The Role of Sabai Grass Industry in The Economic Development of Mayurbhanj District of Orissa (India)

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Abstract

Sabai grass cultivation has brought about a miracle in the economic life of the Tribal’s and poorer people of Mayurbhanj district of Orissa state of India is now a gorgeous truth. The reality which has been deciphered has to be kept thriving in the present and in the coming years. Mayurbhanj district is said to be a land of tribals. Out of 62 tribal communities of Orissa, 45 communities are found in Mayurbhanj district alone. The per capita income of Orissa as measured by net state domestic agricultural and forest product per head of population, was about 20 percent lower than the all India per capita income in 2008. It remained as much as 43 percent below that of national average in 2007-08. Thus it was intended to make all empirical investigation of rural income in Mayurbhanj district of Orissa State in India and to assess the impact of agricultural and forest product marketing programmes initiated by the Government of Orissa over the years. In spite of rich natural and human resources it is a poor district more than 48 per cent of the rural area people live below the poverty line. Though majority of population are dependent on primary sector, the agriculture is undeveloped because the district is lacking in irrigation facilities. In agricultural sector there is hardly any marketable surplus production in the district except for Sabai grass. Sabai grass is practically considered to be “The Money Plant” which ensures cash receipt throughout the year. The industry is associated with various activities of raising Cultivation of Sabai grass and processing of consumer goods such as ropes, mats, carpets, sofa sets, wall hangings and other sophisticated fashionable articles. The Sabai grass industry has tremendous export potential. Artistic designing Sabai products are very popular in foreign countries which
earn precious foreign exchange for the country. The industry helps in the
growth of entrepreneurship amongst the villagers. This ensures economic
development through modernization and innovation of the industrial culture in
rural areas.

Keyword: Sabai grass, economic development, Anova, analysis, Marketing.

Introduction
The sample study covers the district of Mayurbhanj which is located at the northern
region of Orissa State in India. It is a land locked district surrounded by Singhbhum
district of Jharkhand State and Midnapur district of West Bengal State and Keonjhar
and Balasore district of Orissa State of India. The district is called ‘Mayurbhanj’ after
the name of the ex-state which on its merger with Orissa State in January 1st, 1949
(not Jan’ I) constituted the entire district covering an area of 10,418 square meter.
which constitutes 6.69 per cent of the state territory. According to 2001 census of
India, the total population of the district was 22.23 lakhs which accounts for 6.06 per
cent of the State’s total population. Density of population in the Mayurbhanj district is
213 per sq. as against 236 at the state level. It is a rural based district where the rural
population constitutes 93.83 per cent as against state average of 86.62 per cent. It is
also an agriculture dominated district as more than 80 per cent of the working
populations are cultivators, forest product collector and agricultural laborers.

The cultivation of Sabai Grass is usually done in the degraded and up lands.
Rainfall and manuring is immaterial although irrigation and application of manure
results in better yield. The cultivation is done with specially prepared seeds and
seedlings. Once planted the Sabai grass continues to produce grass for 10 to 12 years
with ploughing once a year. The expenditure of the cultivation is minimum excepting
for keeping away from the cattle menace and thieving and for fencing. Watch and
Ward are sometimes essential. Not only individual cultivators but also government
Farms, Non Government Organisation (NGO) have come forward to encourage and
assist the cultivators. Usually Sabai grass and Sabai ropes are sold on auctioned to
merchant and normally fetch Rs.750 (INR) to Rs.1,800 (INR) per quintal. The grass
and ropes are utilized by Paper Mills. Carpets, sofa set, doormat and many
sophisticated articles are also manufactured which sells like hot cakes. The products
fetch at least Rs. 5,000 (INR) per hectare compared to cost of cultivation of Rs. 3,600 (INR) per annum. The income and economic conditions of the rural poor has gone a revolutionary change due to Sabai grass commonly called “Money Plant”. It generates employment opportunities too and gainful engagement to all family members involved in Sabai grass cultivation.

**Figure 1:** Income from Sabai grass of the respondents.

**Figure 2:** Opinion on places of sale of Sabai grass products.
Mayurbhanj is a tribal dominated district and used to live in a miserable condition. 67% are Schedule Tribes (ST) and Schedule Cast (SC) compared to 33% general populations. Both sections resided in cottages with little access to education and nourishing diet. Picking up of Sabai grass sale and tremendous export potential have brought a sea-change in their socio economic life and status. The Mayurbhanj district alone sells and exports 600 metric tons of Sabai grass and products per annum with an earning of Rs. 4 to 6 Crore. At present Sabai grass processed in traditional method and manually. Meanwhile machines have been developed to help processing of Sabai and products with a perspective of expeditions production and quicker transportation to the users and prospect of export promotion. In nutshell increased thrust on Sabai grass cultivation through incentive of cooperative societies, NGO, Bank finance and Government assistance change the economic pattern of the district of Mayurbhanj heralding an age of prosperity, removing the financial constraints and making of self sufficient.

The Sabai grass business among the indigenous communities of many villages in Mayurbhanj District is a big one, rivaled only by the business of making ropes and furniture from Sabai grass. In local market, the grass, which brings in more income than rice, is now grown in rice paddies and marketed by the tones in the form of bundles of either grass or rope. The Rural Development Centre of Mayurbhanj district is collaborating with the communities in order to diversify the products made from this grass, which has a high tensile strength. Furniture made from Sabai grass is a marvel of the arts.

