A PROJECT REPORT

ON

METHODS USED FOR STORAGE OF FOOD CROPS, VEGETABLES AND FRUITS: A CASE STUDY OF JAIDOH VILLAGE, WEST KHASI HILLS DISTRICT, MEGHALAYA.

SUBMITTED IN PARTIAL FULFILLMENT OF VI SEMESTER GEOGRAPHY PRACTICAL EXAMINATION, NEHU, SHILLONG FOR THE ACCADEMIC SESSION:2023-24

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Nongstoin College, Nongstoin 2024

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We would also sincerely gratitude to our principal for permitting to us to conduct this group project as per the partial fulfillment of practical examination conducted by NEHU, Shillong.

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Place: Nongstoin College

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This group project is an original work of the students and it has not been published in any form whatsoever. Hence, this report may be placed for evaluation and consideration.

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CHAPTER-1

INTRODUCTION

1.1 Introduction:-

Food processing, preservation, and packaging are important to increase food availability for human consumption. Food processing includes mechanical, chemical, and thermal methods to process foods to increase their palatability and shelf life. Food processing transforms raw ingredients into food or other intermediate products, and preservation is the process of handling and treating food to control its spoilage by stopping the attack and growth of foodborne diseases causing microbes, avoiding oxidation of fats (rancidity), and maintaining the nutritional value, texture, and flavor of the food. According to Saini et al. the chemicals, microbes, and enzymes present in the food itself result in food spoilage if not processed and preserved. Besides, food and its products must be transported from one place to another. During transit, there are chances to deteriorate the food, loss or decrease in morphological properties, and reduction in the nutritional value of the food. Therefore, it is important to make efforts for food processing and preservation for longer shelf life, stability in quality, maintaining morphological properties, and no change in taste .

Various traditional and modern methods were developed, considering the importance of food preservation to reduce post-harvest losses and the chances of food poisoning and other diseases. Commonly used food preservation methods are refrigeration, canning, irradiation, drying, salting, smoking, and fermentation, which help improve the shelf stability of foods such as meats, fruits, vegetables, and fish-based products. Many traditional methods, such as preserving fruits by changing them into jams, had lower energy input and carbon footprint than modern techniques . Some traditional methods involve boiling fruits to kill microbes and decrease the moisture contents, adding enough sugar to prevent the regrowth of microbes, and sealing them in an airtight jar to prevent contamination. Sugaring causes the jam much hypertonic and makes it hard for microbes to survive. Various research areas of food preservation include preventing the growth of bacteria, fungi, or other microorganisms and preventing chemical reactions, such as retarding the oxidation of fats, thus extending the shelf life of food products. In addition, packaging research focuses on improving the shelf life of convenient, ready-to-eat, tasty, and mild processed food products. Currently novel biodegradable packaging materials are gaining importance in addressing the environmental pollution caused by fossil-based packaging materials.

This chapter provides an overview of food processing, preservation, and packaging technologies used to develop new products and improve their shelf life

1.2 Statement of the problem:

Food storage in India faces several challenges, primarily due to its diverse climatic conditions, inadequate infrastructure, and socioeconomic factors. Here are some of the key problems:

Inadequate Cold Storage Facilities: A significant portion of food in India is perishable, especially fruits, vegetables, and dairy products. However, there is a shortage of cold storage facilities, particularly in rural areas, leading to substantial post-harvest losses.

Poor Infrastructure: India's storage infrastructure is often outdated and insufficient to handle the country's vast agricultural output. Lack of proper roads, warehouses, and transportation facilities exacerbate the problem, causing delays and losses during transit.

Seasonal Imbalance: Agricultural production in India is highly seasonal, with peaks during harvest seasons. However, the storage capacity often does not match the seasonal supply, leading to gluts in the market during peak seasons and shortages during off-seasons.

Quality Control: Maintaining the quality of stored food products is crucial for preventing spoilage and ensuring food safety. However, due to inadequate monitoring and quality control measures, stored food often deteriorates, leading to wastage and health hazards.

