

# MALDIVES

## CONSULTANCY MISSION REPORT POULTRY PRODUCTION PROJECT

Submitted by

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STATE OF ISRAEL  
MINISTRY OF FOREIGN AFFAIRS  
ISRAEL'S AGENCY FOR INTERNATIONAL  
DEVELOPMENT COOPERATION (MASHAV)

MINISTRY OF AGRICULTURE  
AND RURAL DEVELOPMENT  
CENTRE FOR INTERNATIONAL  
AGRICULTURAL DEVELOPMENT  
AND COOPERATION (CINADCO)

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## COOPERATING HOST ORGANIZATIONS

### ISRAEL'S AGENCY FOR INTERNATIONAL DEVELOPMENT COOPERATION (MASHAV)

MASHAV was founded in 1958 as part of the Ministry of Foreign Affairs. Over the past five decades it has been responsible for initiating and implementing Israel's development cooperation program worldwide. MASHAV aims at transferring the expertise and technologies which have assisted Israel in its own path to development to other developing countries. Israel cooperates with more than 140 countries providing training, operating on-site demonstration projects and building medical infrastructures in partner countries. MASHAV is active in fields ranging from agriculture and medicine, to community development and entrepreneurship.

### CENTER FOR INTERNATIONAL AGRICULTURAL DEVELOPMENT COOPERATION (CINADCO)

CINADCO is the agricultural implementing arm of MASHAV and Israel's Ministry of Agriculture and Rural Development. Its headquarters are located in Beit Dagan near Tel Aviv, with training activities held at the MASHAV/CINADCO international training center at Kibbutz Shefayim. Training activities focusing on research and development (R&D) are conducted in cooperation with the Agricultural Research Organization (ARO) at Beit Dagan.

CINADCO has been actively involved over the years in formulating, implementing and conducting international agriculture-based development cooperation programs. These activities are based on international agricultural training courses and workshops held in Israel; on-the-spot courses and workshops conducted overseas; agricultural and rural development demonstration – technology transfer – capacity building projects carried out in different developing countries. The activities are suited to different natural resource conditions and development-related situations and are designed to meet the challenges of sustainable utilization and management of production means. CINADCO programs reflect appropriate project and training opportunities that contribute to sustainable development and the enhancement of people's livelihood and economic growth.

## ACKNOWLEDGEMENTS

The Mission expert wishes to express his deep appreciation to all the people who supported the visit - for their participation, assistance and contribution to the carrying out of this joint activity.

I would also like to express my deep appreciation and thanks to the hosts of this visit: Dr. Aminath Shafia, the Minister of State for Fisheries and Agriculture, Republic of Maldives; Ibrahim Shabau, the Director (Acting Division Head); Paul Van Driessche, Marketing and Business Sector Expert, FADiP. Special thanks go to Mr. Hassan Shuabee- Managing Director of the project. Thanks for their exceptional hospitality and assistance during the Mission visits to production sites and farms.

The Mission wishes to acknowledge the assistance and support extended by Mr. Samuel Livne, Head of Asia-Oceania Desk, MASHAV, Ministry of Foreign Affairs, and the Israeli Embassy staff in New Delhi, India, especially to Mr. Itay Tagner, the Political Counsellor.

This is also to express our appreciation to Mr. Daniel Carmon, Deputy Director-General and Head of MASHAV, Ministry of Foreign Affairs; and also to Mr. Ephraim Ben-Matityahu, Director, Projects Division, PPP – Public Private Partnership - for their advice and contribution to the formulation of this joint program.

Last but not least thanks and appreciation to Mr. Shai Dotan, Director of CINADCO; Mr. Shaike Stern, Director of Projects & Special Assignments, CINADCO - for their professional and technical support in implementing this Mission, and to the CINADCO staff - for their assistance in preparing this document.

## FOREWORD

This document is aimed to expose the results of the Poultry Development Mission in the Maldivian Islands, in the frame of developing stages for agricultural opportunities in rural islands, in order to establish an economically sustainable poultry industry in the Maldives in general, and table eggs production in particular.

Within the mission that has been carried out, new fields for enhancing and improving of the local infrastructures were detected. The local Ministry of State for Fisheries and Agriculture was strongly advised to further develop its agricultural and industrial knowledge.

It is envisaged that this initiative will further strengthen technical cooperation endeavors and the long-standing close ties of cooperation between the governments of Republic of Maldives and Israel.

