Ministry of Food Processing Industries
Government of India

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Reading Manual for Wheat Flour

Under PMFME Scheme

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Abbreviations & Acronyms

Sr:No.	Abbreviations &Acronyms	Full Forms
1.	FAO	Food and Agriculture Organization
2.	Kcal	kilocalorie
3.	APEDA	Agricultural and Processed Food Products Export Development Authority
4.	PET	Polyesters
5.	PA	Polyamide
6.	WVTR	Water Vapour transmission rate
7.	FSSAI	Food Safety and Standards Authority of India
8.	FBO	Food Business Operator
9.	FLRS	Food Licensing and Registration System
10.	PFA	Prevention of Food Adulteration
11.	MoFPI	Ministry of Food Processing Industries
12.	FPOs	Farmer Producer Organizations
13.	SHGs	Self Help Groups

CHAPTER 1
INTRODUCTION

1.1.Industrial Overview:

Cereal Grains

Tiny, hard and edible dry seeds that grow on grass-like plants called cereals are cereal grains (or simply grains). In most nations, they are a staple food and have more food power worldwide than any other food category, by far. In human history, grains have played a major role, and grain agriculture is one of the key developments that fuelled civilization's growth.They are consumed by people, and they are also used for feeding and fattening animals. It is then possible to transform grains into many different food items.

Cereals are an essential component of the human diet and are an important source of starch and other dietary carbohydrates (dietary fiber) that play an important role in human consumption of energy and nutrients.

A whole grain consists of 3 main parts:

- Bran: The hard, outer layer of the grain. It contains fibre, minerals and antioxidants.
- Germ: The nutrient-rich core that contains carbs, fats, proteins, vitamins, minerals, antioxidants and various phytonutrients. The germ is the embryo of the plant, the part that gives rise to a new plant.
- Endosperm: The biggest part of the grain contains mostly carbs (in the form of starch) and protein.
- A refined grain has had the bran and germ removed, leaving just the endosperm.

1.1.1. Types of Cereal Grains

The cereals most commonly cultivated are wheat, rice, rye, Oats, millet, barley, corn (maize), and sorghum.

Image	Name	Description
	**Rice (*Oryzasativa*) .**	Rice is an excellent source of calories because of its starch content. It comprises 75-80% of starch, 7% of protein, 0.4-0.8% of lipids and 12% of water. The protein of rice oats is of highly digestible nature and contains 4.1mg/100g of protein lysine higher than wheat.
	**Barley**.	It is extremely nutritious and essential for malting. Usually used as an oat breakfast cereal, it is often used as animal feed. It is primarily grown on land that is unable to produce wheat.
	**Sorghum**	Highly nutritious and used as a feed for livestock.
	**Millet**	In China, Russia and Germany, millet porridge, mostly grown in Asia and Africa, is common. It may also be used as animal feed and bird feed for the manufacture of alcoholic beverages.
	**Oats**	They are a staple cereal in Scotland and are exceptionally nutritious and used in more than half of the world as breakfast cereals. It is normal to reduce weight and lower blood sugar levels because of the high content of fiber.

	**Rye**	Cold climate cereal grain, used to produce beer, breads, whiskeys, vodka, and sometimes used as animal fodder.
	**Maize**	Corn is a staple cereal used worldwide also as animal feed on continents such as South America and Africa. Cornflakes are a globally popular cereal, too.
	**Wheat**	Wheat is one of the oldest domesticated grains and a major cereal crop. In modern times, wheat is used to manufacture bakery items for meals, breakfast cereals, and oats. It can be grown on a wide variety of soils, but in temperate climates it thrives.

1.2.Product Description:

Among cereal grain flours, wheat flour is unusual in that its protein components, when mixed with water, form an elastic network capable of retaining gas and forming a strong spongy structure during baking. The protein substances that contribute to these properties (gliadin and glutenin) are known collectively as gluten when combined with water and mixed together. Generally speaking, the suitability of flour for biscuit making is determined by its gluten. Gluten attributes are determined by genetics, the growing conditions of the wheat, and the method of milling. India mainly grows three kinds of wheat.

- 95% "triticum aestivum" or the popular wheat bread
- 4%' triticum durum' or pasta wheat
- 1% "triticum dicoccum" or emmer wheat (also known as khapli, samba godumai, diabetic wheat) is the world's largest emmer wheat grower in India.

On the basis of product categories that primarily include all-purpose, semolina, whole-wheat, fine wheat and bread, the wheat flour industry has been segmented. Amongst these, the most popular flour products are all-purpose and whole-wheat.A whole-meal wheat flour, originating from the Indian subcontinent, is Atta or Chakki Atta, used for making flat-breads such as chapati, roti, naan, paratha and puri. It is the most plentiful flour on the Indian subcontinent. Hard wheat, used to make atta, has a high content of gluten that provides elasticity, so it is solid and can be rolled into thin sheets with dough made from atta flour. Traditionally, Atta was ground in a stone chakki mill at home. When using a tandoor, where the flatbread is stuck to the inside of the oven, this is helpful and also makes chapatis smoother as more water is absorbed by the dough.

1.3. Market Potential:

In 2019, the global demand for wheat flour reached a consumption volume of 391 million tons, with steady growth during 2014-2019. Wheat flour is currently one of the most common food ingredients used in the world. It provides health benefits, such as reducing levels of cholesterol, improving metabolism, managing obesity, and controlling blood sugar levels.Because of the presence of gluten, a protein that gives strength and elasticity to the dough as well as contributes to the texture of baked goods, wheat flour is used extensively. The global demand for wheat flour has been further strengthened by factors such as population growth, growing disposable incomes, increasing consumption of bakery goods and changing lifestyles.

