Determination of Storage Loss in Rice with Respect to Moisture Loss in FCI

D .Deviga
Department of the Computer Applications
Sri Sairam Engineering College, West Tambaram, Chennai

J. Vijayalakshmi
Department of the Computer Applications
Sri Sairam Engineering College, West Tambaram, Chennai

A. Abdul Rahman
Department of Mechanical engineering
Sri Sairam Engineering College, West Tambaram, Chennai.

Abstract - The wastage of food materials is one of the biggest problems at the food storage depot of the food corporation of India .A methodology is developed in this project to prevent the wastage of food grains that has been stored at the godowns of the food storage depot of the FCI .This storage loss of food grains has been found hugely caused due to the change in moisture content of the food grains . Traditionally the storage loss has been determined manually by the people in charge however presently a quick method has been developed with an computerized solution. This methodology has been useful in predicting the storage loss due to moisture.

Key Words: Computerized methodology, Storage loss.

I. INTRODUCTION

Rice is being procured from within Tamil Nadu state and also from other states in India and are being stored in the Food Storage Depot (FSD) by Food Corporation of India (FCI). At present about 32 lakh tones of rice is stored and main storage depot are in Egmore, Chennai.

It is reported that there is a considerable loss in storage of rice particularly with reference to boiled rice. The storage period varies up to 3 months depending upon the delivery period of rice stock through central warehouse of districts to ration shops. During the storage various factors have been considered which are responsible for loss of rice during storage. The study has become an important factor to prevent storage loss of rice in the food storage depot.

The factors such as temperature, humidity, moisture and other factors such as the length-width ratio, chalkies value, broken grains, and fragment grains have been considered for study. Damaged grains, discolored grains, Based upon these factors the moisture content of the stored rice are calculated and the loss is determined. There is a need to find out the exact moisture content responsible for loss of weight in rice which is calculated and algorithm is used to measure and compared with the accepted standards.

II. LITERATURE SURVEY

2.1 Goals of rice storage

According to James F. Thompson, Good storage practices prevent rice quality loss by:
1) Keeping rice below a moisture which corresponds to a 65% equilibrium relative humidity,
2) Keeping rice temperature within 10° F of the average monthly air temperature and below 60°F as long as possible during the year,
3) Designing and operating aeration system to maintain uniform rice moisture and temperature,
4) Storing only well cleaned rice.
Fungi (mold) growth is minimal below 65% relative humidity and bacteria growth is minimal at even higher relative humidities.
Table 1 shows the safe long-term storage moisture for rice. It is based on equilibrium moisture data.

Table1 Rice moisture and temperature for safe, long-term storage.

Temperature (°F)	Moisture (% w. b.)
40	14.0
60	13.0
80	12.5

Rice can be stored above this moisture content, but the risk of noticeable mold growth increases as moisture, storage time, and rice temperature increase.

2.2 Role of moisture content in Rice:

2.2.1 Moisture Content:

Moisture content (MC) is the weight of water contained in rice expressed in percent. MC is usually referred to the wet basis meaning the total weight of the grain including the water (MC_{wb}). For research moisture content referred to the dry matter of the grain is sometimes used (MC_{db}).

2.2.2 Important of measuring moisture content:

Accurate moisture content testing is important in managing and marketing paddy and rice. Inaccurate tests lead to:

- Extra drying cost and harvesting loss if paddy is harvested wetter than necessary.
- Spoilage if the grain is too wet in storage.
- Extra drying cost and loss of quality if paddy is dried too far.
- Lower head rice when milled at wrong MC.
- Weight loss (loss in profit) if grain is sold too dry.

The optimum grain MC depends on the desired storage duration

MC (%)	Purpose
<9	Storage for more than 1 year
9-13	8-12 month storage
14	to attain optimum milling
14	not safe for storage

Figure-1: The IRRI Moisture Meter was developed to get a quick assessment of the moisture content anytime, anywhere.