Effie Ben-Matityau,  
Director of International  
Development Projects,  
PPP - Public Private Partnership  
Israel's Agency for International  
Development Cooperation (MASHAV)

Shai Dotan,  
Director  
Centre for International Agricultural  
Development Cooperation  
Ministry of Agriculture and  
Rural Development  
(CINADCO)

## INTRODUCTION

Maldives agriculture is one of the most important sectors of the island. The total area of land in Maldives is almost 300 square kilometers. Statistics show that the total cultivable land area in Maldives is 9% of the total area. Agriculture in Maldives holds an approximate of 7.7% share in the country's GDP. Though Maldives do not have any river, the annual rainfall received by the island is high.

Rainwater and ground water are the major sources of water for the cultivation of crops in Maldives. Maldives agriculture therefore heavily depends on these two sources of water due to the lack of rivers. There is no irrigation as the crops are naturally irrigated by rainfall. The main crops of Maldives grown in the soil of the island are corn, sweet potatoes, millet, almonds, sugarcane, pineapples and a number of tropical fruits and vegetables.

The fruits and vegetables are mostly grown in the home gardens of the Maldiviens. Rice, which is a staple for the people of Maldives, has to be imported. Fish is the main export followed by coir and copra -the products from the coconut palms. Other agricultural Maldives products are mangoes, limes, breadfruits, papayas, taro, pumpkins, chili peppers, watermelons and bananas.

In 1999 the cultivation of the crops like corn, sorghum and millets was quite low. The agricultural production of Maldives in the same year consisted of 2000 tones of copra and 12,000 tones of coconuts. Maldives agriculture holds a significant place in the economy of the island as its contribution is valuable with respect to economy as well as food production for the people of the country.

In respect to the mentioned above, the absence of poultry products (eggs and meat) from local source is mostly notable for two main reasons:

Poultry farm does not occupy much land or water in comparison to fruits, vegetables and crops, and can be designed to strongly preserve the environment.

Although the fishing industry is considered significantly more important, establishing economical poultry industry in Maldives will supply an alternative source for animal protein for the tourism sector and to the people of the country; this way the pressure of fish products industry will be reduced, so the fishing industry would have better monitoring fleshing.

Focusing on table eggs production that has been defined the most important issue of the present mission among other poultry sectors.

Eggs are considered as highly nutritional valued food (contain a range of proteins, vitamins and mineral), at reasonable price.

The potential of demanding eggs among local population and tourism sector is much higher. Yet under such market conditions the eggs are much too expensive, low in quality and in freshness (as estimated by Hogue scale-unit to measure egg quality in the market), do not contain any labels to follow neither date and place of production, nor size and type of egg for further inquires. Hence the immediate goal is to produce the table egg demand of the local market with no import dependence.

Today, more than 95% of the eggs in Maldives market are imported (270.000/day). The table below presents detailed data of countries and prices of egg imports in 2010.

Table A. Figures in respect to egg imports into the Maldives. These are from Maldives Customs 2010.

Country of Consignment	Quantity	CIF MRF.
U.A.E	104,626.00	424,702.30
AUSTRALIA	340,988.00	949,510.62
GERMANY	34,441.00	125,720.44
INDONESIA	10,500.00	8,884.24
INDIA	3,286,710.00	63,373,990.83
SRI LANKA	5,703,034.00	12,272,425.92
MALAYSIA	10,644,060.00	7,658,420.28
SINGAPORE	483,456.00	894,375.63
THAILAND	334,276.00	416,791.21
TURKEY	120.00	2,412.84
U.S.A	8,452,080.00	6,725,364.36
Total	99,394,291.00	92,852,598.67

Data received from: Paul Van Driessche  
Marketing and Business Sector Expert.  
Ministry of Fisheries and Agriculture, Male' 20025, Republic of Maldives.