**Objective of the Study**

Mayurbhanj District is blessed with naturally grown forest Sabai Grass along with cultivable varieties produced in the backyard Grass of dwelling Forests, Govt. Lands, and Own Lands etc. The major use is only restricted to structural-base like roofing, pandals, temporary sheds, raw material for paper pulp that does not give much value to the existing farmers. Besides, the Sabai Grass artisans only produce traditional house-hold articles like, Mates, Ropes, Small Baskets, Chairs, etc. which also does not give much value addition to the raw material and give comparatively less remuneration to the artisans. As a result, these traditional skills are becoming extinct day-by-day. The main objectives of study is-
1. To find out the innovative schemes and the planning of organization for marketing of sabai grass products;
2. Diagnosis of the area sample formation in the Mayurbhanj district and;
3. Analyze market chains and propose concrete actions in research and development to increase their competitiveness;
4. Creating and Implementing the concept of Sabai grass enterprise option for the development by the way of education, training and also their support in financing for improving the sabai grass products;
5. Identification of supply, demand and gaps in the local business development services by designing the strategy to strength the market decision and for enterprise development in the sample area of Mayurbhanj district.
6. To examine the various government plans, programmes and their implementation in the development of sabai grass.
7. The flow of Sabai grass from the lessee to the final consumers has also been traced and the value addition at each level has been computed and compared.
8. To review the present growth of sabai grass industry scenario of Orissa in comparison to other states in India;
9. To find out the innovative schemes and analyse the role of sabai grass industry for the economic developments of growers of the district;
10. To examine the various State Government plans, programmes and their implementation in the agricultural development of sabai grass;
11. To identify the marketing opportunities and problems faced by the sabai grass industries and to suggest suitable measures for solving them;
12. To explore the involvement of existing agencies (NGO, Bank and Co-operative Society) for development by the way of education, training and their support in financing for improving the sabai grass products and processes. To identify the Sabai grass production and marketing in Mayurbhanj district of Orissa state of India. To explore the possibilities of the work involved in production of Sabai grass in the Mayurbhanj districts of Orissa and to suggest the improvements in the spheres of storage, economic utilization, marketing and value-addition.

Data Sources

The secondary data are those, which have already been collected by someone else thorough Books, Internet, Television, journals, Magazines, etc. On the other hand primary data does not exist here. Primary data has been collected here by questionnaire method. As the Mayurbhanj district in Orissa has been selected for the sample study, primary data have been collected from the selected village and block area by conducting a statistical sample questionnaire survey.

There are 210 questionnaires used for this study. Each questionnaire consists of 22 questions. Mayurbhanj is a tribal dominated district having 26 blocks. The villages are selected on the basis of agricultural production of sabai grass. The data required for the study is based upon the primary sources. The primary data have been collected from the field sources by direct observation and interview to the persons associated
with sabai grass industry such as growers, processors, rope makers, entrepreneurs, traders and other intermediaries.

Based on the above sampling design, the data have been collected from the households using structured schedules. The questions are related to information regarding the size of the households and characteristic of household members such as age, sex, education, economic status and activities, income source and expenditure pattern, landed property, Government and NGOs support, marketing, packaging and transportation facility available etc. A house to house survey was conducted with the help of the questionnaire covering 210 households in 18 selected villages of Mayurbhanj district of Orissa. The period of study is mainly confined to the years from 1999 to 2008.

The secondary data have been collected from various published sources of the Central and State Government such as the Census of India volumes, statistical abstract, selected socio-economic statistics, per capita Net State Domestic Product of States, Economic Survey etc. (Central Government Publications) and District Statistical Handbooks, Indian Council of Marketing Research journals and several other national and international journals.

**Discussion**

The Sabai Grass is an ornamental gramineae. This plant in the spring, summer, autumn, winter assumes a green white colouring; it is medium in size and can reach 2 m high. It keeps its leaves in the winter. Growing they develop a round-shape shrub.

Sabai grass is not only a very effective soil binder, but also provides raw material for paper industry and used for rope making by the rural poor. For paper making, the grass is extracted every year in November and December, transported from forests on camels to yards where it is sun-dried and then sent to the paper mills. Grass cutting, transporting and sun-drying provide lean period employment to a large number of local people in the close vicinity of their villages. This job of converting grass into rope provides employment to women, landless and weaker sections of society. Any increase in the availability of Sabai grass is, therefore, a sure means of additional employment to the poorer structure of the society.

Most of the Sabai Grass plantations are located in the Revenue Sub-division of Baripada and Kaptipada of Mayurbhanj District. The coverage in other two Sub-division is very much limited. Roughly the total area under Sabai Grass in district at present is about 22758 hectares Sabai Grass was in cultivation long since in the district, however, substantial extension of area was achieved during the 8th, 9th and 10th plan period. Up to the end of 7th plan the total area under Sabai Grass was estimated to be 9218 heccts. This was increased to 21665 heccts by the end of 9th plan.
It is an important source of fiber grass, which provides long fiber pulp for paper manufacturing and is primary raw material for rope making industry. Moreover, poor people and tribal’s of village living within or near forest areas collect small quantities of Sabai grass for making rope for their own cots, for tying thatched roofs and agricultural produce.

