A Review on Present Scenario of Tobacco Farming: Sorting, Grading and Baling.

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Abstract : In today's world of technology, much advancement is being done in various fields of science. However, the most important sector to be enhanced is agriculture. Tobacco plays important role in agriculture industry. Since ancient times the grading and sorting of the tobacco was performed manually. The automated technology is better substitute in place of human at many places in agriculture sector. However, the different requirements and recent developments of hardware and software for semi-automatic system are discussed. The technologies developed for sorting, grading and baling process in tobacco farming are briefly reviewed.

Keywords **- Sorting, Grading, Quality, Tobacco, Automation, Bale.**

I).INTRODUCTION

I.I History of Tobacco

Tobacco was brought to India by the Portugal people in the 17 th century. when they landed on the Indian Shores. Initially the tobacco was introduced to the maharajas during their rule and soon was spread to the commoners where it found a flavor. In a very short time Tobacco became a very valuable crop for barter trade, tobacco was used for purchasing textile by Portuguese sailors. The taste of tobacco leaves was first accepted by the royals of India and was soon spread to the local people in ancient time. Also there is another story of tobacco travelling to Indians from their famously named American cousins, through European merchants who sailed the Arabian seas and travelled every continents in search of new markets and colonies.

After the arrival of British people to India, the production and growth of the tobacco was at the peak. At first the British people brought American tobacco to Indian market and after they financed the farmers and supported their commodities for the growth of the leaf. After the independence of American colony the tobacco plant was grown as a valuable cash crop by the East India Company. Many research and attempts were made for increasing and expanding the growth of tobacco plant in India. The British East India Company used tobacco for domestic consumption and foreign trade from India. They never started manufacturing industry in India during ancient time. Because they believe in exporting the leaves of tobacco and importing cigarettes from Britain after adding high value in addition process.

As the overall usage of cigarettes rised, the tobacco company started the production within India, retaining its control over demand and and making profit over it.

In the end of 19th century, the beedi industry was started in India. The oldest beedi manufacturing industry was started in 1887 and in 1930 the industry was spread wide across the country. The taxes policies which were adopted by the government of India after independence too favored the beedi in comparison to cigarettes. This further leads in growth of beedi consumption over cigarettes. [3]

At present in India, Gross Value Added (GVA) for Services sector is 92.26 lakh crore INR in 2018-19. In which Services sector was 54.40% of total India's GVA of 169.61 lakh crore Indian rupees. Where as in sector wise Indian GDP composition in 2017

states contribution the Agriculture was at 15.4%, Industry was at 23% and Services was at 61.5%.[1] Tobacco is the most important high value cash crops grown. It is grown in an area of 0.45 million hectares in 15 different states of the India. India is second in production and export of tobacco leaves in the world. Tobacco cultivation provides employment directly and indirectly to 45.7 million people and contributed nearly Rs.22,737 crore as excise duty and Rs.5,975 crore Rupees of foreign exchange, during 2016-17.[2]

I.II Economic History of Tobacco Production in the world.

Tobacco occupies an important place in the Indian economy. It has a large contribution to agriculture, industrial and export sector. In the world India stands second in production of tobacco. Where, China is first and USA stands third, where in terms of tobacco cultivation Brazil, Turkey, Zimbabwe, Malawi, Italy and Greece are the other major tobacco cultivating countries. In 2000-2001, the contribution of tobacco to the Indian economy was Rs 81,820 million, which accounted for about 12% of the total excise collections.[3]

With the advantage of the agriculture climate and other parameters lie fertile soil, rainfall and sunlight, india has potential to grow and produce different varieties of tobacco. Figure 2.3 shows the locations and variety of tobacco grown in different Indian states. Around 65% of India's total production is from Andhra Pradesh, Gujarat and Karnataka. Tobacco production is also practiced in Orissa, Uttar Pradesh and West Bengal. Andhra Pradesh, Gujarat, Karnataka and Uttar Pradesh together account for over 90% of the total tobacco production in India. Currently, Indian tobacco is exporting tobacco to 80+ countries which are spread over all the continents.[3]

