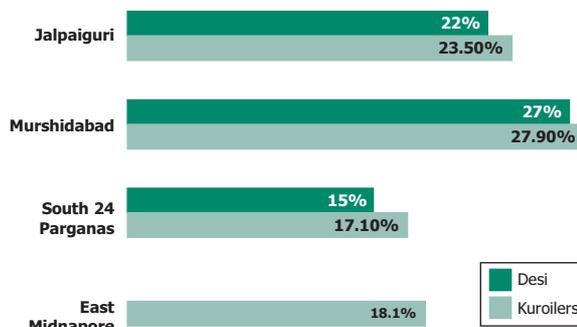
Bird type	Months of age				
	5	6	7	8	9
<i>Desi</i>	0.80	0.70	0.97	1.00	1.23
Kuroilers	2.50	2.60	2.70	2.75	2.70

**Table 4.7: Age and weight at sale by districts**

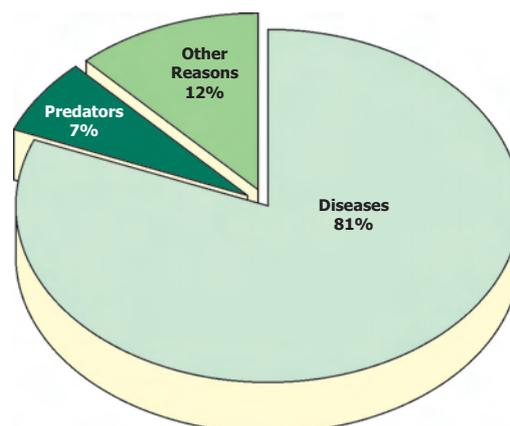
	East Midnapore	South 24 Parganas	Murshidabad
Age at sale (months)	6.2	5.1	7.0
Weight at sale (Kg)	2.4	2.5	2.8

Based on the data on deaths and new purchases of Kuroilers, mortality rates were calculated to be a little over 20 percent. Although the mortality rate was slightly lower for *desi* birds, statistically the differences were not significant. Both East Midnapore and South 24 Parganas reported lower mortality rates than Murshidabad and Jalpaiguri (Figure 4.10) and at least part of this difference could be attributed to better vaccination rates at the Mother Unit and better feeding/husbandry practices at the household level due to better market orientation in poultry production in these areas.

**Figure 4.10: Mortality Rates (percent)**



**Figure 4.11: Reasons for mortality**



In the context of this study, an important question to ask was which factors did the households considered important in influencing their choice of rearing Kuroiler. While their contribution to income and household nutrition are obvious candidates, the qualitative component of the survey attempted to go beyond these factors to create a more complete list of factors considered important by the households. These are mentioned below.

**Access to market.** Marketing the Kuroiler was perhaps the most critical factor identified by the households. At the same time, most households had a rather easy and assured market for Kuroilers. In some of the villages located away from small towns/village *haats* the desire for shifting to Kuroilers was low. In some other villages the *pheriwalla*/Mother-Unit extended their services to create that missing market link

and that worked quite well even when they retained part of the final price as their margin. In many cases when the households could not manage to sell the Kuroilers, these were consumed at home but most of these households were not willing to expand their flock size.

**Kuroiler easier to sell than a goat.** The short interval between investment and earnings makes the Kuroiler an especially attractive option for households living on a day to day basis. Also, larger animals including goats need open areas to graze and invariably find their way to neighbours' yards if left on their own. Most households avoid options which could lead to confrontation with their neighbours or relatives. Kuroiler can be easily managed within the courtyard or house and provide a business opportunity while the woman is at home tending to the household chores.

**Suited to women's daily timetable.** The women rearing Kuroilers have adjusted their own routines to seamlessly integrate Kuroilers into their lives. In the household jobs that are expected of the woman concerning children, cooking, cleaning etc the task of Kuroiler rearing has also been added.

**Kuroiler looks good.** The Kuroiler has the beauty of a zoo bird. With a rich colourful plumage, large size and long legs, the Kuroiler is a treat to watch. These qualities add to its reputation and make it a preferred bird. Its majestic carriage enhances the status of the rearer in the community.

#### **Easier to sell**

Mrilinalini wants nothing to do with goats or cows. Investment in their purchase is beyond her means. Kuroiler of course are so manageable and practically look after them. The returns are faster and higher than those of broilers. She has a ready market whenever she decides to make a sale. Her Kuroiler hens provide the nutrition for her children.

#### **Suited for women**

Sabita Jana raises 50 Kuroilers on her farm. She has a family with five school going children. Her sister in law helps her manage the household. They cannot think of going out of the house to earn money. The Kuroiler are managed within the available time and resources. Kuroiler are kept in a shed and do not demand too much of her time. They are left out of the shed for scavenging for about two hours a day. At other times the Kuroiler are stall-fed within the shed. The earnings from the Kuroiler are a major motivation for Sabita to rear them.

#### **Looks good**

Tarabela Ghosh considers the Kuroiler royalty. She reveres them to the extent that she spends more time than required in looking after the birds. From dusting them with ash to cleaning the coop daily to feeding them better than herself, Tarabela has her life dedicated to serving the Kuroiler. Kuroilers have not disappointed her. She has not lost any of her birds despite the fact that none have been dewormed or given preventive medication. This is a unique case of royalty not disappointing their subjects!

**Kuroilers not as good as *desi* at avoiding predators.** The survival instincts of *desi* birds have been honed by their generations learning to live in a hostile environment with predators. The reaction of a *desi* bird in the presence of predators is either to stay motionless or to make it scarce. Kuroiler are sloppier than their local cousins in avoiding danger. This quality of the *desi* makes it a preferred option for the poor who cannot oversee the scavenging of the birds and have permanent or seasonal predators in the vicinity of their household.

**They do have to be fed.** Although the Kuroiler is propagated as a scavenging/ semi scavenging bird, it has been observed that Kuroiler need to be fed as they cannot meet food requirements exclusively through scavenging. This is more pronounced when the Kuroiler do not have sufficient access to open areas to scavenge. The Kuroiler in many households is fed mash and paddy, especially in villages with limited and poor quality scavenging spaces.

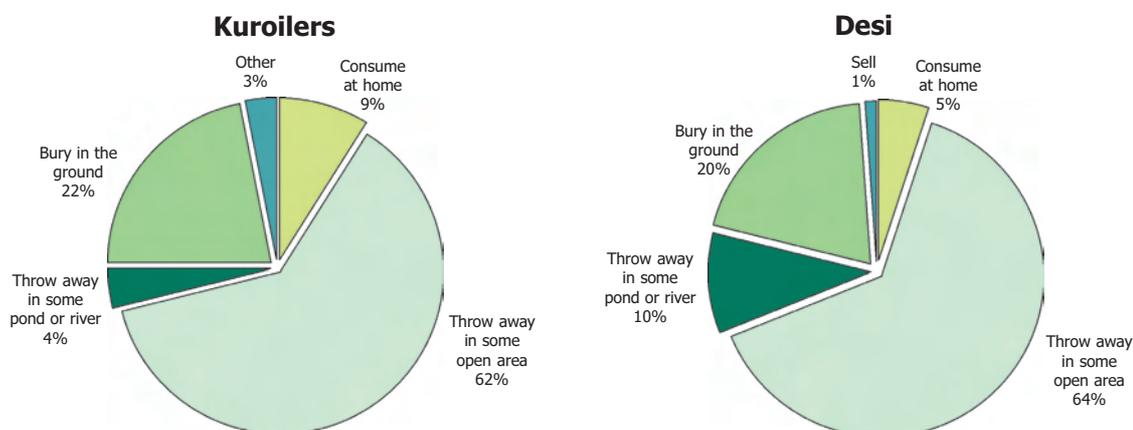
Adoora Bibi is not quite convinced of the scavenging ability of the Kuroiler. In her view, Kuroiler are not as good as *desi* as far as scavenging ability is concerned and therefore need supplementary feeding. The Kuroiler scavenge throughout the day and are still hungry, she says:

"If I do not give them paddy, they peck at my *sari* and demand food."

### Husbandry Practices

In the survey districts, the housing patterns followed for both Kuroiler and *desi* were similar with approximately 80 percent households preferring to provide separate shelters to their birds. Large proportions also preferred to separate new born/bought

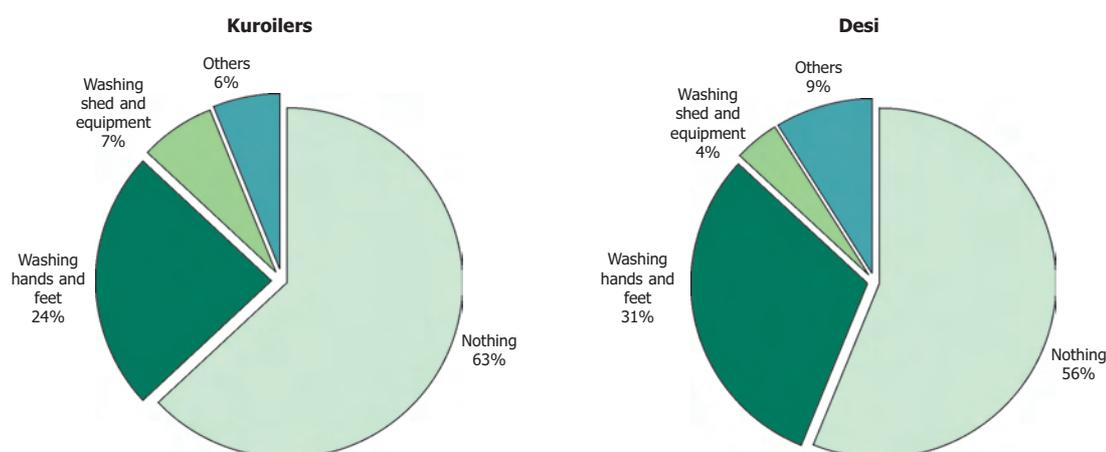
**Figure 4.12: Disposal of carcass**



chicks from older flocks and provided separate (mostly make-shift and rudimentary) shelters.

The pattern of disposal of carcasses was similar across both categories of households (Figure 4.12). Over 60 percent of the households simply discarded the carcass in some open area whereas 20 percent buried it in the ground<sup>8</sup>. The rest consumed the dead birds at home or dumped it in some pond, river or any other open water body. This is a very dangerous practice since a large number of these village water bodies are also used for bathing, cleaning, fishing, and drinking water for other livestock. Overall, the husbandry practices followed by these households are rather crude with little or no attention to disease prevention. Most households take no precautionary measures or at best just wash their hands and feet with tap/well/pond water after handling the chicks and birds. The number paying no attention to any disease prevention measure was as high as 60 percent (Figure 4.13).

