AGRICULTURE RECONSTRUCTION AND DEVELOPMENT PROGRAM FOR IRAQ

Poultry Survey in Erbil, Dahuk and Sulaymaniyah

Summary Report

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Introduction

Poultry meat and eggs have become the main source of animal protein in the Iraqi diet, and in the past few years poultry production has become one of the most dynamic agricultural subsectors. In the governorates of Erbil, Dahuk and Sulaymaniyah, poultry production is entirely in the hands of private sector entrepreneurs. Because of its economic contribution to the regional economy, it is important to identify the problems and constraints of the poultry sector in these governorates.

Modern poultry production in Erbil, Dahuk and Sulaymaniya began in the middle 1970's with the establishment of a few dedicated poultry farms. Poultry production has expanded so that today there are hundreds of farms scattered throughout the three governorates. In the wake of the Gulf War in the early 1990s, the poultry subsector endured destruction and plunder, and production collapsed to less than 10 percent. During the second half of the 1990s decade, the subsector had a revival in Erbil, Dahuk, and Sulaymaniyah thanks to the political stability in this region. However, this revival was made possible by the provision of highly subsidized production inputs and restricted markets. In 2003 the poultry subsector suffered from the disruptions caused by the removal of subsidies in feeds, veterinary supplies, and equipment, and breakdowns in the supply of electricity. However, the subsector has also benefited from an open a market where demand for its products increased rapidly thanks to increased household cash incomes.

There has been a significant turnover of responsibility for the operation of poultry farms. Some original owners have rented their farms to new operators or put their farms in the care of managers with little experience in poultry production. An effective private sector network for the provision of veterinary services, vaccines, and medicines has not yet emerged to replace or complement the official veterinary system whose services and supplies have suffered from reduced funding.

The Ministry of Agriculture in Erbil and ARDI carried out this survey of the poultry subsector in the Erbil, Dahuk, and Sulaymaniyah in order to gain a detailed picture of the current situation of the sector, to pinpoint the problems and constraints, and to make recommendations as to how to raise incomes and productivity of poultry farmers.

General Background

Developed countries consume animal products at a higher rate than less developed and developing countries. Protein from animal sources is a recommended component of a well-balanced diet because it contributes to building up the body and maintaining good health. Meat is the main source of animal protein, and it contributes other nutrients such as fat, vitamins, and carbohydrates that are also necessary for a good diet. Poultry meat is a healthy source of animal protein and is affordable to most Iraqi households.

This survey examines the current situation of the poultry industry to identify the problems and obstacles that poultry producers encounter. A statistical survey is a tool to obtain reliable quantitative information from representative operators of the entire sector. In addition to gathering data relevant to technical production issues, the survey also seeks to make an evaluation of business related issues like the structure of costs and profitability.

There are no comparable prior quantitative studies of the poultry industry in northern Iraq to serve as patterns for this study. Before the 1970s, poultry production in the region was mainly limited to small scale backyard operations by village households. There were no specialized breeds for eggs and meat. Production was dual purpose: female chickens were used for eggs and males were used for meat. Modern poultry production technology was introduced in the early 1970's as both small private undertakings and large state projects. Nearly all of the poultry farms were privatized before the 1990s.

The Gulf war of 1991 and the subsequent trade embargo that was imposed on Iraq devastated the poultry sector. In addition to the unavailability of inputs such as chicks, vaccines, medicines, soybean and maize for feeding, household income collapsed overnight and families no longer could afford to buy meat. During the sanctions period in the early 1990s, white meat became unavailable and unaffordable in the market. More than 90 percent of poultry farms stopped production as a result of the United Nations economic blockade.

After 1998, when the oil-for-food program was introduced, poultry production increased gradually for several years thanks to the period of relative political stability and renewed access to production input requirements. This production increase came even though average household incomes remained extremely low. With the downfall of the previous regime in 2003 came the opening of the economy to trade and enterprise, reactivation of the economy, and increased purchasing power due to salary increases. Under these conditions demand for meat in general and poultry meat in particular has rapidly expanded. On the other hand, prices for poultry inputs have also increased by several folds due to the removal of previous subsidies, and because the supply channels have been disrupted. The opening of the borders has also led to the inflow of large quantities of imported frozen chickens. The current poultry market situation in Erbil, Dahuk, and Sulaymaniyah closely approximates an internationally competitive market subject to free trade, free entry, and prices determined by the interplay of supply and demand forces.

Objective

The purpose of this exercise is to provide regional and local agricultural authorities and the private business community with current basic information on the poultry farms and production inputs for use in policy formulation and making business decisions. This study is part of a larger study profiling the structure of the poultry industry in Iraq as it adapts to changes brought about in the past few years. It also evaluates the technical and economic performance of poultry production and estimates feed consumption requirements.

Methodology

A representative sample of poultry farms in the three northern governorates – Erbil, Dahuk, and Sulaymaniyah – was selected out of a database of registered poultry farms maintained by the Ministry of Agriculture. In order to operate a commercial poultry farm, farmers are required to get a license from the Ministry of Agriculture, and each registered farm is assigned to a veterinarian who is responsible for doing periodic on-site inspections. Farms

are required to post in a visible place in the premises a large sign with the particulars of the license, including authorized capacity and dates of issue and validity. The updated database of poultry farms is kept by the Department of Veterinary and Animal Resources in each governorate.