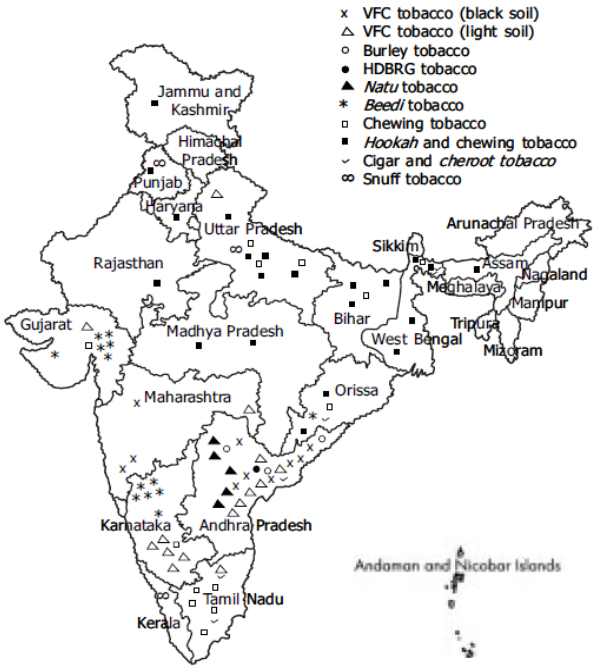

Fig: 1: The Tobacco map of India (Note: map not to scale)[3].

Tobacco production is very important source of income for Indian farmers. In general, if we stop tobacco production, it would result in low income and food security for a considerable large numbers of Indian farmers.

The tobacco production has created employment for 35 to40 lakh people in different processes like harvesting, grading, processing, transportation. It is estimated that almost ten lakh people are engaged in trading tobacco. Tobacco industries have many different constraints in its development and growth. [4]

Current scenerio of leading countries in tobacco production in 2016 by satista.

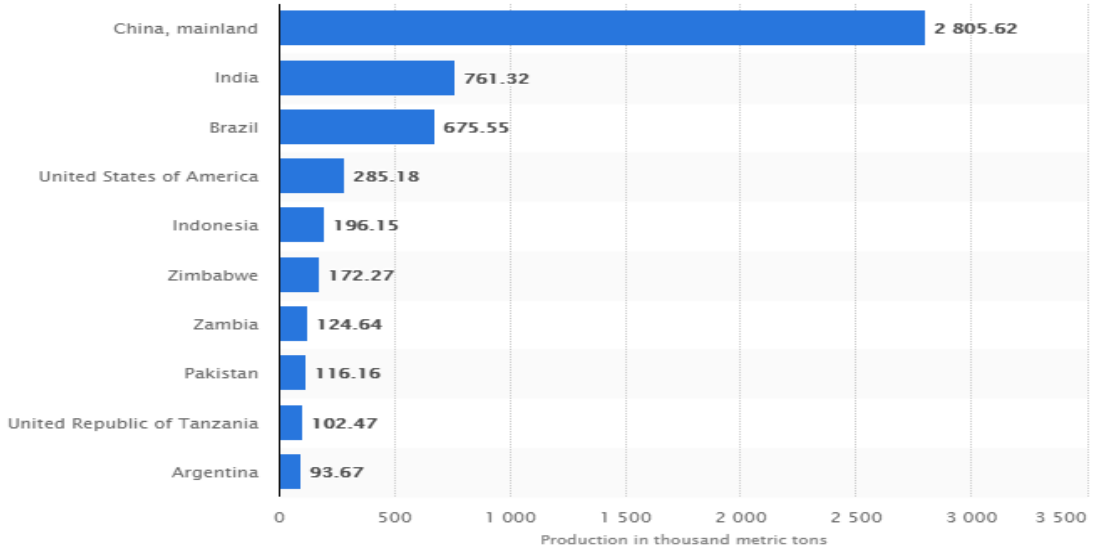

Fig:2: Leading Countries in Tobacco Production.(5)

Apart from increasing productivity of tobacco improving of quality of it is also important. Harvesting the leaf at the right time, better curing and bulking methods would help to improve the quality of tobacco leaf [4].

2. Different Stages for Farming of Tobacco.

Tobacco farming at farm level follows different steps like:

2.1). Crop Cultivation.

2.2). Harvesting.

2.3). Tobacco -curing.

2.4). Grading & stabilizing.

