# A New Technique of Quality Analysis for Rice Grading for Agmark Standards

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***Abstract—The quality inspection method of rice grain which is followed by Agmark is based on manual inspection by the assigned inspectors which proves to be an improper way and outcomes that results are inaccurate. A digital inspection method for Agmark Standards for quality assessment of rice is required. So this paper proposes a digital method which can be used to evaluate the quality of rice for the present Agmark Standards. The proposed method is formulated with the help of digital image processing technique on MATLAB. In this paper three parameters; Broken Grain , Foreign Particle and Admixture of Agmark Standards are converted to digital form for digital quality inspection of rice. The outcomes of inspection of the samples studied, showed that our model was an effective way for digital inspection of Agmark Standards.***

***Index Terms— AGMARK, Binarization, Grayscale ,MATLAB, Region Props.***

## I. INTRODUCTION

Rice is the most important and widely grown food crop in the world..It is the staple food of more than 65 percent of the world population .Rice is mainly produced and consumed in the Asian region. India has the largest area under rice in the world and ranks second in the production after china. It has also emerged as a major rice consumer. Rice is primarily a high energy calorie food. The major content of rice consists of carbohydrate in the form of starch, which is about 72-75 percent of the total grain composition. In India to overcome the need of ever-increasing population it is necessary to make advancement in agricultural sector. Due to automation need of high quality and safety standards achieved with accurate, fast and cost effective quality determination of agricultural goods. Quality check is of great importance in the Grain industry because after harvesting, based on quality parameter a grain product has been sorted and graded according to the standards.

AGMARK is a set of Standard Guidelines establish by Food & Drug Department where by all food products which are listed under Agmark Division should comply with the benchmarks stated for their production & packaging etc. Agmark is an acronym for Agricultural Marketing. This organization used to approve the food products for their quality. This has been dominated by other quality standards including the non manufacturing standard ISO 9000. Food and Drug Administration FDA also approves certain quality standards for food items.

The entire system of Agmark, including the name was created by Archibald Macdonald Livingstone, Agricultural and Marketing Advisor to the Government of India, from 1934 to 1941. He was supported by a staff of several hundred. The system was designed to benefit local farmers throughout India who were, in the absence of a certification as to quality, exposed to receiving less for their produce from traders than its true worth. The Agmark certification is employed through completely state-owned Agmark laboratories present across the nation which act as testing and certifying centres. In addition to the Central AGMARK Laboratory (CAL) in Nagpur, there are Regional AGMARK Laboratories in 10 nodal cities (Mumbai, New Delhi, Chennai, Kolkata, Kanpur, Kochi, Guntur, Amritsar, Bhopal).Each of the regional laboratories is equipped with and specializes in the testing of products of regional significance. Hence the product range that could be tested varies across the centre laboratories. The testing done across these laboratories include chemical analysis, microbiological analysis, pesticide residue, and aflatoxin analysis on spices, ground spices, ghee, butter, vegetable oils, mustard oil, honey, food grains(wheat), wheat products, gram flour, soya bean seed, ginger, oil cake, essential oil, oils and fats, animal casings, meat and food products.

Image Processing is widely used in biological and agricultural research with the improvement of Digital technology and significant reduction of the cost of hardware and software of digital imaging. There are many researches applied machine visions to estimate rice quality inspection. The objective of this research is to propose a Machine Vision System for AGMARK which would help in identify the grains and foreign matter according to their Area, Perimeter and Major Axis Length from the rice sample images.

## II. PROBLEM IDENTIFICATION

The present rice quality inspection method is affected by various factors which degrades the rice quality.

1. Adulteration: Some fraudulent traders unethically release sub-standards products to the consumer market. Because of such practices there are so many inferior quality grains arriving to the market. These grains consist of several impurities like stones, dust broken granules etc.
2. Accuracy: It is necessary to have the accurate information of rice appearance quality. Rice is evaluated with length, thickness, and the ratio of length and thickness of rice grains. At present, the length and thickness of rice grains are usually measured by an inspector using a ruler or caliper.

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3. Security for food: People are much aware as compared with earlier times about the necessity of high quality of food products to remain healthy. High degree of accuracy in food adulteration is required to satisfy customer demands these days.

## III. AGMARK STANDARDIZATION FOR RICE

1. Foreign Matter: It includes dust, stones, lumps of earth, chaff, stem or straw and any other impurity.
2. Broken: Brokens shall include pieces of kernel, which are less than ¾ of a whole.
3. Admixture: The Presence of inferior quality grains in the sample.

## IV. PROPOSED TECHNIQUE FOR RICE GRAIN ANALYSIS

1. Foreign Matter: It will be detected if the area of the grain will lie under the given the range. A>(1/3)Max.A, where A is the Area of object in the image and Max. A is the Maximum Area of the object in the image.
2. Broken: It will be detected if the Major Axis Length of the grain will lie under the given range.(1/3)Max.MA>MA>(3/4)Max.MA, where MA is the Major Axis Length of the object and Max.MA is the Maximum Major Axis Length of the object.
3. Admixture: It will be detected if the Perimeter of the grain will lie under the given range.(1/3)Max.P<P<(3/4)Max. P, where P is the Perimeter of object in the image and Max. P is the Maximum Perimeter of the grain.

