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BANGLADESH AGRICULTURAL RESEARCH PROJECT PHASE-II

LIVESTOCK AND POULTRY RESEARCH IN BANGLADESH

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BANGLADESH AGRICULTURAL RESEARCH COUNCIL
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by

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LIVESTOCK AND POULTRY IN BANGLADESH

BY

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Bangladesh is one of the most densely populated countries of the world. It is estimated that the population is increasing at the rate of 3%. From the pattern of food imports it is evident that the rate of food production lagged way behind that of the population growth. The economy is completely rural with nearly 85% people living off the land. In terms of nutrition the most important foods available are rice, wheat, pulse, vegetables, oilseeds and fish.

The consumption of animal protein in the form of meat, milk and eggs is completely inadequate. The 1972-74 average per capita per day available animal protein was 6.1 grams, of which 3 grams were from meat, milk and eggs, which represent 49 percent of total animal protein, and 7.4 percent of total protein available. Out of the 3 grams, 1.5 grams were from meat, 0.1 gram from eggs and 1.4 grams from milk*.

When the minimum recommendations of animal protein by UNO is 15 grams per capita per day**, the consumption in Bangladesh is only 6.1 grams. This shortage of animal protein can be responsible for mental retardation in children.

Animal protein is superior to vegetable protein owing to its high co-efficient of digestibility and adequacy of all essential amino acids. Vegetable proteins are labelled as incomplete proteins, which means that they are lacking in one or more of the amino acids which are essential for normal growth, and that they are far less

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* Bangladesh Bureau of Statistics, Ministry of Planning, 1976.

** Food and Nutrition Procedures in times of disaster, FAO, Rome, 1967.

assimable by the human body. For instance, maize proteins are only 53 percent assimable. In comparison, eggs have a net proteins utilization rate of 94 percent, milk 82 percent, and beef 73 percent***.

CATTLE

As stated by Jasiorowski (1972), 70% the world's cattle and buffalo population is in the developing countries, but it yields only 21% of the world's milk production and 34% the world's beef production. This situation not only contributes to the low consumption of animal protein but it also means that the developing countries have to spend a great deal of their national income for importing animal products from the developed countries.

Again, amongst developing countries, the condition of livestock in Bangladesh is probably the worst. The out-turn from the huge number of livestock is miserably low, which is evident from the facts stated below:-

a) A cow on an average weighs only about 200 kgs. and yields only about 1 kg. of milk per day during a lactation period of not more than 8 months. A western cow weighs on an average about 400 kgs. and yields more than 15 kg. of milk per day in 300 days of lactation period.

b) An indigenous heifer matures on an average at the age of 3 years, which is too long and quite expensive to be maintained, but an western heifer matures at the age of less than 2 years.

*** Vandemaele, Fank P., 1977. The role of animal production. World Animal Review, 21.

c) The intercalving period is quite long in Bangladesh cows, and usually not less than 1½ to 2 years in contrast to 1 year in the case of cows of western breeds.

The estimated annual production of cows milk in Bangladesh is approximately 2,000 million pounds. This quantity is far below the normal requirements of the people. The estimated per capita consumption of fluid milk is a little over an ounce as against the normal requirement of 16 ounces per day. It may be calculated that there is a deficiency in production of more than 25,000 million pounds of milk in Bangladesh.

There are more than 20 million cattle in Bangladesh and it has been estimated that they constitute about 90 percent of the animal units of the country. Together with the buffalo, sheep, goats and poultry they are fed to a very large extent on crop residues and by products which would otherwise have little alternative use by humans. Very little land is available for forage production.

Cattle provide almost all of the farm power for the production of the vital food crops of Bangladesh. They are used, along with some of buffaloes, for land preparation ploughing, harrowing, leveling, ditching or weeding, cart hauling, thrashing and turning sugar cane crushers. Bullocks are the most common kind of draft cattle but in recent years there are more cows and young bulls drawing plows. The following table gives the destribution of cattle according to farm size (Groenewold et. al. 1983).

TABLE NO. 1

FARM SIZE AND CATTLE HERD SIZE

Farm size (Ac.)	No. of Holdings ('000)	Average holding size (Ac.)	Average Cattle size 1/ (head)
0 - 0.5	342 (5.5%)	0.3	1.92
0.5 - 1.0	646 (10.3%)	0.7	2.07
1.0 - 2.5	2,122 (33.9%)	1.6	2.62
2.5 - 5.0	1,829 (29.2%)	3.5	3.55
5.0 - 7.5	726 (11.6%)	6.0	4.73
7.5 -10.0	269 (4.3%)	8.5	5.86
10.0 -15.0	204 (3.3%)	11.7	7.08
15.0 -25.0	93 (1.5%)	18.1	9.18
Over 25	23 (0.4%)	32.1	12.67
Total/Average	6,254 (100%)	3.5	3.52

1/ There are about 600,000 additional holdings without land but with an average of 2.42 head of cattle/holding.

Source: FAO/World Bank 1983. Bangladesh Livestock Development Pilot Project No. 60/83 BGD. 37 Rome.

Animals are often of particular importance to the landless families by providing opportunities for both employment and income.

Available studies show that the poorer farmers tend to use cows for draft. Farmers with medium sized holdings (between 3 and 5 ac.) use both bullocks and cows for work. Holdings up to 3 ac. work predominately with cows, but about 40 percent of holdings of this size have no draft animals at all. World Bank estimates indicate that in 1983 only about 70% of the power requirements for land preparation can be met by cattle and buffalo and it appears from this that some of the land preparation on the smallest farms is by the only major alternative human labor. Shortages of sufficient draft power can delay crop planting beyond the optimum time.

The working of cows can be expected to reduce milk yields, shorten lactation and prolong calving intervals. These negative associations could be reduced if the cows received adequate feeds to cover their requirements for maintenance, lactation and work. Unfortunately the small farmers seldom have enough feeds to supply the full needs of the cattle. In spite of this, the poor farmer finds logic in working cows. With small holdings there is a reduced total farm draft requirement. The farmer cannot afford to keep bullocks solely for his limited farm needs. The milk, although reduced in quantity, and the calves cover part of the cost of maintaining his draft stock. One way to reduce the stresses of his situation, is to help him find increased feed resources from better use of crop residues and perhaps from relay forage planting within his cropping system. Cropping systems need to consider animal needs as a part of total crop requirements.

Although all the cattle of Bangladesh are of Bos indicus inheritance, they vary in size and productivity. The largest are the cattle in Pabna district of west central Bangladesh where they graze on a flood plane called the Bathan which is annually seeded to forage crops. These cows have been upgraded with Hariana and

Sahiwal bulls, weigh approximately 220 kg. and yield on the average 600-800 kg. of milk per lactation. The pressure to reclaim more of the Bathan for cereal crop production has resulted in a steady reduction in the acres of Bathan available for grazing:

TABLE NO. 2

Bathan Land in the Pabna Milk Shed

Unit	1978	1979	1980	1981	1982
Acres	7,000	6,250	5,000	4,000	4,000

Leading cattlemen in the district predict that this sharp reduction in grazing land will continue until little Bathan remains.