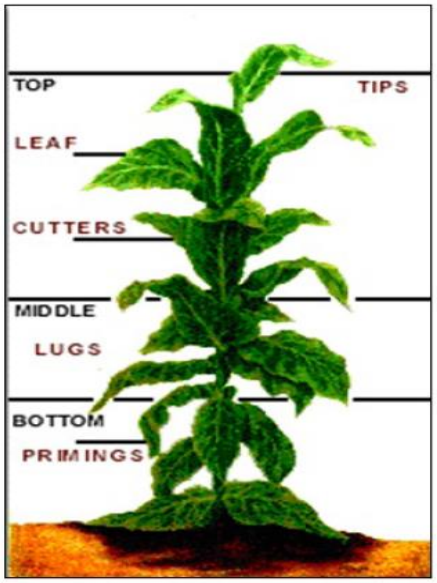

Fig:3: leaf types at different positions on tobacco.[6]

2.1: Crop Cultivation: The way of growing techniques for tobacco starts from sowing the seeds in the farms. Initially the seeds are grown in the half of the farm depending upon no of plants tissue culture required for growing in the farm. This process generally takes place in month of July and seeds take 1.5month approx to be ready for planting in the farm. The final sowing of the pants

begins in September generally after half of September tobacco plant takes 6 month from the date of growing to be getting ready. Time during this period of six months and fertilizers are also applied before every watering on the basis of the need of the crop. The various types of fertilizer used are DAP (Diammonium Phosphate), Urea, NPK (Nitrogen Phosphorous-Potassium) and sulphate. Fertilizers are used on the basis of need of the plant and current behavior of soil and the plant on environment and its growth.As shown in figure1.4 the many of the automatic planting machines are developed so that the planting of tobacco plant can be done automatically where, the spacing between the two plant can be maintained with the help of this automatic harvestor.

Weeding is done at regular intervals so that the unwanted crops can be removed and the crops can absorb the minerals fed to them through the fertilizers.

Budding is the process of removal of the tobacco flowers. The budding process is also known as “pilla”. Generally the flowering stage of tobacco comes in the month of October. Generally, the farmers here hire few labors and are manually removed by them

Fig:4:Automatic planting machine.

2.2: Harvesting: Harvesting of tobacco leaves are done in the month of February. The technique used for the harvesting is the whole plant harvest and leaf by leaf harvest. The harvesting of the tobacco is generally of two type i) a whole plant harvest ii) leaf by leaf harvest. In whole plant harvest all the leaves of the plant are harvested at once or the whole plant is removed from its root while in the leaf by leaf harvest the leaves of the plant are removed from bottom to top after a certain period or after actual ripening period of every leaf. Now a days many technologies have been developed to obtain the quality leaves from the tobacco plant the automatic harvestor was invented as shown in fig1.5. The harvestor is about to harvest the whole plant line by line in the farm. [7]

Fig:5: Automatic Harvesting Machine.[7]

2.3: Tobacco curing: In tobacco curing process the leaves of the tobacco are manually placed on the ground after harvesting. The total leaves are kept in the farm so that in the presence of sunlight the ripening of the leaves takes place even faster generally, the curing process can be made possible in three different ways which were: 1).sun-curing 2).fire-curing and 3).air-curing. All the different curing forms have theris different values. The curing process depends on different types of tobacco grown in the field.

2.4: Grading and stabilization: The tobacco is then graded by the farmers manually they sort the leaves of the tobacco on the basis of colour, shape, texture, size, and the moisture present in the leaf. Then it is made in the small bulks are made gathering the 30-35 leafs together and are placed forming a big pile. The bulks are tied to the one end with the help of strip or grass. The unwanted or irregular leaf is excluded from the bulks. The farmers and the labors here can make this step quiet easy by using a trainable or a semi-automatic tool for this grading and sorting process.

Hence, Quality inspection of tobacco leaves plays an important role in quality maintenance. The quality of tobacco leaves determine the quality of tobacco products.(4) In Gujarat charotar region is generally known as a land of golden leaves. Due to the practices of

growing tobacco in this area is higher than any else. The high quality tobacco is grown in this area. The process of growing tobacco varies from different state to state and country to country due to different climate and soil.

Charotar has mainly has the black soil which is very suitable for growing tobacco. And has some areas with light soil which also is very well known for growing different type of Tobacco.

Packages of tobacco wrapped in pile or hay are known as bales. The formation of the bale made manually by farmer is shown in figure6.

Fig:6 Bale of tobacco leaves.

Bales are generally prepared for sale of raw tobacco by the farmer, a good quality of bale higher the pricing.

The tobacco is generally brought to market through formation of bales. Where the quality leaves are formed in a small bulk and arranged in such a way as shown in figure 6

Fig:[7] preparation of bale manually.