Pests and Infestations: Insects, rodents, and other pests pose a significant threat to stored food grains. Inadequate pest management practices result in substantial losses, especially in grain storage facilities.

Lack of Access to Finance: Small-scale farmers and agricultural producers often lack access to affordable financing options to invest in modern storage facilities or technologies, limiting their ability to preserve and market their produce effectively.

Policy and Regulatory Constraints: Complex regulations, bureaucratic red tape, and inconsistent policies hinder private investment in storage infrastructure and innovation in the sector, further exacerbating the storage problem.

Addressing these challenges requires concerted efforts from the government, private sector, and civil society to invest in modernizing storage infrastructure, improving transportation networks, implementing better quality control measures, and providing financial support and technical assistance to farmers and food producers. Additionally, promoting sustainable

practices and leveraging technology, such as cold chain logistics and innovative storage solutions, can help mitigate food storage problems in India

1.3 Objectives:

1. To find out what type of storage of food crops is used in the concerned area.
2. To find the season most suitable for storage of food crops.
3. To find the type of food crops that is usually stored in the concerned area.

1.4 Literature Review

Cereals and legumes generally known as grains constitute the most vital diet component for the majority of people in the world (Duranti, 2006; Rajashekar et al., 2016) providing the calories and proteins consumed by the resource-poor and provide the rural folks with employment and sustainable source of income. Food grains are the most commonly stored durable food commodities in the tropic and subtropics usually stored to provide food and feed reserves as well as seed for planting. The major grain crops cultivated in tropics and subtropical nations are maize, rice, wheat, sorghum, cowpea, soybean, pigeon pea, kidney bean, mung bean, black gram, and lentil (Asif et al., 2013). According to Biam and Okorie (2012), Nigeria produces 1.09% and 2.85% of world production of cereals and legumes respectively. In India, food grain production is by far the major agricultural activity with 80% of arable land put into its cultivation.

Postharvest losses are a major cause of concern worldwide where below 5% research funding has been allocated (Rajashekar et al., 2012). The food problem in Nigeria and India is largely due to the inability to preserve food surpluses during the short harvest periods rather than to low production. Grain production plays minimal role in the economies of developed and developing nations because agricultural production is seasonal while the demands for agricultural commodities are more evenly spread throughout the year (Rajashekar et al., 2014; Swinnen and Maertens, 2007). In this circumstance, there is a need to meet average demand by storing excess supply during the harvesting season for gradual release to the market during the off-season period. For regular availability of agricultural outputs or stabilizing the economy of any country, it is required that quality food grains must be supplied to the consumers for making different products and marketing, as well as to the farmers for sowing and growing healthy grains (Wright and Cafiero, 2011). In order to satisfy the demand for a plentiful supply of cereals and legumes, grains must be stored throughout the year.

A substantial amount of food grains is being damaged after harvest due to lack of adequate storage and processing facilities. Moreover, significant agricultural production could be impacted due to variations in periodicity and intensity of climatic events like floods and droughts, temperature and rainfall patterns (Arun et al., 2017). FAO estimates of worldwide annual losses in stored produce have been given as 10% of all stored grain (Parfitt et al., 2010). In Sub-Saharan Africa, 25–40% of food grain losses occur during storage at the farm level. Rajashekar et al. (2012) stated that, post-harvest losses in India were 12 to 16 million metric tons of food grains per year, an amount that the World Bank stipulates could feed one-third of poor Indians. In India, the estimated post-harvest losses account for 9.5% of total pulses production. Among the post-harvest operations, storage is responsible for the maximum loss (7.5%). Among storage losses, pulses are most susceptible to damage due to insects (5%) compared to wheat (2.5%), Paddy (2%) and maize (3.5%) (Deshpande and Singh, 2001). This generally results from inadequate post-harvest management practices and imperfectly designed storage structure.