The heaviest milk receipts at the Baghabarighat, Pabna co-operative milk plant, which serves the Bathan, are in January and February and the lowest are in September and October. During the monsoon many of the Bathan cattle are taken to other areas if rented grazing land is available. Those that remain overgraze the very limited non-flooded areas adjoining the Bathan.

In Noakhali district in southern Bangladesh bordering the Bay of Bangal cows weigh only 125 kg. and their lactation yield does not exceed 200 kg. (Groenewold et. al. 1983).

THE PROGRAM ON CROSS BREEDING BY ARTIFICIAL INSEMINATION

The Savar Central Cattle Breeding Station has followed a program of experimentation based upon the premise that indigenous cattle could be improved by crossing with Holstein Friesian or other European breeds. The experiments have demonstrated that when irrigated improved forage can be provided, the crossbred cattle can perform well. However, under village conditions where only rice straw and limited concentrated supplements were available, even the cattle with one quarter exotic blood had poorer performance than the indigenous cattle. Their genetic potential for growth rate, final weight and milk yield could not be expressed under the feeding systems of the villages. Thus the changes in genotype actually resulted in lower performance levels than those of the local cattle (Groenewold et. al. 1983).

If the government policy of crossbreeding with AI can be supported on the knowledge so far gained, it can only be done under a renewed and expanded commitment to provide improved forage systems under farm conditions. The top priority must be placed on improved nutrition. The DLS has the manpower to continue the AI program but not the organization and infrastructure to carry out the critically needed research on forage production and on improved use of available crop residues and by-products. The proposed BLRI does not have a forage section. Cooperative research between BLRI and BARI on forage production for small farmer is the best possibility for effective research to improve livestock in the short term. Such cooperative efforts may require special consideration and direction from the Ministry of Agriculture.

A second deficiency in the current AI program is its lack of a sire testing or a breed evaluation program at the farm level. To be effective for livestock improvement, the AI program first needs the support of improved nutrition at the farm as just discussed and secondly a breeding evaluation program capable of proving the AI sires are actually of superior genetic potential. This proof is difficult in a

developing country. However objective measurements of birth weights, weight at one year, age at first calving, calving intervals, and milk yields are essential if superior bulls are to be identified and their genetic potential exploited.

Where the use of Friesian blood is continued, it should be limited to selected farms and areas where facilities for the required feeding and management are available. In rural areas the dual purpose zebu breeds like Sahiwal and Hariana may be used in consideration of their proven adaptability to the prevailing hot and humid climate. Wherever AI is used, it should be systematically accompanied by effective programs involving feeding, care, proper management and disease control.

For the AI program to be justified in the long term it will need to be accompanied by adequate cattle nutrition and sire evaluations based on progeny performance at the farm level.

BUFFALOES

In Bangladesh buffaloes are much less important than cattle. Their numbers are much fewer, perhaps 500,000 at present, and their milk is less preferred than cows milk. Their average fertility has been reported as about 50% and lactation yields range from 800 to 1000 kg. Camoens (1976) reported a survey of about 5000 buffalo in Malaysia and the few that were milked produced 327 to 818 kg. FAO (1977) reported that the average Indian desi buffaloes gave 550 to 640 liters per lactation and that in addition the estimated intake by the calf was 140 to 180 liters.

About half of the buffaloes of Bangladesh are on the new aluvial (Char) lands of southern Bangladesh (Groenewold et. al. 1983). Owners keep large herds up to 800 head from which some are rented. These buffalo owners have the objective of using them to their fullest extent on the newly emerged land in the delta area. The remaining half of the buffaloes are in small herds for draft power on small farms and for cart transport.

J.C. Madamba (1985) has suggested a three fold increase in buffalo and a 40 percent decrease in cattle over a 10 year period in Bangladesh. His objectives include the slaughter of inefficient, poorly maintained cattle. The buffaloes because of their larger size have been claimed to be better adapted to single hitch draft. In theory this is more efficient than the commonly used double hitch.

Studies comparing the digestibility of forages by cattle and buffalo are very limited. Camoens (1976) cites the research of R. Grant and W.L. Johnson in the Philippines. Their detailed studies with both species and with forages fed in different forms showed that the digestibility of protein and cell wall were greater for the

buffalo than for the cattle, but the small advantage was not a consistant finding. The advantage of the buffalo over the oxen was seldom over 4 percent. Camoens states, "The absence of consistency for differences favoring the buffalo should caution anyone accustomed to hearing that 'Crude fiber' of the proximate analysis is more digestible by the buffalo than by oxen". When 'Crude fiber' is expressed as the plant structural material, the advantage was found to be nebulous.

Camoens (1976) in striving to find a scientific basis for feeding buffalo concludes that the buffalo, in the absence of data, might have to be fed along the same lines as beef cattle for productive purposes. He thus feels that the nutritive requirements of the two species are similar.

Kassir and associates (1969) compared the feed lot performance of Iraq Genubi cattle with the buffaloes common in Iraq. Males of each species were fed from 264 to 770 lbs. and slaughtered. The efficiency of feed conversion was neither significantly different between the species nor were there significant differences in ratios of meat, fat and bone in 3 rib carcass samples.

Evidence to indicate a significant nutritional advantage of buffaloes over cattle seems to be lacking in reported scientific studies.

GOATS

The approximately 8.5 million goats are widely distributed throughout Bangladesh. Although they serve largely as scavengers, their production of meat is very significant. They are seldom milked. They provide income for village households and serve as source of emergency cash when there is a need.

Loosli (1984) has reported the contribution by goats to milk and meat by countries. Although India is considered to be basically a vegetarian nation, the goat contributes 35% of her meat supply. Jul and Padda (1984) give evidence that there is an increased desire for eating meat in India.

TABLE NO. 3

Goat's Contribution to Milk and Meat.

	% of Total			% of Total	
Country	Milk	Meat	Country	Milk	Meat
Libya	50	36	Turkey	23	16
Iraq	58	12	Greece	26	—
Cyprus	50	14	India	3	35
Morocco	33	16	Brazil	5	2

Little scientific study has been given to goats in Bangladesh. In many countries goats are underrated and blamed for overgrazing, soil deterioration and the destruction of trees and shrubs. If these criticisms are justified in Bangladesh, the correction should be proper management.

The Black Bengal goat of Bangladesh is hardy and naturally accustomed to surviving when exposed to health hazards which could be severe on imported goats. None the less, Bangladeshi goats are like most goats in developing countries, unimproved and unselected

for productivity. These native goats are in estrus without relation to seasons of the year. Many females are said to have two parturitions within 12 months. Twinning is common and triplets occasionally occur.

Base line data on age at first kidding, kidding interval and frequency of twinning among village goats would provide valuable information. The argument that Bengal goats are already good and therefore need not be researched is opinion unsubstantiated by data. "On farm" observations comparing the Bengal goats with some imports or crosses might be helpful in identifying goats with superior meat producing ability. Crosses should be avoided with breeds that would likely require grossly improved nutrition and management for favorable performance. For instance the crossing with high milk producing breeds from temperate climates would be unwise. The Bengal goat might provide a source of some hybrid vigor when crossed with another goat breed that is naturally accustomed to warm humid climates.