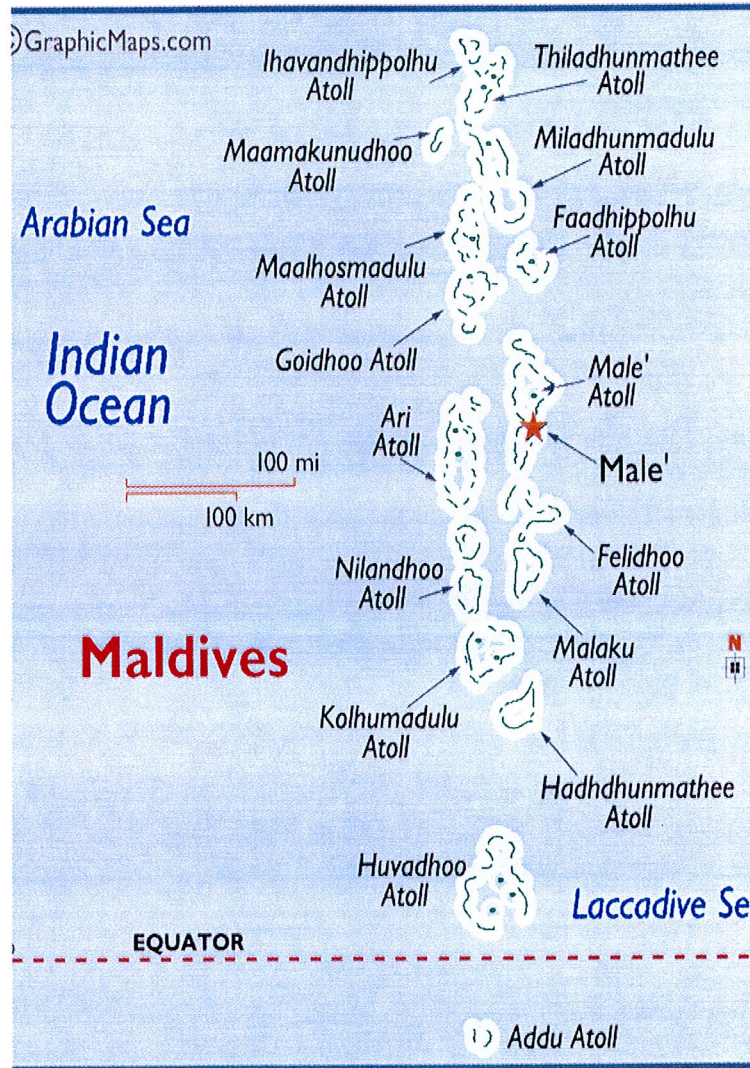
From table A appears that the main source of eggs imports to the local market is India. Due to "Maldives Customs 2010", in a fairly low price, but a short survey in supermarkets at Male resulted in a much higher price for the customers (double) with low quality, low in freshness and without labels to follow neither date and place of production, nor size and type of egg for further inquires. Such situation discourages demand for table eggs, especially by tourism feeding sector (the economical and central sector in Maldives) and also by the people of the country.

Hence the immediate goal is to produce the table egg demand of the local market with no dependence on eggs importing.

A sustainable egg industry must consist of safe local source of day old chicks and pullets supply on the one hand, and central professional feed mill with long-term contract of raw materials sources supply, with preference to local sources on the other hand.

Since the local demand of table egg is relatively small, 270,000 eggs/day can be a produce in one modern layer farm. This type of poultry farm is not recommended for biosecurity aspects. Furthermore, such investment would be neither economical, nor suitable to Maldives topography, climate and local marketing conditions. Statement before, appropriate layer farm consists of three superset sheds for 2000-3000 bird backed by pullets raising house fits in to 10 000 birds, located far enough away from poultry facility.

MAP OF MALDIVES

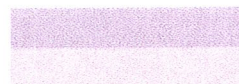


**OBJECTIVES AND MAIN FINDINGS**

TABLE B - TENTATIVE PROGRAM FOR THE POULTRY EXPERT MISSION			
	Day	Time	Details
7-Sep-11	Wednesday	08 20	Arrival
8-Sep-11	Thursday	09 00 (To be confirmed)	Courtesy call-Minister of Fisheries and Agriculture Dr Ibrahim Didi
		09 30 (To be confirmed)	Meeting with Minister of State for Fisheries and Agriculture Dr Aminath Shafia, Permanent Secretary Dr Abdulla Naseer, Director Ibrahim Shabau
		17 00 (To be confirmed)	Departure to HDh Hanimadhoo from Male' City
		18 00 (To be confirmed)	Arrival to HDh Hanimadhoo
9-Sep-11	Friday	08 00 (To be confirmed)	Field visit at HDh Hanimaadhoo
10-Sep-11	Saturday	11 00 (To be confirmed)	Field visit to Theefaridhoo (Commercial Poultry farm)
		15 00 (To be confirmed)	Field visit to HA Baarah (Community Poultry farm)
11-Sep-11	Sunday	11 00 (To be confirmed)	Departure to Hanimaadhoo from Baarah
		15 30 (To be confirmed)	Departure to Male' City from Hanimaadhoo
		16 30 (To be confirmed)	Arrival to Male' City
12-Sep-11	Monday	09 00 (To be confirmed)	Departure to Th Veymandoo from Male' City
		14 00 (To be Confirmed)	Arrival to Th Veymandoo
			Field visit
13-Sep-11	Tuesday	13 00 (To be confirmed)	Departure to Male' City from Th Veymandoo
		18 00 (To be confirmed)	Arrival to Male' City
14-Sep-11	Wednesday		Stationed in Male' city in Desk works. Arrival to Felivaru
15-Sep-11	Thursday		
16-Sep-11	Friday		Departure to Male' City from Felivaru