Post-harvest facilities or appropriate storage technology has been the major problem of India and Nigeria and other developing nations for a long time. This has resulted in a considerable waste of agricultural output and hence considerable loss to the economy. The average proportion of food grains retained by farmers for their own (not for sale) is usually assumed to be 60–70% in indigenous storage structures (Kanwar and Sharma, 2003). Farmers usually keep such food grains in storage structures mainly for household consumption. The surplus grains, on the other hand, may be sold within two or three months of harvest. After harvest, the grains may be stored temporarily in bulk or in bags for a month or two before being transferred to a structure. It is observed that different localities in Nigeria and India have peculiar storage methods depending on the types of crop grown and farmers attain a varying degree of success in applying the basic principles involved in the safe storage of food grains.

Storage practices differ and there are small or big storehouses, indoor or outdoor, temporary or permanent and individual or community storage design. These structures have open storage system, semi-open storage system and closed storage system (Gwinner et al., 1990). These traditional approaches have been used for many years with little or no modification and are successful because of the application of scientific values, though accidentally. The choice of a traditional storage system is often relevant to climate, but regional natural resources and customs also influence the choice of the storage methods (Hall, 1970).

Traditional methods of storage are a type of knowledge, which has evolved into the community and has been passed on from one generation to another generation (Natarajan and Santha, 2006). Certain traditional methods of grains storage practices are unique to the culture of society and vary among countries, villages, locals and even communities. These indigenous practices originate from the cultural connection with specific environmental conditions and are based on traditional societies having intimate consciousness of their environment. It is estimated that 60–70% of food grains produced in developing nations are stored at home level in traditional structures either in threshed or unthreshed forms. In order to reduce the losses incurred after harvesting, farmers take measures such as sufficiently drying maize before storage, using storage structures which are moisture proof and are adequately aired (Nduku et al., 2013). Most of the structures are constructed at the beginning of the harvesting season and harvesting time varies with the agro-climatologically zones. In Nigeria, the prominent structures found in the three different climatic zones are; granaries, mud rhombus, thatched rhombus, platforms, cribs, earthen pots or baskets, domestic or indoor storage such as plastic containers, gourds, earthen pots and metal containers. Other storage structures include bags, which could be made of jute, hessian, polyethylene or plant fiber. In addition to the use of traditional storage structures, farmers use other coping strategies aimed at reducing these postharvest losses such as the use of traditional knowledge. These include the use of herbs such as the Mexican marigold and hot pepper in storage, selling grain soon after the harvest and cleaning or dusting the storage structure with pesticide thoroughly before depositing the maize or by acquiring the new maize storage technologies.

The fundamental requirements of every grain storage methods or structures are to secure the grains from insect, rodents and prevent spoilage of the grains by the activities of the microorganisms (Hall, 1970). It is also essential to keep the grains cools and dry during storage. The various natural resources associated with the adoption of synthetic insecticides have necessitated the search for safe and affordable storage structures, which do not have an adverse effect on secondary consumables and the environment. Therefore, this review was conducted to re-examine the various traditional storage practices adopted by resource-poor farmers in Nigeria and India to store food grains product in order to maintain food security.

1.5Methodology

Different methods have been used for the collection of data, analyzing in this project. Some of these methods are as follows:

1. Selecting the Subject Matter /Project Title (Land Use: A Case study of Jaidoh, West Khasi Hills District, and Meghalaya).

2. Selection of the Study Area (Jaidoh, West Khasi Hills District,Meghalaya).

3. Preparation of interviewer schedule: Questions for generating information are framed according to the requirement of the survey. Two types of questions are generally asked during the field survey.

a. Simple choice question.

b. Open ended question

4. Actual Survey: The survey of the subject matter has been conducted in the selected area on the 9th of March, 2024 with the help of the interviewer schedule to investigate the people of that area in order to get the correct information about the population and employment status of that area.

5. Other Information: Some information has been taken from various books, magazines, internet sources, etc. This information that obtained from various books helps to frame the data.

