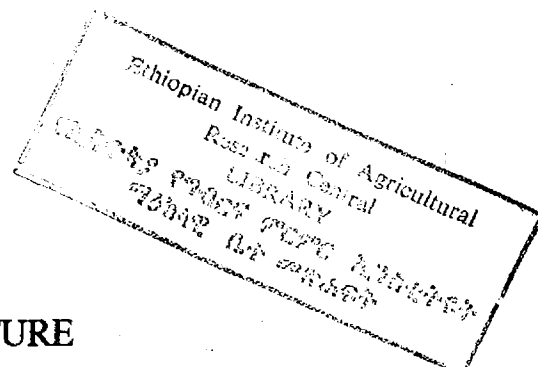




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ETHIOPIA
MINISTRY OF AGRICULTURE
ANIMAL AND FISHERIES RESOURCE DEVELOPMENT
DEPARTMENT

TRAINING IN RURAL POULTRY DEVELOPMENT
PROJECT

RICE HUSK INCUBATION OF CHICKEN EGGS

prepared for the

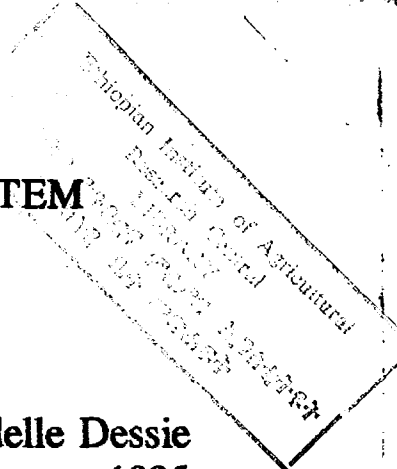
In-service Training of Ministry of Agriculture Field Staff

by

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THE CHINESE RICE-HUSK INCUBATION SYSTEM



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Introduction

This interesting traditional method of incubation (keeping eggs warm until they hatch) is in common use throughout Thailand, Vietnam, the Philippines, Laos, Singapore, Malaysia, Taiwan and China. The system uses no electricity and requires only the occasional use of a small kerosene stove. The method can be used in villages lacking power and using locally available materials.

The system makes possible the hatching of hundreds of chicken eggs at a time. The basis for the whole procedure is the fact that the chicken embryo (egg-bound baby chick) of seven days or more will produce enough body heat to warm itself and other eggs if placed in a well-insulated container. When the incubation is beginning and there are no older eggs, it is necessary to keep the eggs heated by placing them between jute bags filled with heated rice husk; later, no additional heat will be needed except that which is produced by the eggs themselves. Practice is necessary to master this system of incubation. Because of the fact that electricity is not necessary for this method, large scale extension work is also possible by hatching of eggs in rural area. It is also helpful to improve the economic and social status of rural poor people, by improving the income from sales of chicks.

2. What is hatchery?

What is its importance?

- Hatchery is where hatching of eggs is made in artificial way.
- Types of hatchery:- A few types of hatchery to hatch eggs, e.g.
 - Fish hatchery
 - Poultry/Duck hatchery

Importance of maintaining hatchery:-

1. Quite substantial number of eggs can be hatched at a time
2. Extension of high yielding varieties can be done in faster way
3. Chicks can be produced as per demand, in relation to time and number.

4. Possible to meet the demand of nutrition, that is protein of animal origin
5. Creates opportunity for employment and source of income to rural women.

3. Types of hatching eggs

Generally eggs can be hatched in two ways:-

- i) In natural way (by using broody hen)
- ii) In an artificial way through kerosene or electric operated incubator and Chinese Rice Husking method

4. Advantage and disadvantages of hatching eggs in different methods

Methods	Advantage	Disadvantage
Natural way (using broody hen)	less costly	less number of eggs at a time
	acceptable in rural condition	extension of high yielding varieties is not possible in faster way
	no need of electricity	non availability of broody hen
	less laborious	chance of spreading disease is more
Artificial way through electric incubator	less laborious	more costly
	generate employment	its use in rural area is not possible
	extension of high yielding varieties is possible easily	higher technology is involved
	chicks can be produced as per demand	chance of loss during electric failure is high
	chance of spreading disease is less	
Rice husking method (artificial way)	possible to practice in rural area	hardly any disadvantage is seen
	generate employment	much labour is necessary
	inputs are locally available	hatcherer has to remain present in most of the time
	higher technology is not involved	all time supervision is necessary
	chicks can be produced as per demand	intensive care is necessary

	hatching percentage is higher	
	less costly	
	rural women can easily operate it in addition to house hold affairs	