Goat carcasses produce a high precentage of lean meat as shown in Table No.4. Small goats such as the Black Bengal goats may be one of the breeds with the very highest proportion of lean. Data should however be collected to establish if this is the case.

TABLE NO. 4

Comparative Slaughter Data of Goats, Lambs and Beef Cattle.

Items	Goats, Age Months			Mature Goats		US Choice	
	4-8	9-14	15-24	Small	Large	Lamb	Steer
Slaughter weight, lb	27	43	65	48	97	105	990
Dressing %	52.1	56.7	57.2	45.5	50.8	50.4	62.0
Carcass							
Lean, %	64.6	64.6	66.2	66.0	57.6	53.6	58.2
Fat, %	6.5	12.0	11.3	15.0	23.4	29.4	25.9
Bone, %	28.9	23.4	22.5	19.0	19.0	17.0	14.7

From Loosli, 1984.

Opinions have been difficult to confirm or deny on the ability of goats to more efficiently consume and digest different plant materials than sheep or cattle. Goats are more selective feeders and they browse more different species than sheep or cattle. They do not exhibit superior performance when only one, or only a few, forage plants are available to them.

The skins of goats in Bangladesh are of superior quality because many are from young animals and they are free from the thorns common in goat skins from arid countries.

POULTRY

The 50 to 60 million chickens and the 12 million ducks in Bangladesh are kept for the most part, as scavengers by rural households. They produce valuable income from the sale of live birds and eggs. Some are consumed in the farm home.

The native chickens weigh about two pounds and lay 40 to 90 eggs per year. A backyard poultry improvement program has been in operation since 1976. It has included cockerel exchanges at the farms using New Hampshire, Rhode Island Red, Black Australop and White Leghorn breeds. The commercial type of broiler and egg production has been introduced but these are not significant developments.

The present duck development program is weak but is receiving some consideration. Due to a shortage of chicken eggs and meat, there is a good demand for the less popular duck eggs and birds. Native ducks are reported to lay about 70 eggs per year. A small start has been made to introduce Khaki Campbel ducklings from Thailand. Ducks scavenge well in the many water places adjacent to the

farms but farmers find the losses from theft can be a problem when ducks wander from their immediate home area. The ducks are claimed to be more disease resistant than the chickens. There is a vaccination program under way for protection against duck plague.

LIVESTOCK AND POULTRY DISEASES

Parasites and diseases cause serious losses in draft power and in the livestock and poultry production. Compounding factors make the control of health problems difficult and they include:

* General low level of nutrition
* Large livestock population
* Warm humid climate
* Congestion of animals during annual flooding
* Difficult communications impede implementing control programs.

The government has estimated that losses due to internal parasites are far greater than losses caused by diseases but both are serious.

TABLE NO. 5

Parasitic Incidence on the Basis of
Fecal Samples in Percent

Parasite	Cattle	Goats
1. Strongyle	80	70
2. Paramphistomes	80	80
3. Fasciola	50	30
4. Ascaris	50	-
5. Strongyloides papillosus	22	35
6. Cestodes	20	30
7. Capillaria	20	20
8. Coccidia	10	6

From Dr. Jainal Abedin - personal communication.

Adequate levels of nutrition would significantly reduce production losses caused by parasites.

The most frequently reported diseases among cattle and buffaloes are anthrax, black quarter and foot and month disease. Newcastle disease, fowl pox, fowl cholera and duck plague are common among poultry.

The Directorate of Livestock Services (DLS) laboratories produce vaccines and serra for control. There is some shortage in capacity of the laboratories to meet all of the needs. However, this is a serious problem due to an inadequate or ineffective system of distribution to the farm level. According to Groenewold et. al. (1983) the government estimates that not more than 5-10 percent of the livestock are actually reached by DLS. The total DLS staff includes 1600 professionals and about 2000 technicians. It has been reported that many of the personnel are primarily at the stations and there is little incentive for them to go out into the villages. Funds are inadequate for program implementation.

The training of more lay personnel for the administration of medications seems advisable. More availability of drugs for control of parasites, better organization and greater incentives for work at the village level appear to be needed. Where there is duplication of efforts and lack of coordination between production technicians and disease control technicians, revisions and strengthening of supervision should be made.

Base line data generated by farming systems research would provide valuable information on the magnitude of the losses from diseases. It could help in the revision and improvement of services provided by DLS.

RESEARCH INSTITUTES/STATIONS AND PROSPECTIVE RESEARCHERS IN BANGLADESH

The national livestock research system of Bangladesh consists of a complex of institutes, centers, services and universities.

A strong institutional base for livestock research is conspicuously non-existant in the country. Whatever infrastructure has been developed in the name of livestock research, under the Directorate of Livestock Service, it includes only a few laboratories for production of vaccines and sera for prevention and control of major infections and contagious diseases. Before 1984 there were three Research Institutes in the Directorate of Livestock Services, namely, Animal Husbandry Research Institute at Comilla, Veterinary Research Institute at Dhaka and Livestock Research Institute at Mohakhali. The Animal Husbandry Research Institute at Comilla consisted of six sections, namely, Biological Product Section, Pathology and Bacteriology Section, Parasitology Section, Animal Genetics Section, Animal Nutrition Section and Animal Husbandry Section.

The Livestock Research Institute at Mohakhali was comprised of 11 Sections:

1. Disease Investigation Section.
2. Foot and Mouth Disease Vaccine Section.
3. Ranikhet Disease Vaccine Section.
4. Fowl Pox Vaccine Section.
5. Duck Plague Vaccine Section.
6. Rabies Vaccine Section.
7. Ecto-Parasitology Section.
8. Endo-Parasitology Section.
9. Animal Nutrition Section.
10. Animal Breeding Section.
11. Public Health Section.

The Veterinary Research Institute at Dhaka was engaged in the production of vaccines against Rinderpest only. The Institute had 3 sub-stations located at Barisal, Chittagong and Rajshahi.

All three institutes were primarily engaged in limited diagnosis of infectious and contagious diseases of livestock and largely with the production of prophylactic vaccines and sera. These institutes gave little effort to research on livestock and poultry production.

In addition to the institutes DLS had a Central Cattle Breeding Station (CCBS) at Savar to conduct research for upgrading local cattle as well as for fodder production.

In 1984 the organizational structure of DLS was revised. The Livestock Research division of Directorate of Livestock Services is now under the Additional Director, Research, Training and Evaluation. The present Livestock Research Division comprises of the following sections.

1. Research Media and Seed Culture
2. Veterinary Public Health (Microbiology and Virology)
3. Pathology
4. Toxicology
5. Endo Parasite
6. Ecto Parasite
7. Biological Products (Freeze Dried Ranikhet Vaccine)
8. Duck Plague Vaccine
9. Foot and Mouth Disease Vaccine
10. Rinderpest Vaccine
11. Haemorrhagic septicemia Vaccine
12. Anthrax Vaccine
13. Black Quarter Vaccine
14. Anti Rabies Vaccine
15. Fowl Pox Vaccine

16. Fowl Cholera Vaccine
17. Quality Control of Vaccine and Drugs
18. Laboratory Animal Rearing
19. Central Disease Investigation
20. Field Disease Investigation Laboratory
21. Animal Nutrition
22. Animal Breeding.