**Figure 4.13: Preventive measures to avoid diseases**

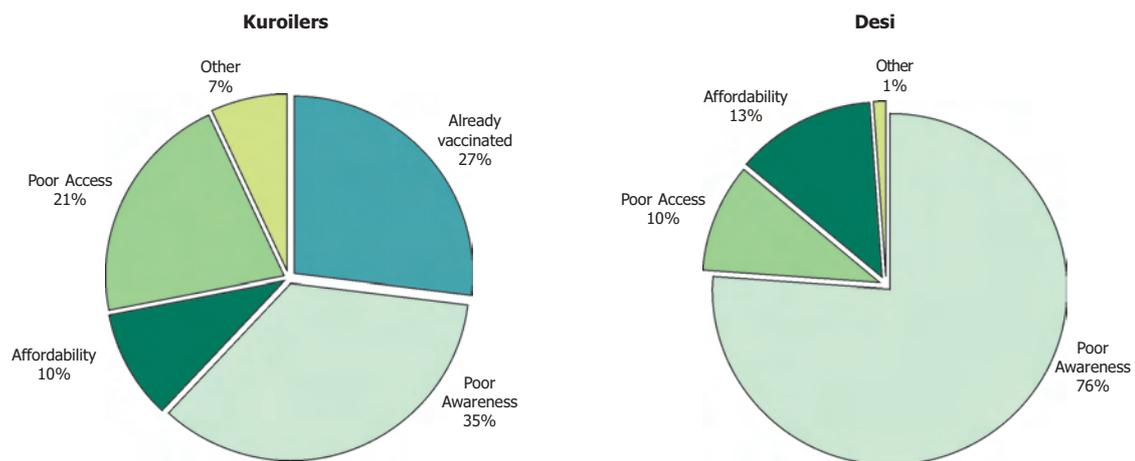


Similarly, there was very little vaccination of birds against common diseases (such as New Castle disease and Fowl Pox) despite significant mortality. Although a relatively larger proportion of Kuroiler were vaccinated as compared to *desi* birds, a large part of these vaccinations were carried out at the Mother Unit level. Vaccination against New Castle Disease needs to be done within 5-7 day with Lasota/F1 and booster at

<sup>8</sup> Burying was not carried out as a biosecurity measure but to avoid conflicts with neighbours in the case of stray dogs carrying the dead bird to the neighbours yard.

the age of 28 days. Although these can be done at Mother Unit level, a large number of Mother Units chose to circumvent the vaccination cost and passed the entire risk of disease/mortality on to the village households. This represents a critical gap in the chain which should be addressed either by Keggfarms on its own or in partnership with other stakeholders<sup>9</sup>.

**Figure 4.14: Reasons for not vaccinating poultry**



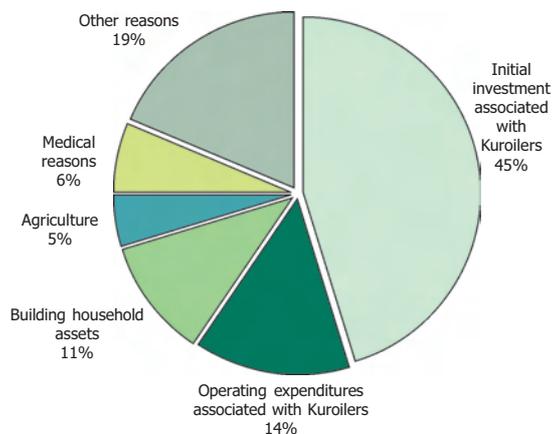
### Credit and extension

In the 12 months immediately preceding the survey, nearly 40 percent of the households reported to have taken some credit. More than half such households used the credit to cover initial expenditure and operating expenses associated with Kuroiler. Building household assets and meeting health related household expenditures were other key factors for which credit was used (Figure 4.15). Those, who did not take any credit in that period, cited 'no need, as the prime reason followed by 'poor access', 'affordability' and 'no collateral' as other reasons (Figure 4.16).

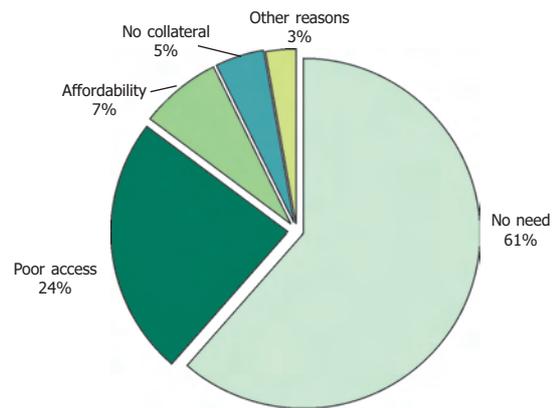
On the whole, therefore, access to credit did not appear to be a major constraining factor for these households. Access to any kind of extension, on the other hand, was woefully poor with less than 10 percent of the households rearing Kuroiler receiving any kind of formal or informal training in poultry health management. Their main

<sup>9</sup> Most of the households interviewed claimed of losses as high as 70 to 80 percent in case of New Castle outbreak. Fowl pox was another disease that caused mortality in chicks and led to losses in production. Both are preventable diseases through timely vaccination. De-worming of birds is another practice that most poultry rearers are unaware of and results in slow growth.

**Figure 4.15: Utilization of Credit for various purposes by sample households accessing credit**



**Figure 4.16: Reasons for not accessing credit**

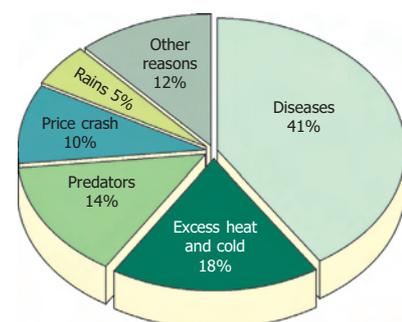


sources of information were either the Mother Unit owners or the *pheriwallas* providing limited tips on disease prevention and control, construction of poultry houses, carcass disposal and vaccination.

Comparatively though, access to information was relatively better among Kuroiler keepers. Overall 27 percent of the Kuroiler rearers had no access to poultry related information while the comparable figure for *desi* poultry rearers was 43 percent. The main sources of information for most households were neighbours, friends and local *pheriwallas*.

Households were asked for the factors they considered as most likely to disrupt their poultry-based livelihood component. Most households identified diseases, inclement weather, and predators as factors that could possibly disrupt the poultry component of their livelihoods (Figure 4.17).

**Figure 4.17: Perceived reasons for disruption of Kuroiler based livelihoods**

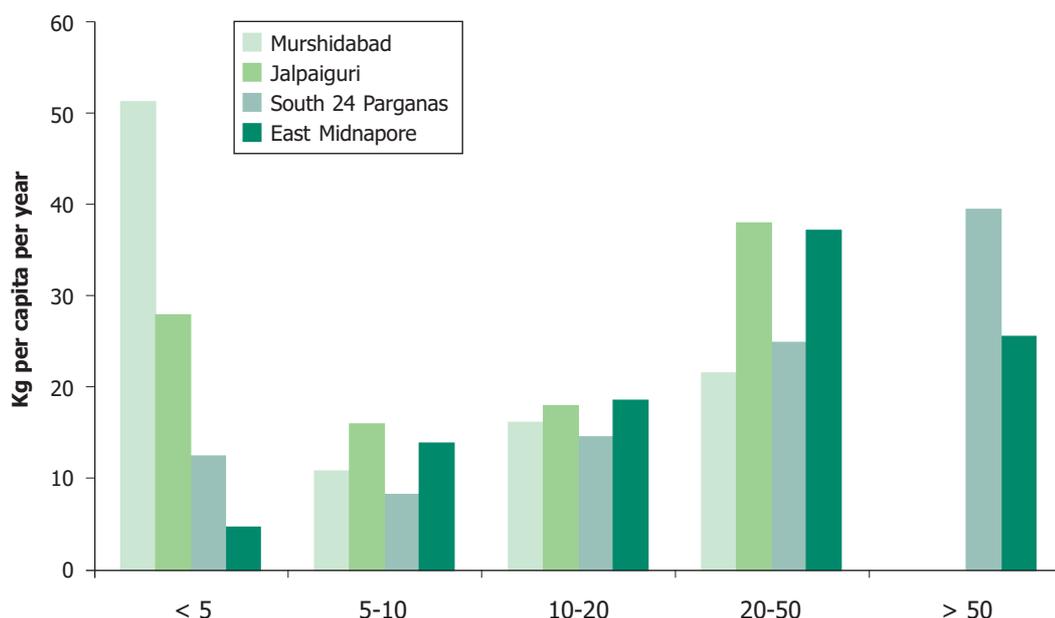


### Economics of Poultry keeping

Depending upon the socio-cultural, agro-ecological and market conditions, practices of poultry keeping vary across and within districts. While a number of households keep poultry under scavenging conditions, there are also a sizeable proportion raising poultry under full confinement, and overall cost and revenue structure varied greatly

with production practices. In areas with relatively higher village biomass and low population density (Jalpaiguri and Murshidabad), a larger proportion of households kept poultry under scavenging conditions resulting in lower unit cost vis-à-vis the coastal districts of East Midnapore and South 24 Parganas. The distribution of households by cost structure (excluding the chick cost) is given in Figure 4.18. As can be seen from the figure almost 50 percent households in Murshidabad reported spending less than five rupees per chick towards feed and other maintenance costs.

**Figure 4.18: Distribution of unit cost of Kuroiler production (excluding chick cost)**



Comparable figures for Jalpaiguri, South 24 Parganas and East Midnapore were 24, 10 and 4 percent. It is important to note here that Keggfarms operations in Murshidabad are rather recent and market linkages for poultry production (both on input and output side) rudimentary at best. As a result most households spend very little on feed and medicines. It is plausible that with increased market orientation and flock sizes, households move towards semi-scavenging or pure confinement systems adding to the overall production cost for Kuroiler, mainly on account of feed<sup>10</sup>. Such choices would however be driven by the overall rate of return which would in turn depend on the demand for these birds.

<sup>10</sup> Of those who incurred significant costs, most of it was due to feed. In South 24 Parganas and East Midnapore, the feed cost comprised about 80 percent of overall cost structure

Tables 4.8 and 4.9 present the enterprise level economics for Kuroiler and *desi* birds in the four study districts. Since the sample size for households rearing *desi* birds in East Midnapore and South 24 Parganas were small, data from these two districts were pooled to prepare cost and revenue estimates for *desi* poultry production.