5. Suitability of rice husking method to our rural village poultry production system

In our country, electricity is not available in every parts of rural area and, therefore, electric hatchery is not possible to operate. On the other hand, hatching of poultry eggs through hens can not meet up the demands. Distribution of chicks to the remote rural areas is not possible from the Government-operated central hatcheries. There is a pronounced deficiency of protein in the country and therefore, demand for poultry is quite high. As such hatching of eggs in grain husk method and with other locally available materials can satisfy the demand to a great extent in rural area. No electricity is necessary and only sunlight and kerosene operated furnace is enough to operate this system and as such village based operation is possible. Hatching of eggs through rice husking Chinese system is a village based process and because it needs all time supervision, the village women can easily take care of it. This system can influence the development of socio-economic situation to a great extent. Considering all points the Chinese rice husking method is an appropriate technology in our country, Ethiopia at least it does not compete for the hard currency to import high-tech incubators to meet the demand.

6. Source of hatching eggs and hatchability of eggs

6.1. Source of hatching eggs

Because eggs are the main components of hatchery, the identification of source of eggs needs the following points:

- a) The rearers of poultry should be faithful.
- b) The source of eggs for the hatchery should be near by the hatchery.
- c) The male to female ratio should be proportionate (1:8) and healthy.
- d) The house should be hygienic (hatchery)
- f) Ash should be used in the floor, which keep to disinfect.
- g) Regular vaccination of the flock if possible.

6.2. What is the fertility and How to improve the fertility of eggs?

Eggs that hatch chicks are termed as fertile eggs. Eggs that do not hatch chicks are non-fertile under normal condition.

How to improve the fertility of eggs?

- a) The male to female ratio should be 1:8.
- b) The layer should be kept for only one year from the start of lay.
- c) More males should not be allowed in the flock.
- d) Aged males should be eliminated from the flock.

7. Selection of eggs and Transportation

7:1 Necessity of selection of eggs

- a) Good quality chicks will be produced.
- b) Higher percentage of eggs will hatch.
- c) The loss of hatching eggs will be less.
- d) The size of the chicks will be uniform.
- e) Higher percentage of hatching will lead to less loss.

7:2 Conditions for selection of eggs

- a) No rough eggs should be set
- b) Eggs coming out without mating of male should be avoided
- c) Eggs wet in rain should not be used
- d) Eggs having light shell and with crack should not be set
- e) Eggs laid and stay outside for longer period should be avoided
- f) Dirty eggs should not set
- g) Eggs of unusual shape and size should be avoided
- h) Eggs having smaller or bigger airsac should be avoided
- i) Eggs having direct sunlight, immediately after lay should not be set.
- j) Eggs stained with blood should be avoided.

8. Preservation of hatching eggs

8:1 Necessity of preservation of eggs

While setting egg in the hatchery relatively, quite a big number of eggs are needed at a time. But required number of eggs at a time may not be available. As such, daily collected eggs have to be preserved for a certain period of time. The eggs laid immediately after should be preserved for a few days (5-7 days) and when set afterwards, it can give higher hatchability percentage.

8:2 Preservation period of eggs should as follows

In summer 3-4 day's

In Winter 7-10 day's

This period is applicable from the day of lay.

8:3 Preservation of eggs at village level:-

There is hardly any modern facility for preservation of egg at village level, generally eggs can be preserved with materials used in day to day life e.g.

-In big pots made of earth.

-In basket made of bamboo.

-under the cot making litter with sand and/or ash.

-usually in the country side, farmers put eggs inside the grain "silo", mostly inside tef grain.

It is to be noted that the room where egg is preserved should be safe and should have free passage of air and light, eggs with smaller airsac should be preserved keeping it upwards while the eggs with bigger air sac should be preserved in down ward position.

9. Description of materials used in Chinese Rice Husking System.

The following materials will be necessary while hatching eggs in Chinese System:

- a) Incubation box which is the main frame of the system.
- b) A room for establishing hatchery (if necessary bed room can be used).
- c) Incubation cylinder.
- d) A strainer (flat basket) made of bamboo with several openings.
- e) Turning cylinder (cylinder for turning eggs).
- f) Pillow filled of rice husk or feathers.
- g) Coloured cloth for tightening eggs.
- h) Husk of rice or any locally available material that can serve the purpose.
- i) A thermometer
- j) A hurricane ("Fanos").
- k) A stove
- l) A torch light
- m) Flat basket made of bamboo
- n) Hatching bed
- o) Savalon
- p) Signing per
- q) Black lime
- r) Gunny sheet
- s) Register
- t) Blanket, fan and piece of cloth