India's packaged wheat flour market is rising by almost 21% at a whooping CAGR . If the growth trend stays the same, by the end of the current fiscal year (2020-21) itself, the market could be likely to hit a new height of Rs 20,000 Cr. The numerous micro- and macroeconomic variables pave the way for the growth of the market.However, wheat flour, which was still packed, remained an urban phenomenon, with the urban market occupying more than 90% of the overall market. But with the market penetration of the leading players in the market expanding, the rural market would also see a steady increase in demand for packaged wheat flour in India.

1.4. Raw Material Description:

Wheat grains, or kernels, consist of about 85 percent of the starchy endosperm, or food-storage portion; about 13 percent of several outer layers that make up the bran; and about 2 percent of the oily germ, or embryo plant. The aim of the milling process in the manufacture of refined flour is to distinguish the endosperm from the other kernel parts.Both parts of the kernel are used in processing whole wheat flour.

Nutrients	Quantity
Carbohydrate	70%
Protein	9-15%
Fat	2-2.2%
Fiber	2-2.5
Ash	1.8 %
Moisture	9-13%[i]

Starch's health effects largely depend on its digestibility, which determines its effect on levels of blood sugar.After a meal, high digestibility can cause an unhealthy spike in blood sugar and have harmful health effects, particularly for individuals with diabetes.Wheat produces small quantities of soluble fibers or fructans that can cause digestive symptoms in individuals with irritable bowel syndrome (IBS). Gluten, a large protein family, accounts for up to 80% of the total protein content. It's responsible for wheat dough's peculiar elasticity and stickiness, the properties that make it so useful in making bread. A good source of various vitamins and minerals is whole wheat. The quantity of minerals depends on the soil it is grown in, as with other cereal grains.

- Selenium: In your body, this trace factor has numerous critical functions. In some regions, including China, the selenium content of wheat depends on the soil and is very low.
- Manganese: Present in high quantities in whole grains, legumes, fruits and vegetables, due to its phytic acid content, manganese may be poorly absorbed from whole wheat
- Phosphorus: In the preservation and development of body tissues, this dietary mineral plays an important role.
- Copper: Copper, an important trace element, is often low in the Western diet. Deficiency may have detrimental effects on the health of the heart.
- Folate: Often known as folic acid or vitamin B9, folate is one of the B vitamins. During pregnancy, it is especially necessary.

1.5. Types of Raw Material:

The main varieties of wheat grown in India are as follows VL-832,VL-804, HS-365, HS-240, HD2687,WH-147, WH-542, PBW-343, WH-896(d), PDW-233(d), UP-2338, PBW-502, Shresth (HD 2687), Aditya (HD 2781), HW-2044, HW-1085, NP-200(di), HW-741.[ii]

Sl. No.	Varieties	Year of Release	Characteristics
1.	HS 542 (PusaKiran)	2015	A semi-dwarf variety with grain yield potential of 6.03 t/ha under rain fed situations. HS 542 has good chapatti and bread making qualities. The variety is resistant to stripe and leaf rust.
2.	HW 1098 (Nilgiri Khapli)	2015	A high yielding, semi-dwarf (85 cm) dicoccum wheat variety with yield potential of 4.78 t/ha and high degree of resistance to stem, leaf and yellow rust. HW 1098 produced bold grain (40.3g), with better grain quality (>13% protein and 3.7 ppm β carotene)
3.	HDCSW 18	2015	This is the first variety of the country bred specifically for CA. It has genetic yield potential of more than 7t/ha. It out yielded the checks like HD 2967, PBW 550 and DBW 17 under CA by 11.13 to 20.74 % in NCR. It is resistant to high temperature at seedling stage. It escape high temperature at maturity due to early

			seeding. It is highly resistant to brown rust and has lower incidence of Karnal bunt.
4.	HD 3117	2015	It has genetic yield potential of 5.5 t/ha. Average yield of this variety under late sown (after 15 th Dec.) is 4.78 t/ha under tilled condition and 4.79 t/ha under conservation agriculture condition. It is free from brown and yellow rust under natural condition and highly tolerant to Karnal bunt. Grain protein content is 11.7 %.
5.	HD 4728 (PusaMalvi)	2015	A semi-dwarf (90 cm), 120 days maturing durum wheat variety with genetic yield potential of 6.8 t/ha. The variety has high degree of resistance to leaf and stem rust diseases. Its has bold and lustrous grains and superior quality traits for end-use in semolina-based industry.
6.	HS 562	2015	It has genetic yield potential of 6.2 t/ha under irrigated condition. It has shown good levels of field resistance to leaf and stripe rusts and possesses good chapatti and bread making qualities.

