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Economic cultivation and marketing of elephant foot yam in Andhra Pradesh

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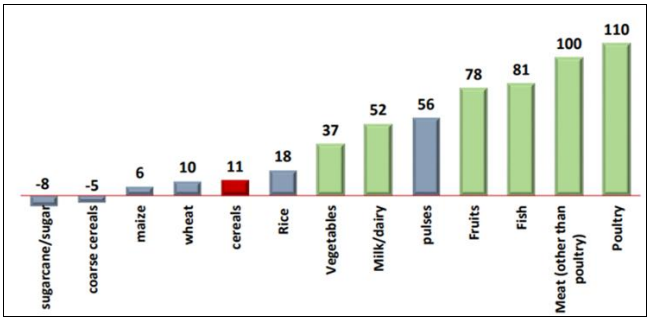
Abstract

In India, elephant Foot Yam (EFY) is grown traditionally in the states of Andhra Pradesh, Tamil Nadu, Kerala and West Bengal. The tubers are rich in medicinal properties and hence became an integral part of age old Indian medicinal practices including Ayurveda, siddha and Unani. However, it's cultivation is restricted to only few regions and moreover, marketing is a major concern for the farmers as they depend only on commission agents for procurement and marketing. Hence an attempt was made in this study to analyze the cost of cultivation, identify the marketing channels and bring out the strategies for efficient marketing of foot yam. Bapatla and Krishna districts in Andhra Pradesh were selected for the study as the crop is primarily cultivated in this area. By using secondary data, the average annual growth rates of area and production of EFY were worked out in the state and it revealed a meager increase in area by 0.14% whereas production declined by 3.82% during 2023-24. Analysis of primary data collected from the farmers cultivating elephant foot yam in the study area during 2022-23 has revealed that the total cost of cultivation was Rs. 7,03,707.45 per hectare. Among different inputs, the cost incurred on planting material constitutes about 38.08 per cent of total cost incurred *i.e.* Rs. 2,67,995/ha. The gross income obtained by the farmer was Rs.13,65,460/ha and the net returns were Rs.6,61,753/ha. In order to overcome the marketing challenges faced by the farmers, an efficient value chain system has to be established by directly linking the farmers to the processors or by establishing an organized retail chain system. As the tubers have high export potential, the Farmer Producer Organizations (FPOs) can be promoted for training the farmers especially on quality control, postharvest management, packaging, branding etc. and also to tap the international markets. On a priority basis, sufficient numbers of processing units are to be set up for preparation of value-added products.

Keywords: FPOs, exports, organized retail chain, value chain JEL classification: Q13, D20, F10, D61

Introduction

Indian horticulture sector with an estimated production of 352.23 MMTs during 2022-23 is found to play a significant role in the economy by way of ensuring nutritional security, enhanced income to the farmers and providing alternative rural employment opportunities for rural youth. With the increasing demand for horticultural produce from all over the world as well as within the country, the sector faces many challenges of further increasing the production in order to meet the demand. Keeping this in view, the Government of India and concerned state governments have implemented several schemes for a holistic growth of the sector covering fruits, vegetables, root and tuber crops, mushrooms, spices and condiments, plantations, flowers, medicinal and aromatic plants, and bamboo. A research study conducted by the Department of Agriculture and Farmers Welfare, (MoA&FW) [1] GoI, projected the demand for fruits and vegetables by 2030 in India in comparison to 2011. The projections revealed an increase in demand for fruits by 78 per cent and vegetables by 37 per cent during 2030 (Fig.1).



Source: MoA&FW, GoI

Fig 1: Projected increase in food demand in India by 2030

As far as different states are concerned (Table-1 & Fig-2) during 2022-23, Uttar Pradesh produced the largest share of horticultural crops in India, accounting for 16.36 per cent followed by West Bengal (14.38%), Madhya Pradesh (10.94%), Bihar (8.48%) and Gujarath (7.389%). In case of Andhra Pradesh the productivity is high among the all states i.e. 32.34 MT/ha, which is 72 per cent more than national productivity.