10. Use of materials used in the Rice Husking method

Materials	Use
Incubation box	it is a box where the incubation cylinder is placed and spaces surrounding the cylinder are covered with rice husk to up keep the heat
Incubation cylinder	eggs are placed inside it and required heat is maintained
Strainer with opening (made of bamboo)	it is used for turning eggs
Turning cylinder	the basket is placed over it for turning the egg sometimes, it is used for providing heat to eggs
Pillow filled with husk or feathers	this is used inside the cylinder both underneath and above the eggs for maintaining the required heat for eggs
Coloured cloth for tightening the eggs	used for tightening a given number of eggs

Husk	it is an ideal material for controlling heat of eggs and, therefore, used in incubation box, husk pillow and hatching bed
Thermometer	used for determination of temperature
Hurricane	used for providing heat to the cylinder and light in the rooms during night
Stove	during cold weather when sunlight is not available, it is placed under the turning cylinder to provide heat to the eggs through basket with opening
Torch light	used for examining the fertility of eggs
Flat basket made of bamboo	to cover the mouth of the incubation cylinder and sometimes it is used to keep eggs after cleaning
Hatching bed	this is used to keep the eggs spreaded from 18th day up to the day of hatch. This is also used to provide heat and to control the heat
Savlon	used for washing egg and to keep free microorganism
Signing pen(market)	used to mark the egg
Black lime(ash)	to overcome the moisture content of the room and outside , it used as disinfectants
Gunny sheet	used as sheet under the incubation box (to cover the lower mouth), hatching bed and sometimes to cover the eggs
Blanket, fan and piece of cloth	used when it becomes necessary
Note book	to keep records

11. Measurement of various materials used in rice husking methods and its preparation technique

* Incubation box

The box with four cylinders will have the following measurements

length ___
 breath ___
 height ___

The upper and lower part of the box made of wood will remain open. Any carpenter can prepare it:

* Cylinders (4 in number)

A sheet made of bamboo having 18" (46cm) breadth and 24" (60cm) long can be folded in the form of a cylinder with required diameter. The cylinder will then be tied with small plates made of bamboo both inside and outside.

The entrance of the room should be in the western side. In case of light, there can be one window in either north or in southern side. In that case, the window should be covered with clean polythene in a way that air can not pass.

13. The Technique of Setting Incubation box

The incubation box has to be set carefully in a way that it prevent air and moisture. The following steps have to be followed:

A polythene sheet measuring 6 x 4 feet (180 x 120cm) wide has to be spread in the floor. On it, a light plain sheet tin measuring 5 x 3 feet (150 x 90cm) in the size of the bottom of the box has to be placed. the box has to be placed over the tin. Then add the Husk up to 6 inches (15cm) and then put the incubation cylinder with slight pressure and giving a 6 inches (15cm) space in between the cylinder's and it has to be noted that the upper part of the cylinder remains about 1 inch (2.5cm) higher than the box. Lastly, the husk on the upper part of the box has to be covered with Gunny sheet except the mouth of the cylinder.

14. Hatching of poultry eggs in Chinese system

The shell of poultry eggs's is thin as compared to duck egg, therefore, more than 300 eggs are not hatched at a time by one cylinder. Because of thin shell, more eggs other than 300 may cause breakage of eggs in the lower region because of pressure. It is not necessary to wash the poultry eggs. In case dirty eggs are there, it should be cleaned carefully by using warm water and Savlon disinfectant and put it under sunlight. Latter on, the eggs should be tightened in coloured cloth and kept in the incubation cylinder. The 1st and 2nd candling of egg will be done on 7th and 14th day respectively. On 18th day, the eggs will be placed in hatching bed and turning accordingly. On the 21st day chicks will come out.

15. Necessary points for Hatching eggs and its application in Rice Husking method.

To attain success in hatching eggs, importance has to be given on the following points:

15:1 Temperature:-

Temperature is a main and important factor in hatching of eggs. The hatching period can be divided in to 2 phases. The phase-wise temperature will be as follows.

<u>Phase</u>	<u>Day</u>	<u>Temperature</u>
Incubation phase	1-18 days	98°-100°F
Hatching phase	18-21 days	101°F-102°F

It is to be noted that higher temperature than the desired one may cause the boiling of egg while temperature lower than desired may cause the death of the embryo.

15:2- Moisture

During the latter part of the hatching period, moisture content is very essential. The desired moisture content (Relative Humidity) should be 85%. In case the atmospheric condition is dry and moisture content is less, desired moisture content is maintained by spreading warm water over the egg or container with water may also be kept under the bed to increase the moisture content.