A stratified sample of poultry farms was obtained by using the following method. The farmers were sorted into five strata according to registered installed capacity, ranging from small farms with capacity for less than 10,000 birds at a time to a few large farms with installations able to hold over 50,000 birds at a time. Within each stratum, a simple random sample of farmers was selected from the list using random numbers generated in Excel. One out of four farms in each stratum was selected to be interviewed in each governorate. No attempt was made to ensure proportional representation according to the districts where farms were located. A separate list of alternate sample farms in each stratum was prepared ahead of time in case for some reason it was not possible to interview a person knowledgeable about the farm.

Using this method, a total of 160 poultry farms were selected in the three governorates out of a list of 644 farms registered: 78 in Erbil, 20 in Dahuk, and 62 in Sulaymaniyah.

Ten teams of enumerators were selected and assigned by the Ministry of Agriculture to carry out the survey farm interviews; four teams each in Erbil and Sulaymaniyah and 2 teams in Dahuk. Each team was comprised two staff members, one from the Department of Veterinary and Animal Resources and the other from the Planning Directorate (statistics unit). One monitor was assigned in each governorate to coordinate all field team activities.

Team members came mainly from district offices of the agricultural department. Each team was scheduled to interview two farms per day in or nearby their respective districts. Hired vehicles were assigned to take each field team to the target sample farms.

Questionnaire design

A single questionnaire was developed by ARDI staff members to collect essential information on each farm. The questionnaire was reviewed in detail during the one-day training sessions held for the teams of enumerators at the Extension Service training facilities in each governorate. Several modifications were made to the original before a final version was adopted. A few days after the start of the field survey, a review session was held to address problems that the enumerators encountered during their initial interviews with farmers. The review session helped to ensure that data collected by all teams was clearly understood and that measurement units were consistent and fully comparable.

During the survey, the teams focused on obtaining good data on the composition of poultry rations used by farmers in the region. Farmers can have as many as three different rations for distinct stages in the growth curve of poultry because nutrient content and composition of ingredients differ accordingly. The price of each ingredient and the origin (whether it was purchased in the market or produced at the farm) was recorded.

In order to evaluate the productivity and economic performance of poultry farms, farmers were asked to recall details about the last batch or flock of birds that they had sold. The

details recorded included number of chicks purchased, number of days in each ration, weight at the end of each growth stage – starter, growth, and finishing – and sale age and price of birds. Estimates of the quantity of each feed ration consumed by the last batch were also recorded. Revenue from the sale of the last batch could then be estimated from the data on the number of birds sold, average weight, and average price per kilogram live weight.

In addition to feed costs, the questionnaire included questions regarding the cost of day-old-chicks, the cost of vaccines and veterinary medicines, labor wages and other direct costs incurred for the last batch of birds sold. Some farms were not active at the time of the interview because during the winter, when the survey was conducted, maintaining proper temperature in the coops required major effort and cost, and some farmers preferred to suspend operations during the coldest months and wait for warmer weather in spring instead. The questionnaire requested information on which months the farm was not in operation, in both winter and summer.

Survey activities

- Obtain a list of poultry farms (or projects) from the Ministry of Agriculture offices in the three governorates with their identification and location, and select a sample for interview and data collection.

- Design an appropriate questionnaire to capture necessary information from each enterprise regarding production, technology, inputs, costs and revenues.

- Train teams of enumerators and monitors to interview managers of poultry operations.

- Draft a calendar of interviews and assign enumerator teams a list of poultry farms to visit.

- Begin data collection. Data collection took place in a seven week period between mid December 2004 and end of January 2005.

- Begin data entry. Data entry and preliminary analysis started immediately after the end of data collection. Inconsistencies in data sometimes required revisiting a few farms for clarifications.

- Report writing and analysis was the responsibility of the principal researchers.

Personnel

The survey was a joint effort of the Ministry of Agriculture in the three governorates and the ARDI project. The Statistics Unit within the Planning Department of the Ministry of Agriculture in Erbil was principally responsible for carrying out data collection, data entry,

and data processing under the supervision of its Director. ARDI staff advised on statistical procedures.

Questionnaires were entered into an Access database designed by staff of the Statistics Unit of the Ministry of Agriculture, Erbil. Each questionnaire was carefully reviewed by the supervisor before entering data in the database. A thorough interactive process of debugging and cleaning was needed to ensure that only clean data was included in the analysis. When it was not possible to resolve questionable data, those observations were not taken into account in the analysis.

Main Findings

Location of poultry farms

In 2004 there were 644 licensed poultry farms by the Department of Veterinary and Animal Resources of the Ministry of Agriculture in the three Governorates – 322 of them in Erbil, 78 in Dahuk, and 244 in Sulaymaniyah.

This survey was concerned only with broiler production. In each governorate there is also one large company producing table eggs, but these are not included in the survey. Broiler farms are located throughout the governorate, but with a higher concentration in the districts closer to major urban centers and near the main roads.

Farm size

Farm size refers to the number of birds that the installed housing capacity of the farm could hold at a given time. For sampling purposes we divided the farms into five size groups, as follows:

Fewer than 10,000 birds
10,001 to 20,000 birds
20,001 to 30,000 birds
30,001 to 50,000 birds
More than 50,000 birds

From each of the size groups we selected one fourth of the farms. A total of 160 broiler farms were thus selected for interviewing. The median farm size in Erbil and Sulaymaniyah was 10,000 birds.