6. For Analyzing of various step are taken, such as calculation of percentage, the formula is below:

Percentage=value/total value x 100

GIS work through Qgis and Arcgis

1.6 Source of Data

The sources of data for this field survey are of two types:

- Primary data
- Secondary data.

Primary data: Here, the information is collected from the field through interviewer schedule and observation directly about the living standard of the people.

Secondary data: Here, the information is collected from various sources such as books, Magazines, newspaper, Internet Sources etc.

CHAPTER-2

GENERAL OUTLINE OF THE STUDY AREA

2.1 Background of the study area

The JaidohVillage is located in Nongstoin C&RD Block, West Khasi Hills district, Meghalaya. It has a total number of 130 household with a population of 812, (419 males and 393 female) which account 51.6% male and 48.3% female. The sex ratio of Jaidoh village is 937 female per thousand males which is lower than that of the national level which is about 943 female. The total literacy rate of the study area is about 73.2 %.

2.2 Location

The latitudinal extension of Jaidoh is 25°27' 45" North to 25° 29' 26" North and the longitudinal extension is 91°20'13" East to 91°21'23" East. It is a part of Nongstoin Block. It is about 12.5 km away from Nongstoin the district headquarter of West Khasi Hills District and 85.3 km away from Shillong which is the Capital of Meghalaya. It is bounded by Nonglwai in the east, Mawthungkper in the West, Nongkynjang in the North and Marshan Nongrim in the South. It covers an area of 1.878 Sq/ Km's. We can further understand with the help of the following map:

2.3 Relief

Jaidoh covers mostly with gentle slopes, this covers the North, the north east and the south with height of 1410 meters above sea level to 1430 above sea level. The contour difference in the gentle slope is about 30 meters. Steep slope can be seen only in the north western part with a height of 1430 to 1480 meters above sea level. The lowest elevation of Jaidoh is 1410 meters above sea level and the highest is 1480 meters above sea level .We can further understand with the help of the following map:

2.4 Drainage

Drainage system is one of the main factors which shape agricultural land use. The main river of the study area is the Kynshi River which is situated in the eastern part of the village. This river goes through from north to south. This river is a perennial river. This river provides water for many purposes, either for agriculture, drinking, and domestic uses or for other purpose. There are many small streams in the village, some of them are perennial streams, and some are non-perennial streams. When we look at the pattern of these streams, they are mostly dendritic pattern, this shows that these rivers go according to the slope of the land. We can further understand with the following map:

2.5 Climate

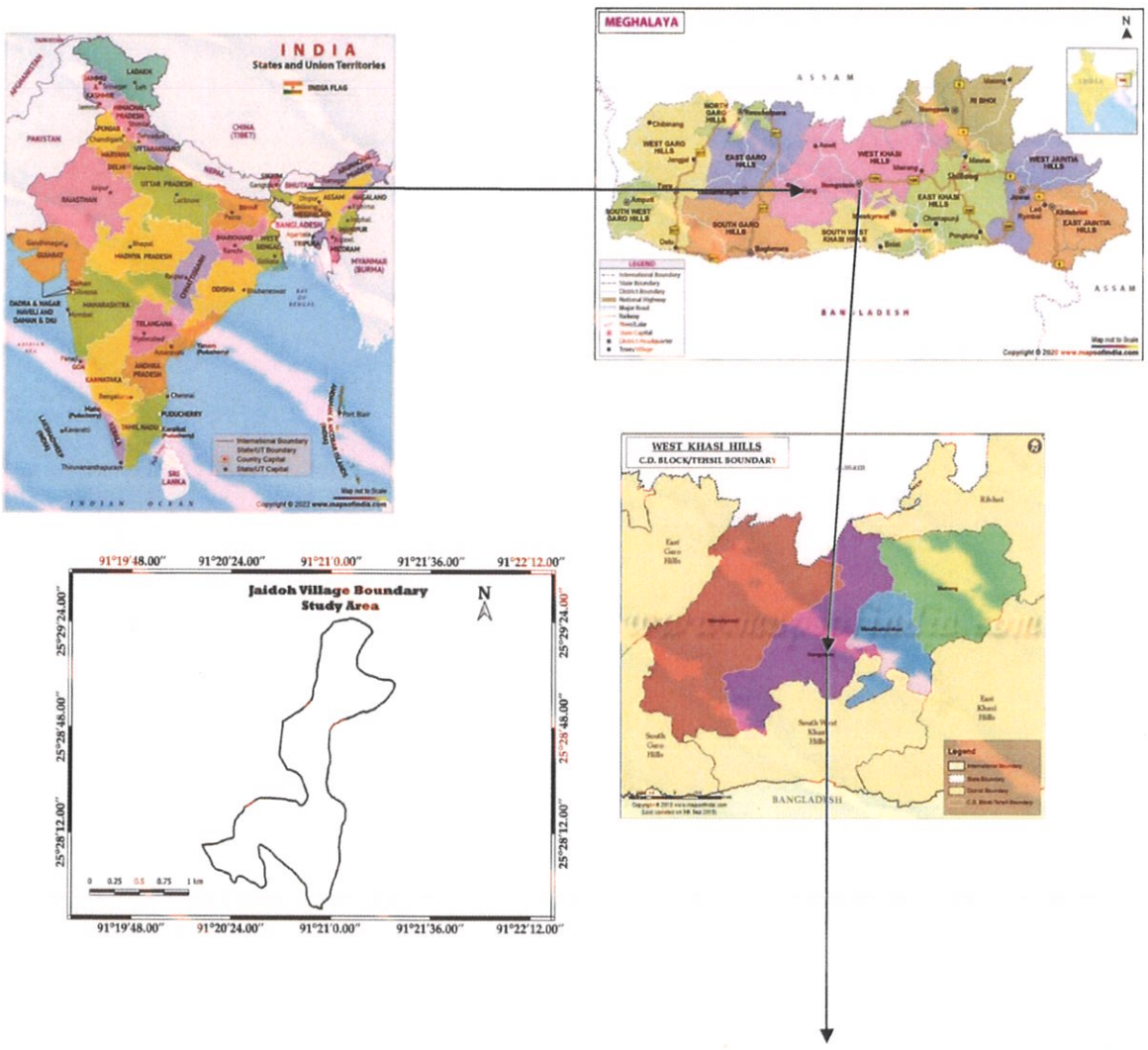
The climatic conditions of the study area are similar to that of the West khasi Hills District. It experienced four distinct seasons that is, spring, summer, autumn and winter. Its climate is being affected the relief of the region. It experienced a monsoon climate with a warm rainy summer and a cold and dry winter. The average temperature of the coldest month and hottest month is 17°C and 24°C respectively. The region experience low rainfall during winter with 0 mm during December and the highest rainfall is experience during the month of July with 1567.6 mm.

Table 1: Monthly rainfall of Nongstoin

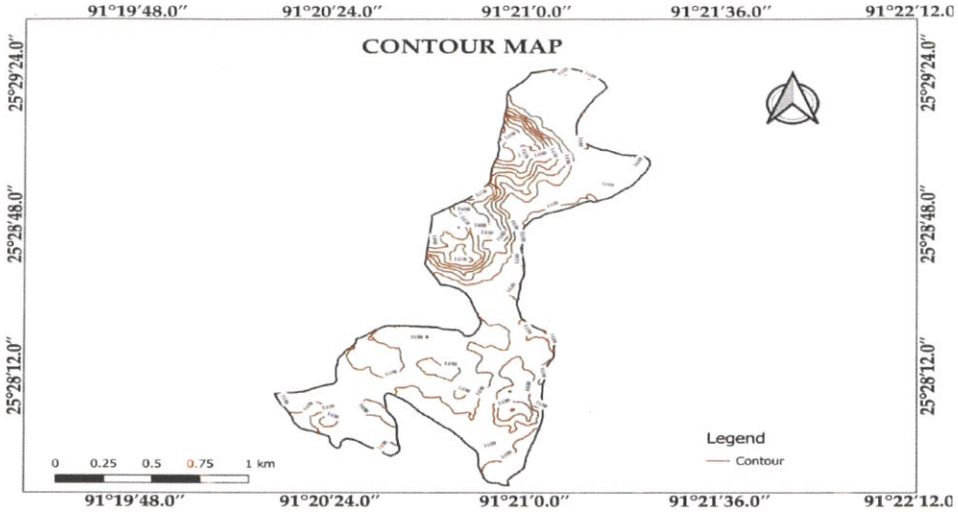
Month	Jan	Feb	March	April	May	June	July	Aug	Sep
Rainfall (mm)	14.6	21.1	42.8	25.8	430.8	877.2	1567.6	401.2	752.8
Month	Oct	Nov	Dec	Total					
Rainfall	293.8	11.4	0	4671.3					