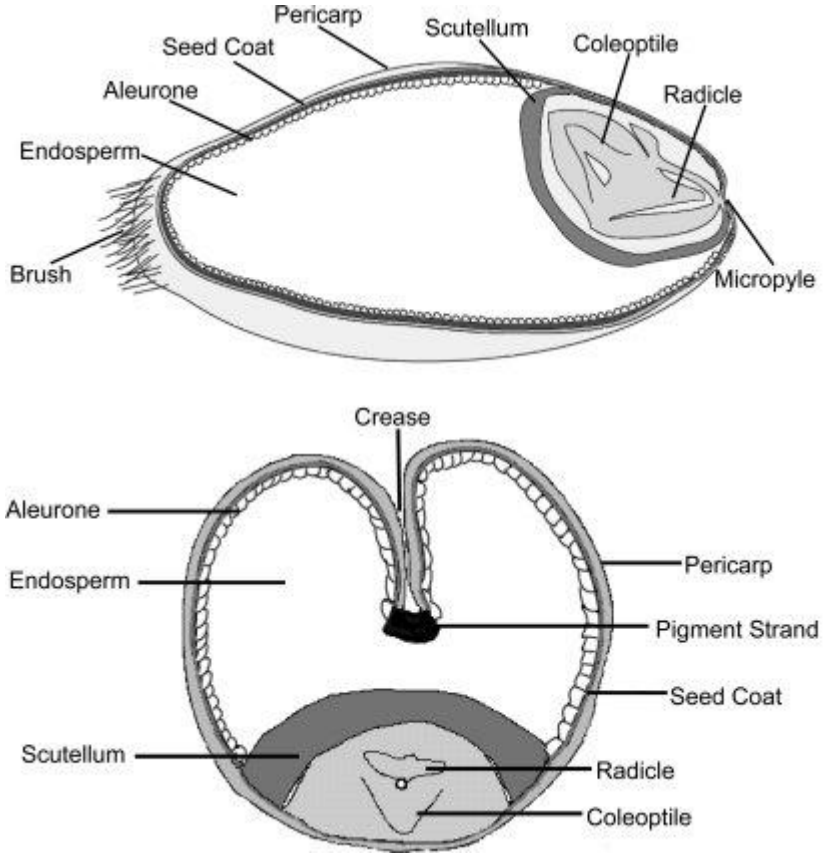
7.	HD 3226	2019	The Wheat Variety HD 3226 is released for commercial cultivation in North Western Plain Zone comprising of Punjab, Haryana, Delhi, Rajasthan (Except Kota and Udaipur Divisions), Western Uttar Pradesh (Except Jhansi Division), Jammu and Kathua district of J&K, Una district and Paonta Valley of H.P and Uttarakhand (Tarai region) under Irrigated, timely Sown Conditions.[iii]

CHAPTER 2
PROCESS AND MACHINERY REQUIREMENT

2.1. Raw Material Aspects:

Three main groups can further divide the standard of wheat: I botanical (species and cultivars); (ii) physical and (iii) chemical characteristics. Wheat quality physical properties include grain mass, hardness, grain size and form, and color. Moisture content, protein (gluten) content, amylase content, and fiber content are chemical characteristics of wheat. As mentioned above, when he needs to determine if he can purchase the grain and what he wants to pay for it, the buyer of the grain takes into account the various assets.

Grain grading and grain specification systems ensure that the groups engaged in the manufacturing, storing and processing of grain are able to manage, exchange, and process grain that meets the requirements or properties necessary. Grain grading depends on four primary properties, including (i) hectolitre mass, (ii) moisture content, (iii) foreign matter, and (iv) damaged grains.



2.2. Source of Raw Material

Uttar Pradesh is the largest producer of wheat in an area with 9.75 million hectares (32%), followed by Madhya Pradesh (18.75%), Punjab (11.48%), Rajasthan (9.74%), Haryana (8.36%), and Bihar (6.82%).

As wheat is a major grown crop the availability of wheat grain is easy in the northern states of India. Various mandis are available in every district for wheat. Raw material can be procured from these mandis, local vendors, or direct from the farm.

2.3. Technologies:

- **Hand operated flour mill:**

  Saddle stonesmilling is the method of ground cereal grains into flour. Traditionally, this would have been done by grinding the grain between two stones, a lower, stationary stone called the quern stone, and an upper, mobile stone called the hand stone.

Saddle stones are the oldest known flour milling machines. A saddle stone is a piece of hard stone that is cradle-shaped and carries the grain. The sandstone will have been either a cylindrical piece of stone (worn in both hands and traced like a rolling pin over the grain) or a disc held in one hand with a vertical handle on its back (rather like an upside-down mushroom). These hand stones were used to crush the grain and fairly coarse flour was made. Before being used, the grain was also malted in order to make grinding faster. These work in a manner similar to modern millstones and consist of two circular stones, a static bed stone overlying a revolving runner stone. The grain joins the quern through a hole at the middle of the runner stone and migrates when it is ground to the edge, emerging as a coarsely ground floor from between the stones. These rotating querns are hand-powered and are thus constrained by their operator's strength in size and milling capability. They could, however,

be much heavier than the hand stone used for saddle querns, so they could be used to make finer flour with the unmalted grain.

- **Mills and mill stones:**

As the agricultural Production of cereals was the need for more efficient methods of flour production. In such mills, even larger circular-shaped stones would be used and a finer flour would be produced than that produced by handheld instruments. To move the spinning motion of the runner stone, power sources have been used. Initially, cattle or slaves used to turn these big stones around. Over time, the source of power to transform the millstone became water or wind.

Electric motors are used in modern flour mills that use spinning millstones. Millstones do not touch when in operation. There is a distance between the rotating runner stone and the static bed stone that is defined by the grain scale. In the middle of the runner stone, the grain is fed from a chute into a cavity, referred to as the eye. The grain is spread over the millstone surface by a complex series of groves known as furrows, which help to ventilate and cool the millstones as well. The millstones' grinding surfaces are known as land and are separated into areas called harps. Once ground the flour passes along narrow groves called cracking and is expelled from the edge of the millstones.