Basic facilities

Poultry houses are simple rectangular cinder block structures with a solid concrete floor and roof supported by columns. Although all farms are connected to the electric grid, they all have one or two backup generators ready to provide power because the supply of electricity is sporadic. Water for the farms usually comes from a deep well at the farm. Most farms

are built some distance away from population centers, but a small house for the caretaker's family is usually built next to the coops.

Ownership of farms

All farms are private commercial enterprises and nearly all are owned by only one individual. One farm in the sample of 160 farmers was reported as a cooperative society, and twelve of them were reported as partnerships. Ninety percent of farms (143 out of 160) are individually owned. Four remaining farms did not report ownership status because they had been out of operation for several years. Depending on the context, the latter four farms are either included or excluded from subsequent calculations derived from the survey. The Ministry of Agriculture's roster of licensed farms needs to be periodically updated to remove farms that go out of business. (See Table 1).

Table 1. Ownership of poultry farms

Governorate	Erbil	Dahuk	Sulaymaniyah	Total	Percent
Individual	69	14	60	143	89.4%
Partnerships	5	6	1	12	7.5%
Cooperative	0	0	1	1	0.6%
Unknown	4	0	0	4	2.5%
Farms	78	20	62	160	100.0%

Many producers are not experienced broiler growers and lack the modern technical know-how required for efficient operations. Many operators rent the housing facilities of the original owners who registered the farm with the Ministry. Major management and maintenance problems were observed in the course of the survey, mainly because many of the farm owners and producers are absent or live in nearby cities and leave the day to day operations in the hands of caretakers with little experience.

Year farms built

The oldest farm in the survey sample dates back to 1977. Table 2 depicts the number of sample farms built each year since 1977. It appears that 14 percent of the farms were built before 1980. A significant increase in the number of poultry farms occurred between 1980 and 1990, a period when many government farms were privatized and sold to individual entrepreneurs.

Only two farms were built between 1991 and 1995, a period when Iraq was subject to the trade embargo imposed by the United Nations. Starting in 1996 there was a major increase

in the number of farms – 47 percent of the farms in the survey sample were built (or rebuilt) after 1996. This latter year corresponds to the beginning of the United Nations Oil-for-Food program in which the Food and Agriculture Organization (FAO) initiated a major campaign in the three northern governorates to increase poultry meat production as a way to provide a source of animal protein to the population. (Note: a lag of one to two years might elapse between the time when the farm is built and when it begins operations).

Table 2. Year when poultry farms were built

Governorate	Erbil	Dahuk	Sulaymaniyah	Total	Percent
Farms	78	20	62	160	100.0%
Before 1980	16	2	5	23	14.4%
1980-1985	19	4	6	29	18.1%
1986-1990	7	0	16	23	14.4%
1991-1995	0	0	2	2	1.3%
1996-2000	16	1	13	30	18.8%
After 2000	15	13	18	46	28.8%
Not known	5	0	2	7	4.4%

Capacity Utilization

There is a significant difference between the potential production capacity of poultry farms and the actual production reported by the survey sample farms. On average, farms operated at only 46 percent of capacity in 2004. One of the main reasons for the low capacity utilization is that farms rarely process the upper limit of five batches of chickens per year. Less than half of poultry farms work at near full capacity of 4 to 5 batches per year; the rest of the farms operate below capacity at 3 batches or less during 2004. Many producers sold only one batch during the survey year. The low number of batches accounts in great part for the low utilization ratio.

Table 3 shows how many batches were produced by sample farms in 2004. Only 11.3 percent of farms produced five batches, and 35.6 percent had four batches during the survey year. The remaining 43.7 percent, produced one to three batches. Some of the registered farms (about 9 percent of the total) have not been in operation for several years, some as a result of destruction and looting during recent years, others because owners had problems that made them unable or reluctant to renew operations.

Table 3. Number of batches produced by sample farms in 2004					
Governorate	Erbil	Dahuk	Sulaymaniyah	Total	Percent
No production	10	3	2	15	9.4%
One batch	9	1	7	17	10.6%
Two batches	13	1	3	17	10.6%
Three batches	18	3	15	36	22.5%
Four batches	24	3	30	57	35.6%
Five batches	4	9	5	18	11.3%
Total Farms	78	20	62	160	100.0%

Months of suspended activity

Environmental factors are the main reason why poultry farms in the selected sample do not operate continuously to produce at least five batches throughout the year. The survey questionnaire asked farm operators to specify the months in which operations were suspended. Table 4 shows how many farms stopped work in each of the months of the year. There are two obvious peaks of non-activity. The first one is in the summer season (July-August) during which over 30 percent of farms stopped activity. The second period is in winter (January and February) when another 30 percent of farms stopped production.

Table 4. Months when farms suspend operations

Governorate	Erbil	Dahuk	Sulaymaniyah	Total	Percent
January	28	4	20	52	32.5%
February	26	4	12	42	26.3%
March	18	5	5	28	17.5%
April	16	5	3	24	15.0%
May	15	4	3	22	13.8%
June	17	6	4	27	16.9%
July	27	5	16	48	30.0%
August	30	5	18	53	33.1%
September	16	5	6	27	16.9%
October	13	3	5	21	13.1%
November	9	3	5	17	10.6%
December	16	3	15	34	21.3%
Total Farms	78	20	160		

Clearly, most broiler producers prefer to avoid production during the months of extreme heat in summer and extreme cold in winter. About one third of the farms in the sample were not operating at the time when the survey was taken. These weather related stoppages account for the low number of chicken batches per year. Climatic control is a major stumbling block on poultry production. The physical structures used are poorly insulated and therefore the interior is subject to the extreme temperature variations typical of northern Iraq. For cooling during summer, large window openings along the walls are used to force air through water soaked straw mats. During winter, gas heaters are needed to warm the air inside, and those large windows must be sealed to prevent heat loss.