Table 1: State-wise Area, Production and Productivity of Vegetables 2022-23

States/UTs	Area ('000 ha)	Share (%) in total area	Production ('000 Ton)	Share (%) in total production	Productivity (MT/ha)
Uttar Pradesh	1413.94	12.50	34766.65	16.36	24.59
West Bengal	1590.44	14.06	30574.49	14.38	19.22
Madhya Pradesh	1179.90	10.43	23260.26	10.94	19.71
Bihar	920.38	8.14	18020.61	8.48	19.58
Gujarat	777.22	6.87	15676.29	7.38	20.17
Maharashtra	1045.19	9.24	15236.43	7.17	14.58
Odisha	703.09	6.22	9782.11	4.60	13.91
Tamil Nadu	362.29	3.20	9203.81	4.33	25.40
Karnataka	431.48	3.82	7486.92	3.52	17.35
Andhra Pradesh	221.25	1.96	7154.17	3.37	32.34
Others	2663.56	23.55	41386.73	19.47	15.54
India	11308.73	100.00	212548.44	100.00	18.80

Source: Indiastat.com

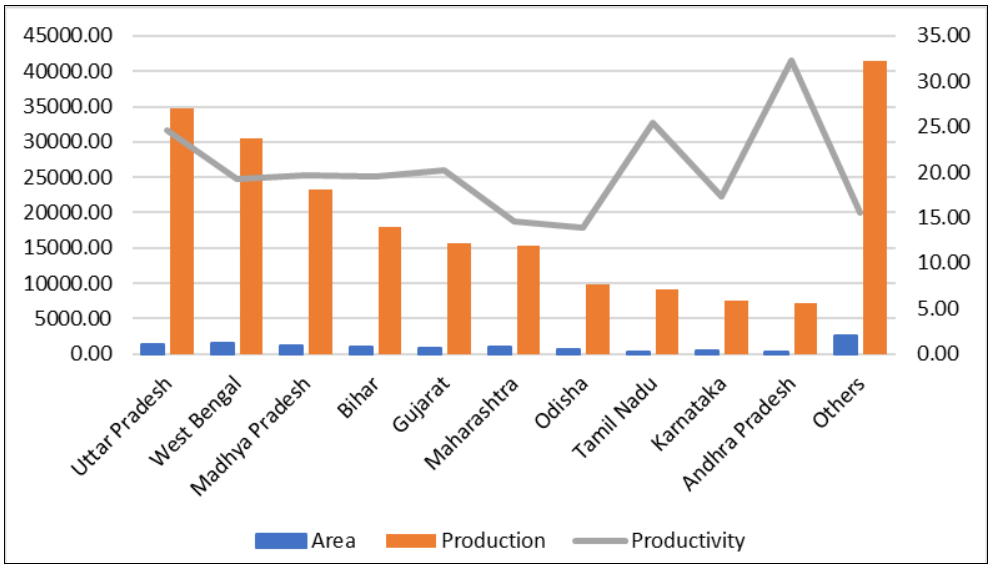


Fig 2: State-wise Area, Production and Productivity of Vegetables 2022-23

Among different horticultural crops, vegetables are considered to be protective foods because of their high nutritional composition and hence they play crucial role in alleviating malnutrition. Indian climatic conditions are congenial for cultivation of a wide variety of vegetables ranging from temperate to humid tropics and from sea level to the snowline. Andhra Pradesh in particular has made significant contributions to Indian horticulture sector, recording a growth of 12 per cent year on year, ranking first place in the country (Indiatimes.com). However, with the growing population and increasing demand for only a certain group of vegetables, resulted in a very negligible area under ethnic vegetables.