17- Sep-11	Saturday		Public Holidays
18- Sep-11	Sunday		Stationed in Male' city in Desk works.
19- Sep-11	Monday	1:20	Departure

Table B prepared by : **Hassan Shuabee,**  
 Assistant Quarantine Officer  
 Ministry of Fisheries and Agriculture



Travel through Air  
 Travel through Sea  
 Confirmed

**PROFESSIONAL VISITS AND MEETINGS**

Table B presents the schedule and places I have visited during this poultry mission - in order to study the needs of the local poultry industry and learn how to apply the Ministry for Fisheries and Agriculture manager's demands. At the first day of arrival I met with Dr. Aminath Shafia, the Minister of State for Fisheries and Agriculture; Dr. Abdulla Naseer, Permanent Secretary and the Director, Ibrahim Shabau; Paul Van Driessche, Marketing and Business Sector Expert. We had discussions on the above subjects by emphasizing the importance and the needs of locally eggs production defined as Ministry first priority. All the above meetings took place in the Ministry for Fisheries and Agriculture head office, in Male.

From the second day there have been many changes in the original program because of stormy weather and transportation difficulties.

The first field trip was to **Hanimahda** where a Governmental Agricultural Center is located. The place is facilitated already with equipped Henhouse for eggs production. After renovation and reorganization this poultry facility can be used as an Experimental Poultry Farm. This facility can be operated by the Ministry workers for personal professional development and also can be used as satellite poultry farm for village farmers to upgrade their egg production management skills.

The next visit, accompanied by Minister of Agriculture and Ministry officials was held in Baarah where a Community Poultry Farm is located. The layer shed in the farm is very well managed and equipped.

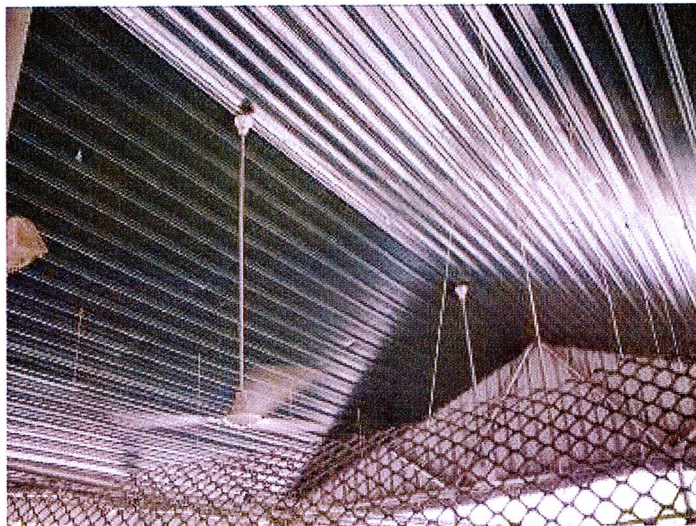
It is recommended to extend the place, so that the same ideas described above for Hanimahda could be applied also in Baarah.



Baarah port



Baarah Layer shed



Insolated ceiling of the shed



The next visit was to a commercial layer farm in **Theefaridhoo**. The commercial layer farm we visited belongs to a local family. In my visit to the layer-sheds I saw the birds and met the farm manager and workers. As they were not friendly and did not cooperate, it was impossible to get professional data and certainly not economic. I found out a tremendous lack in managing, husbandry and knowledge of poultry raising in this farm.