The risk of high mortality from extreme heat or cold and the high cost of climatic control discourage most farm operators from producing year round. One unfortunate sample producer recently suffered the loss of a large number of birds from heat stress when the heating system malfunctioned in the middle of winter and the attendant did not realize it in time. Automatic air conditioning systems are not used because they are expensive and subject to stoppages during breakdowns in the supply of electricity. Manual control systems are also unreliable.

Production capacity

A large difference exists between potential production capacity of sample poultry farms and their actual production. Actual production is the reported number of birds sold in year 2004. Production capacity is based on the assumption that a producer can produce five flocks (batches) of birds during one year in the same coop. This allows about 73 days per batch, and most batches are sold at 50 to 55 days of age, which leaves 21 days (three weeks) for cleaning and disinfecting the facility and getting it ready for a new batch of day-old-chicks. The assumption of five batches per year is a conservative one, allowing for a long growing period and plenty of idle time between batches. The number of broilers sold during by sample farms in year 2004 is reported in Table 5.

Median production capacity among survey sample farms was estimated at 51,000 birds per year, on the assumption that five batches or flocks can be produced in one year in each chicken coop. The largest farm had capacity to produce 300,000 birds per year.

Poultry farms are operating at less than half of their installed production capacity. Total production in 2004 by sample farms was 4.7 million birds, compared with 10.1 million capacity. Broiler production in the three governorates is therefore estimated at 18.8 million birds. The gap between actual and potential production represent ample spare capacity that could be rapidly expanded under more favorable conditions.

Table 5. Production capacity and number of birds sold by sample farms				
Governorate	Erbil	Dahuk	Sulaymaniyah	Total
Housing area in square meters	80,311	2,078	70,712	153,101
Average birds per batch	959,300	265,500	792,784	2,017,584
Production capacity per year	4,796,500	1,327,500	3,963,920	10,087,920
Actual birds sold per year	2,016,138	752,140	1,884,450	4,652,728
Percent Performance	42.0%	56.7%	47.5%	46.1%
Share of birds in region	43.3%	16.2%	40.5%	100.0%
Total farms	78	20	62	160

The gap between potential production and actual sales is shown for each governorate and the performance percentage ratio is calculated. The following observations can be derived from the above table.

First, in Erbil, Dahuk and Sulaymaniyah, annual production in 2004 was less than 50 percent of design capacity. The reasons for the poor performance are discussed below.

Second, Erbil shows the lowest percentage of capacity utilization at 42 percent. Dahuk has the highest capacity utilization at 56.7 percent, probably because the small number of farms benefit from the presence of a poultry slaughter house and meat packing factory. Sulaymaniyah produces 47.5 percent of its installed capacity.

Third, Erbil governorate contributes 43 percent of total broiler production in the three governorates, and Sulaymaniyah follows with 40.5 percent. Dahuk only contributes 16.2 percent of broiler production. These shares roughly reflect the number of farms in each governorate. The number of farms in each sample is the same proportion (one fourth) of the farms in the governorate. Dahuk, with the smallest number of farms in the sample, 20 out of 160 farms, contributes also the smallest percent of regional production (16 percent).

Production Problems

Survey sample farms were asked to about the most severe problems encountered in their operations. Table 6 reports their responses.

Table 6. Number of sample farms reporting serious production problem

Governorate	Erbil	Dahuk	Sulaymaniyah	Total	Percent
Day-old-chicks availability	14	0	9	23	15.9%
Feed availability and quality	4	2	7	13	9.0%
Availability and quality of medicines	19	2	14	35	24.1%
Availability and quality of equipment	18	10	16	44	30.3%
Marketing problems	45	13	43	101	69.7%
Mortality of birds	52	5	43	100	69.0%
Other problems	0	0	0	0	0.0%
Total farms responding	68	17	60	145	100.0%

The table above reflects the following shortcomings in broiler production:

Quality and availability of day-old-chicks

Sixteen percent of the respondents refer to problems in the availability and quality of chicks. Broiler producers in Erbil, Dahuk and Sulaymaniyah have several choices of chicken breeds. Many chicks are imported from Iran, but most are produced locally by authorized breeders. Prices for chicks vary by breed between 360 and 450 dinars per chick (24 to 30 cents per chick).

With regards to quality, producers often believe that some of the diseases are brought in by the chicks themselves, but this could not be confirmed.

Feed

Feed costs are the greatest factor in broiler production costs, but only 8.9 percent of responding sample farms considers availability and quality of feeds a serious problem, the lowest percentage of all potential problem sources. Feed ingredients are purchased in the open market at competitive prices.

All producers except one mix their poultry rations in place at the farm, milling and mixing all the ration ingredients themselves. Pre-mixed rations are not commonly available in the market, and the little there is costs more. Maize is seldom used in rations because it is more expensive than wheat. Local wheat is the main feed ingredient and accounts for up to 60 percent of the ration because it is a cheap source of calories and is widely available year round in the local market.