**Table 4.8: Economics of Poultry Keeping—Kuroiler**

Description	East	South 24	Murshi-	Jalpaiguri
	Midnapore	Parganas	dabad	
	<b>Revenue (Rupees)</b>			
Kuroilers sold during the past 12 months	24.0	17.3	2.7	6.9
Kuroilers consumed during the past 12 months	4.2	8.0	3.1	2.1
Average weight	2.5	2.4	2.8	2.8
Price per Kg	55.2	65.9	60.8	60.9
Value of Kuroiler sold	3304.3	2734.6	452.0	1170.3
Value of Kuroiler consumed	590.8	1202.6	335.0	345.0
Egg production during the past 12 months	677.0	699.0	372.0	322.0
Eggs sold during the past 12 months	356.0	255.0	96.0	130.0
Eggs consumption during the past 12 months	321.0	444.0	276.0	192.0
Average price of eggs	2.25	2.30	2.95	2.40
Value of eggs sold	748.8	573.4	279.0	311.0
Value of eggs consumed	712.0	993.0	781.0	461.0
Total cash revenue per household per year	4053.0	3308.1	731.0	1482.0
<b>Total value of production per household per year</b>	<b>5355.8</b>	<b>5503.8</b>	<b>2062.3</b>	<b>2294.1</b>
<b>Total value of production per chick bought</b>	<b>121.2</b>	<b>155.0</b>	<b>116.5</b>	<b>128.8</b>
	<b>Cost (Rupees)</b>			
Chicks bought during the past 12 months	44.2	35.5	17.7	17.8
Mortality rate (percent)	18.4	16.8	21.1	22.2
Cost of chicks	701.1	662.7	617.2	611.4
Feed cost	1461.2	984.4	258.6	278.9
Medicines and vaccination cost	204.8	173.5	76.0	65.7
Total cost	2367.1	1820.7	951.8	956.0
Average investment in poultry sheds and equipment	1009.0	671.0	813.0	728.0
<b>Average net income per household per year</b>	<b>2988.7</b>	<b>3683.2</b>	<b>1110.4</b>	<b>1338.1</b>
<b>Average net income per chick bought</b>	<b>67.6</b>	<b>103.7</b>	<b>62.7</b>	<b>75.5</b>
<b>Net profit margin ratio (percent)</b>	<b>55.0</b>	<b>66.0</b>	<b>53.0</b>	<b>58.0</b>
<b>Rate of return on investment (percent)</b>	<b>296.0</b>	<b>548.0</b>	<b>136.0</b>	<b>183.0</b>

**Table 4.9: Economics of Poultry Keeping—Indigenous (*desi*) Birds**

Description	East Midnapore/ South 24 Parganas	Murshidabad	Jalpaiguri
<i>Desi</i> birds sold during the past 12 months	6.9	4.4	10.1
<i>Desi</i> birds consumed during the past 12 months	7.9	7.3	3.8
Average weight (Kg)	1.0	0.6	1.0
Price per Kg	55.0	60.0	61.0
Value of <i>Desi</i> birds sold	379.5	158.4	616.1
Value of <i>Desi</i> birds consumed	434.5	262.8	231.8
Value of egg production during the past 12 months	405.2	509.9	531.5
<b>Total value of production per household per year</b>	<b>1219.2</b>	<b>930.0</b>	<b>1379.4</b>
<b>Total value of production per bird</b>	<b>82.4</b>	<b>79.5</b>	<b>99.2</b>
Cost (Rupees)			
Feed cost	203.5	25.4	107.4
Medicines and vaccination cost	87.0	69.3	71.6
Other costs	101.4	99.1	72.1
Total cost	391.9	198.7	251.1
Average investment in poultry sheds and equipment	401.0	354.0	482.0
Net Revenue/profit per household per year	827.3	636.6	1128.3
Net revenue per bird	38.9	54.4	74.3
<b>Net profit margin ratio (percent)</b>	<b>67.0</b>	<b>68.0</b>	<b>81.0</b>
<b>Rate of return on investment (percent)</b>	<b>206.0</b>	<b>179.0</b>	<b>234.0</b>

Average size of Kuroiler enterprise was significantly larger in South 24 Parganas and East Midnapore districts. Indeed, in the villages selected for the study, most households had replaced *desi* birds with Kuroiler and then scaled up the enterprises. On average, the households bought about 40 to 60 Kuroiler in a year. With mortality rate being in the range of 25 to 30 percent, an average household lost about 10 to 15 chicks during the year. Accounting for home consumption of poultry meat and eggs, net income per annum per household was estimated to be Rs.3000-3500 in East Midnapore and South 24 Parganas and approx Rs.1100-Rs.1300 per year in Murshidabad and Jalpaiguri districts. The profit margin ratios (profits as percent of gross value of production) were however within comparable range.

Similar calculations for households keeping indigenous birds suggested comparable and some time even higher net profit ratio and rate of return on investment but significantly lower net returns in absolute terms even with comparable size of the enterprise. Further, because Kuroiler households were more market oriented, the cash

component of overall production value varied between 60 to 75 percent as compared to 20 to 35 percent for the households keeping indigenous birds. Households used this increased cash income to pay for educational expenditures, medical emergencies, overcoming food shortages, and other little indulgences of life. This was possible only because Kuroiler provided sufficient marketable surplus to make it worthwhile for individuals to incur extra cost and effort of accessing markets.

Tables 4.10 and 4.11 present the economics of household poultry production across income groups. As can be seen, overall size of enterprise increased with economic status with total number of Kuroilers (sold and consumed at home) increasing from about 9 birds in the bottom 20 percent to nearly 17 birds in the top 20 percent. The net

**Table 4.10: Economics of Kuroiler Rearing across income groups**

	Bottom 20 percent	Middle 20 percent	Top 20 percent
<b>Revenue (Rupees)</b>			
Kuroilers sold during the past 12 months	8.1	9.65	9.8
Kuroilers consumed during the past 12 months	1.0	3.60	7.2
Average weight (Kg)	2.67	2.63	2.67
Price per Kg	58.8	60.9	61.7
Value of Kuroilers sold (Rupees)	1271.0	1550.1	1618.9
Value of Kuroilers consumed (Rupees)	153.8	582.5	1114.7
Egg production during the past 12 months	229.0	346.2	466.0
Eggs sold during the past 12 months	166.0	204.2	225.0
Eggs consumption during the past 12 months	226.0	316.0	320.0
Average price of eggs	2.37	2.40	2.54
Value of eggs sold (Rupees)	362.5	462.9	535.1
Value of eggs consumed (Rupees)	542.0	766.0	760.0
<b>Total cash revenue (Rupees)</b>	<b>1633.5</b>	<b>2013.0</b>	<b>2154.0</b>
<b>Total value of production (Rupees)</b>	<b>2329.0</b>	<b>3361.5</b>	<b>4028.0</b>
<b>Cost (Rupees)</b>			
Chicks bought during the past 12 months	19.7	26.6	30.0
Mortality (percent)	25.4	17.8	20.1
Cost of chicks (Rupees)	481.0	630.0	714.8
Feed cost (Rupees)	288.7	675.0	777.3
Medicines and vaccination cost (Rupees)	85.0	82.3	155.0
<b>Total cost (Rupees)</b>	<b>855.0</b>	<b>1387.3</b>	<b>1647.5</b>
<b>Net Revenue/profit (Rupees)</b>	<b>1401.0</b>	<b>1974.2</b>	<b>2381.1</b>
<b>Net profit margin ratio (percent)</b>	<b>60.0</b>	<b>58.0</b>	<b>59.0</b>

**Table 4.11: Economics of Poultry Rearing—*Desi* birds**

	Bottom 20	Middle 20	Top 20
<b>Revenue</b>			
<i>Desi</i> birds sold during the past 12 months	7.2	7.2	5.4
<i>Desi</i> birds consumed during the past 12 months	2.1	4.3	13.6
Average weight (Kg)	0.8	0.9	0.8
Price per Kg	55.0	61.0	62.0
Value of <i>Desi</i> birds sold (Rupees)	316.8	395.3	267.8
Value of <i>Desi</i> birds consumed (Rupees)	92.4	236.1	675.0
Value of egg production during the past 12 months	522.3	421.8	519.5
Total value of production (Rupees)	931.5	1053.2	1462.3
<b>Cost</b>			
Feed cost	67.8	128.1	24.1
Medicines and vaccination cost	56.4	110.6	66.2
Total cost	176.9	293.9	279.8
Net Revenue/profit	755.4	759.3	1182.5
Net profit margin ratio (percent)	81.5	72.0	80.0

profit margin ratio when calculated on total income from Kuroiler (including home consumption) was comparable across income categories, but the share of Kuroiler meat consumed at home as a proportion of total production increased dramatically with income. In the bottom 20 percent only about 10 percent of Kuroiler meat was consumed at home with the proportion increasing to over 40 percent in the case of top 20 percent households. Interestingly, the share of eggs consumed at home as a proportion of total egg production was similar across income groups. All three income groups consumed about 60 percent eggs at home and such a pattern was reconfirmed by qualitative component of the study. The households that had Kuroiler hens typically reserved the eggs for children, specially the younger ones. Although there is preference for male child, it was not manifested in food distribution. All children had equal access to food and mothers did not practice any discrimination as far as the food is concerned.

Krishna Kayal sees Kuroilers as source of eggs for her two growing sons Vivek (7 years) and Bikram (2 ½ years). She keeps a small flock of four hens to provide her with eggs and meat that come from a known source, her own birds!

Her Kuroilers have not let her down. She gets three eggs every day and her children consume them as omelets daily. Krishna & her husband too get to eat them once or twice a week. This is very important for the family since they don't have access to any fish pond and the eggs are a major source of protein in their diets.

Overall the share of cash revenue in total value of production was about 70 percent in the case of poor 20 percent households declining to about 53 percent for top 20 percent households. Further, although net profit margin ratios were higher for non-Kuroiler households (on account of very low costs), due to higher productivity and scale of operations, Kuroiler households generated more than five times the value from their poultry enterprise when compared to non-Kuroiler poultry households. In the case of very poor households the cash earnings were typically used for buying carbohydrates like rice. Vegetable, pulses, oil etc. were bought but at a lower priority than rice. Other than food, major item of expenditure were educational expenditures and medical emergencies. Remarkably, contrary to conventional wisdom, many households indicated that they give priority to education of girls. That could be the result of Kuroiler money going the hands of women who would like to see their daughters becoming useful earning members for whom a big dowry may not be required.

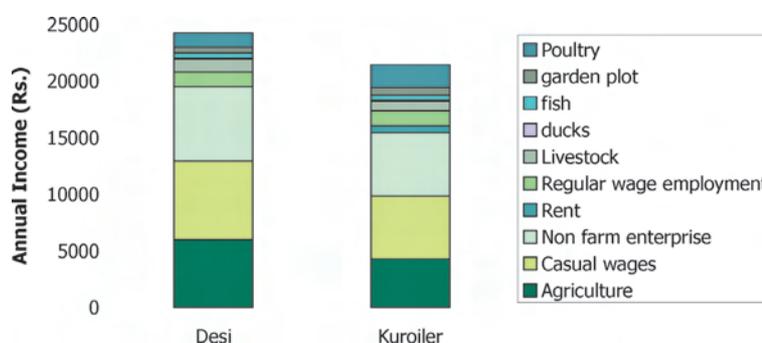
"Whenever there is a need to visit the doctor for medical emergency, a Kuroiler is sold"

"..boys can always work in the field even if they are illiterate but girls should be educated..."

### Income mapping

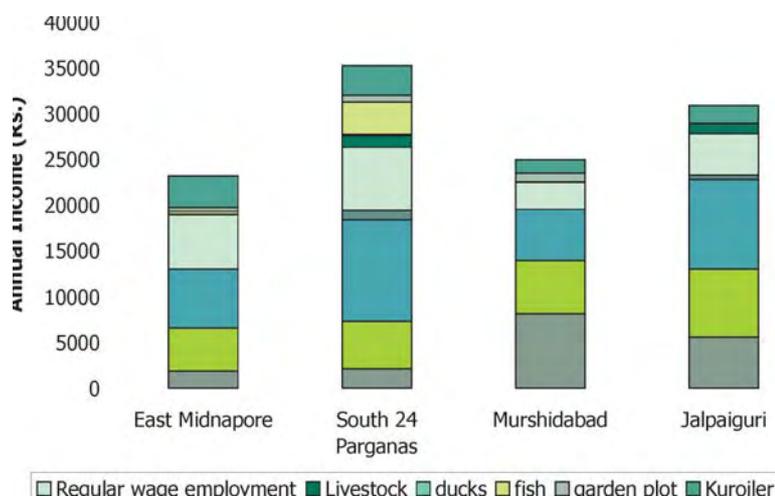
Households typically derive their livelihood from a diverse set of activities including agriculture, livestock, wage employment, non-farm enterprises, small pieces of land where they can grow vegetables and fruit trees and so on. Poultry is one of the many sources of livelihoods and studies from several parts of the world have reported the contribution of household poultry within a 5 to 15 percent range. In the survey conducted for this study, poultry production was found to contribute about 7 percent for *desi* birds and 10 percent for Kuroiler keeping households. The main sources of

**Figure 4.19: Contribution of different activities to annual household income disaggregated by type of poultry raising households**



of income were non-farm enterprises<sup>11</sup>, casual wages and agriculture – together they accounted for over 70 percent of the household income. Only 5-7 percent of the households had a family member with a regular job. Interestingly, the contribution from other

**Figure 4.20: Districtwise contribution of different activities to annual household incomes**



activities—agriculture, non-farm enterprises, etc was lower than that for households keeping desi birds. This could mean that poorer landless households found it more worthwhile to rear Kuroilers than those who had some land or other means of livelihood support (Figures 4.19 and 4.20)<sup>12</sup>.

