Ministry of Food Processing Industries
Government of India

सत्यमेव जयते

NIFTEM
Knowledge. Innovation. Outreach

Reading Manual for Soya Chaap
Under PMFME Scheme

National Institute of Food Technology Entrepreneurship and Management
Ministry of Food Processing Industries
Plot No.97, Sector-56, HSIIDC, Industrial Estate, Kundli, Sonipat, Haryana-131028

Website: http://www.niftem.ac.in
Email: pmfmecell@niftem.ac.in
Call: 0130-2281089

CONTENTS

Abbreviations & Acronyms

Sr:No.	Abbreviations &Acronyms	Full Forms
1.	PM FME	Prime Minister's Formalisation of Micro Food Processing Enterprises Scheme
2.	OPP	Oriented Polypropylene
3.	OD	Optical Density
4.	OTR	Oxygen Transmission Rate
5.	LP	Laminated Pouches
6.	WVTR	Water Vapour Transmission Rate
7.	HACCP	Hazard Analysis and Critical Control Point
8.	GAP	Good Agricultural Practices
9.	GMP	Good Manufacturing Practice
10.	SOP	Standard operating procedure
11.	FSSAI	Food Safety and Standards Authority of India
12.	FoSCos	Food Safety Compliance System
13.	FBO	Food Business Operator
14.	FLRS	Food Licensing and Registration System
15.	FSS	Food Set and Sound Nutrition
16.	PFA	Prevention of Food Adulteration
17.	GST	Goods and Services Tax
18.	MoFPI	Ministry of Food Processing Industries
19.	FPOs	Farmer Producer Organizations
20.	SHGs	Self Help Groups

CHAPTER-1

INTRODUCTION

Soya chaap is a meat substitute available in various shapes and slices like that of sausages, tikkis, meat loafs etc. The most classic form of soya chaap is the laced soya chaap over candy stick.It is a high protein snack or Veg Meal soya chaap is a delicious vegan protein option.

Raw material for soya chaap production is soyabean.

1.1 Soyabean origin and history

- Southeast Asian origin.
- Named as Chinese pea or Manchurian beans
- Soya bean has been reported to be extensively cultivated in china from pre historic times.

Fig. 1: Soy bean

Crop physiology

- Soybeanloses viability very quickly.

- It is a major pulse in hilly region.
- Local variety is known as kalitur.
- Scientists Hunter and Erickson (1952) found soil water necessary for soyabean seed germination was 50% where as 30% in maize and 26% in rice.
- Soyabean has got taproot system.
- Optimal conditions for germinations are found in early season after the first substancial rainfall.
- Optimal temperature for germination of soyabean are 34-36 degree celsius with minima of 4 degree cel and maxima in the range of 42-44 degree celsius.
- Delouche found that seeds took minimum period for germination at temperature 30 ° C while it took twice longer to attain the same percentage at 20 ° C.
- Soyabean is a water spender with LWP falling to low level before stomata completely close.
- Stressed soyabean shows minimal paraheliotropy.
- Sinha found that soyabean plants accumulatedabout 2/3rd or more of total early weight at the time of flowering and at the beginning of pod development.
- The rate of seed fill is affected by photoperiod in soyabean.
- Soyabean produce yields less than other cereals and potatoes.
- A yield of 10-15 g/ha in 60-70 days is equivalent to a yield of 20-30 g/ha in 120 -140 days.

Climatic requirement

- Soyabean distributed in areas around the world between 0° and 20° N in medium altitudes and 200 and 400 N in low altitude.
- Soyabean is a kharif crop but grows in summer in hilly region.
- It requires warm and moist climate

- Temperature of 250 to 300 C is optimum for its growth.Maximum flower initiation occurs at day at temperature of 24-300 ° C.And complete inhibition takes place at 130 ° C.
- The growth ceases at minimum temperature of 100 ° C and maximum temperature of 380 ° C. Optimum growth range at 24-300 ° C.
- Yield decreases by delay in harvest by 8-12 days due to slattering.
- Threshing is done after sundrying the plants for few days.
- For storage , grains are dried in sun till the water content of seeds comes down to 10-12%

Storage

• Soyabean seeds are sensitive to humidity and temperature in storage.

• Soyabean with higher moisture content of 13.5% stored at 300 ° Cfailed to germinate after 5 months.