Vaccines and veterinary medicines

One fourth (24.1 percent) of total poultry farmers complain about the quality of the vaccines and veterinary medicines available in the market, and their high price and low effectiveness. The high prices and unreliable quality of vaccines and veterinary medicines discourage farmers from using them regularly, and this often results in increased mortality.

Poultry farmers also report in informal conversations that they do not know what accounts for the death of many of their birds. There is a lack of easily accessible diagnostic laboratories to determine cause of death. Determining the causes of high mortality is one of the most difficult challenges for the poultry sector.

Equipment

Most farms operate with old and poorly maintained equipment, especially old generators and climatic control equipment. Thirty percent of farms report suffering from deficiencies of equipment available in the market and their high prices. Automatic feeders, heating and cooling equipment are the main sources of frustration. Poor maintenance of equipment and machinery, combined with the irregular supply of electricity, result in costly breakdowns that affect the performance of the operation. Higher mortality and fewer batches due to equipment malfunctions or interruptions in electricity were often reported in the survey.

Marketing

Table 6 shows that 69 percent of poultry farms in this survey faced marketing problems when selling their production. Most producers suffer when they sell their production because prices for chickens remain low while the cost of many production inputs has increased month by month. Nearly all broilers are sold live to traders and retailers who in turn resell to urban households. Competition from imported frozen chickens, mainly from Brazil, keeps the price of live chickens low enough to cover costs of only the more efficient producers. This discourages local production.

There is a lack of marketing channels, which sometimes causes partial losses of production. Marketing difficulties and delays result in producers having to keep birds beyond their optimal sale age, which results in higher costs per live kilogram. Lack of slaughtering facilities, refrigerated storage, and packaging infrastructure contribute to limit marketing options available to producers.

Mortality

High bird mortality is a major factor that results in low capacity utilization and high feed conversion ratios. The combined effect of few batches per year and lower number of birds sold per batch result in low capacity utilization and financial losses for many producers.

Production capacity estimates are based on the number of birds that can be processed in a batch in a given space. High mortality reduces the final number of birds sold from each batch. 69 percent of producers indicate that a high rate of mortality is a serious problem affecting their operations (see Table 6). The combined effects of few batches per year and a reduced number of birds per batch result in overall utilization ratio of less than 50 percent among sample survey farms. The figures in Table 7 summarize the average mortality among sample farms in Erbil, Dahuk and Suliemaniyah. Those mortality rates were obtained for the last batch sold from the farm, for which figures were know with greater confidence, whether the farm was operating at the time of the visit or not.

Table 7. Mortality ratios among survey sample farms last batch

Governorate	Erbil	Dahuk	Sulaymaniyah	Total
Day-old-chicks purchased	698,403	210,000	612,861	1,521,264
Birds sold	544,411	173,640	490,800	1,208,851
Mortality (birds)	153,992	36,360	122,061	312,413
Percent Mortality	22.0%	17.3%	19.9%	20.5%
Total farms responding	68	17	60	145

For the last batch of chickens sold by the surveyed farms, about one quarter of the farms had mortality rates below 10 percent. Half of the farms had mortality below the median rate of 16.8 percent, and the other half exceeded that rate. Analysis of the data shows an average mortality of 20.5 at the regional level and the highest percentage was in Erbil governorate at 22 percent. Dahuk has the lowest mortality at 17.3 percent, and Suleimaniya occupies an intermediate position at 19.9 percent.

Farm operators cite many reasons for the high mortality rates. Most owners attribute high mortality rates to the poor quality of vaccines and medications against the main poultry diseases. Others attribute it to the lack of availability of proper equipment such as automatic feeder systems. A large number of producers complain of the low grade quality of chicks available in the market. These chicks may be hatched under poor sanitary conditions and therefore introduce pathogens into the coops. There is also negligence among producers and managers to maintain strict isolation and sanitary conditions in the farm, and veterinary service and technicians do not track and follow-up with the poultry farms. Most farm managers are not able to tell precisely the cause of death of birds because there is a dearth of diagnostic laboratories or tools.

Vaccinations

Broiler producers are aware of the need to vaccinate their chickens against contagious diseases. Over eighty percent of the sample farms vaccinate against fowl-pox, Newcastle, and Gomboro, and 54.7 percent vaccinate against IB (infectious bronchitis). A few farms (21.3 percent) report using CRD vaccine, and 38 percent of producers use treatment against Coccidiosis.

Farmers consistently complain about the quality of vaccines and veterinary medicines available in the local markets. Unreliable supply of electricity can lead to gaps in the cold chain necessary to maintain the effectiveness of some vaccines and medicines. Farmers don't know the actual causes of mortality among birds for lack of diagnostic laboratories. Better diagnosis of mortality is one of the most critical improvements that the poultry industry needs.

Table 8. Percent of farms using common vaccines and medicines

Governorate	Erbil	Dahuk	Sulaymaniyah	Average
Newcastle	88	70	85	84.3
CRD	42	20	2	21.3
IB	57	40	67	54.7
fowl pox	85	70	83	82.7
Gomboro	95	20	83	82.7
Coccidiasis	42	70	2	38
Farms	68	17	60	145

Composition of poultry feed rations

Poultry farmers distinguish three distinct growth stages in broilers, each with its own nutritional, health, and environmental requirements. The total life cycle of a broiler ranges between 50 and 60 days. The first – starter – stage takes day-old-chicks through the first two or three weeks, followed by a rapid growth stage, and then a finishing stage. For convenience we refer to ration A for starting, ration B for growth, and ration C for finishing. The figures in Table 9 show how the average compositions of these three rations change in terms of kilograms of each ingredient per ton of ration.