**Employment Generation**

Generation of Employment opportunity is the key indicator for strengthening economic development by reducing poverty and ensuring equitable distribution of income among all sectors of the Society. For this, need based self-employment ventures and training (preferably in technical trades) need to be encouraged.

It was observed that the Mayurbhanj district consists of tribal people of 58% of the total population. Almost 80% of the population is living below the poverty line. 90% of the total population lives in the rural areas. Besides the S.C. literacy and S.T. literacy rate is 37.79% and 24.10%. Hence the onus of the all-round development of Schedule Cast (S.C.), Schedule Tribe (S.T.) and Below Poverty Line (BPL/OBC) category of the population residing in the rural and remotest villages especially in the border blocks of Mayurbhanj district like Kaptipada, Thakurmunda, Sukruli, Raruan, Bijatala, Tiring, Jamda, Sarskana, Sulipada etc. Considering the above, the district administration has planned to arrange short course service oriented skill training in selected trades that provides earning to the persons with little investment.

![Caste composition in the study area](image)

**Figure 2**: Caste composition in the study area
Considering the options on intake of candidates by various Government approved technical Institutions as well as proximity of Blocks, Gram Panchyats (G.P.) earmarked under the above programme, an Institution-cum-Trade wise allocation of 540 trainees is made to be covered within three years from current year onwards. Provision for residential training with facility of accommodation is also mentioned against the institutes. The syllabus for the training programme may be collected from the training institutes with due approval from Directorate of Technical Education and Training (DTE&T), Orissa Cuttack before commencement of training programme to make the programme more realistic.

Many rural poor households depend on it to a great extent for their livelihood. Besides providing a source of employment and income to the landless poor and marginal and small farmers, sabai grass yields raw materials for several small-scale cottage industries and mini paper plants and affords protection against soil and water erosion.

An important feature of employment generation from Sabai grass is that it is available whenever it is needed; one can make ropes of Sabai grass at one convenience and at any place inside or outside one’s dwelling. This work does not hamper one’s main activity and is therefore a good source of supplementary income. The most important advantage of Sabai grass is its low cost of cultivation compared to the returns it gives. No intensive care is required for its cultivation. The cultivation of Sabai grass generates about 120 man days of employment per hectare over the 12 years period of which 53 man days of employment is generated in first two year. The ropes produced from the grass are very strong, heat resistant and durable because the grass contains a high proportion of silicon dioxide. Its products are in demand throughout the country.

Rope making is often a part time activity in the rural family. Work is sometimes done in the morning and sometimes in the evening and often during the night before retiring. However, whole day is consumed in the Twisting work (‘Enthai’).
Ladies and Children are primarily involved. Since there is no other alternative employment outlet, families engaged in rope making to provide a supplemental income (even where incremental income is very small). Because of engaging themselves traditionally in rope making, the community has not developed other skills, which is a handicap and on account of which the members feel loath to do any other work even where an opportunity exists.

Sabai grass is grown in a wide part of Mayurbhanj district which is mainly used for making Sabai Rope. Sabai Ropes are mostly sold outside and inside the state for use in weaving Charpai (Cots) and in paper manufacturing concerns. Sabai rope is also used in making Sofa sets, Chairs, Small Baskets, Tea Poi etc. The main body frames of the Chairs and sofas are made in Bamboo and wood and Sabai rope is woven and coiled over the frame to give a finishing shape, which attains exceptional excellence. The civil Jail of Baripada is pioneer in introducing such Sofa and some other items namely Car mats, Screens, Carpets etc.

In recent years utility articles like Dining mat; Fruit Basket/Tray; Flower vases etc. are produced by using jute twine along with Sabai rope with intervention of National Council of Jute Development. Development Commissioner Handicrafts Govt. of India through their facilitating agency ANWESA, Bhubaneswar of Orissa State in India have conducted design development program at village Churuni of Khunta Block in Mayurbhanj district by involving the traditional sabai craft artisans and 17 (seventeen) prototypes in sabai rope has been developed, which looks beautiful and shall fetch good market price. The sabai product making is thus a flourishing handicraft trade of the district. At present about 50 artisans are engaged in Sabai product making exclusively in Baripada and Betnoti Block areas of Mayurbhanj district.
With growing demand for Sabai grass furniture and sabai products, one training centre has been opened at Baripada by Director Handicraft and Cottage industry Orissa to train local boys and girls particularly from Scheduled Caste and Scheduled Tribe groups. There is one NGO in the name of DASI at Madhuban in Baripada of Mayurbhanj district for production of Sabai-Jute diversified products. They have participated in various State level and out state exhibition and sold their articles.

Some Government Society and NGO are also help for increase the marketing potential of Sabai Grass products in the Mayurbhanj District.

**Methodological Foundation**

The first Step of Methodological foundation is to define the problem chosen for investigation. The precise definition of the problem helps in determining the techniques to be used and the extent of information to be collected etc. This step is very significant one since it is said that “a problem well define is half solved”.

This Research Design is based on the (a) Marketing Model Dynamics and (b) Computer based Statistical Empirical analysis to study the role of sabai grass industry in economic development. A research design is the arrangement of condition & analysis of data in manner that aim to combine relevance to the research purpose with economy in procedure. The research design specifies the method of data collection and data analysis.

The sample data collected from 210 selected respondents of eighteen villages under three blocks of Mayurbhanj District. The data analysis and interpretation is undertaken mostly with the help of marketing model dynamics and computer based statistical empirical analysis.