• But full vialbility maintained even after 10 years when it is stored at 100 ° C.

• Seeds under ordinary storage conditions do not retain viability for longer than one season. • Seeds should be dried to moisture content down to 10 % before storage

Quality

• Soyabean exists as black yellow and chocolate seeded type.

• In northern India black seeded type is cultivated which has higher percent of protein and lower percent of oil than yellow and chocolate ones

1 kg of soybean flour is equivalent in protein to 2kg of beef , 2.3 kg of mutton ,2.1 kg of fish,108 eggs and 18L of milk.

• Soyabean constitutes of 43.2 and 19.5% protein and fat respectively.

• Soybean is a legume crop principally containing protein ,lipids ,carbohydrates and minerals . • Soybean has highest amount of protein among the cultivated legumes.

• Sobean usually contains 20-22% fat on dry weight of which 12-15% is saturated fatty acids comprises of palmatic and stearic acid.

• Indian soybean haveaccounted for 43.2 and 19.5% protein and fat respectively

Seed structure

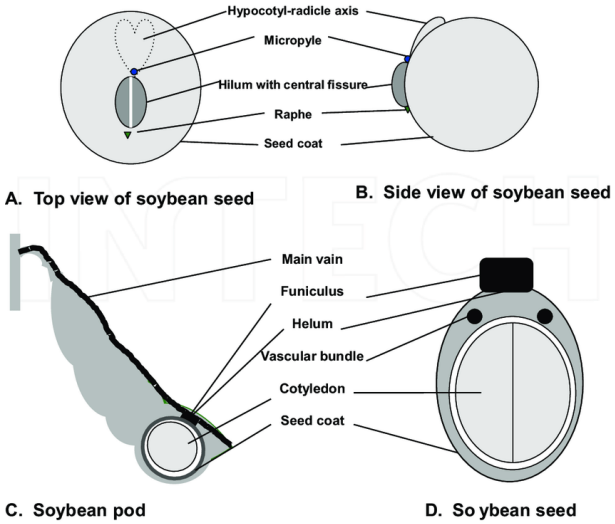


Fig. 2: Soybean Seed Structure

1.3 Production scenario of soyabean

United States of America is stood first with 1195.18 lakh tonnes in 2017-18 followed by Brazil (1145.99 lakh tonnes), Argentina (549.71 lakh tonnes), China (131.52 lakh tonnes) and India (109.81 lakh tonnes).

Soyabean has become an important oilseed crop in India in a very short period with 113.98 lakh ha area under its cultivation during kharif 2019-20. The major soyabean growing states are Madhya Pradesh, Maharashtra, Rajasthan, Karnataka, and Telangana. According to the first advance estimates, Govt. of India, soyabean production is estimated at 135.05 lakh tonnes during kharif 2019-20.

As per recent World Agricultural Supply and Demand Estimates Report, soyabean meal production of India is estimated lower at 7.76 million tons for 2019-20 compared to previous year record i.e., 7.85 million tons. However, it is higher from 6.16 million tons in 2017-18 season. India may export 1.90 million tons soya meal in 2019-20 lower from 2.30

million tons in previous year. Domestic consumption of the country may stand at 5.80 million tons i.e., higher from 5.48 million tons in 2018-19.

Soya meal exports have been reported down in August 2019 to 699,212 tons from a sixmonth high of 879,319 tons in July 2019 and 761,899 tons exported in August 2018.

Table 1: Global Soyabean Supply and Demand (in million tonnes)

	2017/18 (Estimated)	2018/19 (Forecasted)	2019/20 (Projected)
Opening Stocks	47.80	44.30	54.70
Production	340.90	363.10	343.70
Imports	152.70	148.60	149.70
Total Availability	388.70	407.40	398.40
Food	19.10	19.20	20.20
Feed	14.50	14.60	13.70
Crush	302.20	308.80	314.50
Total Consumption	344.70	352.50	358.10
Exports	152.70	148.60	149.70
Ending Stocks	44.30	54.70	40.70

Source: https://igc.int/en/default.aspx

In India, area under soyabean during 2019-20 was 113.98 hectares as against 113.09 hectares during 2018-19. Among the states, Madhya Pradesh stood first with 55.16 lakh ha followed by Maharashtra (40.11 lakh ha), Rajasthan (10.60 ha), Karnataka (3.30 lakh ha) and Telangana (1.77 lakh ha).