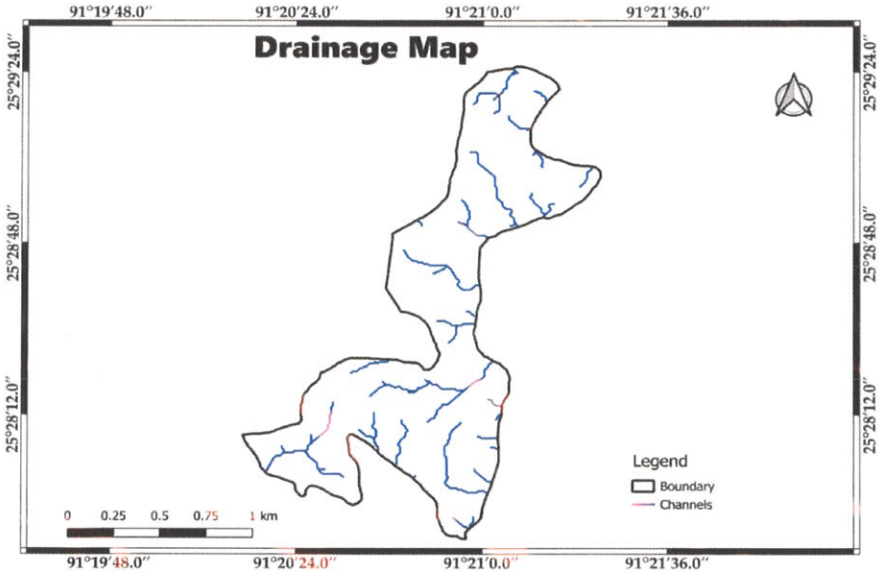
Source:Directorate of Agriculture Meghalaya

Figure 1: location map of Jaidoh



Map2.2: Contour map of Jaidoh





2.6 Natural Vegetation: Natural vegetation of the project area is fairly poor due to tremendous biotics such as recurring fire hazard, timber, fuel wood and charcoal burning etc. The area consists mostly of degraded and open forest with scattered pocket of trees.

2.7 Major Soil Groups:

Soil is an important part of the land as it where settlements, road, etc are built. Soil is very important especially for agriculture, as the types of soils affect the types of crops grown and produced. When we look at the study area, the major soil group is luvisols, cambisols and acrisols. We can understand major soil groups of Jaidoh better with the help of the followingmap

Luvisols:

Luvisols is a soil group in Reference Base for Soil Resources. Luvisols are fertile soils and are used for agriculture. Luvisols have an argic horizon and a surface and sub surface of higher clay content. Luvisols is formed as soil is being washed down or eroded downward by water, either by rains or rivers from uphills and are deposited in the downhills. This soil is very good for cultivation.

From the above map, it is seen that Luvisols cover mostly in the Central and the southern part of the area.