**Figure 01**
Creating and Implementing the concept of Sabai grass enterprise option;
Identification of supply, demand and gaps in the local business development services by designing the strategy to strengthen the market decision and communication as shown in the model for enterprise development in the sample area of Mayurbhanj district.

**Figure 02**

A marketing model based information system is a continuing and interacting structure of people, equipment, and procedures to collect, sort, analyze, evaluate and distribute pertinent, timely and accurate information. It is used by marketing decision makers for their improvement in planning, implementation and control. The product prices are a key positioning factor and must be decided in relation to the target market.

The marketing model is extensively used to determine the Sabai grass product marketing demand in national and international market so as to develop the economic status of the cultivators. (Singh, Katar., “Sabai grass processing and marketing”).

**Analysis**
Most of the Sabai Grass plantations are located in the Revenue Sub-division of Baripada and Kaptipada of Mayurbhanj District. Roughly the total area under Sabai Grass in district at present is about 22758 hectares. Sabai Grass was in cultivation long since in the district, however, substantial extension of area was achieved during the 8th, 9th and 10th plan period. Up to the end of 7th plan the total area under Sabai Grass was estimated to be 9218 hectares.

Sabai Grass is cultivated mostly by poor marginal and small farmers on their degraded lands. It is also collected by them as well as by the landless poor from the common pool village lands where it grows naturally. The per acre cost of production of Sabai Grass in the initial year works to around Rs.2,200. The cost for the second
year is roughly Rs.650 and from the third year to ten year Rs.1000 per year. The produce is finally harvested in the 11th and 12th years. In the last two years, no maintenance is required and hence no maintenance costs. Thus the total cost of production over a period of 12 year works out Rs.11500 per acre. (Barik. “Performance of Sabai .,” IJASVol. 68).

The returns are realized from the sale of dry Sabai Grass which has a good market in the Mayurbhanj district. The total yield per acre over a period of 12 years was about 96 quintals (qt). The gross returns from the sale of Sabai Grass were estimated at the 2008 market price of Rs.500 per quintal. The gross returns over a period of 12 years were estimated to be Rs.48,000 per acre and net return to be Rs.35,500. The average net return per acre per annum over the 12 year period was Rs.3041. This represents a significant income from (land) resources that is degraded and whose opportunity cost is almost zero.

Sabai Grass of the Mayurbhanj district of Orissa in India is of good quality and has been accepted widely in the Indian market. Most of the traders prefer the Ropes made out of the Sabai Grass of this region. A large number of people are involved in this cottage industry (harvesting and rope making) or as a trader sending the produce (ropes) to the urban areas, both near and distant.

The total harvesting area of the Mayurbhanj district is 4.47 lakh hector of which 43.70 percent is highland with very poor water retention capacity. The highlands are generally not suitable for harvesting of crops or orchards. But they are suitable for harvesting of Sabai Grass. The agro climatic conditions obtaining in the district are also suitable for Sabai Grass production. According to general estimate the total production of Sabai grass in Mayurbhanj district of the state is about 15000 to 20000 metric ton per annum of which some 9000 to 12000 metric ton is converted into ropes and the remainder is used for other purposes. At an average/minimum price of Rs.10 per kg of ropes and Rs.5 per kg of grass the total value of the produce works to Rs.16 crore per annum which is quite a significant contribution to the economy of the Mayurbhanj district.

Marketing Analysis
The marketing of Sabai Grass in Mayurbhanj district is analysed with the following points taken into consideration that, method of Marketing, Types of Market Place, Setting up Sabai grass enterprise, Marketing Agencies, Cooperative Societies, Market Yard Brokers, Price, Fixation of Price, Distress Sale, Problems of Marketing, Transportation, Storage, Supply of Agricultural Inputs Marketing Information and Role of Government in agricultural marketing.

Traditionally farmers have made decisions on what they should grow, what they should keep for home consumption, and what they are able to sell at the marketplace. In former times sales would have cantered on local markets and it would have been rare for a farmer to venture far a field in search of new market opportunities or to consider developing new, higher value to consider developing new, higher value products. This traditional form of agriculture starts to change as communities and nations begin to modernize. Through processes of urbanization, generally fostered by industrialization, demand for Sabai grass product from urban dwellers becomes
dependent upon more sophisticated arrangements that require aggregation of farm produce, transportation, storage, wholesaling, processing and retailing. As cities expand, supply systems develop into increasingly longer and more complex market chains with many market channels and specialization of roles in the market chain based on product type, levels of added value and market segmentation.

Farmers must also provide products and services at a price that is competitive with rival suppliers and there is increasing social pressure to ensure that production systems are environmentally sustainable. To achieve desired levels of competitiveness, farmers and their service providers need to build strategies that incorporate the following elements:

- A clear market orientation, producing the right product for the right buyer at the right time and price.
- The establishment of production systems that makes efficient use of existing financial human and natural resources.
- The incorporation of necessary post harvest handling and processing techniques.
- Appropriate business and marketing skills and organizational schemes which lead to economies of scale by reducing costs and increasing marketable volumes of produce.
- Improved links among market chain actors and flows of both market based information and new production technologies.

The NTFP collection and marketing both private and collective domain are equally important. If one suppresses the other, it leads to exploitation of marginalized, inefficient management and non-realization of desired goal. In the first case, no importance was given to collective domain. As a result individuals continued to be exploited in one or other form in spite of corrective measures taken by government.