Table 2: State wise area under soybean in India

State	2018-19		2019-20	
	Area (lakh ha)	% to total area	Area (lakh ha)	% to total area
Madhya Pradesh	53.18	47.02	55.16	48.39
Maharashtra	40.44	35.76	40.11	35.19
Rajasthan	10.46	9.25	10.60	9.30
Karnataka	3.39	3.00	3.30	2.90
Telangana	1.78	1.57	1.77	1.55
Others	3.84	3.40	3.04	2.67
All India	113.09	100.00	113.98	100.00

Source: www.agricoop.com

1.4 Classification of soybean

There are 1200 to 1400 varieties of soybean

1.Yellow group: • Pai-mai- yellow seed with white white scar

• Chin huan –the round seed with yellow golden scar

• Hui chi-the yellow seed with dark brown colour.

2.Black group : • The wu-tou the large black seed.

• Peinwutou the flat black seed.

• The small black seed.

3.Green group: • The epidermis green but green yellow.

• Epidermis and germ both green.

Japanese classification

According to shape, size, colour, period of maturity and the uses to which is to put.

Marten's classification: Marten in 1869 classified according to form or shape of seed.

• Sojaelliptica or the oval seed

• Sojaspelica or the round seed

• Sojacompressa or the compressed seed

Aarz's classification: According to form of pods

- Sojaplatycarpe : flat podded soya bean
- Sojajumida : swollen podded soya bean

Botanical description

- Botanical name: *Glycine Max,* is a herbaceous annual plant in the family Leguminosae.
- Seeds can be variety of colours including yellow , green, blacks or a melted combination.
- Plants can grow upto 50-200 cm
- Taproot system , presence of root nodules.

Table 3: Soybean variety features

Variety	Features
Alankar	White flowers , tawny pubescence , yellow seed coat , light brown hilum and determinate , tolerate bacterial pustules , yellow mosaic
ADT 1	Determinate , gray pubescence , yellowish white seed coat , brown hilum , tolerate pustules , leaf webber
Birsa soy	Determinate plants with flowers, dark green leaves and black seeds with dull white hilum
Bragg	White flowers , gray pubescence , yellow seed coat black hilum , brown pods, determinate , resistant to bacterial pustules ,

	susceptible to YMV

• Self pollination , flowering starts from lower parts of stem.

Some Varieties of soya bean :

Other varitiesinclude :Durga , Gujarat soyabean 1 & 2 , Hara soya ,Indira soya , Improved pelican ,Ahilya variety , NRC variety

1.5 Importance of Soybean in Indian Economy

- Soybean contributes significantly to the Indian edible oil pool.
- Presently soybean contributes 43 % to the total oilseeds and 25% to the total oil production in the country.
- Currently, India ranks fourth in respect to production of soybean in the world. The crop helps earn valuable foreign exchange (Rs. 62000 millions in 2012-13) by way of soya meal exports.
- Soybean has largely been responsible in uplifting farmer's economic status in many pockets of the country.
- It usually fetches higher income to the farmers owing to the huge export market for soybean de-oiled cake.
- While on one hand production of Soybean in India has increased at a CAGR of 9.60 per cent from 6.87 million tonnes in 2004-05 to 15.68 million tonnes in 2012-13.
- On the other hand Soybean meal consumption has also increased at a CAGR of 10.82 per cent over the last eleven years from 1365 thousand million tonnes in 2004-05 to 4225 thousand million tonnes in 2014-15. Therefore to keep pace with the increasing demand it is imperative to increase the productivity level of Soybean in the country.

1.6 Processing of Soya Chaap

Ingredients:

1. Soyabean
2. Water
3. Soya chunks
4. Maida, salt
5. Sticks

Procedure:

1.Take soya bean in a bowl, add water to it .

2.Soak it overnight and then grind to make a paste.

3.Now take water in a bowl, add soya chunks to it and bring it to boil .

4.After the boil, drain out the water and soak it in cold water till they become soft.

5.After draining out all the water, grind the soya chunks to make it a paste.

6.Take soya bean paste in a bowl and add soya chunk paste to it.