Necessity of moisture:-

- Soften the shell of eggs and the chicks can come out of the shell easily
- The feather of the chicks does not get stick with the shell and thus helps coming out easily
- The chicks can suck/absorb the necessary calcium from the shell

15:3- Candling

While eggs remain in the incubation cylinder, it becomes necessary to examine the fertility of eggs in different phases. The candling of eggs will be done with ordinary torch light

1 st candling at	6 th day
2 nd candling at	12 th day
3 rd candling at	18 th day

1st candling:- In the dark hatching room, the egg is examined by torch light

Fertile eggs: Cluster of the blood vessel in side the egg, that is the embryo. It appears like network of spider

Infertile eggs: Inside of the egg will be visible and clear

Rotten eggs: The inside of the egg appears to be open or there will be blood staining and the yolk will be broken

2nd candling

Fertile egg: The blood vessels will be spread further and clearly visible there will be movement of embryo

Infertile egg: There will be no movement of embryo and it will be dead. The blood vessel will appear black and will be stained with shell.

3rd candling:

Fertile eggs: The blood vessels will be more prominent and the embryo will occupy the whole shell

Infertile eggs: There will be no appearance of blood vessels and the inside vessels and the inside of the egg will appear dark

15:4 Turning of egg

Turning of egg is necessary for up keeping the freshness of the egg through maintaining equilibrium of temperature and supply of oxygen in eggs. In case there is no turning, there is chance of the embryo to be coming attached with the shell causing its death. During hatching, turning of egg is necessary in every specific time of interval. How to undertake the turning of eggs and in what specific period is shown below:

1st to 12th day - after every 4 hrs interval

13 - 18th day - after every 2 hrs interval

18th - 21st day - no turning

15:5 Condition of eggs

From 1st to 18th day, there is hardly any change in the egg. Egg can sustain any situation within the packet of coloured cloth. But after the 18th day, the egg will be placed in hatching bed in a way it does not overlap one another. Generally the narrow part of the egg remains more hot than the flat part and as such if the narrow part is placed down ward, it may become more hot and ultimately lead to the spoilage of egg. Of course, on 21st day when the chicks start to come out of the egg, the flat part of the egg should be kept upwards for few hours for facilitating the coming out of chicks. In order to maintain the temperature don't allow space between eggs.

16. Different phases of rice husking methods

The phases of rice husking method can be divided in to the following

16:1 Washing of egg:

Egg should be washed with warm water mixed with "Savlon" or any other antiseptic lotion. This will help to keep the egg clean and germless.

16:2 Drying of egg:

After washing, the eggs should be dried in a airy and shady place keeping them in strainer basket over the Gunny sheet. Sometimes, the fan made of anything can be used for quick drying.

16:3 Marking of egg:

Eggs used every time should be marked for identification. After every 6 days interval new eggs have to be mixed with old ones and they should be marked in a way that they can be easily identified.

16:4 Tightening the eggs with cloth:

On being marked, 35 eggs should be tightened in basket with a coloured cotton cloth. It should be done in a systematic way. Initially, the eggs should be kept in coloured cloth,

On 18th days the bundle of eggs should be taken from the cylinder and after opening the egg from the basket, it should be placed in hatching bed. Before placement of eggs in hatching bed, it should be arranged with rice husk 2 inches (5cm) depth covered with sheet to avoid loss of temperature. In case of unfavourable weather, the temperature of the hatching bed has to be maintained by keeping hurricane light. To measure the temperature of the hatching bed, 2 thermometer should be kept for full time and during this time no turning at all.

17- Supplementation process of additional eggs:-

17:1- Necessity of supplementation of eggs:-

New eggs are supplemented with the old eggs in the cylinder for the following advantages:-

- 1- Much more eggs can be hatched
- 2- New eggs can get heat out of the heat of old eggs and thus needs no supporting heat
- 3- Continuous setting of eggs can be done for production of chicks as per demand.
- 4- Chance of sudden rise of temperature is less.

17:2- Continuous supplementation of eggs:-

1400 eggs can be set in a cylinder with the capacity of 1050 in a gradual process in a month. How supplementation of eggs can be done? Given in the following table:

Date of supplementation of egg	No of eggs and batch No	In the incubation bed	In the hatching bed	Hatched
01-01-95	350(A)	300(A)		
07-01-95	350(B)	700(A+B)		
13-01-95	350(C)	1050(A+B+C)		
19-01-95	350(D)	1050(B+C+D)	350(A)	
25-01-95	350(E)	1050(C+D+E)	350(B)	350(A)

The capacity of this incubation cylinder is 1050 eggs. It is observed on the basis of above table that on 13-01-95, the cylinder is complete with capacity. But on 19-01-95 additional 350 eggs are possible to supplement because the 1st batch of eggs are transferred to hatching bed by 18-01-95 and this will be continued subsequently.