In the second case on Sabai grass cooperatives, collective domains did not ensure private growth through interdependent accountability. It only aimed at solving marketing problems. This was the case of collective suppressing private domain to a great or small extent. As a result individual producers became less accountable to the cooperatives. The Market value of Sabai rope at present is Rs.13.00 to Rs.16.00 per Kg. as per quality. The Sabai grass from the Forest Corporation and Soil Conservation department Depot is available at Rs.1150/qtl., compared to the rate of Rs.1300 to Rs.1700/quintal in the open market. So the regional income is estimated to be Rs.8.12 to 6.5 lakhs per week, depending on the seasons.

Therefore an attempt has been made to appreciate the importance of both private and collective domain through mutually interdependent growth sustenance cycle. Here individuals are encouraged to enhance their living standard through skill up gradation. Commons facilitate the individual growth and ensure most competitive market price. This makes private and common dependent on each other without intruding into others domain or suppressing individual’s enterprising ability. However, as system it is of recent origin, one needs to wait and watch how it works in the long run.
The major functions are:

- Attending exhibitions at state, national and international level with rural ethnic products like Sabai grass, Jute products of Mayurbhanj.
- Organising Pallishree Mela and District Level Exhibition.
- Assisting DRDA in implementing SGSY scheme from planning to implementation stage.
- Preparation of model project report based on cluster approach under SGSY scheme.
- Formulation of unit cost under SGSY for individual and group finance.
- Developing two key products covering all aspects of micro enterprise right from market identification, technology transfer, improvement of productivity and quality, organizing skill development training, bank credit linkage and market tie-up.
- Organising training/workshop on related topics design development, product development, micro enterprise development etc for block level functionaries, bankers, NGOs, Integrated Community Development Society (ICDS) and for Swarojgaris.

Statistical Analysis

The analysis reveals that the 1.0% of the respondents Sabai grass product are purchased by consumers, 3.0% by both consumers and middlemen, 15.0% by Government organization, 31.5% by non-government organization and 47.5% by co-operative enterprises. There are nearly 8000 SHG that have been formed over the years. Sabai Grass Development Corporation was set up in 1994 to provide improved varieties of Sabai seeds and implements to women engaged in cultivation and trade. The bank caters to the farm credit establishment of the farmers through its 15 branches and 52 affiliated LAMPS.

An analysis has been made to know the effect and significant contribution of indicators towards income from Sabai grass for economic development in the study area. For multiple regression analysis Independent variables taken are

In most variables the calculated value of the coefficient (Beta) in the regression equation is either negative or insignificantly different from zero.

\[ Y = f (X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8), \]

Where \( Y = \) Income from Sabai grass and Total Income

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The form of equation fitted for production is given below linear model
\[ Y = C_0 + C_1X_1 + C_2X_2 + C_3X_3 + C_4X_4 + C_5X_5 + C_6X_6 + C_7X_7 + C_8X_8 \]

It shows that with increase in income from Sabai grass, the role of transportation \((X_4)\) followed by sale \((X_1)\) increases. Therefore the factor transportation \((X_4)\) and sale \((X_1)\) have more effect on the dependable variable \((Y)\) i.e. income from Sabai grass than other factors. It is found that transportation and sale plays important role to increase income from Sabai grass in the study area. The factors like Market trend \((X_2)\), Land holding \((X_3)\), Age \((X_5)\), Education \((X_7)\) and Occupation \((X_8)\) have negative impact on income from Sabai grass. It is also observed that the factor family size \((X_6)\) has positive impact on income from Sabai grass.

The correlation between a set of obtained scores and same score obtained from the multiple regression equation is called coefficient of multiple correlation. It is designated by \(\text{'}R\text{'}\).

Karl Pearson’s Coefficient of Correlation \((R)\) =

\[
\frac{N \sum XY - \sum X \sum Y}{\sqrt{N \sum X^2 - (\sum X)^2} \sqrt{N \sum Y^2 - (\sum Y)^2}}
\]

\(X = \text{given, or reduced values of the first variable}\)
\(Y = \text{given, or reduced value of the second variable, and}\)
\(N = \text{number of pairs of observations of } X \text{ and } Y.\)

The value of \(\text{'}R\text{'}\) lies between \(\pm 1.\)

Thus the correlation between Income from Sabai grass and other eight independent factors is 0.586. It means that scores in income from Sabai grass predicted from a multiple regression equation containing independent factors \(X_1, X_2, X_3, X_4, X_5, X_6, X_7 \text{ and } X_8\) correlate 0.59 with scores obtained in dependent factor Income from Sabai grass \((Y)\). Here \(R^2\) is 0.343; this shows 34\% of the total variance of dependent income from Sabai grass is associated with the independent factors.

The value of \(\text{'}R\text{'}\) lies between \(\pm 1.\)

The t-statistic for each \(C_i\)

\[
t = \frac{\hat{C}_i - C_i}{\text{SE}(\hat{C}_i)}
\]

which follows t-distribution with \((n-1)\) degrees of freedom.

Thus, greater the value of \(t\) the stronger the evidence that \(C_i\) is statistically significant. Tabulated value of t-test for transportation \((X_4)\) and sale \((X_1)\) are more significant and have significant contribution towards income from Sabai grass.