- **Roller mills:**

As the population multiplied and the need for more and better flour and bread increased, a modern method of milling was devised. By moving the grain through a series of paired

counter-rotating rollers with fluted surfaces, these mills work. To separate the bran from the starchy endosperm, the resulting crushed grain is sieved between each pair of rollers. It is a super-fine white flour that is the finished result. To produce wholemeal flour from this type of milling it is necessary to collect the bran that has been sieved off during the early stages of

milling and add them back to the final product. To obtain brown flour a proportion only of the extracted material is added back.

2.4. Manufacturing Process:

- **Grain delivery**: The grain is supplied by covered trucks and hopper railcars to factories. The distance travelled by the grain varies tremendously. In several times, the 110-car unit train has covered hundreds of miles. In other situations, it is shipped in the same county from a nearby plant. After arriving at the mill, grain stocks will often have gone through a variety of accumulation processes (farmer, country elevator, terminal elevator, etc.).The number of conveyances carrying grain can vary based on the time of harvesting and delivery.
- **Grain standard:** Before wheat grains are unloaded in a factory, the assessment is required with samples. The grain is tested for moisture, test weight, unsound seeds, and foreign material. The grains are categorized according to Indian Grain Standards and are also subject to the ISO trade standards. Product management chemists start experiments to identify grain and assess end-user values during unloading.
- **Cleaning:** After inspection, the grain is unloaded directly from the truck into the unloading container and transferred into large bins or silos through conveyors and bucket lifts. Grain storing is a science. It is necessary to maintain the correct moisture, heat, and air or mildew, sprout, or ferment wheat. The grain can also be fumigated to eradicate insect pests during transportation. During the process In terms of nutrient level and consistency, barely is stored.
- **Cleaning the wheat grains:** It can take as many as six steps. The machines that clean the grain are collectively called the cleaning house.
  - ✓ **Magnetic separator** – The grain first passes by a magnet that removes ferrous metal particles. It will pass through other metal detectors after milling to ensure that no metal pieces are in the finished product. Magnets are also positioned throughout the milling process and at the last step prior to load-out.
  - ✓ **Separator** – Vibrating or rotating drum separators remove bits of wood, straw, and almost anything else too big or too small to be the desired grain.
  - ✓ **Aspirator** – Air currents act as a vacuum to remove dust and lighter impurities.
  - ✓ **De-stoner** – Using gravity, the machine separates the heavy material from the light to remove stones that may be the same size as the desired grain.

- ✓ **Disc separator** – The grain passes through a separator that identifies the size of the kernels even more closely. It rejects anything longer, shorter, more round, more angular or in any way a different shape.
- ✓ **Scourer**– The scourer eliminates the outer husks, the soil in the kernel crease, and other minor impurities with vigorous scouring action. Currents of air are dragging up all the loose stuff.
- ✓ **Impact Entoleter**– The centrifugal force cuts down some unsound kernels or insect eggs and the aspiration rejects them from the flow of the mill. From the meet, the sound of the Wheat flows into the grinding bins, large hoppers that regulate the feeding of the Wheat to the actual milling process.
- ✓ **Colour Separator** – Newer mills may also utilize electronic color separators to simplify the cleaning process.

- **Grinding**: The grains of wheat are now ready to be milled into flour.The modern milling process is a gradual reduction of the wheat grains through the grinding and sifting process. This science of analysis, blending, grinding, sifting, and blending results in consistent end product. Wheat kernels are weighed or fed from bins to roller mills, corrugated cylinders made of chilled steel. The rolls are paired and rotated inward to each other at varying speeds. Passing through the corrugated "first break" rolls, the separation of the bran, endosperm, and germ begins.

  There are about five roller mills or breaks in the system. Again, the aim is to remove the endosperm from the bran and the germ. To get as much pure endosperm as possible, each break roll must be set. The "break" rolls, each has successively finer corrugations, through the break rolls. The grist is sent back upstairs to drop through sifters after each trip. The system reworks the coarse stocks from the sifters and reduces the Wheat particles to granular “middling” that are as free from bran as possible.
- **Sifting-** Through pneumatic tubes, the broken particles of Wheat are elevated and then dropped into huge, vibrating, box-like sifters where they are shaken to separate the larger from the smaller particles by either a series of bolting cloths or screens.

  There may be as many as 27 frames inside the sifter, each covered with either a screen or nylon or stainless steel, with square holes that get narrower and smaller and the farther down they go. It is probable that up to six different particle sizes come from a single sifter.
- **Blending:** From the fibre, the flour is separated and the process is repeated again.

- **Testing of the final product**: Lab checks are carried out after milling to ensure that the flour follows the specification and standards. Millers also conduct routine monitoring of indicator natural organisms. While dry flour does not provide an atmosphere that is conducive to microbial development, it is important to note that flour is not a ready-to-eat food and is a minimally processed agricultural ingredient. Flour is not meant for raw use. Baking, baking, boiling, and cooking heat processes are sufficient to kill any pathogens that may be found in flour and lower the possible risk of food borne disease.
- **Packaging of Product:** The packaging is carried out in a much simple process then milling, the Wheat flour is fed to holding tank of the packaging machine, which simply seals one end of continuous packaging first, then it simply fills the packet as per required weight & seals the other end, generating the required packet.