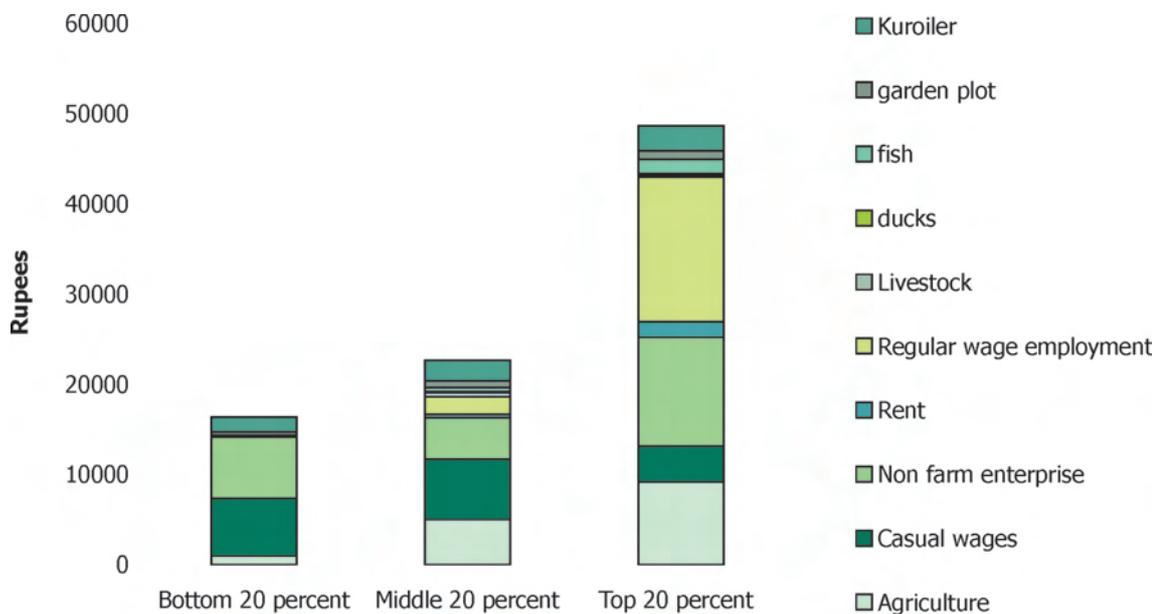
Among the Kuroiler households, for the bottom 20 percent, 81 percent income came from casual wages and non-farm enterprises whereas for the middle 20 percent, agriculture and regular jobs formed a significant portion of the income along with casual wages and non-farm enterprises. In case of the top 20 percent, almost 80 percent income came from regular jobs, non-farm enterprises and agriculture (Figure 4.21).

These numbers however need to be interpreted keeping in mind the socio-cultural and economic context of Kuroiler keepers. Quite a few households in the villages agreed that even though in absolute terms the income generated from poultry may not be very high, they still value the enterprise as the cost of rearing is low and the entire enterprise fits well within their resource base, societal hierarchies and complexities, taboos, anxieties and inter relationships. Indeed, the study team met a number of very poor households who had lost birds to diseases or predators but had not lost hope. A number of poor, having learnt their lesson wanted to go for a larger

<sup>11</sup> Such as hawking, rickshaw pulling, road side shacks and grocery stores etc.

<sup>12</sup> Such a hypothesis needs further testing because of rather small sample of *desi* households covered in this study.

**Figure 4.21: Contribution of different activities to annual household incomes disaggregated by income groups**



enterprise involving Kuroilers. The effectiveness of the supply chain was a major motivator for poor farmers to continue Kuroiler keeping despite set backs. *“If I sit at home and give my survivable chicks the attention they need, they quickly grow to marketable size and then are bought off from home giving money in my hand, I surely like the system”*, opined a number of Kuroiler keepers. On occasions, especially social occasions, having poultry helps poor households meet their social obligations that are sacrosanct to them. Guests are an excuse for the Kuroiler in the house to be sacrificed. This is all part of the traditions which most of the people follow to remain part of the society. Festivals are other occasions for the festivities to include meat in their diet. Being a livelihood option that

**Consumption increases when guests come:**

The best Kuroiler in the house is kept for the son in law of the house. Even if he does not visit, his permission is taken before the best bird is sold or eaten in the household, or else the son in law would feel bad. It is traditional for the bird to be shown to the son in law before being offered to him in the meal. Very much like a vintage wine is shown to the customer in a good restaurant!

**Bibijaan Bewa** – Bewa means widow. This is

how a widow is called in this predominantly Muslim village. Bibijaan is about 50 years old and lives on her own. She lost her husband six months ago. She has no land or kitchen plot although the house is her own. Since Bibijaan has no source of income her sons try to help their mother.

Bibijaan had no experience in keeping poultry and decided to keep poultry for the first time seven months ago. She thought it to be something an old woman like her could take up and purchased five Kuroiler chicks from a *pheriwalla*. She wanted to earn some income through it as her sons are too poor to look after her. She saw an opportunity in Kuroiler keeping and went on to try it out.

has always been around and having grown with them around the household, learning to take care of Kuroiler comes naturally to the rural poor. The care that a Kuroiler requires is much less than that required by cows and goats. Grazing grounds having reduced due to population pressures on the land, rearing large livestock has become unviable. Under those circumstances, Kuroiler provide a viable addition to the menu of livelihood options especially for those who have little or no land.

### **Market orientation and women empowerment: Are the two incompatible?**

Regardless of Kuroiler's contribution to average household income, the livelihood implications of Kuroiler raising are significant as this is primarily a women's enterprise and the external effects of women entrepreneurship in terms of intra-household expenditure allocation, nutritional intake and better education of girls are substantial. In this context, an argument is often made that the decision making role of women in economic enterprises diminishes with the growth of enterprise. As such enterprises grow and become more market oriented, men tend to take over and women again get relegated to tending household activities.

**Status:** "My Kuroiler is four and a half years old" said Rabi-ul-Sheik proudly pointing to the biggest Kuroiler the team had seen. The dark coloured good looking Kuroiler had been a champion of the village. The competition they say is fierce and adds greatly to the status of the owner. One was reminded of Arab sheiks showing off their thoroughbred horses! This may not pass the traditional benefit-cost analysis test and might even appear irrational given the prevailing poverty levels, but even for these very poor households being able to hold their head high seemed to be more important!!

The survey carried out for the study collected data on gender division of involvement in various tasks associated with Kuroiler keeping. Taskwise division of labour across men and women is given in Annex 2. Although some division of labour is discernible in the Annex, there is no systematic decline in women's involvement with the size of enterprise. Indeed, women involvement continues to

**Empowerment:** Mrilnalini Poria is an entrepreneur in her own right. She used to run a mother unit till she got pregnant and she had to shut down the mother unit. She presently has got a flock of six Kuroiler which she can easily manage along with her two young daughters. She had to meet different people including villagers, pheriwallas and company officials, while she was running the mother unit giving her confidence which she otherwise would have lacked. She is also confident of her making good investments in the field of poultry in future. She has already made up her mind to restart the mother unit when her new born is slightly older.

be sizeable in all activities including disposal and utilization of poultry income, decisions about further investments, etc. Therefore, at least within the size range captured in this survey, there is no evidence of declining women's involvement with increased market orientation. Qualitative component of the study also confirmed that a large number of women realized the power of economic independence derived from Kuroiler money, howsoever modest. The more experience they acquired in this more confident they became and with confidence came respect and standing amongst their peer group. More and more women seemed quite confident with Kuroiler and actively sought more information about better rearing practices so that they could avoid losses. While a large number of women are still rooted into their 'cultural' role that 'society' has scripted for them, the small money earned through Kuroiler does help them enhance their voice in matters of children, household and how the money is spent.

### **The Value Chain that binds it all together**

Every year Keggfarms distributes about 14 million birds to 800,000 farmers located in some of the remotest parts of the country. The most credible aspect of this operation is that this chain supports a commodity serving the poorest in a financially sustainable manner without the support of any external agency. The scale of operations is large and requires good coordination to ensure continuous supply all year round. The key to its viability is of course the inter-dependence of agents within the chain. Each link depends on the other and it is in the interest of all to ensure the viability of others in the chain. In addition to the households at the end of the chain who rear Kuroiler, the chain provides livelihood opportunities to a large number of entrepreneurs namely suppliers/dealers, Mother Unit owners and *pheriwallas*. Most of the *pheriwallas*, for example, are landless and were earlier unemployed or worked as farm and non-farm labourers prior to entering this occupation. Given below is a description of the agents involved in the Kuroiler value chain and the functions they perform.

- **Hatchery/Company:** Key functions are to conduct research for developing birds with desired traits, production of day old chicks and their supply to the dealers.
- **Field representatives:** These are employees of Keggfarms responsible for performing a number of functions to develop and sustain the market for Kuroiler

at the field level. Their tasks include (i) identification, monitoring and coaching of suppliers/dealers, (ii) overseeing the entire chain and (iii) providing advice and assistance as per demand and need. They are indeed fully responsible for coordinating safe transportation and timely delivery of the day-old-chicks.

- **Supplier/dealers:** They are involved in scouting potential entrepreneurs to set-up Mother Units and coach the existing Mother Units to produce quality chicks (2-4 weeks old). In addition, (i) they manage demand and supply at the Mother Unit level by keeping track of the demand and ensuring supply of day old chicks via the Keggfarm's field representatives, (ii) stock and maintain cold chain for the vaccines and its timely dispersal to Mother Units, and (iii) stock poultry feed and medicines. The *pheriwallas* approach them for basic poultry medicines like coccidiostats and de-wormers. Finally, if there are issues with health and mortality of chicks at the farmer level, the *pheriwallas* rely on the suppliers/dealers to obtain necessary advice. In general, the suppliers/dealers are in close contact with the relevant field representatives and where relevant they provide assistance in executing their tasks.
- **Mother Units:** The Mother Units purchase day old chicks and rear them for an initial period of two to four weeks before selling to *pheriwallas* for further sale. This is a critical period for the birds when it is very important to vaccinate the birds to reduce mortality further down the chain. In principle, F1 and LaSota vaccination<sup>13</sup> is provided respectively on day 6-7 and 4th week.
- ***Pheriwallas:*** *Pheriwallas* purchase the birds from the Mother Units and sell them to the farmer households. They are the sole agents in the chain with direct contact with the farm households. They provide input to the farmers based on information they receive from various sources. A *pheriwalla* is not obliged to buy from one particular Mother Unit.
- **Farmer Households:** Farmers purchase birds from the *pheriwallas*/Mother Units and rear them for consumption of eggs and meat within the household or sale to other farmers or the local market.