Few vegetables like root and tuber crops, gourds, leafy vegetables, jackfruit, bamboo etc. belong to ethnic group of vegetables in Andhra Pradesh. However, in spite of their high nutritional values, farmers cultivating these vegetables face several challenges like availability of seeds/planting material, identifying the market, fetching remunerative prices, value addition etc. These challenges restrict the farmers in cultivating these vegetables. Elephant foot yam, one of the ethnic vegetables though found to have high nutritional values and commercial significance in Andhra Pradesh, because of its limitations, it couldn't be cultivated in several parts of the state and as such there are very limited research studies conducted on the same. Hence, for the present study, elephant foot yam is selected in order to carry out its economic analysis as well as to study the marketing aspects in selected districts of Andhra Pradesh.

Scenario of Elephant Foot Yam in Andhra Pradesh

Elephant foot yam (EFY) is a tropical tuber crop with high potential for adoption as a cash crop in tropical nations as well as due to its high production potential and popularity as a vegetable in a variety of delectable cuisines. Its tubers are found to possess high medicinal values curing many ailments and are thus used in medicinal formulations. Despite of its importance, the cultivation of foot yam anywhere in India is generally a subsistent to semi-commercial crop due to low productivity because of non-adoption of advanced technologies like improved varieties. (Kanak *et al.* 2020). However, it is grown traditionally in the states of Andhra Pradesh, Tamil Nadu, Kerala and West Bengal. Furthermore, Andhra Pradesh is considered as the major hub for marketing of EFY in terms of quantity sold annually (Srinivas *et al.* 2012) [6]. Hitherto very limited studies were found in literature pertaining to economic analysis and marketing aspects of EFY. Hence, an attempt was made in the present study to analyze the cost incurred and returns obtained during its cultivation as well the marketing constraints faced by the farmers in selected districts of Andhra Pradesh.

Materials and Methods

For the purpose of present study, purposive and multistage random sampling technique was employed to acquire the samples. In order to analyze the growth in area and production of elephant foot yam in Andhra Pradesh during 2014-15 to 2022-23, secondary data pertaining to the same was collected from the department of horticulture, Andhra Pradesh. Average Annual Growth Rates (AAGR) during the study period were worked out as follows

$$AAGR= (GR_A+GR_B+\ldots+GR_n) / N$$

Where, GR_A = Growth rate in period A, GR_B = Growth rate in period B, GRn = Growth rate in period n, N= No. of years.

To identify the share of EFY in total vegetables in the state both in terms of area and production during 2014-15 to 2023-24 and also to know the contribution of each district to total area of the crop in A.P during 2022-23 simple percentages were calculated.

With regard to economic analysis, two districts namely Guntur and Krishna were selected as the crop is primarily grown in the selected areas. A sample of 60 farmers were selected from both districts i.e. 30 farmers in each district by using simple random sampling method. From these selected samples, primary data pertaining to various costs incurred and returns obtained by the farmer was collected for the agricultural year 2022-23. Tabular and percentage analysis were carried out to work out the cost concepts and farm income measures of elephant foot yam.

Cost Concepts

These include cost Cost A_1, Cost A_2, B_1, B_2, C_1, C_2, C_3

- **Cost A_1** = these costs include

1. Wages of hired human labour
2. Wages of permanent labour / contract labour
3. imputed value of owned bullock labour
4. Charges of hired machinery / Imputed value of owned machinery
5. Market rate of manures and fertilizers / Market rate of seeds
6. Imputed value of manures
7. Land revenue, cess and other taxes
8. Depreciation on farm machinery, implements, equipment farm buildings
9. Interest on working capital
10. Miscellaneous expenditure

- **Cost A_2** = Cost A1 + rent paid for leased in land
- **Cost B =** Cost A2 + interest on fixed capital excluding land + rental value of owned land
- **Cost C =** Cost B + imputed value of family labour
- **Cost** B_1 = Cost A_1 + interest on amount of owned capital invested in the business excluding the value of land
- **Cost B_2** = Cost B_1 + rental value of owned land less land revenue + rent paid for leased in land
- **Cost C_1** = Cost B_1 + imputed value of family labour
- **Cost C_2** = Cost B_2 + imputed value of family labour
- **COST C_3=** COST C_2 + value of management input at 10 Per cent of total cost (C2).