2.5. Flow Chart:

Steps	Machine Name	Description	Machine Image.
Grain Delivery	Unloading Bins	These are large bins designed for unloading of grains & similar product; they are equipped with large rod mess to prevent big impurities from entering system.	
Grain Storage	Silos	These Equipments are class of storage Equipments which are specifically designed for dry grain raw material of small granule composition. Usually used to store grains but can also be used to store cement & aggregate.	
Cleaning	Vibrating Pre-Cleaner	It's composed of a vibrating sieve, powered by an exciter which is in turn is powered by an appropriate motor; which is used to remove most of the dirt & large impurities from given grain.	

Grinding	Heavy duty Pulveriser Mill	It basically a grinder class machine, which may employ any possible grinding arrangement to achieve, required grinding as per product to be grinded.	
Sifters	Flour Sifter Machine	It's basically an industrial version of the sieve used to sieve out, large fibers, particles etc, to achieve required particle size in flour.	
Finished Product Testing	Flour testing kit	This is the type of kit that measure moisture of flour before packaging of final product.	
Packaging & Storage	Packet Filling & Packaging Machine	It's a simple packaging machine, designed to fill the given food grade plastic material's continuous pouch with required product after sealing one end & after filling sealing the other end also to generate packet of product.	

2.6.Additional Machine & Equipment:

Machine Name	Machine Description	Machine Image
De-stoner	It's a machine which is used to remove stones from the given grain, widely used in various grain mills in cleaning section.	
Disc Separator	It's a separator class machine, generally used to remove foreign grains from required grain efficiently	

Magnetic Separator	It's a type of separator which is used to magnetic impurities from given product using powerful electromagnets, used in wide range of industries for separation.	
Aspirator	It's a more fine-tuned separator designed to remove finer impurities like remaining dirt, similar sized impurities, leaves etc	
Food Grade Conveyor	These are conveyors with food grade belt to maintain food safety standards set by monitoring authorities.	

2.7.General Failures & Remedies:

S. No.	General Failures	Remedies
1.	Ball bearing failure of various machine	1. Proper periodic lubrication of all bearings in various machines. 2. Regular replacement of all bearing to prevent critical failures.
2.	Power Drive Overload	1. Ensure proper weighing & metering specially in case of semi-automatic plant. 2. Install warning sensor in buffer region of loading capacity to ensure efficient operation.
3.	Mechanical Key Failure	1. Ensure that mechanical keys are replaced as per there pre-defined operational life. 2. Prevent Overloading.
4.	Loss of Interface	1. This problem is dominant in newly established automatic plant, one must learn to maintain rules in plant & ensure no employee goes near transmission lines, unless authorised.

		2. Provide proper physical shielding for the connections.
5.	Improper Hulling	Grain has the whole hull intact. Extra cleaning required for wheatgrains flour milling to sift out the impurities (dirt, chaff, etc.)

2.8. Nutritional Information:

Composition of wheat products per 100g edible portion

Wheat Product	Protein[1]	Fat[1]	Carbo-hydrate[1]	Starch[1]	Total Sugar	Vitamin E[2]	Thiamin[2]	Riboflavin 2	Niacin[2]	Folate[3]
Wheat germ	26.7	9.2	44.7*	28.7*	16.0*1	22.0	2.01	0.72	45	?
Wheat bran	14.1	5.5	26.8	2.0	3.8	2.6	0.89	0.36	29.6	260
Wheat flour	12.6	2.0	68.5	66.8	1.7	0.6	0.30	0.07	1.7	51
Whole meal flour	12.7	2.2	63.9	61.8	2.1	1.4	^	0.09	^	57
White flour (plain)	9.4	1.3	77.7	76.2	1.5	0.3	0.10	0.03	0.7	22
White flour (self-raising)	8.9	1.2	75.6	74.3	1.3	0.3*	0.10	0.03	0.7	19
White flour (bread-making)	11.5	1.4	75.3	73.9	1.4	0.3*	0.10	0.03	0.7	31

Source:astonjournals.com/manuscripts/Vol2011/LSMR-22_Vol2011.pdf

2.9. Export Potential & Sales Aspect:

India's wheat production has historically been dominated by India's northern region. In India, the northern states of Punjab and Haryana Plains have been prolific producers of wheat. While this cereal grass has been closely studied in the past, the production of distinctly superior varieties of Durum Wheat has paid off in recent years of meticulous study by India's finest scientific talent. This hard wheat is grown in Clay soil and is widely sought for its physical characteristics. Its high strength of gluten and uniform golden color makes it ideal for baking bread and cooking pasta. India is the second-largest producer of wheat in the entire world today. Several surveys and research have shown that wheat and wheat flour are playing an increasingly important role in controlling the food economy in India.

CHAPTER 3
PACKAGING

3.1. Shelf Life of Product:

Flour infestation is a common problem that both traders and flour millers face. Maintaining the consistency of the grain and its flour is a difficult task. With due treatment & managed conditioned climate, flour can be stored without any signs of damage for up to 6 months. Wheat has very good shelf life that can extend up to few months. The first thing to know is that it will remain good long past its "best by" or "better if used by" date that can be found on the original container. Regular flour tends to last 6-8 months past its printed date, while whole wheat flour is typically only best for an extra 4-6 months.

- The moisture content of the Wheat flour:
- Storage Conditions
- Storage –Temperature & Humidity
- Cross Contamination
- Unhygienic Conditions
- Cracks on the floors & walls
- Standing water near the stores
- Spillage & bird faeces in the stores/stairs & floors
- Presence of grains germs in the flour.

