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**S Brahma**

Sarat Chandra Sinha College of Agriculture, Assam Agricultural University, Rangamati, Dhubri, Assam, India

**V Upadhaya**

Regional Agricultural Research Station, Assam Agricultural University, Telipara, Gossaigaon, Assam, India

**RK Nath**

Sarat Chandra Sinha College of Agriculture, Assam Agricultural University, Rangamati, Dhubri, Assam, India

**P Sarma**

Krishi Vigyan Kendra, Assam Agricultural University, Telipara, Gossaigaon, Assam, India

**R Sarma**

Sarat Chandra Sinha College of Agriculture, Assam Agricultural University, Rangamati, Dhubri, Assam, India

**Corresponding Author**

**S Brahma**

Sarat Chandra Sinha College of Agriculture, Assam Agricultural University, Rangamati, Dhubri, Assam, India

## Scope of cassava (*Manihot esculanta* Crantz) in improving livelihood of tribal people in rural areas of Kokrajhar district of Assam, India

S Brahma, V Upadhaya, RK Nath, P Sarma and R Sarma

### Abstract

Tapioca or Cassava (*Manihot esculanta* Crantz) has multifaceted role in fulfilling the needs of the tribal people in rural areas contributing to food security, poverty eradication and livelihood improvement. Cassava is a native vegetable of South America grows very well in tropical and sub-tropical areas, where potatoes don't and acts as a barrier against starvation. It has excellent drought tolerance and can be planted with a low input requirement in almost all types of soil, where other crops cannot be cultivated economically. Among the tropical root, and tuber crops it occupies first position globally in terms of the area and production. It is an important tuber crop intimately associated with the livelihood of the Bodo tribes of Kokrajhar district of Assam, North East India. Tapioca is preferred to be eaten as a snack after boiling with addition of salt. Apart from use as snack different types of value added products like tapioca cakes, biscuits, chips, barfi, sagu, starch etc. can be prepared. Tapioca flour has the largest amount of pure starch, more than any other crop and has great value in the textile industries, in pharmaceutical industries, as adhesives etc. The cassava flour finds use in making vermilion and natural holi colours. Above all, tapioca leaves are used as secondary food source for the Eri culture industry closely associated with the culture and tradition of the Bodo tribes and occupies a prominent place in the Socio-economic development and livelihood improvement of the people particularly Bodo women folk of BTR of Kokrajhar district of Assam, India.

**Keywords:** Bodo tribe, cassava, improvement, Kokrajhar, livelihood, poverty

### Introduction

Cassava (*Manihot esculenta* Crantz) is considered as one of the oldest root vegetable and tuber crop used by humans to produce food, feed, and beverages by the humans. It is one of the fastest expanding staple food crop in cassava consuming countries and is also gaining industrial importance (FAO, 2018) [7]. Globally cassava stands first among the tropical root and tuber crops and occupies fourth position among staple crops with a production of about 160 MT per year (Lawrence and Moore, 2005) [8]. Approximately 13% of Asian cassava production comes from India. In India mostly it is grown in Kerala, Tamil Nadu, Andhra Pradesh, Karnataka, Nagaland, Meghalaya and Assam and Kerala and Tamil Nadu contributes to major share of production of cassava.

In India it is cultivated for more than a century and introduced by the Portuguese during the 17<sup>th</sup> century from Brazil as a food crop. The spread of the crop in the initial period of introduction was attributed to a famous ruler of the Travancore State, Sri Visakam Thirunal, who had encouraged the cultivation of popular varieties of cassava from the erstwhile Malaya and other places to overcome shortage of food (Nair *et al.*, 2014) [9].

During the 20<sup>th</sup> century famine at the time of Second World War in India the importance and food value of cassava was recognized. According to NHB, (2017-18) tapioca production in India is 40.96 lakh tonnes with a productivity of 20.89t/ha from an area of 1.96 lakh ha. Nationwide, Assam stands sixth in tapioca production with an area of 3120 ha with production of 28870 MT and productivity of 9.25 MT/ha (NHB, 2017-18). The tribal districts viz., Karbi Anglong and Kokrajhar is the major tapioca producing district of Assam. Kokrajhar district of Assam, North East India has an area of 736 ha followed by production of 3522 MT, and productivity of 4.78 MT/ha in

Tapioca or Cassava is a cash crop and can perform better and achieve good yield with good crop management practices. Being a climate resilient crop it requires minimum agronomic input and care for its growth. More calories per acre of the crop can be obtained due to affordable source of carbohydrates, and also key vitamins and minerals compared to cereals.