Average costs of poultry feed ingredients reported by survey sample farms is 404,139 dinars per ton (404 dinar per kilo) or about 0.27 cents/kg. The highest cost component is soybean meal which costs 548 dinars per kilogram and represents 34.5 percent of cost. Wheat accounts for 32.4 percent of cost of the average ration, and the price of wheat is 214 dinars per kilogram.

Table 9. Composition of poultry feed rations. (kilos per ton)

Ration	-- A -- Starter	-- B -- Growth	-- C -- Finish	Average	Dinars per kg	Cost: dinars	% weight	% cost
Wheat	569	609	658	612.0	214	130,784	61.2%	32.4%
Maize	26.6	23.3	20.4	23.4	301	7,042	2.3%	1.7%
Soybean meal	295	255	213	254.3	548	139,451	25.4%	34.5%
Protein	61	57.3	52	56.8	1,348	76,538	5.7%	18.9%
Cooking oil	32.7	39.7	40.3	37.6	613	23,040	3.8%	5.7%
Kils	7.7	7.7	7.3	7.6	94	709	0.8%	0.2%
Other	8	8	9	8.3	3,189	26,575	0.8%	6.6%
Total	1,000	1,000	1,000	1,000	404	404,139	100.0%	100.0 %

Table 9 draws a contrast between the relative shares of weight and cost of an average feed ration for the different ingredients. Whereas wheat contributes 61.2 percent of the weight of the poultry ration, it accounts for only 32.4 percent of the total cost. Soybean meal, on the other hand, only provides 25.4 percent of the weight but accounts for 34.5 of the cost. The greatest contrast is with “protein” that contributes 5.7 percent of the weight and 18.9 percent of cost. Vegetable oil contributes 3.8 percent of weight and 5.8 percent of cost, and other supplements amount to about 1 percent of weight but about 7 percent of cost.

Ingredients of poultry feed rations

Wheat

Wheat is by far the main ingredient in poultry feed rations, accounting for nearly two-thirds (612 kilograms) of the weight in each ton of ration, and is the main source of energy (calories) in the chicken diet.

It is not a common practice to use wheat in chicken rations, but in northern Iraq wheat is widely available at a price far lower than the cost of alternative grains such as yellow maize. Wheat is the main agricultural product in the northern governorates and grows well under rain-fed conditions during the winter season. The Iraqi government prefers to use imported wheat from Australia or the United States for the food ration distribution system because locally produced wheat is of low quality, often affected by high incidence of smut, Sunn pest damage, extraneous weed seeds, and other varieties of foreign matter, which makes it unsuitable for human consumption. Because the monthly household food ration gives 9 kilograms of wheat flour made from imported wheat free of charge to every person, locally produced wheat is sold by farmers at low enough prices to make it attractive for poultry feed use. Wheat constitutes more than 60 percent of the weight of poultry feed rations, but only accounts for 32 percent of the cost of an average ration.

The nutritional composition of wheat makes it in fact desirable as poultry feed. Most poultry farmers have a hammer mill to grind wheat and other grains before combining with other ingredients in a feed mixer.

Soybean Meal

Soybean meal is the main source of protein in the broiler rations. Soybean meal is imported from neighboring countries, mainly Syria and Turkey, though the original raw material reportedly comes from Argentina or Brazil. Starter rations contain up to 30 percent of soybean meal (295 kilos per ton), but the soybean meal content diminishes to only 21 percent (213 kilos per ton) in the finishing ration. Except for domestic wheat, all other ingredients used in poultry feed are imported, including soybean meal, yellow maize, vegetable cooking oil, and high-protein and animal health supplements. There is potential for Iraq to lessen its current dependence on imported feeds by increasing production of maize, soybeans, or sorghum.

Yellow Maize

Few broiler producers use maize in poultry rations because it costs more than wheat, while the nutritional value is roughly comparable. Most yellow maize in the market is imported from overseas through seaports, originating mainly from the United States. Maize is mainly used in starter rations, and on average only accounts for 2.3 percent of weight of an average ration.

Vegetable Oil

Poultry farmers add between 30 to 40 kilograms of vegetable for every ton of poultry ration as a cheap source of energy and to improve the consistency of the ratio. All the vegetable oil used in poultry feed rations is recycled from the household food ration distribution program, cheaply available in the secondary market because many families prefer to sell part or all their oil allowances for cash and purchase better quality cooking oil.

High protein supplement

Small percentages of high-protein pre-mixed supplements are also added to poultry rations. Protein supplements come in 5 percent bags and 2.5 percent bags, meaning that a bag of 50 kilos or 25 kilos can be added per ton of ration. These supplements are commonly referred to as simply “protein” because they contain high concentrations of animal protein derived mainly from fish meal. This animal protein supplement is imported nearly exclusively from the Netherlands and comes in ready-to-mix bags labeled as 5% or 2.5%.