In order to improve the shelf life of the flour, the following additional precautions should be taken by millers -:

- Use clean & fumigated grains for milling
- Use scouring machines in the cleaning line
- Set cleaning machines with optimum efficiency to separate out all the impurities from the Wheat grains
- Clean the dead pockets of the cleaning line frequently, to get rid of non-moving grains at the elevator bottom & outlets, grains conveyor troughs, and tempered grain conveyors.
- Fumigate empty Grains bag.
- Before milling, use scourers to remove dirt in tempered grains

- Regularly clean the milling equipment like roller mills, feed hoppers, flour conveyors, gravity spouts, plan shifters purifiers, bran finishers, flour bins, flour elevators, flour packing hoppers, bran elevators line, etc.
- Fumigate packing materials before every use.
- Frequently fumigate bins & conveyors.
- Always keep the parking area & the flour storage area clean.
- Type of packaging materials used.

3.2. Wheat flour Packaging:

Packaging refers to the act of designing and producing the container or wrapper of a product. It is one of the most important parts of marketing.

There are many factors that need to consider while selecting a suitable type of pack for the product:

- The product contents.
- The application of the product.
- Content stability.
- Protection from any environmental factors
- Acceptability of the pack to the customer.
- Regulatory, legal, and quality issues.

Characteristics of packaging material

- The material selected must have the following characteristics:
- Must meet tamper-resistance requirements
- Must not reactive with the product
- They must protect the preparation from environmental conditions
- Must be non-toxic
- Must not impart odour/taste to the product
- Must be FDA approved.

Flour is packed directly in gunny bags, gunny poly-line bags for bulk sale, and for retail sale in laminated pouches or poly-bags.

- **Hanging Bags-** Hanging bags in grocery stores and other shopping outlets are commonly used. They are a type of plastic bag that is also sealed with a back-middle seam on both

ends as well. Hanging bags have a pre-cut hole that makes it easier for them to hang from hooks so that they can be seen in an attractive way.

- **Pillow bags -** A pillow bag is another typical type of package. The bags are named for their shape, which is like a cushion. They are found lying flat on grocery store shelves in the grocery store and were known to carry the items.
- **Gusseted Poly Bags**- Gusseted bags are often called flat-bottom bags because they feature a tucked in pleat that's been pressed flat. It allows the bag to expand for greater carrying capacity and to keep the shape of a box if necessary. These types of poly bags can be heat sealed, tied, stapled, or taped shut. They're the perfect poly bag for anyone looking to get more flour in a single bag.
- **Flexible Pouches**- Flexible pouches are a perfect way to carry most packaged items. They can be made with zipper-seal closures, which tend to keep the inside contents fresh for use. Flexible pouches offer amazing printing capabilities, so you can add your attractive product branding to the pouch itself. Many pouches stand up on their own, which helps you improve your shelf appearance.

3.3. Packaging:

- **Primary packaging:** Primary packaging is packaging which is in close association with the product itself and is often referred to as a consumer unit. The main purpose of the primary packaging is to contain, protect and/or conserve the final product, in particular against contamination.

- **Secondary packaging:**Secondary packaging is the outer packaging of the main packaging, which connects packages and further covers or marks the prescription component.
- **Tertiary packaging:**Tertiary packaging is used for the handling, transportation, and delivery of bulk products.

3.4. Material of Packaging:

In addition to cellulose and Aluminium foil, a very large amount of polymeric materials is used for packaging products. Paper boards and metal containers are also used for such purposes. While a range of packaging materials are available, the ultimate option of the packaging depends on the appropriate shelf life, the efficiency of the packaging machine, and the cost that is purely based on the market segment targeted by the manufacturer. The most common choice of packaging medium is plastic (usually flexible) as it offers the requisite safety and preservation, resistance to grease, physical strength, machinability, and printability.

Plastics that are lighter in weight are also the most preferred material for the packaging of flour. There are changing trends in the packaging of Flour. Plastic films and their laminates are increasingly used due to better properties and aluminium laminates due to price and better flex crack properties. Plastic packaging products that can be used are described below.

Polypropylene- Polypropylene films have better clarity than polyethylene and enjoy superior machinability due to stiffness. Lack of good salability has been a problem; however, PVDC and vinyl coating have been used to overcome this problem. Some varieties of PP have been specially developed for twist-wrap applications as they have the ability to lock in position after twisting.

Poly Vinyl Chloride (PVC)- PVC is a stiff and clear film having a low gas transmission rate. PVC can be used as small wraps, bags, and pouches. PVC when co-polymerized with polyvinylidene chloride is known as Saran. Since it is a costly material, it is only used as a coating to obtain barrier properties and heat salability. PVC film is also used for twist wraps, as it has twist retention properties and is excellent on high-speed machines.

Polyesters (PET) and Polyamide (PA) - Polyethylene terephthalate film has high tensile strength, gloss, and stiffness as well as puncture resistance. It has moderate WVTR but is a good barrier to volatiles and gases. To provide heat seal property, PET is normally laminated to other substrates. Nylons or polyamides are similar to PET but have high WVTR.

CHAPTER 4
FOOD SAFETY REGULATIONS AND STANDARDS OF WHEAT FLOUR

4.1. Introduction to FSSAI:

The Food Safety and Standards Authority of India (FSSAI) has been established under Food Safety and Standards, 2006 which consolidates various acts & orders that have hitherto handled food-related issues in various Departments. The FSSAI is responsible for setting standards for food so that there is one body to deal with and no confusion in the minds of consumers, traders, manufacturers, and investors. The Act aims to establish a single reference point for all matters relating to food safety and standards, by moving from multi-level, multi-departmental control to a single line of command.