Tapioca has more dietary fibre, magnesium, riboflavin, sodium, thiamine, nicotinic acid, and citrate, and low in Iron and Vitamin A (Bradbury and Hallway, 1988) [5].

### Health Benefits of Cassava

- 1) It has provides more calories
- 2) It is a good source of vitamins and minerals
- 3) Cassava contains high amounts of dietary fibre.
- 4) Cassava is a gluten free tuber
- 5) Cassava increases immune function
- 6) Cassava may slow down ageing

**Table 1:** Nutritive value of cassava (mg/100g fresh weight)

Sl. No.	Nutrients	
1.	Moisture (%)	65.5
2.	Fat (%)	0.2
3.	Protein (%)	2.5
4.	Starch (%)	32.4
5.	Energy (K cal)	135
6.	Vitamin B <sub>1</sub> (mg)	0.04
7.	Vitamin B <sub>2</sub> (mg)	0.02
8.	Vitamin C (mg)	35
9.	Calcium (mg)	26
10.	Phosphorus (mg)	32
11.	Sodium (mg)	2
12.	Potassium (mg)	39.4
13.	Iron (mg)	0.9

(Source: Tropical Tuber Crops edited by Balagopalan *et al.*, 1999) [4].

Tapioca being a commercial crop in India is used for making several products including food, flour, paper, textiles, food additives and animal feed. Besides tapioca root can be processed into primary or secondary processed products based on requirements.

### Processing of tapioca

Being highly perishable in nature the processing of tapioca can be taken up to overcome perishability of fresh produce. A number of products can be produced from tapioca roots after processing. It can be processed into a number of products such as starch, flour, chips, ethanol, glucose syrup, bread etc.

### Primary processing of Tapioca

- Plain White Chips
- Parboiled Chips
- Tapioca Flour
- Tapioca starch
- Tapioca sago

### Secondary processing of Tapioca

- Safe Holi Colour
- Biscuits/Tapioca cake
- Tapioca barfi
- Tapioca ethanol etc.

Proper post-harvest handling, processing and marketing of tapioca can contribute immensely to the livelihood security of poor tribal people in rural areas of Kokrajhar district. Apart from creating employment opportunity processed products of tapioca will enhance income of the farmers, thus prevent the distress sale of the fresh tapioca tubers. The present study was therefore conducted with the objectives, to study the different multipurpose uses of tapioca plant *viz.*, the primary and secondary processing of tubers besides use of fresh tubers as

well as the uses of leaves by the *Bodo* tribes of Kokrajhar district of Assam and also to popularize the different value added products for establishing small scale rural agro-based industries.

### Materials and Methods

The uses of tapioca tuber both in fresh and low cost processed products (primary and secondary processing) as well as leaves were studied through a semi-structured questionnaire, group meetings with village head man, SHGs, KVKs, State agriculture departments, Sericulture departments, Books, Journalsetc.

### Results and Discussions

Kokrajhar district, is located in the extreme northwest of Assam, the district is the entry point from the rest of India to the NE region. It has small ranges of low hills in the north and flat plains in the south. The district belongs to the Bodoland Territorial Region (BTR), an autonomous administrative body created for the local administration of Kokrajhar, Chirrang, Baska and Udalguri districts which are dominated by the *Bodo* community. It is a small district; half its area is covered by forest and close to a quarter is net sown area. In the district majority of the farm households are smallholder which forms the majority of the rural population and its economy. Paddy is the main crop followed by pulses, legumes, root crops like tapioca and tuber crops, spices like ginger, turmeric, chilli, fruit crops like banana, pineapple etc. is produced in Kokrajhar. Cassava is a popular indigenous commercial root crop and commonly grown in every household of the tribal district and has recorded production over a third of Assam's tapioca. Mostly it is relished as snacks after boiling with salt. The farmers receive Rs 20 per kg for the produce while the production cost is only around Rs 2-3 per kg. One tree can yield up to around 45 kg, and the average yield is about 20 kg per plant. Cassava offers immense opportunity to be used as a source of food, animal feed and as a raw material for various industries purposes.