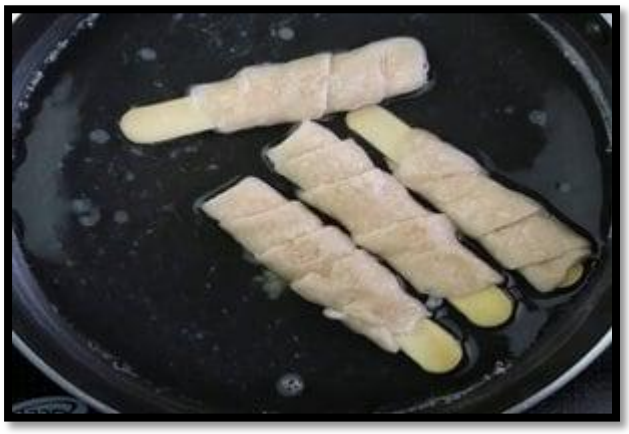
7.Mixmaida and salt to the bowl. Stir all of them thoroughly.

8.Add some water and knead a dough.

9.Flatten the dough like a chapatti and cut long pieces out of it.

10.Roll the long pieces on to the sticks.

11. Take a pan full of water and heat it, add the sticks and let it boil a little.



12.Now drain the water and let it cool down.

13.Soak the sticks in cold water for a few minutes.

Another method for making Soya Chaap:

1. Raw material :Soyabean flour , wheat bran , oil and refined wheat flour .
2. Mix the above ingredients and make dough out of it .
3. After allowing the dough to rest for a while , cut the dough and roll over the sticks.
4. After shaping ,these chaps are boiled for 30 minutes .
5. Once this is done allow the boiled chaaps to cool buy soaking them in water for 10 to 15 minutes.
6. Finally the chaaps are frozen in blast freezer , packed in large packages and stored in cold chamber.
7. According to the market demand the chaaps are removed form the chamber , sorted , graded and packed in various quantities.
8. The supply of these soya chaaps in done through the cold chain .

1.7 Equipments

Soya Chaap Making Machine, Automation Grade: Automatic

Brand	Haryana Agro Industry
Automation Grade	Automatic
Frequency	50/60 Hz

Voltage	220-240 V

Fig. 3: Soya Chaap Making Machine

Soya Chaap Making Machine, 7.5kw

Machine Type	Semi-Automatic
Capacity	250 kg
Power Consumption	7.5kw

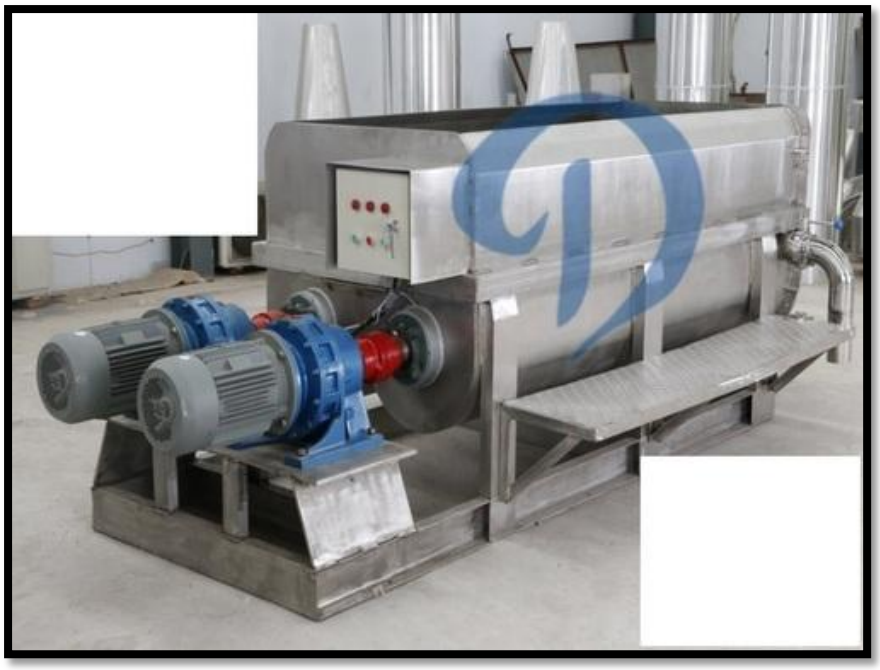


Fig. 4: 2 HP Chaap Making Machine, Automation Grade: Automatic

Brand	Haryana Agro Industries
Automation Grade	Automatic
Motor power	2 HP
Motor Type	Three Phase
Frequency	50/60 Hz
Voltage	220-440 V

Fig. 5: Soy Chaap Making Machine

Usually in the small scale industries most of the work in done manually apart from freezing operation which is carried out using blast.