18 - Various problems of hatching, reason of problems and it's solution

Problems		Reasons		Solutions
Large number of eggs becoming unfertile	a	male to female ratio may not be alright	a	1:8 male to female ratio
	b	quarrelling during mating	b	avoid more mails
	c	old cock	c	put young cocks
	d	diseased birds	d	regular vaccination
	e	malnutrition	e	improve feeds
Bloody stain within the egg and death of embryo	a	much higher or lower temperature	a	keep always desired temp.
Death of embryo within the eggs	a	higher or lower temperature	a	control the temperature
	b	no regular turning	b	there should be regular turning of egg
Death of chicks during hatching	a	less moister	a	keep desired moisture condition
	b	less temperature	b	keep desired temperature
	c	situation of mal-nutrition in the flock	c	improve feed quality
Hatching of chicks before the scheduled time	a	higher temperature	a	desired temp. has to be maintained
Attachment of chicks in shell	a	less temp.	a	"
	b	drying of eggs to a great extent	b	temp.& moisture has to be maintained
Weak chicken	a	situation of higher temp.	a	"
Defective chicks	a	higher or lower temp.	b	"
	b	no regular turning	b	turn eggs regularly
Smaller chicks	a	small size egg setting	a	set desired sized eggs
	b	situation of less moisture	b	keep desired moisture

The naval condition of chicks is defective	a	higher low temp. and moisture	a	keep desired temp. and moisture
Uniform hatching is not there	a	egg with different age set	a	set eggs with 2-3 days of age
Chicks with no eye	a	higher temperature	a	control the temp.

19- What factors influence on the hatching of eggs:-

19:1- Reasons for influencing on the hatching of eggs.

There are many factors which influence on the hatching of eggs eg.

- a) Ratio of male to female poultry in the flock
- b) Age of male and female birds in the flock
- c) Feed condition in the farm
- d) disease condition
- e) desired temperature
- f) desired moisture
- g) desired turning
- h) careless use of kerosene
- i) careless transporting of eggs
- j) careless in preservation of eggs
- k) use of dirty eggs
- l) initially, over heating of egg
- m) use of much older eggs

19:2- How to increase hatchability percentage of eggs

If more care is taken during the operation of hatchery, the hatchability percentage of eggs can be increased and more chicks may be available.

- a) Through maintaining the ratio of male to female
- b) feeding condition of the flock
- c) disease free flock
- d) careful transport of egg
- e) maintaining desired temperature and moisture through out hatching etc.

19:3 - How to take account of hatchability

$$\text{Hatchability percentage (\%)} = \frac{\text{No of hatched chicks}}{\text{Total fertile eggs}}$$

Example:- If 500 eggs are set in a hatchery and there appears 20 infertile eggs in 1st candling then the hatchability will depend upon 480 eggs. When out of the 480 eggs, 450 chicks hatched out, the percentage of hatchability will be 93.75%.

20. Expenditure involved in different items while hatching chicks in the hatchery:-

The expenditure may be divided in to two, as permanent and recurrent expenditure.

*** Permanent expenditure**

- a) Room
- b) Incubation box
- c) Hatching bed
- d) Cylinder
- e) Cloth/pillow
- f) Husk
- g) Hurricane/stove
- h) Torchlight/strainer
- i) Repairing

*** Recurrent expenditure**

- a) Purchase of eggs
- b) Kerosene
- c) Thermometer
- d) Savlon/soap
- e) Battery for torch light
- f) marker pencil
- g) Chimney for hurricane
- h) labour charge/transport cost etc

21:- How to minimize the expenditure:-

If the operational cost of the hatchery can be minimized, the production cost of chicks will be less and the profit margin will be more. If the daily expenditure can be minimized, the operational cost also reduced.

- a) If the egg collection can be done by the operator other than through labour (middle men).
- b) Careful turning of eggs so that no breakage is there
- c) using sunlight to heat the egg to cut the cost of kerosene
- d) careful use of everything as per necessity.

22:- What is the use of keeping register (note book) in the room:-

- a) To keep accounts of income and expenditure
- b) To keep all information about the number of eggs, date of setting eggs, probable date of hatching etc.

23:- What factors influence on the profitable operation of hatchery:-

The following factors influence the profitable operation of the hatchery:-

- a) Efficient use of fuel and labour
- b) Hatchability Advertisement
- c) Nearby source of egg
- d) Production of strong and healthy chicks
- e) Number of eggs set in the cylinder
- f) Long term planning of hatchery
- g)
- h) Facilities for marketing
- i) To have good communication

end