The Bangladesh Agricultural University through the various departments under the Faculties of Animal Husbandry and Veterinary Science conducted a good number of researches in the areas of Animal Production as well as Health with their limited resources. Most of the researches were meant for partial fulfilment of graduate studies and obviously of academic nature.

The proposed Bangladesh Livestock Research Institute (BLRI) is supposed to work as a Livestock Research Institute at the National Level. If adequate fund and facilities are provided, both the faculties of Animal Husbandry and Veterinary Science in the Bangladesh Agricultural University may be able to share the responsibilities of conducting researches at the national level on the basis of priorities in collaboration with the BLRI. The existing facilities at Baghabarighat for conducting researches on livestock production and disease investigation may be utilised.

THE SERIOUS IMBALANCE BETWEEN CROP AND LIVESTOCK RESEARCH IN BANGLADESH

F.A.O. (1979) has listed Bangladesh among the low income countries, among those least developed and among countries with a low level of past growth rate of agricultural production (below 2%).

Rice is the major crop and its production traditionally requires heavy inputs from draft animals for plowing, tilling, thrashing and

transport. This will continue to be the case in Bangladesh.

Jahnke and Kirschka (1983) in analyzing the quantitative indicators for priorities in international research state, "Cereal production has a high power demand, using more than half of all available labor, draft animals and tractors". In Bangladesh gross observation would suggest that the input from animal draft in all cereal production is very substantial.

As discussed earlier, livestock and poultry contribute substantially to the nutrition and well being of the people of the country. However the portion of the agricultural research effort directed toward improving the livestock and poultry appears to have been pitifully small.

As shown in Table No. 6, Bangladesh Animal Husbandmen made up only 3.2 percent of the agricultural research scientists of the country. This is not only the lowest percentage among developing

TABLE NO. 6

Research scientists in selected developing countries by sector of agriculture [a], in percent of total number of agricultural research scientists.

	Year	Crops	Animal husbandry	Forestry	Fisheries	Other sectors
Asia						
Bangladesh	1977/78	79.9	3.2	8.1	1.8	7.0
Indonesia	1974	66.3	11.1	11.7	10.9	-
	1979	54.6	8.0	10.1	9.7	17.6
Malaysia	1980	60.5	13.0	-	1.5	25.1
Nepal	1980	75.9	6.8	14.4	2.7	-
Pakistan	1977/78	81.9	13.7	2.9	1.5	-
Philippines	1974	37.0	10.0	10.0	6.0	37.0
	1978	45.0	7.0	13.0	9.0	26.0
Thailand	1974	69.6	12.2	12.8	5.4	-
	1979	86.5	8.9	0.9	3.7	-

a) According to a study by IFPRI and ISNAR

Source: IFPRI/ISNAR, Resource Allocations to National Agricultural Research: Trends in the 1970s, prepared by P.H. Oram and V. Buidlish, Washington and The Hague 1981.

countries in Asia but also is less than half of the percentage in Philippines and Thailand, which are the two other Asian countries with the smallest percentage of agricultural research effort devoted to Animal Husbandry.

The serious imbalance in the agricultural research effort between livestock and crops may soon constitute a constraint on crop production. Jabbar and Green (1983) have found that more cows are pulling plows due to the reduced number of bullocks. This indicates less available draft power and suggests an accompanying reduction in the milk and meat produced.

As discussed elsewhere, the contributions of livestock to the agricultural production are made at the farm level in an inter-related farming system composed of the farm family with its needs, the crop and the livestock contributions.

Good livestock and poultry research should be expanded to provide additional technology for farmers to produce more products. When the technology is developed and introduced through farming systems research, authorities generally agree that new practices will be adopted. Agriculture production will be enhanced.

ACCEPTANCE OF RESEARCH RESULTS

Frequently the blame for poor crop and livestock production has been given as failure to adopt the already proven technical practices. Failures in acceptance of "improved technology" have been almost universal with livestock projects in developing countries Evenson and Kislev (1975). They noted that "programs designed to transport 'modern technology' continuously come up against the realization that the technology offered had little or no advantage over the old

traditional methods, given the economic, soil and climatic conditions facing producers".

All seem to agree that the livestock and poultry of Bangladesh are poor producers because of inadecuate nutrition, diseases, parasites and possibly some shortage of superior hereditary traits. However the specific identification of the livestock problems and the production constraints, together with effective ways to eleviate the constraints, must come through adequate farming systems research.

Short term studies are incapable of the specific identification of the livestock and poultry problems facing the small farmers or in providing solutions.

The Farming Systems Research must consider the farm and family as a single socio-economic unit. The necessary base line studies must be adequate for subsequent research planning designed to help the farmer live better through improved crop and livestock production.

Farm practices which provide for more income or an improved quality of life are those that will be accepted. Only by farm family acceptance can the agricultural technology improve the national agricultural production.

In the development of Farming System Research, scientists must learn some things from farmers. Farmer inputs will be needed in research planning, "on farm" testing and demonstrations.

CONSTRAINTS TO LIVESTOCK AND POULTRY RESEARCH

1. The absence of a well defined national research policy on livestock and poultry is a constraint. The present research is conducted at the Bangladesh Agricultural University (BAU) and under selected divisions of the

Directorate of Livestock Services (DLS).

The research at BAU is primarily conducted as part of the degree requirements of graduate students. The research done by DLS has, for the most part, has been initialed by foreign specialist teams. The Central Cattle Breeding Farm at Savar and the nutrition research with its diagnostic disease laboratory at Baghabarighat were each developed by foreign specialists now departed. With severly reduced research personel and financial support these research efforts have been sharply diminished.

The expected Bangladesh Livestock Research Institute (BLRI) should provide opportunities for new thrusts in research. It will be under the Fisheries and Livestock Division of the Ministry of Agriculture. It is significant in administrative organization that the crop research, including research on forages, falls under the Agriculture and Forest Division of the Ministry of Agriculture which in turn administers BAU and the Bangladesh Agricultural Research Council (BARC). administrative organizational structure thus results in a wide separation between crop and fodder production research and livestock research. Recommendations regarding the wide administrative separation of crop and livestock research include the implementation of cooperative projects with joint funding. Support and direction from the Ministry of Agriculture will be needed for implementation of jointly sponsored research by BARI and BLRI.

2. A second constraint is the shortage of trained scientists available and working on livestock and poultry research. Bangladesh has the most severe imbalance between crop scientists and animal scientists of any Asian Country. Animal scientists are four fold less in percentage of effort than those in

Indonesia, Malaysia, Nepal, Pakistan, the Philippines and Thailand.

DLS has two Ph.D. and 12 M.Sc. BAU has (including those in Veterinary Science) 23 Ph.D. and 103 M.Sc. but most at BAU are heavily committed to teaching and, as mentioned, their research is largely limited to graduate student theses.

3. The present limited funds for research, both at BAU and DLS, largely precludes an expansion of livestock research. The expected World Bank funding for BLRI will open new possibilities for new and expanded projects.

4. The crop research has enjoyed very high priorities to cover the overall agricultural research needs. This has been justified. However, the high crop research priority has been accompanied with very little consideration for the need of research on feed and forage production, on crop residues and on the many nutritional, breeding, and management problems of livestock.