In my last visit to **Felivaru** (15-16/09) I met a group of enthusiastic people that were oriented to establish a feed mill and a layer shed in order to produce eggs. They asked for help and advice in poultry farms development and poultry food preparation knowledge. I ended the tour with a presentation and a lecture on the use of different raw materials for preparing food for birds. Importantly, the meetings in Felivaru were conducted in a pleasant serious atmosphere with friendly and interesting executive group in the place. During the visit I collected samples of locally made animal feed pellets and raw materials (rice & fishmeal, "goat feed" pellets and coconuts scrape, sea grass and Felevaru mash as been defined by people giving the samples) to check the nutritional values and their adaptation to laying hens and pullets feeds in Israeli laboratories.

## SUGGESTED IMPROVEMENTS AND RECOMMENDATIONS

### General

Eggs contain a wide range of proteins, vitamins and minerals, therefore considered as highly nutritional valued food at reasonable price where the production is efficient. Poultry feed is the highest expenses for table eggs producers among other production expenses (about 60%-70%).

Therefore the mission has focused on production of table eggs for Maldives market and the development of feed mill for animal mash. In terms of layer feed, the latest FOB Colombo price I have got from Paul Van Driessche Marketing and Business Sector Expert is U\$550.00 / mt. We have not received chick starter / grower for some months but the last FOB prices were U\$580.00 / mt for the starter and U\$540.00 for the grower. The approximate shipping cost per cubic meter from Colombo to Male' is U\$52.00." The quote is based for future economic comparison (if needed).

It was proposed to develop the table eggs production sector and factors that would support the production, in **a three stages modular program**:

1. Immediate
2. Short tram (up to 2 years)
3. Long tram (up to 5 years)

As start point of **the first stage in the project** it was suggested to establish a Central Feed Mill in **Felivaru**, since machinery and the necessary equipment have been purchased and stored by the local staff. The people I have met in Felivaru were very skilled and experienced in operating and maintained similar equipment form the fish processing industry in the place.

### **The feed mill**

The equipment mentioned above can be used after assembling it in an appropriate shed, considering enough storage space for raw materials and readiness for feed using. The feed mill should be located near by the sea-port, with convenient roads for easy transportation of goods.

Software: in order to formulate a balanced poultry feed at reasonably price and supply the poultry feed demand for local farmers, I would recommend using a computer program that is appropriate for poultry feed preparation. It is recommended to coordinate the implementation of this software with an Israeli expert who will also teach how to work effectively with this designated software. Furthermore, it is suggested that people employed in preparing the poultry feed will arrive to Israel for a short-term training in this topic.

Feed and Feed Alternatives: Presently, all of the poultry feed in the Maldives consists of import ready-for-use feeds and additives for feed production. Local poultry feed production with increase a use of local available raw materials and can contribute to the achievement of two objectives:

1. To reduce the price of feed ingredients and keep the ration balanced with more qualified ingredients containing locally produced and inspected grins & oil byproducts.
2. To encourage farmers expand agricultural production by growing grains such as Maize, Wheat sorghum, et cetera, in order to supply the feed ingredients for preparing the poultry feed, the corresponding plots for field crops will need to adjust local conditions and feed mill requirements.

It is strongly recommended that all stages of feed mill establishment detailed above, and the development of new field crops will be accompanied by Israeli experts that will arrive to Maldives for a Short Term Mission assisted by MASHAV and the Israeli Embassy.

### **Experimental poultry farm (stage 1)**

Experimental poultry farm is an amazing management tool for professionals to study the types of feed, growing methods on the hens' performance under the Maldives climate and environmental conditions. It is kindly suggested to develop the facility in Hanimahda. The farm should be managed by an extension officer and nutritionist (employed by the government) in cooperation with the feed mill - to conduct and apply research program with the aim to examine feed additives from local ingredients, breeds, husbandry methods and more. The accumulated knowledge from such Experimental poultry farm can be used practically by nutritionists and poultry farmers anywhere in the Maldives. Hanimahda Agricultural Center was suggested since the facilities already exist in the place. This poultry farm (after reorganization) can be managed very well by an extension officer and nutritionist employed in the Agricultural Center (by the government). In order to conduct the research the special design planning of buildings on the site will be given by the Israeli expert as well as applied research annual programs.

A second advantage is that such a farm may also be used as satellite poultry farm for farmers from the near village to come and learn egg production management. The same idea described above can be applied also in **Baarah** Community Farm, where I found a well managed and equipped layer shed. In addition, it is highly recommended that Baarah Community Farm should be extended by adding two more layer sheds and one pullets' shed as described below.