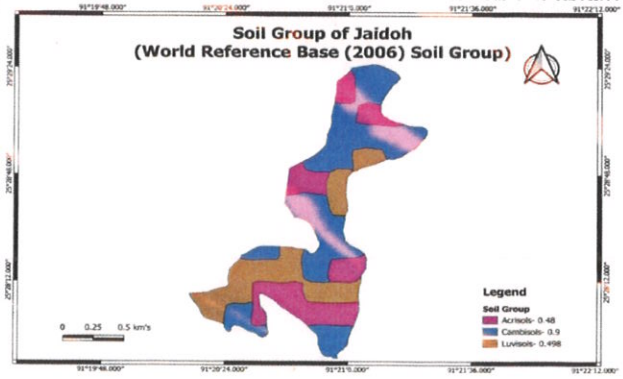
Cambisols:

Cambisols is one of the soil group from World Reference Base for Soil Resource. It is a soil which is form in the beginning of soil formation, the horizontal differentiation is weak, mostly brownish discolouration. Cambisols is good for agriculture and is intensively used.

From the map above, It is seen that cambisols covers the most part of the study area. It is found mostly in the north and the central part of the study area, some can also be found in the southern part of the study area.

Acrisols:

Acrisols is one of the groups of soil in World Reference Base for Soil Resources. Acrisols is rich in clay.From the map acrisols can be found a little in the north, the central and the southern part of the study area.



CHAPTER- 3

FINDINGS

3.1 Findings for objective No. 1:

It was found that all households/ farmers in Jaidoh village use traditional method of storage. They store the food crops in a cold dry room or house in room temperature. This is also called the Dry Storage. It is one of the traditional ways of storing food crops in the Khasi Hills. Duration of the storage depend on the types of crops and foods crops. Perishebility still remains on the moisture content of the crops .Crops rich in vitamins like leafy plants cannot be stored in this traditional way of storage. Climate plays a major factor here as it is cold and dry especially during winter season.

3.2 Findings for objective No.2:

It was found that winter season is most suitable for storage of food crops because winter is dry and cold and those are the two main conditions for storage. Summer season is least favourable because it is hot and humid promoting decay and decomposition.

3.3 Findings for objective No.3:

It was found that food crops and vegetable like rice, potato, maize, pumpkin are mostly stored.

Some others are like squash, sweet potato, sesame seed, mustard seeds, yam are also stored.

1. Rice can be stored because it has zero percentage of water and it is easy to stored because we can just keep it in a dry place and we can store it both in summer and winter season.
2. Potato can also be stored according to the local but they have to be stored in a dry area and their own traditional way of storing by using of basket like storing item (bamboo basket) or by using just bamboo mat which will keep the potato out of any humidity and it can last up to three months and more.
3. Maize can also be store by using the traditional method by just hanging them near the fire outside the house which is dry and do not come in contact with water and they can be easily stored just like that but maize if not check properly insects may eat and destroy it.
4. Pumpkin can also be stored but it have to be put or stored in a very cool and dry place but it depends if the pumpkin is having any sign of rot because it will destroy the pumpkin

CHAPTER- 4

DISCUSSION AND CONCLUSION

4.1 findings and conclusion

Agriculture is the Main occupation of Jaidoh village. Traditional way of storing them mostly used type of storage in the concerned area whereby crops. vegetable and food crops are stored in a cold dry place for months. Rice, maize, potato, are the most stored of food crops in Jaidoh Village.

Some others liked squash, sweet potato, yam, sesame seeds, mustard seeds are also the food crop stored in the concerned area.

Winter season is more suitable for storage of food crops because its cold and dry.

During field survey, upon asking questions, it was found that people /farmers did not receive any help either financially or in term of infrastructure from the government regarding storage of food crops. It was also found that people wanted help from the government; it might be in terms of finance, infrastructure, training, workshops, or in any other forms. According to the farmer's responses storage in a very valuable necessity as it can save them a lot of money and produced from going to waste.

After thorough investigation, intervention from the government is highly recommendable in Jaidoh village, in terms of facilities and finance for storage of crops.