The current manufacturing of bales of tobacco is done manually.[24] The automation can be implemented in sorting and grading process. Recent trends in grading and sorting of tobacco leaves are shown in literature review.

3. Literature survey:

Brief literature Review:

[1] Shen PAN et al: in the year 2009 investigated edge detecting technique for tobacco leaves images which were based on fuzzy morphology. In order to detect edge and texture information such as vein edge extraction in tobacco leaf images were used. The images were received by CCD cameras which were first processed by a membership function. A fuzzy algorithm was used to detect edge. Efficiency of morphology is proved by comparing the results.[8]

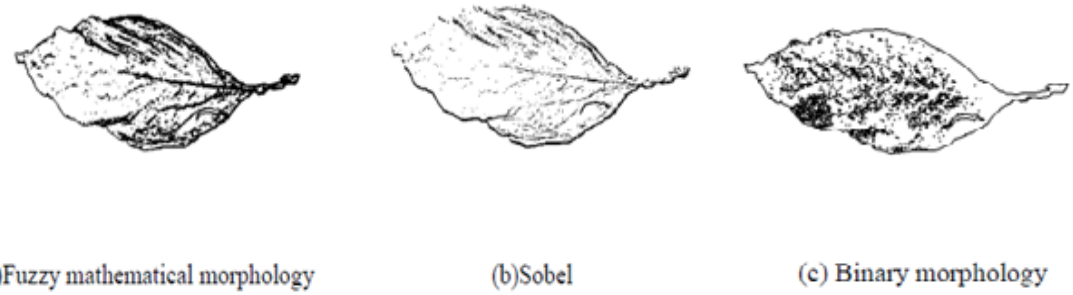

Fig: 8: Edge detection under noise free conditions.[8]

The results of edge detection which was based on Sobel and binary algorithm are compared with fuzzy mathematical morphology.[8]

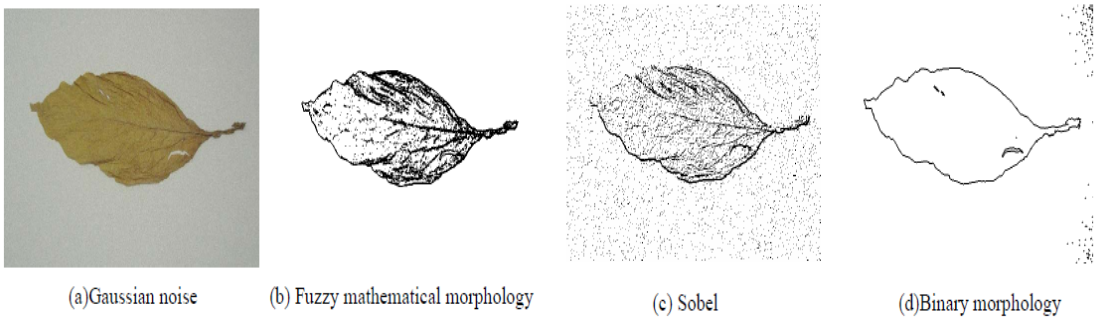

Fig: 9: Edge detection under noise conditions.[8]

[2] Fan Zhang et al: in the year 2011 proposed classification based on image processing and fuzzy evaluation. In this paper, classification of tobacco leaves based on the image processing and the fuzzy sets is reported. A grading system was developed for automatic inspection and grading[9].

This system uses technology of machine vision for analysis of colour, , shape and surface texture and size. The neural network was used to estimate and forecast the membership function[9].

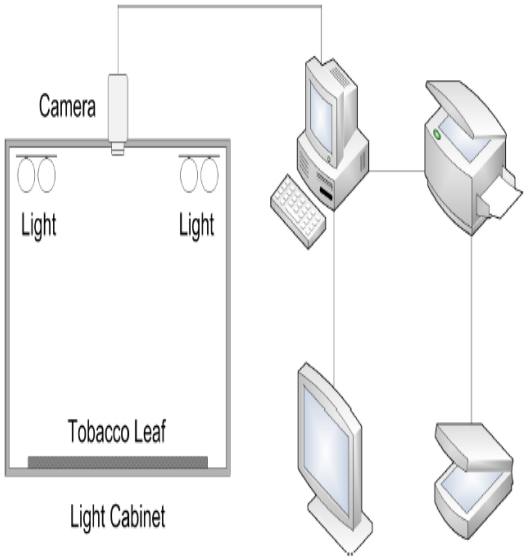

Fig: 10: tobacco leaves grading using the image processing system[9].