5. There has been only a very small amount of research designed to improve animal draft power. This results from lack of funds and lack of appreciation of the seriousness of the need for improvements in animal draft. There is evidence that seasonal shortages in draft becomes a constraint on cereal production.

6. The lack of comprehensive data on livestock inputs within Integrated Farming System Research (IFSR) is a constraint on responsible research planning and implementation. This is a very serious constraint on the final acceptence of research results by farm families.

7. The programs under DLS for providing effective health care at the village level have been reported as very inadequate. The extension service is without livestock and poultry programs. When research is considered in its broad aspect, including the application of proven technologies, the inadequate field and extension services are constraints on reaching research objectives.

8. Interviews with professionals actively engaged in research suggested that research supervision was, on occasion, inadequate because of the assignment of incapable supervisors.

9. Research personnel receive advances in position and salary largely through time in service. The absence of provisions for advancements and rewards based upon research performance constitutes a significant research constraint.

RECOMMENDATIONS

Short-term research priorities

1. Collection and analysis of comprehensive livestock data under Integrated Farming Systems Research (IFSR) and the national livestock resource survey by BLRI.

2. Expansion of research on forage production and crop residue treatments that will be applicable under farm conditions.

3. Review and re-evaluate the policy on cattle crossbreeding and artificial insemination (AI).

   a. Evidence is convincing that attempts to introduce exotic blood for improvements in production have failed at the village level.

   b. Continued use of Friesian sires seems only justified when adequate nutrition and management can be economically provided.

   c. The increased use of Hariana and Sahiwal bulls seems advisable.

   d. The lack of any A.I. sire evaluation program is a serious deficiency. DLS personnel may be able to organize a plan where some dam daughter comparisons of production can be made. Without some form of sire evaluation, much of the advantage of A.I. is lost.

4. Formulate comprehensive research plans for the long-term.

Long-term research priorities

1. Revise and extend IFSR

   a. Fully characterize the livestock and poultry contributions within the crop-livestock components of the family farm system.

   b. Special analysis of draft power through IFSR.

2. Complete analysis of livestock resource survey by BLRI.

3. Establish joint, cooperative research on forage and feed production between BARI and BLRI.

   a. Provide for joint funding and cooperative projects.

   b. Develop systems for combined forage and cereal crop production.

4. Strengthen research on forage production and crop residue treatments at BAU.

   a. Provide increased funds.

   b. Study methods for acceptable applications of research at farm level.

5. Establish research for improvements in the use of draft animals.

First phase:

   a. Study the overall efficiency of buffaloes vs. bullocks in different areas of Bangladesh.

   b. Devise improved designs of yolks, hitches and animal drawn implements.

Second phase:

a. Study the relationships between levels of feeding and draft performance.

b. Determine the influence of draft on cows.

(i) Under optimum levels of feeding

(ii) Under feeding at the levels commonly used.

6. Develop a more effective program for providing medication to control internal parasites.

a. Determine costs and secure funding.

b. Implement an improved plan for the administration of the drugs at the village level.

(i) Trained lay personnel.

(ii) Extension personnel.

c. Provide for periodic evaluation of program and rejustification of expenditures where positive results are experienced.

7. Conduct studies to provide base line, comprehensive data on the production performance of the Bengal goat.

a. Determine through IFSR the contributions now made by goats to the income and quality of life of the rural families. Include information on goats owned by landless families if this can be included in the IFSR research.

b. Develop research designed to improve goat production under village conditions.

8. Evaluate, expand and improve the government sponsored breeding programs for chickens and ducks.

   a. The present program of cockerel exchange is based on sound principles but it appears to have been sporadic.

   b. The continued use of Black Australop Mates seems difficult to justify.

   c. Expansion of the distribution of males from improved duck breeds seems desirable.

9. Establish a research program on improved breeding and management for village or "back yard" poultry.

   a. Analized data from IFSR should suggest the character and extent of the research.

   b. Landless owners of poultry should be included in this portion of IFSR if possible.

   c. The faculty and graduate students at BAU, assisted by adequate funding, could conduct expanded research on "back yard" poultry production helpful to small farmers in many countries.

   d. DLS and the Extension Service are a potential resource for the implementation of recommended practices.

REFERENCES

1984. National Agricultural Research Plan 1984-1989. Bangladesh Agricultural Research Council, Dhaka-15, Bangladesh.

Camoens, J.K. 1976. The Baffaloes in Malaysia. Ministry of Agriculture, Malaysia. Bul. No. 145.

Evenson, R.E. and Y. Kislev, 1975. Agricultural Research and Productivity. Yale University Press.

F.A.O. 1977. The Water Buffalo. Animal Production Health Services No. 4. Rome.

F.A.O. 1979. "Agriculture: Toward 2000" FAO Conference Document C 79/24. Rome.

Groenewold, H.H., T. Lohavisaavpanich, P. Clark and F. Dolberg, 1983. Bangladesh Livestock Development Pilot Project. FAO/World Bank Co-operative Program Rept. No. 60/83 BGD. 37. Rome.

Gosh, J.C. The History of Milking Cows of the Bathan Area of Pabna District, 1981. Bangladesh Agricultural University, Mymensingh.

Jahnke, Hans E. and Dieter Kirschke, 1983. Quantitative Indicators for Priorities in International Agricultural Research. FAO.

Jabbar, M.A. and D.A.C. Green, 1983. The Status and Potential of Livestock within the Context of Agricultural Development Policy in Bangladesh. Department of Agricultural Economics. The University College of Wales.

Jasiorowski, H.A., 1972. FAO activities in Livestock Development. World Animal Review, 1.

Jul, M. and G.S. Padda, 1984. Meat production in India: The potential of buffalo beef. World Animal Review No. 50 p.29.

Kassir, M.S., D.G. McFetridge and N.G. Hansen, 1969. Studies on the growth, feed costs and carcass composition of young. male cattle and buffalo fed under comparable conditions. Tech. Rept. No. 21, FAO - Govt. of Iraq. Baghdad, Iraq.

Loosli J.K. 1984. Role in meeting the world food supplies. Extension Goat Handbook. U.S.D.A. Washington, D.C.

Madamba, J.C. 1985. Employment in the Livestock sector, Chapter III (draft). ADB/GOB Framework Studies for the Third Five Year Plan.

APPENDIX I

TERMS OF REFERENCE

Dr. George H. Wellington
Livestock Research Consultant

1. Assessment of present status of livestock and poultry production in the country.

2. Identification and characterization of major researchable constraints in livestock and poultry production and utilization.

3. Preparation and recommendation of short-term and long-term research priorities and programs for livestock and poultry.

4. Identification of research institutes/stations and prospective researchers for undertaking short-term and long-term research programs.

5. Conduct a 2-day group discussion of livestock scientists on research priorities in livestock and poultry.

APPENDIX II

EFFICIENCY OF ANIMALS IN DRAFT TEAMS

Goe and Mc Dowell (1980) summarized the advantage of fewer draft animals in hitches as follows:

Efficiency of Animals in Teams

Animals hitched as a team incur a loss of energetic efficiency which is relative to the tractive effort of a single animal (Marks', 1951; FAO, 1972). This loss amounts to 7.5% for two, 15% for three, 22% for four 30% for five, and 37% for six animals. For example, if one animal weighing 450 kg. was able to generate a tractive effort equal to 10% its weight(45 kg.), a pair of the same strength could be expected to develop a total tractive effort of 83 kg. Total tractive pull increases as more animals are hitched together, but tractive pull per animal decreases. Trials conducted in West Africa (FAO, 1971) showed that a pair of 1/2 Brahma oxen generated approximately twice the tractive pull per animal as compared to the two and three pairs of Madagascar Zebu bullocks.