Other supplements

Other ingredients included in the feed ration are vitamins, veterinary supplements, trace minerals and essential amino acids. Only small amounts of these supplements are added per ton of ration, but their high cost represents nearly to 7 percent of the total. A few kilos (five to ten) of ground calcium rock (kils) are also mixed in every ton of poultry rations.

Production Costs

An analysis of production costs is an important component of this survey because it brings together the technical and business factors in poultry production. Costs are generally categorized into:

a) Fixed costs that include land, housing, equipment, infrastructure, and capital;
b) Variable costs that include all direct expenditures needed to produce a batch of chickens including inputs such as day-old-chicks, feed ingredients, wages for laborers, vaccines and veterinary medicines.

Table 10 summarizes the structure of variable costs incurred in broiler production, standardized as dinars per bird sold.

Table 10. Variable costs of broiler production. (dinars per bird sold)					
Governorate	Erbil	Dahuk	Sulaymaniyah	Average	Percent
Day-old-chicks	459	409	469	446	15.2%
Feed ration costs	2,129	1,780	2,017	1,975	67.2%
Vaccines and medicines	213	160	144	172	5.9%
Water and electricity	29	63	35	42	1.4%
Fuel and gas	174	128	159	154	5.2%
Labor wages	79	57	70	69	2.3%
Other variable costs	64	89	87	80	2.7%
Total variable costs	3,147	2,686	2,981	2,938	100.0%

Average production costs per bird sold amounts to 2,938 dinars at the regional level (Erbil, Dahuk and Suleimaniya). The average feed ration cost per bird in the sample farms is estimated at 1,975 dinars or 67.2 percent of total variable costs. Most farmers have feed costs between 1,600 and 2,200 dinars per bird, but one farmer suffered from exceptionally high mortality in the last batch and had feed cost over 3,800 dinars per bird. The purchase of chicks is the second most significant cost factor and represents 15 percent of total variable costs. Taken together, feed and day-old-chick costs add up for over 80 percent of variable costs (82.4 percent).

Beyond the costs of feed rations and chicks, poultry farmers incur many other cost, including labor, vaccines, medicines, water, electricity, and fuel. Their total combined value of these other variable costs represents about 517 dinars per bird, or 17.6 percent of the total variable cost.

Fixed Costs

This survey did not inquire about the fixed costs of the poultry farm operations, for several reasons. First, many of the farms owners were not present during the data collection visit. Response to the questionnaires was mainly obtained from farm managers, who generally have little knowledge about the costs of the installations or the magnitude of capital invested in buildings and facilities, rent, taxes, costs of buildings and equipment, cost of drilling the well, and other overhead costs. Many of the buildings and equipment were acquired many

years ago, often before the managers began work at the farm. Most producers keep minimal records on their operations which makes the estimation of fixed cost items difficult. Some poultry farms are operated by renters of the housing facilities, and they often have no knowledge of the original cost and age of the facilities. Poultry farms may have been sold and bought several times and the transactions prices are not disclosed. Replacement costs could be estimated, but there are at present few new poultry farms being built in the surveyed governorates. Finally, fixed costs are notoriously difficult to allocate per unit of output; broiler farms producing two batches per year would have double fixed cost per bird than an identical farm producing four.

Economic Evaluation

For every poultry farm in the survey sample it is now possible to estimate the margin between the revenue received for birds sold and variable costs estimated above as the sum of feed, chicks, and other variable costs.

Table 11. Margins between income and variable costs

Governorate	Erbil	Dahuk	Sulaymaniyah	Average
Number of farms	68	17	60	145
Age at sale - days	56	49	57	54
Avg. sale weight - kilograms	2.3	2.2	2.4	2.3
Average income - dinars per bird	3,530	3,232	3,982	3,581
Average income - dinars per kilo	1,544	1,469	1,659	1,554
Average cost - dinars per kilo	1,368	1,221	1,242	1,277
Margin over variable costs - dinars/kilo	166	248	417	277

Table 11 compares costs in dinars per kilogram of live weight, because birds are ordinarily sold live and priced accordingly. From Table 11 we can derive several observations.

The average age at sale for broilers in the three governorates is about 54 days and the average live weight at when sold is 2.3 kilograms.

There is an obvious positive relation between weight of bird and the days of age at sale. Dahuk farms sell slightly younger and lighter birds, and Sulaymaniyah sells birds that are slightly older and heavier.

The average price received for chickens sold in the three governorates was 1,554 dinars per kilogram live weight. The lowest price was in Dahuk at 1,469 and the highest in Sulaymaniyah at 1,659 dinars per kilo live weight. These are competitive market prices determined by supply and demand factors, but also influenced by the influx of imported frozen chickens and chicken parts from South America, Europe and the United States.

The average variable cost per kilo of live weight is 1,277 dinars (equivalent to 2,938 dinars for a 2.3 kg bird). Erbil has significantly higher costs – 1,368 dinars – than Dahuk with the lowest costs at 1,221 dinars per kilo live weight, due in part to higher fuel cost in Erbil at the time of the survey.

The average margin or difference between variable costs and the sale price was 277 dinars per kilogram live weight. The highest margins – 417 dinars per kilo -- were obtained by Sulaymaniyah farmers; the lowest margins are those of Erbil farmers at 166 dinars per kilo. From these margins farmers must subtract fixed costs to arrive at estimates of net returns on broiler production.