General considerations

1. After the dough is mixed allow it to rest for 30 min at least.
2. Longer the cooling time after the chaaps are boiled ,weighed will be the weight of the chaaps . Usually 8-10 hours soaking in water for cooling gives the best results.

1.8 Nutritional facts

- It contains highest lecithin than any other flour.
- Lecithin content in soya bean identical to egg yolks.
- This lecithin may get destroyed during milling so it is advised to take whole grain flour rather than cake residue.
- In the flours of extraction Vit A is destroyed.

- The protein body gets deneutralised.
- The cake which is left after extraction is not fit for meal.
- Soybean contains highest amount of fat, minerals and least starch.
- Highest nutritive and calorific value and biological value.
- It can safely replace the costly animal food
- Protein in soybean flour compares to milk, fish, chicken and eggs.
- Soybean flour is equal to four times flour of cereals.
- 15-20% of fat.
- Soya fat is equal to 20 times of wheat fat.
- Its fat content high in Vit A and Vit D
- Rich in Potassium, sodium, calcium, calcium, phosphorous, Iron .
- It's a great source of starch and carbohydrates along with proteins and fats of high biological value.
- More easily digestible ,high water absorbing
- Coefficient of digestibility is 95.7%.
- Soya can easily replace the costly animal proteins and easily affordable for people in India

Health benefits of Soya chaap

- Perfect blend of protein vitamins minerals and insoluble fibre.
- Lowers the risk of breast cancer among women because of isoflavones
- Reduces cholesterol level

Commercially available soya chaaps

Fig. 6: Commercially available soya chaaps

CHAPTER - 2

PACKAGING OF SOYA CHAAPS

Packaging of the product is important for preserving it as well as for the ease of transport, labelling and advertisement purpose. Type of materials used for packaging soya chaaps are briefed below:

2.1 Pouches

These can be of films, foil, plastics. These strips can be mechanically laminated and heat sealed .Relatively lower cost.

2.2 Cartons

These are usually used to transport a batch of packed products to the destination. Cartons help in easy display of materials in shelf.

2.3 Composite cans

These are rigid containers with circular or rectangular cross section consisting of a body from laminated films mechanically bonded to metal ends. Excellent protection against crushing, damage caused by light. The cans are laminated with various types of sheets including Kraft paper, aluminium sheets etc.

2.4 Rigid plastic containers

Thermoformed tubs of polystyrene or high density polyethylene are used .Jar with minimumthickness of 0.030 inch is recommended.

2.5 Metal cans

Hermetically sealed cans provide protection against crushing, environmental damage, light effects etc. however they are costly .

2.6 Cellophane

It is transparent, glossy and has crisp feel .It is not usually used however it is used along with plastic coating upto 99.5 percent.

2.7 Food Grade PP Film

One of the cost effective means of Packaging .PP stands for Polypropylene,These films may be printed with details &logos.It's used for wide variety of food products

2.8 Food Grade HDPE Film

One of the cost effective means of Packaging .HDPE stands for High Density Polyethylene .These films may be printed with details & logos .It's more suited for liquid food though.

2.9 Laminated Retort Film Rolls

Used by more reputed brand .Material usually includes a laminate of metal & plastic .One of the modern materials used for packaging.Can be printed with required details.

CHAPTER- 3

FSSAI REGULATIONS

3.1 General Conditions

(Soy Flour is only being processed, thus only general condition are required to be observed)

- Display a true copy of the license granted in Form C shall at all times at a prominent place in the premises
- Give necessary access to licensing authorities or their authorised personnel to the premises
- Inform Authorities about any change or modifications in activities
- Employ at least one technical person to supervise the production process.
- The person supervising the production process shall possess at least a degree in Science with Chemistry/Bio Chemistry/Food and Nutrition/ Microbiology or a degree or diploma in food technology/ Dairy technology/ dairy microbiology/ dairy chemistry/ dairy engineering /oil technology /veterinary science /hotel management & catering technology or any degree or diploma in any other discipline related to the specific requirements of the business from a recognized university or institute or equivalent.
- Furnish periodic annual return 1st April to 31st March, within 31st May of each year. For manufacture of Milk and Milk Products monthly returns also to be furnished.
- Ensure that no product other than the product indicated in the license/ registration is produced in the unit.
- Maintain factory's sanitary and hygienic standards and worker's
- Hygiene as specified in the Schedule – 4 according to the category of food business.
- Maintain daily records of production, Raw materials utilization and sales in separate register. (whichever is applicable)
- Ensure that the source and standards of raw material used are of optimum quality.