Tractive effort produced by pairs of animals

Type of animals	Pair(s)	Weight (kg)	Average effort (kg)	Maximum effort (kg)	Tractive pull per animal (kg.) Average	Maximum
1/2 Brahma oxen	1	1060	147	310	74	155
Madagascar Zebu bullocks	2	1300	160	400	40	100
"	3	1945	200	435	33	73

Source: Adapted from FAO (1972).

APPENDIX II(Cont.)

Goe, M.R. and R.E. McDowell, 1980. Animal Traction: Guidelines for Utilization. Cornell Inter. Agr. Memo. 81. Dept. Anim. Sci, Cornell University, Ithaca., N.Y.

FAO, 1971. Tillage and Seeding Practices and Machines for Crop Production in Semi-Arid Areas. Agricultural Development Paper No. 92. FAO, Rome; Italy.

Marks', S.L., 1951. Mechanical Engineers' Handbook, 5th Ed. Mc Graw - Hill Book Co. Inc. N.Y.

APPENDIX III

SCIENTIFIC MANPOWER

The National Agricultural Research Plan 1984-1989* published in 1984 lists the scientific manpower in the research centers in Bangladesh. Scientists with Ph.D. training in Poultry and Livestock are given at 25 and those with Ph.D. degrees in crops total 118. Scientists with M.Sc. degrees are 474 and 103 and those with B.Sc are shown as 123 and 43 respectively between crops and poultry or livestock. Thus the ratio between scientists in livestock and in crops is 1:4.7; 1:4.6; and 1:2.9 for those with the Ph.D. the M.S. and the B.Sc degrees respectively.

Scientific Manpower at Research Centers

	Number			Ratio Livestock & poultry: Crops		
	Ph.D.	MS.	B.Sc	Ph.D.	MS.	B.Sc.
Crops	118	474	123			
Livestock & Poultry	25	103	43	1:4.7	1:4.6	1:2.9

* Bangladesh Agricultural Research Council, Dhaka.

APPENDIX IV

SEASONAL MILK PRODUCTION IN BAGHABARIGHAT MILK SHED OF THE BANGLADESH MILK PRODUCERS' COOPERATIVE UNION LTD., PABNA.

The heavy milk receipts start in December and peak during January and February. The lowest production comes in September, October and November. According to Ghosh (1981) the best cows produce 20 liters a day at peak lactation with a total lactation yield of as much as 3000 liters (6600 lbs.). Exotic bulls have been imported to the region starting with Sahiwal in 1971. Around 1935-36 Hariana bulls were introduced. This was followed by importations of Shiwal and Sindhi in 1961 from West Pakistan (Gosh 1981). In 1975-76 the Directorate of Livestock Services distributed a few cross-bred bulls (Friesian and Jersey crosses with local stock).

APPENDIX V

DRAFT AND SIZE OF ANIMAL

Goe and McDowell (1980) have explaind that, "In proportion to body weight, small animals can pull or carry greater loads than large animals; yet draft capabilities of animals are largely dependent on body weight, i.e., two animals, each one having the muscular power to utilize its entire weight, the heavier will exert the larger draft (King, 1907). To compare the energenic efficiency between different size animals requires consideration of the total work accomplished. In terms of hp produced, small animals are able to develop a greater gross efficiency than large animals since decreasing the weight of an animal increase the value of the ratio.

$$\frac{\text{hp}}{\text{Weight of animal}}$$

and therefore increases the efficiency. (Proctor et. al. 1934). This merely demonstrates that for a large animal to perform work as efficiently as a small animal, it must do twice the work of the latter. The work done must vary in direct proportion with animal size for efficiency to remain constant. When animals are resting, a large animal consumes more feed than a small one, so animals are able to work with equal efficiency, the feed cost of upkeep of a larger animal is greater".

Goe, M.R. and R.E.McDowell, 1980. Animal Traction: Guidelines for utilization. Cornell Inter. Agr. Mimeo. 81, Department of Animal Science, Cornell University, Ithaca, N.Y.

King, F.H. 1907. Physics of Agriculture. Fourth Ed. By author. Madison, Wisc.

Proctor R.D., S. Brody, M.M. Jones and D.W. Chittenden, 1934. Growth and development XXXIII: Efficiency of work in horses of different ages and body weights. Missouri Exp. Sta. Res. Bull. 209.

APPENDIX VI

INVENTORY OF PERSONNEL WITH RESEARCH QUALIFICATIONS

A. Bangladesh Agricultural University, Mymensingh

I. Faculty of Animal Husbandry

a) Department of Poultry Science:

i. Prof. M.A. Latif, M.S., Ph.D. (Texas A&M)

ii. Dr. S.M. Balbul, M.S. (Texas A&M), Ph.D. (British Columbia)

iii. Mr. M.A. Wahid, M.S. (Texas A&M)

iv. Dr. Shafiuddin Ahmed, Ph.D. (Czech)

v. Dr. M.A. Hamid, M.Sc. (A.H.), Ph.D. (BRNO)

vi. Mr. Md. Abdur Rahman, M.Sc. (A.H.)

vii. Mr. Md. Ashraf Ali, M.Sc. (A.H.)

viii. Mr. S.D. Chowdhury, M.Sc. (A.H.)

ix. Mr. A. Rahman Howlider, M.Sc. (A.H.)

b) Department of Dairy Science

i. Mr. A.K.M. Abdul Mannan, M.S. (Texas A&M)

ii. Mr. Nozmul Hassan, M.Sc. (A.H.)

iii. Mr. S.M. Imam Hussain, M.Sc. (A.H.)

iv. Dr. Abdul Wadud, M.Sc. (A.H.), Ph.D. (Rumania)

v. Mr. Abdus Samad Khan, M.Sc. (A.H.)

vi. Dr. M. Mokhtaruzzaman, M.Sc. (A.H.), Ph.D. (USSR)

vii. Mr. M. Nurul Islam, M.Sc. (A.H.)

c) Department of Animal Breeding & Genetics

i. Prof. M.A. Hasnath, M.Ag. (Dhaka), M.S., Ph.D. (Texas A&M)

ii. Mr. Kh. Golam Mostafa, M.Sc. A.H. (BAU), M. Phil. (UK)

iii. Mr. Ahmed Ali, M.Sc. A.H. (BAU), M.S. (Canada)

iv. Mr. Sk. Zinat Ali, M.Sc. A.H. (BAU)

v. Mr. Syed Sakhawat Hussain, M.Sc. A.H. (BAU)

vi. Mr. Md. Omar Faruque, M.Sc. A.H. (BAU)

vii. Mr. A.K. Fazlul Haque, M.Sc. A.H. (BAU)

viii. Mr. Abdul Majid, M.Sc. A.H. (BAU)

d) Department of Animal Nutrition

i. Dr. A.M.M. Tareque, Ph.D. (Czech)

ii. Mr. Md. Abedur Reza, M.Sc. A.H. (BAU)

iii. Mr. Muzharul Islam, M.Sc. A.H. (BAU)

iv. Dr. Md. Ali Akbar, M.Sc. A.H. (BAU), Ph.D. (U.K.)