The multiple correlations between Total Income and other eight independent factors is 0.562. It means that scores in Total income predicted from a multiple regression equation containing factors \(X_1, X_2, X_3, X_4, X_5, X_6, X_7 \text{ and } X_8\) correlate 0.56 with scores obtained in factor Total Income \((Y)\). Here \(R^2\) is 0.316; this shows 32\% of the total variance of income from Sabai grass is associated with the independent factors.
Tabulated value of t-test shows that the Land holding ($X_3$) is more significant and has significant contribution towards Total Income in the study area.

**Analysis of Variance test**

Analysis of Variance (ANOVA) for the factors in case of Income from Sabai grass:

F-Statistics is computed as

\[
F = \frac{\text{Mean sum of square of explained sum square}}{\text{Mean sum of square of residual sum square}} = \frac{\sum y_i^2}{\sum e_i^2 / (n - k)}
\]

since our model consists of five explanatory variable

so,

\[
F = \frac{\sum y_i^4 / (n - 4)}{\sum e_i^2 / (n - 4)} = \frac{\sum y_i^2}{\sum e_i^2}
\]

The null hypothesis $H_0$ is $C_i = 0$. If calculated $F >$ tabulated $F$ with $(k-1)$ and $(n-k)$ degrees of freedom with chosen level of significance, hence reject the null hypothesis and accept that the data is significant. If calculated $F <$ tabulated $F$, then accept the null hypothesis and conclude that data is not significant. (ANOVA Table-I)

Tabulated value of F-test at 5% level of significance for (8,209) degree of freedom $= 1.9384$ and tabulated value of F-test at 1% level of significance for (8,209) degree of freedom $= 2.5113$. In case of the above table only between the indicators (column) is significant. The calculated value is 156.2920. This shows calculated ‘F’ value is more than tabulated ‘F’ value both at 5% and 1% level of significance. (ANOVA Table-II)

Tabulated value of F-test at 5% level of significance for (8,209) degree of freedom $= 1.9384$ and tabulated value of F-test at 1% level of significance for (8,209) degree of freedom $= 2.5113$.

In case of the above table only between the indicators (column) is significant. The calculated value is 156.2920. This shows calculated ‘F’ value is more than tabulated ‘F’ value both at 5% and 1% level of significance. In order to know the effect of different factors, viz. (i) fertilizer consumption per hectare of gross cropped area in kgs of nutrients (ii) actual rainfall (in mm) received during the period of cropping (iii) area under Sabai grass crop in hectare a time series analysis has been carried out with the use of a multiple linear regression model. The analysis considers the relevant secondary data of Mayurbhanj District for a period of 5 years i.e. from 2003-04 to 2007-08 being collected for the season of Kharif and Rabi. The analysis has been made for Kharif (Autumn & Winter) season over a period of 5 years taking variable $Y =$ Production in quintals, $X_1 =$ Area in hectare, $X_2 =$ fertilizer consumption per hectare of gross cropped in Kgs of nutrients, $X_3 =$ Annual rainfall in mm. and also the analysis has been made for Rabi taking into consideration the above variables. It should be mentioned here that the data on fertilizer consumption have been collected in the form of total consumption of fertilizer per hectare of gross cropped area for
The Economic Development of Mayurbhanj District of Orissa

The analysis was carried out with the total consumption of fertilizer.

Table -A shows linear form for kharif season. From the analysis, it is found that intercept value \( C_0 = 80904.922 \), area \( C_1 = -454.962 \), co-efficient of fertilizer consumption \( X_2 \) \( C_2 = 11.246 \) and rainfall \( X_3 \) \( C_3 = -11.101 \). Table-B shows linear form for Rabi season, it is found that D-W statistic = 2.464 and F = 2.850. Further, it is found that the intercept value \( C_0 = 5007.695 \), HYV area \( C_1 \) \( (X_1) = -57.489 \), local area \( C_2 \) \( (X_2) = 0.235 \) and rainfall \( C_3 \) \( (X_3) = 1.323 \).

Tabulated value of F-test at 5% level of significance for (3,5) degree of freedom = 5.4095 and tabulated value of F-test at 1% level of significance for (3,5) degree of freedom = 12.060. Similarly, tabulated value of t-test at 5% level of significance = 2.776 and for 1% level of significance = 4.604, where degree of freedom. = 4.

The Table-A(Linear form) shows the analysis for Kharif season.

**Note:**
1. The value given in ( ) is the value of standard error and the value given in [ ] is the value of \( t \). statistic.
2. * represents the significant of the co-efficient at 5% level of significance.
3. ** represents the significance of the co-efficient at 1% level of significance.

The Table-B(Linear form) shows the analysis for Rabi season.

**Note:**
1. The value given in ( ) is the value of standard error and the value given in [ ] is the value of \( t \). Statistic.
2. * represents the significant of the co-efficient at 5% level of significance.
3. ** represents the significance of the co-efficient at 1% level of significance.

From the analysis table-A, it is found that F-statistics is significant both at 5% and 1% level of significance, where tabulated value is more than calculated value and \( R^2 \) is more than 0.5 for the Sabai grass crop (Kharif season). It indicates strong relationship between dependant and independent variables. Here, the t-statistic for fertilizer is significant only at 5% level of significance and the corresponding regression co-efficient is significant. Also, the corresponding standard error is significant. It is observed that only in case of fertilizer the t-statistic tabulated value is close to calculated value at 5% level of significance which shows fertilizer only provides contribution to the production of Sabai grass. The use of Durbin-Watson d-statistics shows that no auto correlation is present.