For estimation of profitability, income measures were calculated as below

Income measures: These are the returns over different cost concepts

- Gross Returns = Total Yield x Price
- Net Returns = Gross Returns - Cost C_3
- Gross Margin = Gross Returns - Cost A_1
- Net Return on rupee invested = Gross returns / C_3
- Net Return on Gross Margin = Gross returns / A_1
- Cost of Production = C_3 / Yield

Results and Discussion

The data collected from different sources was analyzed using appropriate tools and the results are presented in the following sections

1. Growth Performance of Elephant Foot Yam in Andhra Pradesh

In Andhra Pradesh, elephant foot yam is cultivated in an area of more than 3210 Ha with a total production of 1.12 MMT as per the advance estimates for 2023-24. From the Table-2, it can be observed that, as compared with other vegetables, the per cent share of elephant foot yam in total vegetables in Andhra Pradesh is very small both in terms of area (less than 2%) and production (1 to 4%). However, from the year 2014-15 to 2023-24 (Table-2) as represented by average annual growth rates, a minute increase in area was observed i.e. 0.14 per cent and the production was found to decline by 3.82 per cent.

Table 2: Average Annual Growth Rates (AAGR) of Area and Production of Elephant Foot Yam in Andhra Pradesh during 2014 - 15 to 2023-24

Year	Total vegetables		EFY		Share of EFY in total vegetables (%)	
	Area (Ha)	Production (MT)	Area (Ha)	Production (MT)	Area	Production
2014-15	227763	4261042	3299	181630	1.45	4.26
2015-16	238399	5442773	3609	207521	1.51	3.81
2016-17	233644	8003232	3872	232320	1.66	2.91
2017-18	278822	8661417	4265	252430	1.53	2.91
2018-19	267500	7556697	4540	272400	1.70	3.60
2019-20	264843	7538475	4030	241800	1.52	3.21
2020-21	240036	6783227	3732	158721	1.55	2.34
2021-22	210026	6366350	3560	124470	1.70	1.96
2022-23	221250	7154170	3010	112070	1.36	1.57
2023-24*	188060	7557000	3210	112023	1.71	1.48
AAGR	-0.02	0.08	0.0014	-0.04		
AAGR%	-1.62	7.98	0.14	-3.82		

Source: Dept. of Horticulture, Andhra Pradesh

As far as different districts are concerned, EFY cultivation is limited to few districts and the information presented in Table-3 depicts the total area cultivated under EFY in each district during 2022-23. It can be observed that, Guntur was leading in terms of area as well as production (Table-3) followed by Krishna, East Godavari, and Vizianagaram. The percentage share of Guntur district to total area of EFY in Andhra Pradesh was more than 50 per cent i.e. 56.22 per cent. Krishna district stood second position contributing to 18.71 per cent of total area followed by East Godavari (18.18%). However, in other districts the crop was grown in a small extent of area but found to show an increasing trend.

Table 3: District wise total area and production of Elephant Foot Yam in Andhra Pradesh during 2022-23.

Districts	Area (Ha)	Share (%) in total area	Production (MT)
Guntur	2105.00	56.22	126300.00
Krishna	700.66	18.71	42039.60
East Godavari	680.57	18.18	40834.01
Vizianagaram	201.82	5.39	12109.31
Chittoor	35.00	0.93	2100.00
Nellore	7.23	0.19	433.60
West Godavari	6.33	0.17	379.68
Kadapa	2.30	0.06	138.00
Vishakhapatnam	2.29	0.06	137.49
Srikakulam	1.89	0.05	113.44
Anantapur	0.68	0.02	40.81
Kurnool	0.64	0.02	38.38
Prakasam	0.00	0.00	0.00
Total	3744.41	100.00	224664.32