v. Mr. Jasimuddin Khan, M.Sc. A.H. (BAU)

vi. Mr. Zahirul Haque Talukder, M.Sc. A.H. (BAU)

e) Department of General Animal Science

i. Dr. M. Sadullah, M.Sc. A.H. (BAU), Ph.D. (Denmark)

ii. Mr. Abdul Huq, M.Sc. A.H. (BAU)

iii. Mr. Dulal Ranjan Dey Sarker, M.Sc. A.H. (BAU)

iv. Mr. M. Abdus Samad, M.Sc. A.H. (BAU)

v. Mr. Raisul Alam, M.Sc. A.H. (BAU)

vi. Mr. Md. Shahiduzzaman, M.Sc. A.H. (BAU)

vii. Mr. Mujaffar Hossain, M.Sc. A.H. (BAU)

II. Faculty of Veterinary Science

a) Department of Anatomy and Histology

i. Dr. Md. Ismail, M.Sc. Vet. Sci. (BAU), Ph.D. (Australia)

ii. Mr. Md. Shahjahan, M.Sc. Vet. Sci. (BAU)

iii. Mr. Md. Abdul Bari Khan, M.Sc. Vet. Sci. (BAU)

iv. Mr. Md. Khairul Anam, M.Sc. Vet. Sci. (BAU)

v. Mr. Md. Abdul Kashem, M.Sc. Vet. Sci. (BAU)

vi. Mr. A.K.M. Abdul Quddus Miah, M.Sc. Vet. Sci. (BAU)

vii. Mr. Md. Asaduzzaman, M.Sc. Vet. Sci. (BAU)

viii. Mr. Mohiuddin Ahmed, M.Sc. Vet. Sci. (BAU)

ix. Mr. Nozrul Islam, M.Sc. Vet. Sci. (BAU)

b) Department of Physiology and Pharmacology

i. Mr. Md. Anwarul Islam Khan, M.S. (Texas A&M)

ii. Dr. Kamrul Hassan, Ph.D. (USSR)

iii. Mr. Abdus Sobhan, M.Sc. Vet. Sci. (BAU)

iv. Mr. A.S.K. Emdad Hossain, M.Sc. Vet. Sci. (BAU)

v. Dr. Fozlur Rahman, M.Sc. Vet. Sci. (BAU), Ph.D. (Turkey)

vi. Mr. Md. Momtazur Rahman, M.Sc. Vet. Sci. (BAU)

vii. Mr. Md. Moinuddin, M.Sc. Vet. Sci. (BAU)

viii. Mr. Md. Abdul Awal, M.Sc. Vet. Sci. (BAU)

ix. Mr. Md. Shahidullah, M.Sc. Vet. Sci. (BAU)

x. Mr. Md. Mustafa, M.Sc. Vet. Sci. (BAU)

c) Department of Madicine and Surgery

i. Mr. Abdur Rahman, D.V.M., M.S. (Texas A&M)

ii. Mr. Mir Ashraf Ali, M.Sc. (Vet. Sci.)

iii. Mr. Monoj Mohon Sen, M.Sc. (Vet. Sci.)

iv. Dr. Kh. Serajul Islam, M.Sc. (Vet. Sci.), Ph.D. (Queensland)

v. Mr. Md. Nuruddin, M.Sc. (Vet. Sci.)

vi. Mr. Md. Akhter Hussain, M.Sc. (Vet. Sci.)

vii. Dr. Mojahed Uddin Ahmed, M.Sc. (Vet. Sci.)

viii. Mr. Abdus Samad, M.Sc. (Vet. Sci.)

ix. Mr. Md. Golam Shahi Alam, M.Sc. (Vet. Sci.)

d) Department of Parasitology

i. Prof. Sk. Hefazuddin, M.S., Ph.D. (Texas A&M)

ii. Mr. A.N.M. Abdul Quader, M.S. (Texas A&M)

iii. Mr. Md. Mozammel Haque, M.S. (Texas A&M)

iv. Dr. M. Shamsul Islam, M.Sc. (Vet. Sci.), Ph.D. (USSR)

v. Mr. Shamsul Haque, M.S. (Texas A&M)

vi. Dr. Md. Hafezur Rahman, M.Sc. (Vet. Sci.), Ph.D. (

vii. Mr. Md. Motaher Hussain Mondal, M.Sc. (Vet. Sci.)

viii. Mr. Md. Zahurul Karim, M.Sc. (Vet. Sci.)

e) Department of Pathology

i. Prof. Manik Lal Dewan, M.S. (Texas A&M), Ph.D. (USSR)

ii. Mr. Mosleh Uddin, M.Sc. (Vet. Sci.)

iii. Mr. Md. Abdul Baki, M.Sc. (Vet. Sci.)

iv. Mr. Md. Habibur Rahman, M.Sc. (Vet. Sci.)

v. Mr. Md. Iqbal Hussain, M.Sc. (Vet. Sci.)

vi. Mr. Priya Mohon Das, M.Sc. (Vet. Sci.)

vii. Mr. A.S.M. Mahfuzul Bari, M.Sc. (Vet. Sci.)

viii. Mr. Md. Rafiqul Islam, M.Sc. (Vet. Sci.)

f) Department of Public Health and Microbiology

i. Prof. T.I.M. Fazle Rabbi, M.S., Ph.D. (Texas A&M)

ii. Mr. Abdul Jalil Sirker, M.S. (Texas A&M)

iii. Dr. A.Y.M. Arwarul Haque, M.S., Ph.D. (Texas A&M)

iv. Mr. M. Razzak Ali, M.S. (Texas A&M)

v. Dr. Md. Munsurul Amin, M.Sc. (Vet. Sci.), Ph.D.

vi. Dr. Mofizur Rahman, M.Sc. (Vet. Sci.), Dr. Med. Vet. (W. Germany)

vii. Mr. Md. Anwarul Haque, M.Sc. (Vet. Sci.),

viii. Mr. Md. Ataur Rahman, M.Sc. (Vet. Sci.)

ix. Mr. Khair Ahmed Chowdhury, M.Sc. (Vet. Sci.)

x. Mr. W.I.M. Afzal Hussain, M.Sc. (Vet. Sci.)

xi. Mr. Md. Mustafizur Rahman, M.Sc. (Vet. Sci.)

xii. Mr. Md. Shafiqul Islam Chowdhury, M.Sc. (Vet. Sci.)