From the table-B, it is observed that that calculated F > tabulated F both at 5% and 1% level of significance. It indicates strong relationship between dependant and independent variables, which shows each variable, provides more or less contribution to the production of the Sabai grass. Here use of Durbin-Watson, d-statistics show that no autocorrelation is present.

For Kharif season fertilizer consumption have more contribution towards the
production of Sabai grass, For Rabi season it is observed that all the variables have more or less impact on production of Sabai grass in the study area. Computation of Durbin-Watson d-statistic shows that no autocorrelation is present.

**Discriminant Analysis**

Discriminant analysis is a method of distinguishing between classes of objects. The values of various attributes of an object are measured and a rule (function) is applied that assigns a classification to that object. The discriminant function arrives at coefficients, which set the highest possible ratio. The Table –C shows the Standardized Classification Discriminant Function Coefficients (As in case of Income from Sabai grass).

Discriminant analysis is useful for situations where one need to build a predictive model of group membership based on observed characteristics of each case. The procedure generates a discriminant function (or, for more than two groups, a set of discriminant functions) based on linear combinations of the predictor variables that provide the best discrimination between the groups. The functions are generated from a sample of cases for which group membership is known; the functions can then be applied to new cases with measurements for the predictor variables but unknown group membership. On average, people in family size & health play more roles for economic development in case of income from Sabai grass. A researcher wants to combine this information in a function to determine how well an individual can discriminate between the two groups.

The Table –D shows the Standardized Classification Discriminant Function Coefficients (As in case of Total Income from Sabai grass).

The procedure generates a discriminant function (or, for more than two groups, a set of discriminant functions) based on linear combinations of the predictor variables that provide the best discrimination between the groups. The functions are generated from a sample of cases for which group membership is known; the functions can then be applied to new cases with measurements for the predictor variables but unknown group membership. On average, people in family size play more roles for economic development in case of total income. The researcher found that population size and economic information are important. Discriminant analysis allows estimating coefficients of the linear discriminant function, which looks like the right-hand side of a multiple linear regression equation. (Joshi, Vidyut, Tribals Situation in India- Issues in Development).

**Conclusion**

Sabai Grass of the Mayurbhanj district of Orissa is of good quality and has been accepted widely in the Indian market. Most of the traders prefer the Ropes made out of the Sabai Grass of this region. A large number of people are involved in this cottage industry (harvesting and rope making) or as a trader sending the produce (ropes) to the urban areas, both near and distant.
Sabai Grass is a major Minor Forest Product output from the Mayurbhanj district region, and is being traditionally from time immemorial for rope making. Despite that no serious attempt has been made to attain sustainable utilization of the Sabai Grass. An effort is necessary in this direction to evolve the best strategy to develop its potential without impairing the ecological balance.

Sabai Grass has an average life-span of 10-12 years but in many cases it is found surviving up to 18-20 years. It grows well on steep slopes, foothills and uplands up to an elevation of 500 feet above the mean sea level. It thrives well in a hot and dry climate. The total harvesting area of the Mayurbhanj district is 4.47 lakh hac. of which 43.70 percent is highland with very poor water retention capacity. The highlands are generally not suitable for harvesting of crops or orchards. But they are suitable for harvesting of Sabai Grass. The agro climatic conditions obtaining in the district are also suitable for Sabai Grass production. According to general estimate the total production of sabai grass in Mayurbhanj district of the state is about 15000 to 20000 matric ton/per annum of which some 9000 to 12000 matric ton is converted into ropes and the remainder is used for other purposes. At an average/minimum price of Rs.12 per kg of ropes and Rs.8 per kg of grass the total value of the produce works to Rs.16crore per annum which is quite a significant contribution to the economy of the Mayurbhanj district.

The Mayurbhanj Sabai Processing and Marketing Co-operative Society were established at the behest of the Government of Orissa with the main objective of improving the economic well-being of Sabai grass growers in the district. ORMAS, an apex State Level Marketing Organisation was established with a mandate to
provide non-credit inputs like procurement / purchase of raw materials. District Supply and Marketing Society is engaged in market promotion and facilitating marketing of Swarnajayanti Gram Swarojgar Yojna (SGSY) and Self Help Group (SHG) products. Due to changes in professional status it has impact on the income. It is also found that changes in age, family size and education do not change the total income in same direction. The land holding and transportation are important factor and have significant contribution to increase total income and economic development of the district.