### **Layers and pullets farms (stages 1-2)**

Constraints created by a relatively small market conditions like the one in Maldives basic unit of table eggs production should consist on three layer-sheds of 2000-3000 bird/shad. Separate and remote pullets rearing house. Basically a layer shed should be housed by the minimum of 2000 birds in production in terms of bio-security and economical aspects (the recommended density is 12-14 layers/m<sup>2</sup>, for pullets 15-17 bird/ m<sup>2</sup>). I think deep litter system for poultry raising in areas near by the equator is recommended. Suitable planning and equipment structures (see below). The topography of the Maldives (many islands) requires relatively small farms due to marketing and Bio-Security constraints (disease prevention).

### **Veterinary and poultry health**

It is important to note at this point that due to the considerations of Bio-Security, a vaccination program appropriate to the local conditions must be developed and applied. Birds should be housed in the same age at the farm. All-in-all – out administrative method system. The veterinary service must be supplied, controlled and inspected by the government.

It is kindly suggested that the recommendations listed above will be escorted by Israeli Experts (of veterinarian and poultry production) coordinated with the Israeli Embassy in Delhi.

### **Documentation and data collection**

It is also recommended to prepare printed forms to record all the production data, including the performance of the flock from the start of laying until the end of the cycle. These forms should be identical, clear and easy for the farmer to fill in.

Planning and Renewal of the layers farms (for eggs production follow a three-stage-program: producing pullet flocks (15 week intervals in age between flocks). The pullet flocks at a separate rearing farm in order to have a continuous egg supply throughout the year.

It is recommended that each of the above farms would be fenced in, with an access only to a showroom, an egg care and storage temperature controlled room. The distance between rearing and production farms should be at least 300 meters, and the distance from the hatchery - at least 600 meters.

### **Housing & Equipment**

- Construct the poultry houses with a top window for ventilation, when the roof is not insulated.

- Pave a concrete floor thoroughly.

- Cover the sides of the house with wire mash.

- Supply the poultry house with reserve water tanks of about 300 ml per day (per chicken - for at least 4 days). Evenly distributed between the feeder's rows

- Water bells: one single bell for every 80 birds.

Feeders should be calculated in a way where one is for every 50 birds, at least 3 lines in 12 meter width poultry house.

### **Poultry House Humidity and Temperature**

It is recommended to purchase several data loggers to measure the temperature and humidity inside the poultry house during hot days.

It is recommended to use the methods listed below to help the birds to better cope with heat stress.

### **Fans inside The Poultry House**

It is recommended to install fans inside the poultry house. The size of the fans should be 24"-28", and they should be installed at a height of 1.5-1.7 meters above the ground, along the length of the poultry house, 6-8 meters apart, with the wind direction.

### **Insulation of the ceiling**

Provided fans are installed inside the house; it is advisable to insulate the ceiling of the poultry house with an effective insulation material such as: urethane foam, balsam wool, rock wool, expanded polystyrene.

### **Installing curtains on the sides of the house**

It is recommended to install curtains on the sides of the poultry house, which can be rolled if necessary (changing environmental conditions).

### **Trees for shade**

It is advisable to plant shade trees near the poultry houses. The tree should have tall and bare trunks, great leaf mass and a wide canopy. The tree might significantly reduce the radiated heat-load affecting the birds in the poultry house.

### **Painting the Roof**

It is recommended to paint the roof of the poultry house in a white color to reduce the radiation.

Recommended paint: according to availability - the white color should stick to the roof for a period of two years at least.

### **Genetic Lines**

Introduce other genetic lines which will enable comparison as well as adaption to environmental conditions and climate.

### **Hatchery & Parents stock (commercial breeders flock) (stage 2-3)**

The hatchery and layer's breeder flocks must adapt needs of quarantine conditions. Floor, ceiling, walls and incubator should be built from materials provided for washing and disinfecting frequently. The place must be well fenced and entrance just after a shower and change to locally washed clothes. Entry must be permitted only to employees and authorized individuals. Any object instrument and equipment including setting eggs must undergo appropriate disinfectant process.

The chicken-houses planning and equipment in the breeder's farm recommendation seem to be discarded for eatable eggs layer's farm.

For layer breeders and eggs quantities, number of incubators & capacities please see tables attached in the annex.

**It is highly recommended** to be in contact with MASHAV and the Israeli Embassy in order to conduct the on-the-spot course on poultry production management, disease prevention vaccination and poultry health. A special attention must be paid to another

course - for proper nutrition in Maldives. Furthermore, a short training visit in Israel for people that will be involved in the poultry industry is recommended.

