CHAPTER I

INTRODUCTION

1.1 General

Rice processing is the most important food industry in India where it is estimated that there are over 81,000 rice mills of different types. During 1970-71, about 42 million tonnes of rice were produced from the annual output of 64 million tonnes of paddy in traditional rice mills where the average recovery is 65.6 per cent. There is an estimated loss of 8 to 10 per cent of the yield involved in the various operations, namely, poor harvesting, age-old processes of sun-drying, storage, transport and marketing (41). These reveal why India has to import about 2 million tonnes of rice every year.

By adopting modern means of processing alone, we would be able to produce about 3 to 4 million tonnes of rice more every year from the present production of paddy (41). An increase in the production of paddy does not necessarily lead to a corresponding increase in the quality and quantity of rice. It is the improved post-harvest operations of paddy processing that can ensure extra yield. There is at present an increasing tendency towards harvesting of paddy at a relatively high moisture content to guard against losses arising from shattering and lodging. For instance, if IR-8 paddy were harvested at 18 per cent moisture content rather than at 23 per cent there would

be a shattering loss of about 22 per cent. There are many comparatively new strains including high-yielding varieties like IR-8, which are non photo-sensitive. While this facilitates multi-cropping throughout the year, it may necessitate harvesting in the rainy season when sundrying cannot be resorted to (14). For instance, Kuruvai paddy in Tamil Nadu (India) is harvested in the rainy season, thereby posing a great problem of drying. The problem is more acute in Assam, Andhra Pradesh and coastal regions in India in that the rainy season and harvesting time coincide. Several research workers of India have claimed that the paddy harvested at high moisture content can be stored after treatment with certain chemicals like common salt. However, its commercial success has yet to be established.

From what has been stated in the foregoing paragraphs, it appears that the only practical means to be adopted for safe preservation of freshly harvested paddy is mechanical drying. The usefulness of modern techniques in drying practice is now being realised in India and this explains why during the past few years about 150 mechanical dryers, mostly of L.S.U. type, have been installed. It is common knowledge that drying is one of the costly phases in rice processing. In order to take full advantage of the production of high yielding varieties and minimise the cost of processing, post-harvest processing steps of drying should be thoroughly investigated as a matter of extreme national importance.

Important factors which cause checks and cracks in rice and influence the drying process are:

i) Air temperature, ii) Exposure time, iii) Air velocity, iv) Relative humidity of air, v) Saturation deficit, vi) Preheat treatment of paddy, vii) Tempering time and method, viii) Depth of the paddy bed, ix) Amount of mixing and type of equipment, x) Initial moisture content of paddy (harvest moisture content), xi) Final moisture content of dried paddy, and xii) Variety and size of the grain.

Of these, however, the drying process variables, viz., air temperature and exposure time are found to be most significant and have, therefore, been taken into consideration for the present study. The final moisture content of dried paddy is another important factor that has also been taken into account in this study.

Air velocity, tempering time and method, initial moisture content of each variety of paddy, thickness of the paddy bed are kept constant throughout the experiment. Day-to-day variation in average humidities of ambient air during a certain period of time in a particular season was observed to be small and was taken as constant.

1.2 Research Need

The entire quantity of paddy produced in India is processed either into raw or parboiled rice. In either case drying of

paddy has to be done before storage or processing operation. Paddy is dried either in open yard in the form of thin layer or through mechanical-flow-driers. Essentially, the latter method is based upon the principles of thin layer drying. Hence the study of thin layer drying is quite relevant in the context of rice processing in India. Although several attempts have been made to find out optimum conditions for drying of paddy, the results obtained are limited to a certain range of air velocities. Owing to lack of information on artificial drying of paddy grown in India, the dryer operators and design engineers are handicapped for lack of proper guidance. There is a great dearth of basic information pertaining to the effects of intermittent drying on drying characteristics of paddy. Urgent need for such information has been strongly felt. No mathematical expression relating total drying time to air temperature and exposure time has been worked out as yet for paddy varieties grown in India.

1.3 Objectives

The main objectives of this study are, therefore, to investigate into:

1) the effects of various drying air temperatures and exposure time on total drying time and milling quality of paddy;

ii) the effects of milling paddy at low moisture levels on milling quality of paddy;

iii) the effects of intermittent drying on drying characteristics of paddy; and

iv) derivation of various mathematical expressions relating total drying time to air temperature and exposure time.

Besides statistical method of curve fitting, a new approach has also been adopted to find out a simple mathematical relationship expressing total drying time as a function of air temperature and exposure time. The procedures and results of this research may serve as a model for similar research under different conditions for drying of paddy grown in India so that mechanical drying can be introduced on a scientific basis.