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<sup>13</sup> F1 and LaSota vaccines are applied to prevent New Castle disease.

### ***Profile of sample Mother Units and pheriwallas***

The Mother Units interviewed for the survey had been in this business for about 6 years. More than 80 percent of the people had undergone some education (average was 9 years of schooling) and about 60 percent of them had been involved in poultry business before, mostly broilers. The average investment in setting up the Mother Unit was about Rs.26,000.

About 60 percent of sample *pheriwallas* were landless and of those who owned land, the land size was less than 2 acres. About 30 percent had no education and for the remaining, the education level was less than 7 years. Before taking up this occupation, they were either unemployed (30 percent), or worked as agricultural laborers/ construction workers (43 percent) whereas the remaining were employed in some other jobs. Finally, for about 75 percent of the *pheriwallas*, this was their sole source of income.

The network of *pheriwallas*, Mother Unit owners and dealers/suppliers is fairly strong and well coordinated but there is rather modest<sup>14</sup> technical as well as extension input for poultry husbandry in this network. The dealers/suppliers are given some training initially, but there is no formal system in place to upgrade their knowledge base neither is the training very systematic, but the on-job-exposure and guidance is high. The Mother Units and *pheriwallas* usually have no formal training in poultry management. Dealers/suppliers and Keggfarms field representatives are the key agents providing technical – or any other advice when required. Use of mobile phones is prominent among field representatives, dealers/suppliers and to some extent Mother Unit owners but for *pheriwallas* and households at the end of the supply chain a mobile is a dream item. When asked, a large segment of the *pheriwallas* (60%) reported dealers/suppliers as the major source of information, followed by Mother Units (16%) and other *pheriwallas* (11%). More

The *pheriwallas* of Murshidabad are like magicians...here they come and there they go!! The study team came across a number of cases where chicks had been sold by pheriwallas without being vaccinated. A number of Kuroiler died due to diseases leading to disillusionment amongst the rearers. In other cases observed by the team the pheriwallas were providing advice and extension services. They had managed to encourage more villagers to rear Kuroiler. Such pheriwallas have developed a rapport with the villagers benefiting both the parties.

<sup>14</sup> It is little in terms of scientific know how but actually high with regard to practical know how needed; the information is typically need based and obtained through on-the-job guidance, exposure and experiences. Formal training and extension materials are not in use except for a few pamphlets.

than 70 percent reported giving drugs and medicines to the birds and about 10 percent providing vaccinations. This level of drug use without any training can adversely affect the health of the birds.

Despite the low level of formal technical inputs in the chain, the strong linkages between agents enable some information flow from farmers to *pheriwalla* to dealers. The dealers then take this information back to the company as the feedback from the ground. Upgrading the technical information of the agents can therefore be mutually beneficial. For example, in some cases it was reported that if a critical number of birds died in a region, the *pheriwallas* who might have sold the chicks in that area stopped going there to avoid confronting the villagers. Appropriate back up support from Keggfarms in such cases can serve as an important confidence building measure and a source of identifying weaknesses in the chain.

The suppliers/dealers purchase day old chicks on cash as per requisite of Keggfarms. Yet, a significant number of the suppliers/dealers, who are at times also Mother Unit owners, often supply chicks on credit and provide commercial chick feed to others in the chain downstream as well as provide some type of veterinary and extension services. Similarly chick vendors sometimes extend medicines on credit as well as poultry husbandry advice to rural women rearing Kuroilers.

### ***Financial analysis of Mother Units and pheriwallas***

We now turn to the economics of Mother Unit and *pheriwalla* operations. In order to examine the financials of these operations, the scale of operations at each level is calculated. Next, based on the average purchase price and selling price, the gross margins are calculated. Net margins are arrived at by deducting the variable cost from gross margins. The largest variable cost is typically the feed cost followed by costs incurred on medicines and vaccines. Other costs in the case of Mother Units include labor cost, electricity and other materials used for maintaining temperature, and transportation costs. In the case of *pheriwalla*, the major costs are the feed cost and the cost incurred on preventive medicines and vaccines. The major fixed cost in the case of Mother Unit included cost of constructing sheds for chicks, cages, purchase of bicycle etc. These fixed costs are not included in the analysis. The quantitative analysis presented here is based only on variable costs.

### *Mother Units*

Detailed economics of the Mother Unit is presented in Table 4.12. The analysis for the four districts is presented separately to capture regional variations in these operations. The average monthly scale of operation was around 1500 chicks in the case of South Parganas and Jalpaiguri. In the case of Murshidabad the scale was much lower at around 500 chicks and in the case of East Midnapore, the scale was higher at around 3000 chicks. The overall average scale of operation is around 1500 chicks. Given the overall size of Keggfarms operations, this would mean employment for about 6500 people owning Mother Units.

**Table 4.12: Economic Analysis at Mother Unit Level**

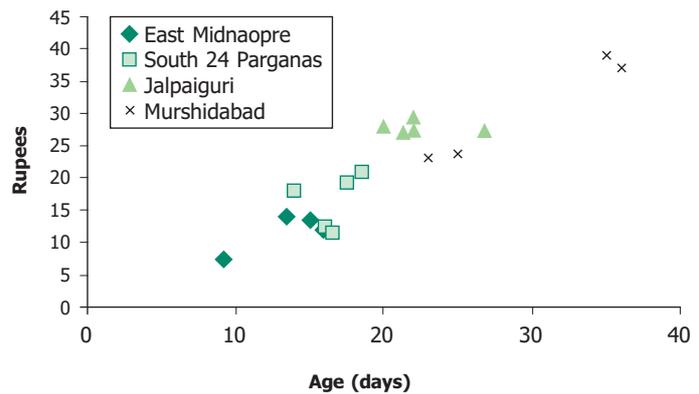
	<b>South 24 Parganas</b>	<b>Murshidabad</b>	<b>East Midnapore</b>	<b>Jalpaiguri</b>
Chicks bought	1510	530	3445	1480
Chicks sold	1458	497	3322	1356
Purchase Price	10.1	11.3	9.7	10.7
Sale Price	17.5	35.9	14.6	27.9
Mortality Rate	5.7	5.4	3.6	6.4
Gross Margin/bird	7.4	24.6	4.9	17.2
Cost	6473	8093	10330	15679
Net income per month	4570	5093	3837	5357
Net income/bird	2.4	11.3	0.9	3.7
Age at sale (days)	17.5	30.8	15.3	22.7

The average scale of operation is more or less constant throughout the year, though the units keep fewer chicks in winter months of Dec, Jan, and Feb, and during May the peak summer month because of high mortality due to cold and heat. The average rate of mortality at the Mother Unit level was estimated at around 5 percent. East Midnapore reported lowest mortality (3.6 percent) and Jalpaiguri the highest (6.4 percent).

The purchase price of day old chicks was in the range of Rs. 9.7-11.3, whereas the sale price varied significantly across regions. Average sale price was the lowest in East Midnapore followed by South Parganas, Jalpaiguri and Murshidabad. The selling price was typically based on the age at which the birds were sold (Figure 4.22). Based on the purchase price, selling price and scale of operation, the gross margin range

between Rs.10,000 and 11,000 per month in South Parganas, Murshidabad and East Midnapore, whereas in the case of Jalpaiguri, the gross margins exceeded Rs.20,000. Gross margin per bird was highest in Murshidabad where the chicks were reared for more than a

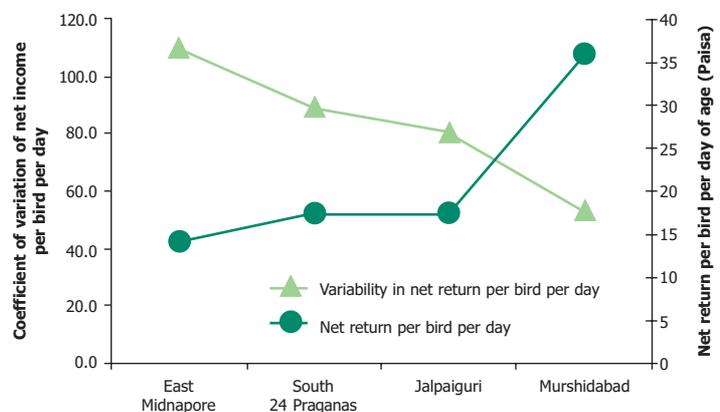
**Figure 4.22: Price-age relationship at Mother Units**



month at the Mother Unit level before being sold to *pheriwallas*. This was followed by Jalpaiguri, South parganas, and East Midnapore. The costs also varied significantly across regions. As a result, the net margins were highest in the case of Jalpaiguri, followed by Murshidabad, South Parganas, and East Midnapore. The net margin per bird was highest in Murshidabad where the birds were reared for more than 30 days.

Further analysis suggested that the variability in net income was lowest and average returns the highest in areas where Mother Units were holding the chicks for longer time periods. Thus, the coefficient of variation (standard deviation/mean) of net income per bird was lowest among the units in Murshidabad where the average age of sale was close to a month compared to about 15 days in East Midnapore where the variability was highest and average returns the lowest (Figure 4.23). This could mean that the ability to hold stock for a longer period at the Mother Unit level allowed these entrepreneurs to adopt superior business strategies by diversifying and targeting different markets and/or weathering the price fluctuations. We do not have sufficient data to test these hypotheses more rigorously but a focused follow-up study of the Mother Units can possibly help unlock much more value in the chain than is being captured currently.

**Figure 4.23: Variability and net returns per bird per day of age**



### *Pheriwallas*

Table 4.13 shows the economic analysis of the *Pheriwallas*. The scale of operation is around 1000 in South Parganas and Murshidabad, around 1500 in Jalpaiguri and the highest in East Midnapore at 2000 chicks. The average purchase price varies across regions, and is linked to the age at which Mother Units sell the chicks. Hence in Murshidabad where the Mother Unit sells the chicks which are over one month old, the purchase price is Rs. 36.9. In Jalpaiguri, where the average selling age is 3 weeks, the purchase price by *pheriwallas* is Rs. 28, followed by Rs. 16.7 in South Parganas and Rs. 13.8 in East Midnapore.

**Table 4.13: Economic Analysis of the *Pheriwalla***

	<b>South 24 Parganas</b>	<b>Murshidabad</b>	<b>East Midnapore</b>	<b>Jalpaiguri</b>
Scale	1026	1156	2005	1518
Purchase Price	16.7	36.9	13.8	28.4
Selling Price	19.0	46.9	15.75	34.1
Gross margin	2000	10438	2187	6304
Gross Margin per bird	2.0	9.0	1.1	4.2
Expenses	511	1127	1024	820
Net margin	1487	9311	1162	5484
Net margin/bird	1.4	5.0	.60	3.6

The gross margins have a wide range from around Rs. 2000 in South Parganas and East Midnapore to Rs. 10,000 in the case of Murshidabad. The *pheriwallas* usually purchase chicks from Mother Units almost every alternate day. They incur feed and minimal preventive medicine costs during the period they keep the birds.