I can see a big advancement in establishment of a local WPSA –World's Poultry Science Association branch in the Maldives consisting of people working in the Ministry of Fishery and Agriculture, poultry industry, students and poultry farmers.

### ANNEX

1). Quantities of birds, eggs number and incubator capacity.

C		B		A	
<u>Hatchery capacity</u>		<u>No. layer breeder in production/year</u>		<u>commercial layer farms</u>	
	504000				270,000 eggs/day
eggs/week	9786.407767	hatching eggs/year	504000	270 eggs/layer	97200000 eggs/year
		no. of layer breeders/year	2100	2000 layers/shed	360000 no.layers needed
		av.(60% lay) No.of fertile eggs/d	1260		<b>180 no.of sheds needed</b>
eggs/year	<b>1247400</b>	av.(75%hatching) No.of chicks/d	945		
egg/d	3465				
egg/3d	10395	av.(60% lay) No.of fertile eggs/ 3d	3780 ###		
egg/7d	24255				
		chicks in 3 consecutive days	2835		
		chicks in 21days incubation period	19845		
		female chicks in 21days incubation period	<b>9923</b>		
		No. of housed sheds/ incubation period	4.96125	5	
		No. of housed sheds in 1 year	85.05		17
		No. of housed sheds in 1 year for 2 layer breeders flock	170.1		
		No. of layer breeders/year (corrected)	2310		0.945
		av.(60% lay) <b>No.of fertile eggs/year</b>	<b>1247400</b>		

The table above presents calculated quantities of birds-breeders and commercial layers, eggs number and incubator capacity as required by the project in question.

**To summarize:** There will be a necessity in 360,000 commercial layers in lay/year housed in 120-180 sheds of 3000-2000 birds, respectively in order to produce 270,000 eggs/day (or 97,200,000 eggs/year) being imported to Maldives now (Column A).

There will be a necessity in 2100 layer-breeders in lay/year to produce 1,250,000 fertile eggs/year for approximately 10,000 female chicks hatching (Column B). In column C the incubator capacity is presented based on the project data above.

**2). Results of local row materials samples taken during the visit to nutritional analysis site in Israel.**

**2A). Rice Fishmeal locally made pellets**

<b><u>Factor tested</u></b>	<b><u>unit</u></b>	<b><u>Result</u></b>
Moisture	g/100g	8.98
Protein	g/100g	17.46
Fat (soxtec)	g/100g	0.61
Ash	g/100g	2.98
Cellulose	g/100g	1.0
Calcium	g/100g	0.68
Phosphorus	g/100g	0.54
Sodium	g/100g	1,340.0
Protein digestion coefficient		87.7
Protein Digest	g/100g	15.31

**2B). Sea Grass locally dried**

<b><u>Factor tested</u></b>	<b><u>unit</u></b>	<b><u>Result</u></b>
Moisture	g/100g	23.92
Protein	g/100g	6.23
Fat (soxtec)	g/100g	0.32
Ash	g/100g	55.84
Cellulose	g/100g	10.9

Calcium	%	15.50
Phosphorus	g/100g	0.12
Sodium	g/100g	4.79
N.D.F	g/100g	87.7
A. D.F	g/100g	15.31

### **2C). Coconuts scrape made and taken in Felivaru**

<b><u>Factor tested</u></b>	<b><u>unit</u></b>	<b><u>Result</u></b>
Moisture	g/100g	14.75
Protein	g/100g	30.88
Fat (soxtec)	g/100g	41.18
Ash	g/100g	2.76
Cellulose	g/100g	0.7
Calcium	%	0.1
Phosphorus	g/100g	0.55
Sodium	g/100g	885.00

### **3). Nutritional recommendation (DATA FROM LOHAMNN LSL MANAGEMENT GUIDE)**

#### **3A). Recommended Nutrient Levels per kg of Feed for layer's feed during production period in different daily Feed Consumption.**

<b><u>Nutrient</u></b>	<b><u>Requirement</u></b> <b><u>g/Hen/Day</u></b>	<b><u>Daily Feed Consumption</u></b>		
		105 g	110 g	115g
120 g				
Protein %	18.50	17.62 %	16.82 %	16.09 %
15.42%				
Calcium %	4.10	3.90 %	3.73 %	3.57 %
3.42%				
Total Phosphorus*% 0.60		0.57 %	0.55 %	0.52 %
0.50%				