**Fig 1:** Cassava tubers in farmers field



**Fig 2:** Cassava tubers in market

Since tapioca root is bulky, it is highly perishable commodity and deteriorated rapidly than any other root crop due to physiological and microbiological changes. Storability of the root under natural condition is less than two-three days. In absence of proper storage methods, and proper market, the farmers of the district delays the harvest and keep the tubers underground intact with the plant. Processing as well as value addition to the crop will check deterioration and wastage of the root crop as well as distress sell by the farmer. The following uses of tapioca tuber as well as root have been documented after thorough discussion village head man, SHGs, KVKs, State Agriculture Departments, Sericulture Departments, Books, Journals, other references etc.

**1. Human food:** Used for human consumption of fresh roots and leaves (or young plant tops) after boiling. The most popular and traditional modes of consumption of cassava tuber in Kokrajhar district of Assam, India is after boiling in water, which provides rich source of carbohydrates, minerals and vitamins.

**2. Production system:** A very-drought tolerant and water-efficient crop, can be grown with low resources very easily. Generally mono-cropping is practised and the crop is shows slow initial growth and low soil cover. According to Silva *et al.*, (2016) <sup>[11]</sup> intercropping with other crops like maize and beans proves to be highly viable and an additional source of income for the farmer. Other crops such as yam, maize, vegetables, grain legumes, or trees, can also be intercropped with cassava which provides largely positive effects on various key ecosystem services. Farmers in Kokrajhar district of Assam, India mainly adopt cassava monoculture in major cassava growing areas. The small and marginal farmers generally plant cassava during the pre-monsoon showers in the month of March/April until May/June. Intercropping systems should be adopted to obtain maximum returns per unit area. Intercrops like castor, colocasia, vegetables, ginger, turmeric and trees like kesseru were found to be profitable in cassava cultivation.



**Fig 3:** Cassava intercropped with castor

**3. Additional farm income:** In addition to income from tapioca, various short duration crops like colocasia, vegetables, ginger, turmeric, legume crops, maize etc. can be grown as intercrop between cassava, which provides additional income to the farmers. Apart from utilizing the yield from main crop and the intercrop, farmers specially the women folks of Kokrajhar district are engaged in silkworm rearing. *Eri* silkworms rearing is a household activity among the *Bodo* people in Kokrajhar District (Teotia and Bajpeyi, 2009) <sup>[12]</sup>, and mostly practised by the women folk (almost 64%) of all age categories (Brahma, 2015) <sup>[6]</sup>. *Eri* silkworm rearing is practised not only for its silk but also for protein

rich food from pre- pupae/pupa as one of its delicacies. The *Eri* culture farming has a high potential with good prospect for economic development of farmer's in the district. It can serve as a foundation for the establishment of small scale *Eri* silk production and weaving industries in the area. So besides the yield of cassava main crop and different intercrops, *Eri* rearing can also be combined along with cassava cultivation where the leaves from castor (annual host plant) and kesseru (perennial host plant) can be used as primary food. In absence of the primary food, cassava leaves can serve as the secondary food source for the *Eri* worms without any negative effect on the growth of *Eri* worms as well as yield of cassava tuber.



**Fig 4:** *Eri* worms rearing with cassava leaves as secondary host plant

So combining the yield from cassava as main crop, different intercrops as well as *Eri* rearing, utilizing cassava and castor as food crop of *Eri* worms in Kokrajhar district, will benefit the small holder and marginal farmer's since sericulture is considered as one of the most remunerative and income generating occupation. The return from this activity is highly profitable with a short gestation period and cost benefit ratio of 3.1 can be obtained (Directorate of Sericulture, BTC, Kokrajhar)

**4. Animal feed:** Both tapioca roots as well as leaves can be utilized as fed to animals specially pig which provides an excellent source of energy due to its highly digestible 70-80% carbohydrates. As per reports (Anonymous, 2007) [3] fresh cassava leaves at levels up to about 25% of the diet are safe to be fed to growing pigs. Ravindran and Ravindran, (1988) [10] reported that the leaves are rich in protein.