Margins and Costs

The above margins over variable costs are averages for the survey sample farms in the three governorates. There is however wide variation among individual farms regarding the level of variable costs. For example, farms with high mortality will have significantly higher costs per bird sold, and in many cases their variable costs actually exceed the revenue from chicken sales. More efficient farms, on the other hand, can have margins above the average 277 dinars per kilo live weight.

A strong relationship exists between margins over variable costs that farmers make and the percent mortality of flocks. A regression analysis was done to statistically estimate the strength of this relationship. The regression equations are highly significant but explain only 50 percent and 22 percent of the observed variation in margins over variable costs in Erbil and Sulaymaniyah, respectively. Clearly there is a negative relation: the higher the mortality, the lower the margin over variable costs, and vice versa.

In an effort to find better alternative explanations for the observed margins over variable costs, a regression was run between margins and two explanatory variables at the same time, namely mortality and feed conversion ratios. The multiple correlation coefficients were 0.79 in Erbil and 0.77 in Sulaymaniyah, and the adjusted R-squares were 0.62 in Erbil and 0.57 in Sulaymaniyah, indicating that 57 percent of the variation in margins can be attributed to feed conversion and mortality. Taken together, the coefficient for feed conversion is highly significant and stronger than the coefficient for mortality. A reduction of 0.1 in the feed conversion ratio raises the margin over variable costs by 73 dinars per kilo live weight. A reduction in mortality of one percent increases margins by nearly 4 dinars per kilo live weight.

There is still much variation in margins over variable cost that remains unexplained. While observed values in general follow closely predicted values, in many farms those values are

far from each other. Part of the unexplained variation might be caused by poor recollection from farmers about quantities of food consumed and other cost components.

Conclusions and Recommendations

Poultry meat production plays a significant role in the agricultural economy of the northern Iraq region because it satisfies the needs of the local population for consumption of animal proteins for a healthy diet, as well as for its contribution to the agricultural production and employment. Poultry meat production also substitutes for imports that otherwise require the expenditure of scarce foreign exchange that could be used for more productive purposes such as improving the technology base and raising the productivity of the agricultural sector through the application of modern inputs.

The prospects for future growth of poultry meat production seem favorable. Higher household incomes in the past couple of years have resulted in increasing demand for consumption of animal products and this has favored interest and investment in poultry production. Producers have responded by gradually renovating and increasing their productive capacity as well as adopting improved production techniques and using modern inputs in their operations.

The results from the poultry survey show that there are small but significant differences in the costs of production per kilogram live weight among the three northern governorates. These differences can be seen above in Table 10: Costs are slightly higher in Erbil by 209 dinars per bird (91 dinars per kilo) above average while in Dahuk and Sulaymaniyah costs are 56 and 35 dinars per kilo below the average, respectively. The main difference in costs can be attributed to higher feed and fuel costs in Erbil.

There is a clear relationship between higher mortality rates and lower margins over variable cost, but the relationship was not as strong as expected, probably because other factors also increase production costs. Feed conversion ratios are also major factors responsible for affecting profit margins. Much of the variation observed in margins over variable costs among sample farms can be attributed to the joint effect of higher feed conversion ratios and higher mortality. An increase in 0.1 in the feed conversion ratio reduces the margin by 73 dinars per kilogram live weight; similarly, an increase of 1 percent in mortality leads to a loss of 4 dinars per kilogram live weight. Accurate monitoring of feed consumption and feed conversion ratios can serve as critical indicators of economic performance of poultry farms.

Recommendations

Because poultry meat has become an essential ingredient of the Iraqi diet and a major component of the agricultural sector, it is important to find ways to encourage the growth of this sector to meet the needs of a growing population with higher incomes.

This survey of poultry farms provides basic information about the production process and problems faced by producers. Based on these observations we suggest the following steps to help poultry farmers overcome those problems and raise the productivity of the sector.

- Encourage the establishment of higher hatchery capacity to meet local demand for day-old-chicks.

- Promote the introduction of broiler breeds with higher production potential. Promote more thorough testing of chicks being sold to farmers to guarantee their health status.

- Encourage the development of poultry feed companies to provide high quality feed for broilers. Poorly balanced rations and poor quality of ingredients result in slower growth, higher mortality, and lower conversion ratios. Rations balanced according to well-established nutritional requirements are badly needed.

- Encourage greater use of vaccinations to protect against common poultry diseases to reduce mortality and production risks. Regular visits and supervision by veterinary inspectors are needed, especially in farms that depend on staff with little experience in modern poultry production. Easily accessible diagnostic laboratories to determine cause of death of chickens are badly needed in all three governorates.

- Study why so many slaughter houses stopped operating in the past few years and have not since renewed their operations. Encourage the rehabilitation on a commercial basis of slaughter houses and factories to pack, freeze and store chickens. The absence of these factories results in economic losses to farmers because it forces producers to sell live birds at lower prices or to keep them extra days at higher cost.

- Provide more reliable supply of electricity to farms in order to maintain better climate control in the coops. Encourage producers also to maintain their equipment in better condition or purchase new equipment for environment controls.

- Enforce stricter testing regulations on imported and locally produced products used by poultry farmers like vaccines and medicines, feed ingredients, day-old-chicks, as well as poultry products like frozen chicken meats. Some of these products do not match the label specifications or are past the expiration date for their best use.

- Study the reasons why production costs in some farms or some regions are significantly higher than the average. In those cases where costs are higher identify specific measures to assist farmers in reducing costs or raising productivity.