Av. Phosphorus%	0.42	0.40 %	0.38 %	0.37 %
0.35%				
Sodium %	0.17	0.16 %	0.15 %	0.15 %
0.14%				
Chloride%	0.17	0.16 %	0.15 %	0.15 %
0.14%				
Lysine %	0.87	0.83 %	0.79 %	0.76 %
0.73%				
Dig. Lysine %	0.71	0.68 %	0.65 %	0.62 %
0.59%				
Methionine %	0.44	0.42 %	0.40 %	0.38 %
0.37%				
Dig. Methionine %	0.36	0.34 %	0.33 %	0.31 %
0.30%				
Meth./Cyst. %	0.80	0.76 %	0.73 %	0.70 %
0.67%				
Dig. M/C %	0.66	0.63 %	0.60 %	0.57 %
0.55%				
Valin %	0.69	0.66 %	0.63 %	0.60 %
0.58%				
Dig. Valin %	0.59	0.56 %	0.54 %	0.51 %
0.49%				
Tryptophan %	0.21	0.20 %	0.19 %	0.18 %
0.18%				
Dig. Tryptophan	0.17	0.16 %	0.15 %	0.15 %
0.14%				
Threonin %	0.64	0.61 %	0.58 %	0.56 %
0.53%				
Dig. Threonin	0.52	0.50 %	0.47 %	0.45 %
0.43%				
Isoleucine	0.66	0.63 %	0.60 %	0.57 %
0.55%				
Dig. Isoleucine %	0.55	0.52 %	0.50 %	0.48 %
0.46%				
Linoleic Acid %	2.00	1.90 %	1.82 %	1.74 %
1.67%				
LSL 1007				

**3B). Recommended Nutrient Levels per kg of Feed for different pullets feeds**

<u>Diet type*</u>	<u>Starter**</u>	<u>Grower</u>	<u>Developer</u>	
<b>Pre-Layer</b>				
<b>Nutrient</b>	<b>1-3</b>	<b>1-8</b>	<b>9-16</b>	<b>18</b>
<b>weeks to lay</b>				
<b>Metabol. Energy kcal</b>	<b>2900</b>	<b>2750-</b>	<b>2750-</b>	
<b>2750- 2800</b>				
<b>minimum MJ</b>	<b>12.0</b>	<b>11.4</b>	<b>11.4</b>	
<b>11.4- 11.6</b>				
<b>Crude Protein %</b>	<b>21.0</b>	<b>18.5</b>	<b>14.5</b>	
<b>17.5- 18.0</b>				
<b>Methionine %</b>	<b>0.48</b>	<b>0.40</b>	<b>0.34</b>	
<b>0.36- 0.40</b>				
<b>Meth./Cystine %</b>	<b>0.83</b>	<b>0.70</b>	<b>0.60</b>	
<b>0.68- 0.73</b>				
<b>Lysine %</b>	<b>1.20</b>	<b>1.00</b>	<b>0.65</b>	
<b>0.85- 0.83</b>				
<b>Valin %</b>	<b>0.89</b>	<b>0.75</b>	<b>0.53</b>	
<b>0.64- 0.67</b>				
<b>Tryptophan %</b>	<b>0.23</b>	<b>0.21</b>	<b>0.16</b>	
<b>0.20- 0.20</b>				
<b>Threonine %</b>	<b>0.80</b>	<b>0.70</b>	<b>0.50</b>	
<b>0.60- 0.59</b>				
<b>Isoleucine %</b>	<b>0.83</b>	<b>0.75</b>	<b>0.60</b>	
<b>0.74- 0.66</b>				
<b>Calcium %</b>	<b>1.05</b>	<b>1.00</b>	<b>0.90</b>	
<b>2.00-3.70</b>				
<b>Phosphor, total %</b>	<b>0.75</b>	<b>0.70</b>	<b>0.58</b>	
<b>0.65- 0.60</b>				
<b>Phosphor, avail. %</b>	<b>0.48</b>	<b>0.45</b>	<b>0.37</b>	
<b>0.45- 0.45</b>				
<b>Sodium %</b>	<b>0.18</b>	<b>0.17</b>	<b>0.16</b>	
<b>0.16- 0.16</b>				
<b>Chlorine %</b>	<b>0.20</b>	<b>0.19</b>	<b>0.16</b>	
<b>0.16- 0.16</b>				
<b>Linoleic Acid %</b>	<b>2.00</b>	<b>1.40</b>	<b>1.00</b>	
<b>1.00- 2.00</b>				