Source: Dept. of Horticulture, Andhra Pradesh

2. Cost Concepts and Farm Income Measures of Elephant Foot Yam in Selected Districts

It is of paramount importance to study the cost of cultivation for a crop as it determines the net income received by the farmer. In the present study, the primary data collected from the selected farmers cultivating EFY was analyzed and the details of per hectare cost and various factor costs involved in the production of elephant foot yam is presented in Table 4. From this, it can be inferred that the total cost of cultivation incurred by the farmer was Rs. 7,03,707.45 per one hectare of area. However, among different input costs, the cost of purchasing the planting material constitutes about 38.08 per cent of total cost incurred, followed by labor costs (20. 53%). The reason behind high cost of planting material could be attributed to the of high seed rate (5-7 tons per ha), in addition to this, non-availability of quality planting material is a major concern, wherein high transportation cost has to be incurred for purchasing it from distance places. (Nedunchezhiyan. 2008) [3]. Labour costs are the next higher costs incurred in the cultivation which is mainly due to a greater number of labour days required for irrigating the crop. (Srinivas & Ramanathan, 2005) [7].

Table 4: Cost of Cultivation of Elephant Foot Yam in selected districts during (2022-23)

Cost Particulars (per ha)	Amount (in Rs/ha)	Percentage share in total cost incurred
Planting material	2,67,995.00	38.08
Farm Yard Manure	62,985.00	8.95
Fertilizers	53,666.93	7.63
Plant protection chemicals	20,872.88	2.97
A. Gross material cost	4,05,519.81	57.63
B. Gross labour costs	1,44,495.00	20.53
Miscellaneous	3,329.56	0.47
Land Cess	617.50	0.09
Depreciation	1,358.50	0.19
Subtotal (A+B)	5,55,320.37	78.91
Interest on working capital	9,718.11	1.38
Cost A_1	5,65,038.47	80.29
leased in land	70,556.93	10.03
Cost A_2	6,35,595.41	90.32
Interest on fixed capital	271.70	0.04
Cost B_1	5,65,310.17	80.33
Cost B_2	6,35,867.11	90.36
Imputed value of Family labour	3,866.93	0.55
Cost C_1	5,69,177.11	80.88
Cost C_2	6,39,734.04	90.91
Cost C_3	7,03,707.45	100
Yield (ton/ha)	40.76	
Price / ton	33,500.00	

As far as the gross income and net returns are concerned, it can be observed from the Table 5 that, the gross income obtained by the farmer was Rs. 13,65,460/- and the net returns Rs. 6,61, 753/- with a gross margin of Rs. 8,00,422/-

Table 5: Gross and Net Returns from Elephant Foot Yam Production in the selected Districts (2022-23

Particulars	Value (in Rs.)
Gross Returns	13,65,460
Net return	6,61,753
Gross Margin	8,00,422
Net Return on Rupee Invested	1.94
Net Return on GM	2.42
Cost of Production (Rs/ton)	17,264

From the above results, it can be inferred that the cultivation of EFY was found to be remunerative to the farmers. However, availability of quality seed is a major challenge faced by the cultivators. Hence, at the time of harvesting which is about eight months after sowing, a small portion of the crop is not harvested and will be retained for seed purpose in the next season. Besides this, farmers have to incur high expenditure on labor, especially at the time of harvesting which is mainly because of the size of tubers. Thus, planting material and labor charges constitutes a major share in total cost incurred by the farmer.

3. Marketing of Elephant Foot Yam in Selected districts

The information collected from the selected respondents with regard to marketing channels for elephant foot yam has revealed that the commission agents are the only source of procuring the produce from the farmers. The marketing channels identified based on the preliminary survey are as follows

Marketing Channel-I: Producer ⟹ Commission Agent ⟹ Exports
Marketing Channel-II: Producer ⟹ Consumer

Majority of the produce is transacted through the first channel i.e. from producer to commission agents and then to exporters. Prior to the harvesting period, the commission agents get into an agreement with the farmers cultivating foot yam for procuring the good quality produce produced by the farmers in the study area. The procured tubers are then exported to different states like Karnataka, Chennai and Maharashtra in India. Further, the tubers from these states are exported to Gulf countries. However, low quality tubers which are not suitable for exporting are sold by the farmers in the local markets. Various marketing costs involved at the time of procuring the tubers from the farmers i.e. transportation cost, packing, loading and unloading charges etc. are borne by the commission agents. This reduces the burden on the farmers as per the information collected from the selected respondents.