[3] Xinhong Zhang et al: in 2008 proposed a machine vision method for automatic inspection system of flue cured tobacco leaves. Machine vision techniques was used in this system to solve problems related to features and analysis of leaves[10]. Three different categories are identified, that is, lugs, cutters and leaf. Three different hue categories, lemon, orange and red-brown, are presented[10].

[4] J. Zang et al: in 1996 developed a technique based on image processing for inspection and grading of tobacco leaves. [11] A rectangular chamber was illuminated by two light bulbs. Leaves are laid upon a white board that had two purposes(1). To provide background for calculation of colour and (2).To enhances the colour between the background and tobacco leaf. As shown in figure below. For implementation of the algorithms Microsoft C 6.0 programming language was used [11]

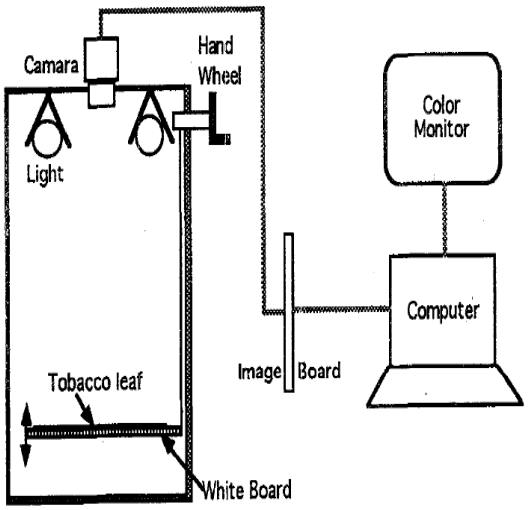

Fig: 11: Image processing system used in this study for tobacco leaf grading.[11]

[5] Adrie D. Dane et al: in 2001 described a feasibility of using calibration model for the determination of moisture in various types of tobacco. Calibration methods used are: (1). Multivariate linear regression,(2). Partial least square,(3). Polynomial PLS and (4).Multi-layer feed-forward artificial neural networks.

All software used was developed under Matlab 5.3.1[12].

[6] Yinhui Zhang et al: in 2011 presented a novel multiscale methodology for detecting the size of tobacco leaves using an automatic machine vision[13].

Fig: 12: A typical vibration grading sifter.[13]

A typical vibration grading sifter. The grading sifter has four layers, in which the holes have different sizes. Higher the layer, larger the holes. After vibrating a specific time, the tobacco leave are grouped into four classes, each of which has a specific range of sizes. [13]

[7] J. Ramprabhu et al: in 2014 presented a technique for sorting and grading of quality of fruit using Msp430 Controller. The design considers features which includes colour and size. Gaussian Mixture Model is used for background removal. Support

Vector Machine was used for colour classification. Existing method for background removal was based on histogram approach. The drawback is removed here using a pixel wise classification method.

[8] Garima Tripathi et al: in 2015 proposed an approach for detection and classification of plant leaf diseases using image processing and neural network. The colour was obtained by converting images from RGB to HSI. To divide images into clusters for demarcation of infected area of the leaves The K- means clustering algorithm was used[15].

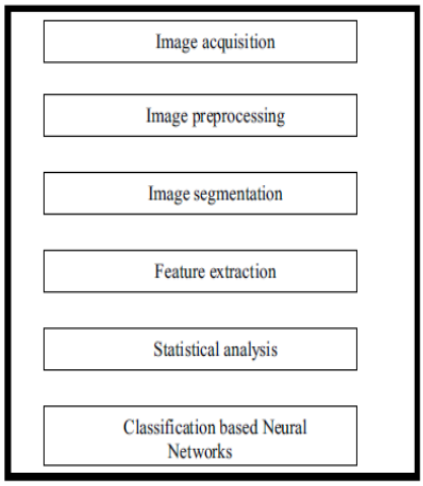

Fig: 13 The basic procedure of the proposed approach.[15]

[9] Shen Weizheng et al: in 2008 proposed a grading process of leaf spot diseases based on image processing. All influencing factors existed in the process of image segmentation was analyzed and leaf region was segmented by using Otsu method. Then disease spot regions were segmented by using Sobel operator to examine disease spot edges. Finally plant diseases are graded by calculating the quotient of disease spot and leaf areas. This method to grade plant leaf spot diseases is fast and accurate. [16]

[10] dheeb al bashish et al: in 2011 proposed different methods for classification of leaf using K-means segmentation and neural networks classification. The proposed method supports accurate and automatic detection of leaf diseases. Results shows models based on neural networks are effective while k-means clustering technique provides efficient results[17].