- Food Business Operator shall not manufacture, store or expose for sale or permit the sale of any article of food in any premises not effectively separated to the satisfaction of the licensing authority from any privy, urinal, sullage, drain or place of storage of foul and waste matter.
- Ensure Clean-In-Place systems (wherever necessary) for regular cleaning of the machine &equipments.
- Ensure testing of all chemical and microbiological contaminants in food products through own or NABL/recognized labs atleast once in a month.
- Ensure that required temperature is maintained throughout the supply chain from the place of procurement or sourcing till it reaches the end consumer including chilling, transportation, storage etc.
- Clean and disinfected chopping boards/grinding stone/machine shouldbe used.
- Personal hygiene of food handlers need to be ensured.
- Water used in the process should be safe and potable.
- Only permitted food additives should be used, if required, and in added in recommended quantities only.
- Spoiled products should be discarded immediately after confirmation of spoilage (change in colour/ texture/ odour).

3.2 Codex general standard for soy protein products

Soy Protein Products (SPP) covered by this standard are food products produced by the reduction or removal from soybeans of certain of the major non-protein constituents (water, oil, carbohydrates) in a manner to achieve a protein (N x 6.25) content of:

In the case of soy protein flour (SPF) 50% or more and less than 65%;

In the case of soy protein concentrate (SPC) 65% or more and less than 90%;

In the case of soy protein isolate (SPI) 90% or more.

The protein content is calculated on a dry weight basis excluding added vitamins, minerals, amino acids and food additives.It is recommended that the products covered by the provisions of this standard be prepared in accordance with the appropriate sections of the Recommended International Code of Practice – General Principles of Food Hygiene (CAC/RCP 1-1969).

To the extent possible in Good Manufacturing Practice, the products shall be free from objectionable matter. When tested by appropriate methods of sampling and examination the product: (a) shall be free from micro-organisms in amounts which may represent a hazard to health; (b) shall not contain substances originating from micro-organisms in amounts which may represent a hazard to health; and (c) shall not contain other poisonous substances in amounts which may represent a hazard to health.

Labelling

The provisions of the General Standard for the Labelling of Prepackaged Foods (CODEX STAN 1-1985) shall apply. The name of the food to be declared on the label shall be: – "Soy protein flour" or "soya protein flour" when the protein content is 50% or more and less than 65%. – "Soy protein concentrate" or "soya protein concentrate" when the protein content is 65% or more and less than 90%. – "Soy protein isolate" or "isolated soy protein" or "soya protein isolate" or "isolated soya protein" when the protein content is 90% or more. The name may include a term which accurately describes the physical form of the product, e.g., "granules" or "bits". When the SPP is subjected to a texturization process, the name of the product may include an appropriate qualifying term such as "textured" or "structured".

Scope of business of soya chaap

The setting up of small scale soya chaap industry is briefed as below.

- Since most work is manual, lot of manpower is required.
- To begin with 18 -25 are needed to start the industry.
- 15-25 kw power would be needed to operate the plant at small scale.

- Since shaping of these chaaps is done by hand, not many equipment's are required. Basic equipment's like knife, large pots,kneader, weighing scale etc .would be sufficient.
- To start this industry at ones own land and infrastructure one would need an initial investment of 38-40 lakhs.
- For such an industry the entrepreneur can achieve 15 % gross profit.
- This production would require licenses like FSSAI ,GST , UDYAM , TRADEMARK
- Schemes applicable: Stand up India, PMFME etc.

References:

1. Soya bean – Kale , F .S
2. Indian Food Industry MAG
3. Codex Standard 175-1989
4. Evaluation of the PPPIAD Project on SOYBEAN – FICCI
5. EntrepreneurIndia TV
6. NDTV Good times
7. The complete technology book on snack foods – NIIR Project Consultancy Services.