The key indicators of profitability are net margin per chick and returns per day. Both these indicators were highest for Murshidabad, followed by Jalpaiguri, South Parganas, and East Midnapore.

It is evident from this analysis that as in the case of Mother Units, the *pheriwallas* also make higher profits for chicks which 3-4 weeks old as compared to 2 week old chicks. This could be because of lower perceived risk of mortality by households allowing the *pheriwalla* to charge a higher retail price.

To summarize, effective functioning of value chain is perhaps the most critical aspect of Kuroiler model that distinguishes it from other similar models. More important, however, the aspect of organizational structure that ensures effective functioning of this chain is its complete independence from any external support. Due to its market oriented nature, there is sufficient opportunity for each agent in the chain to generate adequate surplus.

At the same time, close networking of agents ensures adequate information flow to prevent any serious market failures. Finally, since every one is paying for the goods and services they receive, there is sufficient pressure on delivery.

On the other hand, the aspects of these operations that have implications of public good nature are weak and deserve attention. For example, there is no monitoring of vaccination, mortality and the level of drug use in the chain<sup>15</sup>. This has significant implications for reducing risk and containing losses in the chain hence further enhancing the surplus for rural households. Given that the risk bearing ability of user households is extremely low, any manifestation of this inherent risk (in the form of disease outbreak, for example) can be destabilizing<sup>16</sup>. Addressing this issue, requires investment in skill building and training in poultry management, livelihood analysis, and quality assurance of various inputs used in the chain. Besides, there may also be scope of utilizing this network for developing stronger market linkages such as purchase of eggs and buyback of birds with appropriate links with emerging large scale retailers.

### **Independence**

Gauri Nauskar is a poor Hindu women for whom Kuroiler keeping is a source of income and food. Her two children, a son and a daughter get eggs to eat daily while she and her husband also get to consume eggs once a week. Surplus eggs are sold and money utilized for purchasing notebooks, stationary etc needed by her school going children. There is no discrimination in the diet pattern of the children.

Her good management practices have ensured zero morbidity and mortality in her flock and raise in her status amongst peers. She is now leader of her self help group and has also undertaken training in poultry keeping organized by Panchayat.

<sup>15</sup> Non availability of thermo stable vaccines however makes the vaccination relatively complex. Maintaining the quality of vaccines in the cold chain is difficult considering the rural conditions of West Bengal where power supply in many places is absent or if in place frequent rationing is common. Additionally, the size of doses available are not favorable when limited number of birds are at stake. In short, available vaccines are typically meant for large scale poultry farming.

<sup>16</sup> For example, there was no awareness regarding Bird Flu despite the virus being endemic in neighboring Bangladesh for the last one and half year.

## 5. Summary and Conclusions

This study had three key objectives—(i) to examine the impact of ‘Kuroiler’ in improving and sustaining poor peoples’ livelihoods, (ii) to understand the threats and opportunities for Kuroiler, and (iii) to identify need for policy support/space to promote market oriented household based poultry systems. This section attempts to summarize key findings and hazards alongwith a few recommendations in the process.

With the popularity of the Kuroiler increasing there are villages where rearing Kuroiler has become a way of life. Here the status is influenced by the knowledge villagers have of rearing birds and the quality/quantity of birds they hold. In the absence of any formal extension it is the interdependence of the Kuroiler-growing community that helps them in taking action to ensure the safety of their flock.

Detailed data collected on the costs and benefits of Kuroiler units (rural households, *pheriwallas*, and Mother Units) indicated high profit margin ratios at all levels and hence the enterprises passed the test of economic viability. Although, the profit margin ratios of those rearing *desi* birds were comparable (sometimes higher) with those rearing Kuroiler overall profits generated by Kuroiler enterprises were significantly higher than those rearing *desi* birds. Thus Kuroilers bring in much more market orientation and contribute significantly more to cash flows at the household level. Although the overall *average* contribution of Kuroiler to total household income was about 10 percent their contribution to other aspects of livelihoods such as security, development of entrepreneurial capabilities in women, and strengthening of social networks was substantial. Many poor households considered the kuroiler as a living bank that they can cash in case of an emergency or any other special occasion.

Poultry has been a part of the lives of rural households and they are quite adept at handling birds. Emotional attachment to the birds can be traced back to the influence of birds in the formative years in the life of the poor. Besides the economics of it all, the

memories of chasing the chicken and having them pecking around in the house makes them a natural choice in the livelihood portfolio of the poor. The enterprise also provides a mechanism for effective use of kitchen/feed leftovers while in turn providing manure droppings and feathers for home gardens and making dusters. Thus, 'Kuroiler' easily forms an integrated part of the livelihood system.

The power that the women feel when taking decisions independently is a positive step towards empowerment. In households with Alfa males these decisions remain small but in many households women have taken the lead in making expenditure decisions. These women are generally looked up to by their peer group and sought for advice in matters going beyond poultry. Thus, Kuroiler make a considerable contribution towards inculcating leadership and entrepreneurial skills in significant number of women and can even serve as a window for entering into more complex businesses.

The other significant aspect of household poultry (not necessarily Kuroiler) relates to its contribution towards food and nutrition security. Most households surveyed for this study faced highly food insecure livelihoods. Eggs and poultry meat from their own backyard contributed directly or indirectly to improved nutrition by becoming part of the weekly menu or by facilitating purchase of carbohydrates (rice) and allowing a meal twice instead of one per day.

### Security

Sumitra Dakua says "*The Kuroiler are very useful in case of medical emergency, that is when you need to go to the doctor and need money, sell a bird and the problem is solved!*". The village women agree on this use of the Kuroiler.

### Sustainability

*"Kuroiler has given us a means of livelihood."*  
- Renu Jana

Renu and her husband Raju earn their livelihood through Kuroilers. Renu purchases and sells a flock of 25 Kuroilers thrice a year. They are reared to be sold for meat while Raju is a vendor who sells Kuroiler chicks in villages of the neighborhood.

They have been in Kuroiler business for the past 8 years. Renu had never reared poultry before but with the help of neighbours and the mother-unit person learned all about it. The mother-unit owner gives him chicks on credit to be returned on sale of chicken. Chick-mash is also bought on credit from the mother unit owner.

Renu and Raju are grateful to the mother unit owner for helping them at all times with their Kuroiler business.

Organizational structure of the value chain that supports Kuroiler is what set it apart from other models. **It is not the bird that is the discriminating feature of Kuroiler operations but the system that backs the bird.** Close coordination of chain for flow of goods, services, and information, and economic interdependence of agents in the chain contributes significantly towards its effective functioning. At the same time, there are also a number of weak points in the chain that need strengthening. Firstly, there is some selectivity in the nature and type of information flow in the chain. The information that is of higher commercial interest to the company travels significantly faster than the information that may be in larger public interest. For example, prescribed vaccinations at Mother Unit level are not always provided while the vaccination against the major disease New Castle is not practiced at all. The major losses therefore take place when a New Castle outbreak occurs which happens almost every winter. As a result, mortality rates are relatively high and major improvements can be made by putting vaccination services in place. Such information is slow to travel. Also, apart for brooding management (the care and management of day-old chicks up to 4 – 6 weeks of age), no specific housing advice is provided by the relevant chain agents. In general, however, rearers are able to respect the basics of good housing namely sufficient ventilation and space, day light and dry environment and make innovative use of local materials to keep the costs of housing low.

In this context, it is also important to understand that while there is substantial scope for Keggfarms to strengthen information flow in the value chain, the responsibility of acting in larger public interest goes much beyond Keggfarms. Relevant arms of Government need to be far more active and pro-active in disease prevention and control and provision of extension information while at the same time being supportive of commercial interests of all those whose livelihoods depend on poultry birds including Kuroiler. In the information collected in the survey, none of the poultry rearer received poultry related extension messages through the Governmental or Non-Governmental channel. Most households developed the know-how through experience and by consulting each other<sup>17</sup>. The poultry keepers were, for instance,

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<sup>17</sup> Formally a few write ups on poultry rearing have been produced by Keggfarms manager and were translated in Bangla. A few individuals in the Kuroiler chain established a relation with the government veterinarian but it remains exceptional.

not at all aware of the danger of Bird Flu. None had ever heard of it and all mortality was often mistaken with New Castle disease until the outbreak was confirmed by the government.

The point of the foregoing discussion is that there are significant spaces and avenues for Keggfarms and the Department of Animal Resources Development (DARD) to work together cooperatively and collaboratively so as to combine their strengths for further enhancement of Kuroiler based livelihoods. Unfortunately, the ground situation on that count did not appear very encouraging. Although the DARD is aware of Keggfarms operations, there have been no attempts to either encourage it or seek concrete cooperation and develop synergies. Indeed, the DARD appeared somewhat suspicious of Keggfarms and raised concerns about growing dependence of poultry keepers on the company since Kuroilers (as well as other synthetic birds sold in the West Bengal) do not reproduce at household level due to lack of brooding ability and mothering instincts. The DARD has therefore been promoting the Rhode Island Red (RIR) bird<sup>18</sup>. These schemes, usually promoted through self-help groups are highly subsidized. Day old chicks are sold for a symbolic price of one Rupee to a self help group including free feed for the brooding period of 20 days. Brooding management of about 100 day old chicks is in the hands of one self help group member, while 10 female and one male chick are given out to each member. No data are available regarding the performance of these birds. The RIR bird has been promoted by the DARD for almost three decades but still Kuroiler is far more widespread than RIR due to the chain that delivers day old chicks to the doorsteps of poor farmers.

Similarly, the DARD has been promoting village animal health workers (*Praani Bandhu*) but most of these workers, who have received short training from the DARD and who belong to the community, do not reach out to poultry keepers and are actually not known by the poultry keeping households. In many other settings, however, similar attempts have been quite successful. For example, the concept has proven suitable in Bangladesh with the model of poultry vaccinators –lay woman trained in basic preventive and curative health regarding poultry production, equipped with

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<sup>18</sup> RIR is also, in principle, a poor brooder but the argument is that fertile RIR eggs will be hatched by the desi hens; something what households also practice in case of Kuroiler eggs.

equipment for vaccinations. They have access to vaccines at district level, basic monitoring and support provided by NGO technical staff. These poultry vaccinators play a crucial role in promoting bio-security measures and spreading awareness with regard to Bird Flu.

Thus, there is much scope of public–private cooperation but unfortunately the ground for such cooperation did not appear ripe. Any fruitful cooperation needs a critical minimum level of trust in each other and belief in the common objectives<sup>19</sup>. Much remains to be done to develop that trust and appreciation before meaningful public-private partnership can emerge in this case. It needs to be understood that the word ‘profit’ in Indian policy makers’ lexicon is still often equated with exploitation, whereas the sustainability of the Kuroiler chain actually derives from the interdependent ‘profit motive’ of all stakeholders. Since each link in the chain has an interest in doing well, the systems functions well in absence of any external support. The entire Kuroiler chain has a life of its own and is sustainable as long as there is steady source of Kuroiler day old chicks. All further attempts towards strengthening livelihoods therefore need to work towards developing an appreciation of the critical role played by ‘market orientation’.