2.2.3 Moisture migration during storage

Rice in storage is subject to moisture migration caused by differences in grain temperature. This is particularly true for grain stored in metal bins. Figure 2 shows likely locations of wet spots. In the late fall and early winter, stored rice tends to be warmer than the outside air. Warm air rises slowly out of the center rice, when this air contacts cold rice on the top of the bin it cools and increases in relative humidity and causes the top rice to gain moisture. Sometimes the temperature differences are great enough to cause condensation on the top rice. Air and rice close to cold walls or floors also cool. The air increases in humidity causing the rice closest to the cold metal to sometimes gain enough moisture to cause spoilage.

2.2.4 Moisture meter

Moisture meters are used to measure the percentage of water in a given substance. This information is used to determine if the material is ready for use, unexpectedly wet or dry, or otherwise in need of further inspection.

Figure-3: Indosaw digital moisture meter.

Figure-4: Hot air oven (moisture meter)

III. PROPOSED SYSTEM

3.1 Market survey

About 6 lakhs tons of rice is procured from within Tamil Nadu and about 28 lakhs tons of rice is being collected and stored in food storage depot (FSD) in Egmore, Chennai. Since the storage is done separately in food storage depot under FCI it is decided to take samples during different period of the season and arrival of rice from different places. A comparison will be made to arrive at the inference. Hence, the market survey in the godowns of FCI and warehouse corporations with in Tamil Nadu are made on the application of the technique developed in the present project.

3.2 Innovation / Innovative idea

It has been noted that the rice stored in food corporation of India's has been obtained at an optimum moisture level of 13.5 % to 14 % which is the accepted level of moisture content in rice as suggested by the Government of India. The rice that has been procured at this level is stored at the food depot of FCI. The rice that has been stored at that moisture level is subjected to change due to various reasons which in turn affect the weight of the rice stored and in turn it reduces the weight. Over the past few decades this storage loss has been affecting the rice distribution and it should be avoided. This storage loss could be predicted in advance with the expected loss of moisture content in rice. Based on the historical data obtained from the FCI it seems that for a particular change in moisture level in rice there is a particular amount of storage loss could be expected. This prediction of storage loss has been computerized in this project proposal.

IV. SYSTEM ARCHITECTURE

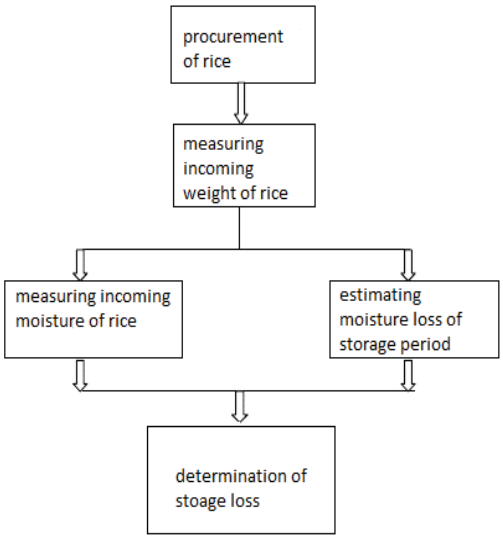

Figure-5: System Architecture

V. EXPERIMENT AND RESULT

5.1 Calculating moisture content from wet weight and dry weight:

Moisture Content of grains is usually determined on wet basis (wb), scientists sometimes use dry basis (db).

MC_{wb}=((IW-FW)/IW)*100

MC_{db}=((IW-FW)/FW)*100

MC_{wb} = Moisture content wet basis [%]

MC_{db} = Moisture content dry basis [%]

W_i = Initial weight

W_r = Final weight

5.2 MOISTURE LOSS

- ML = Initial moisture –Final moisture loss

5.3 WEIGHT LOSS

- WL = Initial weight – final weight

5.4 METHOD FOR MOISTURE LOSS CALCULATION

Step 1:

Q= ((sum of moisture loss / N) /0.1)

Step 2:

X= (sum of storage period) / N

Step 3:

Average moisture loss = X / Q

VI. SYSTEM IMPLEMENTATION

6.1Moisture loss

```
Private Sub Button8_Click (sender As
Object, e As EventArgs) Handles
Button8.Click

    MOISTURELOSS.Text =
STORAGEPERIOD.Text / 15 * 0.1

    MsgBox ("MOISTURE LOSS
CALCULATED")

    OUTGOINGMOISTURE.Text =
INCOMINGMOISTURE.Text -
MOISTURELOSS.Text

    MsgBox ("FINAL MOISTURE
CALCULATED")

End Sub
```

VII. EXPECTED OUTPUT

7.1 Incoming data

Figure-6: Incoming data

7.2Historical data

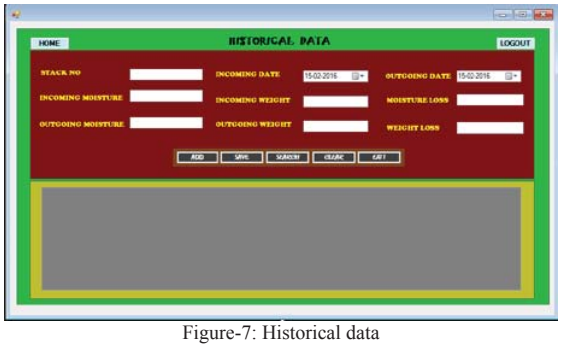

Figure-7: Historical data

VIII. CONCLUSION

The factors such as temperature ,humidity ,moisture and other factors such as the length –width ratio ,chalkies value ,broken grains ,fragment grains have been considered for study .Based upon these factors the moisture content of the stored rice was calculated and the loss has been determined .There is a need to find out the exact moisture content responsible for loss of weight in rice which is calculated and algorithm is used to measure and compared with the accepted standards.

8.1 Future scope and development

The proposed system is used to determine the storage loss that happens in rice storage depot of food corporation of India (FCI).System predicts the future moisture loss that could be cause the storage loss on the rice but it could be enhanced in the future in order to determine the storage loss that could happen in various food grains such as wheat, barley ,grams and other food grains that could be stored at food storage depot of the FCI .The system could be enhanced for various food materials by making the modifications mathematical computation that has been used to predict the storage loss.

IX. SITE EXPLORING

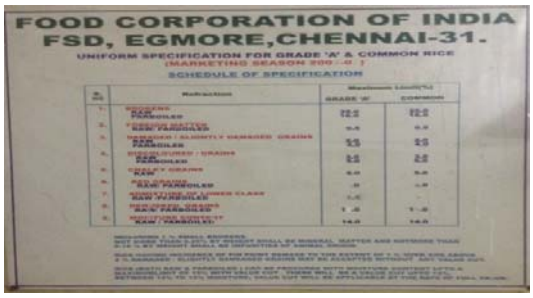

Figure-9: The parameters that have been recorded for boiled rice during the study.

Figure-10: Study team exploring rice stacks at Food Corporation of India

REFERENCES

[1] Siebenmorgen T.J., 1994, Role of moisture content in affecting head rice yield, in Marshal W.E. and Wadsworth, J.I. Rice Science and Technology, Marcel Dekker, Inc., NY, 470p.

[2] T. G. VAN NIEL*, T. R. McVICAR., Calculating environmental moisture for per-field discrimination of rice crops., CSIRO Land and Water, PO Box 1666, Canberra, ACT 2601, Australia.

[3] Shakeel Hussain Chattha1, Che Man Hasfalina2, Muhammad Razif Mahadi2, Benish Nawaz Mirani3 and Teang Shui Lee2., QUALITY CHANGE OF WHEAT GRAIN DURING STORAGE IN A FERROCEMENT BIN.

[4] AS/NZS (1995). Australian Standard/New Zealand Standard 2895.1:1995: Performance of household electrical appliances - Microwave ovens, Part 1: Methods for measuring the performance Ang A. H-S & Tang, W.H. (1975). Probability Concepts in Engineering Planning and Design, Volume 1 Basic Principles. John Wiley & Sons. of microwave ovens for household