Modern technological based storage is costly and not readily available in the local market. And individual might want to setup a storage unit for crops, vegetable and food crops, but it is highly unlikely that he will be able to afford it. Thereby, intervention from the government in any means, way or form is very necessary.

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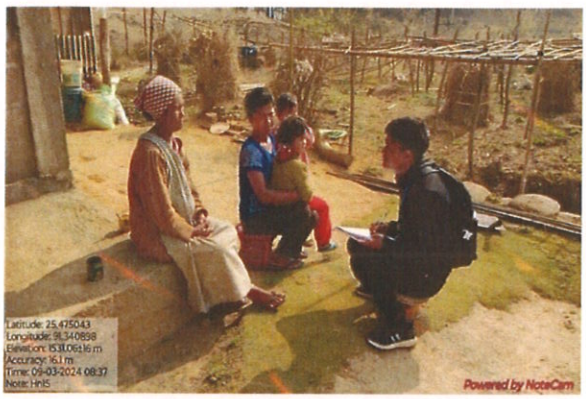
LIST OF PLATE

Plate 1: Students Interviewing with Villagers



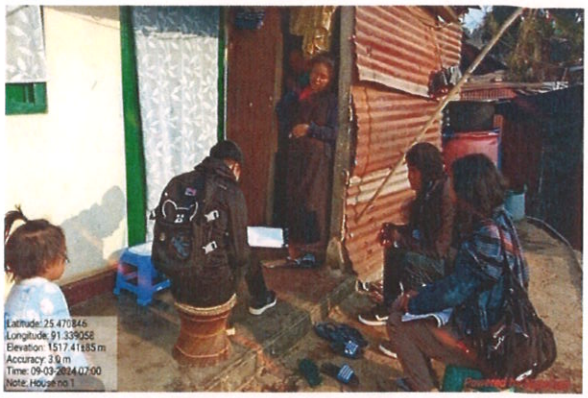


Plate 2: Paddy field

Plate 3: Pig Sty

Plate 4: Paddy field

Plate 5: Squash plantation field

Plate 6:Students along with teachers in Jaidoh villa

QUESTIONNAIRE ON
METHODS USED FOR STORAGE OF FOOD CROPS, VEGETABLES AND FRUITS
A case study of Jaidoh Village
(FOR STUDENTS' USE ONLY)

Part- I

1. State Name: _____

2. District Name_____

3. Block Name: _____

4. Village Name: _____

6. Name of the Respondent: _____

7. Date of interview (dd/mm/yyyy): _____

8. Time of starting the interview: _____

9. Name of the Investigator: _____

10. What is your age? (In completed years) _____

11. For how long have you been living here? _____ (years)

From birth/entire life /No response

12. Gender: 1. Male 2. Female

13. What is your marital status?

1. Married 2. Widowed 3. Divorced 4. Separated 5. Never married/Single

14. Educational Status :

1. Illiterate 2. Primary Education 3. Middle School Education 4. High School education
5. Higher Secondary Education 6. Collegiate Education 7. Others

15. Annual Income :

Part- III

1. Do you store Food crops, vegetables or fruits? (Y/N) _____

1. A. If Yes, What types of Food crops, vegetables or fruits do you store?

_____

_____

2. What method of storing do you use?

a. Traditional way of storing

b. Scientific technology based storage

2. A. (If answer is a.) What are those traditional ways of storage?_____

_____

_____

2. B. (If answer is b.) What are those scientific technology based storage methods do you use?

_____

_____

_____

3. Do you receive any help from the government in terms of finance, trainings, workshops or schemes for Storage of crops, vegetables and fruits? (Y/N)

_____

3. A. If yes, what are they? _____

_____

4. What are the seasons more suitable for storage?

5. How long do the food crops, vegetables and fruits last?

(a) In a Traditional Way of Storage :

_____

(b) In a Scientific Technological Based Storage:

_____

6. Crop wise what type of crops last longer in storage?

_____

_____

_____