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<sup>19</sup> For example, the private sector has the know how to produce a thermo stable New Castle vaccine but due to uncertainty of the market have not taken up such production. When the public sector would consider subsidizing such production lines and instituting other measures to reduce policy uncertainties, it might have a much larger impact than heavily subsidizing the production and distribution of RIR chicks.

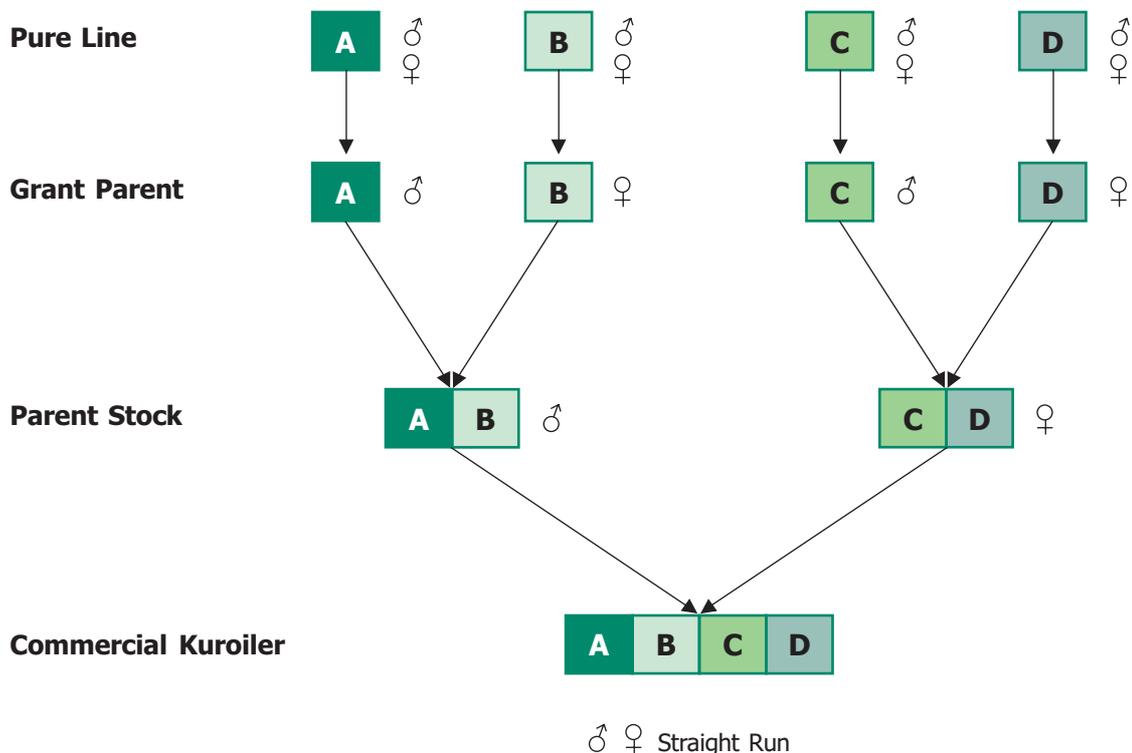
## References

- Ahuja, Vinod, Jan Morrenhof and Arindam Sen. 2003. "Veterinary Services Delivery and the Poor: Case of Rural Orissa, India" OIE Scientific and Technical Review, Vol 22, Number 3, December 2003.
- Ahuja, Vinod (Editor). 2004. Livestock and Livelihoods: Challenges and Opportunities for Asia in the Emerging Market Environment, National Dairy Development Board of Indian and Food and Agriculture Organization of the United Nations. 372p.
- Ahuja, Vinod and Arindam Sen. 2007. Viability and future of small scale commercial poultry production in developing countries, paper presented at *International Conference on Poultry in the 21<sup>st</sup> Century: Avian Influenza and Beyond*, Bangkok, November 5-7, 2007.
- Baumgartner, R. & Högger, R. (Eds.). 2006. In Search of Sustainable Livelihood Systems, Managing Resources and Change, Sage Publications, New Delhi, Thousand Oaks, London.
- Dolberg, Frands. 2004. "Review of Household Poultry Production as a Tool in Poverty Reduction with Focus on Bangladesh and India", in Ahuja, Vinod (Editor), *Livestock and Livelihoods: Challenges and Opportunities for Asia in the Emerging Market Environment*, National Dairy Development Board, India and Pro-Poor Livestock Policy Facility (South Asia Hub) of FAO
- Högger, R. 1994. The Family Universe, towards a Practical Concept of Rural Livelihood Systems. Working Paper, NADEL, Swiss Federal Institute of Technology, Zürich, Switzerland.
- Otte, Joachim. 2006. "The Hen Which Lays the Golden Eggs: Why Backyard Poultry are so Popular?", PPLPI Feature, [www.fao.org/ag/pplpi.html](http://www.fao.org/ag/pplpi.html).
- Filmer, Deon and Lant Prichett. 1998. "Estimating wealth effects without Expenditure Data or Tears: An Application to Educational Enrollments in States of India", The World Bank, Washington DC (unpublished).

# **ANNEXURES**

## Annex 1: Breeding Kuroiler at Farm level

Kuroiler, a dual purpose chicken is developed by mating exotic poultry strains / breeds with distinct characteristics in terms of higher egg production capability, body weight and growth rate suitable for backyard poultry keeping. The breeders have given emphasis on phenotypic characteristics that are of interest to the consumer like plumage colour patterns, shape of combs, color of eggshell and yolk, meat color and texture etc. The Keggfarms have followed the commercial breeder's principle of utilization of hybrid vigor at commercial production level. They maintain grand-parent lines and provide either the parents of the Kuroiler or fertile eggs to the hatcheries. Keggfarms can thus send the parent stock anywhere in the world to produce Kuroiler. They can do this without fear that someone can reproduce the stock because to get the parent stock, grandparent lines are needed and these are only available with the Keggfarms. Based on the feedback from the market and farmers, breeders have developed two to three commercial lines that are successful at farm/household level.



**Note:**

- ♂ - Male
- ♀ - Female

In West Bengal rural households keep 4 to 10 birds depending on the social environment and scavenging area available. Housing is provided for night and adverse weather conditions. These are made out of locally available material like bamboo, mud, palm leaves etc. The birds, raised as backyard poultry scavenge substantial part of their total feed requirement and are also given some locally grown grains and kitchen leftovers. At farms or in rural households, Kuroiler rearing is undertaken primarily for meat and most hens are retained for eggs and then sold for meat. It is also relevant to mention that since Kuroiler are derived from exotic breeds, they do not have broodiness. Most villagers are aware of its regeneration limitations and accept this.

It has been observed in some rural households that fertile eggs obtained from mating of Kuroiler hens and cocks are set under *desi* hens to hatch chicks. In such chicks the level of heterosis is diminished and also the genetic composition is altered, resulting in lower productive capability and livability. This process while acceptable in F1 generation is further heightened during F2 and further generations.

The households that have mixed flocks of *desi* and Kuroiler, natural mating does occur between Kuroiler cocks and local *desi* hens. Such eggs result in 80 to 90 % hatchability. This F1 generation shows good growth and egg laying capacity compared to *desi* but in subsequent generations a drop in body-weight and in egg laying capacity is noticed. Such progeny have productive capabilities far below Kuroiler.

### **Physical**

- Birds of both sexes are fairly large in size weighing on an average about 2 to 2.5 Kg at 5 months of age. The cocks attain a body weight of 4kg while hens weigh 2-2.5 Kg.
- Body is rectangular in shape, broad and deep. Breast is broad and full, carried well forward. These characteristics make it a good meat producing bird.
- Legs are strong, straight and positioned wide apart from each other. The shanks are long and strong. Toes and shanks are yellow to blackish yellow in color and are free from feathers. Spur is not present.
- The birds are alert and have active appearance.

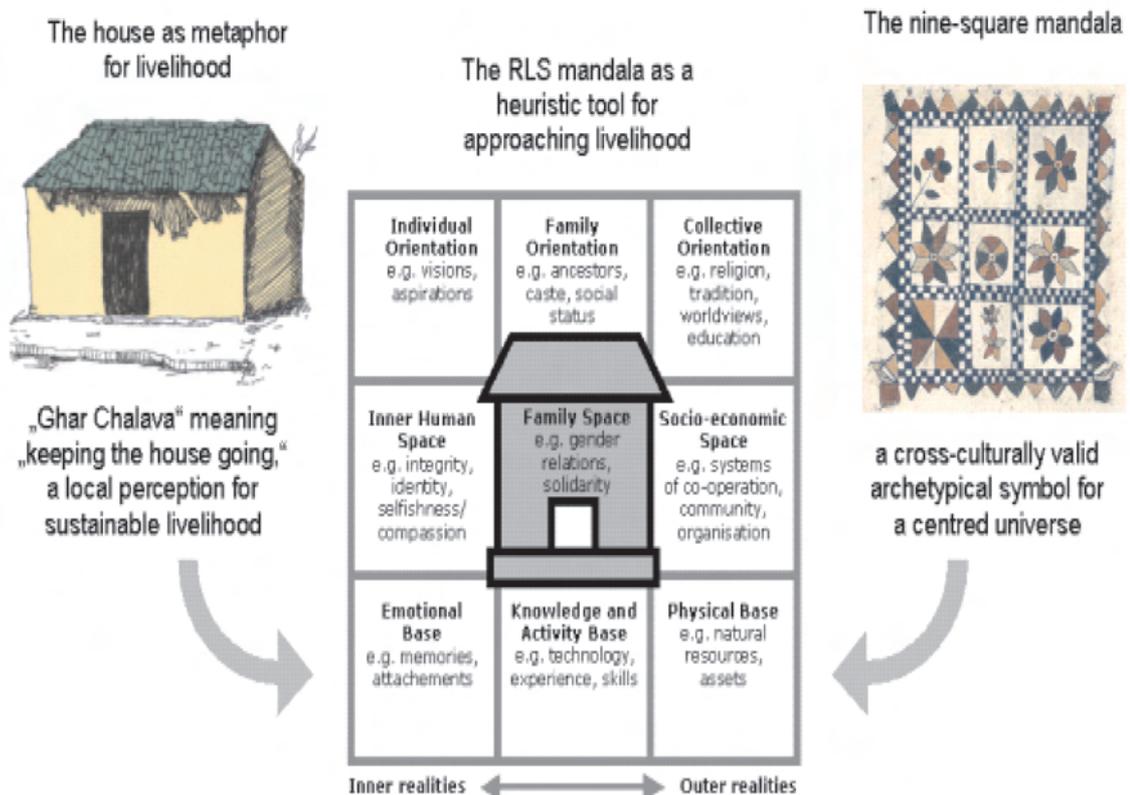


## Annex 2: Nine Square Mandala: A Brief Overview<sup>20</sup>

The nine-square mandala is a heuristic tool which helps in understanding the complexities of rural livelihood systems in a holistic framework. It can be used for planning as well as analyzing the results of livelihoods research.

The tool attempts to examine the whys and the hows of human behavior in a livelihood system. Various tiers and boxes of the mandala (or a rural house) go to the inner recesses of the humans including their dreams, family and the influence of the society people live in. It brings out the role of tradition and culture which may lead people to behave in a certain manner directly affecting their livelihood choices. At times actions which may not appear rational in traditional economic sense may be better understood when seen through the lens of nine- square mandala.