B. Directorate of Livestock Services

I. Ph.D. degree holders

1. Dr. Md. Hossain, Principal Scientific Officer, Duck Plague Vaccine Sec. Mohakhali, Dhaka

2. Dr. Md. Afzal Hossain Miah, Principal Scientific Officer, Central Disease Investigation Lab. Mohakhali, Dhaka

II. M.Sc. degree holders*

1. Mr. Mirza A. Jalil, Director, ELRI

2. Mr. A.K. Naziruddin, Addl. Director (Admn.), DLS

3. Mr. Sk. Nur Mahtab, M.Sc. (Genl.), Chief, Planning & Evaluation Cell

4. Mr. Idris Ali, Technical Officer, Project Implementation Office, DLS

5. Mr. Ziauddin Ahmed, Dy. Director, A.I. Savar Dairy Farm, Savar, Dhaka

6. Mr. Sultan Mohiuddin, Principal Scientific Officer (PSO), Vety. Public Health, Mohakhali, Dhaka

7. Mr. Nazrul Hossain, P.S.O. Ranikhet Vaccine Sec. Mohakhali, Dhaka

8. Mr. M.A. Halim, P.S.O., Quality Control Sec. Mohakhali, Dhaka

9. Mr. B.K. Mitra, Dy. Director, L.S. Dhaka Division

10. Mr. Golam Mustafa, P.S.O. Animal Nutrition Sec. Mohakhali, Dhaka

11. Mr. Samrendra Sarker, Asstt. Director, Poultry Farm, Comilla

12. Mr. A. Latif, Dist. Livestock Officer, Khulna

13. Mr. L.R. Siddiqui, Assitt. Director, (H.Qr.), DLS

14. Mr. M.S. Zaman, Asstt. Director, Central Poultry Farm, Mirpur, Dhaka

15. Mr. Md. Mahbubur Rahman, Asstt. Director, Central Poultry Farm, Mirpur, Dhaka

16. Mr. Syed Abdul Kader, Asstt. Director, Cattle Farm, Sylhet

17. Mr. Md. Awlad Hossain, Senior Scientific Officer, Toxicology Sec. Mohakhali, Dhaka

18. Mr. Monjurul Haque, Asstt. Director, Stores & Equipment, 48, Kazi Alauddin Road, Dhaka

19. Mr. Md. Zainul Abedin, SSO, Vety. Public Health, Mohakhali, Dhaka

20. Mr. Serajuddin Ahmed, D.L.O. Bagerhat

21. Mr. Gazi Jamaluddin, D.L.O. Bhola

22. Mr. Safiuddin Ahmed Chowdhury, D.L.O. Nawabgonj

23. Mr. M.A. Salam, Asstt. Director, Poultry Farm, Narayangonj

24. Mr. Fariuddin, Scientific Officer, Pathology Sec. Mohakhali, Dhaka

25. Mr. Santosh Kumar Nath, Manager, Govt. Poultry Farm, Kishoreganj

26. Mr. Qasem Ali Akond, Scientific Officer, Mohakhali, Dhaka

27. Mr. M.A. Bari, Manager, Poultry Farm, Chuadanga

28. Mr. Md. A. Hashem, Scientific Officer, A.I. Res. Savar Dairy Farm

29. Mr. Rezaul Karim, Scientific Officer, FMD Sec. Mohakhali, Dhaka

30. Mr. Anwarul Azim, Poultry Dev. Officer

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33. Mr. A.K.M. Mashrul Haque, Asstt. Professor, Vety. Training Institute, Mymensingh

34. Mr. Afiluddin Mollah, Scientific Officer, Voto Parasite, Mohakhali

35. Mr. Ramjan Ali, Scientific Officer, Animal Husbandry Res. Inst. Comilla

36. Mr. A. Razzak, Scientific Officer, Animal Husbandry Res. Inst. Comilla

37. Mr. Ramjan Ali, Lecturer, Vety. Training Inst. Mymensingh

38. Mr. Altaf Ali, Scientific Officer, A.I. Centre, Rajshahi

39. Mr. Giasuddin, Poultry Dev. Officer, Tejgaon Poultry Farm

40. Mr. Abul Monsur Moinuddin, Scientific Officer, Savar Dairy Farm

41. Mr. Md. Quddus, Poultry Dev. Officer, Poultry Farm, Madaripur

42. Mr. M.K. Khan, Scientific Officer, Savar Dairy Farm

43. Mr. Md. Ali Imam, Poultry Dev. Officer, Poultry Farm, Barisal

44. Mr. Meshbauddin Ahmed, U.L.O

45. Mr. Ibrahim Khalil, U.L.O.

46. Mr. Md. Kutubuddin, S.O. Disease Investigation Sec. Mohakhali, Dhaka

47. Mr. Md. Zahrul Haque, Zoo Officer, Dhaka Zoological Garden, Mirpur

48. Mr. A. Gaffur. U.L.O. Kuliar Char, Sylhet

49. Mr. Sunil Chandra Pramanik, U.L.O. Faridpur, Pabna

50. Mr. Abul Hossain Miah, U.L.O.

51. Mr. Mujibur Rahman, S.O. Animal Nutrition Section, Mohakhali

52. Mr. Md. Kakubuddin, U.L.O. Kushtia Sadar

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56. Mr. Md. Akkas Ali, U.L.O. Shawarankhola, Kushtia

57. Mr. Joytirmoy Shah, U.L.O. Kumar Khali, Kushtia

58. Mr. Kallan Kumar Pandit, S.O. Disease Investigation Sec. Mohakhali

59. Mr. Md. Shafiqul Islam, S.O. Rabies Vaccine Sec. Mohakhali Dhaka

60. Mr. Md. Nurul Islam, U.L.O. Belabo, Narsingdi

61. Mr. Bhabesh Chandra Ray, P.D.O. Mirpur Poultry Farm, Dhaka

62. Mr. Mahbubur Rahman, U.L.O. Jamalgonj, Sylhet

63. Mr. Farook Miah Sarker, U.L.O. Jamalgonj, Sylhet

64. Mr. Mahfuzul Haque, S.O. Ranikhet Disease Section, Mohakhali, Dhaka

65. Mr. Aminul Islam, S.O. Vety. Public Health, Mohakhali, Dhaka

66. Mr. Hitish Chandra Dev. Nath, S.O. Vety. Public Health, Mohakhali

67. Mr. A.F.M. Shahidullah, U.L.O. Tangail Sadar

68. Mr. Habibur Rahman, Manager, Poultry Farm, Pabna

69. Mr. Kazi Kamar Uddin, S.O. Vety. Public Health

70. Mr. Abul Mortuza Chowdhury, S.O. Quality Control Sec. Mohakhali

71. Mr. Nazrul Islam Pathan, V.A.S. Central Vety. Hospital, Dhaka

72. Mr. Guranga Ray, L.O. Animal Feeds & Fodder, Rajor, Madaripur

73. Mr. Subrata Chowdhury, S.O. Disease Investigation Sec. Mohakhali

74. Mr. Subad Chandra Shaha, U.L.O. Rampal, Bagerhat

75. Mr. Gazi Jamaluddin Mujumdar, S.O. Rabies Vaccine, Mohakhali

C. Bangladesh Agricultural Research Council

1. Dr. M. Altaf Hossain, M.Sc. (A.H.), Dr. Agric. Sc. (W. Germany)

2. Dr. G.M. Shahjahan, M.Sc. (A.H.), Ph.D. (Philippines)

3. Dr. Kazi Emdadul Haque, M.Sc. (A.H.), Ph.D. (Denmark)

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* Most of them are engaged in Administration, Training or Extension work.