Highlights of the Food Safety and Standard Act, 2006-

Various central Acts like Prevention of Food Adulteration Act, 1954 , Fruit Products Order , 1955, Meat Food Products Order , 1973, Vegetable Oil Products (Control) Order, 1947,Edible Oils Packaging (Regulation)Order 1988, Solvent Extracted Oil, De- Oiled Meal and Edible Flour (Control) Order, 1967, Milk and Milk Products Order, 1992 etc will be repealed after commencement of FSS Act, 2006.

The Act also aims to establish a single reference point for all matters relating to food safety and standards, by moving from multi- level, multi- departmental control to a single line of command. To this effect, the Act establishes an independent statutory Authority – the Food Safety and Standards Authority of India with head office at Delhi. Food Safety and Standards Authority of India (FSSAI) and the State Food Safety Authorities shall enforce various provisions of the Act.

Establishment of the Authority-

Ministry of Health & Family Welfare, Government of India is the Administrative Ministry for the implementation of FSSAI. The Chairperson and Chief Executive Officer of Food Safety and Standards Authority of India (FSSAI) have already been appointed by Government of India. The Chairperson is in the rank of Secretary to Government of India.

4.2. FSSAI Registration & Licensing Process:

According to Section 31(1) of Food Safety and Standards (FSS) Act, 2006,Every Food Business Operator (FBO) in the country is required to be licensed under the Food Safety & Standards Authority of India (FSSAI).

As per FSS (Licensing & Registration) Regulations, 2011, Licenses and Registrations are granted to FBOs in a 3 tier system

- Registration - for petty FBOs with annual turnover less than Rs 12 lakhs
- State license - for medium-scale food manufacturers, processor and transporters
- Central License - for large-scale food manufacturers, processor and transporters

FSSAI registration is done online on the FSSAI website through Food Safety Compliance System (FoSCoS)

- FoSCoS has replaced the Food Licensing and Registration System (FLRS).
- Petty food business operators are required to obtain FSSAI Registration Certificate
- "Petty Food Manufacturer" means any food manufacturer, who manufactures or sells any article of food himself or a petty retailer, hawker, itinerant vendor or temporary stall holder (or) distributes foods including in any religious or social gathering except a caterer;

or

- Other food businesses including small scale or cottage or such other industries relating to food business or tiny food businesses with an annual turnover not exceeding Rs. 12lakhs and/or whose production capacity of food (other than milk and milk products and meat and meat products) does not exceed 100 kg/ltr per day

Any person or entity that does not classify as a petty food business operator is required to obtain an FSSAI license for operating a food business in India.

FSSAI License - two types - State FSSAI License and central FSSAI License

Based on the size and nature of the business, the licensing authority would change.

- Large food manufacturer/processors/transporters and importers of food products require central FSSAI license
- Medium-sized food manufacturers, processor and transporters requires state FSSAI license.
- License period: 1 to 5 years as requested by the FBO.
- A higher fee for obtaining FSSAI license for more years.

- If a FBO has obtained the license for one or two years, renewal may be done, no later than 30 days prior to the expiry date of the license.

4.3.Food Safety & FSSAI Standards & Regulations:

"2.4 Cereals and cereal products; 2.4.1 Atta 1. Atta or resultant atta means the coarse product obtained by milling or grinding clean wheat free from rodent hair and excreta It shall conform to the following standards:—

Sl. No.	Characteristics	Requirement
1.	Moisture,	Not more than 14.0 per cent (when determined by heating at 130-133oC for 2 hours).
2.	Total ash	Not more than 2.0 per cent (on dry weight basis).
3.	Ash insoluble in dilute HCl	Not more than 0.15 percent (on dry weight basis).
4.	Gluten (on dry weight basis)	Not less than 6.0 per cent
5.	Alcoholic acidity (with 90 per cent alcohol) expressed as H2SO4 (on dry weight basis)	Not more than 0.18 per cent
6.	It shall be free from rodent hair and excreta	

Food Safety

Part I - General Hygienic and Sanitary practices to be followed by Petty Food Business Operators applying for Registration

Sanitary and hygienic requirements for food manufacturer/ processor/handler

The place where food is manufactured, processed or handled shall comply with the following requirements:

1. The premises shall be located in a sanitary place and free from filthy surroundings and shall maintain overall hygienic environment. All new units shall set up away from environmentally polluted areas.

2. The premises to conduct food business for manufacturing should have adequate space for manufacturing and storage to maintain overall hygienic environment.

3. The premises shall be clean, adequately lighted and ventilated and sufficient free space for movement.

4. Floors, Ceilings and walls must be maintained in a sound condition. They should be smooth and easy to clean with no flaking paint or plaster.

5. The floor and skirted walls shall be washed as per requirement with an effective disinfectant the premises shall be kept free from all insects. No spraying shall be done during the conduct of business, but instead fly swats/ flaps should be used to kill spray flies getting into the premises. Windows, doors and other openings shall be fitted with net or screen, as appropriate to make the premise insect free The water used in the manufacturing shall be potable and if required chemical and bacteriological examination of the water shall be done at regular intervals at any recognized laboratory.

6. Continuous supply of potable water shall be ensured in the premises. In case of intermittent water supply, adequate storage arrangement for water used in food or washing shall be made.