Hence, from the study it can be inferred that, the farmers cultivating EFY has to depend only on the middlemen either for procurement or marketing. The reason behind this is an assured and timely payment by the buyer as well as to avoid various marketing risks. India is the largest exporter of the elephant foot yam in the world, with most of its exports to United Arab Emirates, Ireland and Switzerland. However, due to lack of awareness among the farmers about the demand for EFY in international markets and export procedures, assured price income from the agents force the farmers sell their produce to the middlemen. Hence, few marketing strategies make the farmers to earn even more profits than received by selling to the middlemen. Hence, based on the information collected from the respondents about marketing activities and challenges faced by them, few strategies were recommended in this study in order to establish an efficient marketing system for the EFY.

Marketing Strategies for Efficient Marketing System of Elephant Foot Yam

1. With the increasing technology, several value-added products were developed in India such as EFY cake, chutneys, chops, chips, EFY sweet meat etc. Hence, an efficient value chain system can be established by directly linking the farmers directly to the processors. Market linkage for processed products along the value chain results in doubling income of the farmers.
2. By establishing an organized retail chain system farmers can directly sell fresh EFY produce to the retail stores like SAFAL, Reliance, More etc., who further can process them by using Individual Quick Frozen (IQF) technology which makes the fresh EFY tuber pieces suitable for exports.
3. In order to tackle the issues of production, marketing, value addition and exports of EFY, institutional mechanism like Farmer Producer Organizations (FPOs), co-operatives and federations has to be encouraged and initiated exclusively with the farmers growing EFY in production clusters. As against the current scenario of farmers depending on traders for marketing, these institutions can rope in and procure the produce directly from the producers. This results in complete transparency either in procurement or payment. Moreover, these FPOs have an opportunity of direct linkage with APMCs and exporters. Hence, the farmers can realize better price for their produce. The study has also identified the constraints faced by the farmers in loading and unloading of EFY as well as availability of logistics for transporting to the local markets or rythu- bazaars. Hence, these constraints can also be addressed by the FPOs as they procure directly from the farmers or can provide logistics to the farmers.
4. Grading and packaging of vegetables plays an important role in wider consumer's acceptance. Hence farmers can be trained in these aspects for exploring the urban markets.
5. The crop has high export potential and especially medium sized tubers are preferred for this purpose. Hence, on a priority basis, market intelligence system has to be developed followed by awareness to farmers on marketing and export of the tubers.
6. The status of existing infrastructure has to be identified and the gaps can be bridged for better storage and value addition.
7. The Agricultural and Processed Food Products Export Development Authority (APEDA) has introduced different schemes for promotion of exports. Hence, awareness has to be created about these schemes in the farming community so as to avail benefit by the farmers

or FPOs through exports.

Conclusions and Way Forward

From the present study it can be observed that the cultivation of elephant foot yam yields a profitable income to the farmers. However, several challenges are being faced by the farmers with regard to production as well as marketing aspects. Hence, identification of production clusters is the need of the hour in order to establish an efficient value chain system. Further, Agricultural Produce and Market Committees (APMCs) which are ideal or non-functional in their operations in production areas can be brought under functioning. This creates an assurance among the farmers with regard to procurement of their produce and hence results in no further dependence on middlemen. As EFY has good export potential, area under the crop needs to be expanded and hence, timely capacity building programs are to be organized on various aspects of production and post-harvest activities. Farmers can be encouraged for crop diversification from commercially grown vegetables towards EFY as it is the need of the hour to enlighten the nutritional as well as economic importance of crop.

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