### Nine-Square Mandala: Capturing Meanings of Livelihood<sup>21</sup>



<sup>20</sup> 'In Search of Sustainable Livelihood Systems' Edited by Ruedi Baumgartner & Ruedi Hogger

<sup>21</sup> 'Working with a Sustainable Livelihood System' Nadel, Ruedi Baumgartner

Ruedi Hogger took a rural house as a metaphor and based the livelihood framework of nine-square mandala on it. All houses have a base or floor, walls that enclose space and finally a roof. Similarly Livelihood systems can also be understood as a three tiered entity: It has a basis consisting of material and non material resources:(lower row of squares) the walls are comparable to various spaces of socio economic, familial or personal nature (middle row of squares); and there is always a mental roof providing for collective or individual orientation (upper row of squares).

### **The Basis of Livelihood System**

As we start 'reading' from the right hand lower corner of the mandala, we first touch upon the physical basis of any livelihood system. It may refer to many realities, such as natural or economic resources, income in cash or kind, accumulated wealth or remittances from migrant family members.

At the same level but to the far left of the row, we find a reference to the emotional basis that any livelihood system will depend on. What keeps people alive and on the move are some of their emotional attachments to what they consider to be their homes and their way of life.

The middle square of the lower row refers to the knowledge and activity basis i.e., to the crafts, trades, skills or traditional knowledge on which the family universe is built. Their role in a livelihood system is of key importance and high complexity, binding the physical and the emotional basis of the system together in human activities.

### **Public, Private and Inner Human Space**

The second row of squares referred to as 'space' characterizes the walls of a real village home that demarcate an intricate puzzle of highly differentiated spaces, moving from outer to inner, from public to private, from collective to intimate, from profane to sacred. There are innumerable differentiations of the social space like neighborhoods, caste hierarchies, village community, the panchayat, and multiple relations with government and the market. All these make up the socio economic space referred to in the square at the right hand of the middle tier.

The family space is depicted in the very center of the mandala because it is the key area of what we call a livelihood system. The questions of gender, of generations, and of seniority within generations play important roles. Here traditions are fostered or despised, values are transmitted or refused and family planning is practiced or neglected. Social space may be of great influence for economic and social decision making, but family space is usually decisive and adds even more complexity to it.

On the left side of the middle row reference is made to inner human or intimate space. This is to say that neither the broadly accepted rules of the socio economic space nor those of the family space will ever alone determine what action is going to be taken in a given system. These actions always depend on very personal consideration and qualities of individual people.

### **The Roof: A Place to Look Up to**

Roof of the house is made up of top row of squares in the RLS mandala. It is the place to look up to and take orientation from. In this upper most tier we deal with all mental perspectives that shape and guide the wider community. Some of the collective orientations are common property rights, religious practices and festival, the laws of government and standards of schools. The above orientations are practically the same for all inhabitants of a given area. The multitude of mental orientations will be much bigger when we study the values and convictions prevalent in individual families. The final opportunity and responsibility to seek orientation lies with the individual (left hand square in the upper most tier), who may or may not remain true to the given orientation of the family or the community. Even in a traditional society there is room for personal visions, hopes, aspirations and even 'revolutionary' changes. The dynamics of change very often originate in the attitude or activity of a strong individual.

### **All Aspects are Inter Linked**

As we read through the RLS Mandala from right to left we always go from the outer to the inner realities, from those aspects that can be described with 'hard' data to those that must be sensed and intuited. From the bottom to the top of the mandala it is a transition from physical and emotional basis to the mental roof with its concepts

and perspectives. In other words it is the passage from what people 'stand upon' (looking back) to what they 'look up' to (for their future).

None of the nine chambers are truly independent of each other. Every one of them is intricately linked with each other, and the transitions from one to the other are gradual not abrupt.

These squares are all inter-related and change in one square of the Mandala has an affect on the other squares. It is important to understand that the links between them have to be analyzed to understand the complexities of a livelihood system. For example, policy decisions to ban backyard poultry by the Government (Square 7) would have direct impact on the family's income (Square 4) and its well-being (Square 5).

Similarly relationship between husband and wife (Square 5) will have effect on the Inner human space (Square 6) of the wife. If the husband is supportive, the wife will have more self-confidence and more self esteem. She stands a better chance in succeeding in small business like poultry keeping for she can take active part in decision making. This in turn will impact their income (Square 4).

Looking through the nine squares of the Mandala helps in understanding and analyzing why people behave in a certain way; why they might as per our perception take irrational decisions. Normally we observe the so called outer realities but when looking through the squares especially those on the left (3, 6, 9) helps gain insights in things people normally do not share easily but keep to themselves.

### Annex 3: The Asset Index

To make comparisons across income groups, this study used a composite index based on indicators of household assets. The index was constructed using weights chosen by principal components as proposed by Filmer and Pritchett (1998). This annex describes the methodology used for constructing the index and presents some statistics to demonstrate the robustness and internal coherence of the index.

The index uses 24 asset variables which can be divided into four categories: ownership of consumer durables, characteristics of the house occupied by the household, ownership of land, and ownership of livestock. The index is a weighted linear index where the weights are obtained using the procedure of principal components<sup>22</sup>. The index is constructed as follows

where  $A_i$  is value of index for  $i^{\text{th}}$  household,  $f_k$  is the factor score coefficient for  $k^{\text{th}}$  asset,  $a_{ik}$  is

$$A_i = \sum_k f_k \frac{(a_{ik} - a_k)}{s_k}$$

value of  $k^{\text{th}}$  asset for  $i^{\text{th}}$  household, and  $a_k$  and  $s_k$  are the mean and standard deviation of the  $k^{\text{th}}$  asset over all households. Mean value of the index is zero by construction and the mean, minimum and maximum for the poorest households were  $-0.90$ ,  $-1.17$  and  $-0.76$ , respectively. Comparable figures for the richest households were  $1.67$ ,  $0.79$  and  $3.35$  (Table A1).

The index does very well in separating poor, middle and rich households. Table A2 presents the summary statistics for the variables used in constructing the index across bottom, middle and top 20 percent categories. It is clear that index produces a very sharp difference across these groups in nearly every asset. For example, ownership of un-irrigated land is 1.42 acres for the poorest households and 4.20 acres for the richest households. Comparable figures for irrigated land are 0.08 acres and 1.82 acres. Similarly, the mean for cattle ownership for the poorest 20 percent households in the

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<sup>22</sup> Principal components is a procedure for extracting from a large number of variables those linear combinations that capture common information in those variables.

sample was 2.37 compared to 4.37 for the top 20 percent. At the same time, however, the proportion of crossbreds in cattle stock was about 6 percent for the poorest households compared to nearly 10 percent for the richest households. Similar separations can be seen across all variables.

**Table A1: Mean values of asset index by wealth categories**

Category	Mean	Minimum	Maximum
Bottom 20 %	-4.90	-6.45	-4.03
2 <sup>nd</sup> quintile	-3.07	-4.02	-2.32
3 <sup>rd</sup> quintile	-1.45	-2.32	0.01
4 <sup>th</sup> quintile	1.77	0.02	3.38
Top 20 %	7.59	3.40	14.93

**Table A2: Summary statistics for the variables used in constructing the index disaggregated by wealth categories**

Name of Asset	Mean asset ownership (number per household)		
	Bottom 20%	Middle 20%	Top 20%
Radio	0.09	0.70	0.88
Cycle	0.30	0.85	0.94
Motor cycle	0.00	0.05	0.19
Fans	0.00	0.20	0.87
Watches	0.00	0.57	0.93
Television (B&W)	0.00	0.02	0.52
Television (Colour)	0.00	0.00	0.41
Sewing Machine	0.00	0.02	0.07
Pressure Cooker	0.00	0.00	0.63
Irrigation pump	0.00	0.00	0.17
Irrigated land (acres)	0.03	0.10	0.49
Un-irrigated land (acres)	0.08	0.19	0.93
Local cows	0.43	0.88	1.24
Goats	1.07	1.26	0.83
Ducks	0.04	0.80	0.26

## Annex 4: Division of labour across various tasks in poultry keeping

Task	Percent performing		
	Men	Women	Both
<b>Kuroiler flock size &lt; 5</b>			
Taking care of birds at home	5.50	91.0	3.50
Chick purchase and transport	27.5	66.7	5.80
Feed purchase and transport	55.9	35.3	8.80
Medicine purchase and use	52.2	39.1	8.70
Vaccination	58.3	16.7	25.0
Sale of birds from home	16.2	73.0	10.8
Sale of eggs from home	5.60	86.1	8.30
Sale of birds in the market	53.3	26.7	20.0
Sale of eggs in the market	47.0	33.0	20.0
Further investment	37.2	41.9	20.9
Dealer contact	44.8	44.8	10.3
Decision making about purchase of new chicks	18.2	52.3	29.5
Utilization/disposal of poultry income	19.2	49.0	32.0
<b>Kuroiler flock size between 5 to 9</b>			
Taking care of birds at home	2.90	92.8	4.35
Chick purchase and transport	18.8	75.4	5.8
Feed purchase and transport	39.7	46.6	13.8
Medicine purchase and use	35.9	48.4	15.6
Vaccination	38.1	52.4	9.5
Sale of birds from home	14.0	75.4	10.5
Sale of eggs from home	12.0	72.0	16.0
Sale of birds in the market	45.5	42.4	12.1
Sale of eggs in the market	27.8	55.6	16.7
Further investment	26.7	58.3	15.0
Dealer contact	35.0	60.0	5.0
Decision making about purchase of new chicks	12.3	72.3	15.4
Utilization/disposal of poultry income	14.0	63.2	22.8
<b>Kuroiler flock size between 10 to 15</b>			
Taking care of birds at home	7.14	83.3	9.53
Chick purchase and transport	33.3	59.5	7.15
Feed purchase and transport	44.4	41.7	13.9
Medicine purchase and use	47.5	40.0	12.5
Vaccination	38.1	38.1	23.8
Sale of birds from home	15.4	56.4	28.2
Sale of eggs from home	10.8	67.6	21.6
Sale of birds in the market	54.2	29.2	16.7
Sale of eggs in the market	45.5	27.3	27.3
Further investment	42.1	42.1	15.8
Dealer contact	48.4	41.9	9.67
Decision making about purchase of new chicks	25.6	43.6	30.8
Utilization/disposal of poultry income	24.3	43.2	32.4

Task	Percent performing		
	Men	Women	Both
<b>Kuroiler flock size &gt; 15</b>			
Taking care of birds at home	5.88	82.4	11.8
Chick purchase and transport	35.3	64.7	0.00
Feed purchase and transport	56.3	37.5	6.25
Medicine purchase and use	56.3	37.5	6.25
Vaccination	55.6	44.4	0.00
Sale of birds from home	6.25	75.0	18.8
Sale of eggs from home	0.00	83.3	16.7
Sale of birds in the market	66.7	26.7	6.66
Sale of eggs in the market	66.7	22.2	11.1
Further investment	33.3	40.0	26.7
Dealer contact	47.1	47.1	5.88
Decision making about purchase of new chicks	29.4	58.8	11.8
Utilization/disposal of poultry income	23.5	52.9	23.5

# SOUTH ASIA Pro Poor Livestock Policy Programme

A joint initiative of NDDDB and FAO

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*“development of healthy environments in which healthy animals are reared by healthy people”*

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