## V. METHODOLOGY

1. Take a high quality image of basmati rice sample with the help of high quality camera \ scanner. A black sheet was used which gives the black background to the image which helps in parameter extraction from the image.
2. Input the image into the system. The interface between the Camera/scanner and PC is provided through USB Cable.
3. Now covert the High Quality Image into Grayscale Image (Figure 1).
4. Image was pre processed by removing the background and adjusting the contrast of the image. Most of these operations compute result based on weighted sum of a pixel value and its neighbors values (Figure 2). .
5. The binarization process converts the grayscale image into two values 0and 1. In general, these values are zero and the maximum value in the image (Figure 3). .
6. Values of various Morphological parameters of sample grain are extracted with the help of Region Props.
7. Repeat above steps for different samples.

## VI. RESULTS AND DISSCUSSION

All 5 samples were scanned or captured to create the image to obtain all the required parameters. After getting these parameters, Rice grains were classified into different categories and proposed Agmark standards were evaluated to get the results as shown in Table 1. In the Table 1, we can see various characteristics parameters observed for all 5 rice samples are given. The Table shows the grains and foreign matters detected and also which are actually present in the sample are represented in the bracket.


Figure 1


Figure 2


Figure 3

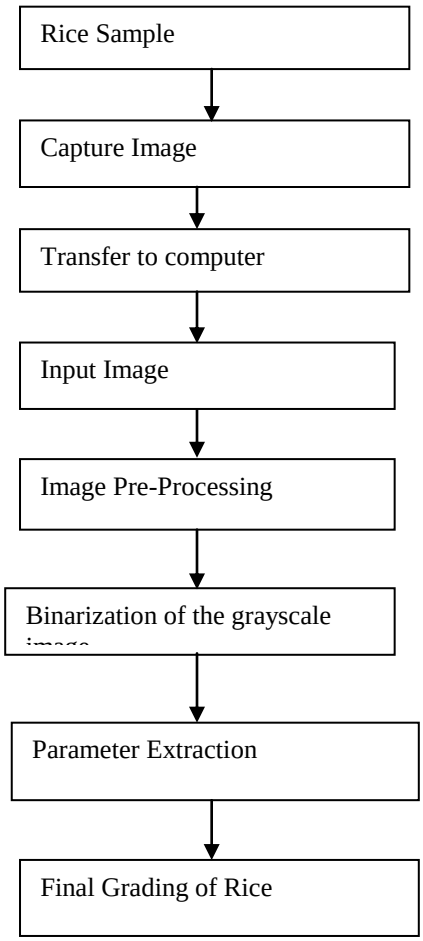


**Table 1**

| Sample no | Total grain (Present) | Broken Grain | Foreign Particle(Present) | Admixture (Present) | Percentage Error |
|---|---|---|---|---|---|
| 1 | 23(21) | 13 | 3(1) | 4(3) | 8.69 |
| 2 | 18(18) | 3 | 2(2) | 3(2) | 0 |
| 3 | 27(25) | 4 | 3(3) | 5(5) | 7.4 |
| 4 | 20(20) | 6 | 1(1) | 5(5) | 0 |
| 5 | 19(18) | 5 | 1(0) | 5(4) | 5.5 |

**Table 2**

| Sample No | Broken % | Foreign Particle % | Admixture % |
|---|---|---|---|
| 1 | 56.62 | 13.04 | 17.39 |

| | | | |
|---|---|---|---|
| 2 | 16.66 | 11.11 | 16.66 |
| 3 | 14.81 | 11.11 | 18.51 |
| 4 | 30 | 5 | 25 |
| 5 | 26.31 | 5.26 | 26.31 |

Table 2 gives the Agmark Standards in percentage by number and based on these values a histogram for the Agmark Standards which shows variations in different samples taken.

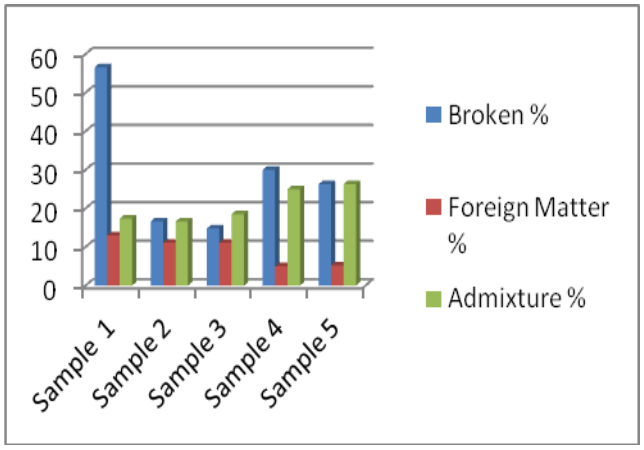


**Figure 4.**

## VII. CONCLUSION

A digital system for Agmark Standardization of Rice has been proposed on the basis of machine vision. We used Image Processing Toolbox of MATLAB for grading of rice grains. The paper illustrates a new method, which is non-destructive for quality evaluation. With proper use of commands and tools, we can design a low cost detector which helps in extracting the morphological features of grains like area, perimeter and length etc of an object. The Machine System designed was found to classify the grains with an accuracy of over 90% at a nominal cost.

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