[11] D S Guru et al: in 2011 presented a model to grade tobacco leaves. Colour features are extracted. Munsell colour system was used. The inter-valued data stored in the knowledge represents the extraction feature. The proposed model had highly efficient compared to other existing models for tobacco leaves. Proposed model has average accuracy of about 91%.[18]

[12] Sanjeev S. Sannakki et al: in 2011 introduces an approach for automatically grade the disease on plant leaves using fuzzy logic. The results obtained with manual grading are accurate[19].

[13] Yud-Ren Chen et al: in 2002 discussed agricultural applications for machine vision technology. The recent developments are presented on multi-spectral and hyper-spectral imaging for food inspection[20].

[14] Jun Bin et al: in 2016 proposed multi class analysis of near infrared spectroscopy. A modified RF approach, named MC-UVE-RF was applied to classify different grades of tobacco NIR Spectral datasets. The method is promising tool for the solution of tobacco leaf grade classification problems.[21]

[15]Debabrata Samanta et al: in 2012 introduced the histogram approach for detection of damage in maize leaf. The histogram approach was also discussed by Gupta Mehul et al.[31] Image processing technology was used. At first, the captured images were processed for enhancement. Then image segmentation was carried out to get target regions. [22]

[16]Frogbrook et al: invented a baling machine for baled product. where baling machine was adopted to produce a a bale in form of mat rolled. Were an inlet for straw or other material to form the mat, a baling chamber was designed for progressively for accumulating a rolled bale.[27]

[17] Vedang chauhan et al: in 2011developed a machine vision system for part colour detection and Sorting. Working of this system is very simple. First, the product is kept on the conveyor belt. Then sensor detects the presence of the product and gives signal to the PLC. PLC sends this signal to the computer. Image processing software of the system will send the signal for capturing the image. Once image is captured, the software processes and generates signals according to requirement which in turn signals back to PLC. Accordingly the PLC will control the conveyer belt & robotic arm. Robotic arm will pick and place the given component with respect to the colour. If colour is not matched with a given parameter, the product shall be rejected. This cycle can be repeated number of times as per given requirement.[28]

[18] Saurin Seth et al: in 2010 developed a automation in sorting system using the technology of machine vision. The similar technique was also proposed by parikh et al. [30] In this system, colour based identification of the parts has been done and then it was sorted according to different colours. After recognizing the colour, robotic arm will automatic pick & place it. If the colour of the object is not matched it was rejected. The sorting system here operates on the MATLAB application using image processing.[29]

Finding from Literature review:

It is observed from the above literature review that the quality and grading is the important step in cultivation of tobacco. Several technologies are used in the grading of tobacco leaves which are image acquisition, machine vision and controllers etc. Thus, no studies have been found in forming the certain bales for the tobacco at farm level. A tobacco bale with precise quality and stable moisture can be sold at high price margin. The pricing in the tobacco is decided by the quality of leaf and other parameters like shape, size, colour and ability of the leaf to bend means the total moisture present in the leaf. Many times it is also priced by its smell. The current problem for the farmers is that labor required for the baling process. In actual this is only a process of arranging the leaf. But in other if the quality is not maintained it can spoil the whole bunch of tobacco. Till the date the process of sorting the leaves and making bales out of it was done manually but an automatic or semi automatic baling system combined with grading of leaves can help the farmers and merchant to provide the quality bales which cannot be made manually.

4. Conclusion & Future Scope.

The current automation made in various farming process of tobacco is reported. The grading and storing is an important part of tobacco cultivation. Tobaccos are presented to the merchants in form of bale. Technologies like machine vision and image processing are used in obtaining high quality images for grading. The grading of the leaf can be made possible by different parameters like size, shape, texture and colour. This current research demands the need of semi/fully automation of baling process. This in turn reduces the wastage and improves the overall quality of bale.

A semi-automatic or automatic grading machine can be developed which include the baling process of the tobacco. The various methods can be used for baling of the tobacco like hydraulic press pneumatic press or any special mechanism through which the piles of tobacco can be pressed to certain pressure and perfect bale can be formed.

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