In addition to leaves tapioca root is a good source of energy for piglets due to its high starch content. Feed replacement by tapioca root of 20% can aid as alternative feed ingredient of energy source in improving carcass weight for growing-finishing swine. Thus, tapioca can be an alternative feed ingredient in growing finishing swine without any detrimental effects on growth performance and meat quality (Alamet *et al.*, 2018) [1]. Because of low protein content of cassava roots, cassava based diets require additional amounts of protein-supplements like soybean meal. If cassava roots are not utilized immediately they can be converted into stable dried products such as chips or pellets for subsequent use as composite animal feeds in long term.

Kokrajhar district is a tribal dominated district. About 90% of rural tribal households (especially *Bodo* community) reared pigs, mostly crossbreeds apart from poultry, duckery, dairy etc. An estimated 70% of households did not breed their own pigs but bought piglets to rear for sale as slaughter pigs. Almost all households tethered or penned their pigs outside below shade of a tree; and only a very few farmers practised the improved method of stall-feeding systems. Traditional feeding practices limit pig performance. Slaughter pigs were reported to reach 40 to 60 kg live weight at 10 months of age with the lower weights being more prevalent. A major contributing factor was the poor diet quality with low protein because feeds were mainly the by-products of rice crop: bran and the residue of country liquor. Colocasia and tapioca though given as on-farm feed source in the district but they were used less frequently. As pig production is a profitable business among the *Bodo* community mainly by the women of the producer households who earn their living from the marketing of pigs, piglets and pork.

In Kokrajhar district though demand for pork meat is gaining importance, there is little or no private-sector investment in more intensive systems of pig production. The small scale piggery sector has been responding to growing market for fresh pork and slaughter pigs. Improvement in feeding practices to 20% substitution with tapioca in local feed resources and incorporating protein supplying ingredients may help the resource-poor tribal households to further increase the performance and size of their herds.

**5. Production of low cost value added products:** In Kokrajhar district of Assam, India, fresh roots as well as boiled and roasted roots are consumed traditionally at household level. Huge market is available only need is marketing intelligence of value added products. Cassava has

the largest amount of pure starch, more than any other crop and has great value in the textile, paper and food industries. Cassava powder can be mixed with wheat flour for bread making, cakes, biscuits etc. besides having numerous other uses.

Different low cost value added products like tapioca flour, sago pearls, noodles, starch, chips, traditional desserts like cakes, biscuits, barfi etc are some common products that can be processed in small scale processing by the rural community. Apart from edible food items, cassava flour can be processed into safe holi colours. More recently, cassava starch is utilized for ethanol production to be used in liquor or as an automotive fuel. Awareness on different low cost value added products prepared from cassava at rural level can enhance income of the farmer and provide good scope for self-employment and entrepreneurship development.



(Source: KVK, Kokrajhar, AAU, Telipara, Gossaigaon, Assam, India)

**Fig 5:** Different value added products from cassava

**Conclusions:** Cassava is a carbohydrate rich diet and is known to provide calorie rich food to millions of people in the tropics. Being the king of tropical root and tuber crops, cassava has got immense opportunity in improving the livelihood of the farmers in rural areas. Karbi Anglong and Kokrajhar district is the record producer of cassava within the state of Assam, India. During peak season of harvest, farmers get Rs. 20.00/kg of the tuber and are forced to distress sale during the period of market glut. So awareness on the multifaceted uses of both cassava tubers as well as the leaves will help the tribal farming community to earn remunerative profit. Cassava tubers are highly perishable commodity and deteriorated rapidly with short storage period of 2-3 days under normal temperature, so adequate knowledge and skilled technique on proper post harvest handling of the cassava tubers and production of different value added products will help the rural tribal community in proper storage of the cassava tubers for use in off-season as well as help the resource poor farmers in getting remunerative prices of their produce.

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