**Table I:** Analysis of Variance (ANOVA) for the factors in case of Income from Sabai grass.

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Sum of Square</th>
<th>Degree of Freedom</th>
<th>Mean Square</th>
<th>F-statistic (Calculated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Row</td>
<td>4035.4979</td>
<td>209</td>
<td>19.3134</td>
<td>1.1322</td>
</tr>
<tr>
<td>Between Row &amp; Column</td>
<td>49851.5556</td>
<td>1680</td>
<td>29.5735</td>
<td>1.7336</td>
</tr>
<tr>
<td>Between Column</td>
<td>21329.2392</td>
<td>8</td>
<td>2666.1549</td>
<td>156.2920**</td>
</tr>
<tr>
<td>Residual (error)</td>
<td>28522.3164</td>
<td>1672</td>
<td>17.0588</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>53888.0534</td>
<td>1889</td>
<td>28.5273</td>
<td></td>
</tr>
</tbody>
</table>

**Table II:** Analysis of Variance (ANOVA) for the factors in case of Total Income.

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Sum of Square</th>
<th>Degree of Freedom</th>
<th>Mean Square</th>
<th>F-statistic (Calculated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Row</td>
<td>4102.3328</td>
<td>209</td>
<td>19.6284</td>
<td>1.1505</td>
</tr>
<tr>
<td>Between Row &amp; Column</td>
<td>49554.0000</td>
<td>1680</td>
<td>29.4964</td>
<td>1.7289</td>
</tr>
<tr>
<td>Between Column</td>
<td>21027.8042</td>
<td>8</td>
<td>2628.4755</td>
<td>154.0623</td>
</tr>
<tr>
<td>Residual (error)</td>
<td>28526.1958</td>
<td>1672</td>
<td>17.0611</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>53656.3328</td>
<td>1889</td>
<td>28.4046</td>
<td></td>
</tr>
</tbody>
</table>

**Table A:** (Linear Form) For Kharif Season.

<table>
<thead>
<tr>
<th>Crop  (Sabai grass)</th>
<th>Intercept ( C_0 )</th>
<th>( C_1 )</th>
<th>( C_2 )</th>
<th>( C_3 )</th>
<th>( R^2 )</th>
<th>Adj ( R^2 )</th>
<th>D-W statistic</th>
<th>F-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kharif</td>
<td>80904.922 (14254.836)</td>
<td>-454.962 (121.907)</td>
<td>11.246 (3.839)</td>
<td>-11.101 (3.847)</td>
<td>0.968</td>
<td>0.870</td>
<td>3.181</td>
<td>9.939</td>
</tr>
</tbody>
</table>
Table B: (Linear Form) For Rabi Season.

<table>
<thead>
<tr>
<th>Crop (Sabai grass)</th>
<th>Intercept 'C0'</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>R²</th>
<th>Adj R²</th>
<th>D-W statistic</th>
<th>F-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabi</td>
<td>5007.695</td>
<td>-57.489</td>
<td>0.235</td>
<td>1.323</td>
<td>0.895</td>
<td>0.581</td>
<td>2.464</td>
<td>2.850</td>
</tr>
<tr>
<td></td>
<td>(1995.389)</td>
<td>(72.387)</td>
<td>(1.124)</td>
<td>(0.651)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[2.510]</td>
<td>[-0.794]</td>
<td>[0.209]</td>
<td>[2.032]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table C: Standardized Classification Discriminant Function Coefficients.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Income from Sabai Grass</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sale</td>
<td>1.960</td>
<td>1.994</td>
<td>2.336</td>
<td>2.739</td>
<td>2.724</td>
<td></td>
</tr>
<tr>
<td>Market Trend</td>
<td>5.741</td>
<td>5.139</td>
<td>5.033</td>
<td>5.005</td>
<td>5.168</td>
<td></td>
</tr>
<tr>
<td>Land Holding</td>
<td>0.357</td>
<td>0.283</td>
<td>0.250</td>
<td>0.183</td>
<td>0.198</td>
<td></td>
</tr>
<tr>
<td>Transportation</td>
<td>0.052</td>
<td>0.080</td>
<td>0.150</td>
<td>0.143</td>
<td>0.158</td>
<td></td>
</tr>
<tr>
<td>AGE</td>
<td>2.974</td>
<td>3.048</td>
<td>3.121</td>
<td>2.428</td>
<td>2.201</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>-0.363</td>
<td>-0.523</td>
<td>-0.478</td>
<td>-0.478</td>
<td>-0.498</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-55.217</td>
<td>-52.905</td>
<td>-47.792</td>
<td>-43.667</td>
<td>-43.881</td>
<td></td>
</tr>
</tbody>
</table>

Table D: [In case of Income from Sabai grass] Standardized Classification Discriminant Function Coefficients [In case of Total Income].

<table>
<thead>
<tr>
<th>Factors</th>
<th>Total Income</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sale</td>
<td>2.508</td>
<td>2.579</td>
<td>2.715</td>
<td>2.270</td>
<td>2.846</td>
<td></td>
</tr>
<tr>
<td>Land Holding</td>
<td>-0.029</td>
<td>-0.097</td>
<td>-0.007</td>
<td>0.125</td>
<td>0.097</td>
<td></td>
</tr>
<tr>
<td>Transportation</td>
<td>0.096</td>
<td>0.158</td>
<td>0.173</td>
<td>0.142</td>
<td>0.184</td>
<td></td>
</tr>
<tr>
<td>AGE</td>
<td>2.245</td>
<td>2.675</td>
<td>2.671</td>
<td>3.413</td>
<td>2.445</td>
<td></td>
</tr>
<tr>
<td>Family Size</td>
<td>10.375</td>
<td>11.022</td>
<td>11.054</td>
<td>11.952</td>
<td>10.312</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>-0.342</td>
<td>-0.414</td>
<td>-0.490</td>
<td>-0.334</td>
<td>-0.455</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-53.604</td>
<td>-55.584</td>
<td>-50.302</td>
<td>-51.096</td>
<td>-43.702</td>
<td></td>
</tr>
</tbody>
</table>
Reference