7. Equipment and machinery when employed shall be of such design which will permit easy cleaning. Arrangements for cleaning of containers, tables, working parts of machinery, etc. shall be provided.

8. No vessel, container or other equipment, the use of which is likely to cause metallic contamination injurious to health shall be employed in the preparation, packing or storage of food. (Copper or brass vessels shall have proper lining).

9. All equipments shall be kept clean, washed, dried and stacked at the close of business to ensure freedom from growth of mould/ fungi and infestation.

10. All equipments shall be placed well away from the walls to allow proper inspection.

11. There should be efficient drainage system and there shall be adequate provisions for disposal of refuse.

12. The workers working in processing and preparation shall use clean aprons, hand gloves, and head wears.

13. Persons suffering from infectious diseases shall not be permitted to work. Any cuts or wounds shall remain covered at all time and the person should not be allowed to come in direct contact with food.

14. All food handlers shall keep their finger nails trimmed, clean and wash their hands with soap, or detergent and water before commencing work and every time after using toilet. Scratching of body parts, hair shall be avoided during food handling processes.

15. All food handlers should avoid wearing, false nails or other items or loose jewellery that might fall into food and also avoid touching their face or hair.

16. Eating, chewing, smoking, spitting and nose blowing shall be prohibited within the premises especially while handling food.

17. All articles that are stored or are intended for sale shall be fit for consumption and have proper cover to avoid contamination.

18. The vehicles used to transport foods must be maintained in good repair and kept clean.

19. Foods while in transport in packaged form or in containers shall maintain the required temperature.

20. Insecticides / disinfectants shall be kept and stored separately and `away from food manufacturing / storing/ handling areas.

4.3.1. Labelling Standards(Regulation 2.5 of FSS)

Labelling requirements for packaged food products as laid down in the Part 2.4 of the Prevention of Food Adulteration (PFA) Rules, 1955, and the Standards of Weights and Measures (Packaged Commodities) Rules of 1977, require that the labels contain the following information:

1. Name, trade name or description
2. Name of ingredients used in the product in descending order of their composition by weight or volume
3. Name and complete address of manufacturer/packer, importer, country of origin of the imported food (if the food article is manufactured outside India, but packed in India)
4. Nutritional Information
5. Information Relating to Food Additives, Colors and Flavors

6. Instructions for Use
7. Veg or Non-Veg Symbol
8. Net weight, number or volume of contents
9. Distinctive batch, lot or code number
10. Month and year of manufacture and packaging
11. Month and year by which the product is best consumed
12. Maximum retail price

Provided that — (i) the nutritional information may not be necessary, in case of foods such as raw agricultural commodities, like, wheat, rice, cereals, flour, spice mixes, herbs, condiments, table salt, sugar, jaggery, or non –nutritive products, like, soluble tea, coffee, soluble coffee, coffee-chicory mixture, packaged drinking water, packaged mineral water, alcoholic beverages or flour and vegetables, processed and pre- packaged assorted vegetables, flours, vegetables and products that comprise of single ingredient, pickles, papad, or foods served for immediate consumption such as served in hospitals, hotels or by food services vendors or halwais, or food shipped in bulk which is not for sale in that form to consumers.

Wherever applicable, the product label also must contains the following

The purpose of irradiation and license number in case of irradiated food. Extraneous addition of colouring material.

Non-vegetarian food – any food which contains whole or part of any animal including birds, fresh water or marine animals, eggs or product of any animal origin as an ingredient, not including milk or milk products – must have a symbol of a brown color-filled circle inside a brown square outline prominently displayed on the package, contrasting against the background on the display label in close proximity to the name or brand name of the food.

Vegetarian food must have a similar symbol of green color-filled circle inside a square with a green outline prominently displayed.

All declarations may be: Printed in English or Hindi on a label securely affixed to the package, or Made on an additional wrapper containing the imported package, or Printed on the package itself, or May be made on a card or tape affixed firmly to the package and bearing the required information prior to customs clearance.

Exporters should review the Chapter 2 of the “FSS (Packaging and Labelling) Regulation 2011” and the Compendium of Food Safety and Standards (Packaging and Labelling) Regulation before designing labels for products to be exported to India. FSSAI revised the

labelling Regulation and a draft notification to that effect was published on April 11, 2018, inviting comments from WTO member countries and the comments received are under review and the publication date remains unknown.

According to the FSS Packaging and Labelling Regulation 2011, “pre-packaged” or “pre packed food” including multi-piece packages, should carry mandatory information on the label.

CHAPTER 5

OPPORTUNITIES FOR MICRO/UNORGANIZED ENTERPRISES

5.1. PM-FME Scheme:

Ministry of Food Processing Industries (MoFPI), in partnership with the States, has launched an all India centrally sponsored "PM Formalisation of Micro Food Processing Enterprises Scheme (PM FME Scheme)" for providing financial, technical and business support for up-gradation of existing micro food processing enterprises. The objectives of the scheme are :

I. Support for capital investment for up-gradation and formalization with registration for GST, FSSAI hygiene standards and UdyogAadhar;
II. Capacity building through skill training, imparting technical knowledge on food safety, standards & hygiene and quality improvement;
III. Hand holding support for preparation of DPR, availing bank loan and up-gradation;
IV. Support to Farmer Producer Organizations (FPOs), Self Help Groups (SHGs), producers cooperatives for capital investment, common infrastructure and support branding and marketing.[iv]

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